CX1145

Maintenance Manual

11111A

Trademarks

- The official name of Windows 95 is Microsoft Windows 95 Operating System.
- The official name of Windows 98 is Microsoft Windows 98 Operating System.
- The official name of Windows Me is Microsoft Windows Millennium Edition Operating System.
- The official name of Windows 2000 is Microsoft Windows 2000 Operating System.
- The official name of Windows XP is Microsoft Windows XP Operating System.
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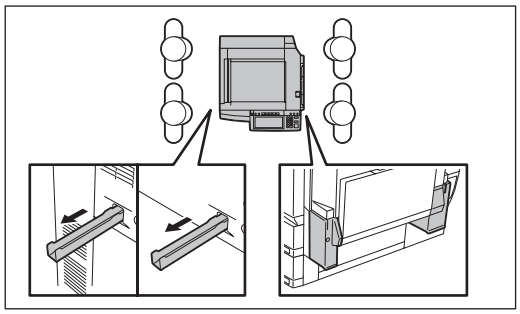
08/04

GENERAL PRECAUTIONS REGARDING THE SERVICE FOR e-STUDIO281c/351c/451c

The installation and service should be done by a qualified service technician.

1) **Transportation/Installation**
   - When transporting/installing the equipment, employ four persons and be sure to hold the positions as shown in the figure.
     The equipment is quite heavy and weighs approximately 113 kg (249 lb), therefore pay full attention when handling it.



   - Be sure not to hold the movable parts or units (e.g. the control panel, ADU or RADF) when transporting the equipment.
   - Be sure to use a dedicated outlet with AC 110 V / 13.2 A, 115 V or 127 V / 12 A, 220-240 V or 240 V / 8 A for its power source.
   - The equipment must be grounded for safety.
   - Select a suitable place for installation. Avoid excessive heat, high humidity, dust, vibration and direct sunlight.
   - Provide proper ventilation since the equipment emits a slight amount of ozone.
   - To insure adequate working space for the copying operation, keep a minimum clearance of 80 cm (32”) on the left, 80 cm (32”) on the right and 10 cm (4”) on the rear.
   - The equipment shall be installed near the socket outlet and shall be accessible.
   - Be sure to fix and plug in the power cable securely after the installation so that no one trips over it.

2) **General Precautions at Service**

- Be sure to turn the power OFF and unplug the power cable during service (except for the service should be done with the power turned ON).
- Unplug the power cable and clean the area around the prongs of the plug and socket outlet once a year or more. A fire may occur when dust lies on this area.
- When the parts are disassembled, reassembly is the reverse of disassembly unless otherwise noted in this manual or other related documents. Be careful not to install small parts such as screws, washers, pins, E-rings, star washers in the wrong places.
- Basically, the equipment should not be operated with any parts removed or disassembled.
- The PC board must be stored in an anti-electrostatic bag and handled carefully using a wristband since the ICs on it may be damaged due to static electricity.

  Caution: Before using the wristband, unplug the power cable of the equipment and make sure that there are no charged objects which are not insulated in the vicinity.

- Avoid expose to laser beam during service. This equipment uses a laser diode. Be sure not to expose your eyes to the laser beam. Do not insert reflecting parts or tools such as a screwdriver on the laser beam path. Remove all reflecting metals such as watches, rings, etc. before starting service.
- Be sure not to touch high-temperature sections such as the exposure lamp, fuser unit, damp heater and areas around them.
- Be sure not to touch high-voltage sections such as the chargers, transfer belt, 2nd transfer roller, developer, IH control circuit, high-voltage transformer, exposure lamp control inverter, inverter for the LCD backlight and power supply unit. Especially, the board of these components should not be touched since the electric charge may remain in the capacitors, etc. on them even after the power is turned OFF.
- Make sure that the equipment will not operate before touching potentially dangerous places (e.g. rotating/operating sections such as gears, belts pulleys, fans and laser beam exit of the laser optical unit).
- Be careful when removing the covers since there might be the parts with very sharp edges underneath.
- When servicing the equipment with the power turned ON, be sure not to touch live sections and rotating/operating sections. Avoid exposing your eyes to laser beam.
- Use designated jigs and tools.
- Use recommended measuring instruments or equivalents.
- Return the equipment to the original state and check the operation when the service is finished.
- Be very careful to treat the touch panel gently and never hit it. Breaking the surface could cause malfunctions.

3) **Important Service Parts for Safety**

- The breaker, door switch, fuse, thermostat, thermofuse, thermistor, batteries, IC-RAMs including lithium batteries, etc. are particularly important for safety. Be sure to handle/install them properly. If these parts are short-circuited and their functions become ineffective, they may result in fatal accidents such as burnout. Do not allow a short-circuit or do not use the parts not recommended by Toshiba TEC Corporation.

4) **Cautionary Labels**

- During servicing, be sure to check the rating plate and cautionary labels such as “Unplug the power cable during service”, “CAUTION. HOT”, “CAUTION. HIGH VOLTAGE”, “CAUTION. LASER BEAM”, etc. to see if there is any dirt on their surface and if they are properly stuck to the equipment.

5) **Disposal of the Equipment, Supplies, Packing Materials, Used Batteries and IC-RAMs**

- Regarding the recovery and disposal of the equipment, supplies, packing materials, used batteries and IC-RAMs including lithium batteries, follow the relevant local regulations or rules.

Caution:
Dispose of used batteries and IC-RAMs including lithium batteries according to this manual.
Attention:
Se débarrasser de batteries et IC-RAMs usés y compris les batteries en lithium selon ce manuel.
Vorsicht:
Entsorgung der gebrauchten Batterien und IC-RAMs (inclusive der Lithium-Batterie) nach diesem Handbuch.

CONTENTS

1. SPECIFICATIONS/ACCESSORIES/OPTIONS/SUPPLIES

1.1 Specifications

•Copy process ..... Indirect electrophotographic process (dry)
•Type..... Desktop type (Console type: when optional Paper Feed Pedestal (PFP) or optional Large Capacity Feeder (LCF) is installed.)
•Original table ..... Fixed type (the left rear corner used as guide to place originals)
•Accepted originals..... Original type: Sheets, books and 3-dimensional objects
Note that when the optional Reversing Automatic Document Feeder is used, carbon, bounded or stapled originals cannot be accepted, and paper type of the original should be 35-157g/m^2 (9.3 lb. Bond -58 lb. Cover) for single-sided copy and 50-157 g/m^2 (13.3 lb. Bond -58 lb. Cover) for double-sided copy.
Maximum size: A3/LD

- Copy speed (Copies/min.)

e-STUDIO281c

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	28 (11)	28 (11)	16 (5)	28 (11)	28 (11)
B5, A5-R, ST-R					-
A4-R, B5-R, LT-R	21 (5)	21 (5)	16 (5)	21 (5)	-
B4, LG	18 (5)	18 (5)	16 (5)	18 (5)	-
A3, LD	16 (5)	16 (5)	16 (5)	16 (5)	-

e-STUDIO351c

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	35 (11)	35 (11)	21 (5)	35 (11)	35 (11)
B5, A5-R, ST-R					-
A4-R, B5-R, LT-R	28 (5)	28 (5)	21 (5)	28 (5)	-
B4, LG	24 (5)	24 (5)	21 (5)	24 (5)	-
A3, LD	21 (5)	21 (5)	21 (5)	21 (5)	-

e-STUDIO451c

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	45 (11)	45 (11)	22 (5)	45 (11)	45 (11)
B5, A5-R, ST-R					-
A4-R, B5-R, LT-R	32 (5)	32 (5)	22 (5)	32 (5)	-
B4, LG	26 (5)	26 (5)	22 (5)	26 (5)	-
A3, LD	22 (5)	22 (5)	22 (5)	22 (5)	-

* "-" means "Not acceptable".
* When originals are manually placed for single-sided, continuous copying.
* Plain paper is selected for the paper type.
* When the Reversing Automatic Document Feeder is used, copying in the speed of 28, 35 and 45 sheets per minute are only possible under the following conditions:

- Original: A4 or LT (single-sided)
- Mode: APS and Automatic density not selected, Plain paper mode
- Number of copies:
  Black mode: 28 sheets or more (e-STUDIO281c), 35 sheets or more (e-STUDIO351c), 45 sheets or more (e-STUDIO451c)
  Color mode: 11 sheets or more
- Reproduction ratio: 100%

* The values in ( ) can be realized in the color mode.

Thick paper / OHP
e-STUDIO281c

Thick1 (81 g/m^2 to 105 g/m^2, 21 lb. Bond to 28 lb. Bond)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	28 (11)	28 (11)	16 (5)	28 (11)	28 (11)
B5, A5-R, ST-R					-
A4-R, B5-R, LT-R	20 (5)	20 (5)	16 (5)	20 (5)	-
B4, LG	18 (5)	18 (5)	16 (5)	18 (5)	-
A3, LD	16 (5)	16 (5)	16 (5)	16 (5)	-

Thick2 (106 g/m^2 to 163 g/m^2, 29 lb. Bond to 90 lb. Index)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT, B5, A5-R, ST-R	-	20 (6)	10 (2)	-	-
A4-R, B5-R, LT-R	-	14 (3)	10 (2)	-	-
B4, LG	-	11 (3)	10 (2)	-	-
A3, LD	-	10 (2)	10 (2)	-	-

Thick3 (164 g/m^2 to 209 g/m^2, 91 lb. Index to 110 lb. Index)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT, B5, A5-R, ST-R	-	20 (2)	10 (2)	-	-
A4-R, B5-R, LT-R	-	14 (2)	10 (2)	-	-
B4, LG	-	11 (2)	10 (2)	-	-
A3, LD	-	10 (2)	10 (2)	-	-

OHP

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	-	10 (3)	-	-	-

e-STUDIO351c

Thick1 (81 g/m^2 to 105 g/m^2, 21 lb. Bond to 28 lb. Bond)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	30 (11)	30 (11)	16 (5)	30 (11)	30 (11)
B5, A5-R, ST-R					-
A4-R, B5-R, LT-R	23 (5)	23 (5)	16 (5)	23 (5)	-
B4, LG	19 (5)	19 (5)	16 (5)	19 (5)	-
A3, LD	16 (5)	16 (5)	16 (5)	16 (5)	-

Thick2 (106 g/m^2 to 163 g/m^2, 29 lb. Bond to 90 lb. Index)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT, B5, A5-R, ST-R	-	20 (6)	10 (2)	-	-
A4-R, B5-R, LT-R	-	14 (3)	10 (2)	-	-
B4, LG	-	11 (3)	10 (2)	-	-
A3, LD	-	10 (2)	10 (2)	-	-

Thick3 (164 g/m^2 to 209 g/m^2, 91 lb. Index to 110 lb. Index)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT, B5, A5-R, ST-R	-	20 (2)	10 (2)	-	-
A4-R, B5-R, LT-R	-	14 (2)	10 (2)	-	-
B4, LG	-	11 (2)	10 (2)	-	-
A3, LD	-	10 (2)	10 (2)	-	-

OHP

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	-	10 (3)	-	-	-

e-STUDIO451c

Thick1 (81 g/m^2 to 105 g/m^2, 21 lb. Bond to 28 lb. Bond)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	30 (11)	30 (11)	16 (5)	30 (11)	30 (11)
B5, A5-R, ST-R					-
A4-R, B5-R, LT-R	23 (5)	23 (5)	16 (5)	23 (5)	-
B4, LG	19 (5)	19 (5)	16 (5)	19 (5)	-
A3, LD	16 (5)	16 (5)	16 (5)	16 (5)	-

Thick2 (106 g/m^2 to 163 g/m^2, 29 lb. Bond to 90 lb. Index)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT, B5, A5-R, ST-R	-	20 (6)	10 (2)	-	-
A4-R, B5-R, LT-R	-	14 (3)	10 (2)	-	-
B4, LG	-	11 (3)	10 (2)	-	-
A3, LD	-	10 (2)	10 (2)	-	-

Thick3 (164 g/m^2 to 209 g/m^2, 91 lb. Index to 110 lb. Index)

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT, B5, A5-R, ST-R	-	20 (2)	10 (2)	-	-
A4-R, B5-R, LT-R	-	14 (2)	10 (2)	-	-
B4, LG	-	11 (2)	10 (2)	-	-
A3, LD	-	10 (2)	10 (2)	-	-

OHP

Paper supply / Paper size	Drawer	Bypass feed		PFP	LCF (A4/LT only)
		Size specified	Size not specified		
A4, LT	-	10 (3)	-	-	-

* "-" means "Not acceptable".
* When originals are manually placed for single side, continuous copying.
* The bypass copying speed is measured with the paper size specified.
* The values in ( ) can be realized in the color mode.

* System copy speed

Copy mode		Sec.		
		e-STUDIO281c	e-STUDIO351c	e-STUDIO451c
Single-sided originals ↓ Single-sided copies	1 set	31.26 (71.97)	28.15 (71.97)	24.99 (71.97)
	3 sets	74.07 (182.19)	61.02 (182.19)	50.03 (182.19)
	5 sets	116.64 (289.94)	95.19 (289.94)	76.63 (289.94)
Single-sided originals ↓ Double-sided copies	1 set	32.61 (81.63)	29.65 (81.63)	28.49 (81.63)
	3 sets	74.69 (189.38)	64.92 (189.38)	60.76 (189.38)
	5 sets	117.45 (299.04)	101.75 (299.04)	92.2 (299.04)
Double-sided originals ↓ Double-sided copies	1 set	64.24 (138.12)	63.54 (138.12)	63.01 (138.12)
	3 sets	150.73 (355.91)	134.25 (355.91)	126.36 (355.91)
	5 sets	234.59 (574.51)	205.69 (574.51)	189.67 (574.51)
Double-sided originals ↓ Single-sided copies	1 set	58.85 (128.31)	58.76 (128.31)	58.09 (128.31)
	3 sets	143.68 (347.08)	126.57 (347.08)	110.94 (347.08)
	5 sets	228.58 (565.02)	194.49 (565.02)	165.19 (565.02)

* Shows the period of time from when the [START] button is pressed until the message "Ready" is displayed. (10 sheets of A4/LT size original are set on the RADF and one of the copy modes above is selected.)
* Setting: when in the Text/Photo mode with Automatic density and APS/AMS set to OFF, or when in the sort mode with paper fed from the upper drawer.
* The Saddle Stitch Finisher and hole punch unit not installed.
* The values in ( ) are the speeds of when in the color mode.

• Copy paper

	Drawer	ADU	PFP	LCF	Bypass copy	Remarks
Size	A3 to A5-R, LD to ST-R, 13" LG, 8.5"SQ			A4, LT	A3 to A6-R, LD to ST-R, 13" LG, 8.5"SQ, 305 x 457 mm (12" x 18") (Non-standard or userspecified sizes can be set.)	
Weight	64 to 105 g/m^2 17 to 28 lb. Bond				64 to 209 g/m^2, 17 lb. Bond to 110 lb. Index (Continuous feeding) 64 to 209 g/m^2, 17 lb. Bond to 110 lb. Index (Single paper feeding)	
Special paper	-				Labels, OHP film (thickness: 80µm or thicker)	Special paper recommended by Toshiba Tec

•First copy time ..... Approx. 6.8 sec. or less (black), approx. 16.2 sec. or less (color)
(A4/LT, upper drawer, 100%, original placed manually)
•Warming-up time ..... Approx. 40 sec. (Stand-alone, temperature: 20°C)
•Multiple copying..... Up to 999 copies; Key in set numbers
•Reproduction ratio ..... Actual ratio: 100±0.5%
Zooming: 25 to 400% in increments of 1%
(25 to 200% when using RADF)
•Resolution/Gradation..... Scanning: 600 dpi x 600 dpi
Printing: Equivalent to 2400 dpi x 600 dpi (black)
Equivalent to 600 dpi x 600 dpi (color)

•Eliminated portion..... Leading edges: 3.0±2.0 mm, Side/trailing edges: 2.0±2.0 mm (black copy)
Leading edges: 5.0±2.0 mm, Side/trailing edges: 2.0±2.0 mm (color copy)
Leading / trailing edges: 5.0±2.0 mm, Side edges: 5.0±2.0 mm (black / color print)

•Paper feeding ..... Standard drawers:
2 drawers (stack height 60.5 mm, equivalent to 550 sheets; 64 to 80 g/m^2 (17 to 22 lb. Bond))
PFP:
Option (One drawer or two: stack height 60.5 mm, equivalent to 550 sheets; 64 to 80 g/m^2 (17 to 22 lb. Bond))
LCF:
Option (Stack height 137.5 mm x 2: equivalent to 2500 sheets; 64 to 80 g/m^2 (17 to 22 lb. Bond))
Bypass feeding:
Stack height 11 mm: equivalent to 100 sheets; 64 to 80 g/m^2 (17 to 22 lb. Bond)

•Capacity of originals in the reversing automatic document feeder (Option)
..... A3 to A5-R, LD to ST-R:
100 sheets / 80 g/m^2 (Stack height 16 mm or less)

•Automatic duplexing unit ..... Stackless, Switchback type

•Toner supply ..... Automatic toner density detection/supply
Toner cartridge replacing method

•Density control..... Automatic density mode and manual density mode selectable in 11 steps

•Weight ..... Approximately 113 kg (249 lb.)

•Power requirements ..... AC 110 V / 13.2 A, 115 V or 127 V / 12 A
220-240 V or 240 V / 8 A (50/60 Hz)

* The acceptable value of each voltage is ±10%.

•Power consumption..... 1.5 kW or less (100 V series), 17 kW or less (200 V series)

* The electric power is supplied to the RADF, Finisher, PFP and LCF through the equipment.

•Total counter..... Electronical counter

•Dimensions of the equipment..... See the figure below (W 660 x D 758 x H 739 (mm))

* When the tilt angle of the control panel is 45 degrees.

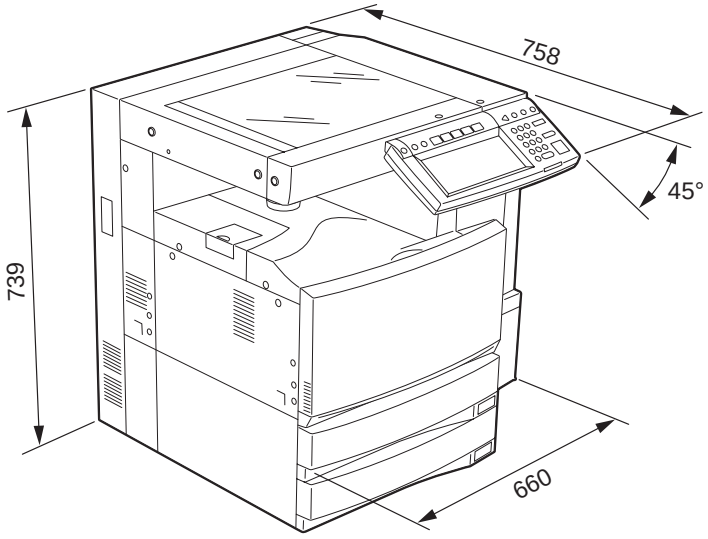


Fig. 1-1

1.2 Accessories

Unpacking/Setup instruction	1 set
Operator’s manual	4 pcs. (except for MJD and ASU)
Operator's manual pocket	1 pc.
Power cable	1 pc.
Warranty sheet	1 pc. (for NAD)
Setup report	1 set (for NAD, MJD and CND)
PM sticker	1 pc. (for MJD)
Drum (installed inside of the equipment)	1 pc.
Control panel stopper	1 pc.
Color developer holder	6 pc.
Rubber plug	4 pcs.
Blind seal (small / large)	3 pcs. /1 pc.
CD-ROM	3 pcs.
Developer material (Y, M, C, K)	1 pc. each (for CND)
Screw M4 x 8	1 pc.
Guide	1 pc.
Approval sheet	1 set (for CND)
Toner cartridge (Y, M, C, K)	1 pc. each (for CND)
Platen cover	1 pc. (for CND)

* Machine version

NAD:	North America
MJD:	Europe
AUD:	Australia
ASD:	Asia, Argentine
TWD:	Taiwan
SAD	Saudi Arabia
ASU	Saudi Arabia, Asia
CND	China
KRD	Korea
JPD:	Japan

1.3 Options

Platen cover	KA-3511PC / -C
Reversing Automatic Document Feeder (RADF)	MR-3018
Drawer module	MY-1021 / -C
Paper Feed Pedestal (PFP)	KD-1011 / -C
Large Capacity Feeder (LCF)	KD-1012 A4/LT / A4-C
Hanging Finisher	MJ-1022 / -C
Finisher	MJ-1023 / -C MJ-1101
Saddle Stitch Finisher	MJ-1024 / -C
Hole punch unit	MJ-6004 N/E/F/S / E-C (for MJ-1023/1024) MJ-6101 N/E/F/S (for MJ-1101)
Staple cartridge	STAPLE-1600 (for MJ-1022) STAPLE-2000 (for MJ-1023/1024) STAPLE-600 (for saddle stitcher of MJ-1024) STAPLE-2400 (for MJ-1101)
Bridge kit	KN-3511 / -C
Work table	KK-3511 / -C
Damp heater kit	MF-3511U/E
FAX unit	GD-1200 NA/AU/AS/EU/C/TW
2nd line for fax unit	GD-1160 NA/EU-N/C/TW
128 MB Expansion memory	GC-1181
512 MB Expansion memory	GC-1230
Wireless LAN module	GN-1040/1041
PCI slot	GO-1060
Scrambler board	GP-1040
Bluetooth module	GN-2010
Antenna	GN-3010
Parallel interface kit	GF-1140
Data overwrite kit	GP-1060
e-BRIDGE ID Gate (HID iClass)	KP-2004
e-BRIDGE ID Gate (MIFARE)	KP-2005
Desk	MH-1700
Harness kit for coin controller	GQ-1020

Notes:

1. The bridge kit (KN-3511) is necessary for installation of the finisher (MJ-1022, MJ-1023, MJ-1024 or MJ-1101).
2. The finisher (MJ-1023 or MJ-1024) is necessary for installation of the hole punch unit (MJ-6004N/E/F/S).
3. The finisher (MJ-1101) is necessary for installation of the hole punch unit (MJ-6101N/E/F/S).
4. The PCI slot (GO-1060) is necessary for the installation of the scrambler board (GP-1040) and the parallel interface kit (GF-1140).
5. The antenna (GN-3010) is necessary to enable the wireless LAN module (GN-1040/1041) and the bluetooth module (GN-2010).
6. Up to 1 antenna (GN-3010) can be connected to the wireless LAN module (GN-1040/1041).
7. When the wireless LAN module (GN-1040/1041) and the bluetooth module (GN-2010) are installed together, only 1 antenna (GN-3010) can be connected to each.

1.4 Supplies

Drum	OD-3511N	
Toner bag	PS-TB-281C/ C-E/ C-C	
Developer (K)	D-3511-K	
Developer (Y)	D-281C-Y	
Developer (M)	D-281C-M	
Developer (C)	D-281C-C	
Toner cartridge (K)	PS-ZT281C-K(4)	NAD
	PS-ZT281C-EK(1)	MJD
	PS-ZT3511DK	Others
	PS-ZT3511TK	TWD
	PS-ZT3511CK	CND
Toner cartridge (Y)	PS-ZT281C-Y(4)	NAD
	PS-ZT281C-EY(1)	MJD
	PS-ZT3511DY	Others
	PS-ZT3511TY	TWD
	PS-ZT3511CY	CND
Toner cartridge (M)	PS-ZT281C-M(4)	NAD
	PS-ZT281C-EM(1)	MJD
	PS-ZT3511DM	Others
	PS-ZT3511TM	TWD
	PS-ZT3511CM	CND
Toner cartridge (C)	PS-ZT281C-C(4)	NAD
	PS-ZT281C-EC(1)	MJD
	PS-ZT3511DC	Others
	PS-ZT3511TC	TWD
	PS-ZT3511CC	CND

1.5 System List

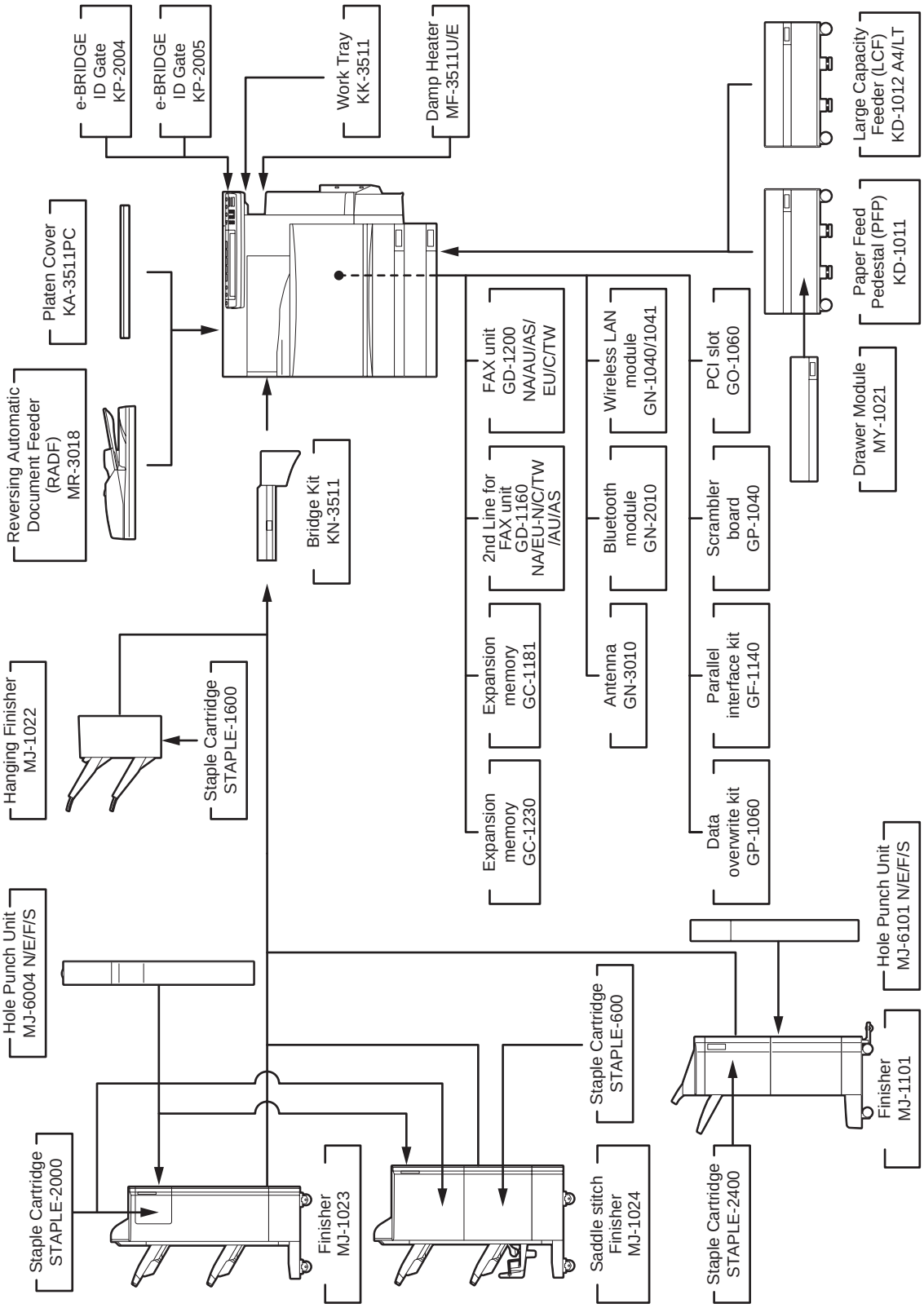


Fig. 1-2

2. OUTLINE OF THE MACHINE

2.1 Sectional View

[A] Front side view

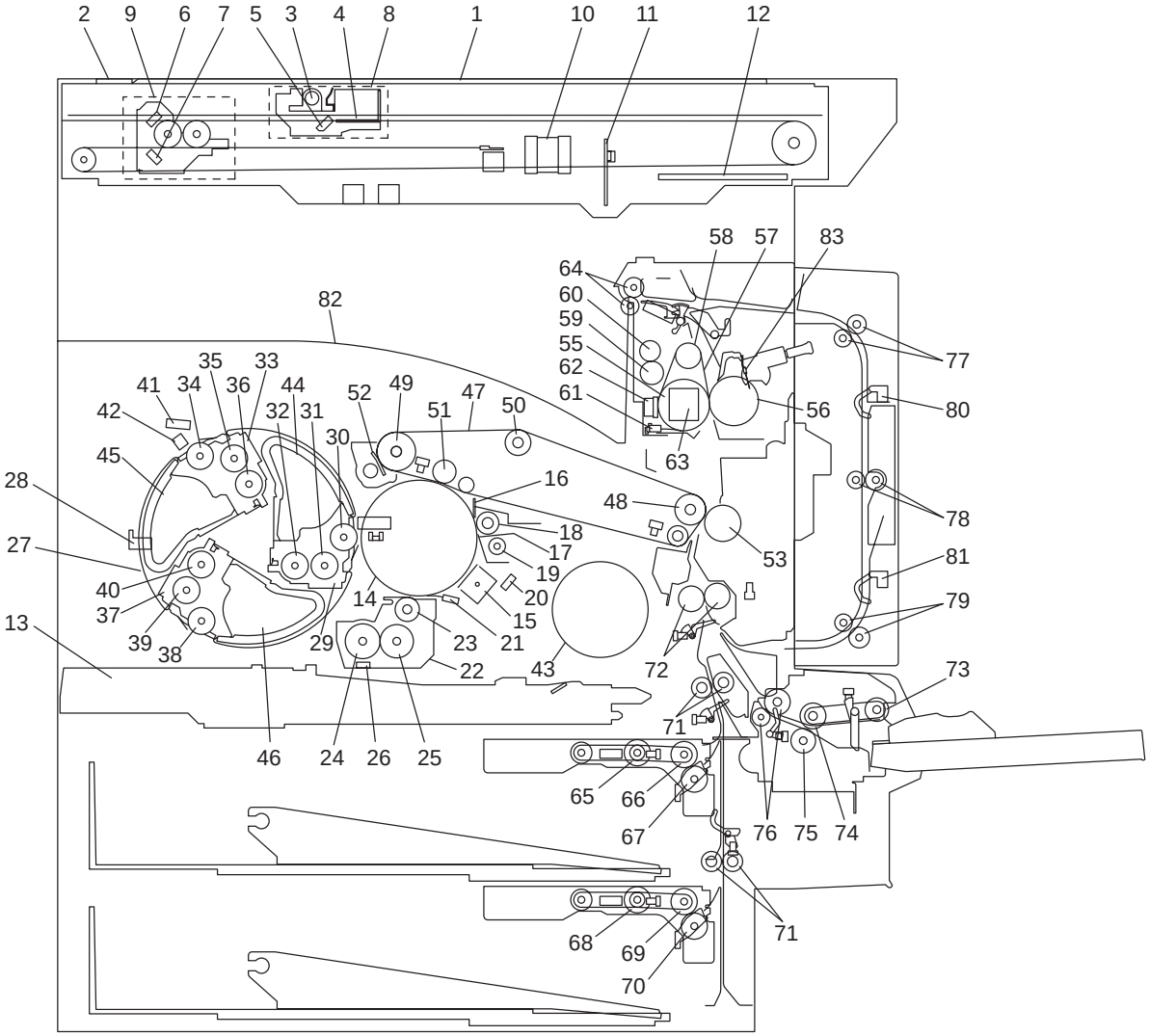


Fig. 2-1

1	Original glass	42	Color toner cartridge sensor
2	RADF original glass	43	Black toner cartridge
3	Exposure lamp	44	Color toner cartridge C
4	Inverter board	45	Color toner cartridge M
5	Mirror-1	46	Color toner cartridge Y
6	Mirror-2	47	Transfer belt
7	Mirror-3	48	2nd transfer facing roller
8	Carriage-1	49	Transfer belt drive roller
9	Carriage-2	50	Transfer belt tension roller
10	Lens	51	1st transfer roller
11	CCD board	52	Transfer belt cleaning blade
12	SLG board	53	2nd transfer roller
13	Laser unit	55	Fuser roller
14	Photoconductive drum	56	Pressure roller
15	Main charger	57	Fuser belt
16	Recovery blade	58	Separation roller
17	Drum cleaning blade	59	Oil roller
18	Drum cleaner brush	60	Cleaning roller
19	Toner recovery auger	61	Thermistor
20	Discharge LED	62	Thermostat
21	Drum thermistor	63	IH coil
22	Black developer unit	64	Exit roller
23	Developer sleeve K	65	Upper drawer pickup roller
24	Mixer-1 (K)	66	Upper drawer feed roller
25	Mixer-2 (K)	67	Upper drawer separation roller
26	Black auto-toner sensor	68	Lower drawer pickup roller
27	Revolver unit	69	Lower drawer feed roller
28	Revolver home position sensor	70	Lower drawer separation roller
29	Developer unit C	71	Transport roller
30	Developer sleeve C	72	Registration roller
31	Mixer-F (C)	73	Bypass pickup roller
32	Mixer-R (C)	74	Bypass feed roller
33	Developer unit M	75	Bypass separation roller
34	Developer sleeve M	76	Bypass transport roller
35	Mixer-F (M)	77	ADU upper transport roller
36	Mixer-R (M)	78	ADU middle transport roller
37	Developer unit Y	79	ADU lower transport roller
38	Developer sleeve Y	80	ADU entrance sensor
39	Mixer-F (Y)	81	ADU exit sensor
40	Mixer-R (Y)	82	Receiving tray
41	Color auto-toner sensor	83	Pressure roller discharge brush

[B] Rear side view (Drive system)

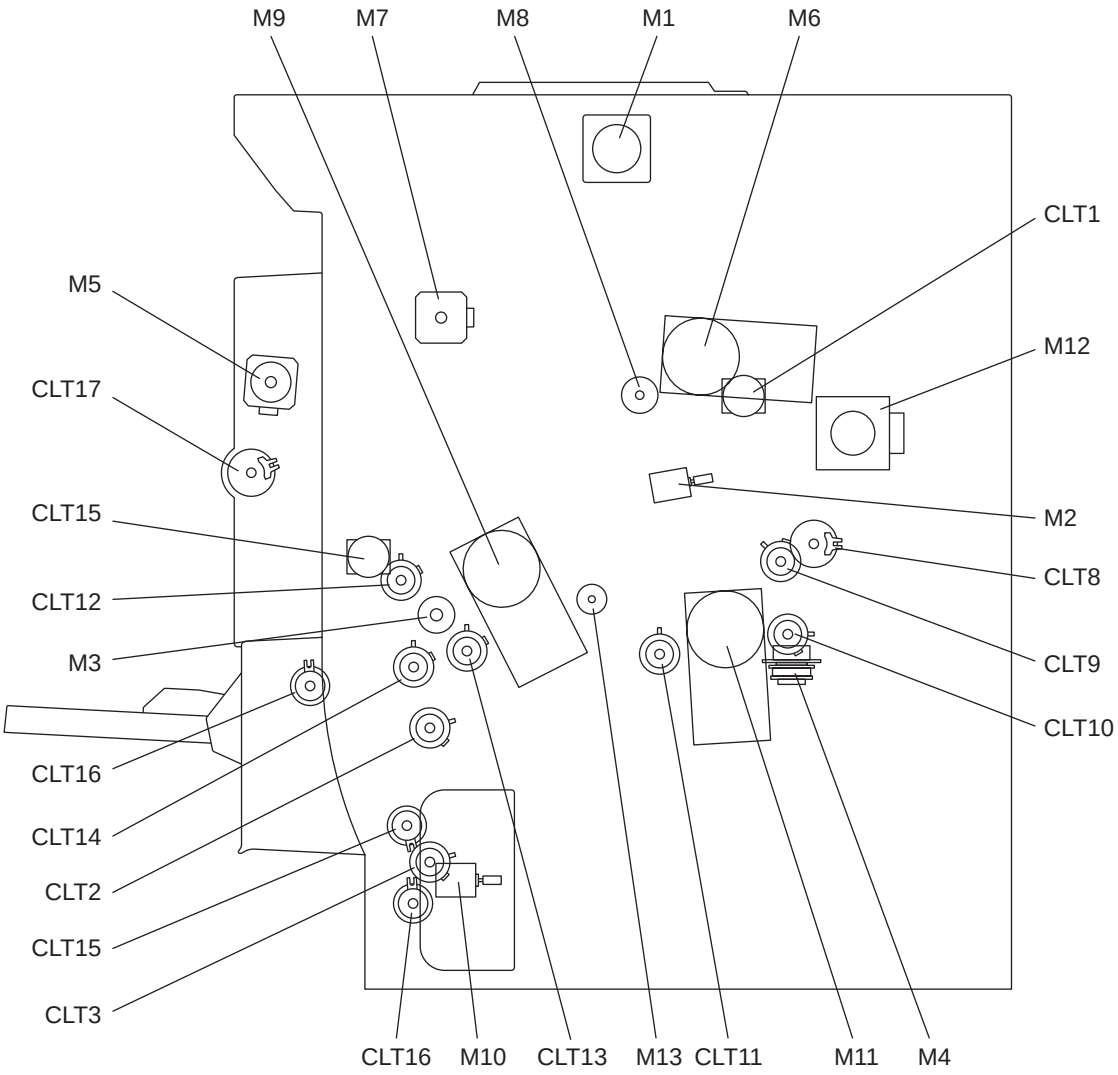


Fig. 2-2

M1	Scan motor
M2	Transfer belt cleaner auger motor
M3	Toner motor
M4	Polygonal motor
M5	ADU motor
M6	Main motor
M7	Exit motor
M8	Drum cleaner brush motor
M9	Transport motor
M10	Tray-up motor
M11	Developer motor
M12	Revolver motor
M13	Charger cleaner motor
CLT1	Transfer belt cleaner clutch
CLT2	Upper drawer feed clutch
CLT3	Lower drawer feed clutch
CLT5	2nd transfer roller contact clutch
CLT6	Bypass feed clutch
CLT7	ADU clutch
CLT8	Color developer toner supply clutch
CLT9	Color developer drive clutch
CLT10	Black developer drive clutch
CLT11	Black developer lifting clutch
CLT12	Registration clutch
CLT13	Upper transport clutch (Low speed)
CLT14	Upper transport clutch (High speed)
CLT15	Lower transport clutch (Low speed)
CLT16	Lower transport clutch (High speed)

2.2 Electric Parts Layout

[A] Unit construction

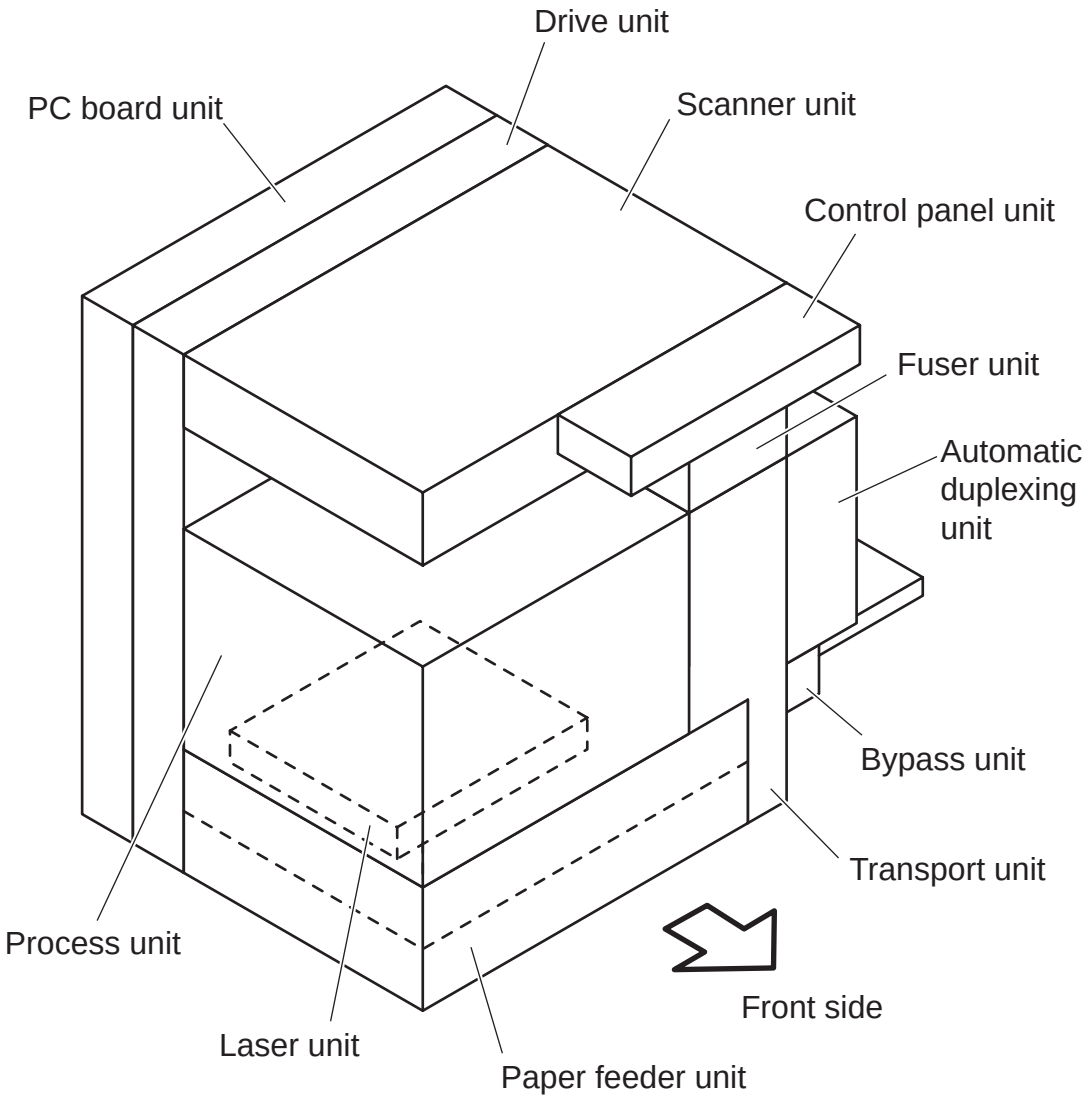


Fig. 2-3

[B] Scanner unit

[B-1] Motor, sensor, lamp

A4 series

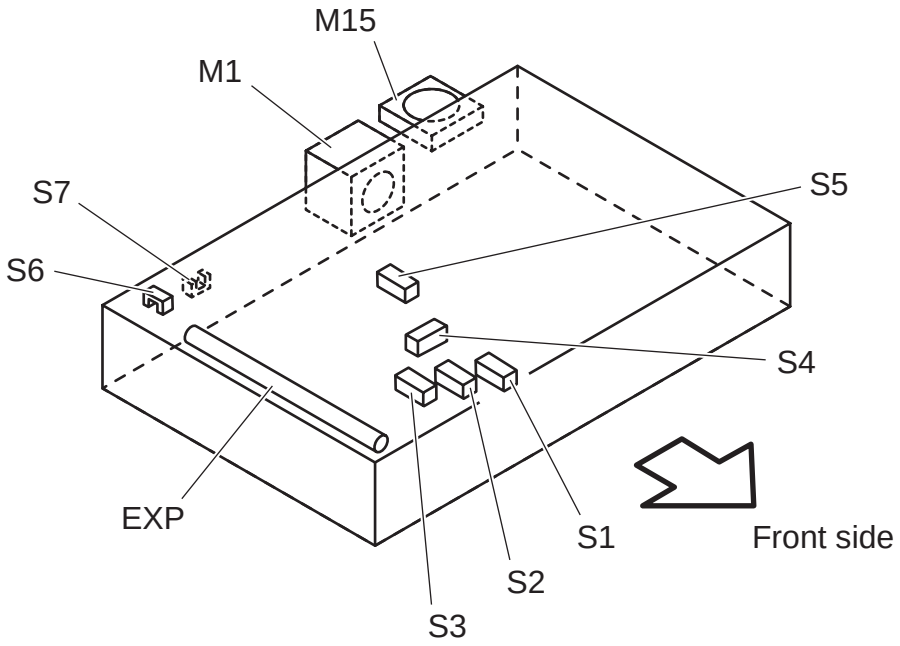


Fig. 2-4

LT series

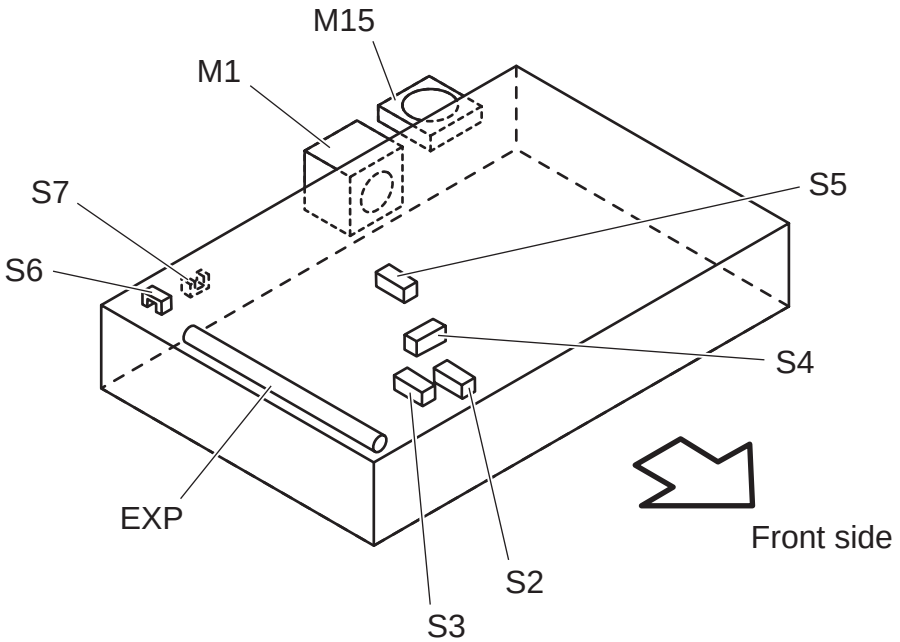


Fig. 2-5

[B-2] Switch, PC board, heater, thermostat, other part

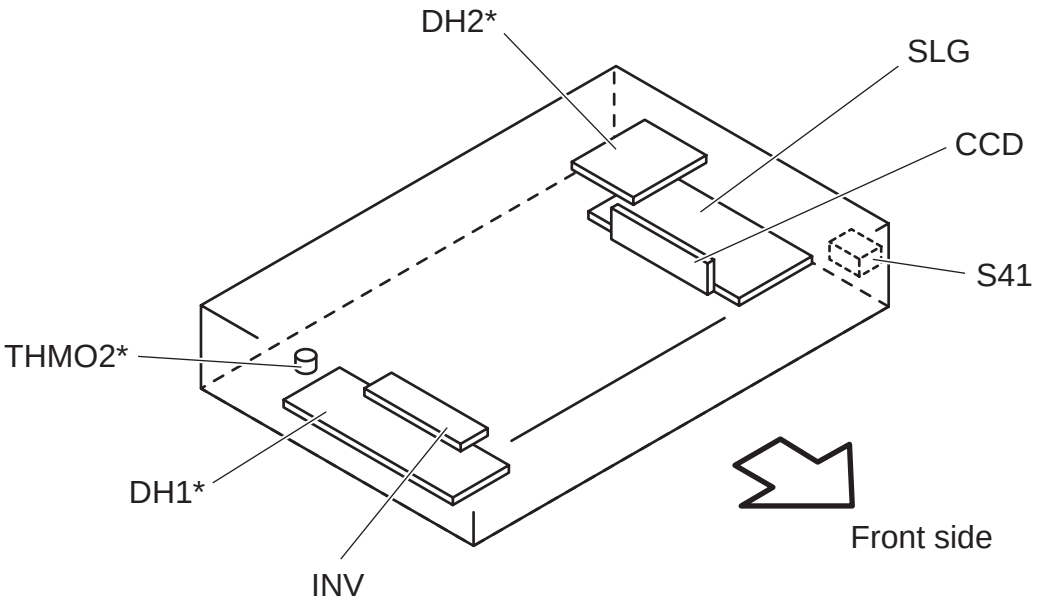


Fig. 2-6

* ASD/AUD/CND/SAD/ASU/TWD/KRD model: Standard,
NAD/MJD model: Option

[C] Control panel unit

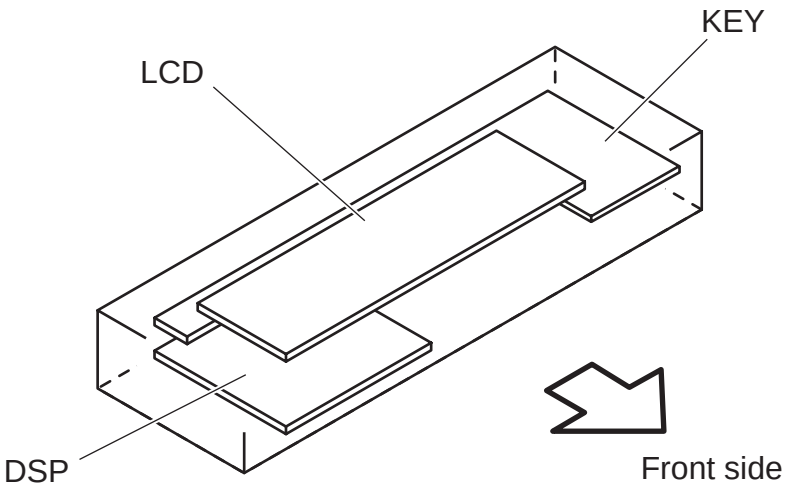


Fig. 2-7

[D] Process unit

[D-1] Motor, sensor, switch, clutch, solenoid

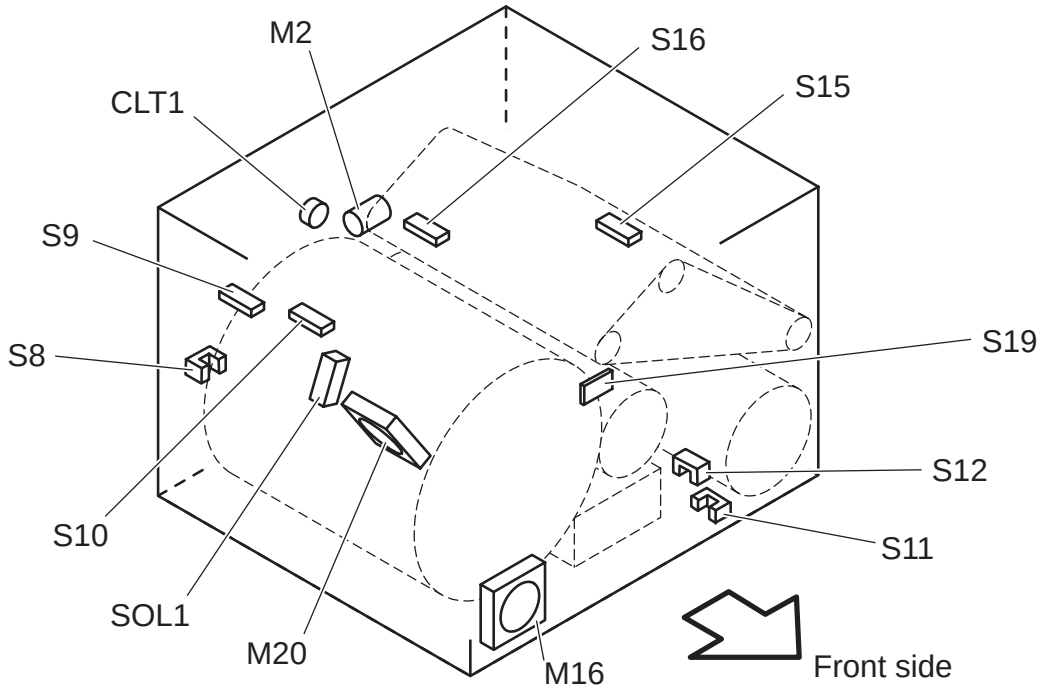


Fig. 2-8

[D-2] Motor, sensor, switch, solenoid, lamp, heater, thermistor, thermostat

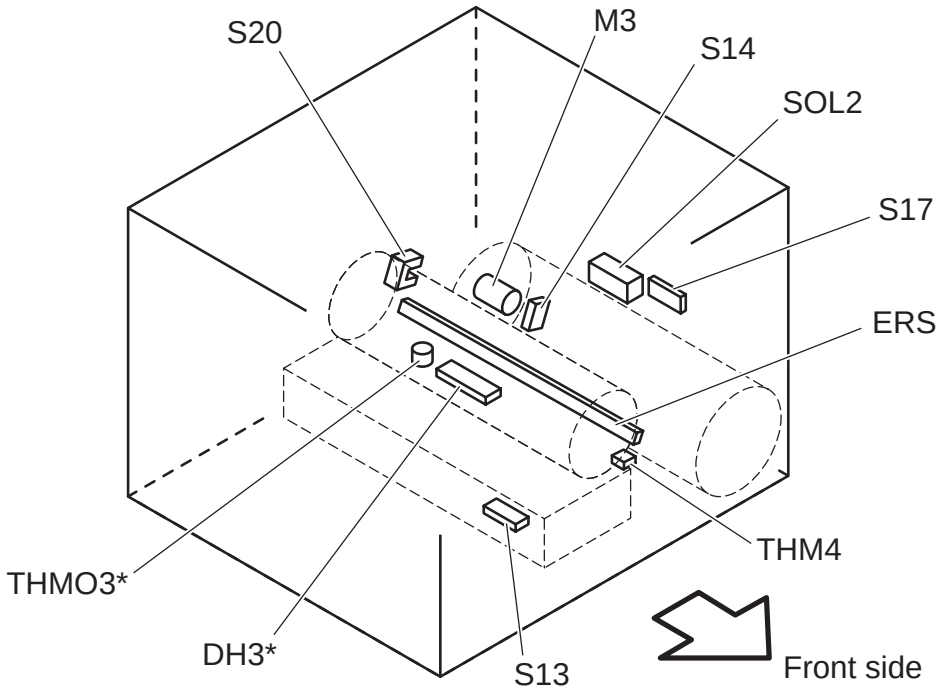


Fig. 2-9

* ASD/AUD/CND/SAD/ASU/TWD/KRD model: Standard,
NAD/MJD model: Option

[D-3] Motor, switch

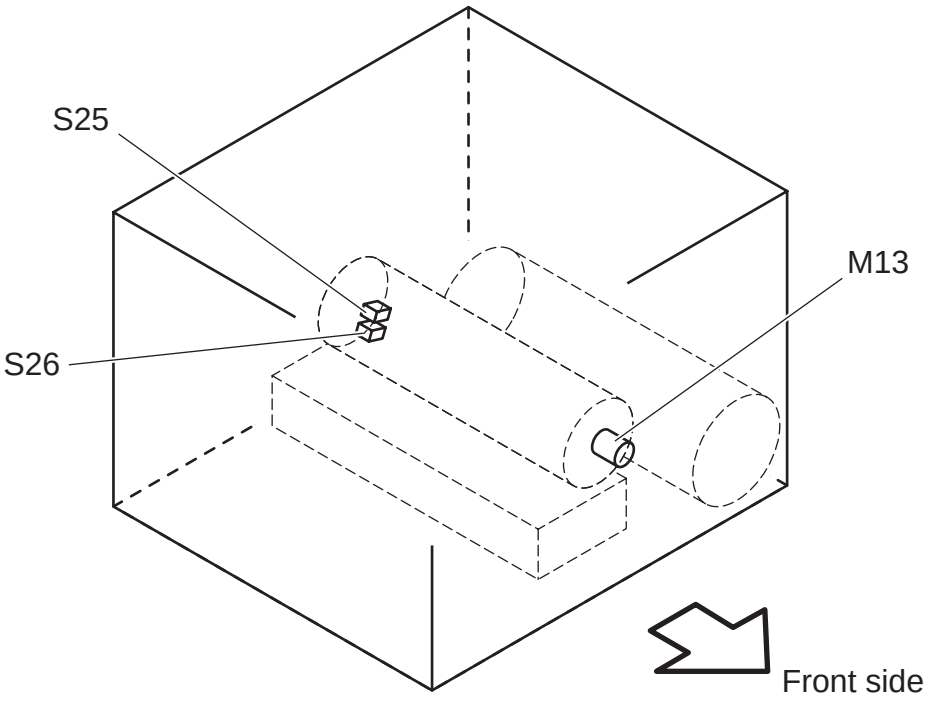


Fig. 2-10

[E] Laser unit

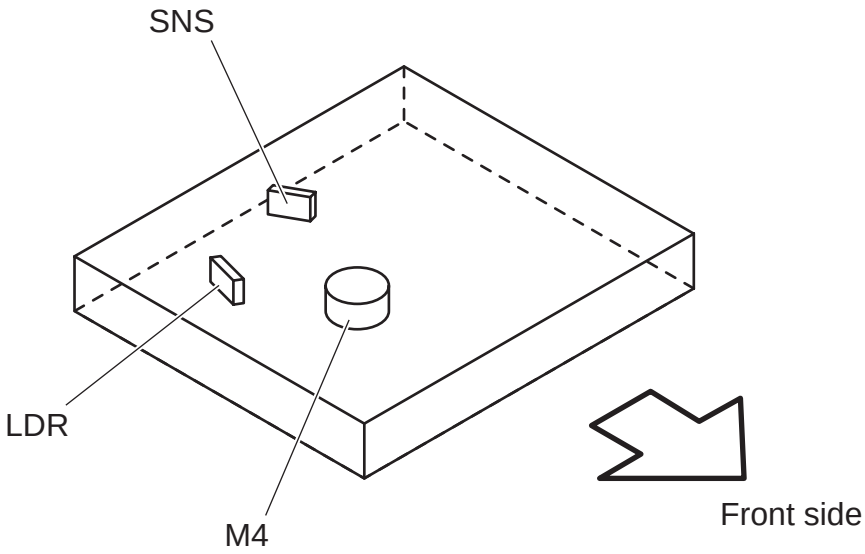


Fig. 2-11

[F] Paper feeder unit

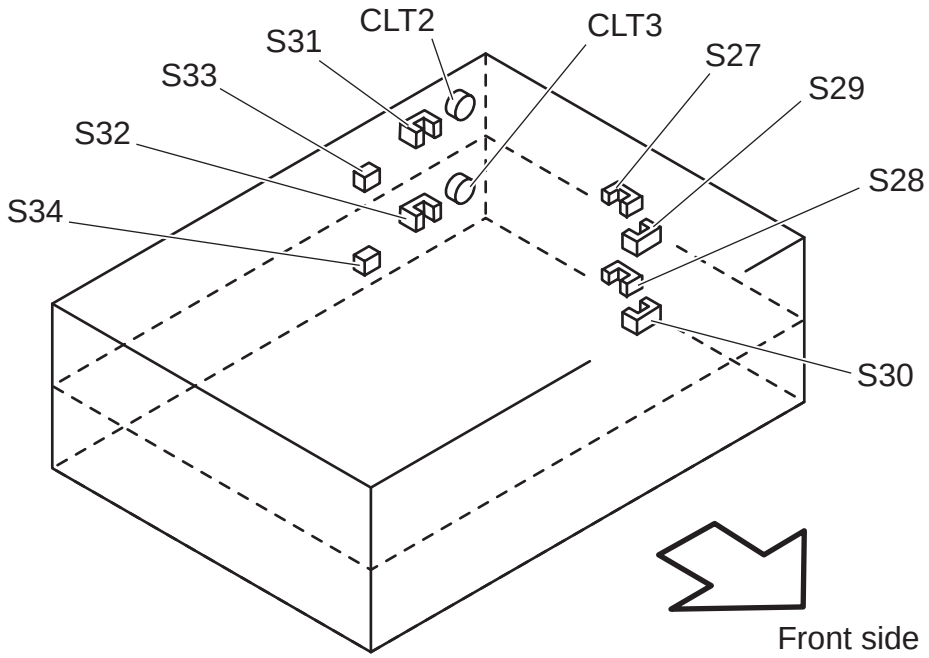


Fig. 2-12

[G] Transport unit

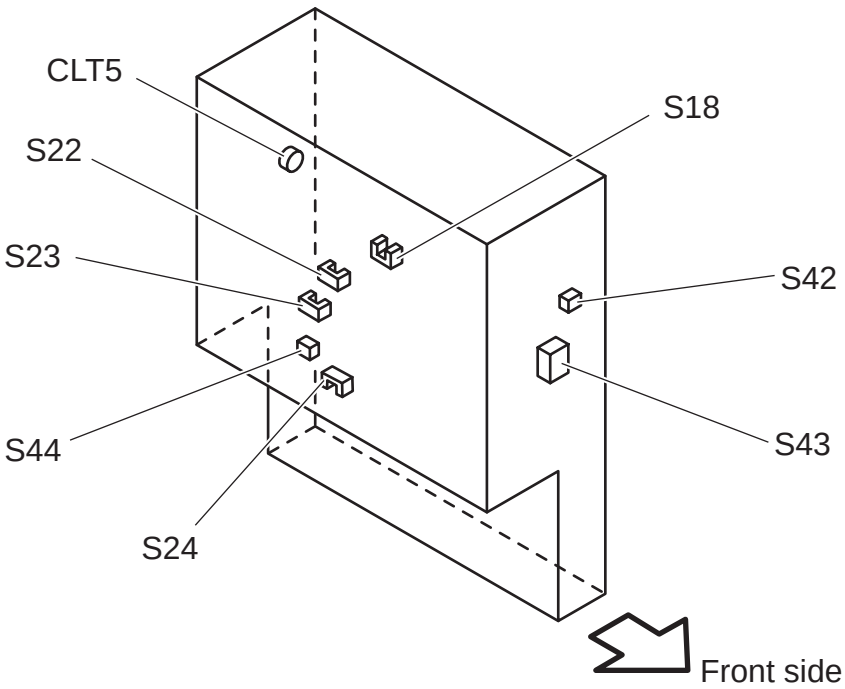


Fig. 2-13

[H] Bypass unit

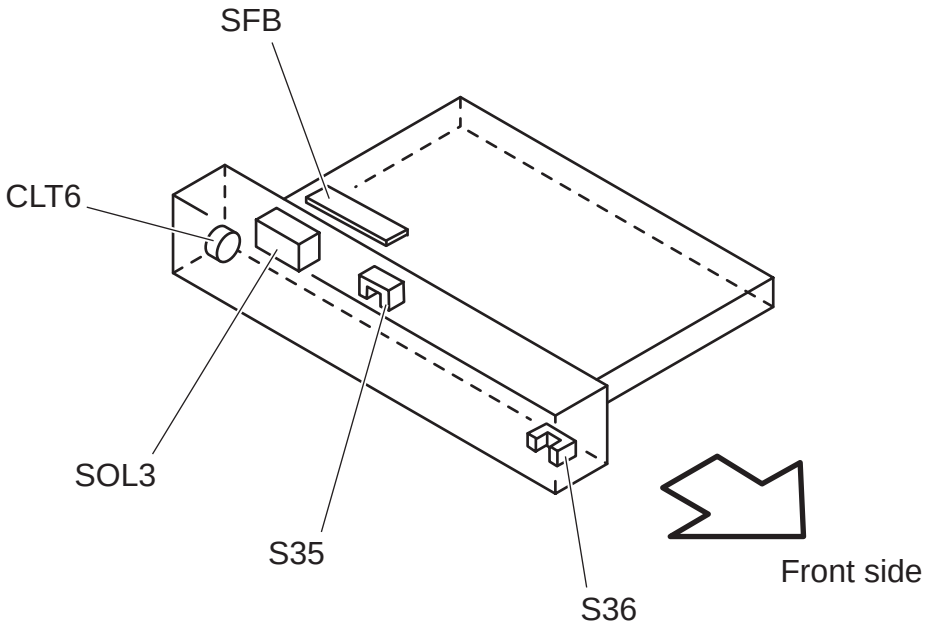


Fig. 2-14

[I] Automatic duplexing unit

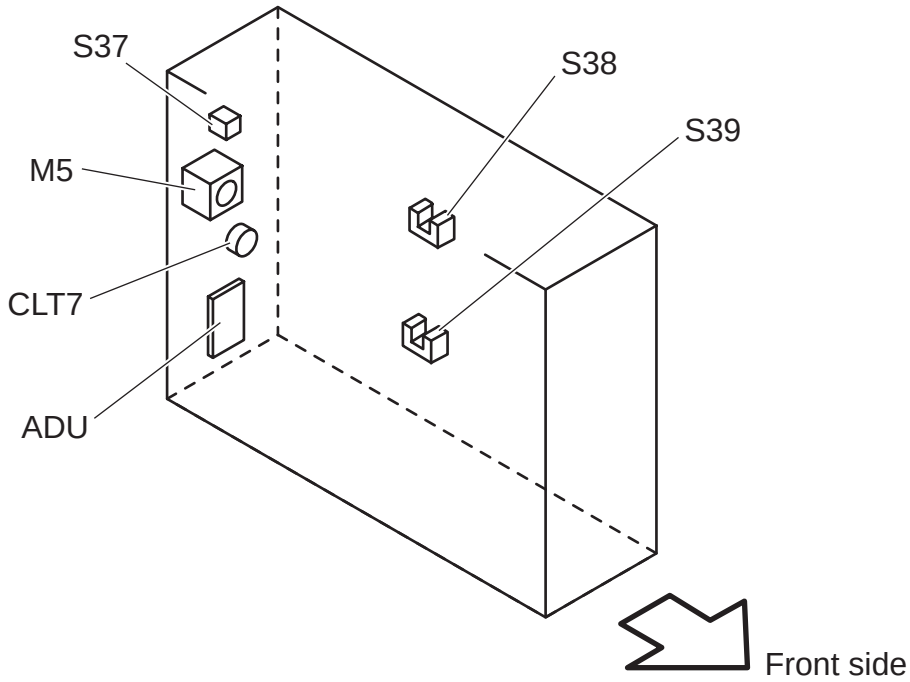


Fig. 2-15

[J] Fuser unit

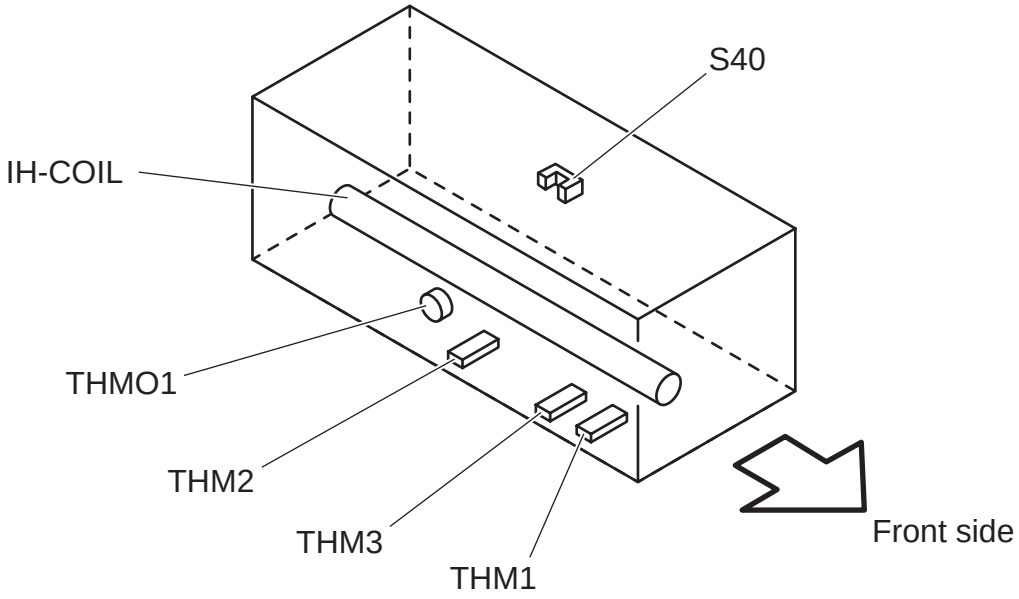


Fig. 2-16

[K] Drive unit

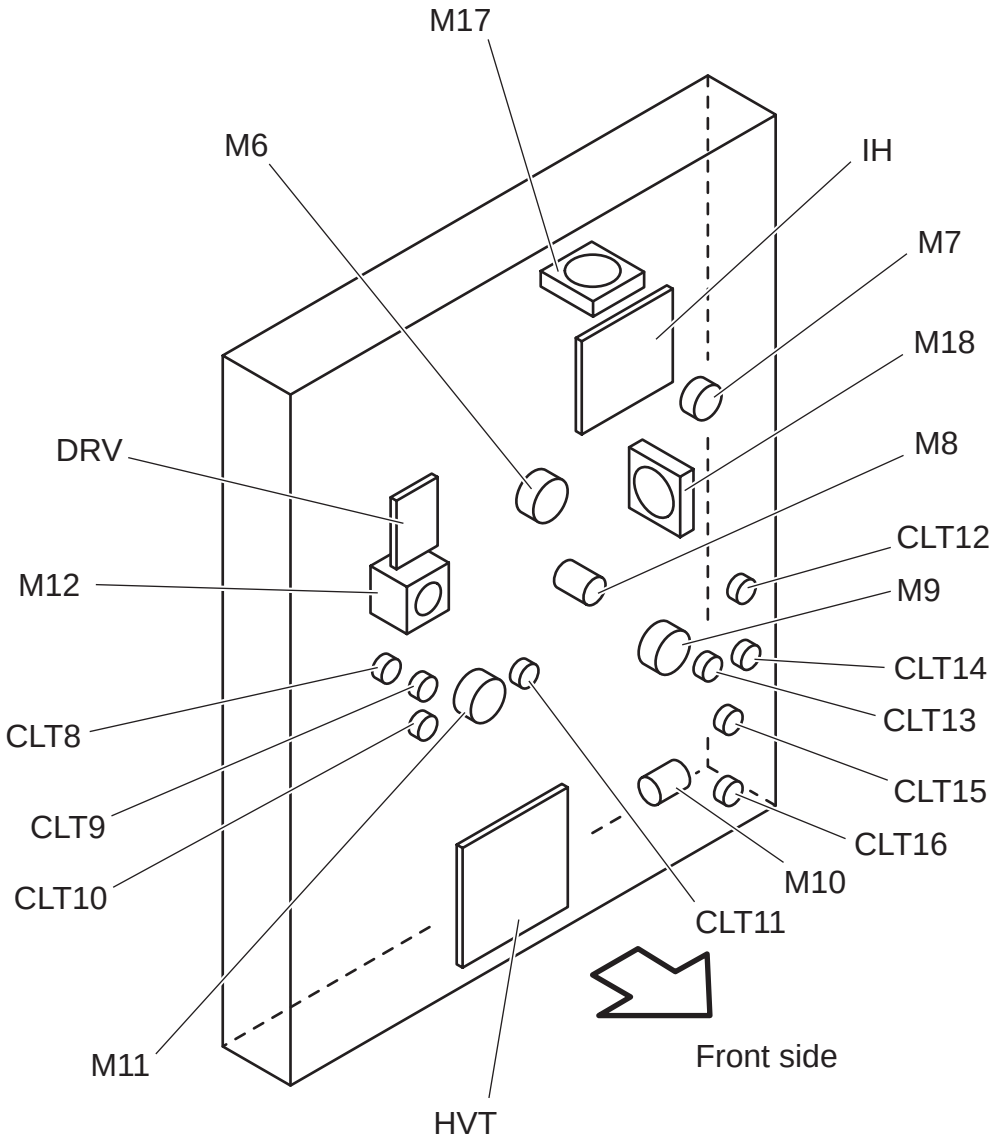


Fig. 2-17

[L] PC board unit

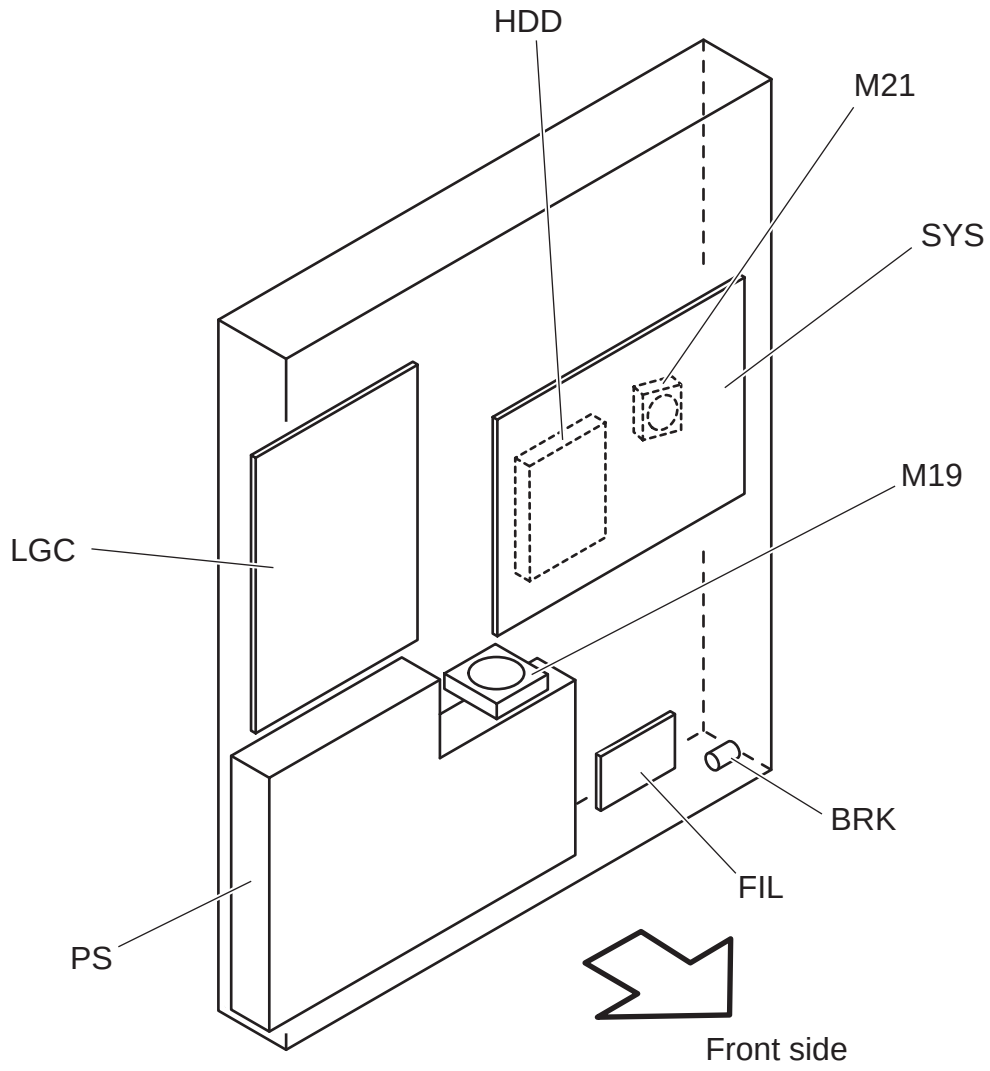


Fig. 2-18

2.3 Symbols and Functions of Various Components

The column "P-I" shows the page and item number in the parts list.

1) Motors

Symbol	Name	Function	Remarks	P-I
M1	SCAN-MOT Scan motor	Driving the carriages	B-1	17-8
M2	BELT-CLN-MOT Transfer belt cleaner auger motor	Driving the transfer belt used toner auger	D-1	32-49
M3	TNR-MOT Toner motor	Supplying the black toner	D-2	37-16
M4	M/DC-POL Polygonal motor	Driving the polygonal mirror	E	10-10
M5	ADU-MOT ADU motor	Driving the automatic duplexing unit	I	43-18
M6	MAIN-MOT Main motor	Driving the drum and transfer belt	K	14-19
M7	EXIT-MOT Exit motor	Driving the exit roller	K	6-24
M8	DRM-CLN-MOT Drum cleaner brush motor	Driving the drum cleaner brush and used toner auger	K	14-27
M9	TRSP-MOT Transport motor	Driving the fuser unit, 2nd transfer roller, registration roller, transport roller and feed roller	K	16-26
M10	TRY-MOT Tray-up motor	Driving the lifting movement of trays in upper/lower drawer	K	4-26
M11	DEV-MOT Developer motor	Driving the black/color developer unit Driving the lifting movement of the black developer unit Supplying the color toner Driving the transfer belt contact/release movement	K	15-1
M12	REVLV-MOT Revolver motor	Driving the revolver unit	K	36-11
M13	CCL-MOT Charger cleaner motor	Driving the main charger wire cleaner	B-1	28-35
M15	SCAN-FAN-MOT Scanner unit cooling fan	Cooling down the scanner unit	B-1	6-25
M16	LSU-FAN-MOT Laser unit cooling fan	Cooling down the laser unit	D-1	5-22
M17	IH-FAN-MOT IH control board cooling fan	Cooling down the IH board and SYS board	K	8-12
M18	OZN-FAN-MOT Ozone exhaust fan	Exhausting ozone and cooling down the equipment inside	K	14-36
M19	PS-FAN-MOT Power supply cooling fan	Cooling down the power supply unit	L	7-9
M20	INTRNL-FAN-MOT Internal cooling fan	Cooling down the equipment inside	D-1	1-35
M21	HDD-FAN-MOT HDD cooling fan	Cooling down the HDD and SYS board	L	8-26

2) Sensors and switches

Symbol	Name	Function	Remarks	P-I
S1-5	APS 1-3, APS-C, APS-R Automatic original detection sensor	Original size detection	B-1	S1-4: 11-12 S5: 11-13
S6	HOME-SNR Carriage home position sensor	Carriage home position detection	B-1	11-17
S7	PLTN-SNR Platen sensor	Opening/closing detection of platen cover or RADF	B-1	17-10
S8	REVLV-HP-SNR Revolver home position sensor	Home position detection of the revolver unit	D-1	36-102
S9	COLR-TNR-SNR Color toner cartridge sensor	Detecting the installation fault of color toner cartridge	D-1	36-104
S10	COLR-ATTNR-SNR Color auto-toner sensor	Detecting toner density adhered on the magnetic roller of the color developer unit	D-1	36-18
S11	K-DEV-POS-SNR Black developer contact position detection sensor	Detecting the black developer contact position	D-1	35-17
S12	K-DEV-TIM-SNR Black developer contact timing detection sensor	Detecting the control of ON/OFF timing of the black developer lifting clutch	D-1	35-17
S13	K-ATTNR-SNR Black auto-toner sensor	Detecting the density of toner in the black developer unit	D-2	34-25
S14	K-TNR-SW Black toner cartridge switch	Black toner cartridge presence absence detection	D-2	37-12
S15	TRBLT-HP-SNR1 Transfer belt home position sensor-1	Detecting the rotation position of transfer belt (for timing of speed switching in thick paper / OHP film mode)	D-1	29-9
S16	TRBLT-HP-SNR2 Transfer belt home position sensor-2	Detecting the rotation position of transfer belt (for timing of the color image data writing)	D-1	29-9
S17	TNLVL-SNR Image quality sensor	Toner amount detection on the transfer belt	D-2	23-24
S18	TR2-POS-SNR 2nd transfer roller position detection sensor	Detecting the 2nd transfer roller contact position	G	12-107
S19	TEMP/HUMI-SNR Temperature/humidity sensor	Detecting the temperature and humidity inside the equipment	D-1	5-28
S20	USD-TNR-FLL-SNR Toner bag full detection sensor	Detecting the used toner is full in the toner bag	D-2	6-107
S22	RGST-SNR Registration sensor	Detecting the paper transport at the registration roller section	G	23-6
S23	FED-U-SNR Upper drawer feed sensor	Detecting paper jam and paper transport at upper drawer feeding section	G	23-6
S24	FED-L-SNR Lower drawer feed sensor	Detecting paper jam and paper transport at lower drawer feeding section	G	24-52

Symbol	Name	Function	Remarks	P-I
S25	CCL-F-POS-SW Charger cleaner front position detection switch	Detecting the position when the main charger wire cleaner is moved to the front side	D-3	28-103
S26	CCL-R-POS-SW Charger cleaner rear position detection switch	Detecting the position when the main charger wire cleaner is moved to the rear side	D-3	28-103
S27	CST-U-TRY-SNR Upper drawer tray-up sensor	Position detection of the lifting tray of the upper drawer	F	18-30
S28	CST-L-TRY-SNR Lower drawer tray-up sensor	Position detection of the lifting tray of the lower drawer	F	18-30
S29	EMP-U-SNR Upper drawer empty sensor	Paper presence/absence detection in the upper drawer	F	18-30
S30	EMP-L-SNR Lower drawer empty sensor	Paper presence/absence detection in the lower drawer	F	18-30
S31	NEMP-U-SNR Upper drawer paper stock sensor	Paper amount detection in the upper drawer	F	18-30
S32	NEMP-L-SNR Lower drawer paper stock sensor	Paper amount detection in the lower drawer	F	18-30
S33	CST-U-SW Upper drawer detection switch	Detecting presence/absence of the upper drawer	F	4-101
S34	CST-L-SW Lower drawer detection switch	Detecting presence/absence of the lower drawer	F	4-101
S35	SFB-SNR Bypass paper sensor	Detecting presence/absence of paper on the bypass tray	H	22-5
S36	SFB-FED-SNR Bypass feed sensor	Detecting the transporting paper fed from the bypass tray	H	22-5
S37	ADU-SET-SW ADU opening/closing switch	Automatic duplexing unit opening/closing detection	I	43-43
S38	ADU-TRU-SNR ADU entrance sensor	Detecting the transporting paper at automatic duplexing unit entrance section	I	43-31
S39	ADU-TRL-SNR ADU exit sensor	Detecting the transporting paper in automatic duplexing unit	I	43-31
S40	EXIT-SNR Exit sensor	Detecting the transporting paper at the exit section	J	40-60
S41	MAIN-SW Main switch	Turning ON/OFF of the equipment	B-2	11-28
S42	FRNT-COV-SW Front cover opening/closing switch	Detecting opening/closing of the front cover	G	5-105
S43	COV-INTLCK-SW Cover opening/closing interlock switch	Controlling cutoff and supply of the 24V voltage by opening/closing of the front cover or jam access cover	G	5-15
S44	SIDE-COV-SW Side cover opening/closing switch	Side cover opening/closing detection	G	24-51

3) Electromagnetic clutches

Symbol	Name	Function	Remarks	P-I
CLT1	TRBLT-CLN-CLT Transfer belt cleaner clutch	Driving the transfer belt cleaning blade contact/release movement	D-1	31-23
CLT2	CST-U-FEED-CLT Upper drawer feed clutch	Driving the upper drawer pickup roller	F	18-29
CLT3	CST-L-FEED-CLT Lower drawer feed clutch	Driving the lower drawer pickup roller	F	18-29
CLT5	2TR-CONT-CLT 2nd transfer roller contact clutch	Driving the 2nd transfer roller contact/ release movement	G	12-14
CLT6	SFB-FEED-CLT Bypass feed clutch	Driving the bypass pickup roller and bypass feed roller	H	21-20
CLT7	ADU-CLT ADU clutch	Driving the automatic duplexing unit	I	43-16
CLT8	COLR-DEV-TNR-CLT Color developer toner supply clutch	Driving the color developer toner supply auger	K	15-10
CLT9	COLR-DEV-CLT Color developer drive clutch	Driving the color developer magnetic roller	K	15-32
CLT10	K-DEV-CLT Black developer drive clutch	Driving the black developer magnetic roller	K	15-28
CLT11	K-DEV-LIFT-CLT Black developer lifting clutch	Driving the black developer lifting cam	K	15-12
CLT12	RGST-CLT Registration clutch	Driving the registration roller	K	16-29
CLT13	CST-U-TR-L-CLT Upper transport clutch (Low speed)	Driving the upper transport roller (Low speed)	K	16-30
CLT14	CST-U-TR-H-CLT Upper transport clutch (High speed)	Driving the upper transport roller (High speed)	K	16-19
CLT15	CST-L-TR-L-CLT Lower transport clutch (Low speed)	Driving the lower transport roller (Low speed)	K	19-16
CLT16	CST-L-TR-H-CLT Lower transport clutch (High speed)	Driving the lower transport roller (High speed)	K	19-16

4) Solenoids

Symbol	Name	Function	Remarks	P-I
SOL1	ATTNR-SHUT-SOL Color auto-toner sensor shutter solenoid	Driving the color auto-toner sensor shutter	D-1	36-25
SOL2	TNLVL-SHUT-SOL Image quality sensor shutter solenoid	Driving the image quality sensor shutter	D-2	23-21
SOL3	SFB-SOL Bypass pickup solenoid	Driving the bypass pickup roller	H	22-11

5) PC boards

Symbol	Name	Function	Remarks	P-I
CCD	PWA-F-CCD CCD driving PC board (CCD board)	Controlling CCD and A/D conversion of image data	B-2	11-10
SLG	PWA-F-SLG Scanning section control PC board (SLG board)	Controlling the original scanning section and RADF	B-2	11-38
DSP	PWA-F-DSP Display PC board (DSP board)	Controlling LCD and the touch panel on the control panel	C	3-26
KEY	PWA-F-KEY Key control PC board (KEY board)	Detecting the button entry and controlling LED on the control panel	C	3-25
LDR	PWA-F-LDR Laser driving PC board (LDR board)	Driving the laser diode	E	10-10
SNS	PWA-F-SNS H-sync signal detection PC board (SNS board)	Detection of the laser beam position	E	10-10
SFB	PWA-F-SFB Bypass tray slide guide width detection PC board (SFB board)	Detection of the bypass tray slide guide width	H	20-13
ADU	PWA-F-ADU ADU driving PC board (ADU board)	Controlling the automatic duplexing unit	I	43-30
IH	PS-IH IH control PC board (IH board)	Controlling each IH coil in the fuser unit	K	8-2
DRV	PWA-F-DRV Driving PC board (DRV board)	Controlling each motor in the system	K	9-5
SYS	PWA-F-SYS System control PC board (SYS board)	Controlling the whole system and image processing	L	8-36
LGC	PWA-F-LGC Logic PC board (LGC board)	Controlling the print engine section	L	9-1
FIL	PWA-F-FIL Filter PC board (FIL board)	Cutting noise of the AC power Power supplying to each damp heater	L	7-11

6) Lamps and heaters

Symbol	Name	Function	Remarks	P-I
EXP	LP-EXPO Exposure lamp	Exposing the original to the light	B-1	26-6
ERS	LP-ERS Discharge LED	Removing the residual charge from the drum surface	D-2	28-32
IH-COIL	IH-COIL IH coil	Heating the fuser roller	J	42-7
DH1	SCN-L-DH Scanner damp heater (Left)	Preventing condensation of the mirrors of the carriages * ASD/AUD/CND/SAD/ASU/TWD/ KRD model: Standard * NAD/MJD model: Option	B-2	11-22
DH2	SCN-R-DH Scanner damp heater (Right)	Preventing condensation of the lens * ASD/AUD/CND/SAD/ASU/TWD/ KRD model: Standard * NAD/MJD model: Option	B-2	11-32
DH3	DRM-DH Drum damp heater	Preventing condensation of the drum * ASD/AUD/CND/SAD/ASU/TWD/ KRD model: Standard * NAD/MJD model: Option	D-2	35-23

7) Thermistors and thermostats

Symbol	Name	Function	Remarks	P-I
THM1	THMS-EDGE-FBLT Front edge thermistor	Detecting the surface temperature at the edge of the front side of the fuser belt (for preventing overheating at the edge of the fuser belt)	J	42-15
THM2	THMS-MAIN-FBLT Main thermistor	Detecting the surface temperature at the fuser belt center (for controlling the center IH coil)	J	42-15
THM3	THMS-SUB-FBLT Sub thermistor	Detecting the surface temperature at the front side of the fuser belt (for controlling the side IH coil)	J	42-15
THM4	THMS-DRM Drum thermistor	Detecting the temperature at the drum surface	D-2	32-31
THMO1	THERMO-FSR Fuser thermostat	Preventing overheating in the fuser unit	J	42-12
THMO2	THERMO-SCN-DH Scanner damp heater thermostat	Controlling the temperature of the scanner damp heater * ASD/AUD/CND/SAD/ASU/TWD/ KRD model: Standard * NAD/MJD model: Option	B-2	11-22
THMO3	THERMO-DRM-DH Drum damp heater thermostat	Controlling the temperature of the drum damp heater * ASD/AUD/CND/SAD/ASU/TWD/ KRD model: Standard * NAD/MJD model: Option	D-2	35-24

8) Transformer

Symbol	Name	Function	Remarks	P-I
HVT	PS-HVT High-voltage transformer	Generating high-voltage and supplying it to the following sections • Main charger wire • Main charger grid • Developer bias (color and black) • Transfer bias (1st and 2nd transfer)	K	7-10

9) Others

Symbol	Name	Function	Remarks	P-I
INV	INV-EXP Inverter board	Controlling the exposure lamp	B-2	26-7
LCD	LCD LCD panel	Displaying and entering each information	C	3-19
HDD	HDD Hard disk	Storing the program data and image data	L	8-115
PS	PS-ACC Switching regulator	Generating DC voltage and supplying it to each section of the equipment	L	7-9
BRK	BREAKER Breaker	Preventing the inflow of overcurrent to the equipment	L	7-3

2.4 General Description

2.4.1 System block diagram

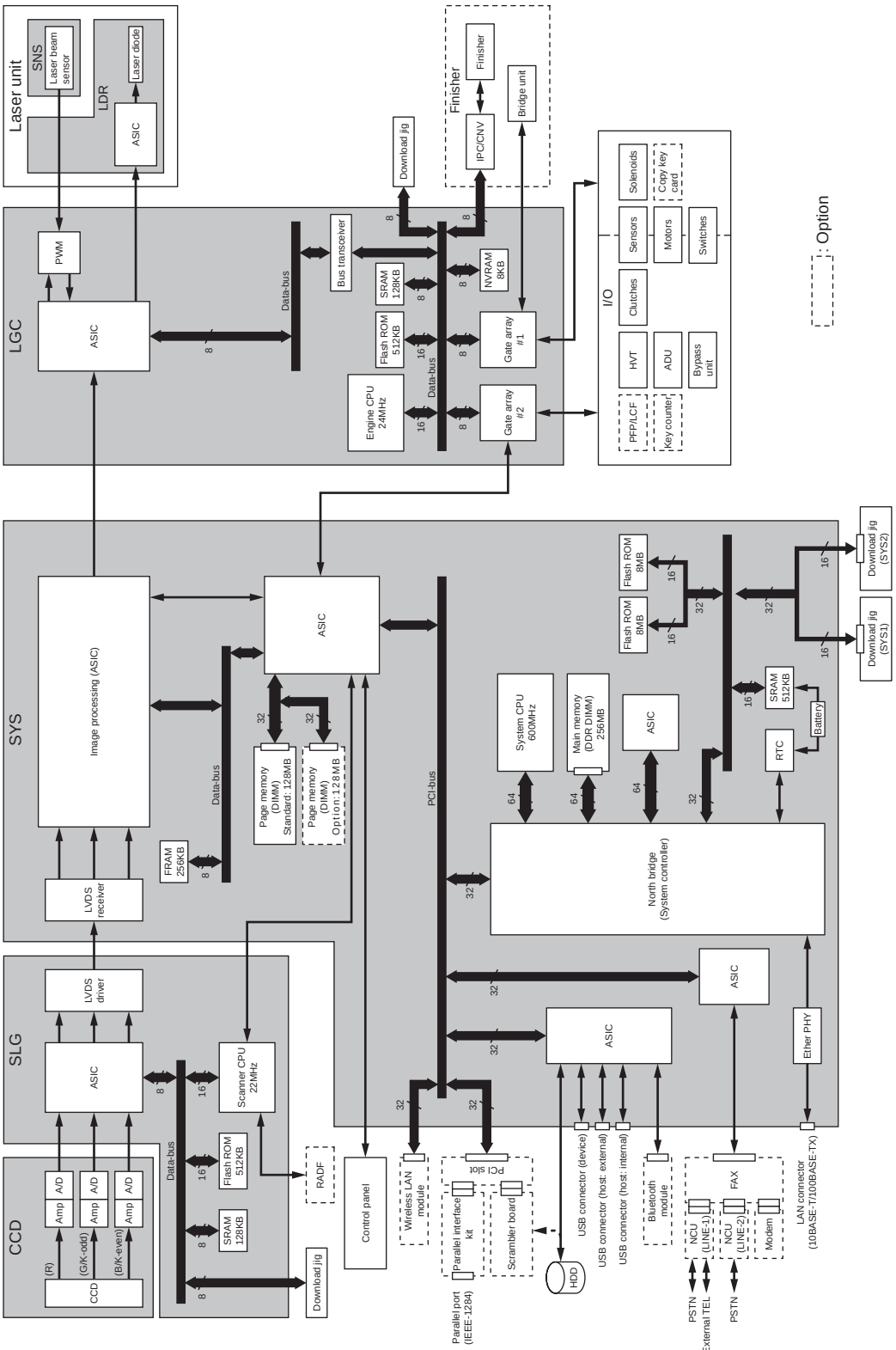


Fig. 2-19

2.4.2 Construction of boards

[1] Construction diagram of boards

This system consists of the following including the SYS board as a main board.

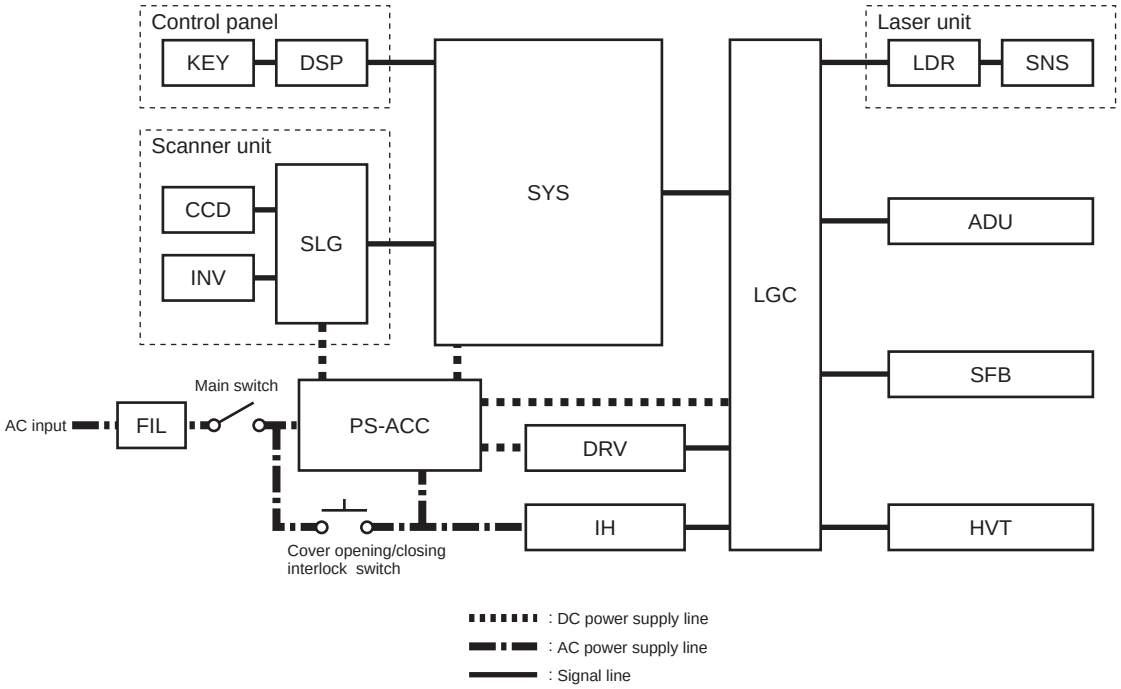


Fig. 2-20

[2] Function of each board

- CCD board:
  This is the board to convert the reflected light by the original to electrical signals. It consists of the CCD, A/D converter, etc. The CCD converts the reflected light by the original to three-color analog signal; red, green, blue, and the A/D converter converts each analog signal to digital.

- SLG board:
  This is the board to mainly control the scanning function (scanner unit) and consists of the Scanner-CPU, ASIC, memory (Flash ROM, SRAM), etc. When scanning the original, the exposure lamp and scan motor are started by the command from the Scanner-CPU. And the image processing is performed for the image data sent from the CCD by each ASIC.

- INV board:
  This is the board on which the lighting control circuit of the exposure lamp is mounted. The exposure lamp lights by the command from the Scanner-CPU.

- DSP board:
  This is the board to mainly control the control panel. The Panel processing CPU detecting the input from each button and touch panel, and the lighting control circuit for the backlight of the LCD are mounted. And it relays the control signal of the control panel from the SYS board to the LCD and KEY board.

- KEY board:
  This is the board on which each button switch and each LED on the control panel are mounted.

- LDR board:
  This is the board on which the laser diode and the ASIC are mounted. The laser is emitted based on the output image data signal from the ASIC on the LGC board.

- SNS board:
  This is the board on which the light sensor for detecting the radiating position of the laser is mounted.
  It outputs the H-sync signal to the PWM (Pulse Width Modulator) on the LGC board.

- SFB board:
  This is the board on which the circuit pattern is printed. It detects the position of the slide guide of the bypass unit.

- ADU board:
  This is the board to relay each signal between the ASIC on the LGC board and the electric parts (motor, sensor, clutch) in the ADU.

- IH board:
  This is the board to generate the electric power for driving the IH coil of the fuser unit from the AC electric power input via the switching regulator. And then it is provided.

- DRV board:
  This is the board on which the driver for driving the revolver motor, and exit motor are mounted.

- SYS board:
  This is the main board taking a leading part in all systems. It consists of the System-CPU, ASIC, memory (DIMM, Flash ROM, SRAM, NVRAM), RTC (Real Time Clock IC) etc. The System-CPU controls each ASIC to perform the control of the image processing, image memory (page memory, main memory, HDD), external interface (10/100 BASE-T/TX, USB, PCI, IEEE-1284), and FAX. And based on the input data from the control panel, System-CPU communicates with Scanner-CPU on the SLG board and Engine-CPU on the LGC board, and then issues an operation command to the scanner and printer engine section.

- LGC board:
  This is the board to mainly control the print function (printer engine). It consists of the Engine-CPU, ASIC, memory (Flash ROM, SRAM, NVRAM), etc. The Engine-CPU controls each ASIC to drive I/O (electrical parts) of each section in the system. It leads to the operation of the laser unit, revolver, developer unit, drum, transfer belt, drawers, bypass unit, ADU, etc. And then the print is made.

- FIL board:
  This is the board to cut off the noise of AC power from outside, and supply the driving AC power to the damp heater for condensation prevention of each section (scanner and drum).

- HVT:
  This is the board to generate the high voltage from +24V to provide the bias to the section of the main charger, developer, and transfer.

- PS-ACC:
  This is the unit to generate each DC voltage, which is used in the equipment, from external AC electric power input. And then it is provided to each electric part.

2.5 Disassembly and Replacement of Covers

[A] Front cover

(1) Open the front cover.
(2) Remove the toner bag (📖 P.11-10 "[A] Toner bag").
(3) Pull up 2 hinge pins on the left and the right and then extract them inside.
(4) Take off the front cover.

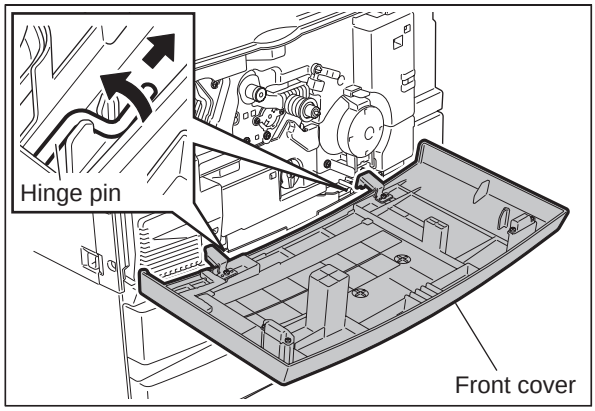


Fig. 2-21

[B] Maintenance tray

(1) Remove 1 screw and take off the maintenance tray.

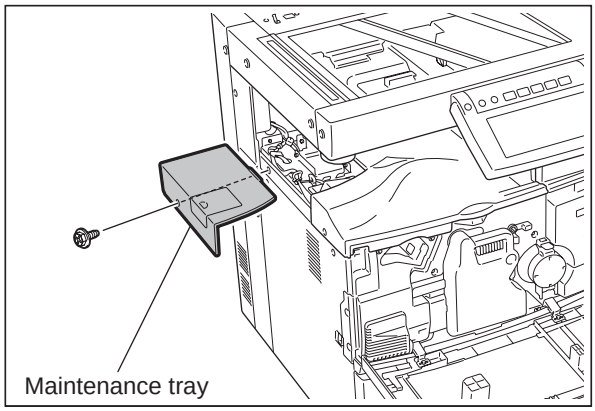


Fig. 2-22

[C] Inner tray

(1) Take off the maintenance tray (📖 P.2-25 "[B] Maintenance tray").
(2) Open the front cover.
(3) Remove 1 screw and take off the Inner tray.

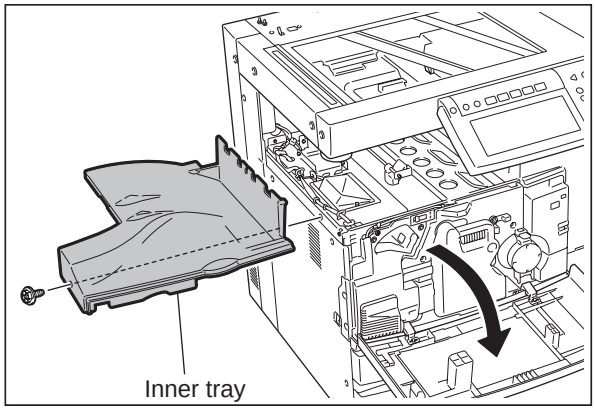


Fig. 2-23

[D] Tray back cover

(1) Take off the inner tray (📖 P.2-26 "[C] Inner tray").
(2) Remove 1 screw and take off the tray back cover.

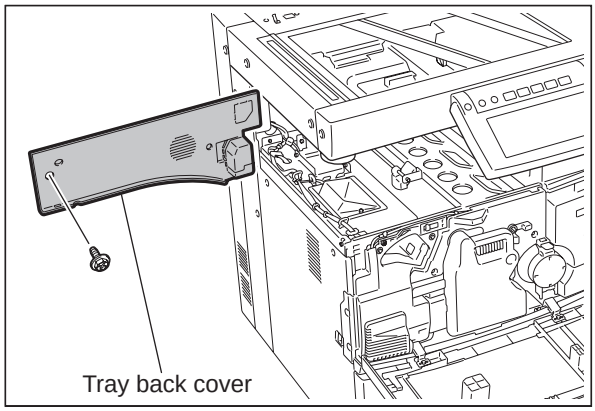


Fig. 2-24

[E] Front lower cover

(1) Take off the front cover (📖 P.2-25 "[A] Front cover").
(2) Take off the black developer unit cover.

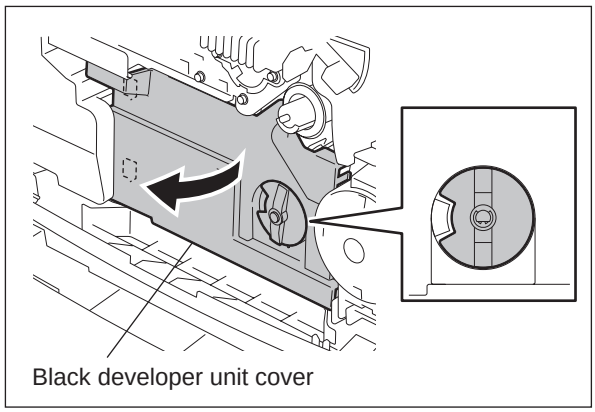


Fig. 2-25

(3) Release 4 latches and take off the front lower cover.

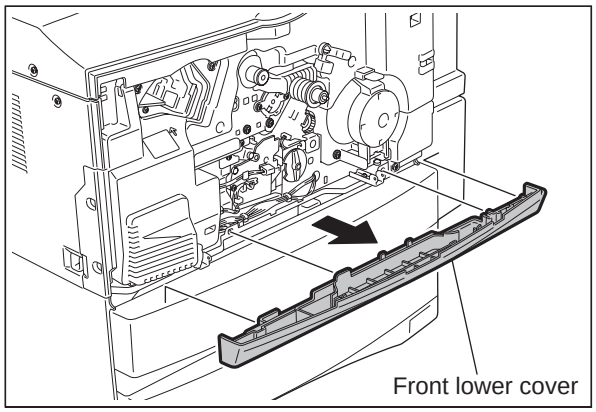


Fig. 2-26

[F] Center inner cover

(1) Remove the toner bag (📖 P.11-10 "[A] Toner bag").
(2) Remove 2 screws and take off the center inner cover.

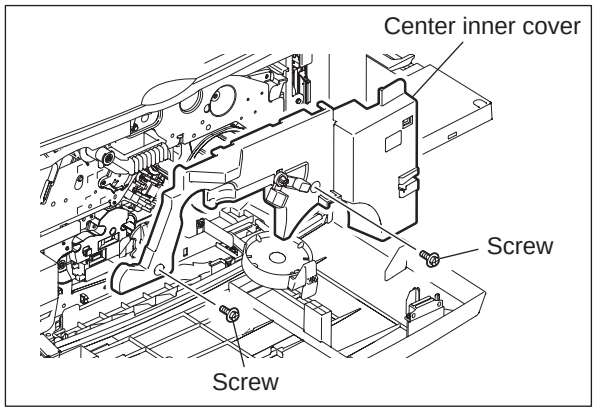


Fig. 2-27

[G] Front upper cover

(1) Remove 2 screws and take off the front upper cover.

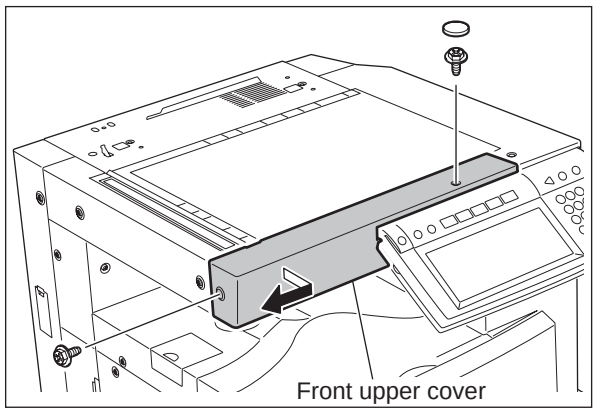


Fig. 2-28

[H] Right upper cover

(1) Remove 3 screws and take off the right upper cover.

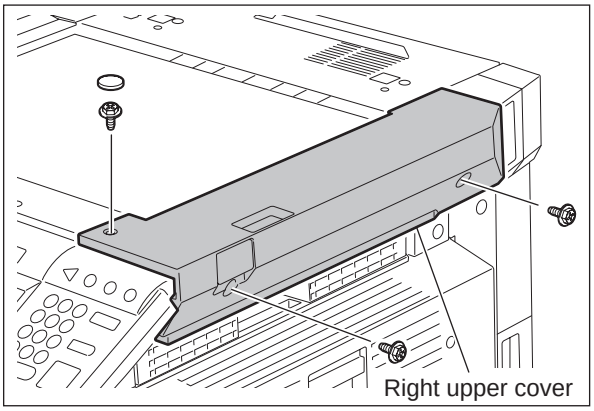


Fig. 2-29

[I] Right front hinge cover

(1) Pull out the upper and lower drawers.
(2) Remove 2 screws and take off the right front hinge cover.

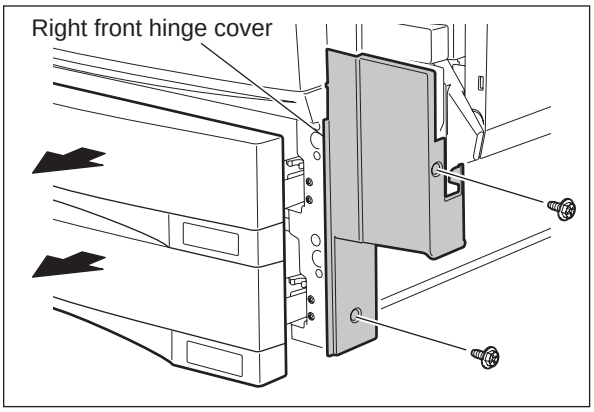


Fig. 2-30

[J] Front right cover

(1) Take off the front lower cover (📖 P.2-26 "[E] Front lower cover").
(2) Take off the center inner cover (📖 P.2-27 "[F] Center inner cover").
(3) Take off the front upper cover (📖 P.2-27 "[G] Front upper cover").
(4) Take off the right upper cover (📖 P.2-28 "[H] Right upper cover").
(5) Take off the right front hinge cover (📖 P.2-28 "[I] Right front hinge cover").
(6) Remove 2 screws and take off the front right cover.

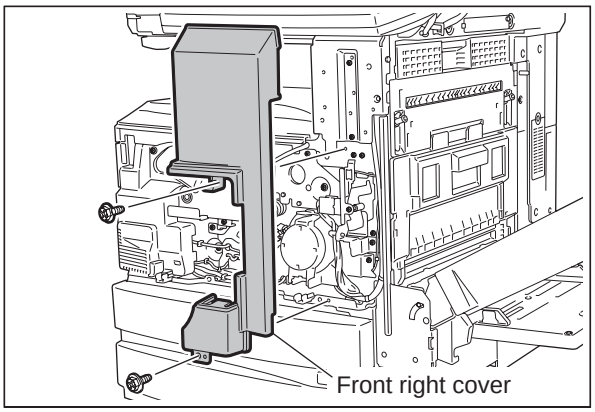


Fig. 2-31

[K] Left cover

(1) Open the front cover.
(2) Remove 2 screws and take off the left cover.

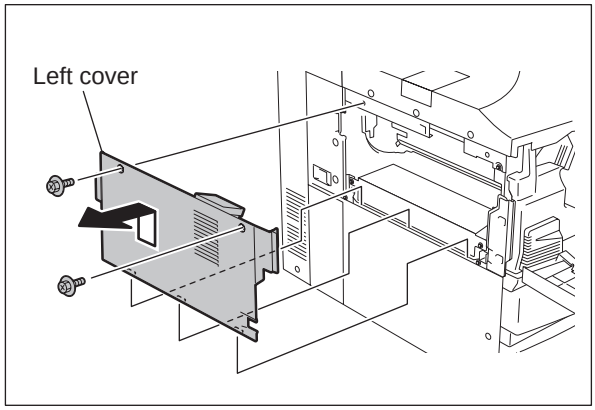


Fig. 2-32

[L] Left upper cover

(1) Remove 2 screws and take off the left upper cover.

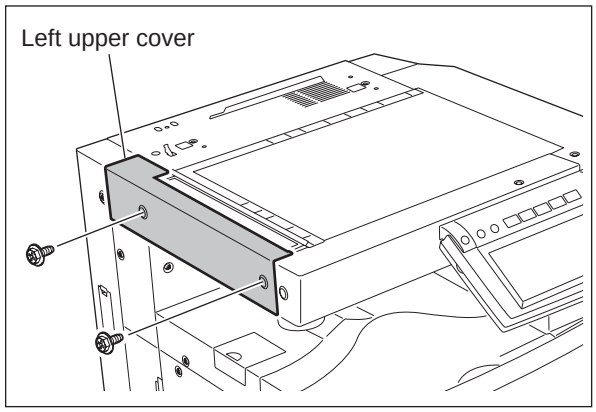


Fig. 2-33

[M] Left rear cover

(1) Take off the left cover (P.2-29 "[K] Left cover").
(2) Take off the left upper cover (P.2-29 "[L] Left upper cover").
(3) Remove 3 screws and take off the left rear cover.

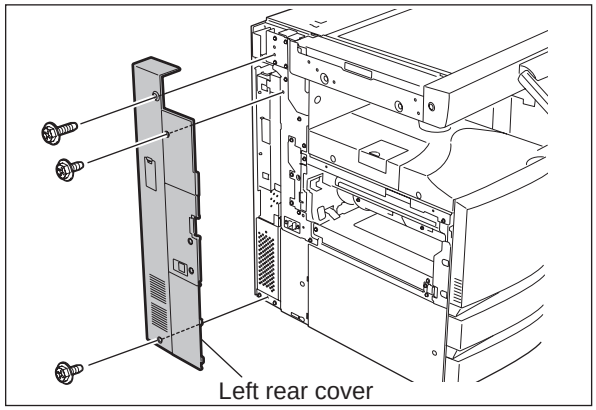


Fig. 2-34

[N] IH terminal cover

Note:

Be sure to unplug before the work so as not to get an electric shock.

(1) Open the ADU.
(2) Open the 2nd transfer unit.
(3) Open the fuser unit cover.
(4) Remove 2 screws and take off the IH terminal cover.

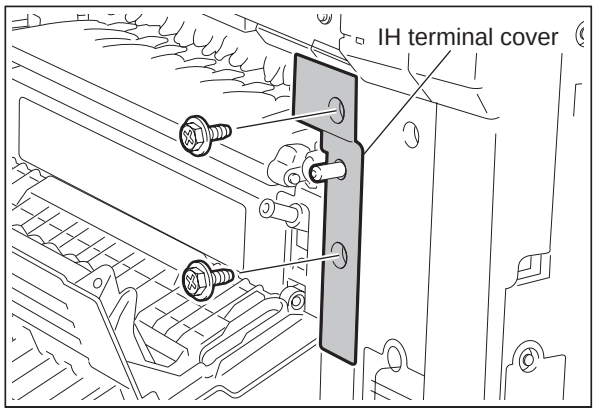


Fig. 2-35

[O] Right rear cover

(1) Take off the right upper cover (📖 P.2-28 "[H] Right upper cover").
(2) Take off the IH terminal cover (📖 P.2-30 "[N] IH terminal cover").
(3) Remove 1 screw and take off the ozone filter cover (📖 P.11-23 "[Q] Ozone filter").
(4) Remove 2 screws and take off the right rear cover.

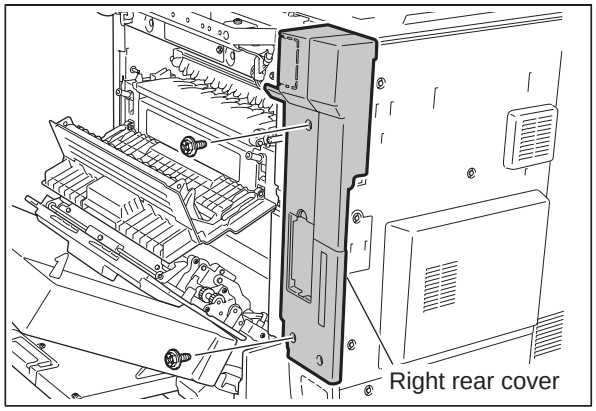


Fig. 2-36

[P] Right rear hinge cover

(1) Remove 2 screws and take off the right rear hinge cover.

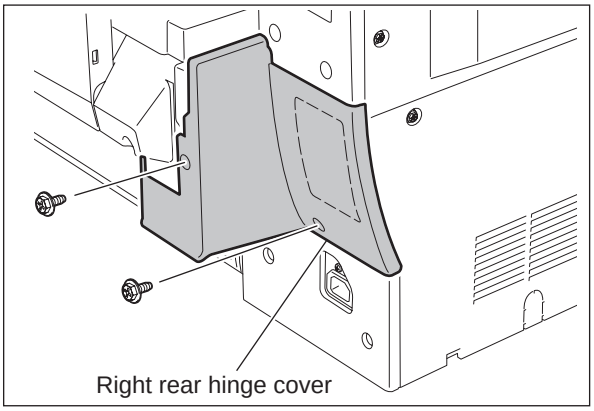


Fig. 2-37

[Q] Right lower cover

(1) Take off the right rear hinge cover (📖 P.2-31 "[P] Right rear hinge cover").
(2) Remove 2 screws and take off the right lower cover.

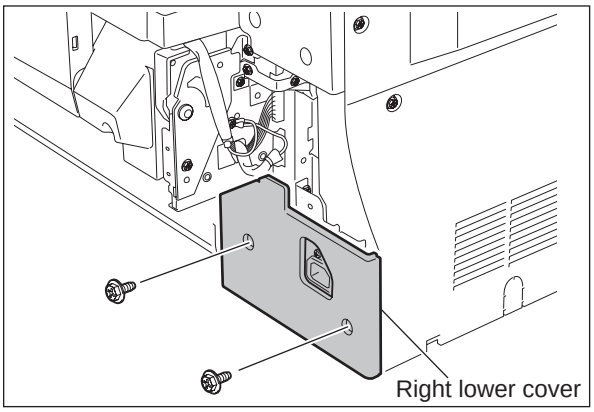


Fig. 2-38

[R] Rear cover-1

(1) Remove 1 screw and take off the connector cover.

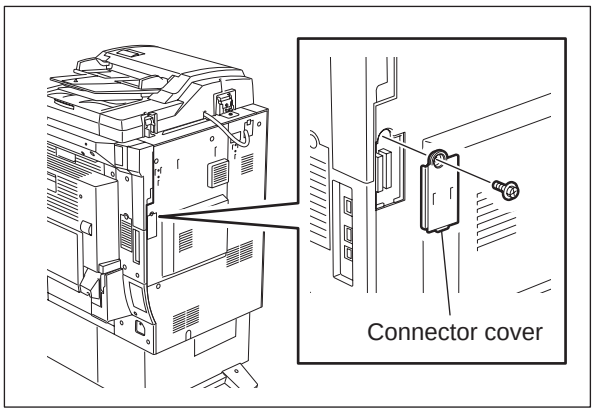


Fig. 2-39

(2) Remove 2 screws and take off the rear cover-1.

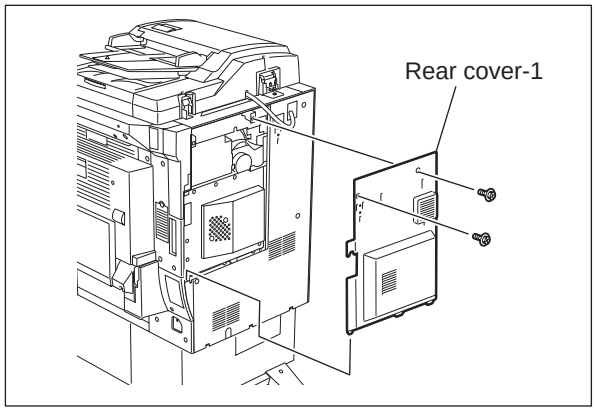


Fig. 2-40

[S] Rear cover-2

(1) Take off the rear cover-1 (P.2-31 "[R] Rear cover-1").
(2) Remove 3 screws and take off the rear cover-2.

Note:
Disconnect the connector of the RADF first when the RADF is installed.

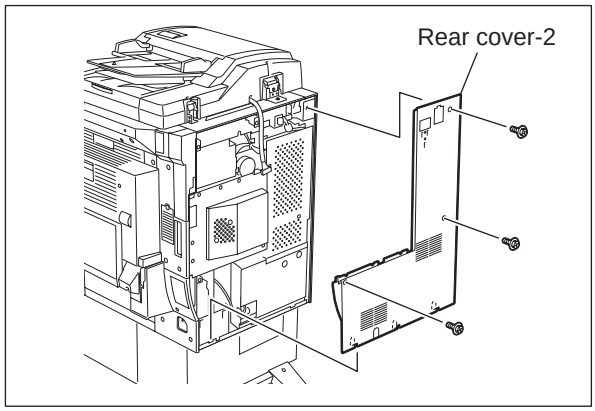


Fig. 2-41

[T] Upper rear cover

(1) Take off the RADF or the platen cover.
(2) Take off the left rear cover (P.2-29 "[M] Left rear cover").
(3) Take off the right rear cover (P.2-30 "[O] Right rear cover").
(4) Remove 2 screws and take off the upper rear cover.

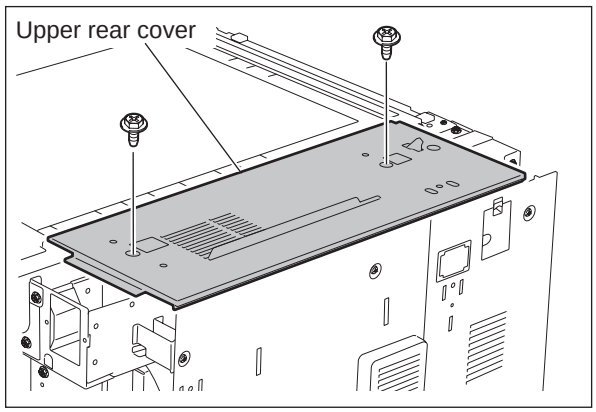


Fig. 2-42

2.6 Disassembly and Replacement of PC boards/HDD

Note:
When the PC board/HDD is replaced, refer to the respective Notes and Cautions of "Replacement of PC boards and HDD" in Chapter 5.3 of the Service Handbook.

[A] HDD cooling fan (M21)

(1) Take off the rear cover-1 (📖 P.2-31 "[R] Rear cover-1").
(2) Disconnect 1 connector. Release the harness from the harness clamp.

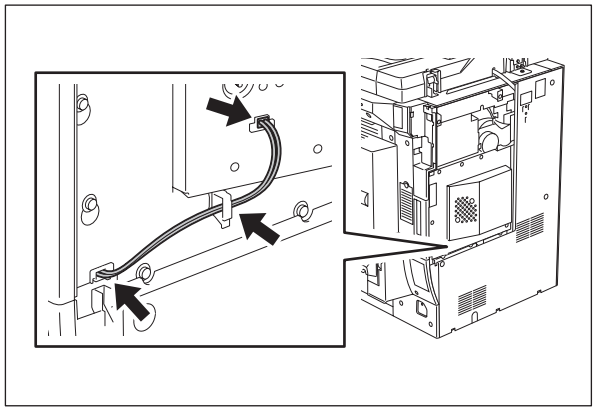


Fig. 2-43

(3) Loosen 11 screws and take off the SYS board cover.

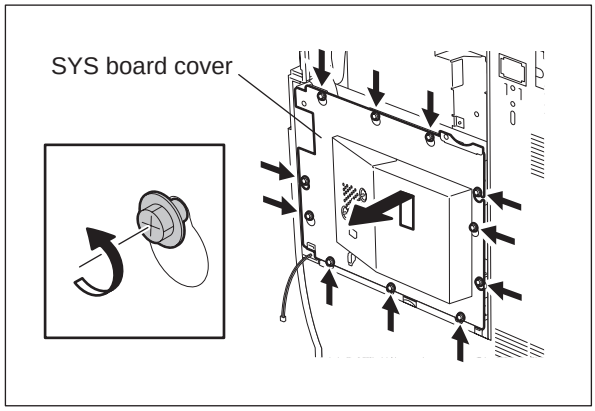


Fig. 2-44

(4) Disconnect 1 connector. Remove 2 screws and take off the HDD cooling fan.

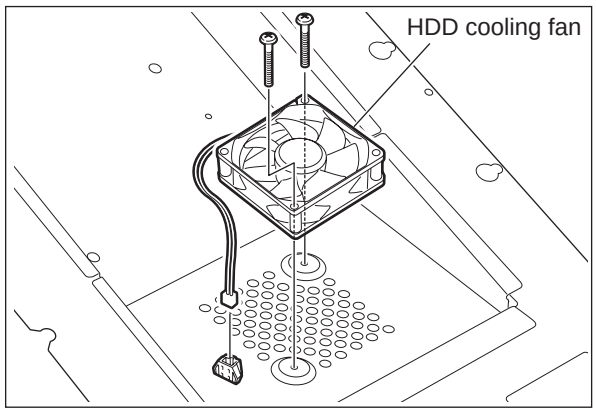


Fig. 2-45

[B] Hard disk (HDD)

(1) Take off the rear cover-1 (📖 P.2-31 "[R] Rear cover-1").
(2) Take off the SYS board cover (📖 P.2-33 "[A] HDD cooling fan (M21)").
(3) Disconnect 2 connectors.

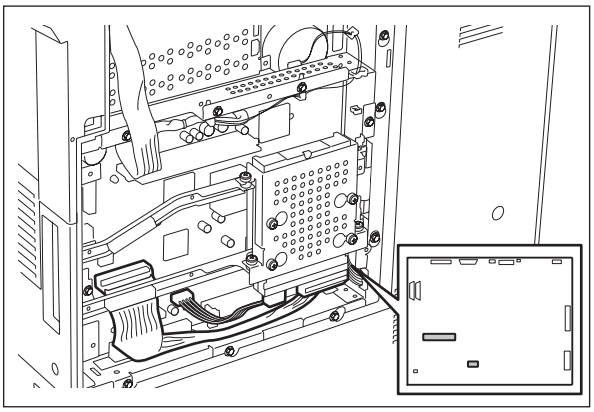


Fig. 2-46

(4) Remove 1 screw and the ground wire.
Remove 4 screws and take off the hard disk.

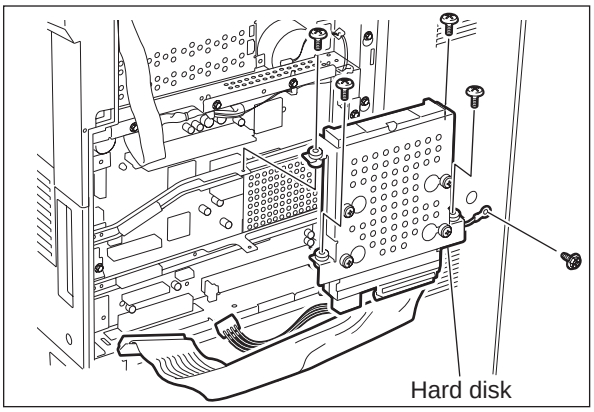


Fig. 2-47

[C] SYS board (SYS)

(1) Take off the SYS board cover (📖 P.2-33 "[A] HDD cooling fan (M21)").
(2) Disconnect 2 connectors, remove 2 screws, and then take off the hard disk with the stay.

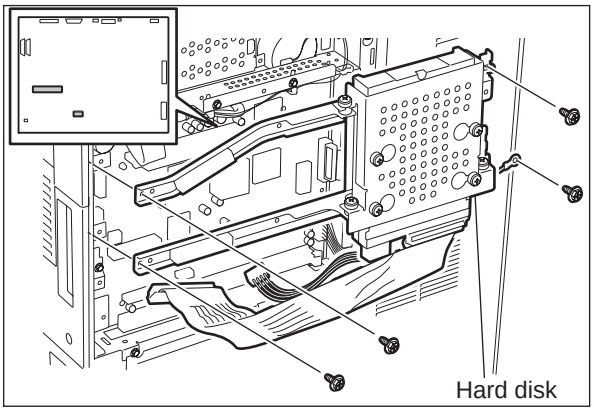


Fig. 2-48

(3) Disconnect 4 connectors. Remove 2 harness clamps.

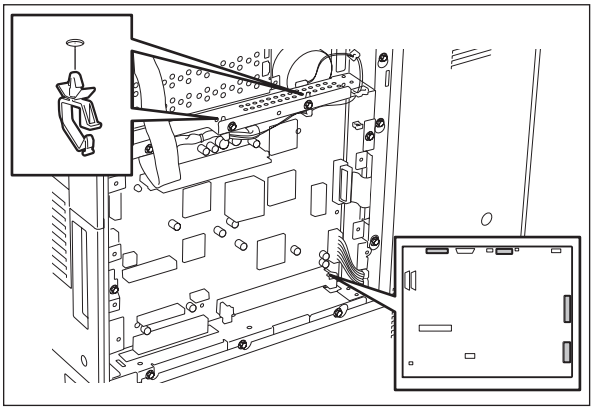


Fig. 2-49

(4) Remove 8 screws, and then take off 2 leaf springs and the SYS board.

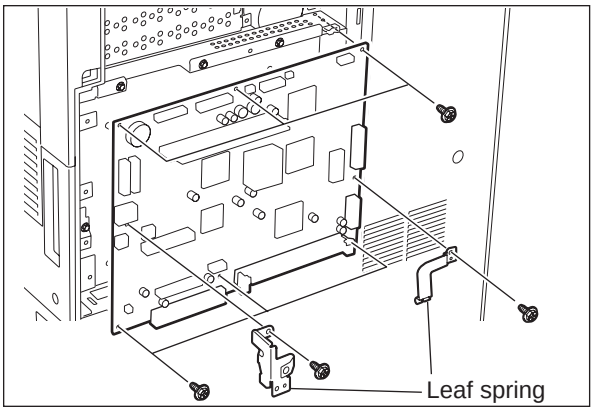
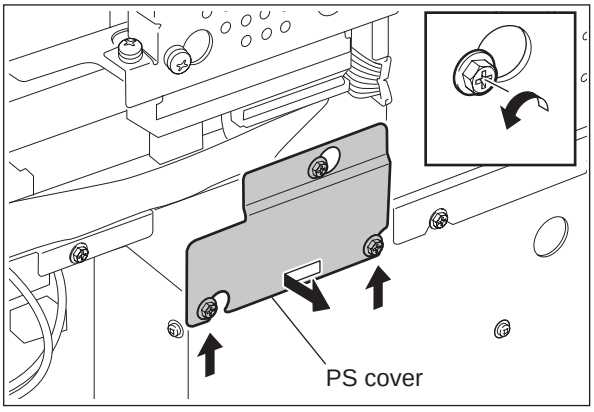


Fig. 2-50

[D] SYS board case

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Take off the right rear cover (📖 P.2-30 "[O] Right rear cover").
(3) Take off the SYS board cover (📖 P.2-33 "[A] HDD cooling fan (M21)").
(4) Loosen 2 screws and take off the PS cover.



(5) Disconnect 4 connectors.

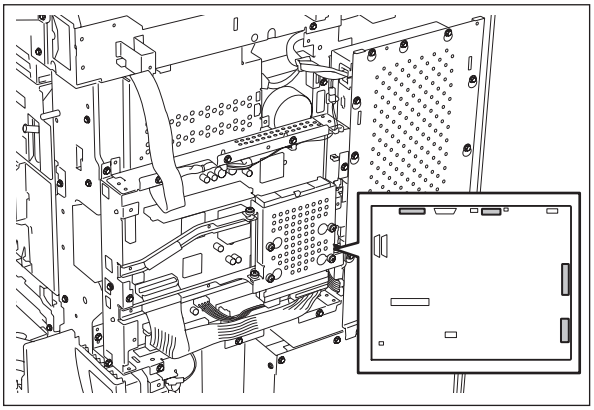


Fig. 2-51

(6) Release harnesses from 4 harness clamps.

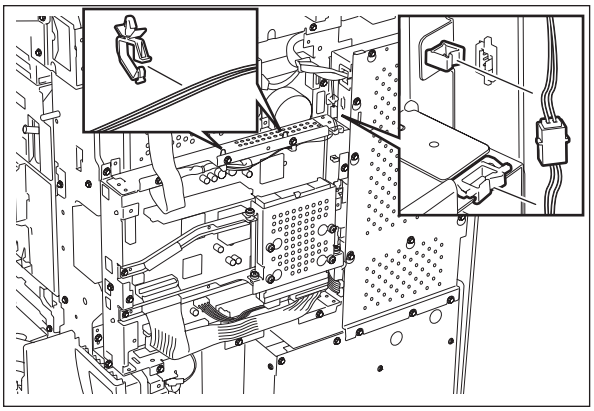


Fig. 2-52

(7) Remove 4 screws. Take off the SYS board case while releasing the harness from the harness clamp.

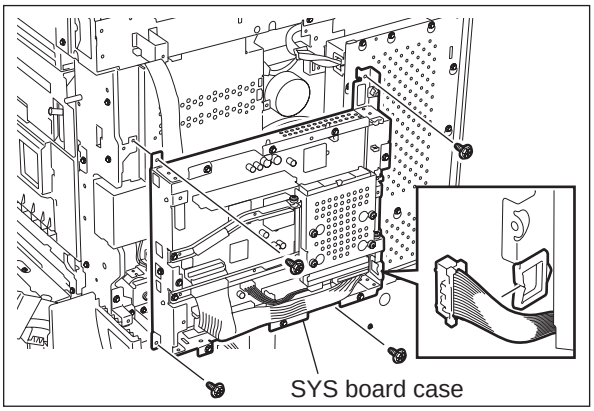


Fig. 2-53

[E] LGC board (LGC)

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Loosen 13 screws and take off the LGC board cover.

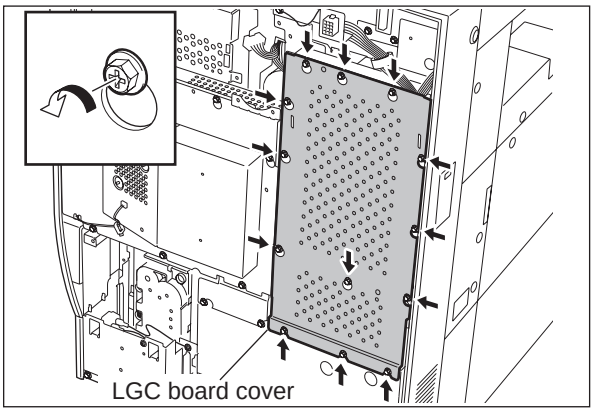


Fig. 2-54

(3) Disconnect 21 connectors.

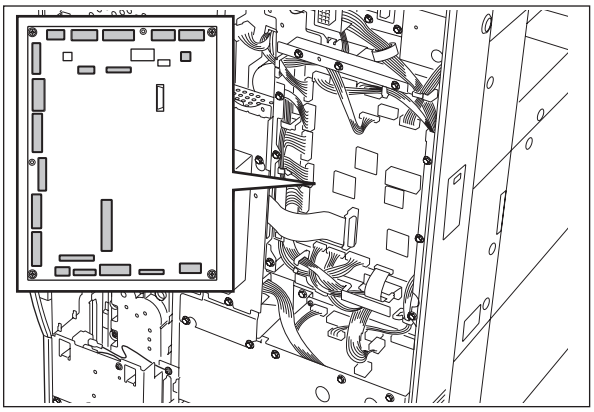


Fig. 2-55

(4) Remove 4 screws, release 2 lock supports, and then take off the LGC board.

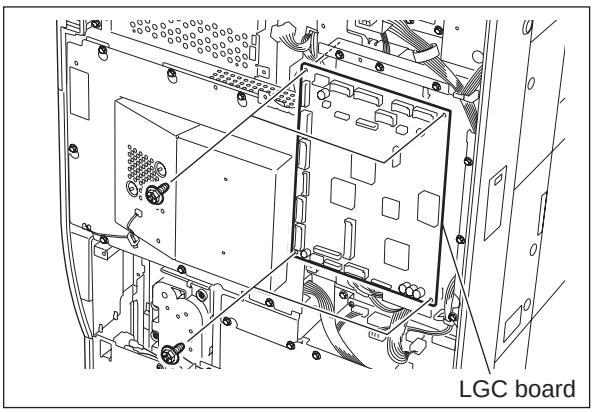


Fig. 2-56

[F] LGC board case

(1) Take off the rear cover-2 (P.2-32 "[S] Rear cover-2").
(2) Take off the SYS board cover (P.2-33 "[A] HDD cooling fan (M21)").
(3) Take off the LGC board cover (P.2-37 "[E] LGC board (LGC)").
(4) Disconnect 22 connectors.

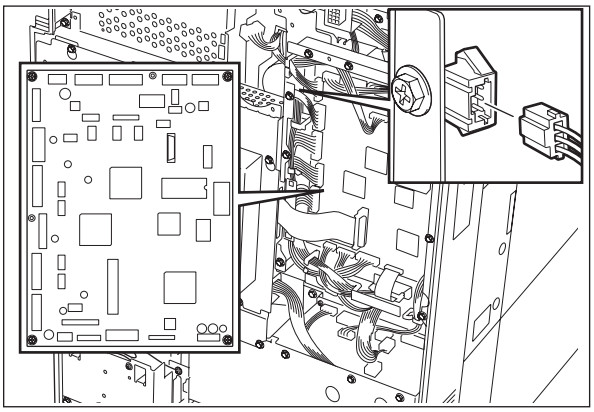


Fig. 2-57

(5) Release harnesses from 12 harness clamps.

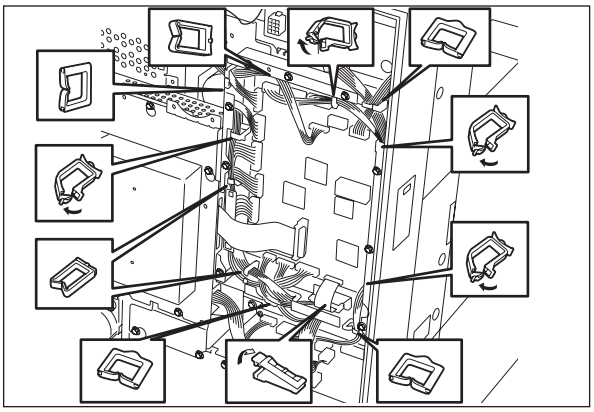


Fig. 2-58

(6) Remove 4 screws and take off the LGC board case.

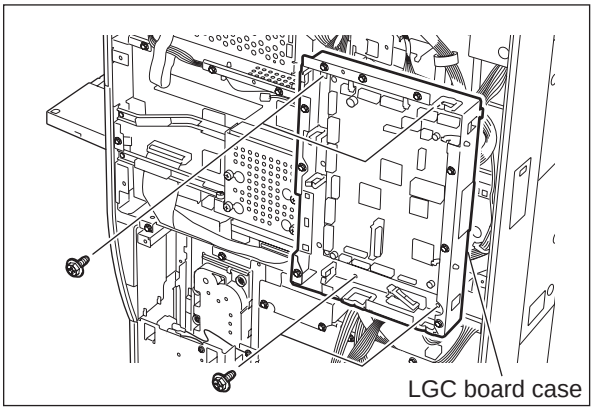


Fig. 2-59

[G] Switching regulator unit

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Take off the LGC board cover (📖 P.2-37 "[E] LGC board (LGC)").
(3) Take off the SYS board cover (📖 P.2-33 "[A] HDD cooling fan (M21)").
(4) Loosen 2 screws and take off the PS cover.

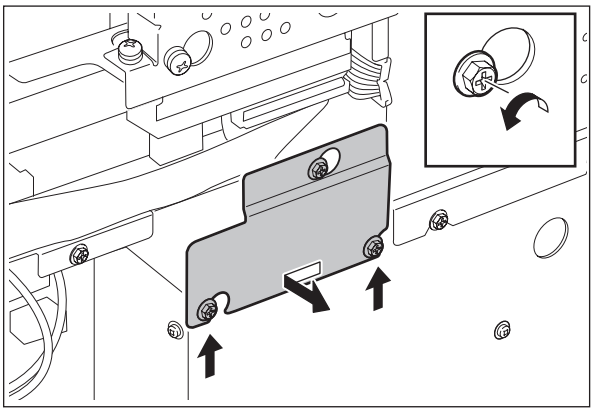


Fig. 2-60

(5) Disconnect 8 connectors.

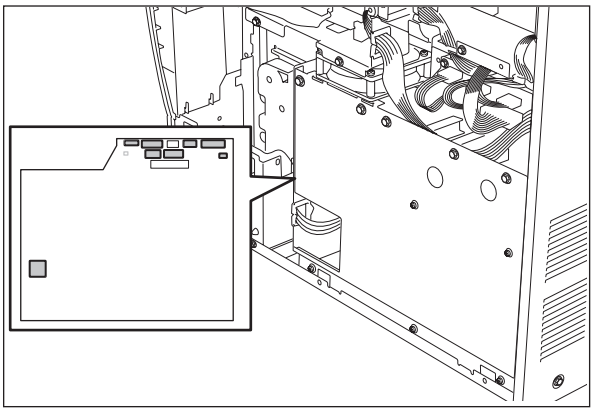


Fig. 2-61

(6) Remove 1 harness clamp. Release the harness from 1 harness clamp. Remove 3 screws and take off the switching regulator unit while the unit is inclined.

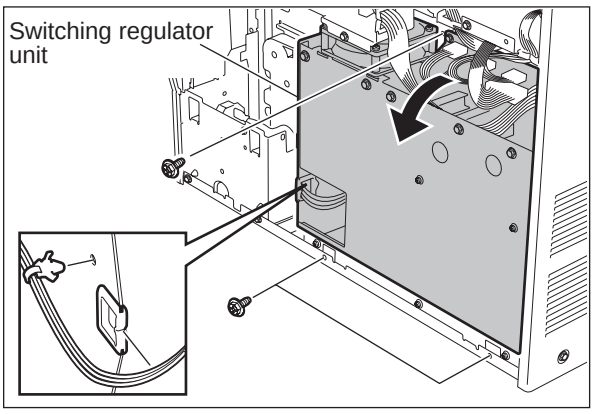


Fig. 2-62

[H] Power supply cooling fan (M19)

(1) Take off the switching regulator unit (📖 P.2-39 "[G] Switching regulator unit").
(2) Disconnect 1 connector, remove 4 screws and take off the power cooling fan.

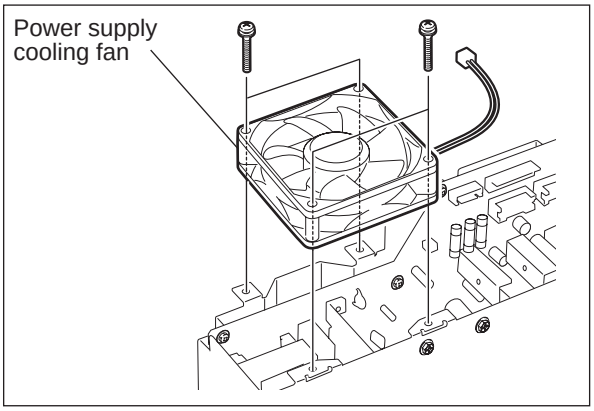


Fig. 2-63

[I] Switching regulator (PS)

Caution:

Be sure to unplug before the work, not to get an electricshock.

(1) Take off the power supply cooling fan (📖 P.2-40 "[H] Power supply cooling fan (M19)").
(2) Remove 9 screws and take off the switching regulator cover.

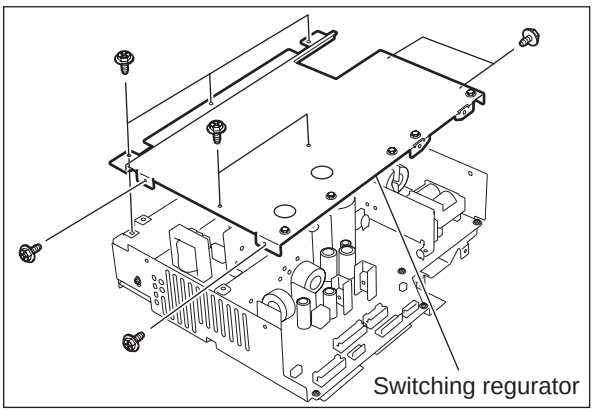


Fig. 2-64

(3) Remove 12 screws (1 screw fastened by a nut) and take off the switching regulator.

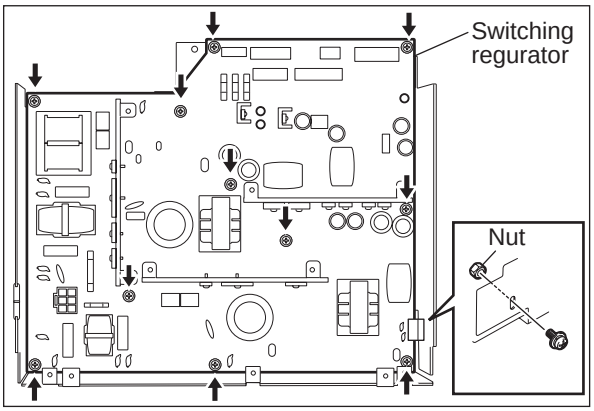


Fig. 2-65

[J] High-voltage transformer (HVT)

(1) Take off the switching regulator unit (📖 P.2-39 "[G] Switching regulator unit").
(2) Disconnect 8 connectors.

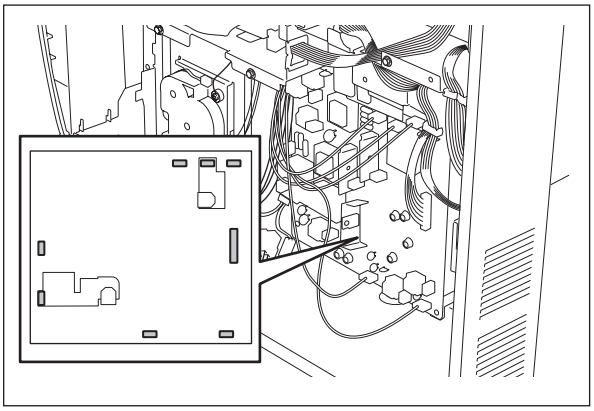


Fig. 2-66

(3) Remove 2 screws, release 2 lock supports, and take off the high-voltage transformer.

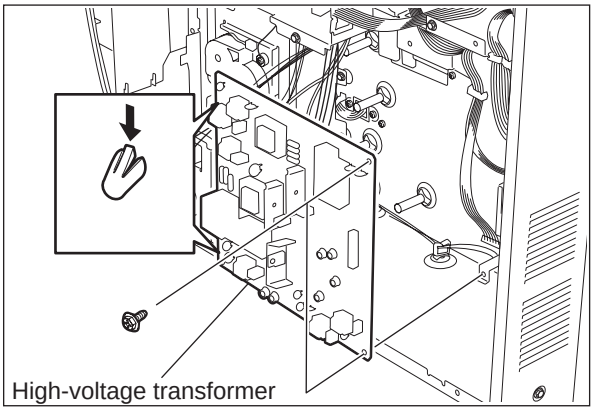


Fig. 2-67

[K] FIL board (FIL)

Caution:

Be sure to unplug before the work, not to get an electricshock.

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Take off the right lower cover (📖 P.2-31 "[Q] Right lower cover").
(3) Remove 1 screw and take off the cover plate.

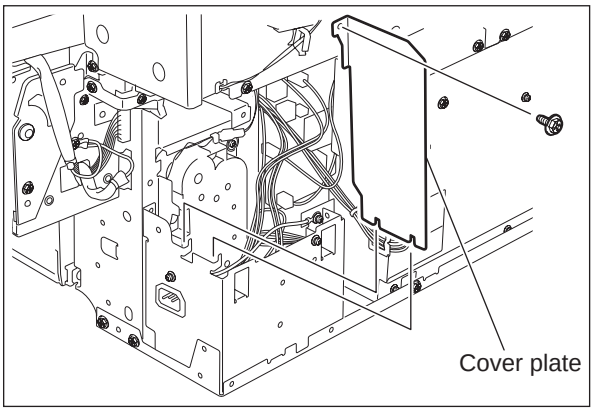


Fig. 2-68

(4) Remove 5 screws and take off the filter bracket.

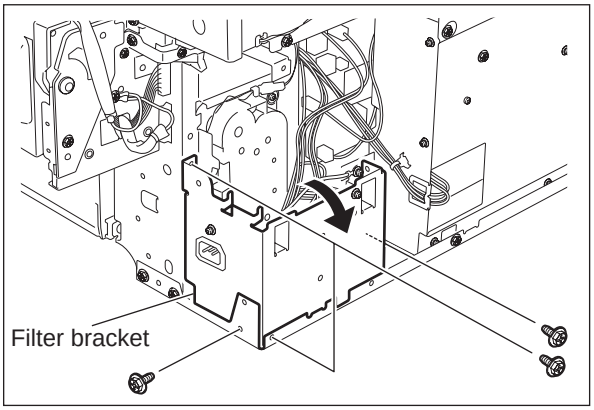


Fig. 2-69

(5) Disconnect 4 connectors and 2 terminals.

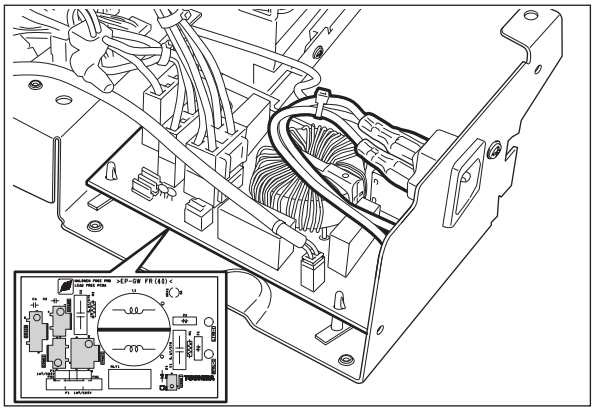


Fig. 2-70

(6) Remove 2 screws, release 2 lock supports, and then take off the FIL board.

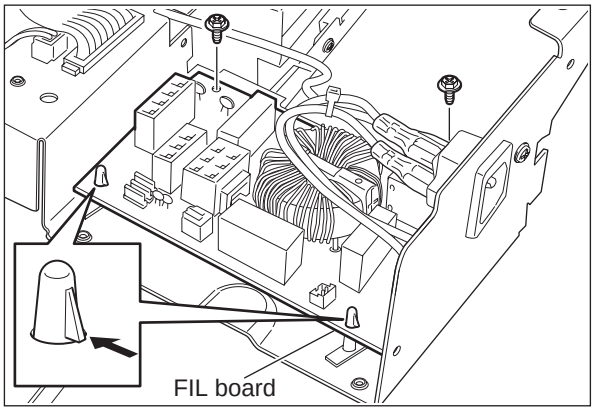


Fig. 2-71

[L] DRV board (DRV)

(1) Take off the LGC board case (📖 P.2-38 "[F] LGC board case").
(2) Disconnect 4 connectors.

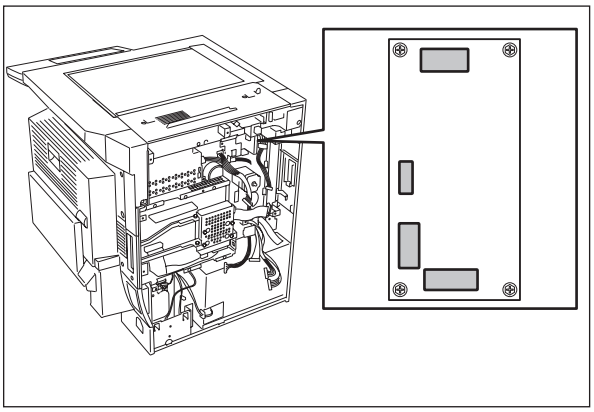


Fig. 2-72

(3) Remove 4 screws and take off the DRV board.

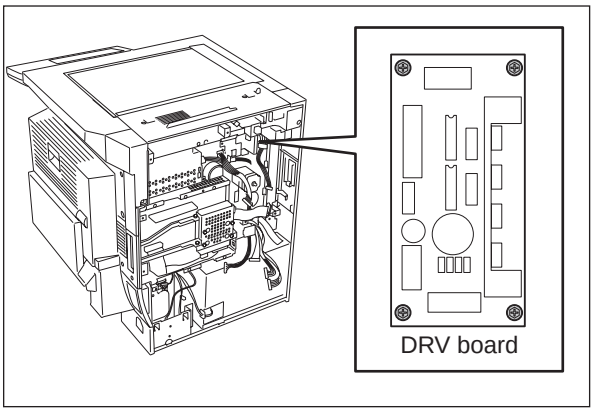


Fig. 2-73

2.7 Removal and Installation of Options

[A] MR-3018 (Reversing Automatic Document Feeder (RADF))

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover.

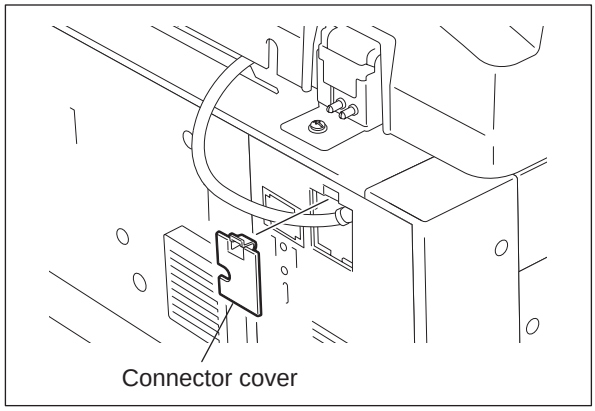


Fig. 2-74

(3) Disconnect the connector.

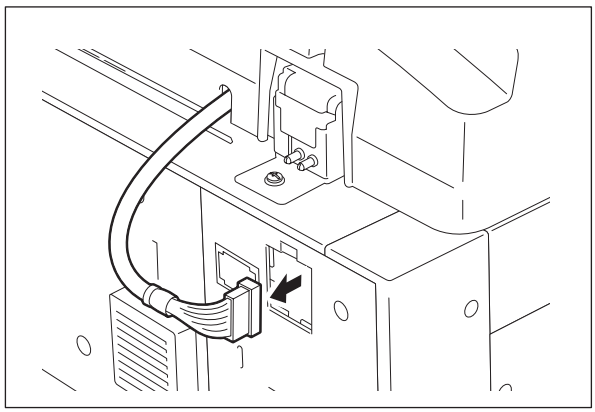


Fig. 2-75

(4) Remove 1 screw and 1 washer on the rear side.

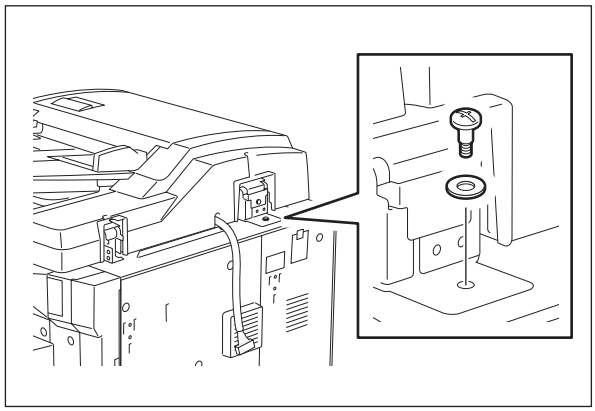


Fig. 2-76

(5) Remove 1 screw on the rear side.

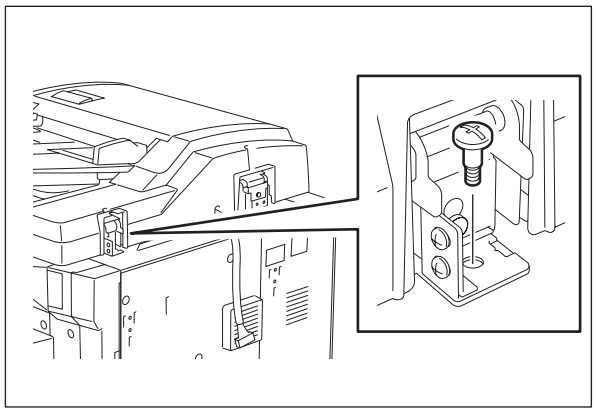


Fig. 2-77

(6) Open the RADF.

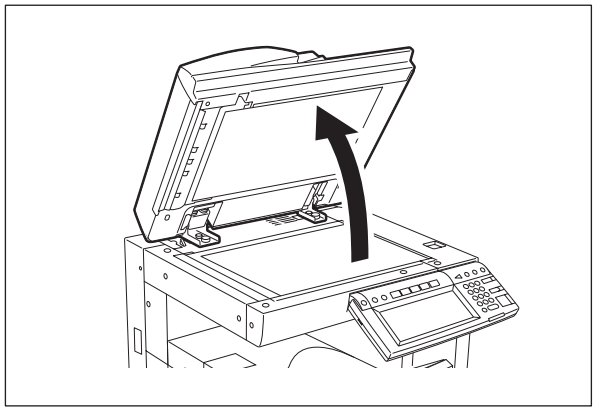


Fig. 2-78

(7) Remove 2 screws on the front side.

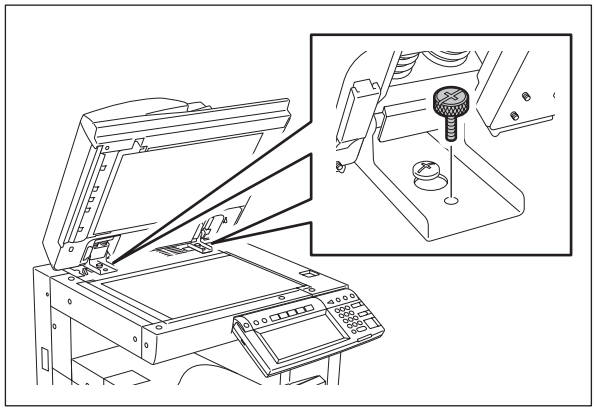


Fig. 2-79

(8) Slide the RADF backward and take off by lifting it up.

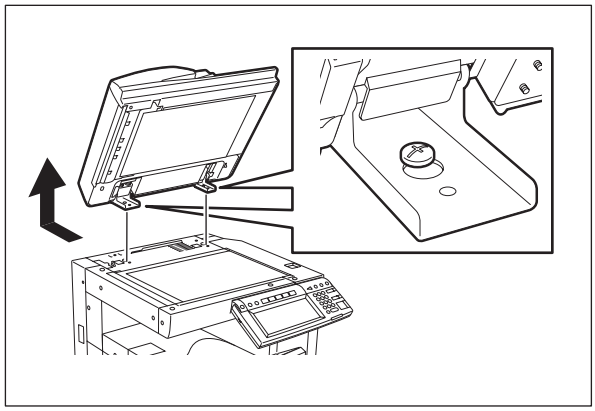


Fig. 2-80

Note:

When disinstalling the RADF and installing the platen cover, or disinstalling the platen cover and installing the RADF, tighten the screw for installing the damper holding bracket of the scanner in the following procedure.

- Remove 1 screw and take off the gel cover.

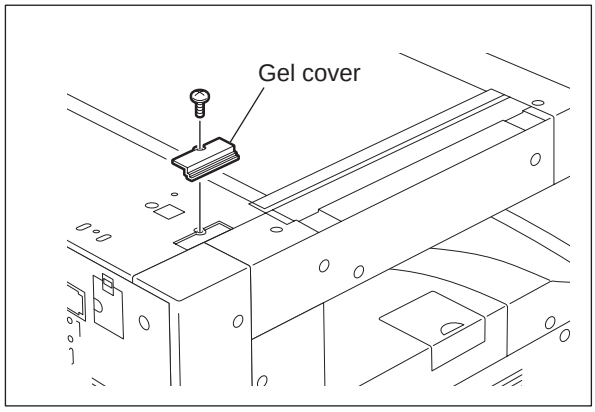


Fig. 2-81

- Change the position of the screw for installing the damper holding bracket.

  Installing the RADF: A
  Installing the platen cover: B

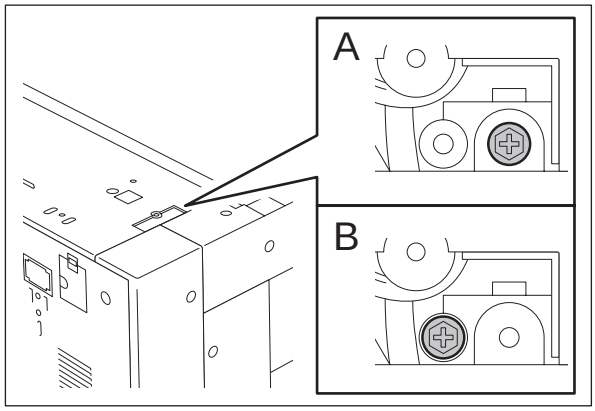


Fig. 2-82

[B] KD-1011 (Paper Feed Pedestal (PFP))

(1) Turn OFF the power and unplug the power cable.
(2) Remove 1 screw and take off the connector cover of the equipment.

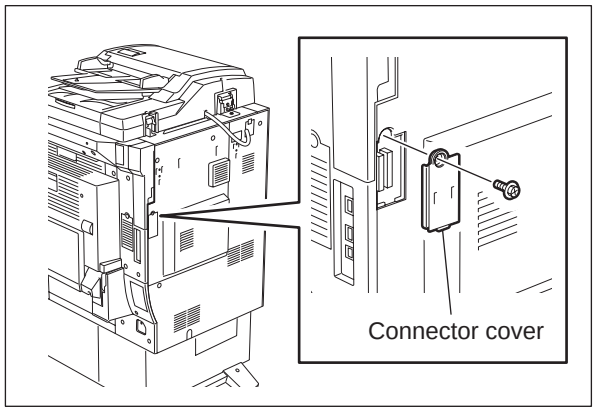


Fig. 2-83

(3) Remove 2 screws and take off the rear cover-1.

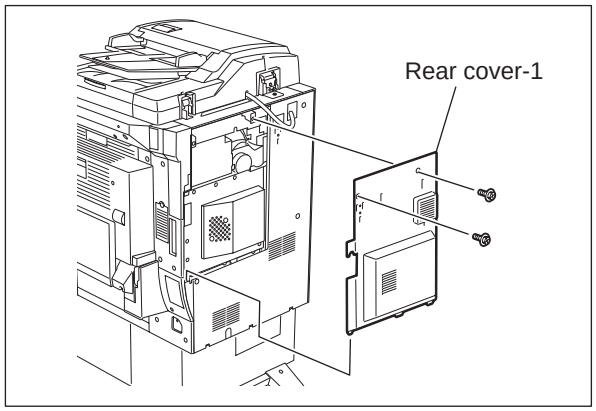


Fig. 2-84

(4) Remove 3 screws and take off the rear cover-2.

Note:
Disconnect the connector of the RADF first when the RADF is installed.

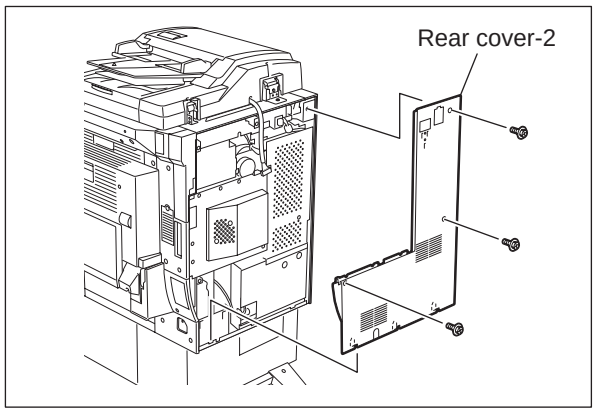


Fig. 2-85

(5) Remove 1 screw and the ground wire, and then disconnect 2 connectors (3 if the optional damp heater is installed).

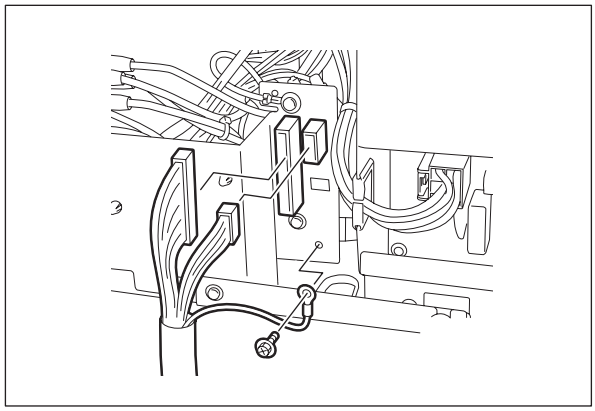


Fig. 2-86

(6) Remove 2 screws and take off 2 fixing brackets on the rear side.

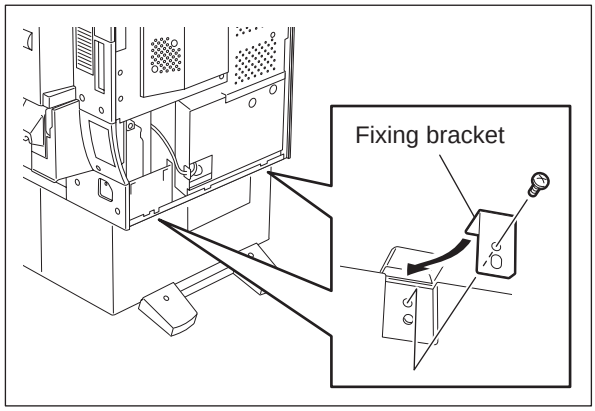


Fig. 2-87

(7) Take off the lower drawer of the equipment and PFP upper drawer.

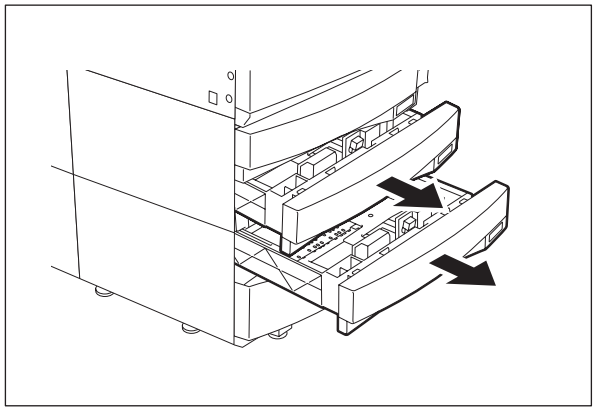


Fig. 2-88

(8) Remove 4 screws and take off 2 fixing brackets on the front side.

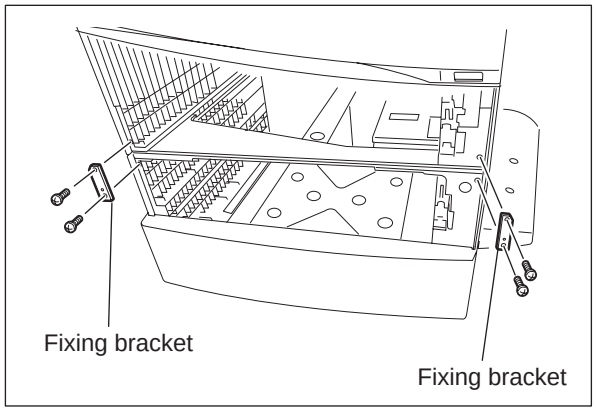


Fig. 2-89

(9) Lift up the equipment and take off the PFP.

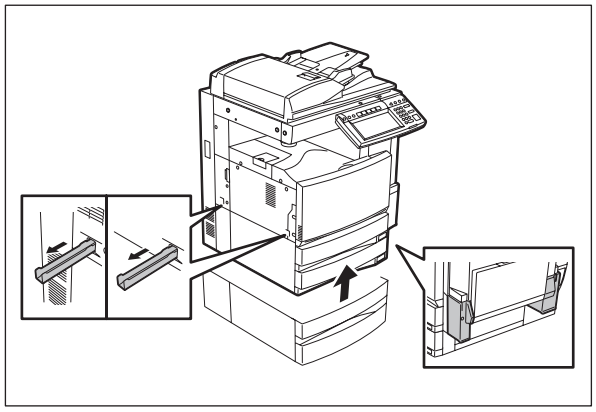


Fig. 2-90

[C] KD-1012 (Large Capacity Feeder (LCF))

(1) Turn OFF the power and unplug the power cable.
(2) Remove 1 screw and take off the connector cover of the equipment.

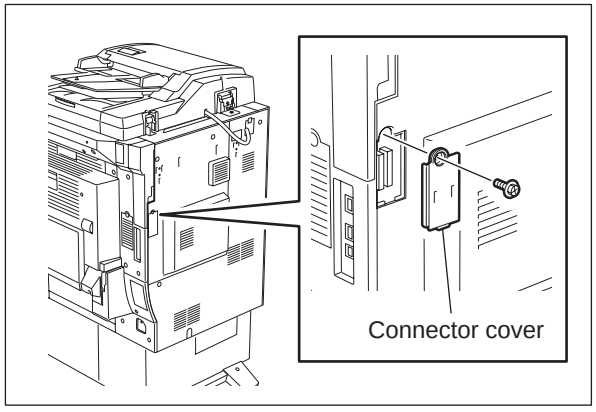


Fig. 2-91

(3) Remove 2 screws and take off the rear cover-1.

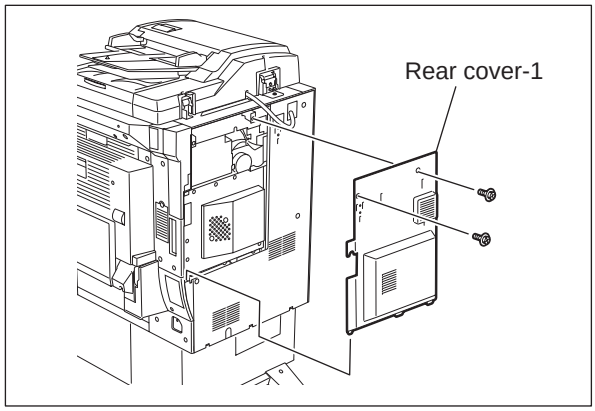


Fig. 2-92

(4) Remove 3 screws and take off the rear cover-2.

Note:
Disconnect the connectors of the RADF first when the RADF is installed.

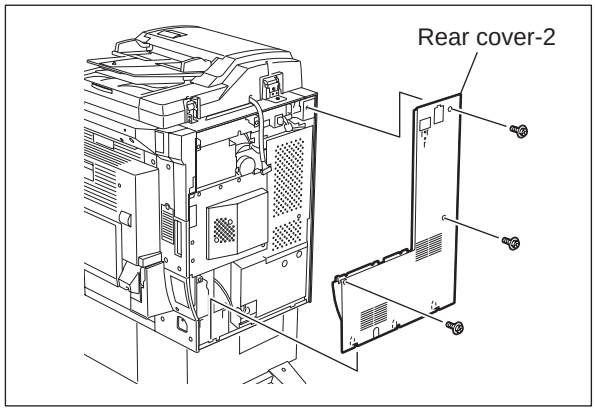


Fig. 2-93

(5) Remove 1 screw and the ground wire, and then disconnect 2 connectors (3 if the optional damp heater is installed).

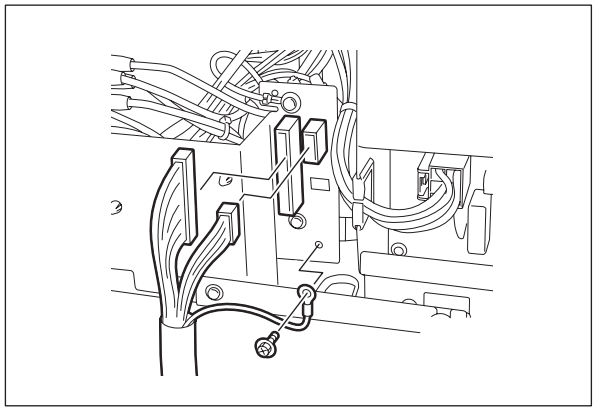


Fig. 2-94

(6) Remove 2 screws and take off 2 fixing brackets on the rear side.

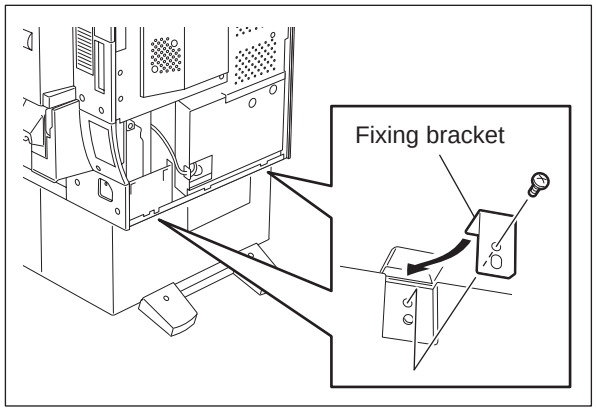


Fig. 2-95

(7) Take off the lower drawer of the equipment.

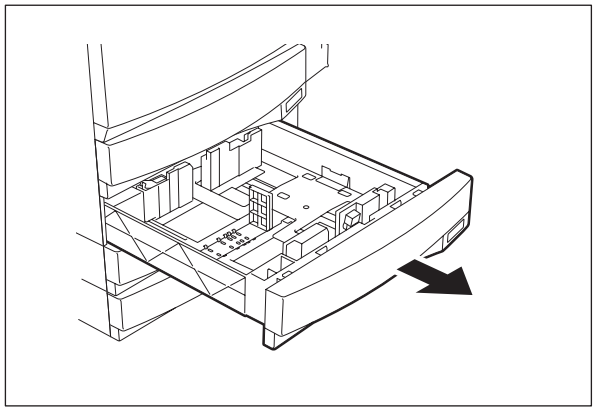


Fig. 2-96

(8) Pull out the LCF drawer.

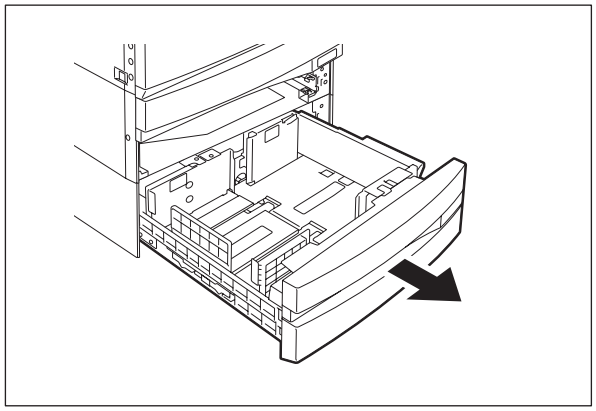


Fig. 2-97

(9) Remove 4 screws and take off 2 fixing brackets on the front side.

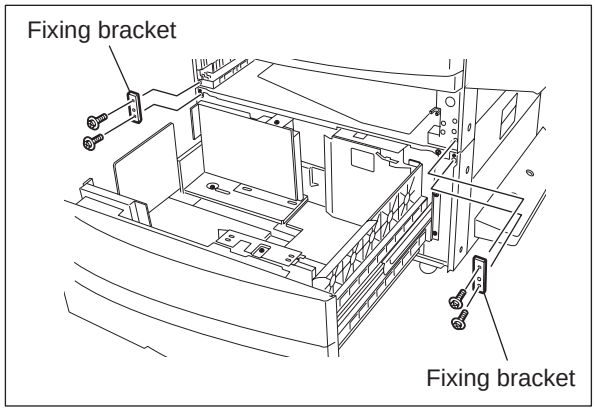


Fig. 2-98

(10) Lift up the equipment and take off the LCF.

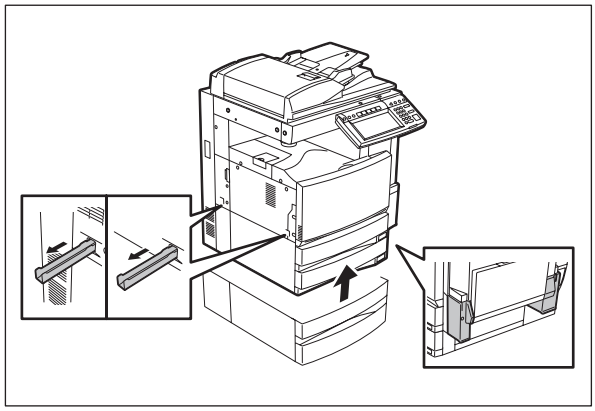


Fig. 2-99

[D] MJ-1022 (Hanging finisher) <When PFP/LCF is not installed>

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect the connector.

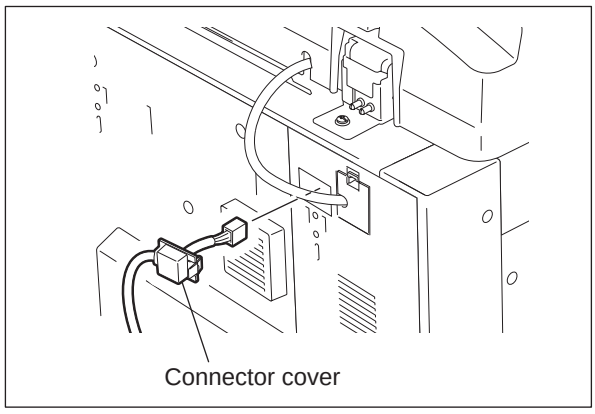


Fig. 2-100

(3) Remove 2 screws and take off the safety bracket on the rear side and the cover.

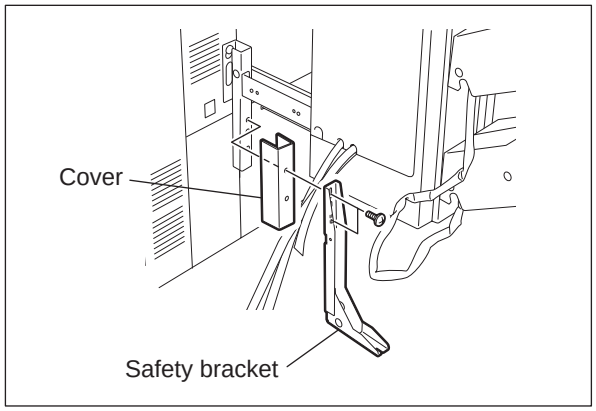


Fig. 2-101

(4) Remove 2 screws and take off the safety bracket on the front side and the cover.

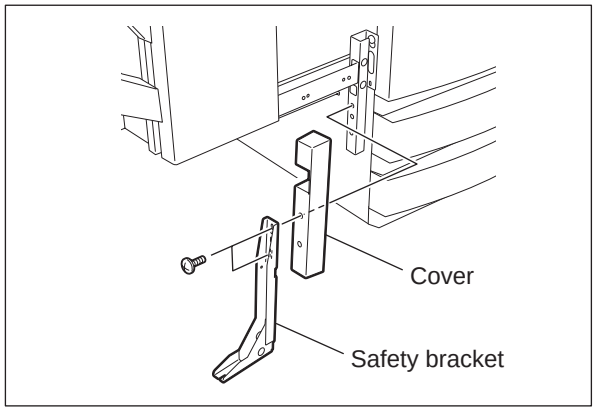


Fig. 2-102

(5) Remove 2 screws.

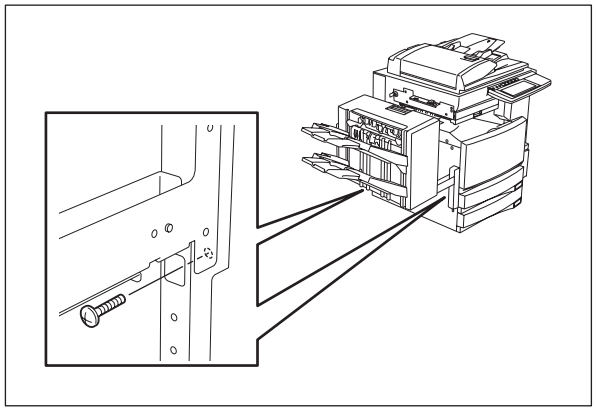


Fig. 2-103

(6) Lift up the finisher and take it off.

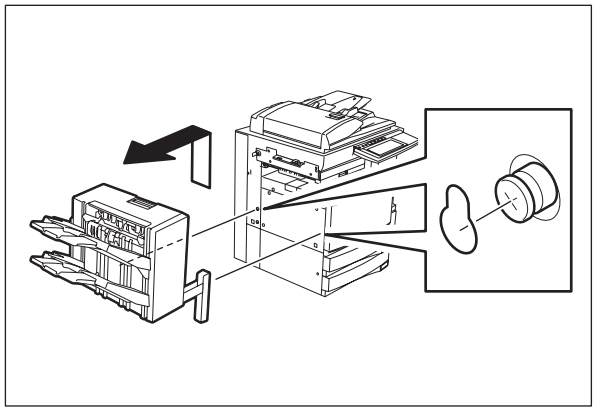


Fig. 2-104

<When PFP/LCF is installed>

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect the connector.

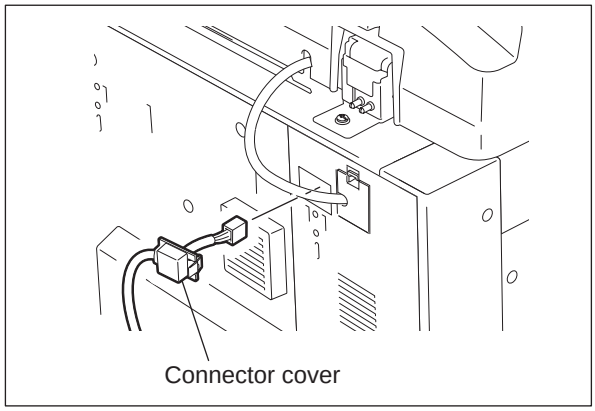


Fig. 2-105

(3) Remove 2 screws and take off the cover on the rear side.

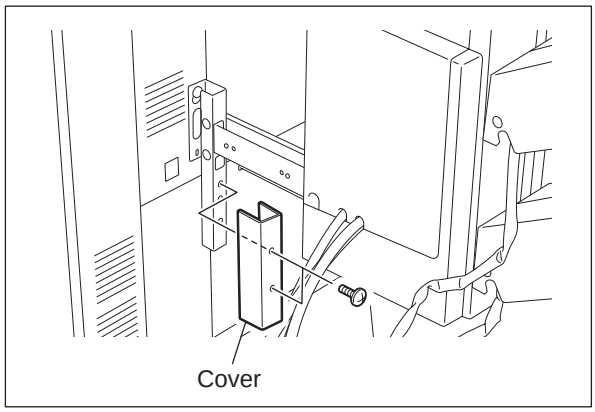


Fig. 2-106

(4) Remove 2 screws and take off the cover on the front side.

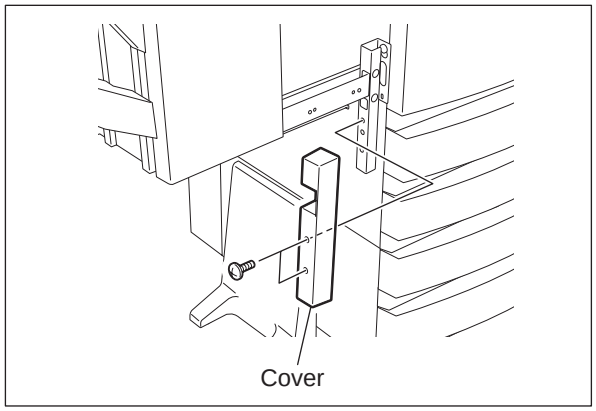


Fig. 2-107

(5) Remove 2 screws.

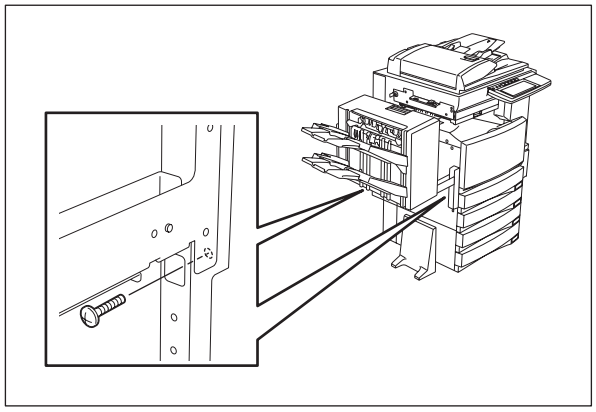


Fig. 2-108

(6) Lift up the finisher and take it off.

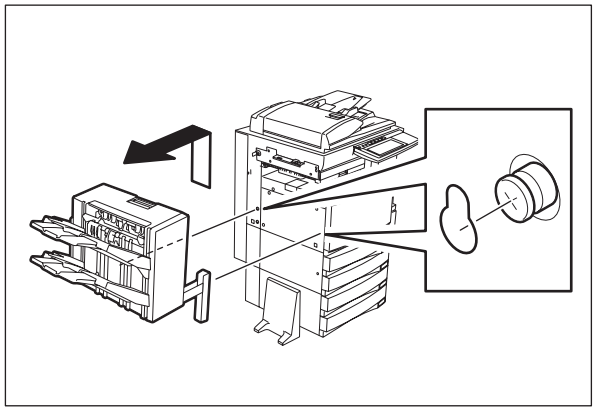


Fig. 2-109

[E] MJ-1023 (Console finisher)

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect the connector.

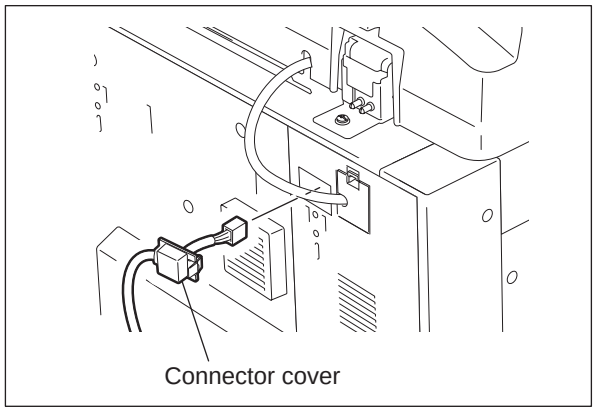


Fig. 2-110

(3) Remove 1 screw and take off the finisher lower cover.

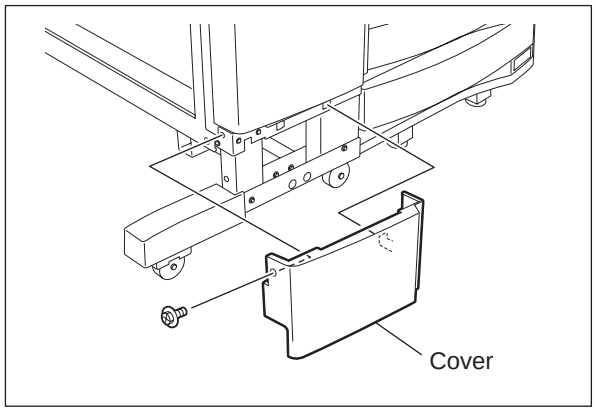


Fig. 2-111

(4) Remove 3 screws and take off the finisher front cover.

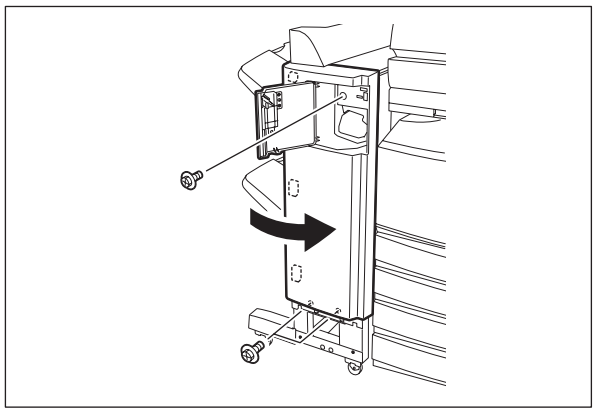


Fig. 2-112

(5) Remove 1 screw.

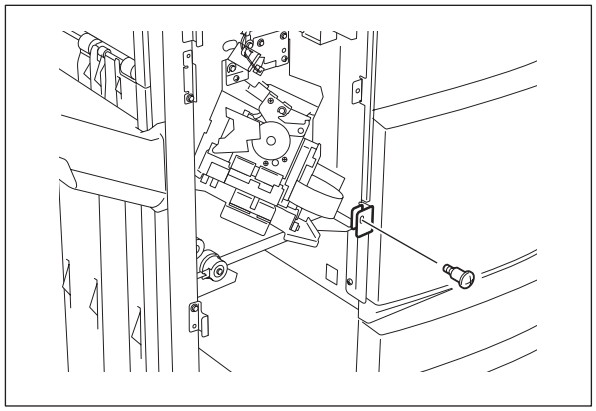


Fig. 2-113

(6) Remove 1 screw and take off the cover of the finisher rear side.

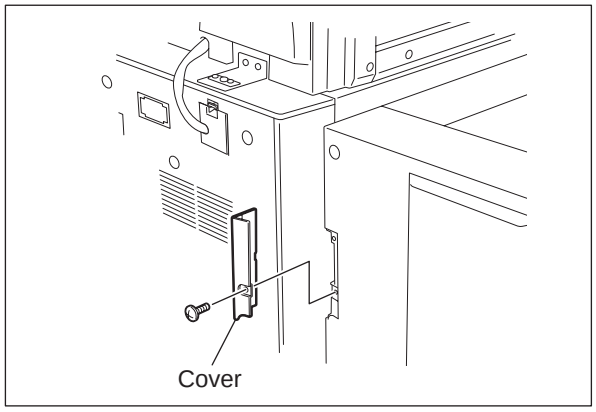


Fig. 2-114

(7) Remove 1 screw.

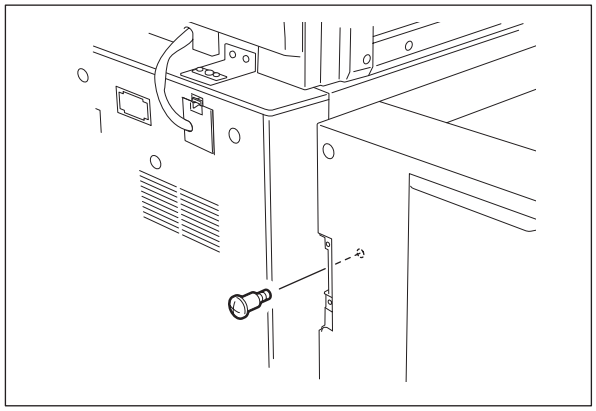


Fig. 2-115

(8) Take off the finisher.

Note:
Be careful not to fell the finisher when moving the finisher unit only.

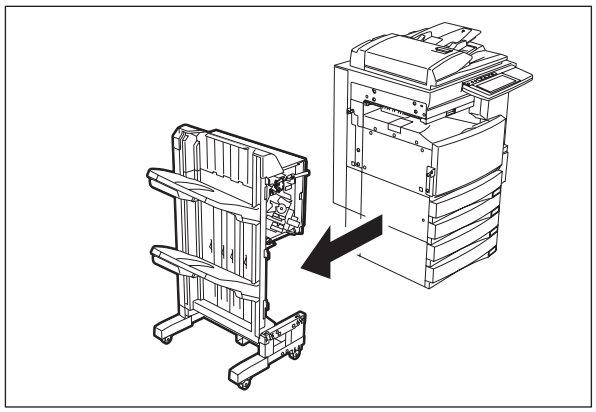


Fig. 2-116

[F] MJ-1024 (Console finisher)

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect the connector.

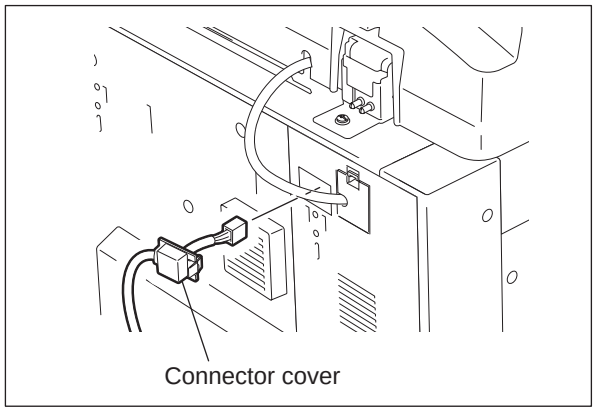


Fig. 2-117

(3) Open the finisher front cover and remove 1 screw.

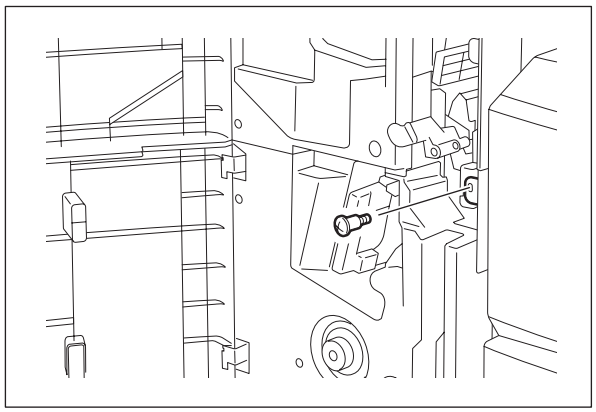


Fig. 2-118

(4) Remove 1 screw and take off the cover of the finisher rear side.

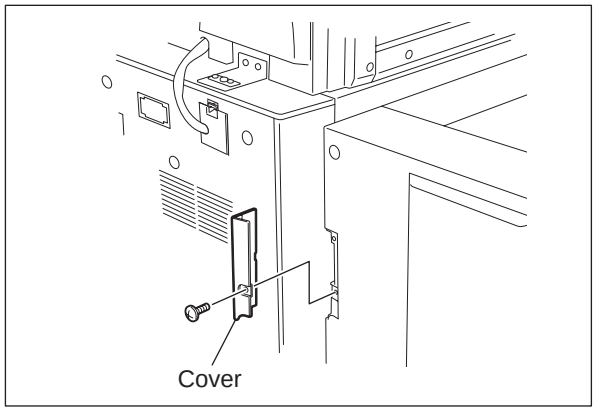


Fig. 2-119

(5) Remove 1 screw.

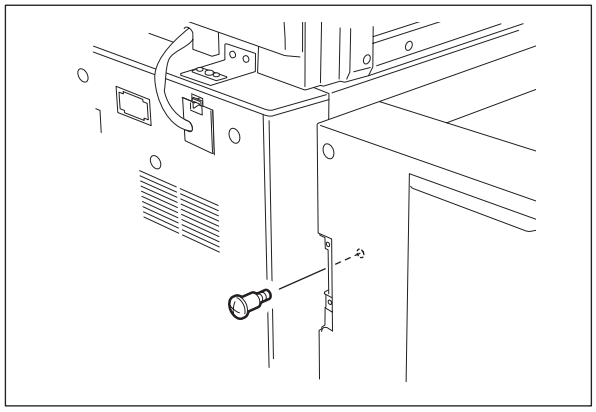


Fig. 2-120

(6) Take off the finisher.

Note:
Note: Be careful not to fell the finisher when moving the finisher unit only.

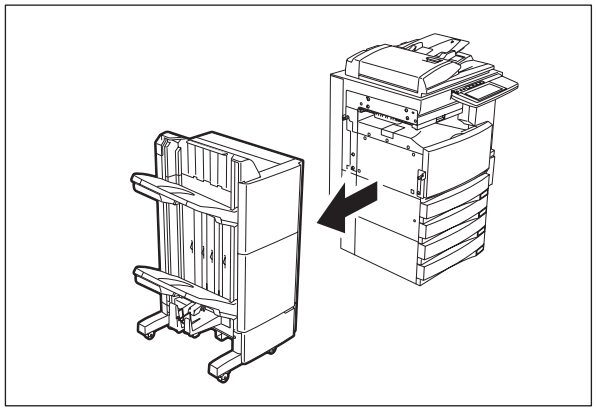


Fig. 2-121

[G] MJ-1101 (Console finisher)

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect the connector.

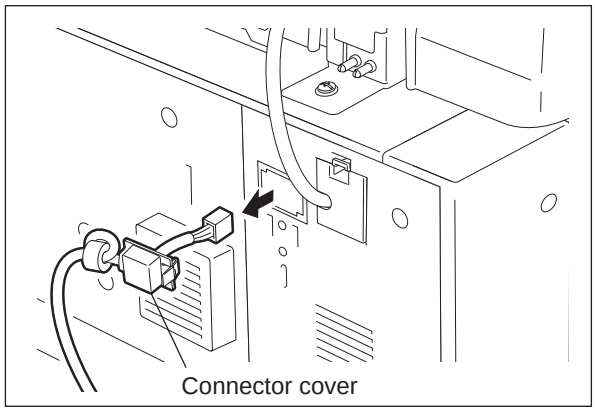


Fig. 2-122

(3) Open the finisher front cover. Remove 1 screw and pull out the fixing plate.

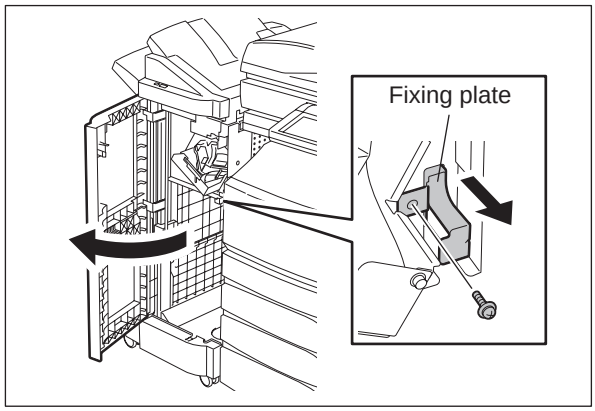


Fig. 2-123

(4) Loosen 1 screw and take off the ground wire.

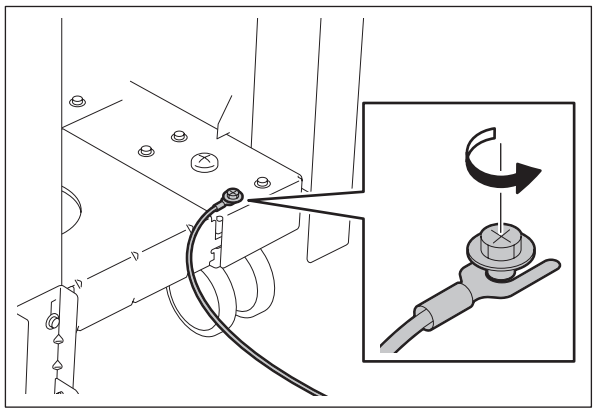


Fig. 2-124

(5) Take off the finisher.

Note:
Be careful not to fell the finisher when moving only the finisher unit.

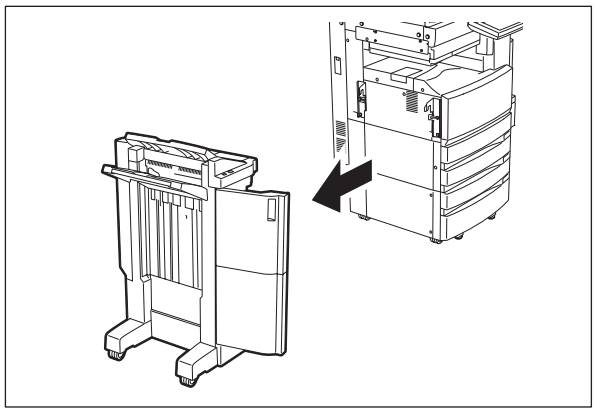


Fig. 2-125

[H] MJ-6004 (Hole punch unit)

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect connector.

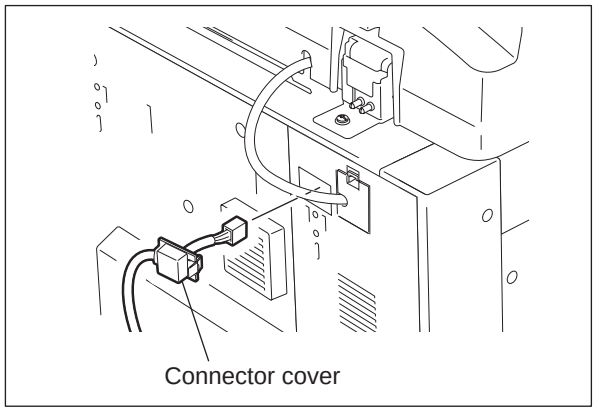


Fig. 2-126

(3) Open the front cover of the hole punch unit and remove 1 screw.

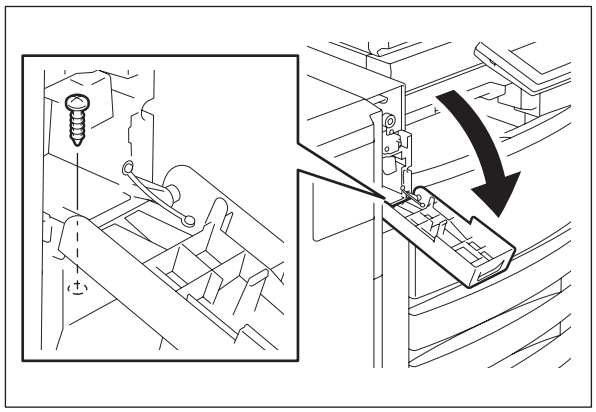


Fig. 2-127

(4) Take off the cover of the punch unit lower side.

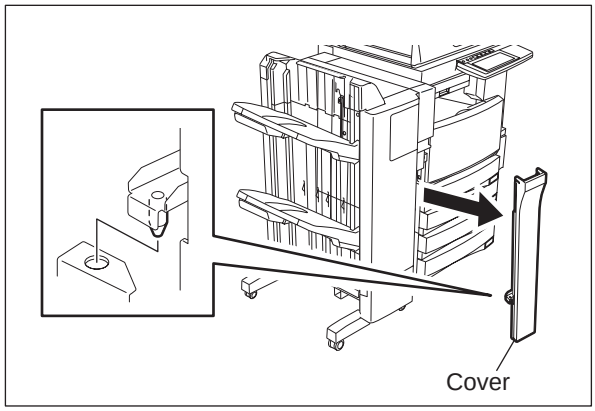


Fig. 2-128

(5) Remove 1 screw.

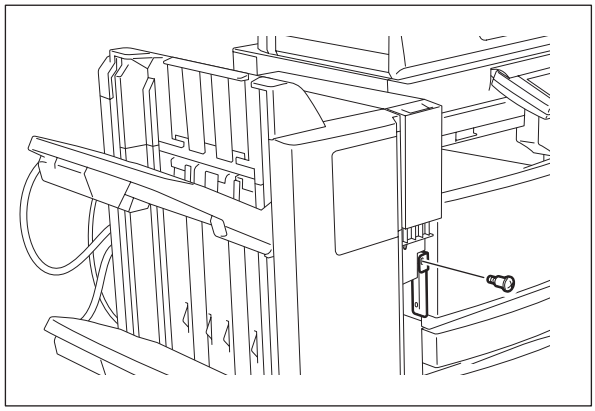


Fig. 2-129

(6) Remove 3 screws and take off the punch unit rear cover.

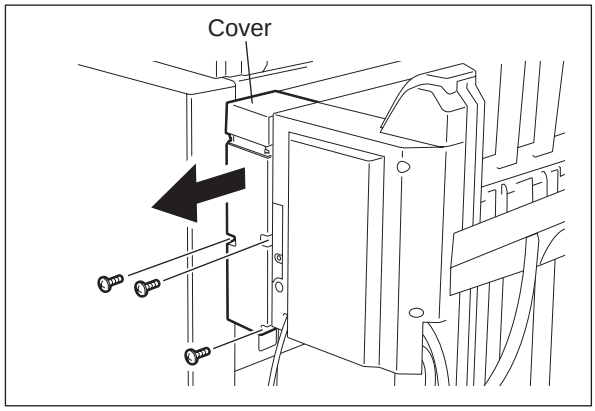


Fig. 2-130

(7) Remove 1 screw.

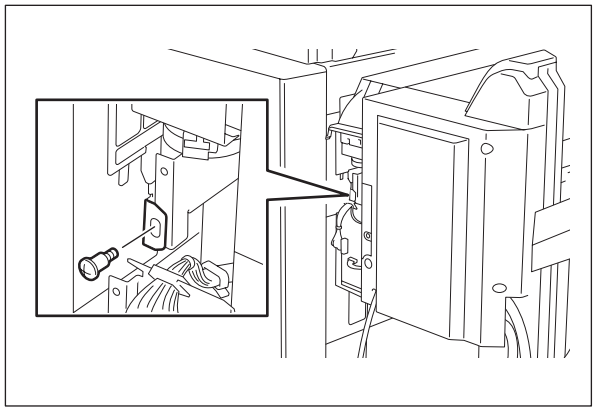


Fig. 2-131

(8) Take off the finisher with the hole punch unit.

Note:
Be careful not to fell the finisher when moving the finisher unit only.

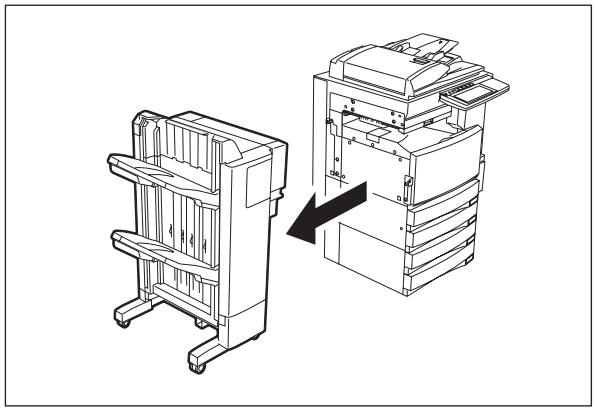


Fig. 2-132

(9) Disconnect 2 connectors.

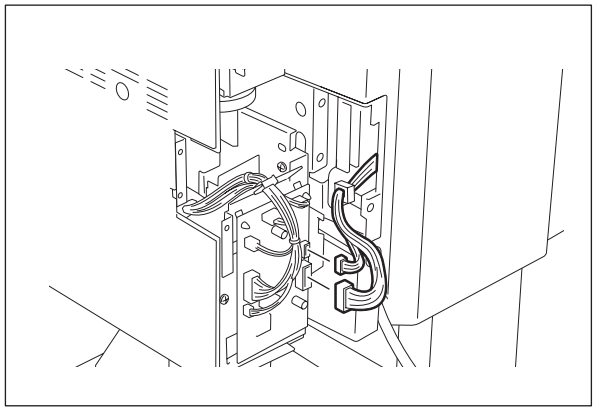


Fig. 2-133

(10) Remove 2 screws.

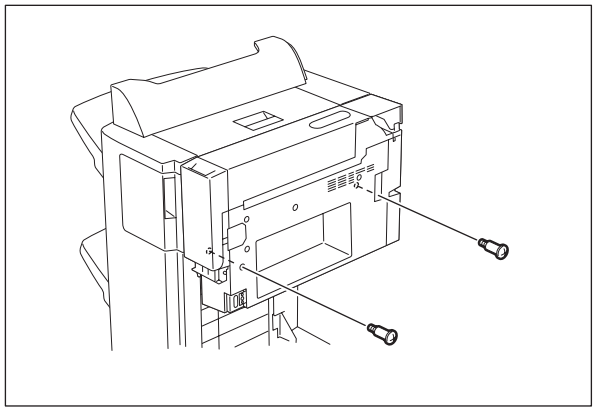


Fig. 2-134

(11) Lift up the punch unit and take it off.

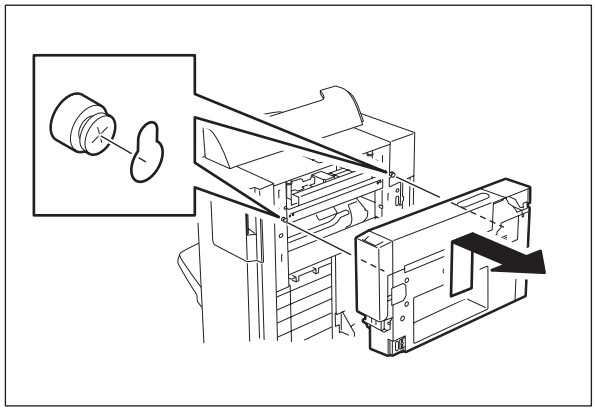


Fig. 2-135

[I] MJ-6101 (Hole punch unit)

(1) Turn OFF the power and unplug the power cable.
(2) Take off the connector cover and disconnect the connector.

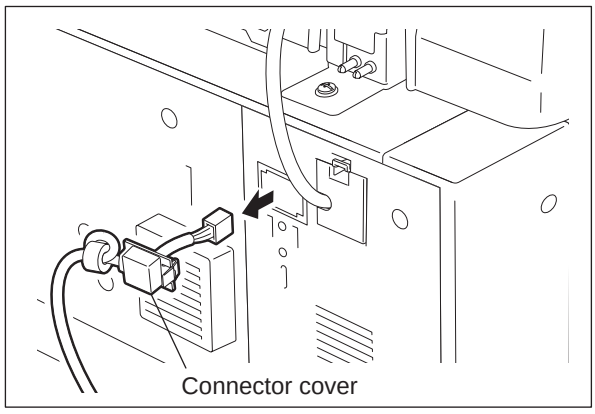


Fig. 2-136

(3) Open the front cover of the hole punch unit. Push the 2 latches and take off the hole punch unit front lower cover.

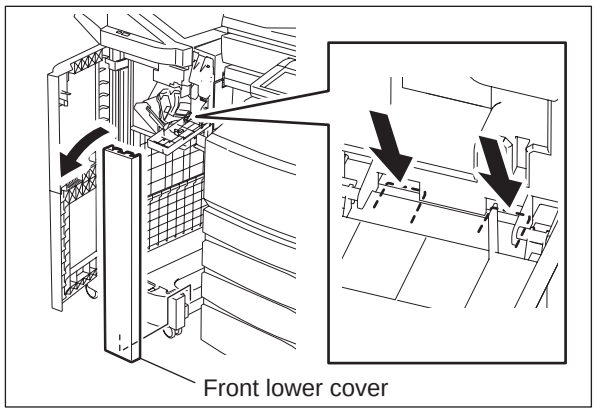


Fig. 2-137

(4) Open the finisher front cover. Remove 1 screw and pull out the fixing plate.

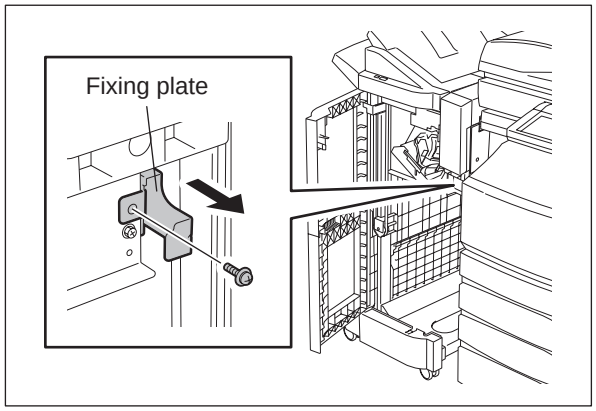


Fig. 2-138

(5) Loosen 1 screw and take off the groune wire.

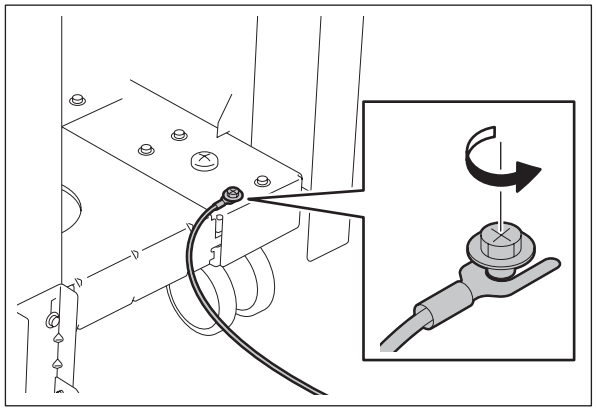


Fig. 2-139

(6) Take off the finisher with the hole punch unit.

Note:
Be careful not to fell the finisher when moving only the finisher unit.

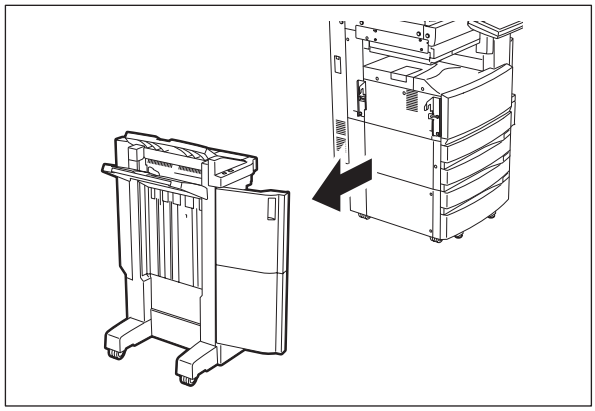


Fig. 2-140

(7) Remove 1 screw and take off the connector cover.

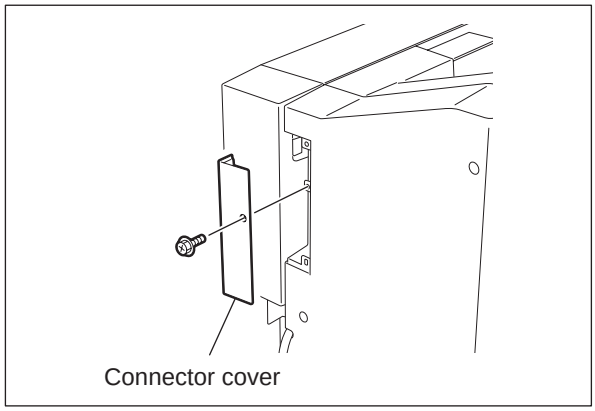


Fig. 2-141

(8) Disconnect 1 connector.

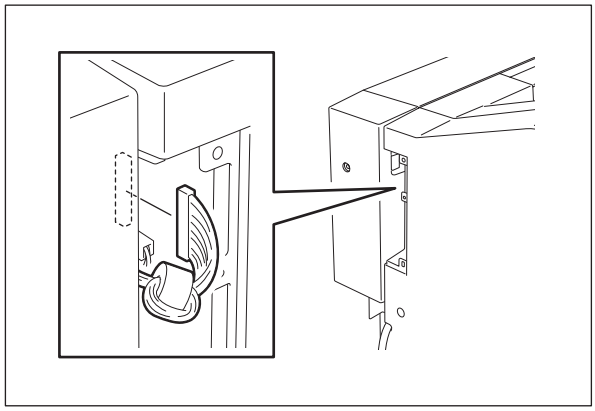


Fig. 2-142

(9) Take off the cover of the hole punch unit rear lower cover.

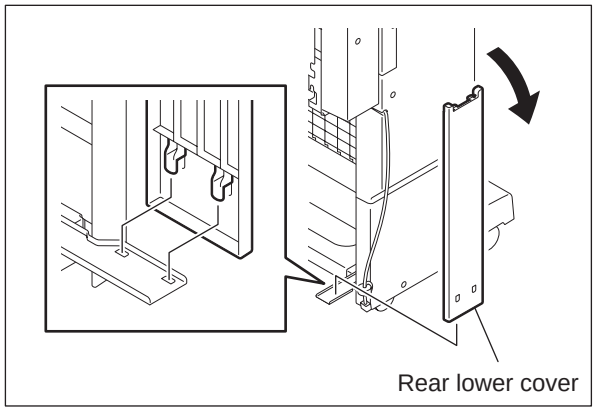


Fig. 2-143

(10) Remove 1 screw and take off the cover.

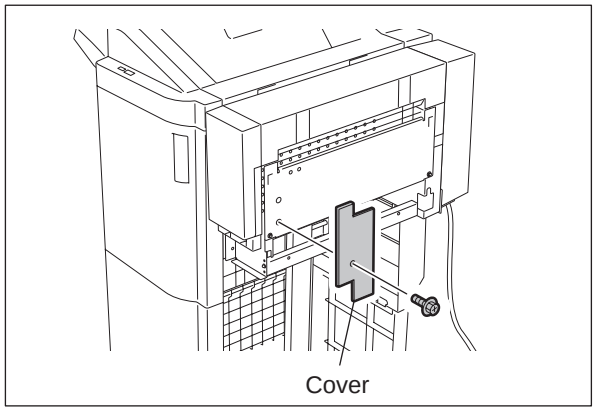


Fig. 2-144

(11) Remove 4 screws. Lift up the punch unit and take it off.

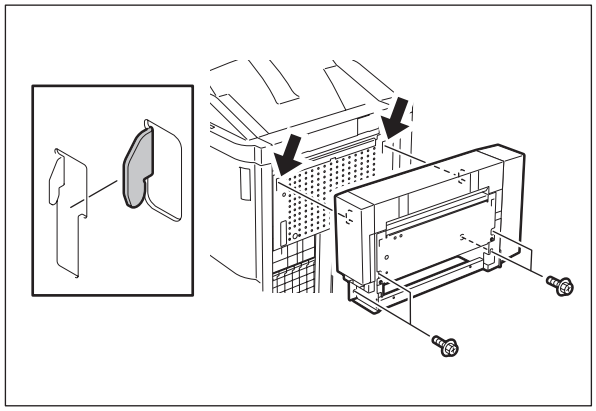


Fig. 2-145

[J] KN-3511 (Bridge unit)

(1) Turn OFF the power and unplug the power cable.
(2) Remove 2 screws and take off the cover.

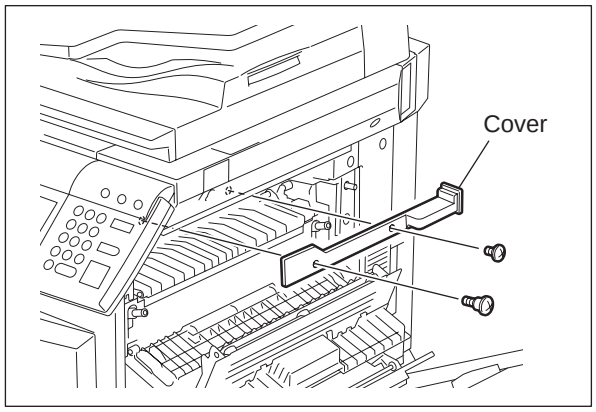


Fig. 2-146

(3) Disconnect 1 connector.

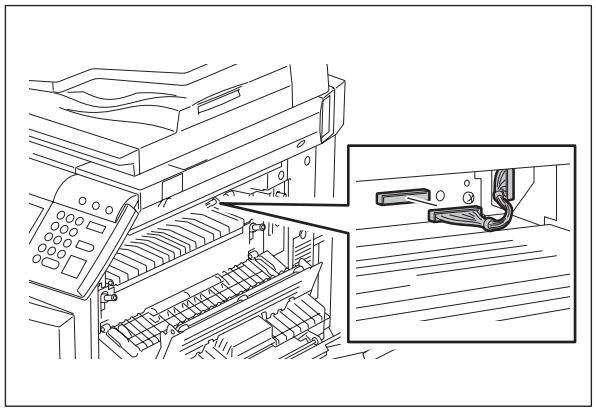


Fig. 2-147

(4) Open the bridge unit. Remove 1 screw.

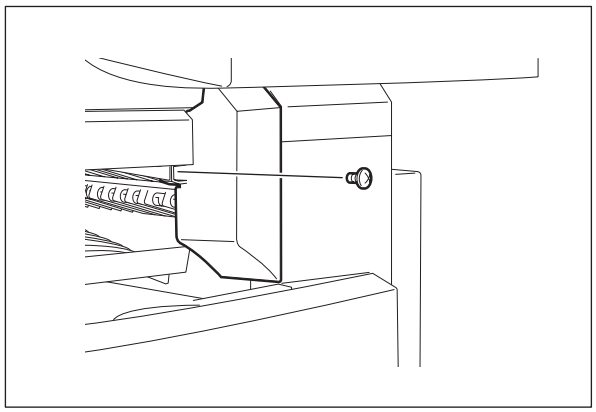


Fig. 2-148

(5) Take off the cover.

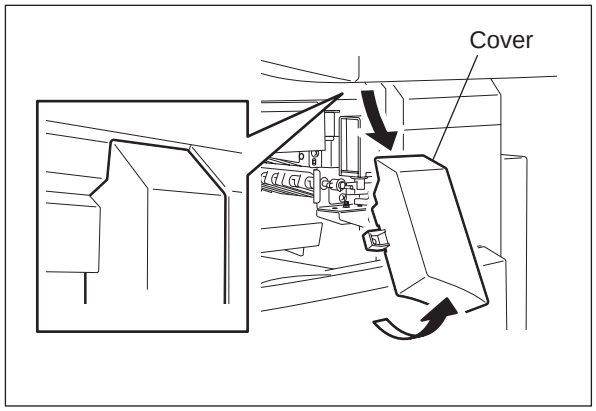


Fig. 2-149

(6) Close the bridge unit and remove 1 screw.

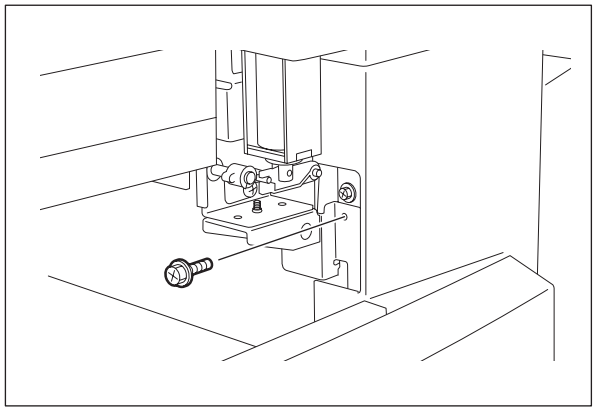


Fig. 2-150

(7) Remove 4 screws and take off the bracket.

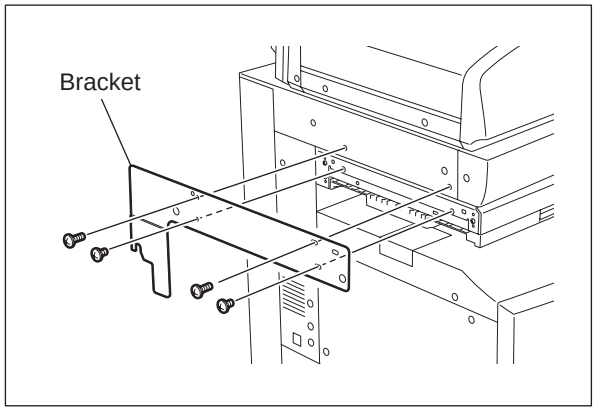


Fig. 2-151

(8) Lift up the bridge unit and release the hook. Take off the bridge unit toward the front.

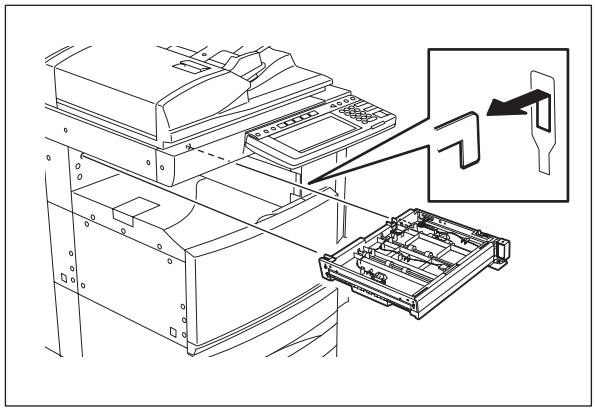


Fig. 2-152

3. COPY PROCESS

3.1 Expression of Colors and 4-Step Copy Process

A variety of colors can be expressed by mixing the three primary colors: Yellow, magenta and cyan. Red can be created by mixing yellow and magenta; blue can be created by mixing magenta and cyan; green is created by mixing cyan and yellow; and mixing all the three primary colors allows you to obtain black.

This equipment has accomplished to improve reproducibility by adding black toner to the mixture of the above three colors at proper ratio.

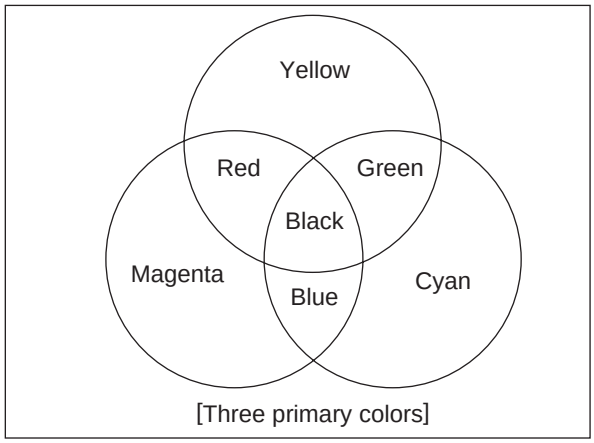


Fig. 3-1

This equipment adopts a revolver mechanism which combines the three developer units of yellow, magenta and cyan. In this process, each image of cyan, magenta and yellow is developed in order by rotating these developers and overlaid on the transfer belt one after another. Then the black image developed by independent black developer unit is overlaid for the best expressions of colors. Four layers of color image (K→C→M→Y) on the transfer belt are transferred onto paper.

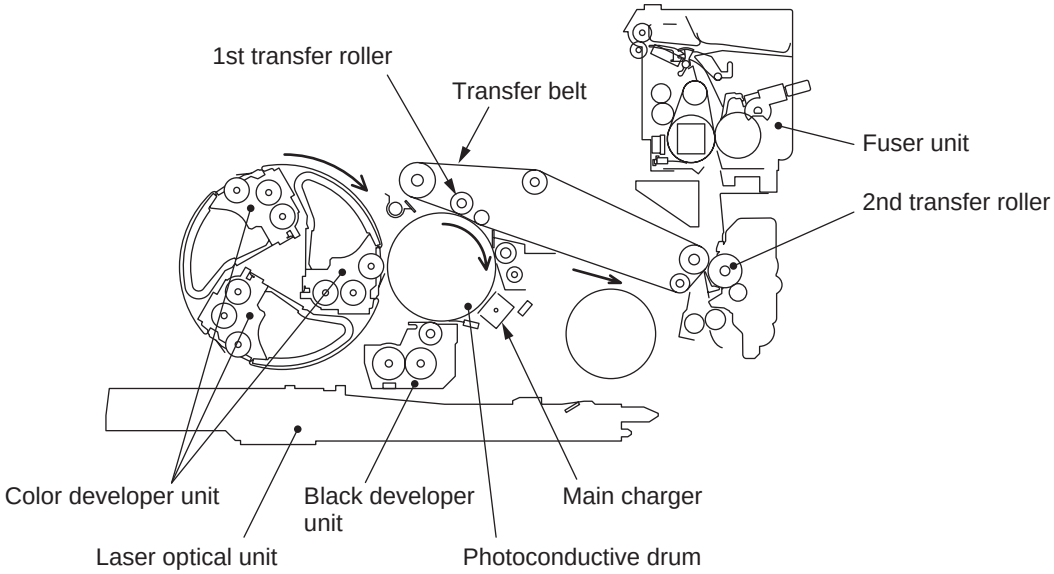


Fig. 3-2

3.2 General Description of Copying Process

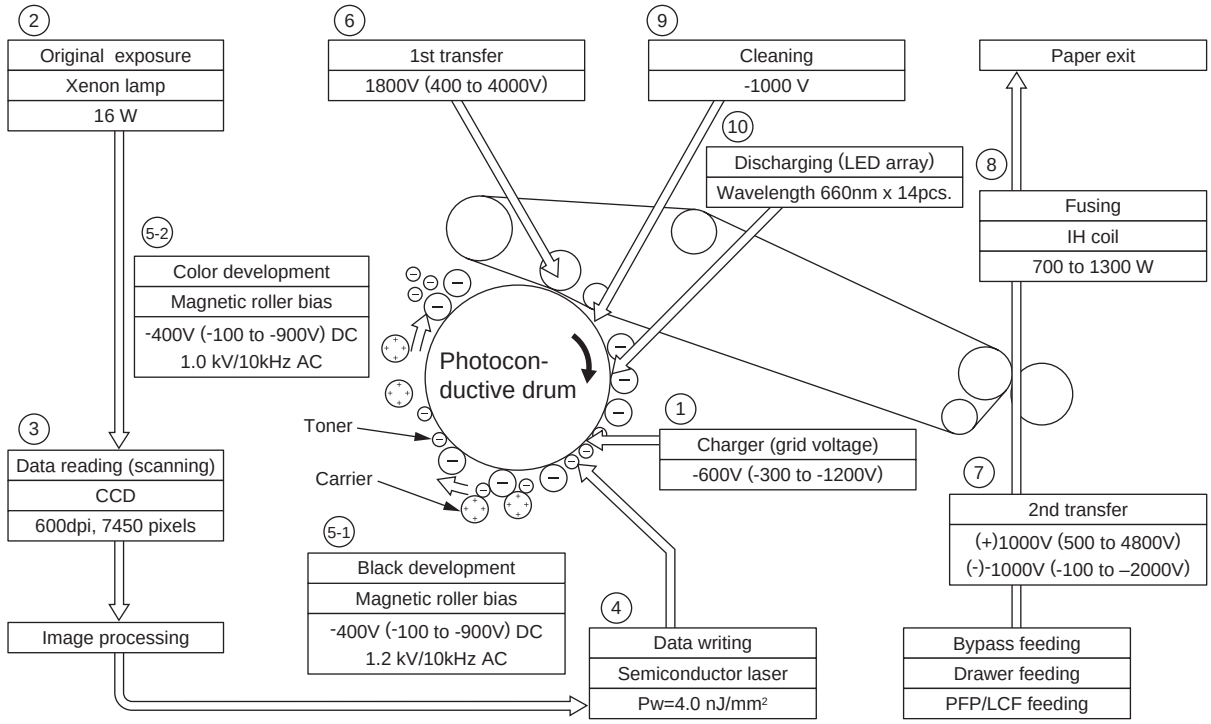


Fig. 3-3

(1) Charging: Places a negative charge on the surface of the photoconductive drum.

↓

(2) Original exposure: Converts images on the original into optical signals.

↓

(3) Data reading: The optical image signals are read into CCD and converted into electrical signals.

↓

(4) Data writing: The electrical image signals are changed to light signals (by laser emission) which expose the surface of the photoconductive drum.

↓

(5) Development: Negatively-charged toner is made to adhere to the photoconductive drum, producing a visible image.

↓

(6) 1st transfer: Transfers the visible image (toner) on photoconductive drum to the transfer belt.

↓

(7) 2nd transfer: Transfers the visible image (toner) on the transfer belt to paper.

↓

(8) Fusing: Fuses the toner image to the paper by applying heat and pressure.

↓

(9) Blade cleaning: While scraping off the residual toner from the drum by the blade, this blade also eliminates the (+) residual charge on the drum left after image transfer.

↓

(10) Discharging: Eliminates the residual (–) charge from the surface of the photoconductive drum.

3.3 Details of Copying Process

1) Photoconductive drum

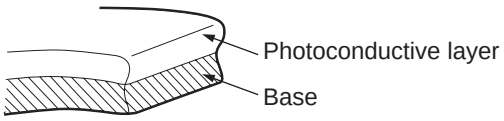
The photoconductive drum consists of two layers.

The outer layer is a photoconductive layer made of an organic photoconductive carrier (OPC), and the inner layer is an aluminum conductive base in a cylindrical form.

The photoconductive carrier has a special property: when it is exposed to light, the electrical resistance it possesses increases or decreases with the strength of the light.

Example:

- Strong incident light→Decreases resistance (works as a conductor.)
- Weak incident light→Increases resistance (works as an insulator.)



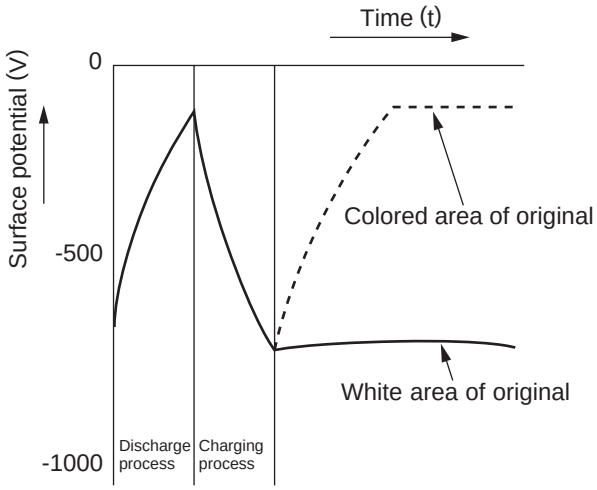
Structure of the photoconductive drum
(Example of OPC)

Fig. 3-4

[Formation of electrostatic latent images]

In the processes of charging, data reading, data writing, and discharging described below, the areas on the drum corresponding to colored areas on the original are deprived of negative charge, while the areas on the drum corresponding to white areas retain the negative charge. Thus it forms a negative charge image on the drum surface.

As this negative charge image on the drum is not visible to the human eye, it is called an “electrostatic latent image.”



Electric potential of the photoconductive drum

Fig. 3-5

2) Charging

Charging is a process to apply charge evenly to the drum surface.

The charger wire produces negative corona discharge, which is controlled by the grid so that the drum surface is evenly charged with negative potential.

The surface potential on the drum is determined by the grid potential and is controlled to a fixed value by the grid control circuit.

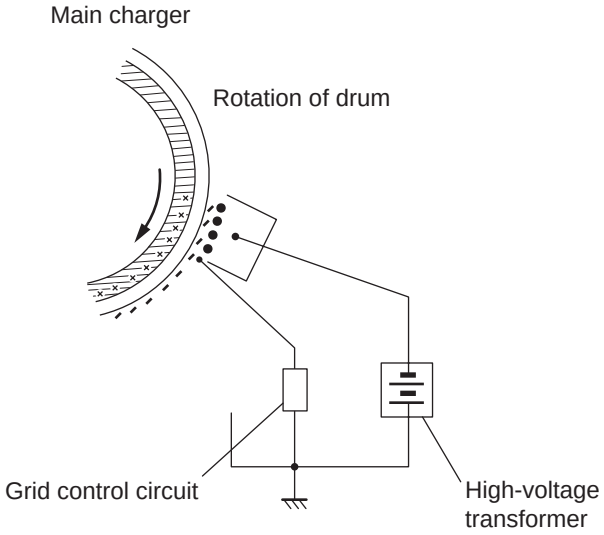


Fig. 3-6

3) Data reading (scanning)
Data reading is a process of illuminating the original with light and converting the reflected light into electrical signals.
The light reflected from the original is directed to the Charge Coupled Device (CCD) and this optical image information is converted to electrical signals (image signals), which are then transmitted to the image processing section via the scanner control PC board.

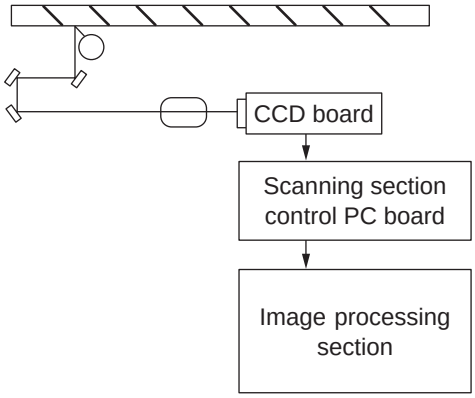


Fig. 3-7

The CCD for color processing has RGB filters provided over its surface, which allow the CCD to read the light amount in the respective ranges of wavelength. The image data corresponding to the respective RGB colors is then transmitted to the image processing section.

(Example)

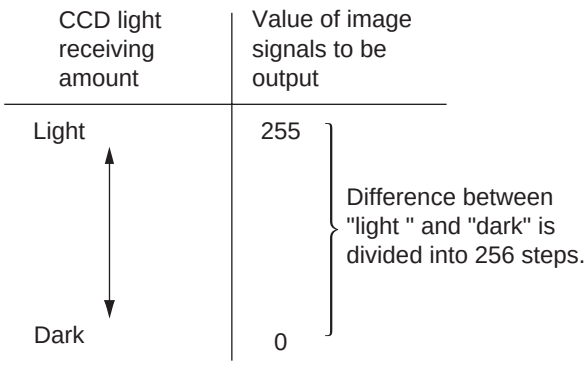


Fig. 3-8

4) Data writing

Data writing is a process of converting the image signals transmitted from the image processing section into light signals and exposing the drum surface with the light signal.

Namely, the image signals transmitted from the image processing section are converted into optical signals (laser emission) by the semiconductor laser element, which are then used to expose the drum surface, thus forming an electrostatic latent image there.

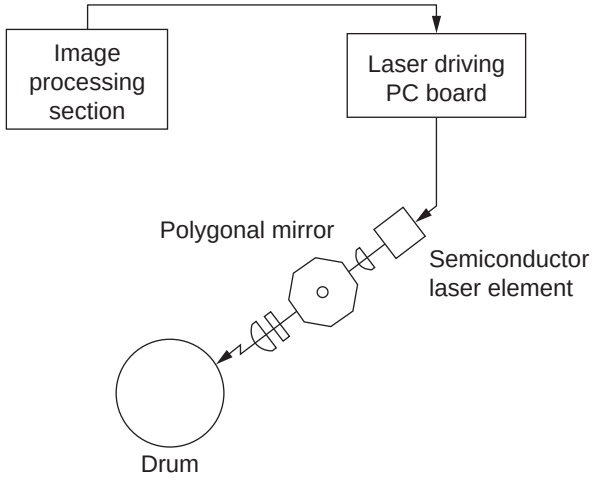


Fig. 3-9

5) Development

Development is a process of making the electrostatic latent images visible to the eye (visible image).

Developer material is supplied to the photoconductive drum surface by means of a magnetic roller, allowing the toner in the developer material to adhere to the areas on the drum surface where the potential is lower than the developer bias which is applied to the magnetic roller (reverse development).

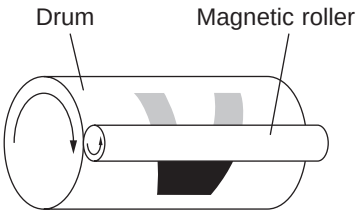


Fig. 3-10

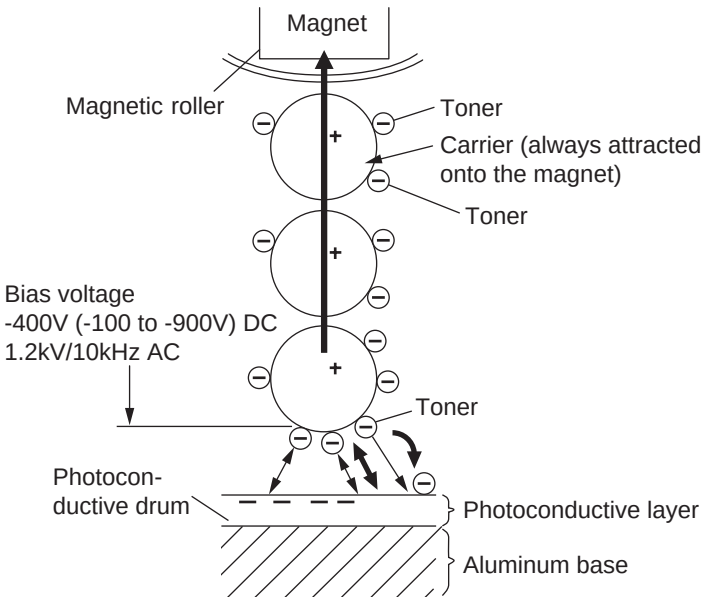


Fig. 3-11

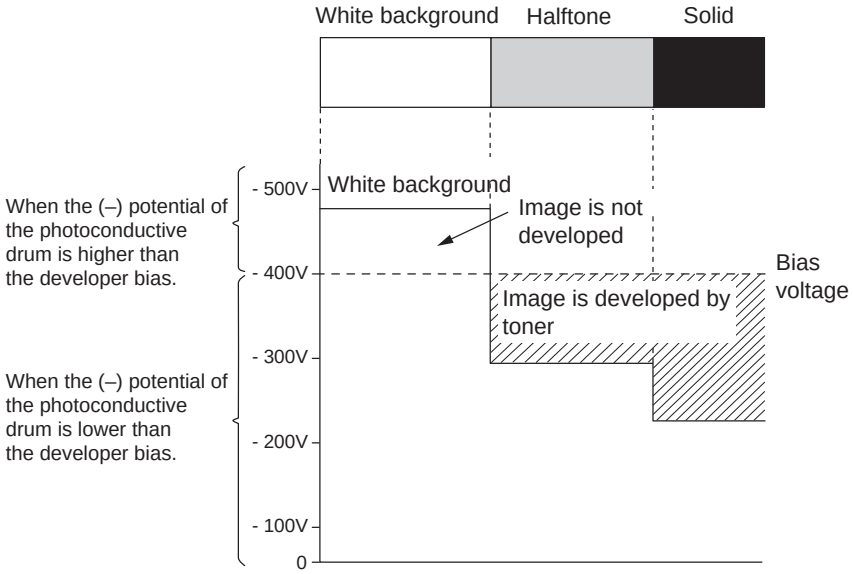


Fig. 3-12

- About developer material
  The developer material is comprised of a mixture of toner and carrier. The toner is charged to a negative polarity and the carrier to a positive polarity, due to the friction with each other caused by mixing.
  Toner: Mainly consists of resin and coloring.
  Carrier: Consists of ferrite, and over its surface resin coating to provide consistent frictional electrification.

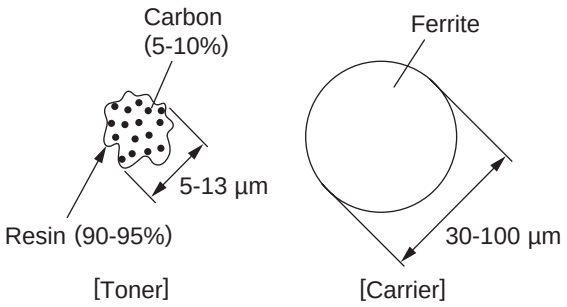


Fig. 3-13

Note:
If the developer material is used for a long period of time (beyond its normal life span), toner will become caked onto the carrier.
↓
The performance of the carrier is lowered.
Result:
1. Image density is lowered.
2. Toner scattering occurs.
3. Background fogging occurs.

Solution: Replace the developer material.

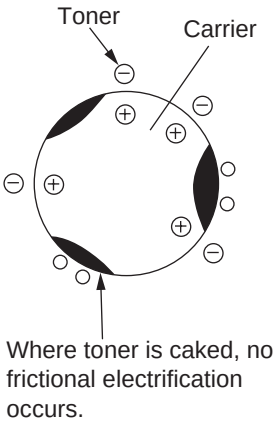


Fig. 3-14

- Magnetic roller
  - Magnetic brush development technique

  Inside magnetic rollers, the south and north poles are arranged as shown in the figure below. The developer material forms a brush-like fluff which contacts the photoconductive drum surface.

  ↓

  This is caused by the lines of magnetic force between the south and north poles.

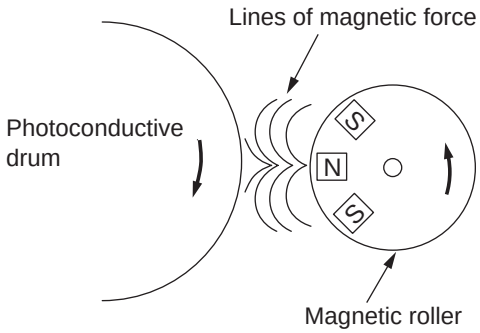


Fig. 3-15

6) 1st transfer

- 1st transfer is a process of transcribing the toner image (visible image) formed on the photoconductive drum to the transfer belt. A positive bias is applied to the transfer roller, causing the transfer belt to be positively charged. This in turn helps to form an electric field E between the transfer belt (positive) and the photoconductive layer of the photoconductive drum (grounded), thus making the toner image transferred to the transfer belt. In the copy process of this equipment, images are transferred in the order of K→C→M→Y on the transfer belt.

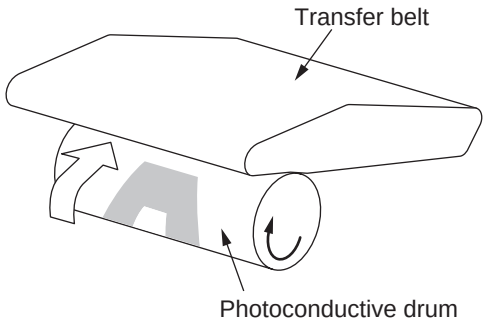


Fig. 3-16

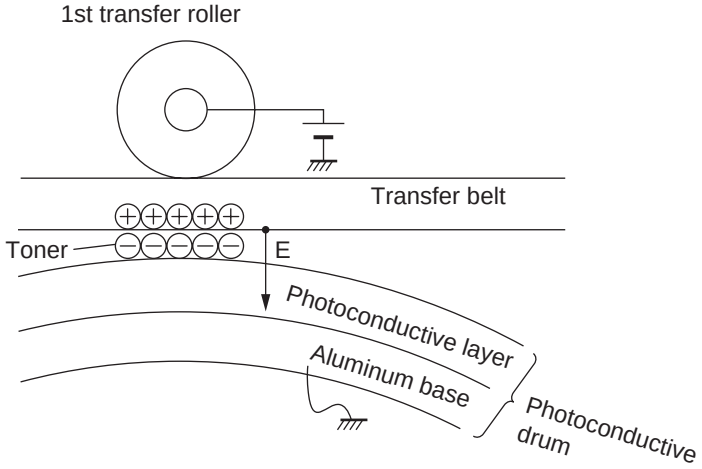


Fig. 3-17

7) 2nd transfer
   - An electrostatic attracting force occurs between the polarized charge (negative) on the lower surface of transfer belt and the belt itself (positive). That makes the toner being absorbed from the belt to the paper. Then an electric field is formed between the 2nd transfer roller and the transfer belt drive roller, which generates a paper polarization and thus the toner is transferred from the belt to the paper.

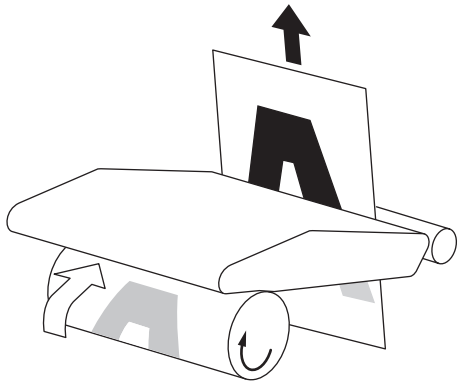


Fig. 3-18

8) Fusing process
   Fusing is a process of melting the toner on the paper and fixing it firmly onto the paper.

   Method:
   The softening point of the toner (main component: resin) is 105-120°C.
   ↓
   (Heat)
   Toner is melted by the fuser belt.
   +
   (Pressure)
   The fuser belt is pressed against the pressure roller by the springs to increase adherence of the melted toner to the paper.
   ↓
   The paper is subjected to the heat and pressure when passing through the fuser belt and the pressure roller.
   ↓
   (Fusing)
   The toner on the paper is fused to it.

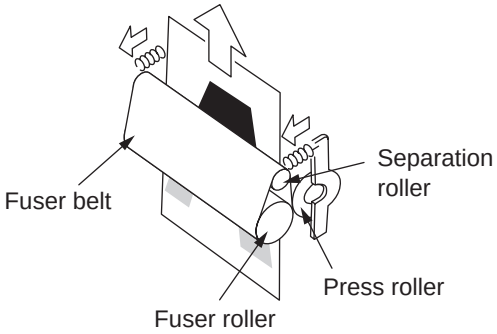


Fig. 3-19

9) Blade cleaning

While eliminating the (+) charge on the photoconductive drum applied during the transfer stage, the conductive blade recovers the toner left on the drum at the same time.

- Elimination of transfer charge

  With this OPC photoconductive drum, (+) charge on their surface cannot be eliminated optically. Therefore, (–) voltage is applied to the conductive blade, which is pressed against the drum, to eliminate the (+) charge applied at the transfer process.

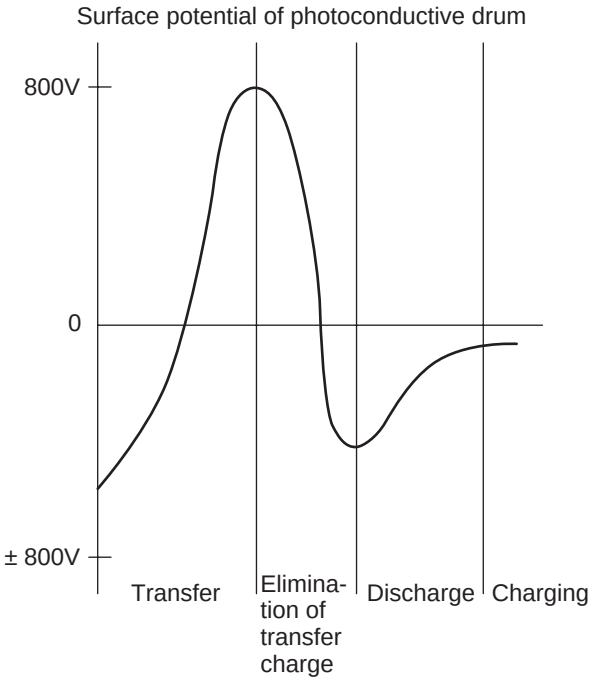


Fig. 3-20

- Cleaning

  The edge of the conductive blade is pressed against the photoconductive drum surface to scrape off residual toner. The toner removed is then caught by the recovery blade.

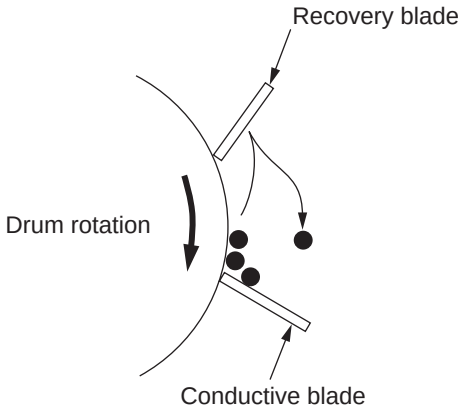


Fig. 3-21

10)Discharging process

Discharging is a process of eliminating the (–) charge remaining on the photoconductive drum before the next charging process.

If the charge remaining on the photoconductive drum is not eliminated, the following phenomenon would occur:

(–) charge remaining on the photoconductive drum surface causes uneven application of the charge for the next copying.

↓

The next copy obtains a double image. (The preceding image remains.)

To prevent this:

The entire surface of the photoconductive drum is flooded with light by the discharge LED array.

↓

The photoconductive drum becomes electrically conductive.

↓

All of the (–) charge remaining on the photoconductive drum is conducted away to ground (However, (+) charge is eliminated by the conductive blade as mentioned in 9)).

↓

Preparation for the next copying process is completed.

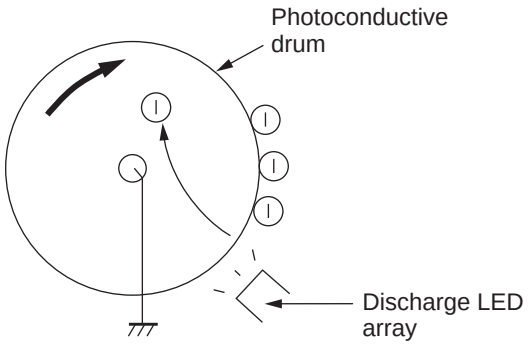


Fig. 3-22

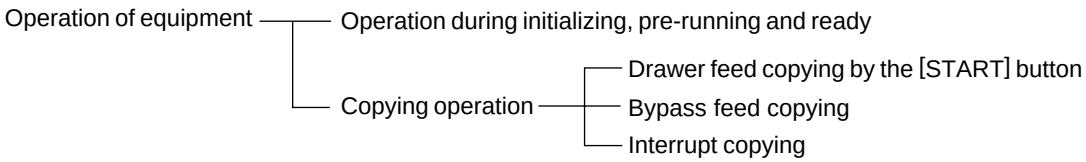
3.4 List of Copying Process Conditions

Process	e-STUDIO3511/4511	e-STUDIO281c/351c/451c
1. Photoconductive drum 1) Sensitivity	OD-3511 (OPC drum) 1) Highly sensitized drum (ø90)	OD-3511N ←
2. Charging	Scorotron type -300 to -1200 V (grid voltage) (adjusting by image quality control)	←
3. Data writing 1) Light source 2) Light amount	 1) Semiconductor laser (adjustment not required) 2) 4.0nJ/mm^2	 ← ←
4. Image control	Image quality control by detecting toner adhesion amount	←
5. Development 1) Magnetic roller 2) Auto-toner detection 3) Toner supply 4) Toner-empty detection 5) Toner 6) Developer material 7) Developer bias	 1) One magnetic roller 2) Black: Magnetic bridge-circuit method Color: Optical reflection sensor method 3) Toner cartridge replacing method 4) Density detection method 5) T-3511-K (black) T-3511*-K (black) T-3511-Y (yellow) T-3511*-Y (yellow) T-3511-M (magenta) T-3511*-M (magenta) T-3511-C (cyan) T-3511*-C (cyan) (Marked*: E, D, C and T) 6) D-3511-K (black) D-3511-Y (yellow) D-3511-M (magenta) D-3511-C (cyan) 7) DC -100 to -900 V (adjusting by image quality control) Color: AC 1.0 kV/10 kHz Black: AC 1.2 kV/10 kHz	 ← ← ← ← NAD T-281C-K, T281C-Y T-281C-M, T281C-C MJD T-281CE-K, T281CE-Y T-281CE-M, T-281CE-C TWD T-3511T-K, T-3511T-Y T-3511T-M, T-3511T-C CND T-3511C-K, T-3511C-Y T-3511C-M, T-3511C-C Others T-3511D-K, T-3511D-Y T-3511D-M, T-3511D-C (K: Black, Y: Yellow, M: Magenta, C: Cyan) D-3511-K (black) D-281C-Y (yellow) D-281C-M (magenta) D-281C-C (cyan) ←
6. Transfer	1) 1st transfer: Transfer belt method 2) 2nd transfer: Transfer roller method	← ←
7. Separation	Self-separation by transfer belt and 2nd transfer roller	←
8. Photoconductive drum cleaning 1) Method 2) Recovered toner 3) Transfer charge removal	 1) Blade cleaning 2) Non-reusable 3) Simultaneous cleaning and discharging by the conductive blade	 ← ← ←
9. Transfer belt cleaning	Blade cleaning (contact/release mechanism)	←
10.Discharge	LED array (red)	←

Process	e-STUDIO3511/4511	e-STUDIO281c/351c/451c
11.Fusing		
1) Method	1) Belt fusing system	←
	- Fuser roller: Fluorinated iron roller (ø40) (IH coil: 700-1300W)	←
	- Pressure roller: Silicon sponge roller (Surface-PFA tube)	←
		Discharge brush
	- Fuser belt: PFA tube belt (ø60)	←
	- Separation roller: Ceramic roller (ø20)	- Separation roller: Sponge roller (ø20)
2) Cleaning	2) Oil roller method	←
	- Oil roller (ø18)	←
	- Cleaning roller (ø16)	←
3) Heat roller temperature	3) ON/OFF control and power control by thermistor	←
4) Heater	4) IH coil	←

4. GENERAL OPERATION

4.1 Overview of Operation



4.2 Description of Operation

4.2.1 Warming-up

1) Initialization
   → Power ON
   → IH coil (IH-COIL) ON
   → Set number “1”, reproduction ratio “100%” and “Wait Warming Up” are displayed.
   → Fan motors ON
   → Initialization of laser optical system
   - The polygonal motor (M4) rotates in high speed.
   → Initialization of feeding system
   - Each drawer tray goes up.
   → Pre-running operation is stopped after five seconds.
   → Cleaning of transfer belt
   - Main motor (M6) is turned ON.
   → Initialization of revolver motor (M12)
   - Detects home position.
   - Rotates the developer unit to the waiting position and stops rotating.
   - (Performs image quality control.)*1
   → Initialization of scanning system
   - The carriage moves to the home position.
   - The carriage moves to the peak detection position.
   - The exposure lamp (EXP) is turned ON.
   - Peak detection (white color is detected by the shading correction plate)
   - The exposure lamp (EXP) is turned OFF.
   → The poligonal motor (M4) rotates in low speed.
   → “READY (WARMING UP)” is displayed.

2) Pre-running operation
   Pre-running operation is started when the temperature of the fuser belt surface reaches a certain temperature.
   → Transport motor (M9) is turned ON.
   - Fuser roller rotation.

3) When the temperature of the fuser belt surface becomes sufficient for fusing,
   → “READY” is displayed.

*1: Image quality control should be performed only at change of environment or periodical performing timing.

4.2.2 Ready (ready for copying)

→ Buttons on the control panel enabled
→ When no button is pressed for a certain period of time,
- Set number “1” and reproduction ratio “100%” are displayed. Equipment returns to the normal ready state.

4.2.3 Drawer feed copying (Upper drawer paper feeding)

1) Press the [START] button ON
   → "READY" changes to "COPYING"
   → Exposure lamp (EXP) turned ON
   → Scan motor (M1) turned ON→ Carriages-1 and -2 move forward
   → The poligonal motor (M4) rotates in high speed.
   → Main motor (M6), transport motor (M9), developer motor (M11) and exit motor (M7) turned ON
   - Drum, fuser unit, developer unit and exit roller are driven
   → Drum cleaner brush motor (M8) turned ON

2) Drawer paper feeding
   → Fans rotated in high speed and upper drawer feed clutch (CLT2) turned ON
   - Pickup roller, feed roller, separation roller and transport roller start to rotate
   → Paper reaches the upper drawer feed sensor (S23)
   - Upper drawer feed sensor (S23) is turned ON
   → Paper reaches the registration roller
   - Registration sensor (S22) is turned ON and aligning is performed
   → Upper drawer feed clutch (CLT2) is turned OFF after a certain period of time

3) A certain period of time passed after the carriage operation
   → Registration clutch (CLT12) is turned ON after a certain period of time→Paper is transported to the transfer area
   → Copy counter operates

4) Completion of scanning
   → Scan motor (M1) turned OFF
   → Exposure lamp (EXP) turned OFF
   → Registration clutch (CLT12) turned OFF (after the trailing edge of the paper passed the registration roller)
   → "READY (PRINTING)" is displayed

5) Printing operation

1) Color printing operation

→ Black developer lifting clutch (CLT11), black developer bias (+150), transfer belt cleaner clutch (CLT1), toner recovery auger, drum cleaner brush, discharge LED (ERS) and cleaning blade bias turned ON

→ Transfer belt cleaner auger motor (M2) turned ON

- Transfer belt used toner auger is driven

→ Main charger and 1st transfer bias turned ON

→ Transfer belt marker detection

→ Black developer lifting clutch (CLT11), black developer bias (-) turned ON

- Contact the black developer roller to the drum surface

→ Laser emission (black image)

→ Black developer drive clutch (CLT10) and black developer bias (AC) turned ON

→ 1st transfer (black image)

- Black image is transferred to the transfer belt

→ Black developer bias (AC) turned OFF

→ Black developer lifting clutch (CLT11) turned ON and black developer drive clutch (CLT10) turned OFF

- Release the black developer roller from the drum surface

→ Black developer bias (-) turned OFF

→ Revolver motor (M12) turned ON

- Revolver rotates 65 degrees to move to cyan developing position

→ Transfer belt marker detection

→ Laser emission (cyan image)

→ Color developer bias (AC) and color developer bias (-) turned ON

→ Color developer drive clutch (CLT9) turned ON

→ Transfer belt cleaner clutch (CLT1) and transfer belt cleaner auger motor (M2) turned OFF

→ 1st transfer (cyan image)

- Cyan image is transferred to the transfer belt

→ Color developer bias (AC), color developer drive clutch (CLT9) and color developer bias (-) turned OFF

→ Revolver motor (M12) turned ON

- Revolver rotates 120 degrees to move to magenta developing position

→ Transfer belt marker detection

→ Laser emission (magenta image)

→ Color developer bias (AC), color developer drive clutch (CLT9) and color developer bias (-) turned ON

→ 1st transfer (magenta image)

- Magenta image is transferred to the transfer belt

→ Color developer bias (AC), color developer drive clutch (CLT9) and color developer bias (-) turned OFF

→ Revolver motor (M12) turned ON

- Revolver rotates 120 degrees to move to yellow developing position

→ Transfer belt marker detection

→ Laser emission (yellow image)

→ Color developer bias (AC), color developer drive clutch (CLT9) and color developer bias (-) turned ON

→ 1st transfer (yellow image)

- Yellow image is transferred to the transfer belt

→ Color developer drive clutch (CLT9), color developer bias (AC) and color developer bias (-) turned OFF

→ Revolver motor (M12) turned ON

- Revolver rotates 55 degrees to move to escape position

→ Transfer belt marker detection

→ 2nd transfer roller contact clutch (CLT5) and 2nd transfer bias turned ON

- Contact the 2nd transfer roller to the transfer belt
- The image on the transfer belt is transferred to the paper

→ Transfer belt cleaner clutch (CLT1) and transfer belt cleaner auger motor (M2) turned ON
→ 2nd transfer roller contact clutch (CLT5) and 2nd transfer bias turned OFF
→ Transfer belt cleaner clutch (CLT1) and transfer belt cleaner auger motor (M2) turned OFF
→ Main charger and 1st transfer bias turned OFF

2) Black printing operation

→ Black developer lifting clutch (CLT11), black developer bias (+150), transfer belt cleaner clutch (CLT1), toner recovery auger, drum cleaner brush, discharge LED (ERS) and cleaning blade bias turned ON
→ Transfer belt cleaner auger motor (M2) turned ON

- Transfer belt used toner auger is driven

→ Main charger and 1st transfer bias turned ON
→ Black developer lifting clutch (CLT11) and black developer bias (-) turned ON

- Contact the black developer roller to the drum surface

→ Laser emission (black image)
→ Black developer drive clutch (CLT10) and black developer bias (AC) turned ON
→ 1st transfer (black image)

- Black image is transferred to the transfer belt

→ 2nd transfer roller contact clutch (CLT10) and 2nd transfer bias turned ON

- Contact the 2nd transfer roller to the transfer belt
- The image on the transfer belt is transferred to the paper

→ Black developer bias (AC) turned OFF
→ Black developer lifting clutch (CLT11) turned ON and black developer drive clutch (CLT10) turned OFF

- Release the black developer roller from the drum surface

→ Black developer bias (-) turned OFF
→ Main charger turned OFF
→ 2nd transfer roller contact clutch (CLT5) and 2nd transfer bias turned OFF
→ Transfer belt cleaner clutch (CLT1), transfer belt cleaner auger motor (M2) and 1st transfer bias turned OFF

6) Paper exiting

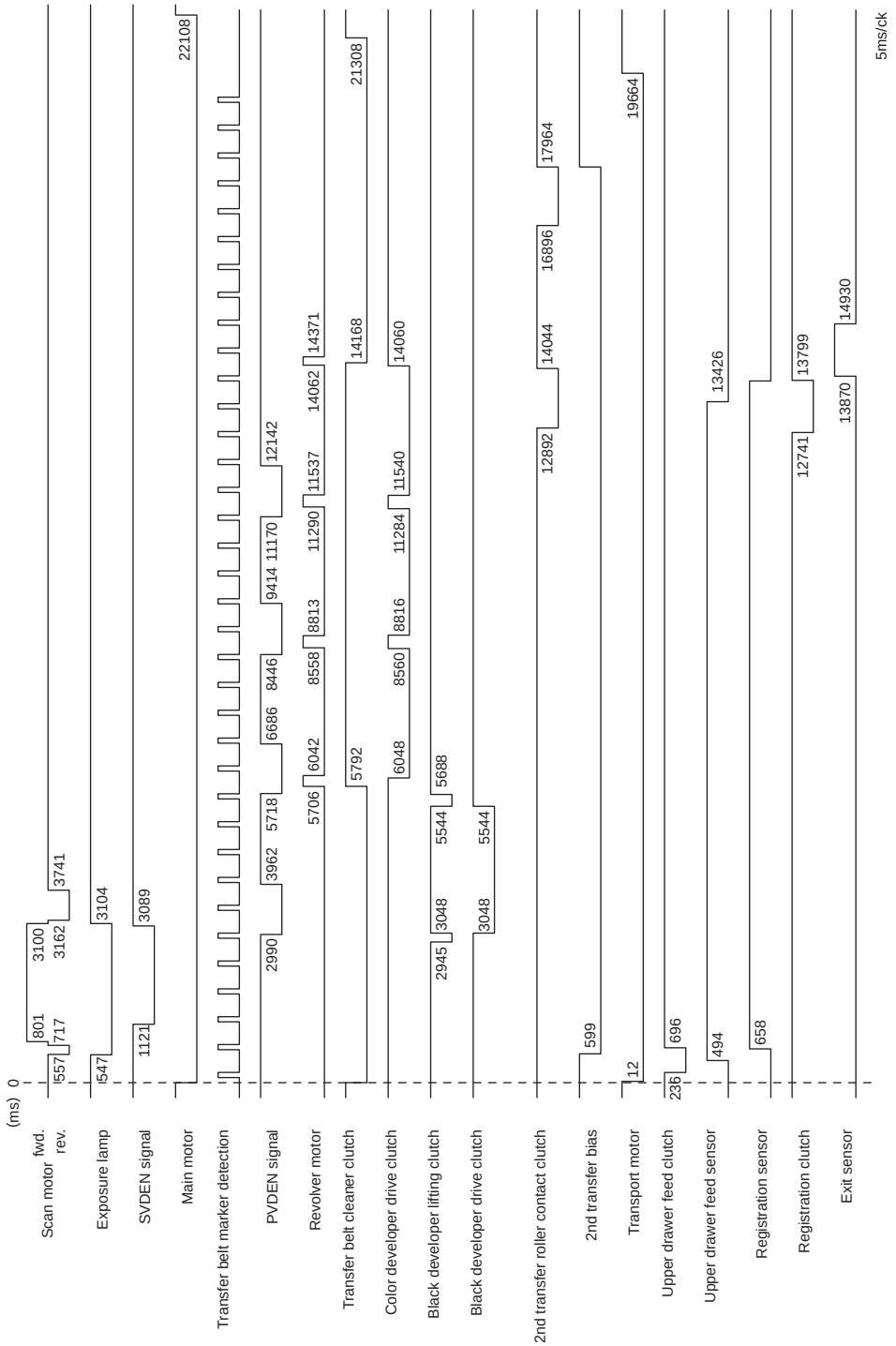
→ The exit sensor (S40) detects the trailing edge of the paper
→ Toner recovery auger, drum cleaner brush, discharge LED (ERS) and cleaning blade bias turned OFF
→ Main motor (M6), transport motor (M9), developer motor (M11) and exit motor (M7) turned OFF
→ The poligonal motor (M4) rotates in low speed.
→ Drum cleaner brush motor (M8) turned OFF
→ Drum, fuser unit and developer unit are stopped

- Fans return to rotate at the normal rotation speed

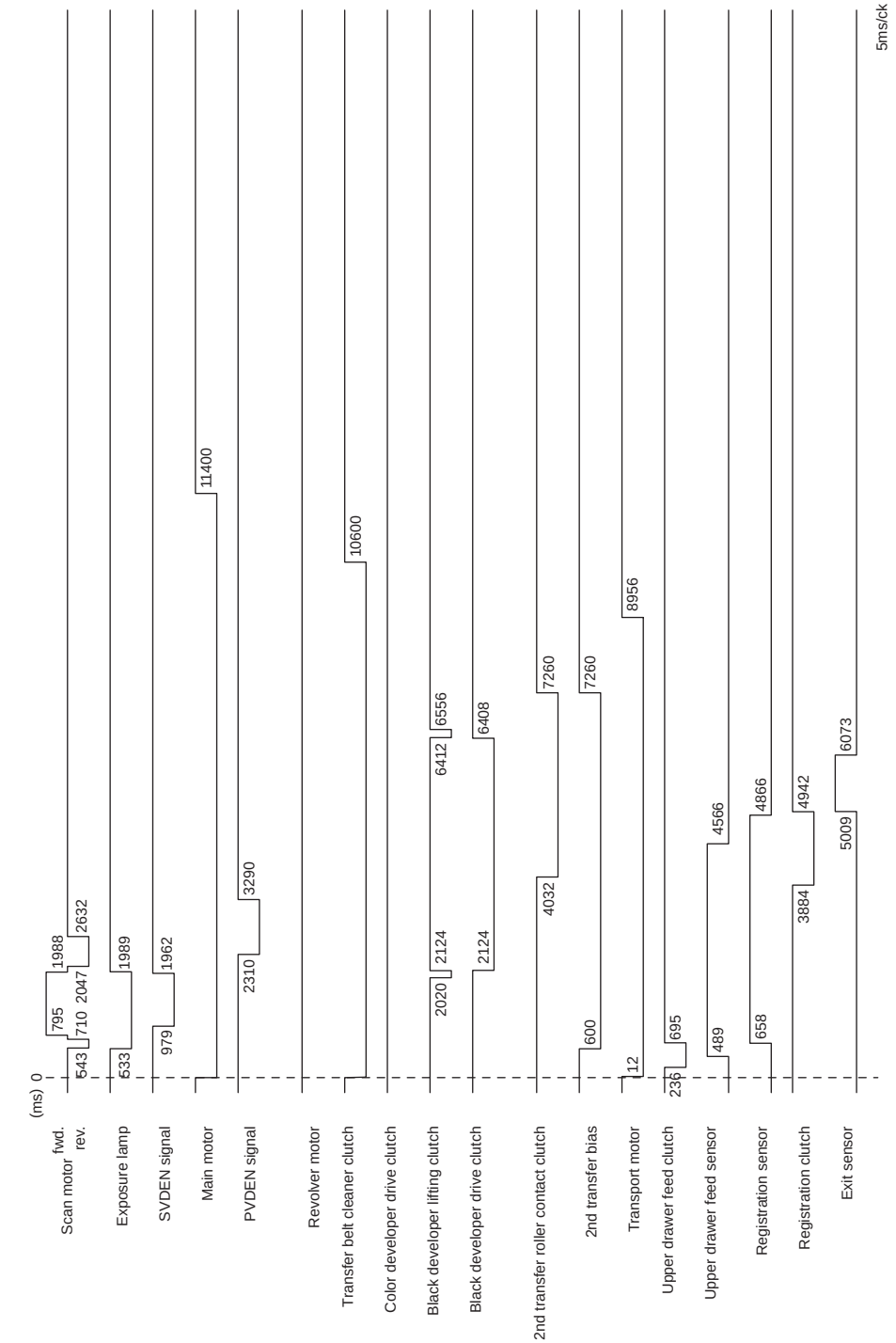
→ “READY” is displayed and the equipment enters into ready mode

Timing chart for copying (A4/LT size, 1 sheet from upper drawer)

1) Color copy



2) Black copy



4

4.2.4 Bypass feed copying

1) Insert a paper into the bypass tray.
   → Bypass paper sensor (S35) is turned ON.
   - "Ready for bypass feeding" is displayed.
   → Carriages move to the home position.

2) Press the [START] button ON
   → "Ready for bypass feeding" changes to "COPYING".
   → Exposure lamp (EXP) ON
   → Scan motor (M1) ON→Carriages-1 and -2 move forward.
   → Main motor (M6), transport motor (M9), developer motor (M11) and exit motor (M7) turned ON
   - The drum, fuser unit, developer unit and exit roller are driven.
   → Drum cleaner brush motor (M8) turned ON.

3) Bypass feeding
   → Fans rotate in high speed.
   → Bypass feed clutch (CLT6) turned ON.
   - The bypass pickup roller is lowered.
   - The bypass pickup roller, feed roller and separation roller start to rotate.
   → Aligning operation
   → Paper reaches the registration roller.
   → After a certain period of time, the bypass feed clutch (CLT6) turned OFF.

4) Hereafter, operations (3) through (6) of "4.2.3. Drawer feed copying" are repeated.

4.2.5 Interruption copying

1) Press the [INTERRUPT] button
   → LED "INTERRUPT" is turned ON.
   → Copying operation in progress is temporarily stopped, and the carriages-1 and -2 return to appropriate positions.
   → "Job interrupted job 1 saved" is displayed.
   → Automatic density and reproduction ratio 100% are set. Set number remains the same.

2) Select the desired copy condition

3) After interruption copying is finished:
   → "Press interrupt to resume job 1" is displayed.
   → LED "INTERRUPT" is turned OFF by pressing the [INTERRUPT] button, and the equipment returns to the status before the interruption.
   → "Ready to resume job 1" is displayed.

4) Press the [START] button
   The copying operation before the interruption is resumed.

4.3 Detection of Abnormality

When something abnormal has occurred in the equipment, symbols corresponding to the type of abnormality are displayed.

4.3.1 Types of abnormality

1) Abnormality cleared without turning OFF the door switch
   (A) Add paper
   (B) Paper misfeed in bypass

2) Abnormality not cleared without turning OFF the door switch
   (C) Misfeed in equipment
   (D) No toner in the cartridge
   (E) Developer unit not installed properly
   (F) Toner bag replacement

3) Abnormality not cleared without turning OFF the main switch
   (G) Call for service

4.3.2 Description of abnormality

(A) Add paper

[In case of the equipment drawer or PFP drawer] (When drawer is not installed)

Drawer not detected

↓

Drawer is not installed:
Drawer is installed but there is no paper in it:

↓

No paper

↓

A signal sent to the control circuit

↓

Drawer area of the control panel blinks
(When the drawer is selected)

↓

[START] button is disabled.

[In case of the equipment, PFP or LCF drawers] (When drawer is installed)
Based on the combination of the tray-up motor movement and the status of tray-up sensor and empty sensor, CPU detects the presence of paper.

- When the power is turned ON or LCF drawer is inserted (When the power is turned ON or equipment/PFP drawers are inserted).
  LCF performs initialization.

  ↓

  Detects the presence of paper
  Tray-up motor ON - The tray goes up

  ↓

  At this time, the tray-up sensor and LCF empty sensor are OFF.

  → When the tray-up sensor is not turned ON in a fixed period of time it means that the tray is in abnormal condition
  "Add paper" is displayed regardless of presence/absence of paper.

  → Cleared by turning the power ON/OFF

  → Tray-up sensor is turned ON in a fixed period of time
  - The tray-up motor (M10) stops.

  At this time, if the empty sensor is ON: It is judged that there is paper.

  OFF: It is judged that there is no paper.

  ↓

  Drawer area of the control panel blinks.
  (When the drawer is selected)

- When the paper in the drawer gets short during copying,

  → The tray-up sensor turned OFF

  → The tray-up motor turned ON - Tray goes up

  → Tray-up sensor turned ON

  → Tray-up motor stopped

- Empty sensor turned OFF during the copying in spite of the tray-up sensor is ON

  ↓

  It is judged that there is no paper.

  ↓

  Drawer area of the control panel blinks.
  (When the drawer is selected)

  ↓

  The copying operation is stopped.

(B) Paper misfeed in bypas

- During bypass feeding
  Bypass feed clutch (CLT6) is turned ON

  ↓

  Registration sensor (S22) is turned ON

  * Registration sensor (S22) is not turned ON in a fixed period of time (E120)

    ↓

    Bypass misfeeding

    ↓

    Bypass misfeed symbol is displayed

    ↓

    The copying operation is disabled.

    ↓

    Solution: The bypass sensor (S35) is turned OFF by removing the paper from the bypass tray.

(C) Misfeed in equipment

- Exit sensor (S40) detects jamming of the leading edge of paper

  ↓

  Registration clutch turned ON

  ↓ Approx 1.2 sec.

  Exit sensor (S40) turned ON
  If the exit sensor (S40) is not turned ON after approx 1.2 seconds,

  ↓

  Paper jam (E010) → The copying operation is stopped.

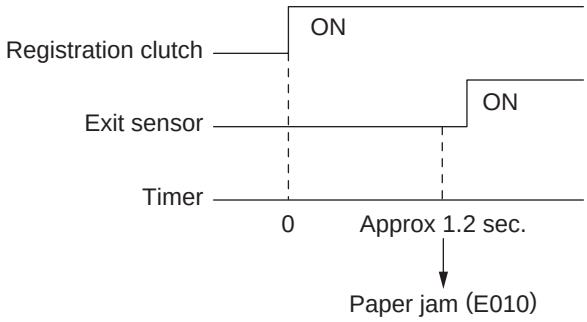


Fig. 4-1

- Exit sensor detects jamming of the trailing edge of paper

  Registration clutch (CLT12) turned OFF

  ↓ Approx 1.3 sec.

  Exit sensor (S40) turned OFF
  If the exit sensor (S40) is not turned OFF after approx 1.3 seconds,

  ↓

  Paper jam (E020) → The copying operation is stopped.

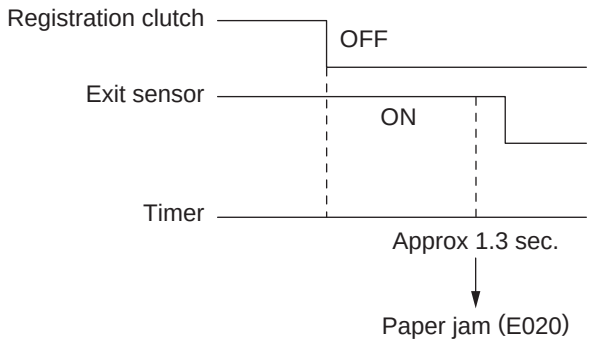


Fig. 4-2

- Immediately after the power ON

  ↓

  Any of all sensors on paper transport path detects paper (ON)

  ↓

  Paper jam (E030)

- Front cover is opened during copying

  ↓

  Paper jam (E410)

- Registration sensor (S22) detects jamming of the leading edge of paper:
  The registration sensor (S22) is not turned ON in a fixed period of time after the leading edge of paper passed the transport roller.

  ↓

  Paper jam (E120, E200, E210, E300, E330 and E3C0)

- During paper feeding from ADU:
  The registration sensor (S22) is not turned ON in a fixed period of time after the ADU clutch (CLT7) is turned ON.

  ↓

  Paper jam (E110)

- During paper transporting from ADU:
  ADU entrance/exit sensors (S38/S39) do not detect the paper at the fixed timing

  ↓

  Paper jam (E510 and E520)

- During paper feeding from the equipment or PFP:
  The registration sensor (S22) is not turned ON in a fixed period of time after the feed clutch is turned ON.

  ↓

  Paper jam (E220, E310, E320, E340 to E360, E3D0 and E3E0: Error code defers depending on the paper source.)

(D) No toner in the cartridge

Toner density becomes low

↓

Auto-toner sensor (S10/S13) detects the absence of the toner

↓

Control circuit → "Install new ** toner cartridge" is displayed: the copying operation disabled

Solution: Open the front cover and replace the toner cartridge with new one.
Toner is supplied → copying operation enabled

(E) Developer unit not installed properly

Disconnection of the connectors of the developer unit

↓

"Developer unit not installed" is displayed.

Solution: Connect the connectors of the developer unit and close the front cover.

(F) Toner bag replacement

- Toner bag is full of used toner

  ↓

  Toner recovery auger shifts to the rear side: Toner bag full detection sensor (S20) ON

↓

"Dispose of used toner" is displayed

- Toner bag full detection sensor (S20) is turned ON during printing

↓

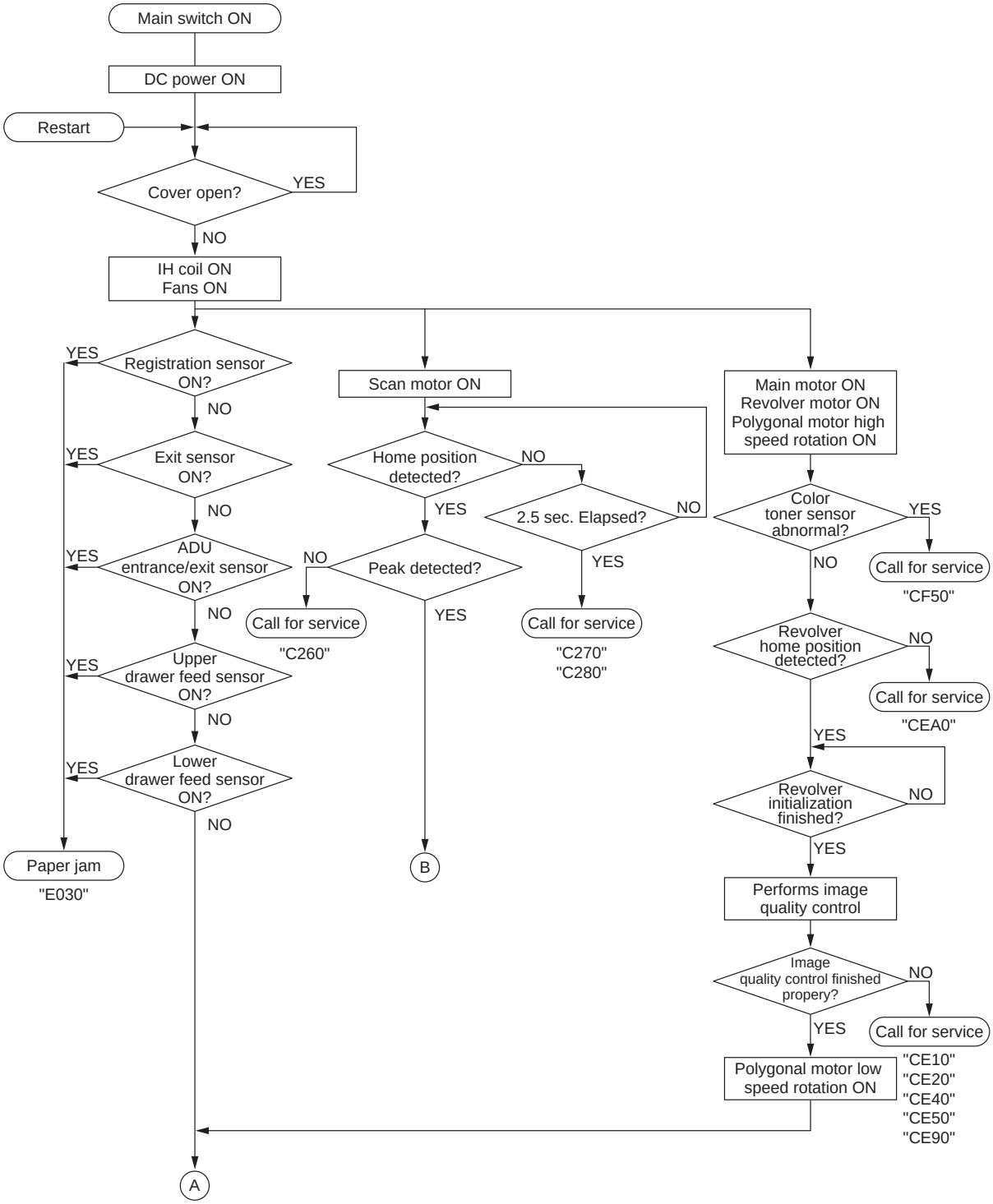
Printing is stopped after the paper being printed is exited
Solution: Replace the toner bag with new one and close the front cover.

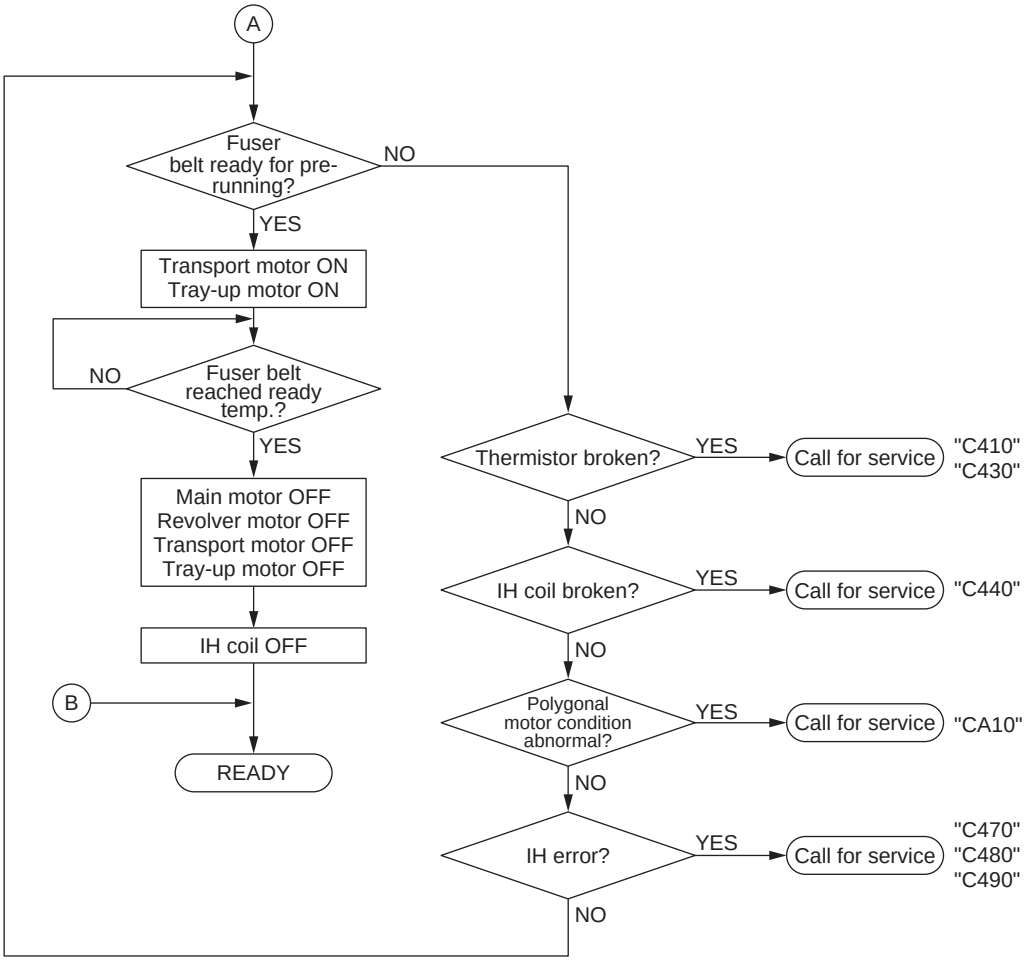
(G)Call for service

Check the error code displayed on the control panel when "Call for service" appears, and handle the abnormality in reference to the error code table in Service Handbook.

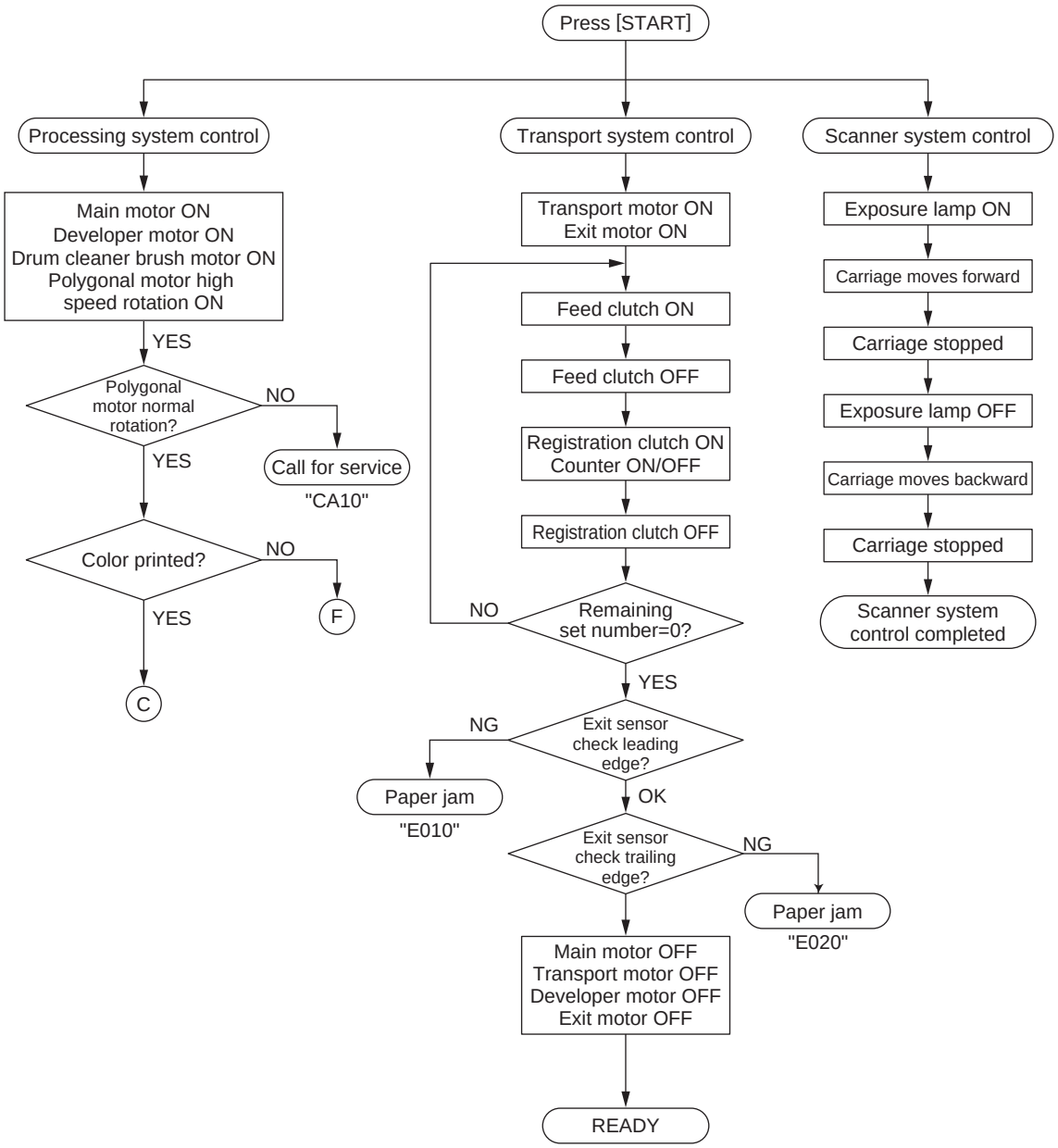
4.4 Flow Chart

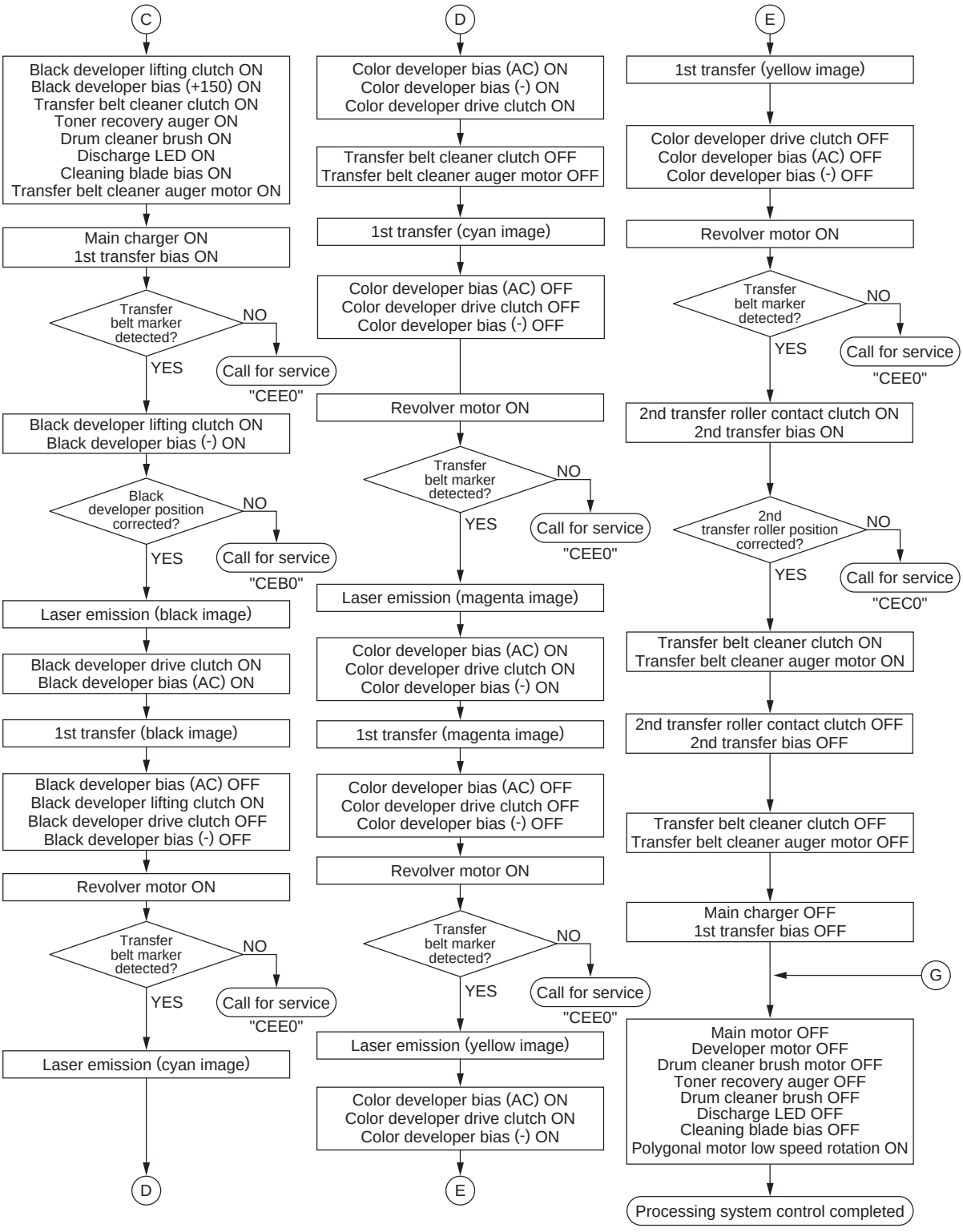
4.4.1 Power ON to ready

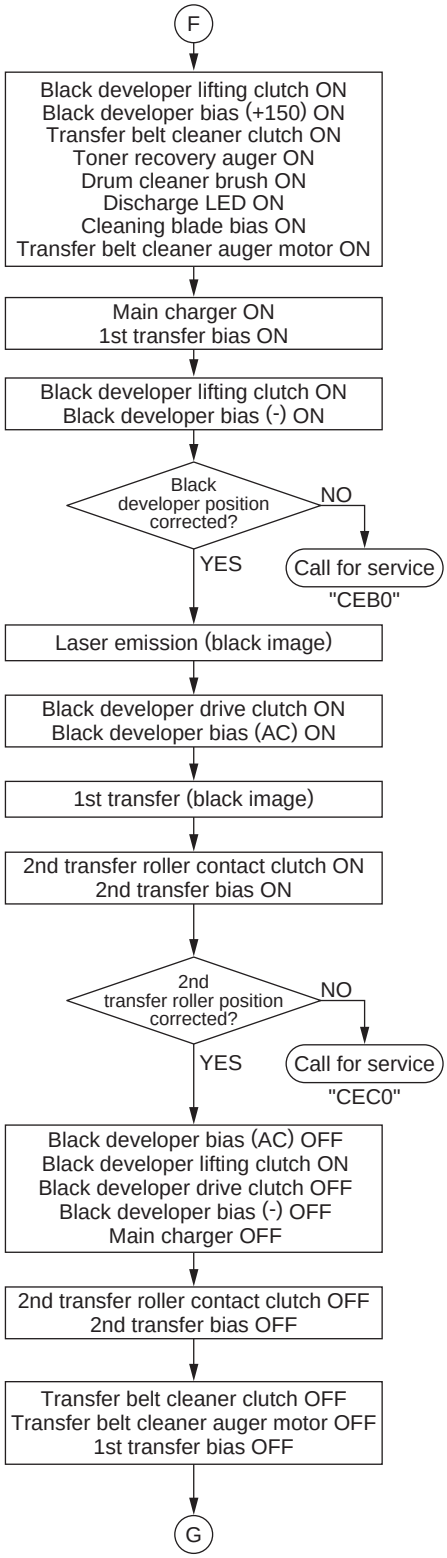




4.4.2 Automatic feed copying







5. CONTROL PANEL

5.1 General Description

The control panel consists of button switches and touch-panel switches to operate equipment and select various modes, and LEDs and an LCD to display the state of the equipment or the messages. When the operator's attention is required, graphic symbols appear with messages explaining the condition of the equipment in the LCD panel.

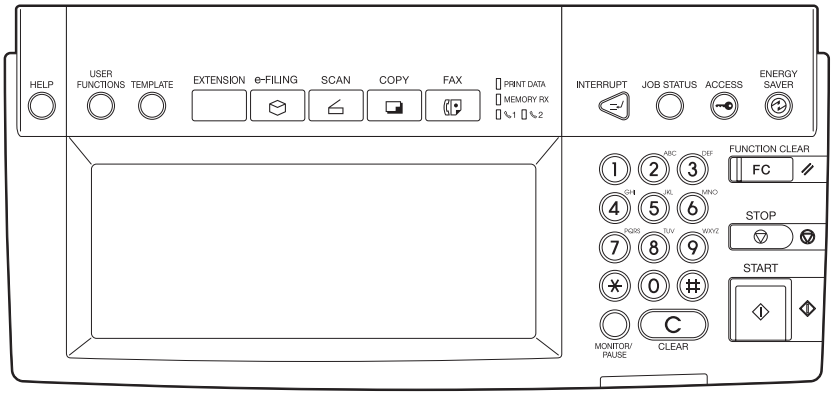


Fig. 5-1

5.2 Items Shown on the Display Panel

5.2.1 Display

1) Basic display
   Displays buttons and messages.

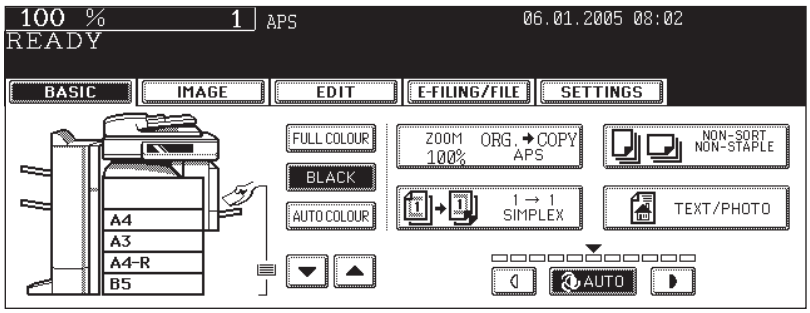


Fig. 5-2

2) Paper jam display
   Displays error code, paper jam position and paper jam release guidance.

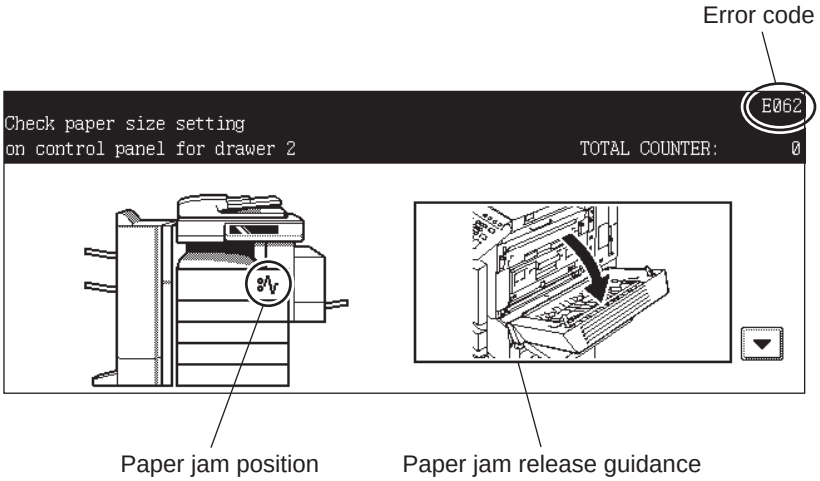


Fig. 5-3

3) Service call display
Displays error code and service call symbol.

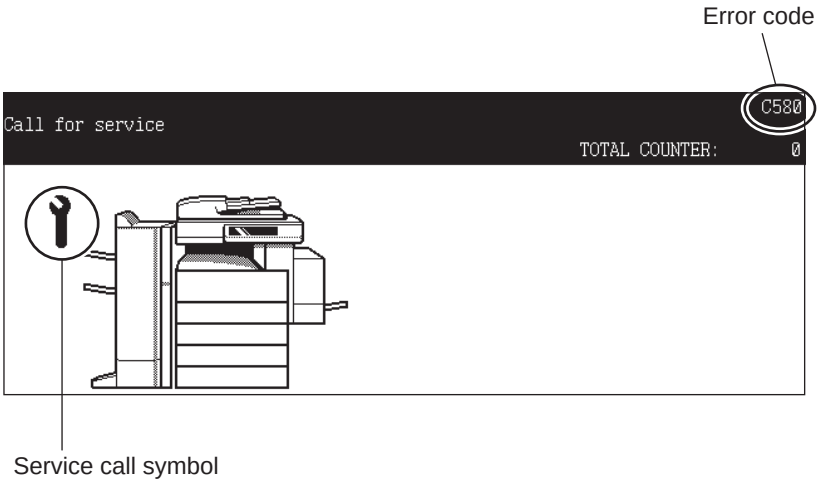


Fig. 5-4

5.2.2 Message

No.	Message	State of equipment	Note
1	-	Power is OFF (at Sleep Mode)	Press [START] button or function button to clear
2	Saving energy - press START button	At Energy Saving Mode	Press [START] button to clear
3	Wait Warming Up	Scanner warming up • Displayed until the equipment becomes ready to start scanning	Auto Start can be set
4	Wait Warming Up Auto Start	Scanner warming up • Displayed when Auto Start is set	Press [STOP] button to clear the Auto Start.
5	WAIT	Displayed when performing the controlling function such as cleaning of 2nd transfer roller or main charger to keep the equipment at the best condition	
6	Wait adding toner	Supplying toner • Equipment becomes the toner supply state	Recovers when the toner supply has finished
7	Performing Auto Calibration	Displayed at image quality control	Recovers when the image quality control has finished
8	READY	Ready for copying • Waiting for the operation	
9	READY Press START button to copy	Copying job interrupted	Press [START] button to resume copying or press [MEMORY CLEAR] button to delete the job
10	READY (WARMING UP)	Scanner warming up • Ready to scan the original	
11	READY (PRINTING)	Printing out the data • Scanning is enabled	
12	READY (ADDING TONER)	Supplying toner • Scanning is enabled	
13	READY (INNER TRAY FULL)	Inner tray in the equipment is full • Scanning is enabled	- When the bridge unit is installed - Resumes printing by removing papers from the tray
14	READY (CHECK STAPLER)	No staples in finisher • Scanning is enabled	Cleared by supplying the staples
15	READY (CHECK STAPLER)	Stapling jam occurred in finisher	
16	READY (CHECK SADDLE STITCH STAPLER)	No staples in saddle stitcher • Scanning is enabled	Cleared by supplying staples
17	READY (ADD PAPER) Press JOB STATUS button	No paper in drawer • Scanning is enabled	Cleared by supplying papers
18	READY (FINISHER FULL)	Finisher is full of paper • Scanning is enabled	Resumes printing by removing paper from the finisher
19	READY (HOLE PUNCH DUST BIN IS FULL)	Punching dust box is full • Scanning is enabled	Resumes printing by removing punching dust from the dust box
20	READY (SADDLE STITCH TRAY FULL)	Saddle stitcher tray is full of paper • Scanning is enabled	
21	READY (CHANGE DRAWER TO CORRECT PAPER SIZE)	Incorrect paper size setting	

No.	Message	State of equipment	Note
22	Ready for bypass feeding	Paper is set on the bypass tray	
23	COPYING	At the copying state	
24	Auto Start	Auto Start is set during printing	Cleared by pressing [FUNCTION CLEAR] button
25	Close Large Capacity Feeder	LCF drawer is not installed when feeding from LCF is set	Cleared by installing LCF drawer
26	Close Large Capacity Feeder Door	LCF cover is open when feeding from LCF is set	Cleared by closing the cover
27	Place Doc. Feeder in the down position	RADF is open when original is placed on RADF	Cleared by closing RADF
28	Place originals in the document feeder	Displayed when the conditions are set and [START] button is pressed with no original placed	Cleared by setting the original
29	Change direction of original	Displayed when the direction of original placed is different from the setting	
30	Place last %d originals in doc. feeder entrance tray	Paper jam occurred during copying (RADF scanning)	
31	Cannot copy this original	Displayed when the original which is not allowed to be copied is placed	Not printed out
32	Add paper	Displayed when the paper in selected drawer is running out	
33	Cannot duplex this size	Displayed when the paper size which is not specified for duplex copying is set	
34	Cannot use this media type	Displayed when the paper size which is not specified for the functions such as stapling or hole punching is set	
35	Copy size: A4/LT only	Displayed when the paper size which is not specified for “Book-type duplex copying” or “Dual-page” is set	
36	Copy size: A4/LT and A4-R/LT-R	Displayed when the paper size which is not specified for “Rotate Sort”	
37	CHANGE DRAWER TO CORRECT PAPER SIZE	Displayed when the selected paper size is not in the drawer	
38	Change drawer to correct media type	Displayed when the selected media type is not in the drawer	
39	Select a paper size for bypass feeding	Displayed when paper size needs to be specified for bypass feeding such as duplex copying	
40	Place the blank sheets in bypass tray and select the paper size	Displayed when no paper is in the selected feeder at Cover Copying Mode	
41	Place the blank sheets in the same direction as the originals	Displayed when the direction of cover page is different from that of other pages at Cover Copying Mode	
42	Place the same size blank sheets as the originals	Displayed when the paper size of cover page is different from that of other pages at Cover Copying Mode	
43	Place insertion sheets in the bypass tray and select the paper size	Displayed when no insertion sheet is in the selected drawer at Sheet Insertion Mode	
44	Select the same size insert1 sheets as the originals	Displayed when the size of insertion sheet (sheet 1) is different from that of other pages at Sheet Insertion Mode	

No.	Message	State of equipment	Note
45	Select the same size insert2 sheets as the originals	Displayed when the size of insertion sheet (sheet 2) is different from that of other pages at Sheet Insertion Mode	
46	Set insert1 sheets in the same direction as the originals	Displayed when the direction of insertion sheet (sheet 1) is different from that of other pages at Sheet Insertion Mode	
47	Set insert2 sheets in the same direction as the originals	Displayed when the direction of insertion sheet (sheet 2) is different from that of other pages at Sheet Insertion Mode	
48	Set transparency film in A4/LT direction	Displayed when the selected paper size is other than A4/LT at OHP mode	
49	CHECK PAPER IN LARGE CAPACITY FEEDER	Papers in LCF are set incorrectly	
50	CANNOT PUNCH THIS SIZE PAPER	Displayed when the selected paper size is not specified for hole punching	
51	Remove paper from the finisher	Displayed when the paper sizes are mixed at Staple Sorting Mode	
52	Cannot staple this size	Displayed when the paper size is not specified for stapling at Staple Sorting Mode	
53	Remove paper from the saddle stitch unit	Finisher is full of papers	
54	Examine stapler	Trouble in the stapler unit in finisher	
55	Check staple cartridge	No stapler in finisher section	
56	Check staple cartridge in the saddle stitch unit	No stapler in saddle stitch unit	
57	Job interrupted job 1 saved	Interrupt copying is accepted	
58	Ready to resume job 1	Interrupt copying is cancelled (finished)	
59	Cannot use AMS mode	Displayed when reproduction ratio is set to be over 200% at AMS Mode on RADF	Set the reproduction ratio 200% or below manually
60	More than 200% is not available	Displayed when reproduction ratio is set manually to be over 200% on RADF	Set the reproduction ratio 200% or below
61	Updated the template setting	Displayed when the template stored is recalled by pressing [TEMPLATE] button	
62	Enter Department Code	Displayed when a button is pressed while the department management setting is available	
63	Cannot copy BLACK mode Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	
64	Cannot copy FULL COLOR mode Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	
65	Cannot copy TWIN COLOR mode Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	

No.	Message	State of equipment	Note
66	Cannot copy Check DEPARTMENT COUNTER	Displayed when the number of print-outs exceeds the limit number of department counter	
67	Not enough memory to store original(s) Will you print out stored originals?	Displayed when confirming the user to print out the data as much as stored at memory - full state	
68	Not enough memory to store original(s) Will you send stored originals in?	Displayed when confirming the user to send the FAX data as much as stored at memory - full state	Displayed only in FAX Function
69	Not enough memory to store original(s) Will you save stored originals in?	Displayed when confirming the user to save the scanning data as much as stored at memory-full state	Displayed only in FAX Function
70	The number of originals exceeds the limits Will you copy stored originals?	Displayed when confirming the user to print out the data as much as stored at memory-full state	
71	The number of originals exceeds the limits. Will you send stored originals?	Displayed when confirming the user to send the FAX data as much as stored at memory-full state	Displayed only in FAX Function
72	The number of originals exceeds the limits. Will you save stored originals?	Displayed when confirming the user to save the scanning data as much as stored at memory-full state	Displayed only in Scanning Function
73	Install new Black toner cartridge	No black toner in the cartridge	Displayed when black toner is running out even if other toner still remain. Copying not enabled
74	Install new Yellow toner cartridge	No yellow toner in the cartridge	Black copying is available Other button functions are available
75	Install new Magenta toner cartridge	No magenta toner in the cartridge	Black copying is available Other button functions are available
76	Install new Cyan toner cartridge	No cyan toner in the cartridge	Black copying is available Other button functions are available
77	Install new Y and M toner cartridge	No yellow and magenta toner in the cartridges	Black copying is available Other button functions are available
78	Install new Y and C toner cartridge	No yellow and cyan toner in the cartridges	Black copying is available Other button functions are available
89	Install new M and C toner cartridge	No magenta and cyan toner in the cartridges	Black copying is available Other button functions are available
80	Install new color toner cartridge	Three colors of toner are running out in the cartridges	Black copying is available Other button functions are available
81	Time for periodic maintenance	PM cycle • Displayed at the time for maintenance • Copying is available	Maintenance and inspection are performed by qualified service technician.
82	READY (CHANGE DRAWER TO CORRECT MEDIA TYPE)	Displays when the printing is stopped because of media type mismatch	
83	PRESS [BASIC] and select normal paper size	Displays the warning that the copy is not enabled when any drawer but bypass feed is selected at Cover Sheet Mode or Sheet Insertion Mode.	

No.	Message	State of equipment	Note
84	Misfeed in copier Press [HELP]	Paper jam in the equipment • Displayed when paper jam occurred in the equipment	Remove the paper in the equipment according to the messages displayed on the panel.
85	Call for service	Displayed when motor, sensor, switch, etc. do not work properly	Turn OFF the power and solve the problem, then turn ON the power.
86	Please try again after a while	Displayed when the Department Code can no be keyed in immediately after power-ON.	Leave it for a while and key in the code again
87	Set standard size	Displayed when the paper size which is not acceptable is set (depends on the setting)	Reset the paper size

5.3 Relation between the Equipment State and Operator's Operation

	During READY status	During warming-up	Auto job start reserved	Scanning original/ Scanning original and printing out the copy
Press [ENERGY SAVER] button	Switches to energy saving mode	Display not changed	Display not changed	Display not changed
Press [ACCESS] button	Displays department code entry screen (when department management is available)	Displays department code entry screen (when department management is available)	Display not changed	Display not changed
Press [JOB STATUS] button	Displays print job list screen	Display not changed	Display not changed	Displays print job list screen
Press [INTERRUPT] button	Switches to interrupt mode	Display not changed	Display not changed	Display not changed (LED blinking)
Press [FUNCTION CLEAR] button after setting the copy mode	Copy mode is cleared after the copy mode is set	Copy mode is cleared after the copy mode is set	Auto job start cancelled	Display not changed
Press [STOP] button	Display not changed	Display not changed	Auto job start cancelled	Scanning or printing out stops, and "READY Press START to copy" and "MEMORY CLEAR" are displayed
Press [CLEAR] button after setting the copy mode	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Display not changed	Display not changed
Press [CLEAR] button after keying in numbers (digital keys)	Number keyed in changes to 1 after being entered	Number keyed in changes to 1 after being entered	Display not changed	Display not changed
Press [MONITOR/ PAUSE] button	Display not changed	Display not changed	Display not changed	Display not changed
Press [FAX] button	Displays FAX screen	Display not changed	Display not changed	Display not changed
Press [COPY] button	Display not changed	Display not changed	Display not changed	Display not changed
Press [SCAN] button	Displays SCAN screen	Display not changed	Display not changed	Display not changed
Press [e-FILING] button	Displays e-FILING screen	Display not changed	Display not changed	Display not changed
Press [EXTENSION] button	Display not changed	Display not changed	Display not changed	Display not changed
Press [TEMPLATE] button	Displays TEMPLATE screen	Display not changed	Display not changed	Display not changed
Press [USER FUNCTIONS] button	Displays USER FUNCTIONS screen	Display not changed	Display not changed	Display not changed

	During READY status	During warming-up	Auto job start reserved	Scanning original/ Scanning original and printing out the copy
Press [HELP] button	Displays HELP screen	Displays HELP screen	Display not changed	Display not changed
Press [START] button with the original set on RADF	Displays “COPYING”	“Wait Warming Up Auto Start” is displayed	Display not changed	Display not changed

	Printing out the copy	During paper jam	When interrupting	When displaying HELP screen	During energy saving mode
Press [ENERGY SAVER] button	Display not changed	Display not changed	Display not changed	Switches to energy saving mode	Energy saving mode is cleared and displays BASIC screen
Press [ACCESS] button	Displays department code entry screen (when department management is available)	Display not changed	Displays department code entry screen (when department management is available)	Displays department code entry screen (when department management is available)	Display not changed
Press [JOB STATUS] button	Displays print job list screen	Display not changed	Displays print job list screen	Displays print job list screen	Display not changed
Press [INTERRUPT] button	Display not changed (LED blinking)	Display not changed	Returns to the status before interrupting	Switches to interrupting mode	Display not changed
Press [FUNCTION CLEAR] button after setting the copy mode	Copy mode is cleared after the copy mode is set	Display not changed	Copy mode is cleared after the copy mode is set	Displays BASIC screen after the copy mode is set and then cancelled	Display not changed
Press [STOP] button	Printing out stops, and “READY Press START to copy“ and “MEMORY CLEAR” are displayed	Display not changed	Display not changed	Display not changed	Display not changed
Press [CLEAR] button after setting the copy mode	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Display not changed	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Display not changed
Press [CLEAR] button after keying in numbers (digital keys)	Number keyed in changes to 1 after being entered	Display not changed	Number keyed in changes to 1 after being entered	Number keyed in changes to 1 after being entered	Display not changed
Press [MONITOR/ PAUSE] button	Display not changed	Display not changed	Display not changed	Display not changed	Display not changed
Press [FAX] button	Displays FAX screen	Display not changed	Display not changed	Displays FAX screen	Displays FAX screen

	Printing out the copy	During paper jam	When interrupting	When displaying HELP screen	During energy saving mode
Press [COPY] button	Display not changed	Display not changed	Display not changed	Display not changed	Displays COPY screen
Press [SCAN] button	Displays SCAN screen	Display not changed	Display not changed	Displays SCAN screen	Displays SCAN screen
Press [e-FILING] button	Displays e-FILING screen	Display not changed	Display not changed	Displays e-FILING screen	Displays e-FILING screen
Press [EXTENSION] button	Display not changed	Display not changed	Display not changed	Display not changed	Display not changed
Press [TEMPLATE] button	Displays TEMPLATE screen	Display not changed	Display not changed	Displays TEMPLATE screen	Display not changed
Press [USER FUNCTIONS] button	Displays USER FUNCTIONS screen	Display not changed	Display not changed	Displays USER FUNCTIONS screen	Display not changed
Press [HELP] button	Displays HELP screen	Display not changed	Displays HELP screen	Switches to the screen previously displayed	Display not changed
Press [START] button with the original set on RADF	Displays “COPYING” and RADF starts feeding	Display not changed	Displays “COPYING” and RADF starts feeding	Displays “COPYING” and RADF starts feeding	Energy saving mode is cleared and displays BASIC screen

5.4 Description of Operation

5.4.1 Dot matrix LCD circuit

1) Structure

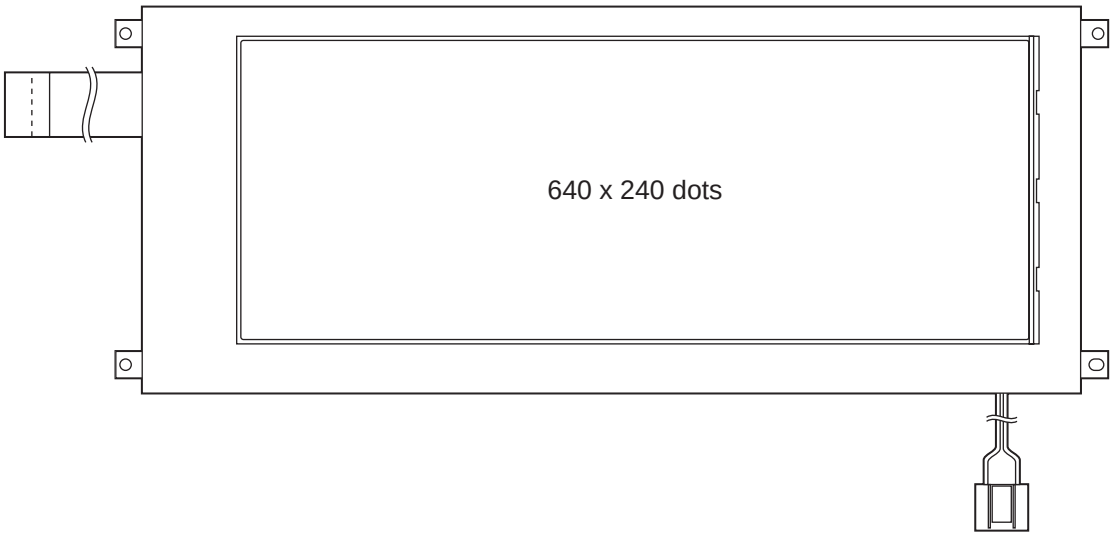


Fig. 5-5

The DSP-LCD-410 is an STN blue mode transmissive type LCD with 640x240-dot display capacity. It consists of a driver LSI, frame, printed circuit board, and lateral type CCFL backlight.

* STN: Super Twisted Nematic
* CCFL: Cold Cathod Fluorescent Lamp

2) Block diagram

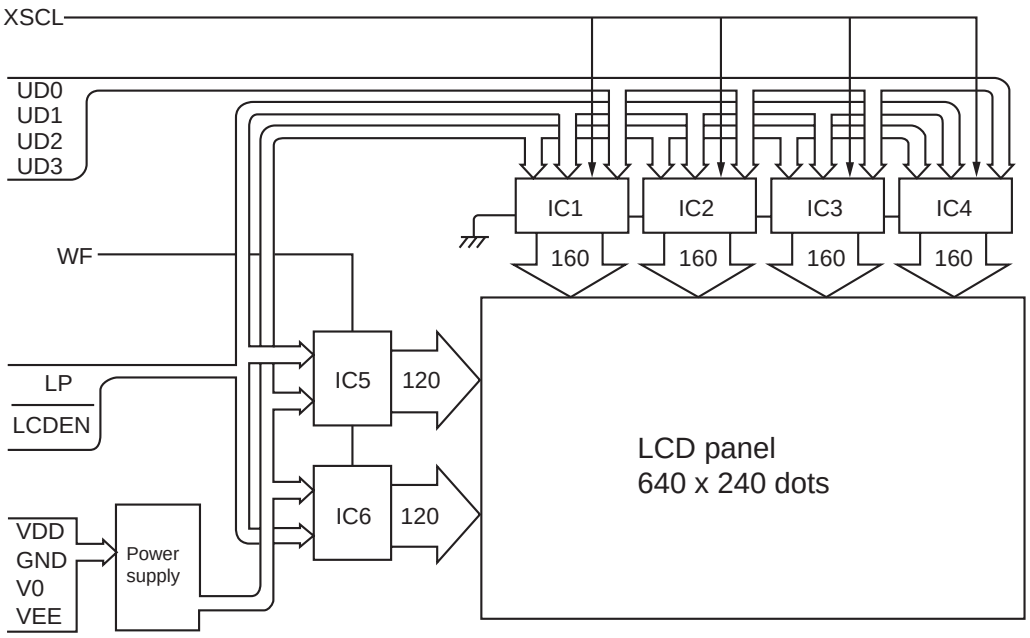


Fig. 5-6

3) System diagram

Signals flowing between the control panel and the system board are indicated in the chart below. When the panel processing CPU detects that the control panel is operated, the operational contents are transmitted to the System board through the serial data. The state of the equipment and the messages from the System board are received by the LCD controller and then displayed on the LCD. The LED and buzzers are switched to ON/OFF with the signals output from the panel processing CPU, based on serial data transmitted from the System control PC board.

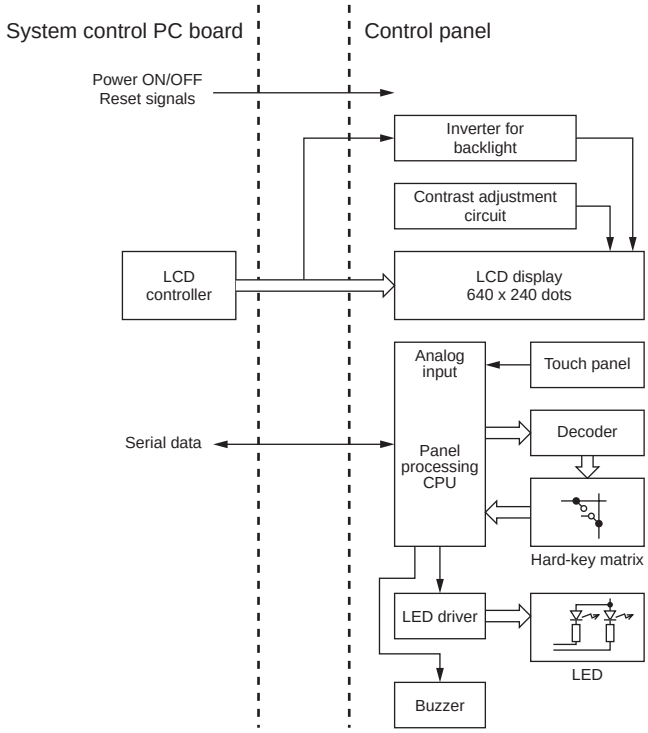


Fig. 5-7

4) Data Transmission

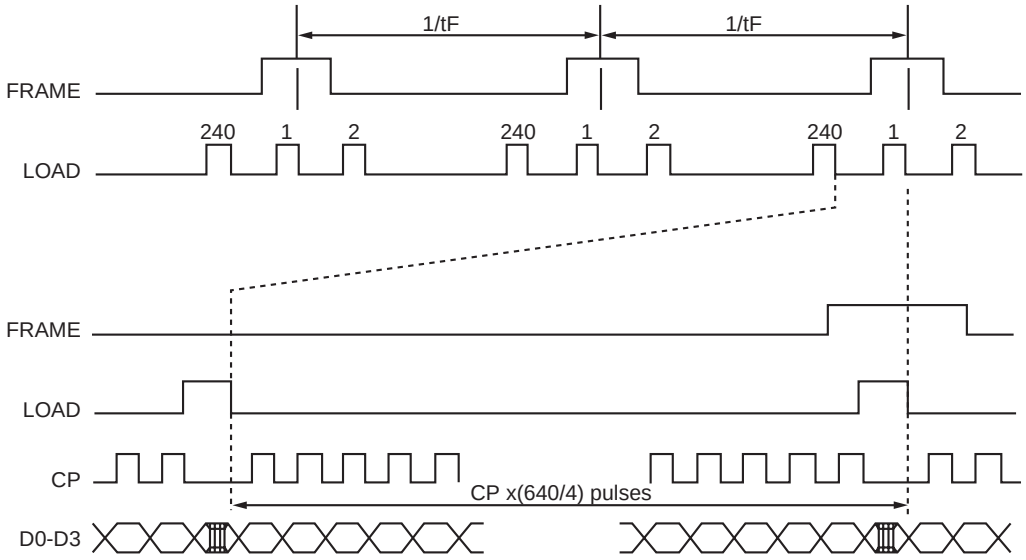


Fig. 5-8

5.4.2 LED display circuit

1) Method of LED display
   ex) Displaying “COPY”.

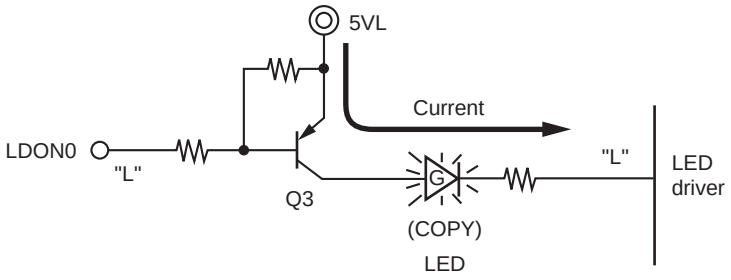


Fig. 5-9

Transistor is turned ON when the LDON 0 signal becomes “L” level.
Also, when LED driver pin changes to “L”, the current flows from 5VL via the transistor to the LED (“COPY”) to turn ON the LED (“COPY”).

Conditions to turn ON the LED

(a) The transistor (Q3) connected to the LED anode is ON.
(b) The output from the cathode side of the LED is “L” level.
The LED turns ON when the conditions (a) and (b) are met.

5.5 Disassembly and Replacement

Note:
When taking off the control panel, check the position of the stopper; if the stopper is at the position “b”, remove the stopper or move it to the position “a”.

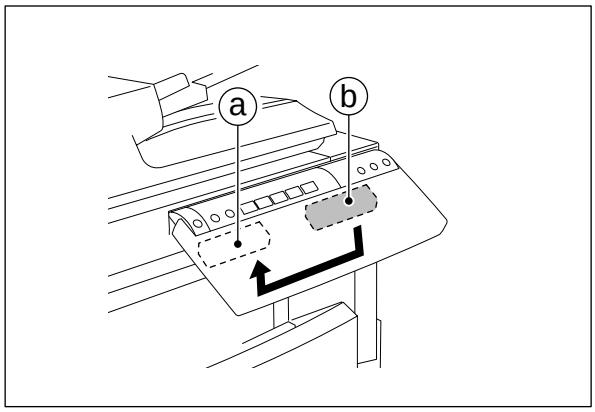


Fig. 5-10

[A] Stopper

(1) Slide the stopper and pull it out.

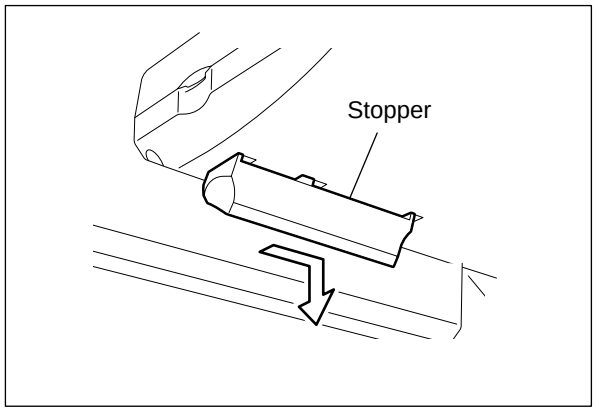


Fig. 5-11

[B] Control panel unit

(1) Take off the right upper cover and the front upper cover (P.2-28 "[H] Right upper cover", P.2-27 "[G] Front upper cover").
(2) Disconnect 1 connector.
(3) Remove 2 screws and take off 2 harness clamps.

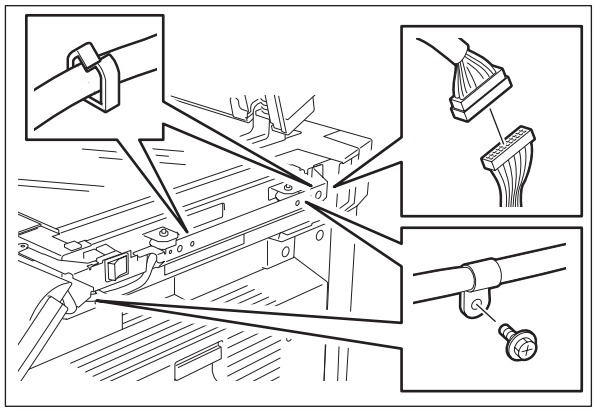


Fig. 5-12

(4) Lower the control panel and remove 4 screws.
(5) Take off the control panel unit while sliding it.

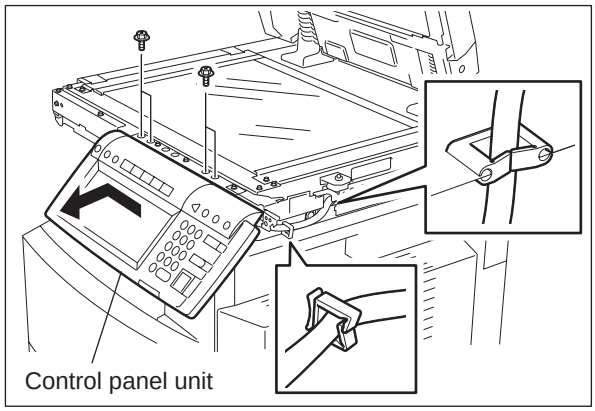


Fig. 5-13

(6) Remove 3 screws and take off the cover.

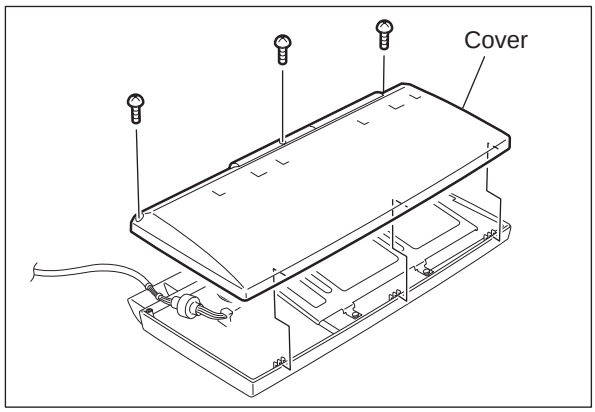


Fig. 5-14

(7) Remove 5 screws and take off the hinge bracket.

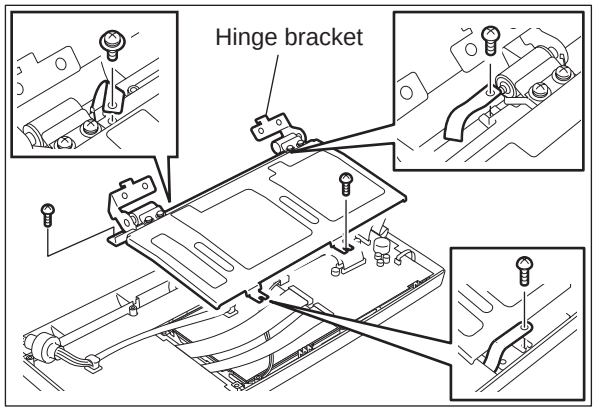


Fig. 5-15

(8) Disconnect 5 connectors.
(9) Release the harness from 2 harness clamps.
(10) Remove 1 screw and take off the DSP board.

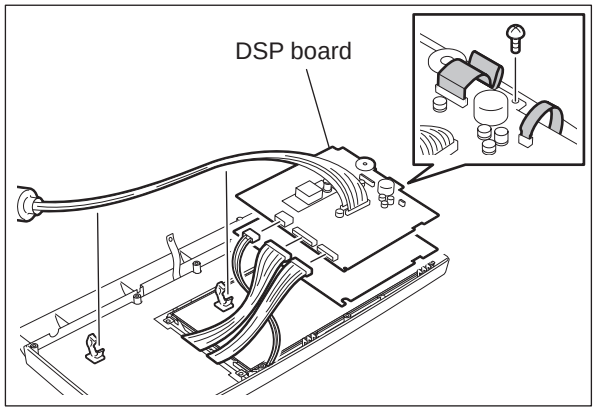


Fig. 5-16

(11) Remove 4 screws and take off the LCD.

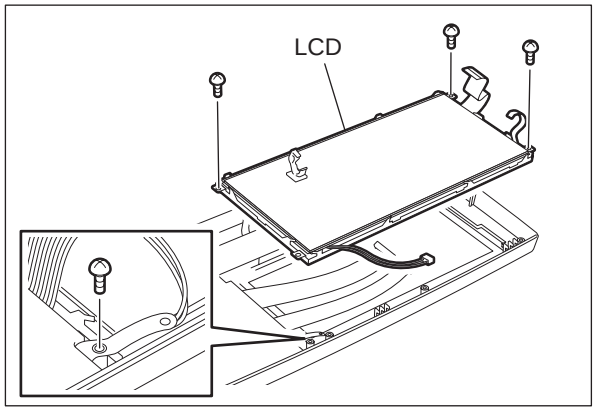


Fig. 5-17

(12) Remove 16 screws and take off the KEY board.

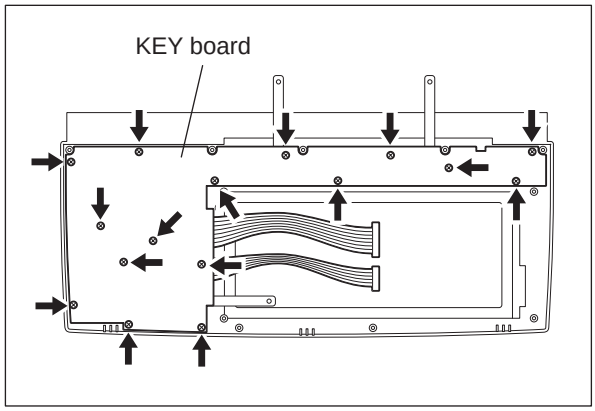


Fig. 5-18

6. SCANNER

6.1 General Description

In the scanning section of this equipment, the surface of an original is irradiated with a direct light and the reflected light is led through mirrors, a lens and a slit to CCD where optical-to-electrical conversion is performed, converting the optical image data into an electrical (analog) signal. This analog signal is changed to a digital signal, which then undertakes various corrective processes necessary for image formation. After that, arithmetic operation is performed on the digital signal, which is then transmitted to the data writing section.
In this equipment, a reduction-type CCD for color processing is used. What this CCD differs from black-and-white CCDs is that its devices are arranged in 4 lines and covered with color filters (Red, Green, and Blue). These lines are composed with 3-line color devices and black-and-white device with no filter.

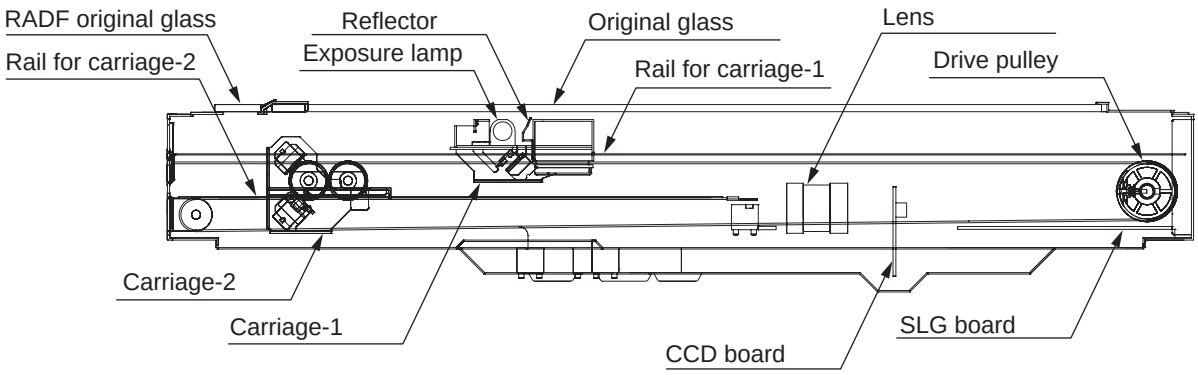


Fig. 6-1

6.2 Construction

Scanner		
Original glass	Original glass	
	RADF original glass	
Carriage-1	Exposure lamp (EXP)	Xenon lamp (16W)
	Inverter board (INV)	
	Reflector	
	Mirror-1	
Carriage-2	Mirror-2	
	Mirror-3	
Lens unit		
CCD driving PC board (CCD)		
Automatic original detection sensor (S1-5)		
Driving section	Scan motor (M1)	• 2-phase stepping motor • Wire drive • Driving the carriage-1 and carriage-2
Other	Scanning section control PC board (SLG)	
	Scanner unit cooling fan (M15)	
	Damp heater (DH1, DH2 THMO2)	
	Carriage home position sensor (S6)	
	Platen sensor (S7)	
	Main switch (S41)	
	Rubber damper	

6.3 Functions

The following shows the construction and purpose of the scanning system:

1) Original glass
   This is a glass for placing original. The light from the exposure lamp (EXP) is irradiated to the original through this glass.
   The ADF original glass is used when original is read with the Automatic Document Feeder. Original is transported on the ADF original glass by the Automatic Document Feeder, and the transported original is read under the ADF original glass by the carriage. Do not use such solvents as alcohol when cleaning the surface of the ADF original glass, because it is coated so as not to be scratched by originals.

2) Carriage-1
   Carriage-1 consists of the exposure lamp (EXP), Inverter board (INV), reflector, mirror-1, etc. It is driven by the scan motor (M1) and scans an original on the glass.

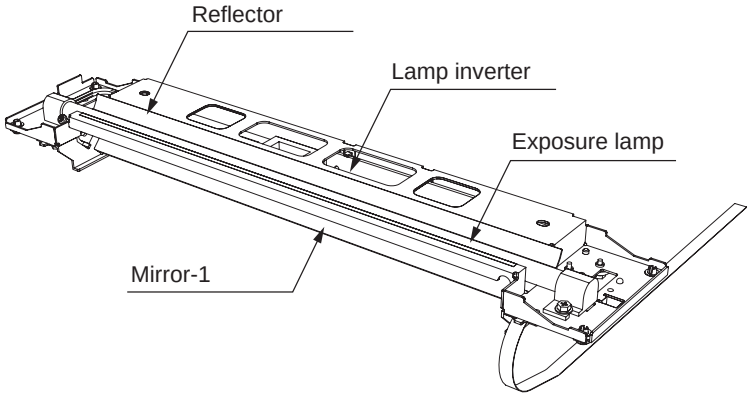


Fig. 6-2

- Exposure lamp (EXP)
  This lamp is the light source to irradiate the original on the glass. (One 16 W xenon lamp)
- Inverter board (INV)
  Controls lighting of the exposure lamp (EXP).
- Reflector
  This is a plate to efficiently direct the light from the exposure lamp (EXP) to the surface of the original on the glass.
- Mirror-1
  This mirror directs the light reflected from the original to the mirror-2 described later.

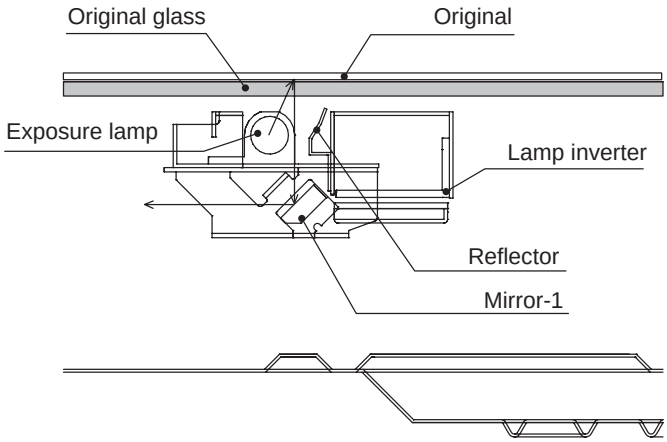


Fig. 6-3

3) Carriage-2
Carriage-2 mainly consists of the mirror-2, mirror-3, etc. and directs the reflected light from the mirror-1 through the mirrors-2 and -3 to the lens.
This carriage is driven by the same scan motor (M1) as that for the carriage-1 at half the scanning speed of the carriage-1 (The scanning distance is also half that of the carriage-1).

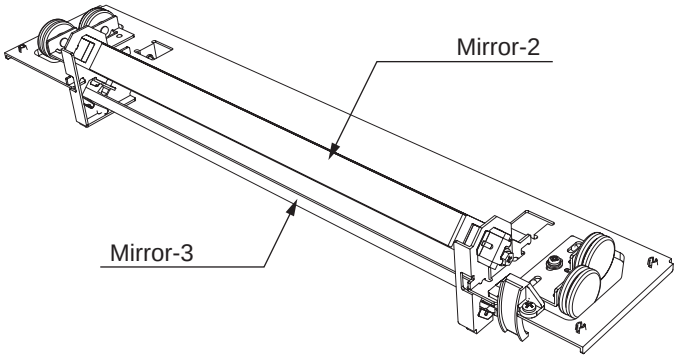


Fig. 6-4

4) Lens unit
The light reflected from the mirror-3 is led to the CCD placed at the focal point of the lens which is fixed in a position.

5) CCD driving PC board (CCD)
Processes such as signal amplification, signal integration and A/D conversion are applied on the electrical signal which was converted by CCD.

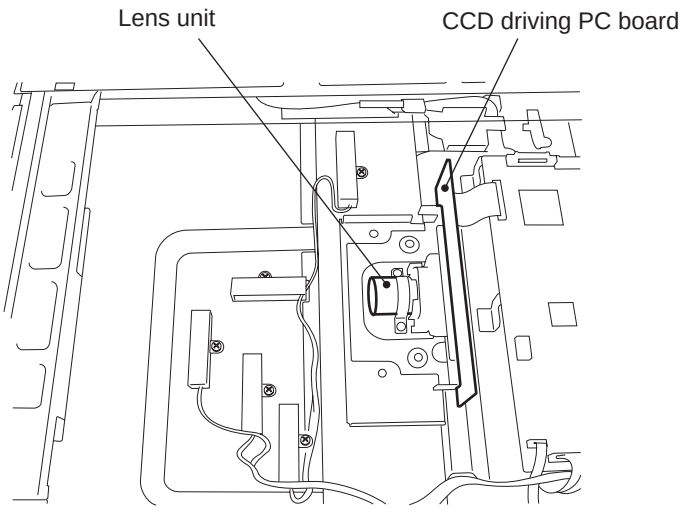


Fig. 6-5

6) Scanning section control PC board (SLG)
This is a board to perform the image correction, such as the shading correction and 3-line correction, and control the scan motor (M1).

7) Automatic original detection sensor (S1-5)
The size of an original placed on the glass is instantly detected using the automatic original detection sensors (S1-5) (APS sensor) fixed on the base frame without moving the carriage-1.

6.4 Description of Operation

6.4.1 Scan motor (M1)

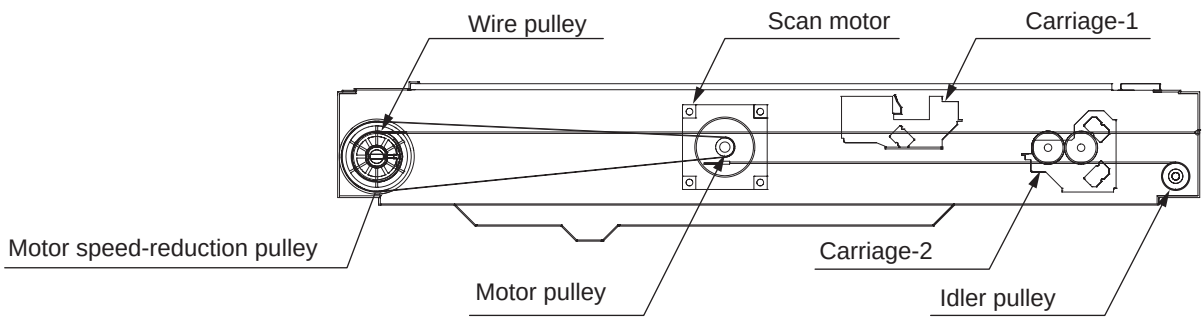


Fig. 6-6

- Scanning of an original placed on the original glass
  This motor drives the carriages-1 and -2 through the timing belt and carriage wire. First, the scan motor drives the carriages-1 and -2 to their respective home positions. The home positions are detected when the carriage-1 passes the home position sensor (S6). When the [START] button is pressed, the both carriages start to move and scan the original on the glass.

- Scanning of an original placed on the RADF
  The carriage-1 stays at the shading position during shading correction, and at the scanning position during scanning operation.

- Scanning velocity
  The scanning velocity at color modes is reduced to a half of it at the Black Mode.

6.4.2 Scanning drive circuit

The scan motor (M1) is a 2-phase stepping motor and driven by the driver IC (STK-672-400).

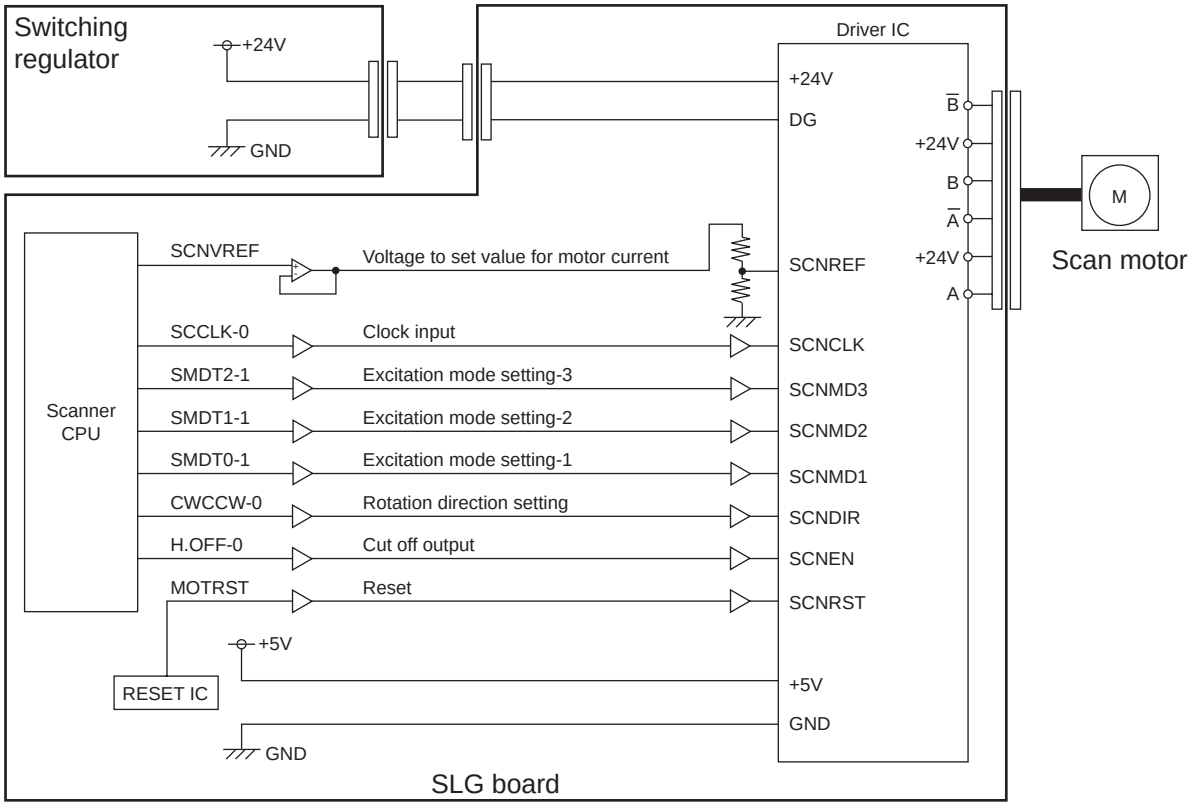


Fig. 6-7

Input/output signals

Clock input	SCNCLK	Input	Motor is rotated by setting number of pulse. * Internal circuit of the motor driver works when the first pulse becomes ON and the last pulse becomes OFF.
Set the direction of motor rotation	SCNDIR	Input	The direction of the motor rotation is determined by setting level of signal. "L"..... Clockwise direction (as seen from the output shaft) "H" .... Counterclockwise direction (as seen from the output shaft)
Cut off the drive out-put	SCNEN	Input	Excitation drive is forcibly turned ON/OFF. "H" .... Normal operation (Excited) "L"..... Excitation drive is forcibly shut off (Not excited)
Voltage to set value for the motor current	SCNREF	Input	Motor wire current value is set in the range of 0 to 2.0 (A)/phase by applying the analog voltage 0 to 5 (V).
Set the exicitation for the motor current	SCNMD1 to 3	Input	Set the excitation mode.
Reset	RESET	Input	Reset for the whole system Internal circuit of the driver is initialized by setting the motor to "L" level. The motor drive circuit is automatically reset when the power is turned ON.

6.4.3 Initialization at power-ON

The carriage moves to its home position and performs the peak detection.
Then it moves to the carriage waiting position and waits.

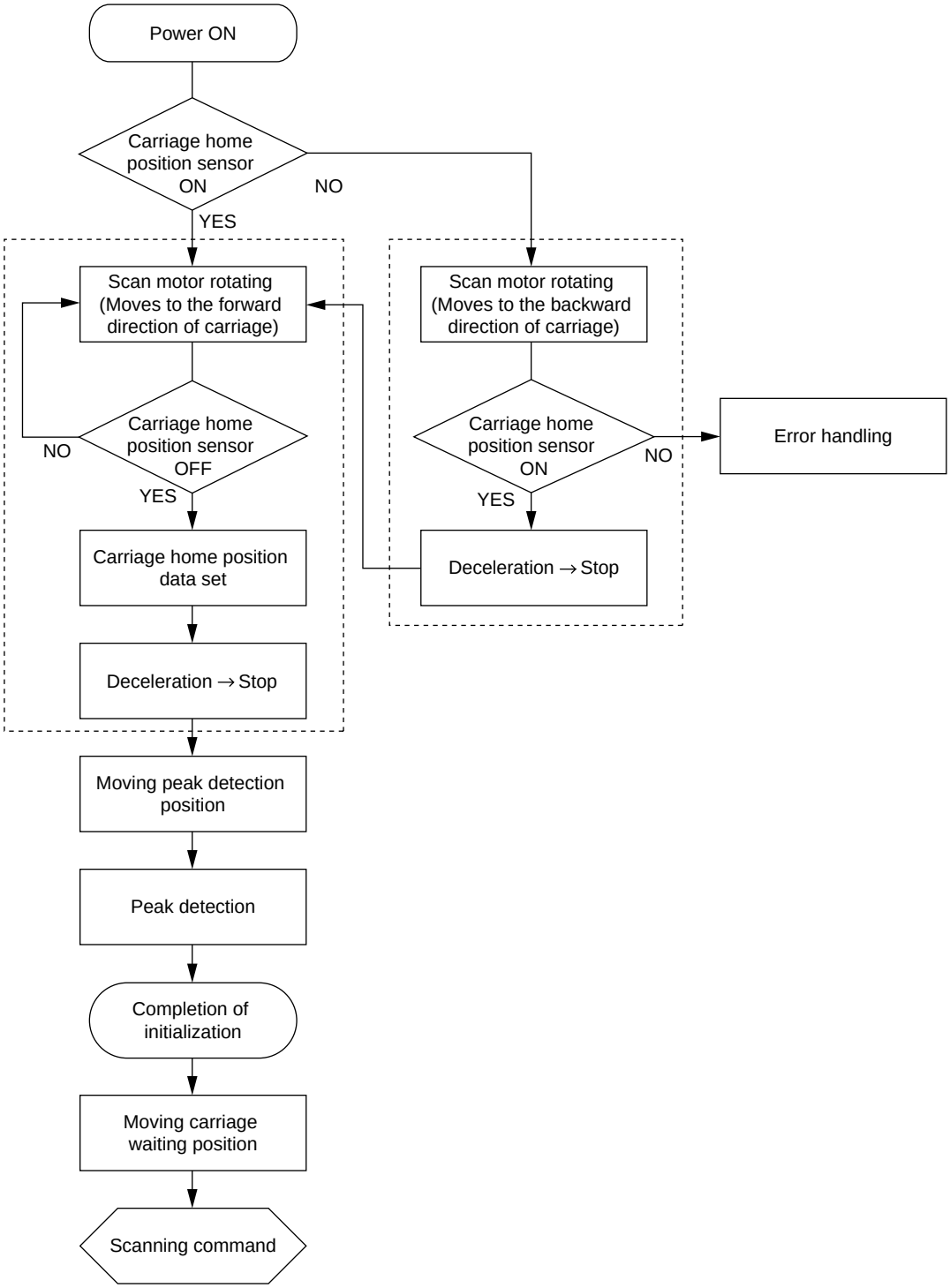


Fig. 6-8

6.5 Control of Exposure Lamp (EXP)

6.5.1 General description

Control circuit for the exposure lamp consists of the following two blocks:

1) Lighting device for the xenon lamp (Inverter board (INV))
   Turns ON/OFF the exposure lamp (EXP).

2) CCD board (CCD)
   This circuit converts the reflected light amount from the original surface and the shading correction plate to electrical signals. The exposure amount is controlled in two ways:
   - White reference formation - reads the reflected light amount from the white shading correction plate
   - Black reference formation - reads the light amount at the regulation position with the exposure lamp (EXP) lights OFF

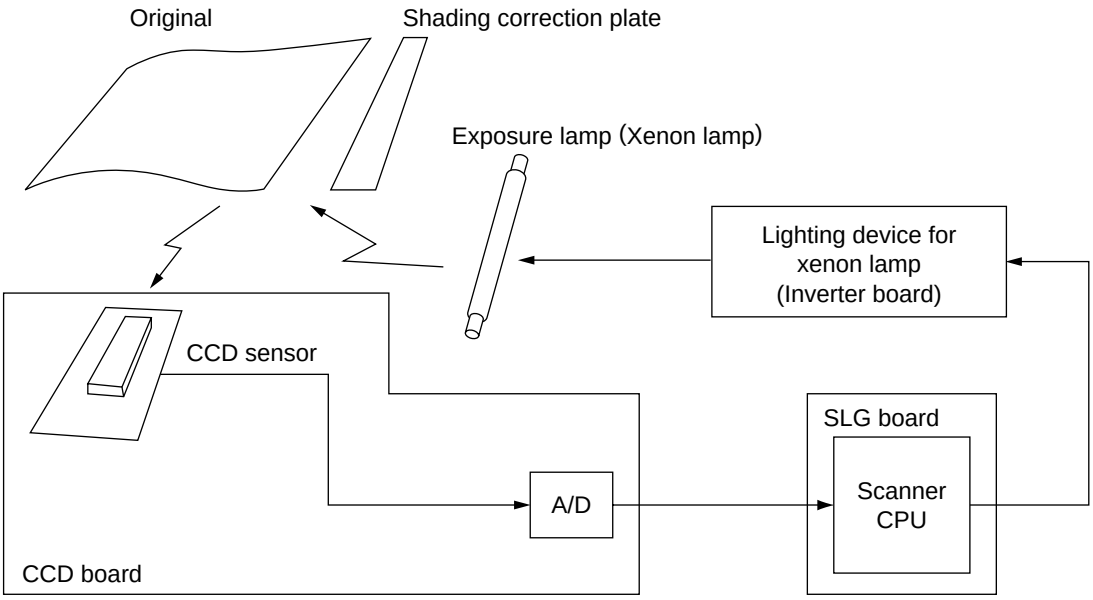


Fig. 6-9

6.5.2 Exposure lamp (EXP)

External electrode type xenon fluorescent lamp is used as an exposure lamp (EXP) in this equipment.

1) Structure
   Fluorescer is applied on the inside surface of the lamp pipe (except a part to be an opening) which is filled with the xenon gas.
   A pair of the external electrodes covered by the film with the adhesive agent is attached over the pipe.

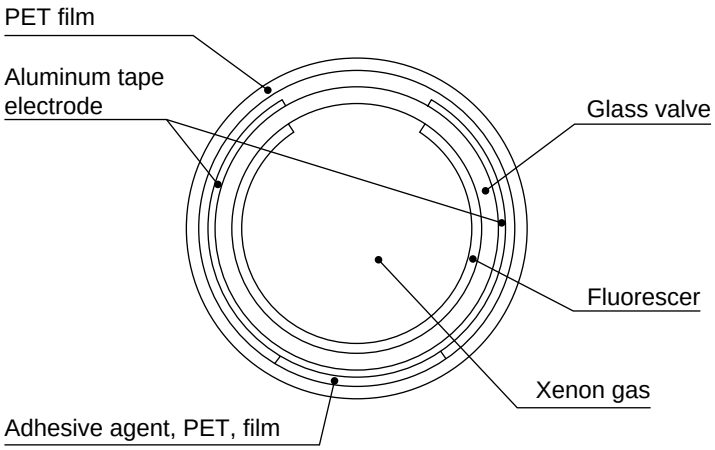
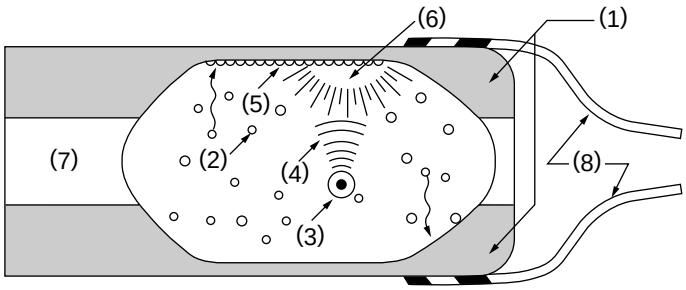


Fig. 6-10

2) Behavior inside the lamp
   The electron inside the pipe is led to the electric field by applying voltage to the pair of the external electrodes, and discharge is started. Electrons then flow and clash with the xenon atom inside the pipe to excite them, and generate the ultraviolet ray. This ultraviolet ray converts the fluorescer into the visible light.



(1) Electrode (2) Electron (3) Xenon atom
(4) Ultraviolet lay (5) Fluorescer
(6) Visible light (irradiated from the opening to outside the pipe)
(7) Openig (8) Harness

Fig. 6-11

6.5.3 Control circuit for the exposure lamp

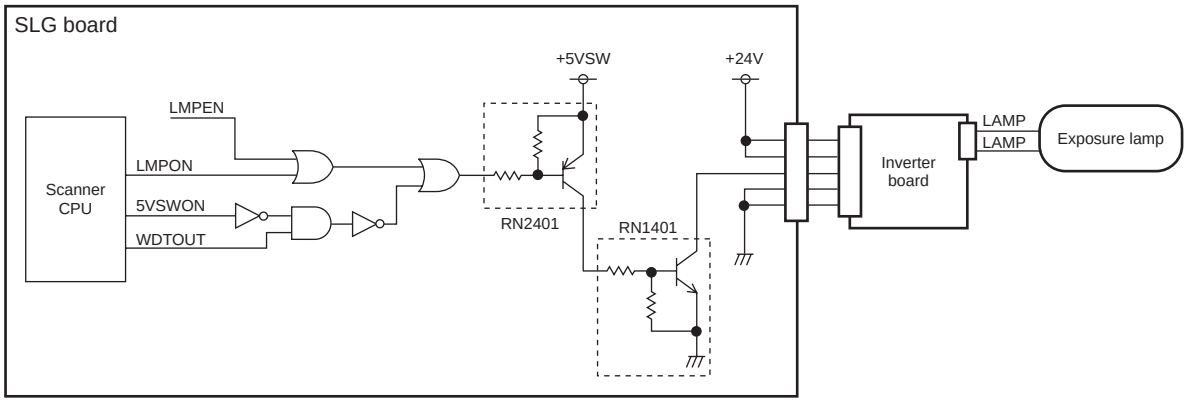


Fig. 6-12

Working conditions

LAMPON	L	-	-	-	Exposure lamp ON signal	Lamp turns ON at “L”
5VSWON	L	H	-	-	+5VSW ON signal	Controls +5VSW by CPU. Normally “L”
WDTOUT	H	-	L	-	Watchdog timer signal	“L” is output when CPU is out of control
LMPEN	L	-	-	H	Exposure lamp enable signal	Normally “L”
Xenon lamp	ON	OFF				

6.6 General Description of CCD Control

6.6.1 Opto-electronic conversion

A CCD (Charge-Coupled Device) is used to produce electrical signal corresponding to the reflected light amount from the original. CCD is a one-chip opto-electronic conversion device, comprised of several thousand light-receiving elements arranged in a line, each one of them is a few micron square. This equipment includes a CCD which has 7,450 light-receiving elements.
Each element of the light-receiving section consists of semiconductive layers P and N. When the light irradiates the element, light energy produces a (-) charge in the layer P; the amount of the charge produced is proportional to the energy and irradiating time. The charges produced in the light-receiving section are then sent to the transfer section where they are shifted by transfer clock from left to right as shown in the figure below, and are finally output from the CCD. At this time, to increase the transfer speed of the CCD, image signals in the even-number and odd-number elements are separated and output in parallel via two channels.

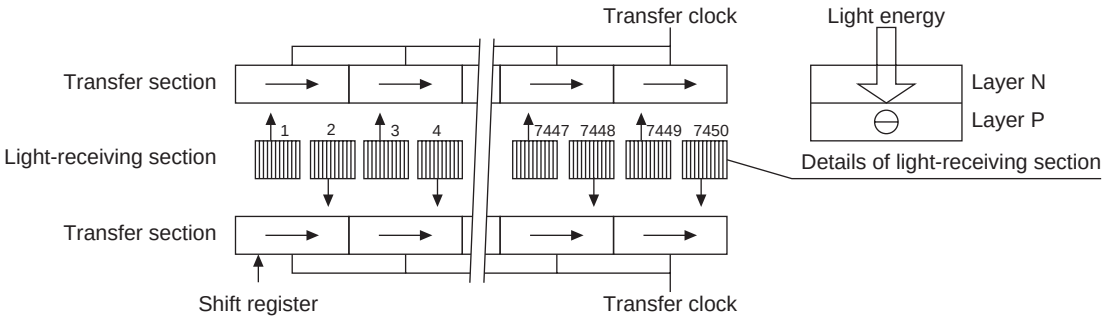


Fig. 6-13

6.6.2 Shading correction

Signal voltages read by the CCD have the following characteristics:

1) Light source has a variation in its light distribution.

2) Since the light beam reflected from the original is converged using a lens, the light path is the shortest at the center of the CCD and the longest at ends. This causes difference in the amount of light reaching the CCD (i.e. the light amount is maximum at the CCD center, gradually decreases toward ends).

3) Each of the 7,450 elements varies in opto-electronic conversion efficiency.

These variation need to be corrected and this correction is referred to as shading correction. Shading correction is performed by applying normalization process using the following formula on the black and white data obtained in advance to correct lighting variance and element variation of the image data.

$$I = k \times \frac{(S-K)}{(W-K)}$$

k: Coefficient
S: Image data before correction
K: Black data (stored in "Black" memory)
W: White data (stored in "White" memory)

6.7 Automatic Original Size Detection Circuit

This circuit detects the size of original (standard sizes only) using the reflection type photosensors arranged on the base frame of the scanner unit.

6.7.1 Principle of original size detection

Reflection type photosensors are placed on the base frame of the scanner unit as shown in the figure below. Each sensor consists of an infrared Light Emitting Diode (LED) on the light emitting side, and a phototransistor on the light receiving side.
When there is an original on the original glass, light beams from the LEDs are reflected by the original and led to the phototransistors. This means that the presence of the original is detected by the presence of reflection (when scanning black image).

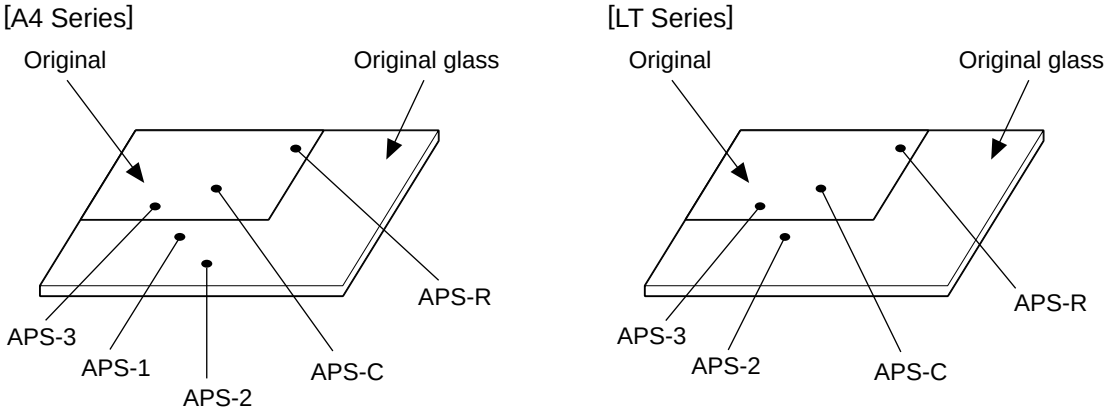


Fig. 6-14

6.7.2 Process of detection of original size

1) When the equipment is in the original size detection mode, carriage-1 is set at its home position.

2) When the platen cover is opened, the sensors receive the light reflected from the original and if one of the matrix conditions shown in 4) for original sizes are met, the size of the original is instantly detected.

3) The output signal from each sensor is input to CPU on the scanning section control PC board to determine the size of the original.

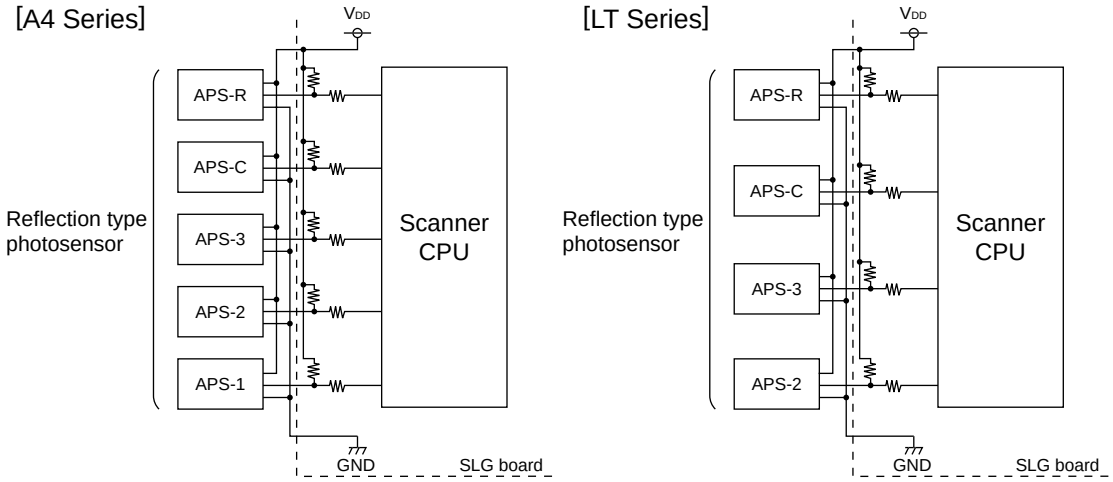


Fig. 6-15

Sensor detection points

[A4 Series]

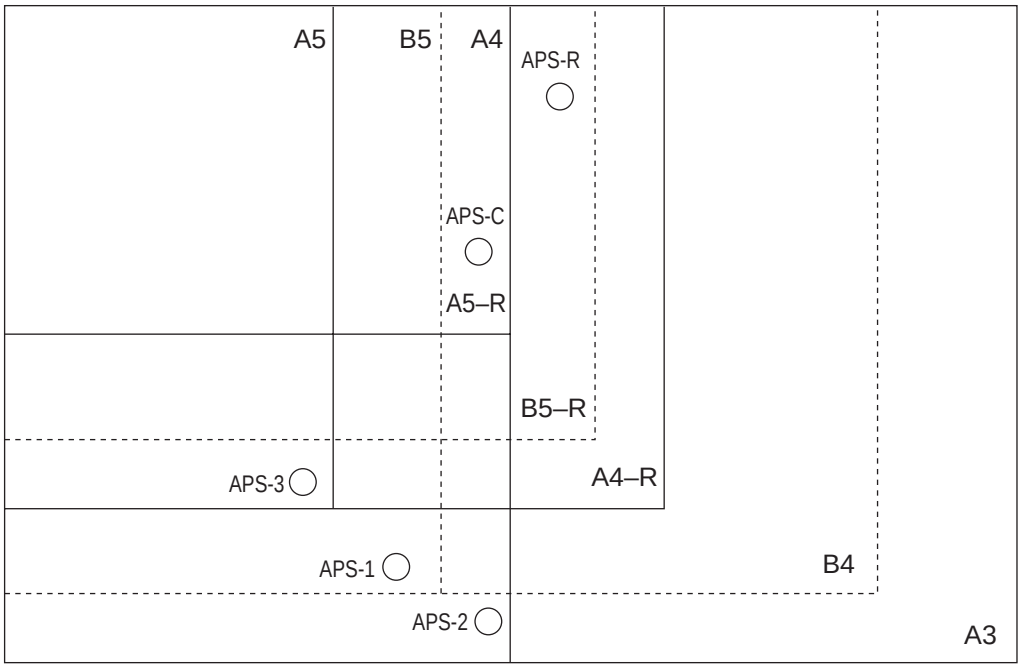


Fig. 6-16

[LT Series]

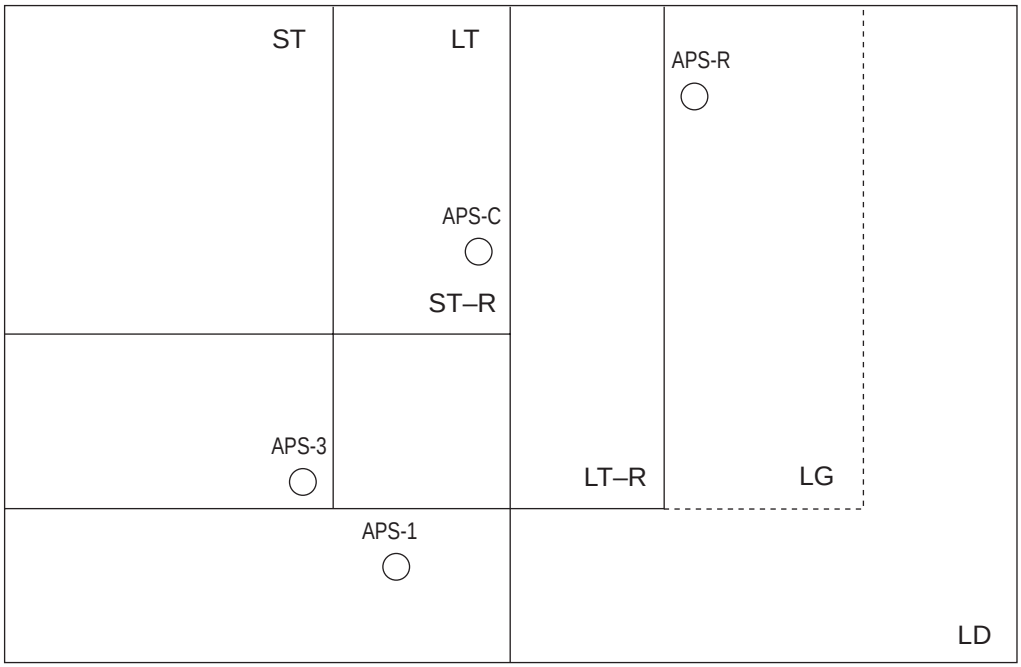


Fig. 6-17

4) Original size is determined by the combination of the signals output from each detection point. Combination charts for size determination of A4 series and LT series are as follows.

[A4 Series]

Size judgement	APS-C	APS-R	APS-1	APS-2	APS-3
A3	0	0	0	0	0
A4	0	1	0	0	0
B4	0	0	0	1	0
B5	1	1	0	1	0
A4-R	0	0	1	1	0
A5	1	1	1	1	0
B5-R	0	0	1	1	1
A5-R	0	1	1	1	1

[LT Series]

Size judgement	APS-C	APS-R	APS-2	APS-3
LD	0	0	0	0
LT	0	1	0	0
LG	0	0	1	0
LT-R	0	1	1	0
ST	1	1	1	0
ST-R	0	1	1	1

Code	Output signal	Original
1	H	Not available
0	L	Available

* When the platen sensor (S7) is OFF;
- The followings are determined by output signals from the APS sensors.
  - Size (The combination of the signals satisfy any in the above chart)
    Size is displayed on the control panel and a specific paper or reproduction ratio is selected.
  - Size retention (The combination of the signals do not satisfy the above chart)
    The latest original size recognized (or no original state) until new paper size is recognized.
  - No original (Output from all the sensors are “H”.)
    Reproduction ratio and paper are not selected.
- Size change is always observed and detected.
- The carriage-1 stays at the standby position even if the reproduction ratio changes corresponding to the change of the original size.

* When the platen sensor (S7) is ON;
The latest original size (or no original state) recognized right before the platen sensor (S7) is turned ON is retained regardless of the status the APS sensor output signals.

About reflection type photosensor

The reflection type photosensor is comprised of an infrared light emitting diode and a phototransistor. It uses pulse modulation to detect an original.

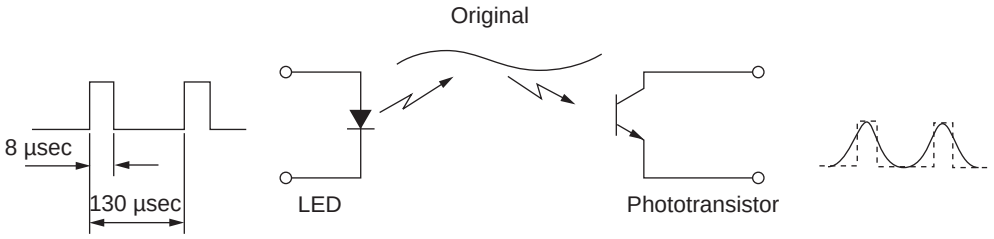


Fig. 6-18

The light emitting diode is driven by a pulse having a 130 µsec. cycle and an 8 µsec. ON time. When the phototransistor receives the same signal as this pulse, it is determined that there is an original. The pulse modulation is performed inside the reflection type phototransistor.

6.8 Disassembly and Replacement

[A] Original glass

(1) Take off the right upper cover (📖 P.2-28 "[H] Right upper cover").
(2) Remove 2 screws and take off the fixing bracket.

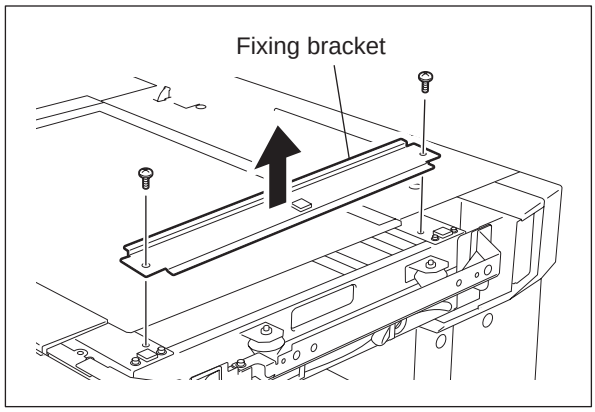


Fig. 6-19

(3) Take off the original glass.

Note:
When installing, fit 2 small protrusions of the-original glass in the groove of the equipment and fix the original glass with the fixing bracket by pushing it to the left rear direction.

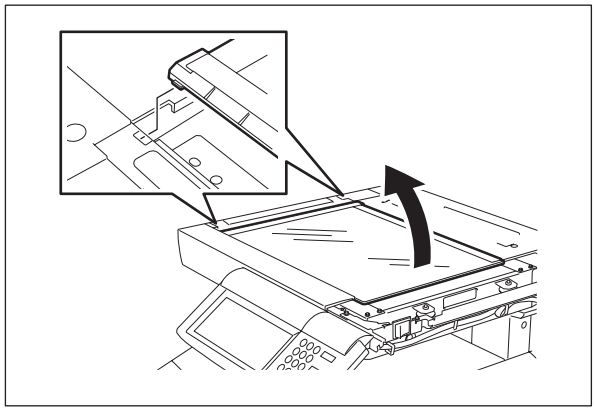


Fig. 6-20

[B] Lens cover

(1) Take off the original glass (📖 P.6-17 "[A] Original glass").
(2) Disconnect 1 connector, remove 6 screws and take off the lens cover.

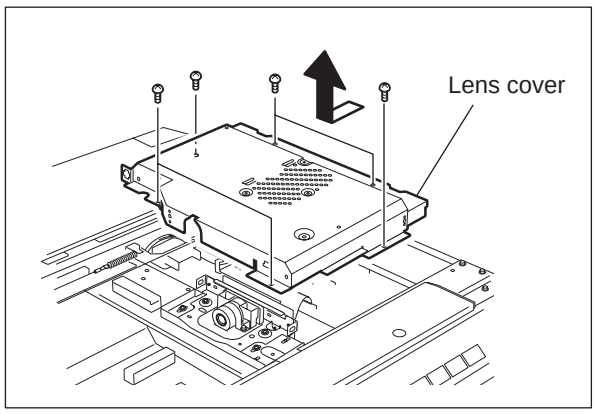


Fig. 6-21

[C] Automatic original detection sensor (APS sensor)

[C-1] A4 series (APS-1, -2, -3, -C, -R)

(1) Take off the original glass (📖 P.6-17 "[A] Original glass").
(2) Disconnect 1 connector and remove 1 screw for each APS sensor. Take off 5 APS sensors.

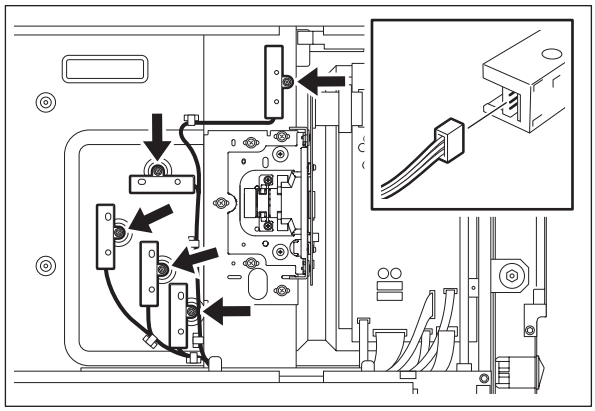


Fig. 6-22

[C-2] LT series (APS-1, -3, -C, -R)

(1) Take off the original glass (📖 P.6-17 "[A] Original glass").
(2) Disconnect 1 connector and remove 1 screw for each APS sensor. Take off 4 APS sensors.

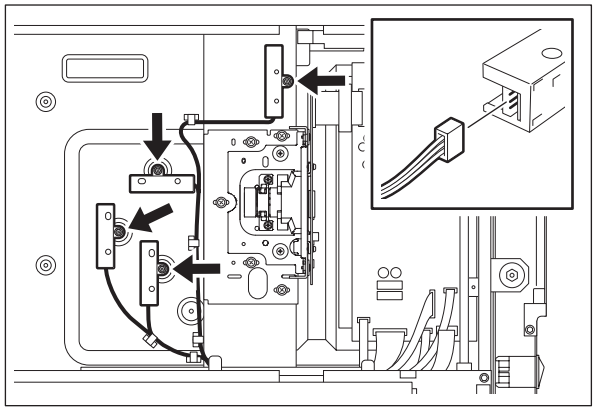


Fig. 6-23

[D] Exposure lamp (EXP)

(1) Take off the original glass and front upper cover (📖 P.6-17 "[A] Original glass", 📖 P.2-27 "[G] Front upper cover").
(2) Move the carriage-1 to the center position.

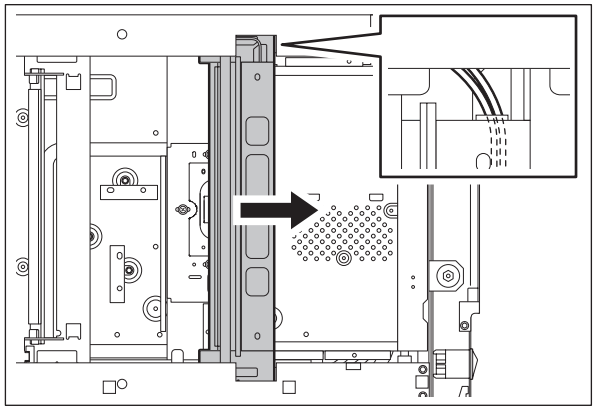


Fig. 6-24

(3) Disconnect the connector of the exposure lamp.

Note:
When disconnecting the connector, pay attention not to give load to the carriage frame.

(4) Release the harness from the harness clamp.

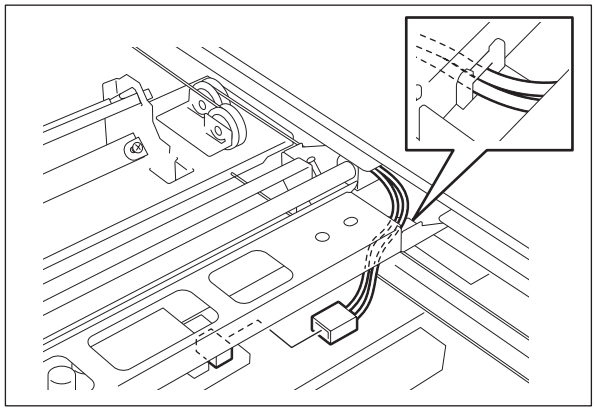


Fig. 6-25

(5) Move the carriage-1 to the position where the side of the frame is cut out.

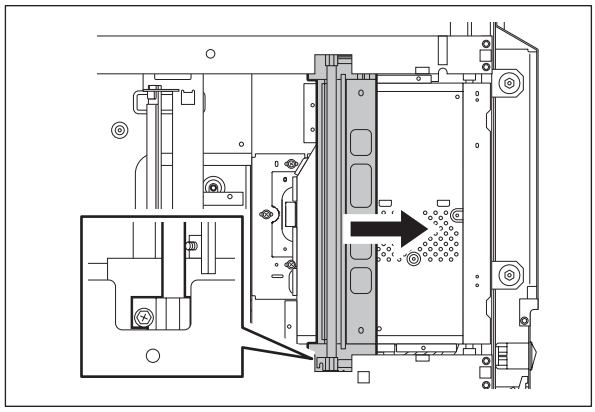


Fig. 6-26

(6) Remove 1 screw.
(7) Lift up the front side of the exposure lamp and take off by sliding it.

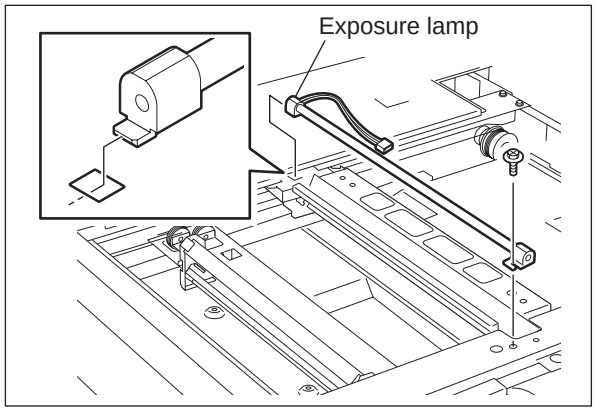


Fig. 6-27

[E] Lens unit

(1) Remove the lens cover (📖 P.6-17 "[B] Lens cover").
(2) Disconnect 1 connector and remove 5 screws, then take off the lens unit.

Notes:

1. When installing the lens unit, fix it while pushing it to the rear direction.
2. For adjustment, refer to “3.9.2 Lens Unit” in the Service Handbook.

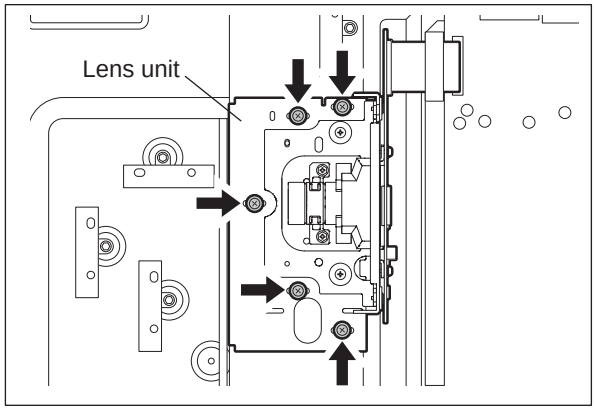


Fig. 6-28

3. Do not touch 6 screws shown with the arrows when replacing the lens unit.

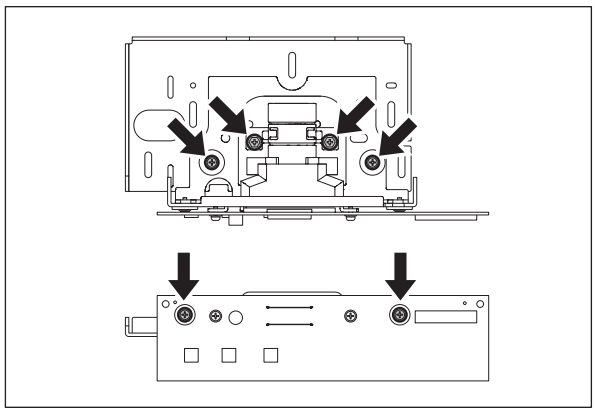


Fig. 6-29

4. Handle the unit with care. Do not touch the adjusted area and lens. (Hold the unit as the right figure.)

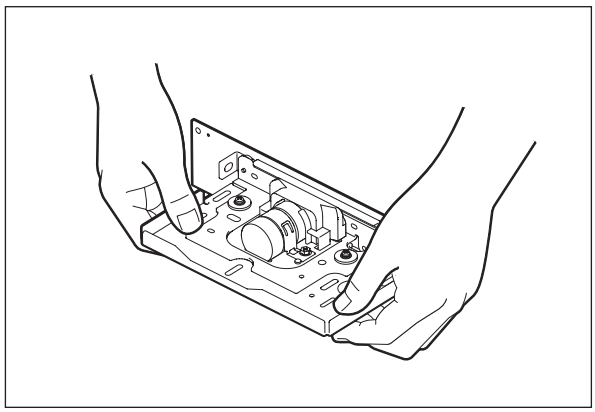


Fig. 6-30

[F] Scan motor (M1)

(1) Take off the upper rear cover (P.2-32 "[T] Upper rear cover").
(2) Take off the rear cover-1(P.2-31 "[R] Rear cover-1").
(3) Disconnect 1 connector.

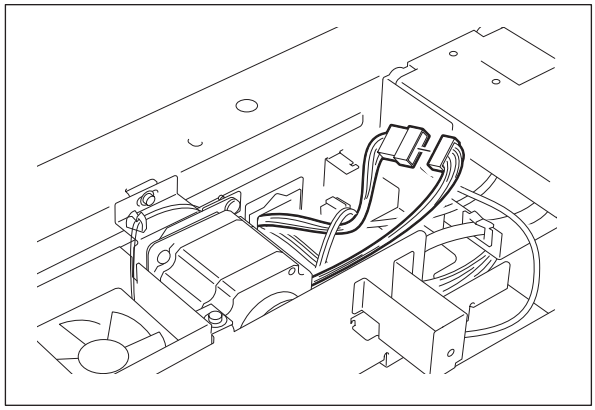


Fig. 6-31

(4) Release the harness from the harness clamp.
(5) Remove 3 screws and take off the scan motor with the whole bracket.

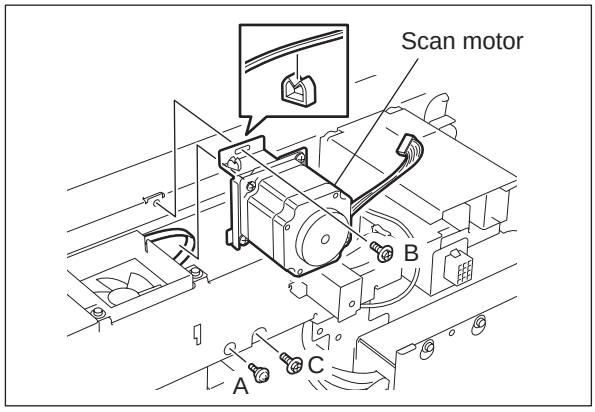


Fig. 6-32

Notes:

When installing the scan motor, use the belt tension jig (spring). The procedure is as follows.

1. Fix the screw A.
   (P.6-22 "Fig. 6-32 ")
2. Temporarily fix the screw B and C.
   (P.6-22 "Fig. 6-32 ")
3. Hook the belt tension jig to the motor bracket and the flame.
4. The scan motor is pulled by the belt tension jig. Fix the screw B and then C at the stopped position.
5. Remove the belt tension jig.

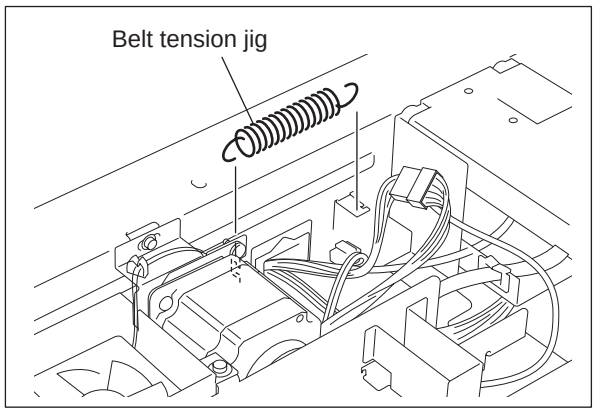


Fig. 6-33

[G] Carriage-1

(1) Take off the original glass, upper rear cover and front upper cover.
(📖 P.6-17 "[A] Original glass",
📖 P.2-32 "[T] Upper rear cover",
📖 P.2-27 "[G] Front upper cover")

(2) Move the carriage and position the holes of the carriage to the holes of the frame.

(3) Remove 2 screws and take off the brackets fixing the carriage-1 to the wire.

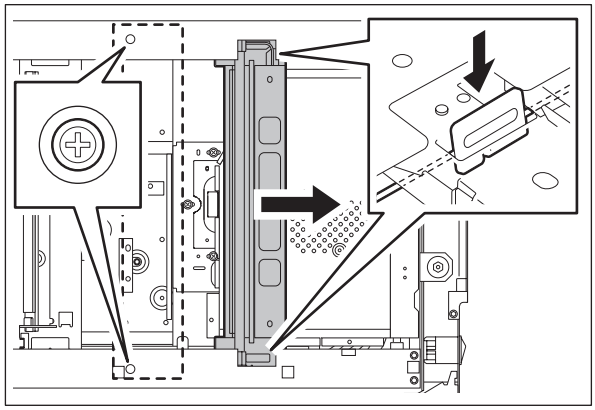


Fig. 6-34

(4) Remove the square seal fixing the lamp harness to the base. Disconnect the connector of the lamp harness from the SLG board.

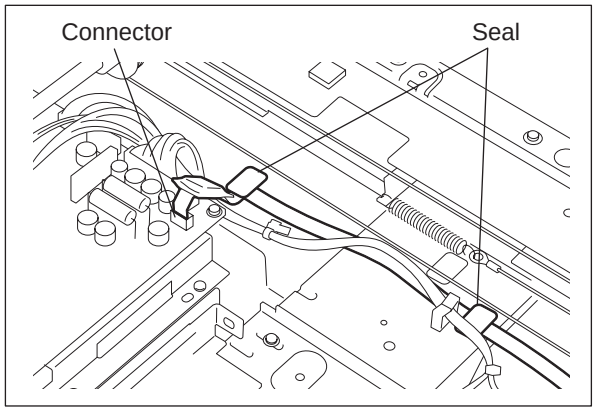


Fig. 6-35

Notes:

Be sure to install the lamp harness by following the procedure below.

1. Using alcohol, clean the area where the seal is to be attached.
2. Align the black line on the lamp harness with the position as shown in the figure, and fix it with a seal.

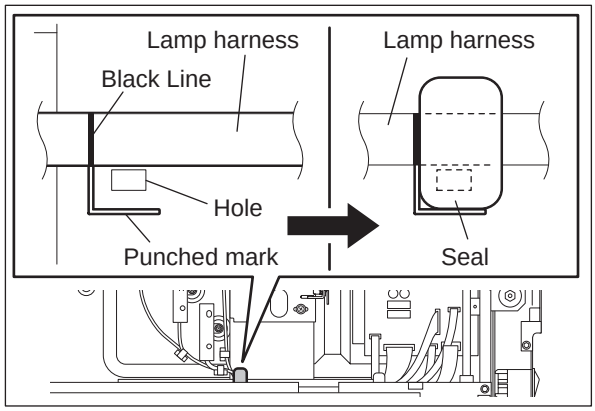


Fig. 6-36

3. Align the bent portion of the lamp harness with the position as shown in the figure, and fix it with a seal.
4. After the installation, move carriage-1 towards the left and confirm that there is no abnormality in the lamp harness, such as twisting.

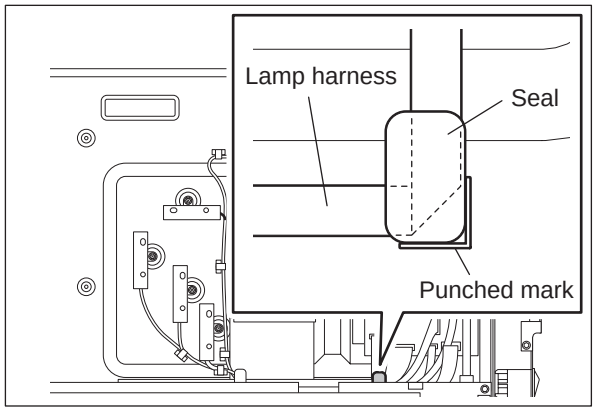


Fig. 6-37

(5) Rotate the carriage-1 in the direction shown in the figure at right, not to touch the mirror. Then take off the carriage-1.

Note:

When replacing the mirror-1, replace the carriage-1 together with mirror-1.
Mirror-1 should not be removed.

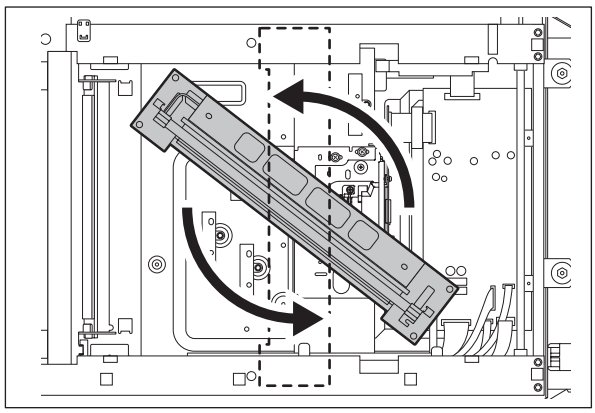


Fig. 6-38

Note:

When installing carriage-1, fix the bracket temporarily at the position (A). Then move it to the direction (B), push it to the end and fix securely.

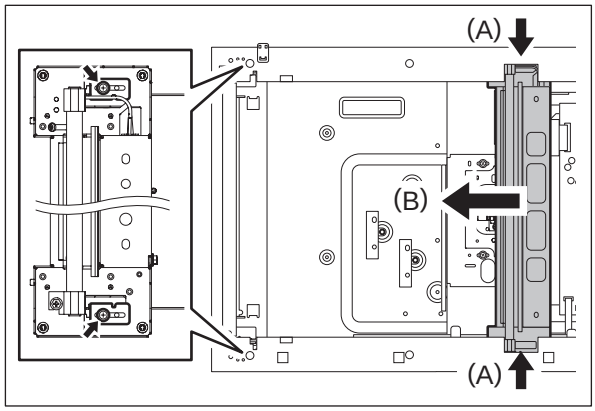


Fig. 6-39

[H] Inverter board (INV)

(1) Take off the carriage-1.
(📖 P.6-23 "[G] Carriage-1")
(2) Disconnect 2 connectors. Remove 2 screws and take off the inverter board.

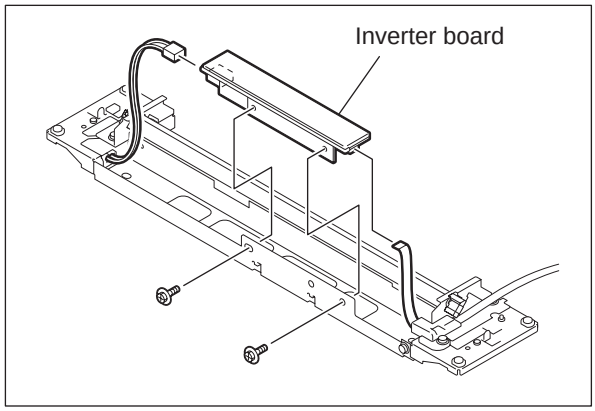


Fig. 6-40

[I] Carriage wire / carriage-2

(1) Take off the carriage-1.
(📖 P.6-23 "[G] Carriage-1")
(2) Attach the wire holder jigs to the pulleys to prevent the wires from loosening.

Note:

Refer to “3.9 Adjustment of the Scanner Section” in the Service Handbook for the direction of the wire holder jigs.

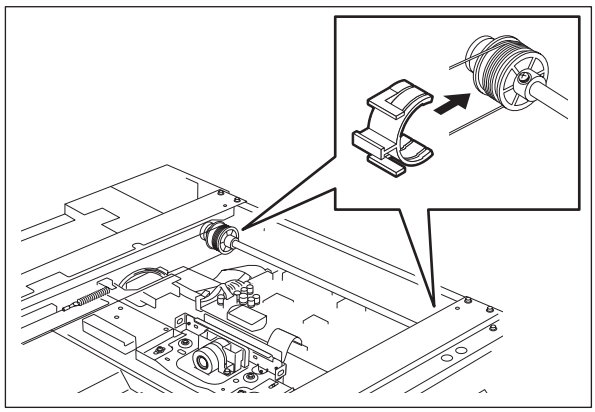


Fig. 6-41

(3) Detach the tension springs of the front and rear sides.
(4) Remove the carriage wires.

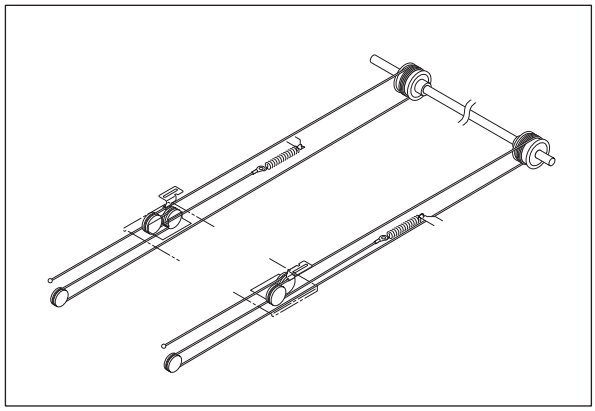


Fig. 6-42

(5) Rotate the carriage-2 in the direction where the inside of the frame is dented shown in the figure at right, not to touch the mirrors. Then take off the carriage-2.

Notes:

1. When replacing the mirrors-2 and -3, replace the carriage-2 together with mirrors-2 and -3. Mirrors-2 and -3 should not be removed.
2. When installing carriage-2, fix the bracket temporarily at the position (A). Then move it to the direction (B), push it to the end and fix securely.
(📖 P.6-25 "Fig. 6-39 ")

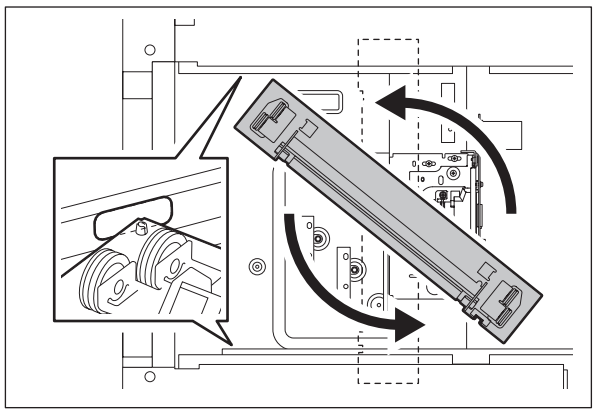


Fig. 6-43

[J] Platen sensor (S7) / Carriage home position sensor (S6)

(1) Take off the upper rear cover.
(📖 P.2-32 "[T] Upper rear cover")
(2) Disconnect 1 connector. Release the latches and take off the platen sensor.
(3) Remove the seal.
(4) Disconnect 1 connector. Release the latches and take off the carriage home position sensor.

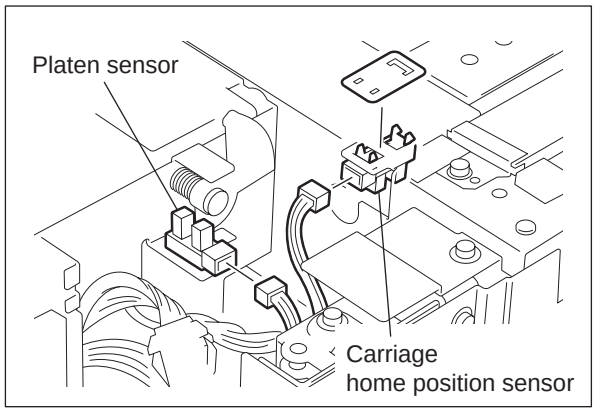


Fig. 6-44

[K] SLG board (SLG)

(1) Take off the lens cover.
(📖 P.6-17 "[B] Lens cover")
(2) Disconnect 8 connectors, remove 6 screws and take off the SLG board.

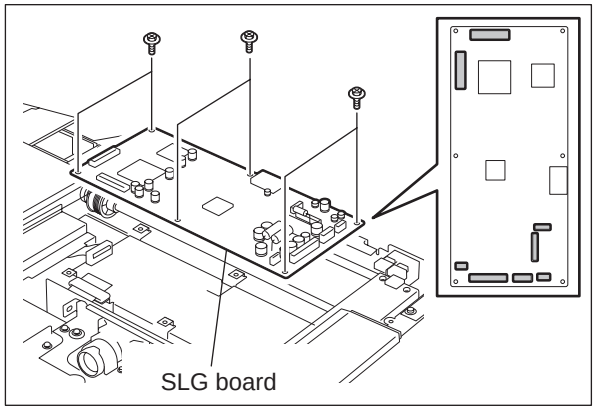


Fig. 6-45

[L] Scanner unit cooling fan (M15)

(1) Take off the upper rear cover.
(📖 P.2-32 "[T] Upper rear cover")
(2) Disconnect 1 connector. Release the harness from the harness clamp. Remove 2 screws and take off the scanner unit cooling fan.

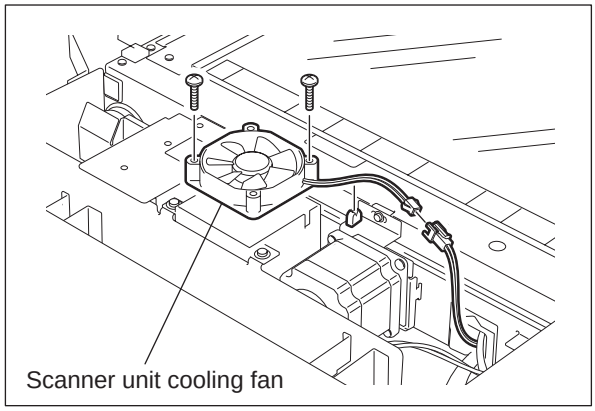


Fig. 6-46

7. IMAGE PROCESSING

7.1 General Description

The following diagram shows the process of this equipment from the input data to writing data on the photoconductive drum surface.

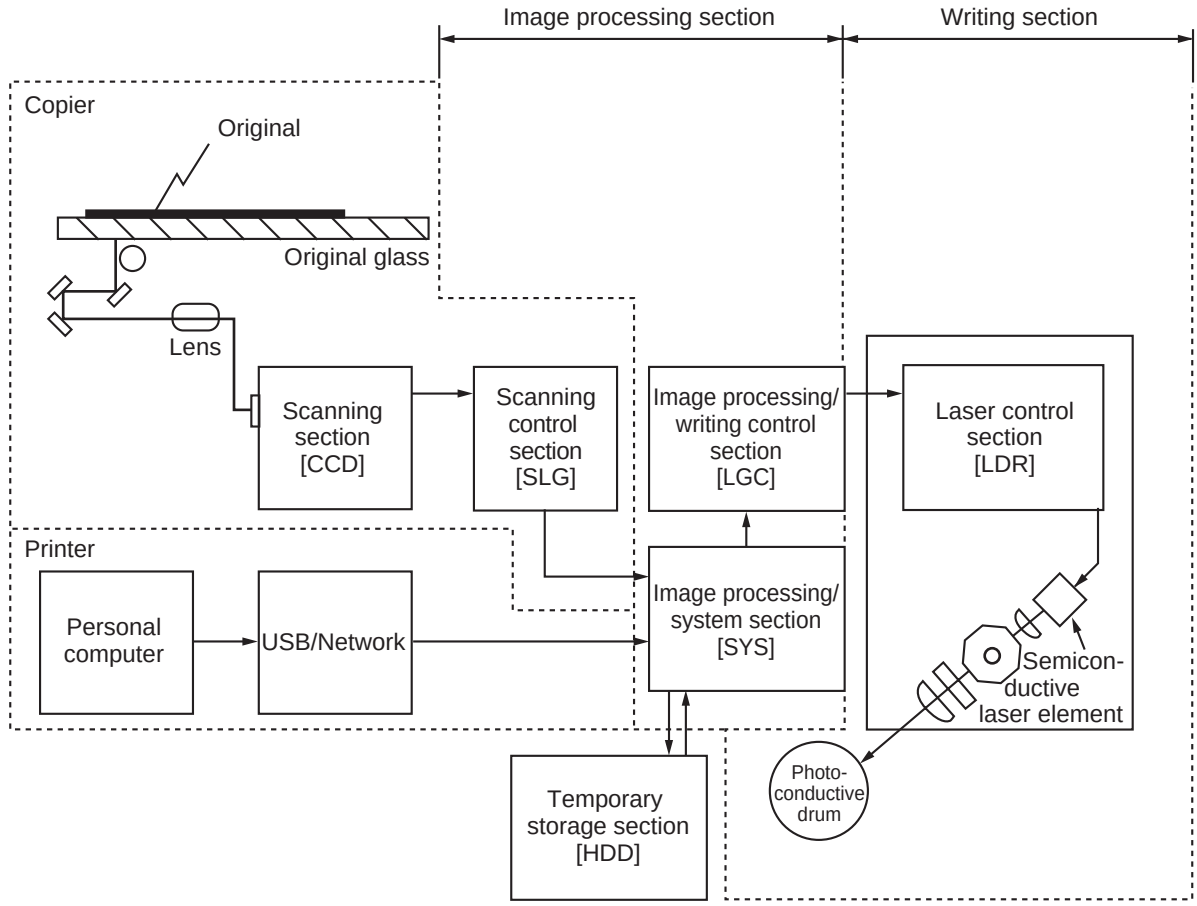


Fig. 7-1

The followings are the boards used for image processing.

Board	Function	
SYS board	PPC	ACS, color conversion, high quality image processing, image memory editing, rectangular area signal generation, editing processing, gamma correction, gradation processing, compression/expansion and black component generation
	PRT/SCN	Scanner high quality image processing, printer high quality image processing, black over print, pure black/pure gray, chroma adjustment and brightness adjustment
LGC board	Smoothing processing, image area control and laser related control	

Image of an original placed on the original glass is scanned by the optical system. The CCD (Charge Coupled Device) reads the optical image signals and converts them into the electrical signals. The electrical signals are amplified and undergo analog-to-digital conversion, then are changed into digital signals. Shading correction (correction of variance in CCD elements and the light source) is performed and the digital signal is output as an image signal from the scanning section.

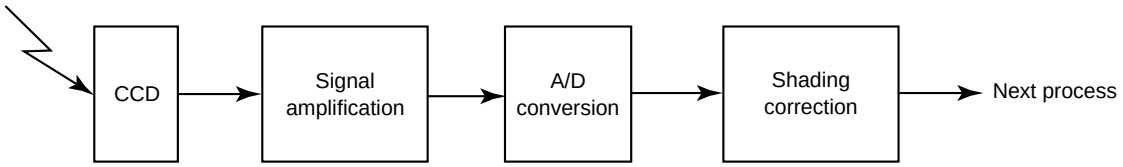


Fig. 7-2

The image processing section inputs the image signal from the scanning section and applies various image processing on the signal, then transmits the output result to the writing section.
Images are processed by the SYS board and LGC board in this equipment. Also, the image signals read with the Scanning Function and the printer image signals are processed in the SYS board.

7.2 Construction

The following diagram shows the image processing section of this equipment.

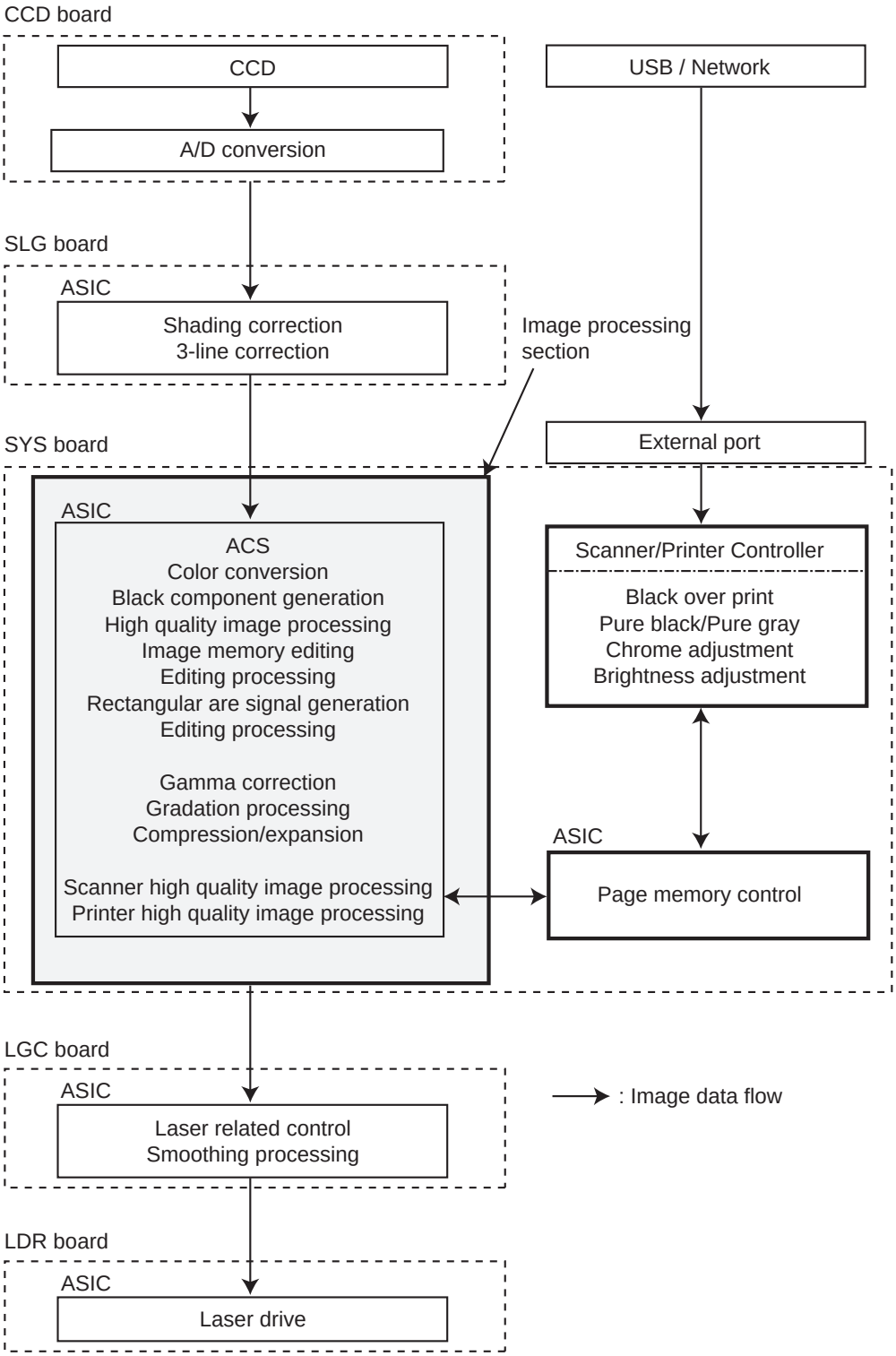


Fig. 7-3

7.3 SYSTEM CONTROL PC BOARD (SYS)

7.3.1 Features

1) The image processing section on the SYS board is controlled by the CPU on the SYS board.

2) The image processing section on the SYS board realizes the following when functioning the copier:
   - ACS
   - Color conversion (CMY image data processing)
   - Black component generation
   - High quality image processing
   - Image memory editing
   - Rectangular area signal generation
   - Editing processing
   - Gamma correction
   - Gradation processing
   - Compression/expansion

3) The image processing section on the SYS board realizes the following when functioning the scanner and printer:
   - Scanner high quality image processing
   - Printer high quality image processing
   - Black over print (Post Script)
   - Pure black / Pure gray (Post Script) / Pure gray (PCL5C)
   - Chroma adjustment (PCL5C)
   - Brightness adjustment (PCL5C)

7.3.2 Functions of image processing circuit

The image processing section on the SYS board realizes the followings:

1) ACS (Auto Color Selection)
   This function determines whether the original to be scanned is colored or monochrome, based on the analysis of the R, G and B signals output from the CCD.

2) Color conversion (CMY image data processing)
   When functioning the copier, the RGB image data is converted to CMY image data. (When functioning the scanner, it is converted to RGB image data.)
   The image data taken in by the scanner represents the intensities of reflection from the three primary colors of light (Red, Green and Blue). These RGB values are then color-converted to the respective amounts of toners corresponding to the three colors (Yellow, Magenta and Cyan) for printing (=CMY image data processing).

3) Black component generation
   K (Black) signal is generated from the CMY image data. Based on this K signal, the CMY image data is corrected to suppress hue on reproducing grays or to make the black look more real.

4) High quality image processing

- Background processing function

  By using the background adjustment function while manually adjusting the image density, undesirable background of the original can be removed if any, and some necessary but disappeared background can be recovered. By using this function, it is possible to cut the background density down when copying originals which have a certain level of background density, such as newspapers.

  <Example>

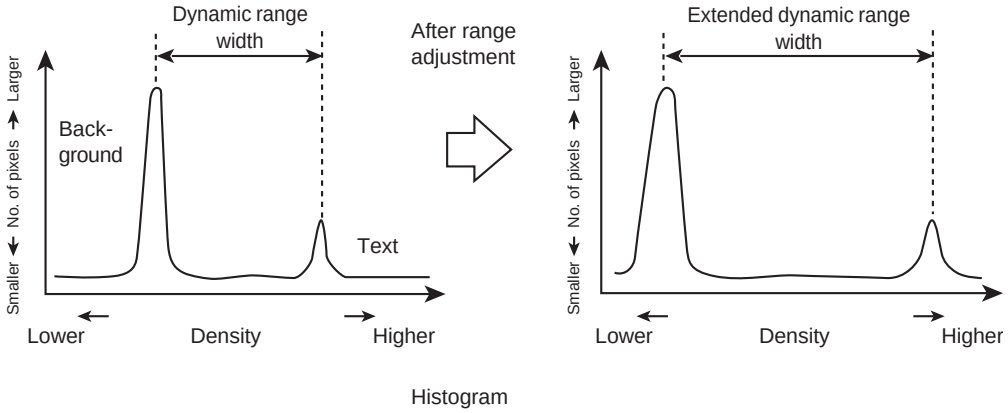


Fig. 7-4

- Image discrimination

  By determining the magnitude of density variation in a block (n x n dot), the target pixels are judged whether they are text or photograph. If they are determined to be text, they are further judged whether they are black or color text, using the differences in the levels of CMY signals.

- Filtering

  This function is enabled by low-pass filter processing and high-pass filter processing.

  Low-pass filter processing

  This processing removes image/electrical noise and decreases moire by performing averaging operation between the image signals of the targeted pixel and those of the neighboring pixels to enhance the reproducibility of original.

  <Example>

  Density of the targeted pixel position is X. Density of pixel positions at front and back of the targeted pixel are “a” and “b” respectively. X is converted to X’ through the low pass filtering.

  When the matrix is (3 x 1):

a	x	b

$$x' = \frac{a+b+x}{3}$$

The above averaging operation is performed for all the pixels to accomplish the high reproducibility of original.
(The following is the case that the low pass filtering is applied on the primary scanning pixel.)

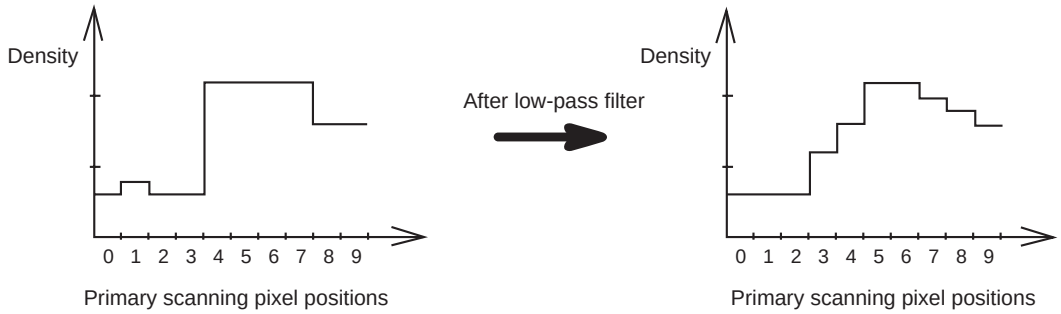


Fig. 7-5

High-pass filter processing
Character outline blurs when the original, such as text, with big difference in density among the pixels is optically scanned and output from the CCD. Characteristic of the lens and other factors cause this phenomenon. In this equipment, processing such as edge enhancement is applied between the targeted pixel and the neighboring pixels to eliminate this phenomenon and realize high reproducibility of original.

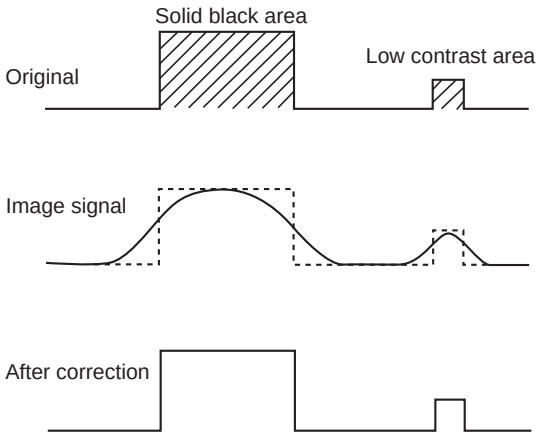
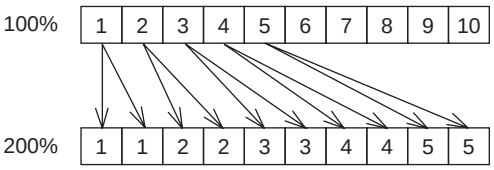


Fig. 7-6

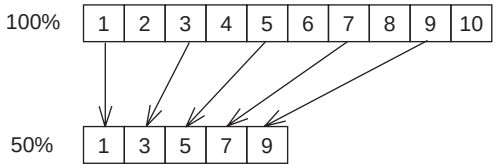
5) Image memory editing
This function performs editing such as enlargement/reduction, mirror imaging, etc., by using a line memory. Pixel data for one line in the primary scanning direction is stored in the line memory and the memory is renewed at each line.

- Enlargement/Reduction
Enlargment/Reduction is accomplished by using the line memory control function in the process of the image processing operation.

<Example> Enlargement



<Example> Reduction



- Mirror imagin
  This is accomplished by reading and outputting data from its end.

6) Rectangular area signal generation
   When a rectangular coordinate position is selected, the corresponding rectangular area signals are generated. Using these signals, various edit processing related to the area specification can be performed.

7) Editing processing
   This function performs trimming and masking.
   - Trimming
     Using rectangular area signals, the image signals inside the rectangular area are left and the other image signals are eliminated.
   - Masking
     Using rectangular area signals, the image data inside the rectangular area are erased.

8) Gamma correction
   This function corrects the input/output characteristics of the scanner/printer and adjusts the image signals so that the input/output characteristics would match with the copy mode.

9) Gradation processing
   In case of color copying, this function switches the type of gradation processing depending on the copy mode: A type which selects the printer characteristics giving the priority to resolution such as for text data, and another which selects the printer characteristics giving the priority to reproducibility of gradation such as for photographic images.
   In case of black copying, this function selects the gradation processing which reproduces the halftone image such as photograph more precisely. Also the gradation processing which makes text data clearer is selected in black copying mode.

10) Compression/expansion
    To lessen the data amount of the color image signals, this function effects the compression/expansion on the data.

11) Scanner high quality image processing
    This function corrects the image signals scanned by the scanner and reproduces them in a higher image quality.

12) Printer high quality image processing
    This function reproduces the image signals output from the printer controller in a higher image quality.

13)Black over print (Post Script)

When black data of text or graphic object are formed on a certain background with no written data underneath them, the color of the paper comes out around the black data when “out-of-color registration” is occurring. To prevent this phenomenon, this process enables to keep the background color around the black data formed as a part of the text or the graphic object on the printer data.

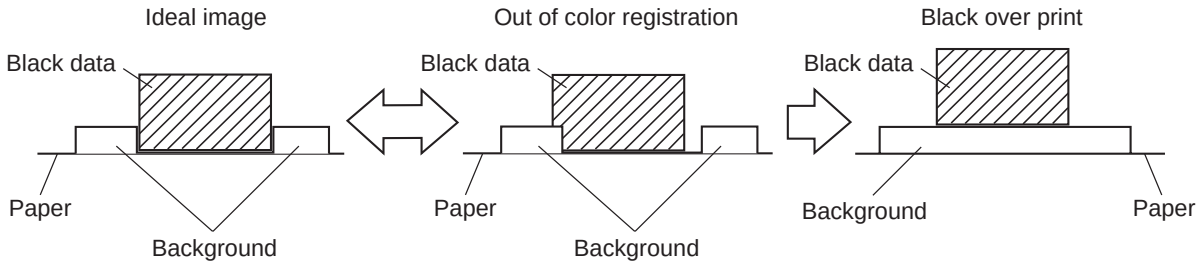


Fig. 7-7

14)Pure black / Pure gray (Post Script) / Pure gray (PCL5C)

This function is to printout the text and graphics formed as black data with black toner only on the printer data, not using 4 color toner. The gray text/graphics are also printed out with black toner only.

15)Chroma adjustment (PCL5C)

This function adjusts chromaticness of the printer data.

16)Brightness adjustment (PCL5C)

This function adjusts brightness of the printer data.

7.4 LOGIC PC BOARD (LGC)

7.4.1 Features

1) The image processing ASIC on the LGC board is controlled by CPU mounted on the LGC board.
2) The image processing functions of the LGC board realizes the followings:
   - Smoothing processing
   - Image area control
   - Laser related control

7.4.2 Functions of image processing circuit

An image processing ASIC mounted on the LGC board enables the following functions:

1) Smoothing processing
   This function removes jaggy and smoothes character outline of images and output them.
2) Image area control
   This function sets the effective image area in horizontal and vertical directions to be output.
3) Laser related control
   This function performs the APC (Auto Power Control).

8. LASER OPTICAL UNIT

8.1 General Description

The laser optical unit radiates the laser beam onto the photoconductive drum responding to the digital image signals transmitted from the scanner, USB, network, etc. to create the latent image. Image signal is converted into the light emission signal of the laser diode on the laser driving PC board (LDR), then radiated on the drum through the optical elements such as cylinder lenses, polygonal mirror and fθ lens. The unit must not be disassembled in the field as they are very sensitive to dust and finely adjusted at the factory.

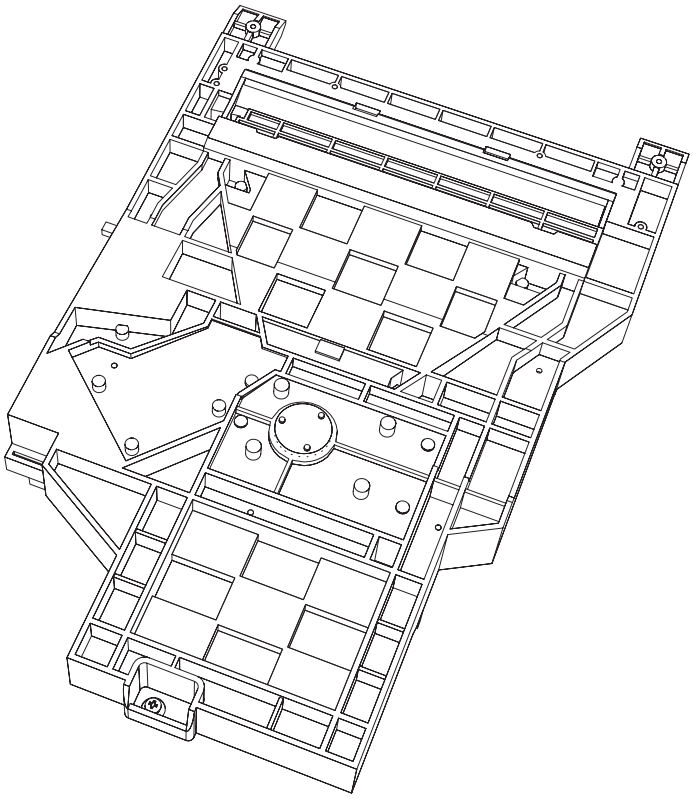


Fig. 8-1

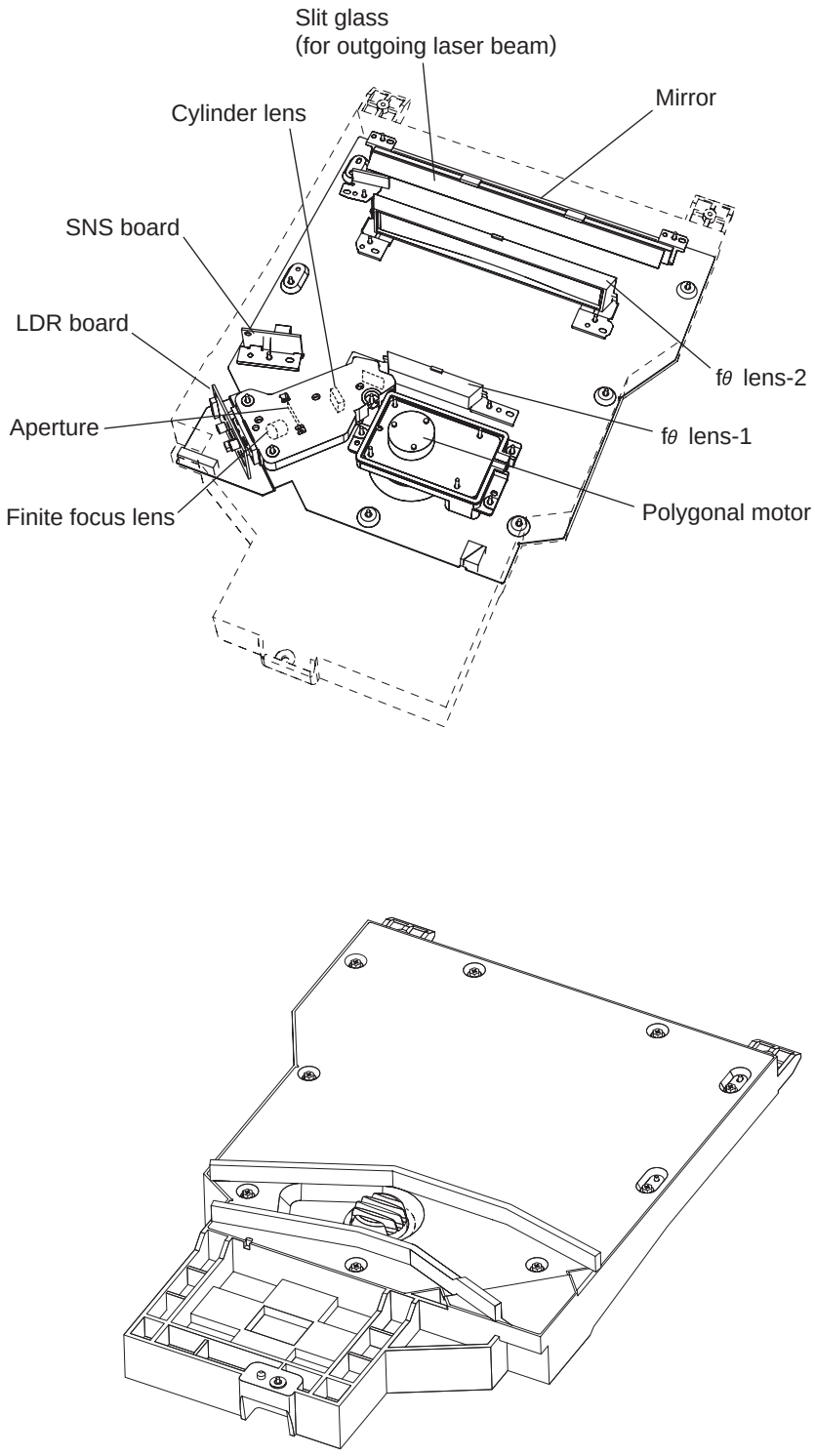


Fig. 8-2

8.2 Structure

Laser optical unit (1 beam)		
Laser emission unit	Laser diode	Wavelength: Approx.785 nm Output power rating: 10 mW
	Fine focus lens	
	Aperture	
	Cylinder lens	
	Laser driving PC board (LDR)	
Polygonal motor unit	Polygonal motor (M4)	
	Polygonal mirror	8 planes
	Polygonal mirror cover	
fθ lens 1		
fθ lens 2		
Mirror		
Slit glass		
H-sync signal detection PC board (SNS)		

1) Laser emission Unit

This unit consists of the laser diode, finite focus lens, aperture and cylinder lens.

- Laser diode

  This laser diode features low droop, small laser variation and low threshold current.
  Aperture determines the shape of the laser beam at laser emission position of the primary scanning and secondary scanning.
  Laser diode radiates the laser beams responding to the laser emission control (ON/OFF) signals from the laser driving PC board (LDR). Laser beams which passed through the finite focus lens are focused on the drum surface.

- Laser precautions

  A laser diode is used for this equipment and radiates an invisible laser beam.
  Since it is not visible, be extremely careful when handling the laser optical unit components, performing operations or adjusting the laser beam. Also never perform the procedure with other than the specified manuals because you could be exposed to the laser radiation.
  The laser unit is completely sealed with a protective cover. As long as only the operations of specified manuals are performed, the laser beam is not leaked and you are in no danger of being exposed to laser radiation.

  The following cautionary label for the laser is attached to the left inner cover.

Fig. 8-3

Cautions:

- Avoid expose to laser beam during service. This equipment uses a laser diode. Be sure not to expose your eyes to the laser beam. Do not insert reflecting parts or tools such as a screwdriver on the laser beam path. Remove all reflecting metals such as watches, rings, etc. before starting service.
- When servicing the equipment with the power turned ON, be sure not to touch live sections and rotating/operating sections. Avoid exposing your eyes to laser beam.
- During servicing, be sure to check the rating plate and cautionary labels such as "Unplug the power cable during service", "CAUTION. HOT", "CAUTION. HIGH VOLTAGE", "CAUTION. LASER BEAM", etc. to see if there is any dirt on their surface and if they are properly stuck to the equipment.

2) Polygonal motor unit
This unit consists of the polygonal motor (M4), polygonal mirror and polygonal mirror cover.

a. Polygonal motor (M4)
This motor rotates the polygonal mirror in high speed.
The DC motor controls the rotation speed of the mirror motor as follows:
During ready: 10,000.00 rpm
During printing
: 36,734.37 rpm (600dpi)
: 37,322.12 rpm (FAX 15.4x16.0dot/mm)
: 35,922.54 rpm (FAX 16.0x15.4dot/mm)

b. Polygonal mirror
One laser beam emitted from the laser diode is reflected by this mirror. As the polygonal mirror is rotated by the polygonal motor (M4), the reflected laser light moves in sync with the rotation. The direction of the movement is the primary scanning direction of the image. One scan is performed on one plane of the polygonal mirror.
As the polygonal mirror has eight planes, eight scans are performed in one rotation of the polygonal mirror.

c. Polygonal mirror cover
Polygonal mirror cover reduces the windage loss and noise, prevents adhesion of foreign matters onto the mirror surface and releases heat.

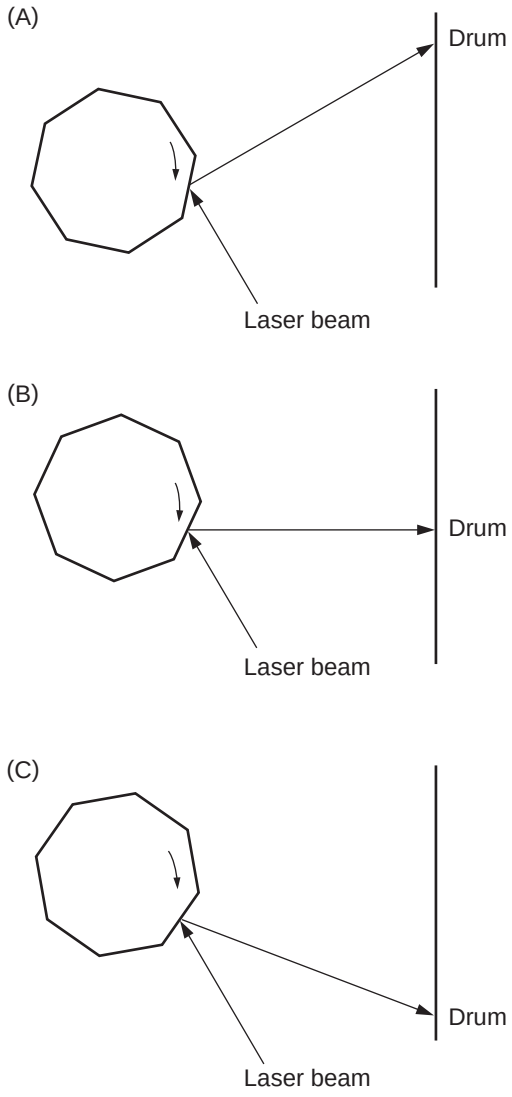


Fig. 8-4

One scan is completed by completion of steps (A) to (C). One scan is performed on one plane of the polygonalmirror. Eight scans can be made with one rotation of the polygonal mirror.

8

3) fθ lenses 1 and 2
These two lenses perform the following adjustment on the laser beams reflected by the polygonal mirror.

a. Uniform-velocity scanning
Since the polygonal mirror is rotating at a uniform velocity, the laser beam reflected from the mirror scans over the drum surface at a uniform angular velocity; namely, the pitch between the dots on the drum is wider at both ends than at the center of the scanning range. The fθ lenses help to correct this difference, making all the dot-to-dot pitches equal on the drum surface.

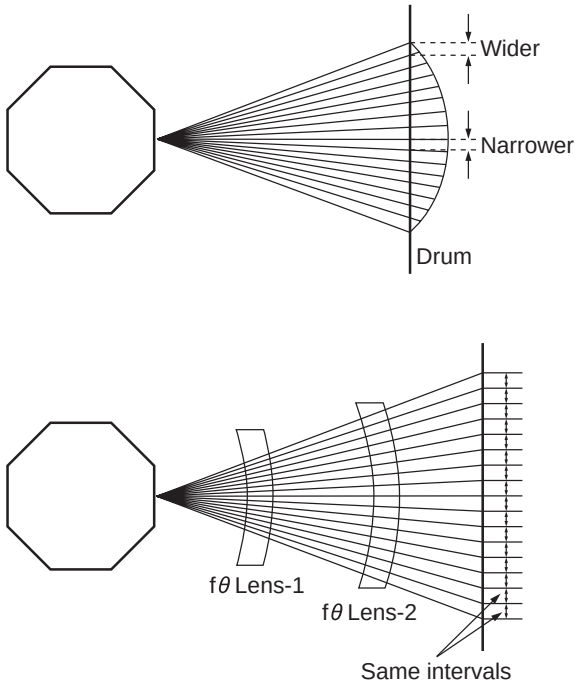


Fig. 8-5

b. Face tilt correction
The reflecting face of the polygonal mirror is tilted slightly to one side against the perfect vertical. Horizontal deviation of the laser light which is caused by the tilt is corrected.

c. Sectional shape of laser beam
The shape of the laser beam spotted on the drum is adjusted.

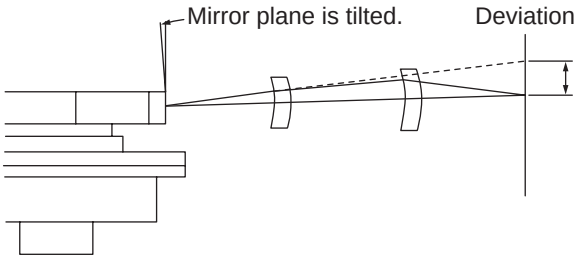


Fig. 8-6

4) H-Sync signal detection PC board (SNS)
The laser light which is started to be scanned from one of the reflected plane of the polygonal mirror is reflected by the H-Sync detection mirror and enters the PIN diode on the H-Sync signal detection PC board (SNS). The primary scanning synchronizing signal is generated based on this reflection.

5) Slit glass
Slit glass is located where the laser beams are output from the laser optical unit, and it protects the unit from dust.

8.3 Laser Diode

The laser used in this equipment is a A1GaAs type semiconductive laser. It is generated in the single-horizontal mode, and its wavelength is approx. 785 nm. This semiconductive laser outputs 10mW with standard DC power supply. Laser intensity is controlled by using the output from the PIN diode for monitoring light output in the semiconductive laser.

The relation between the current and optical output of the semiconductive laser is as shown at right. Light emission is started when the forward current reaches or becomes larger than the threshold current and outputs the monitor current which is proportionate to the optical output. The threshold current and monitor current differs depending on each semiconductive laser. So optical output has to be adjusted to maintain a constant value.
Since the optical output of the semiconductive laser is decreased as the temperature of the laser rises, APC control needs to be performed to maintain a constant optical output.

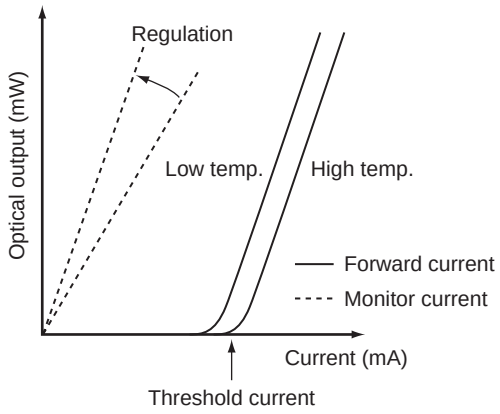


Fig. 8-7

The following diagram shows a block diagram of the semiconductive laser control circuit. The semiconductive laser performs monitor efficiency regulation (a process to control monitor current for the light amount), and laser itself is adjusted to initial output emission of approx. 3.0 mW (approx. 408 µW on the drum surface).
The regulated voltage of the monitor output is feedback to the laser power comparison circuit. This monitor output voltage is compared with the laser power voltage set for the control circuit for every scanning. Laser driver circuit increases the forward current if the laser power is insufficient, and decreases the current when the power is excessive to maintain a constant optical output.

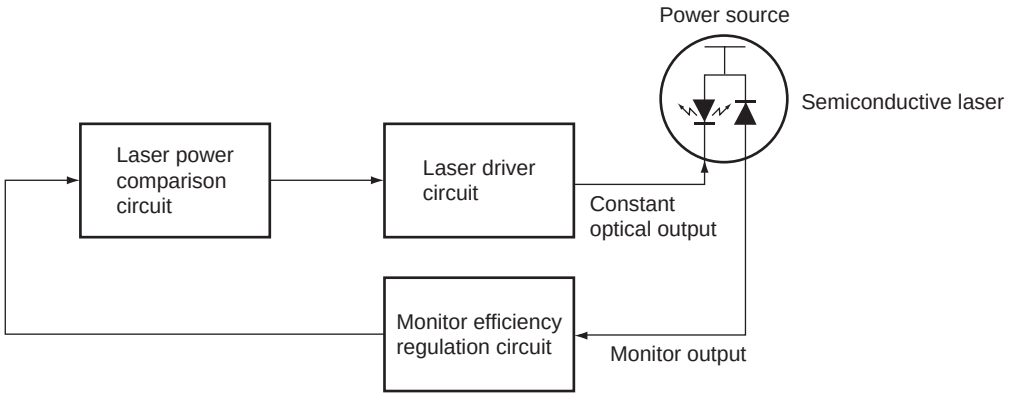


Fig. 8-8

8.4 Laser Unit Cooling Fan

The laser unit cooling fan is a propeller fan (80 x 80 mm). It cools down the polygonal motor and the Laser driving PC board (LDR).

8.5 Polygonal Motor (M4)

1) Drive circuit of the polygonal motor (M4)

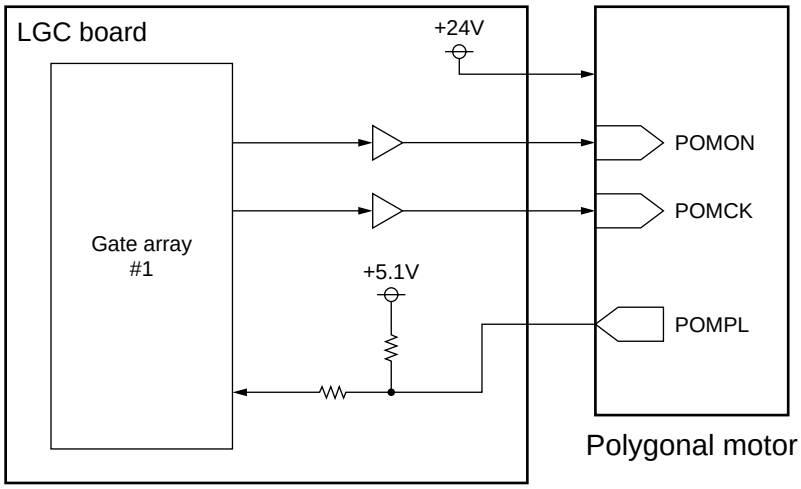


Fig. 8-9

2) Control signal
The polygonal motor (M4) is a DC motor which is PLL-controlled by clock signal. The signals from LGC board controls the polygonal motor (M4).

Signal	Level "L"	Level "H"	Remarks
POMON	ON	OFF	Polygonal motor ON/OFF signal
POMCK	-	-	Polygonal motor reference clock signal
POMPL	Locked	Unlocked	Polygonal motor PLL signal

8.6 Laser Driving PC Board (LDR)

Image signals processed on the LGC board are processed by ASIC for writing control and LDR board. The signal is then laser controlled and written on the drum.

1) Setting of effective image area
   - Top, bottom, left and right margins
2) Horizontal synchronization signal (HSYNC) clock generation section
   - Reference clock signal in the printer section synchronized with HSYNC and its signal.
3) Laser drive section
   - ON/OFF control of the semiconductive laser and APC (Auto Power Control).
     APC : Adjusts disparity of the laser intensity caused by temperature

8.7 Disassembly and Replacement

[A] Laser optical unit

(1) Take off the rear cover-2.
(📖 P.2-32 "[S] Rear cover-2")
(2) Take off the LGC board cover.
(📖 P.2-37 "[E] LGC board (LGC)")
(3) Disconnect 2 connectors from the LGC board.

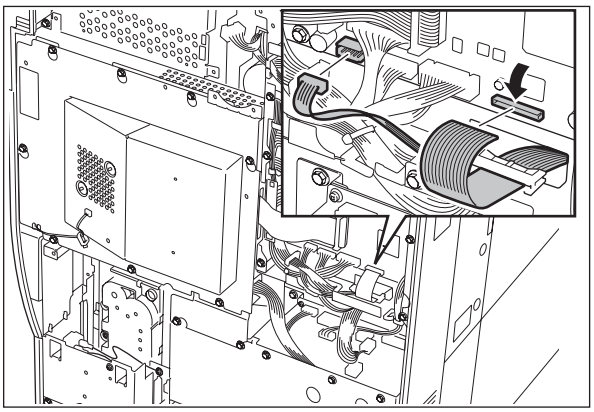


Fig. 8-10

(4) Release the harnesses from the harness clamp.

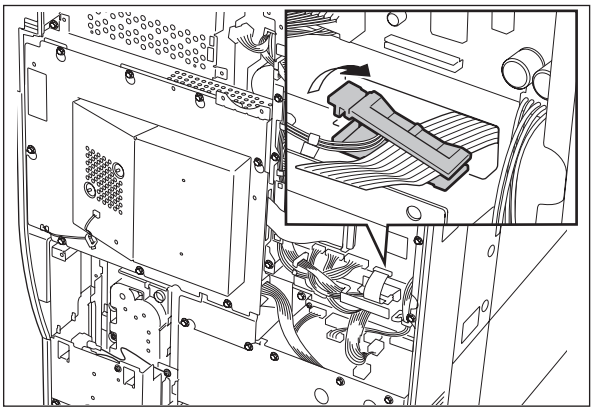


Fig. 8-11

(5) Take off the left cover.
(📖 P.2-29 "[K] Left cover")
(6) Remove 2 screws and take off the toner cover.

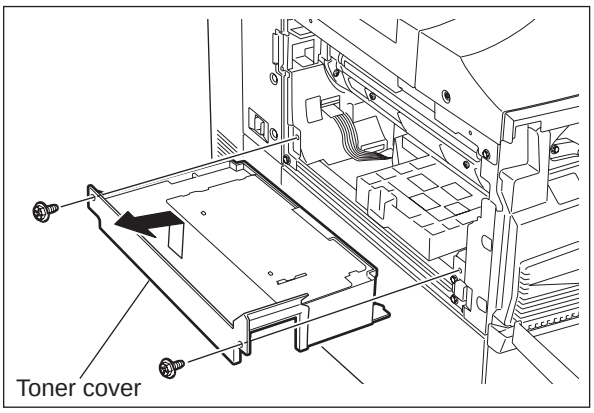


Fig. 8-12

(7) Remove 1 screw. Pull out the laser optical unit while lifting it up and take it off.

Notes:

1. Do not leave fingerprints or stain on the slit glass.
2. Laser optical unit is a precise apparatus. Handle the unit with extra care not to shock or vibrate it.
3. Do not disassemble the unit in the field since it is very sensitive to the dust and stain.

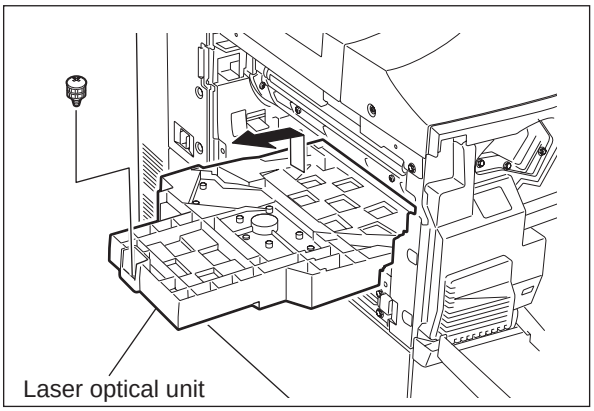


Fig. 8-13

[B] Laser unit cooling fan (M16)

(1) Take off the inner tray.
(📖 P.2-26 "[C] Inner tray")
(2) Take off the front lower cover.
(📖 P.2-26 "[E] Front lower cover")
(3) Take off the left cover.
(📖 P.2-29 "[K] Left cover")
(4) Remove 2 screws and take off the left inner cover.

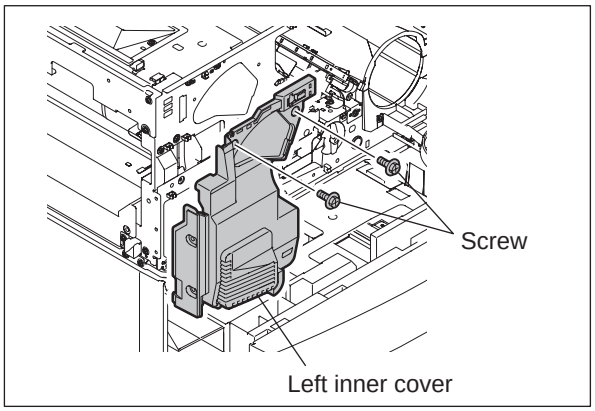


Fig. 8-14

(5) Disconnect 1 connector and remove 2 screws. Take off the laser unit cooling fan.

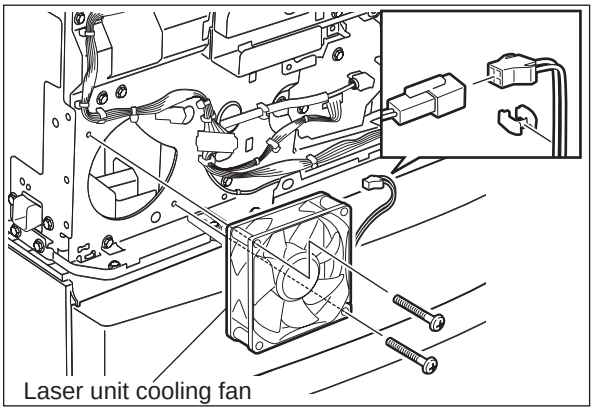


Fig. 8-15

9. DRIVE SYSTEM

9.1 General Description

This chapter explains about each drive system of the main motor (M6), transport motor (M9) and developer motor (M11).
The function of each drive unit is as follows:

- Main motor (M6)
  - Photoconductive drum
  - Transfer belt

- Transport motor (M9)
  - Fuser unit → Bridge unit (option)
  - 2nd transfer roller
  - Registration roller
  - Transport roller
  - Feed roller
  - Bypass feed roller

- Revolver motor (M12)
  - Revolver unit

- Developer motor (M11)
  - Black developer unit
  - Color developer unit
  - Transfer belt cleaner clutch (CLT1)

- ADU motor (M5)
  - ADU

- Exit motor (M7)
  - Exit roller

- Toner motor (M3)
  - Black toner cartridge

- Drum cleaner brush motor (M8)
  - Drum cleaner brush

- Transfer belt cleaner auger motor (M2)
  - Transfer belt cleaner auger

9.2 Main Motor (M6)

9.2.1 Construction

9.2.1 Construction

The main motor drive unit consists of two parts: One part transmits the drive from the main motor (M6) to photoconductive drum and the transfer belt, and another part transmits the drive from the drum cleaner brush motor (M8) to the drum cleaner brush.

The drive to the photoconductive drum and transfer belt are transmitted by the gears and the coupling.

The main motor (M6) is a brushless DC motor.

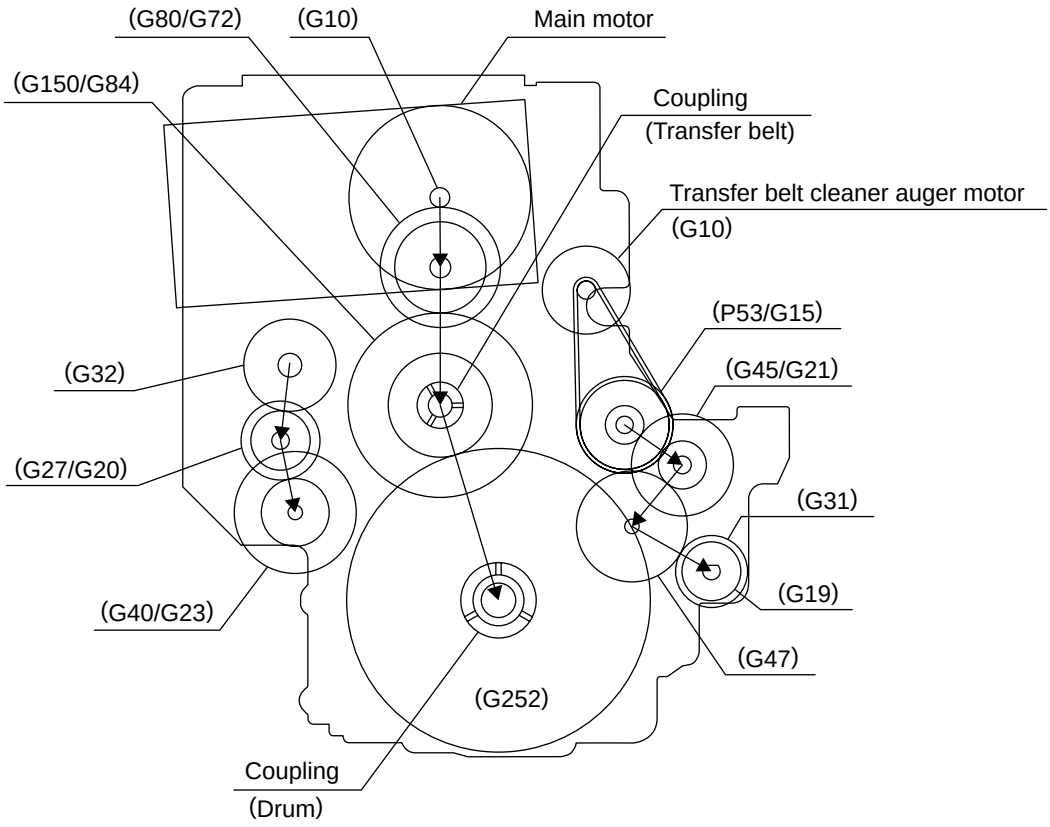


Fig. 9-1

9.2.2 Drive circuit of main motor

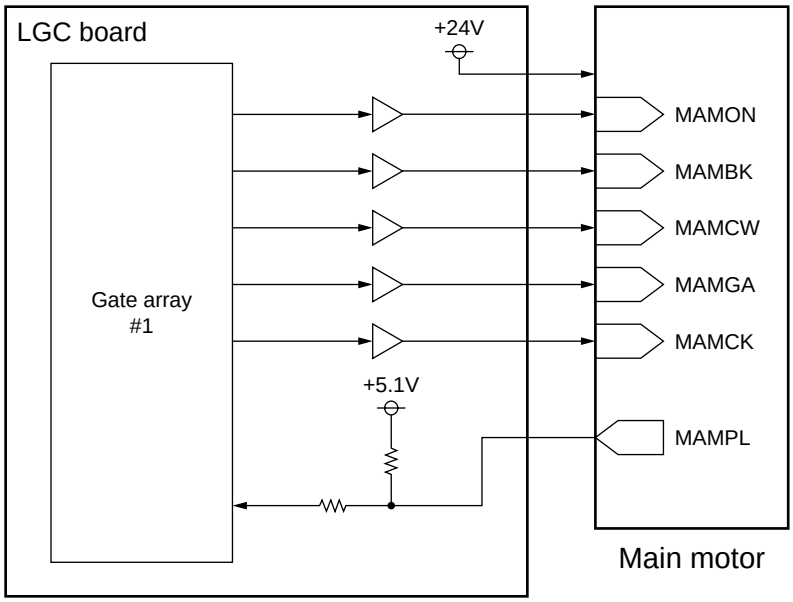


Fig. 9-2

Signal level of motor circuit

Signal	Level "L"	Level "H"	Remarks
MAMON	ON	OFF	Main motor ON signal
MAMBK	Braking	Normal	Main motor brake signal
MAMCW	CW	CCW	Main motor rotational direction signal
MAMGA	Low speed	High speed	Main motor speed switching signal
MAMCK	—	—	Main motor reference clock signal
MAMPL	Locked	Unlocked	Main motor PLL signal

* CCW: forward rotation CW: backward rotation

- The control signal from LGC controls the operations of the main motor (M6), such as switching of ON/OFF, a rotational direction, a rotational speed, etc. The rotational speed is decided by clock frequency output at the main motor (M6). The speed is lowered to the range from 1/2 to 1/3 at the Thick Paper / OHP Film Mode. This switching is performed between the completion of the 1st transfer and that of the 2nd transfer.

9.3 Transport Motor (M9)

9.3.1 Construction

The transport motor drive unit transmits the drive from the transport motor (M9) to the fuser unit, 2nd transfer roller, registration roller, transport roller, feed roller, bypass feed roller and bridge unit (option) through the gears and clutches.

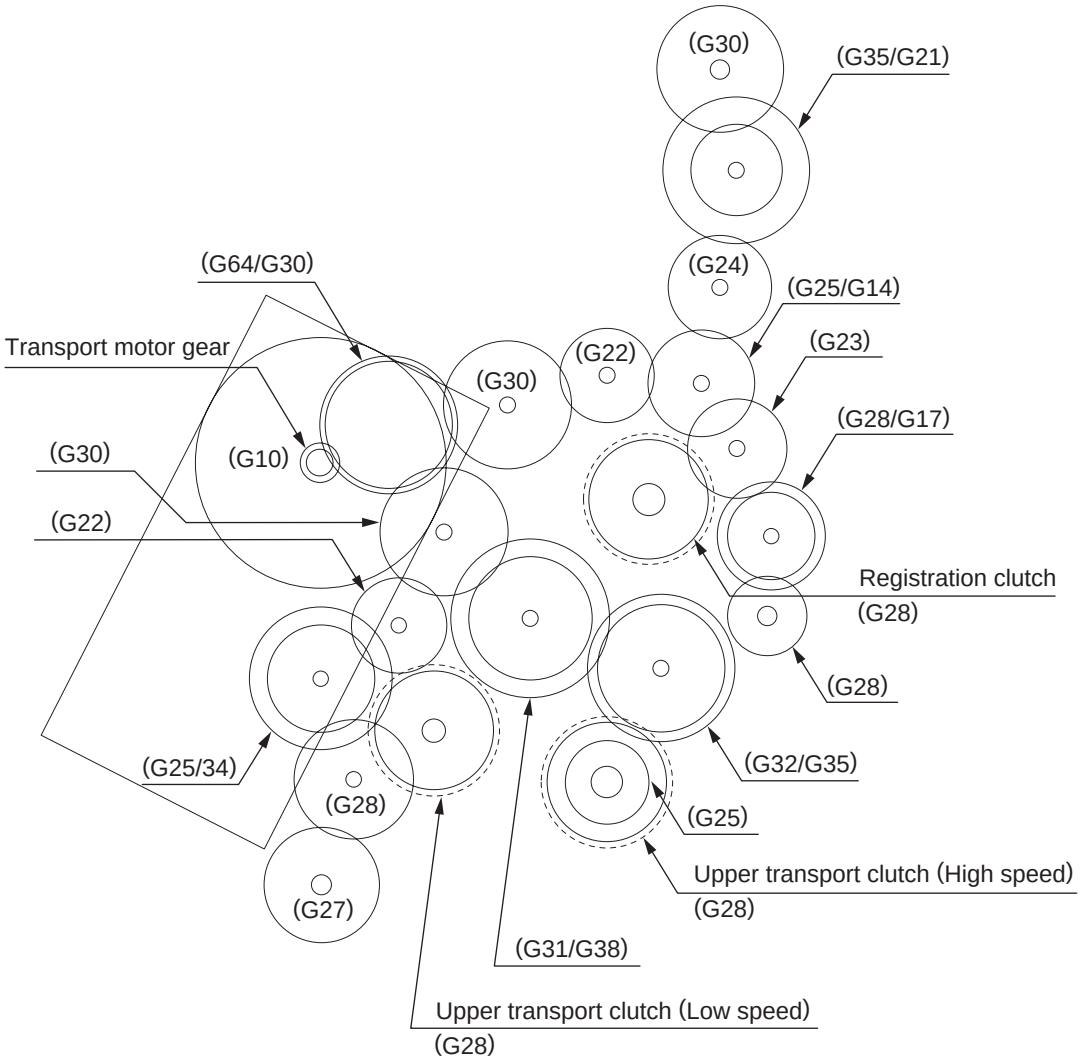


Fig. 9-3

9.3.2 Drive circuit of transport motor

The transport motor (M9) is a DC brushless motor. At color printing modes with thick paper or OHP film, the transport speed is lowered to 1/2 or 1/3 depending on its mode for most effective fusing.
The following is the block diagram of the transport motor (M9).

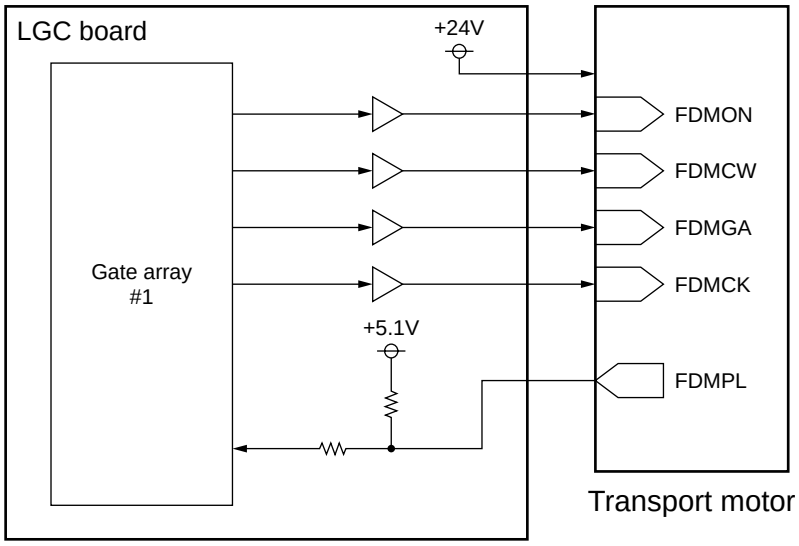


Fig. 9-4

Signal level of motor circuit

Signal	Level "H"	Level "L"	Remarks
FDMON	OFF	ON	Transport motor ON signal
FDMCW	CCW	CW	Transport motor rotational direction signal
FDMGA	High speed	Low speed	Transport motor speed switching signal
FDMCK	—	—	Transport motor reference clock signal
FDMPL	Unlocked	Locked	Transport motor PLL signal

* FDMCW (rotational direction signal): The motor does not rotate backward (CCW) in actual movement.

9.4 Developer Motor (M11)

9.4.1 Construction

The developer motor (M11) is a motor drives the following movements:

- Lifting movement by rotating the lifting cam in the black developer unit
- Rotational movement of magnet roller in the black developer unit
- Rotational movement of toner supply auger in the color developer unit
- Rotational movement of magnet roller in the color developer unit

Each movement is performed by drive transmission from the developer motor (M11) through the gears and clutches.
The revolver unit contains three color developer units. The developer motor (M11) drives the color developer unit only at the developing position; it means each developer unit does not have its own drive. When the revolver rotates, the clutch turns OFF so that the drive of the developer motor (M11) will not be transmitted and a damage to the gear will be prevented.

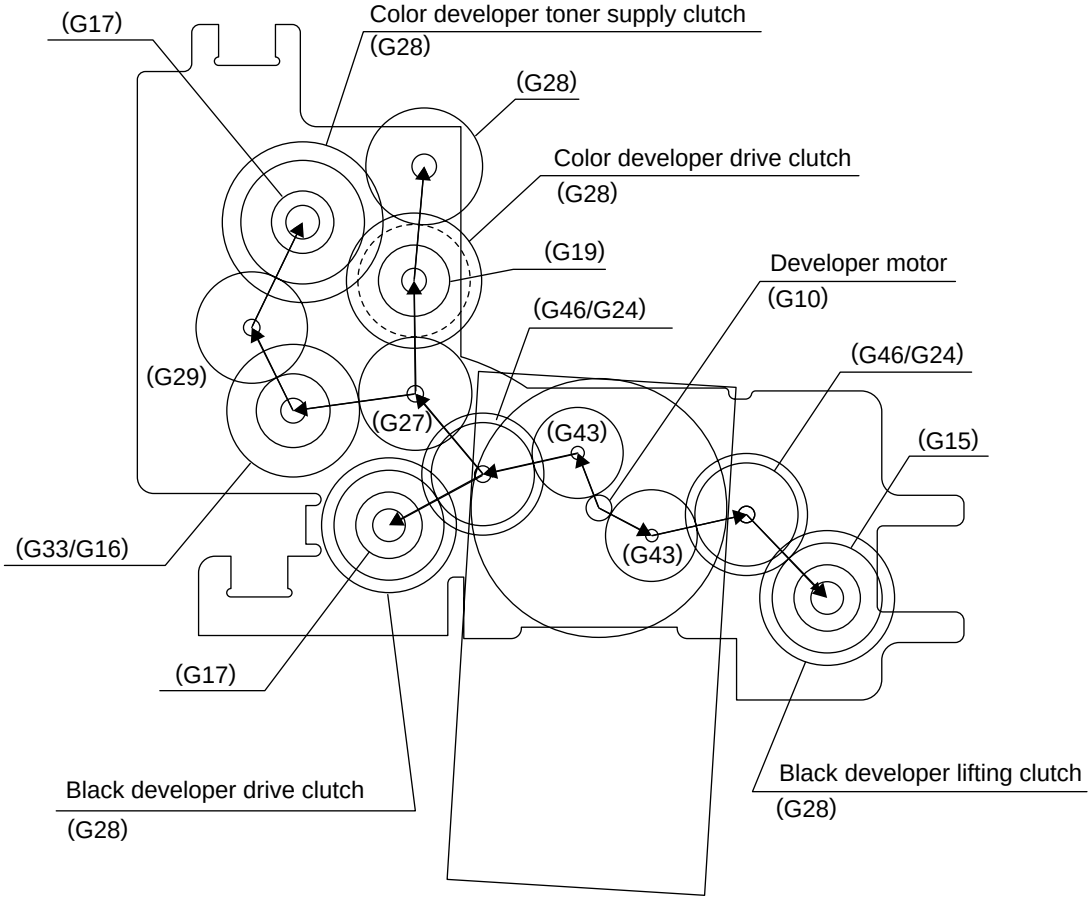
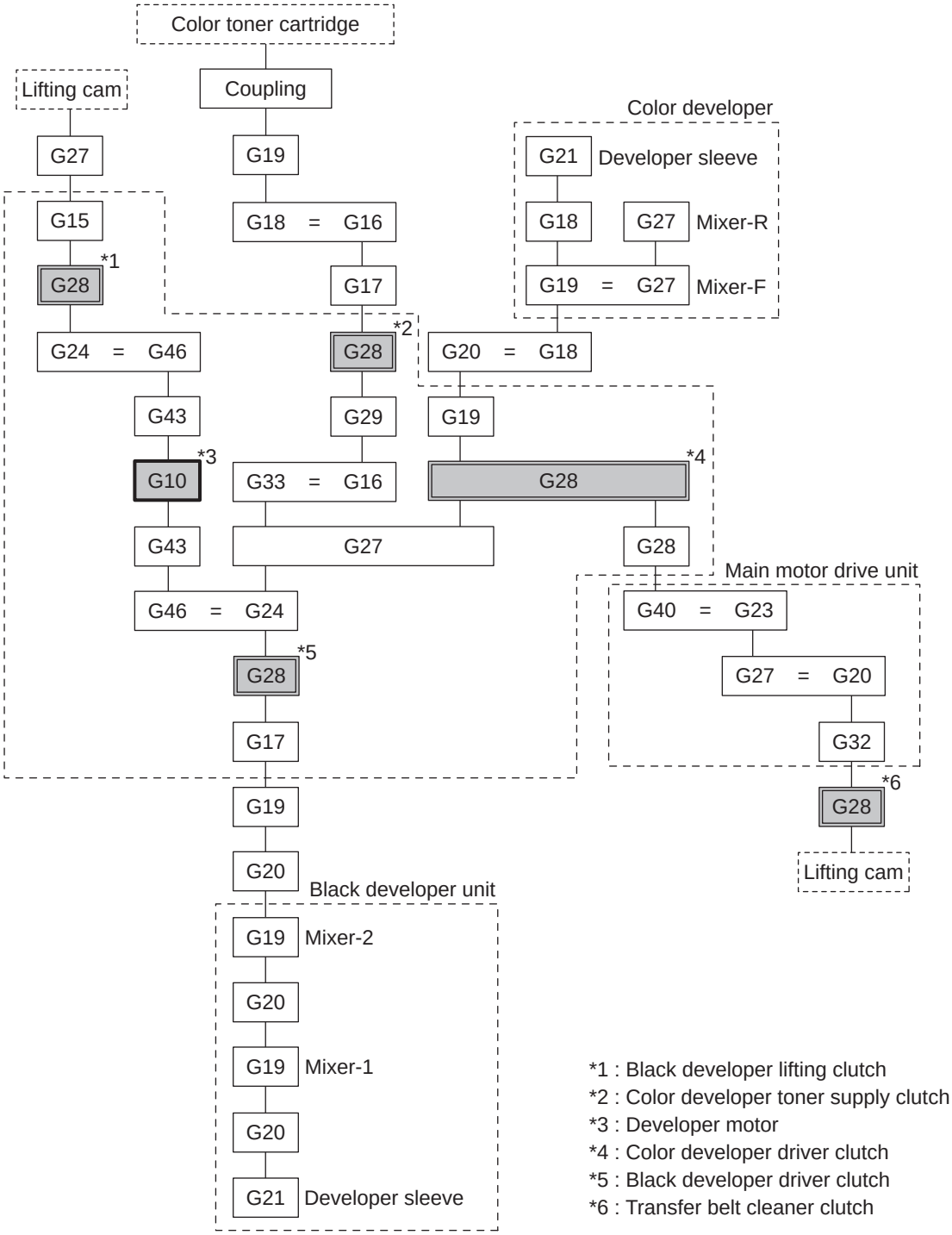


Fig. 9-5



*1 : Black developer lifting clutch
*2 : Color developer toner supply clutch
*3 : Developer motor
*4 : Color developer driver clutch
*5 : Black developer driver clutch
*6 : Transfer belt cleaner clutch

9

9.4.2 Drive circuit of developer motor

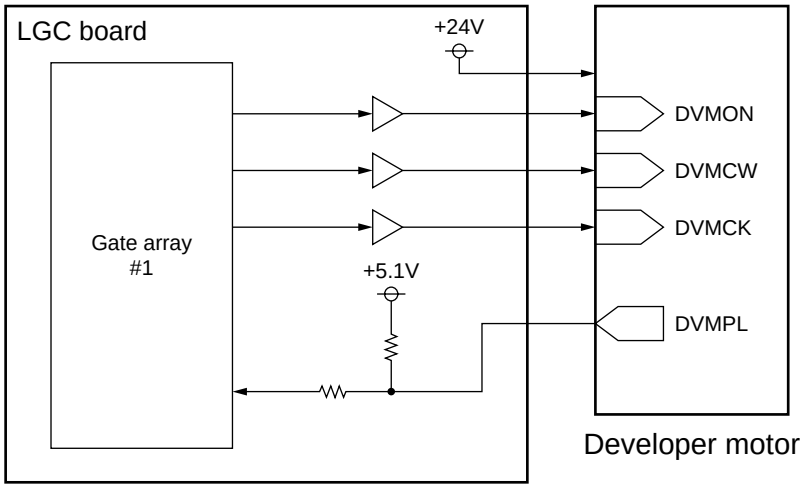


Fig. 9-6

1) LGC board provides a signal to control the rotation of the developer motor (M11).
(DVMON: Developer motor ON signal)
When signal from LGC board is the level "L", the developer motor stops.

2) DVMCW signal controls the rotational direction of the motor. The motor rotates forward (CCW) but does not rotate backward (CW) in actual movement. Namely, DVMCW signal is always output level "H".

Signal level of motor circuit

Signal	Level “L”	Level “H”	Remarks
DVMON	ON	OFF	Developer motor ON signal
DVMCW	CW	CCW	Developer motor rotational direction signal
DVMCK	—	—	Developer motor reference clock signal
DVMPL	Locked	Unlocked	Developer motor PLL signal

9.5 Disassembly and Replacement

[A] Developer motor drive unit

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Take off the LGC board case (📖 P.2-38 "[F] LGC board case").
(3) Take off the SYS board case (📖 P.2-35 "[D] SYS board case").
(4) Take off the switching regulator unit (📖 P.2-39 "[G] Switching regulator unit").
(5) Remove 3 screws and take off the flywheel.

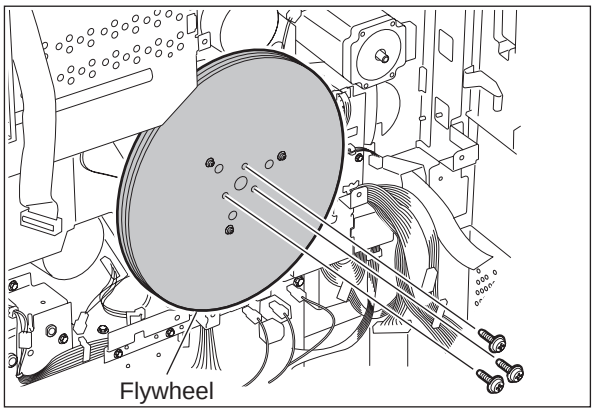


Fig. 9-7

(6) Remove 2 screws and take off the bracket.

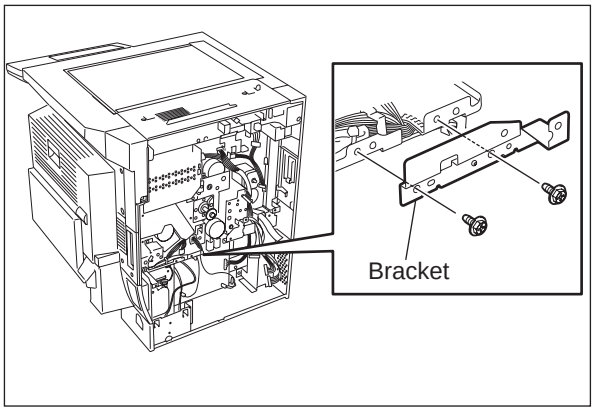


Fig. 9-8

(7) Open the mylar sheet.
(8) Release the harness from 2 harness clamps.

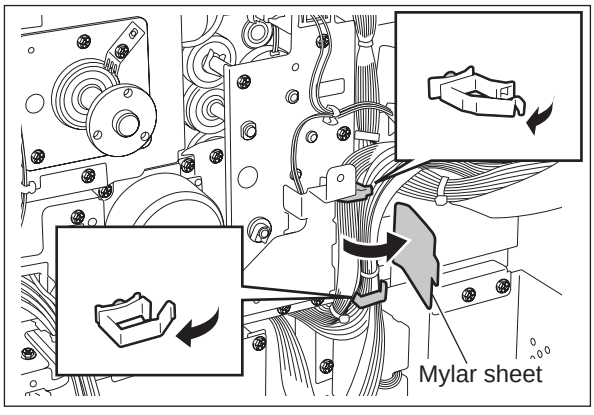


Fig. 9-9

(9) Remove 3 screws and take off the bracket.

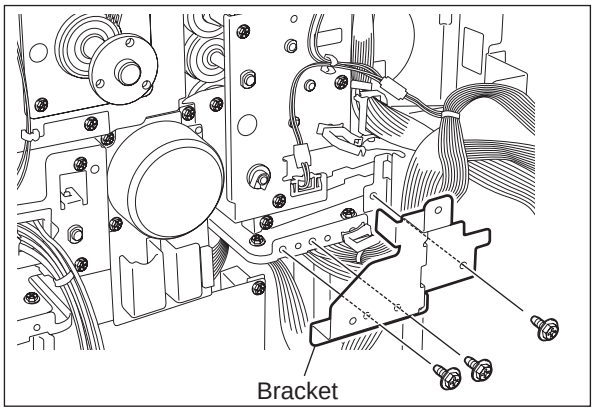


Fig. 9-10

(10) Disconnect 3 connectors and release the harness from 2 harness clamps.

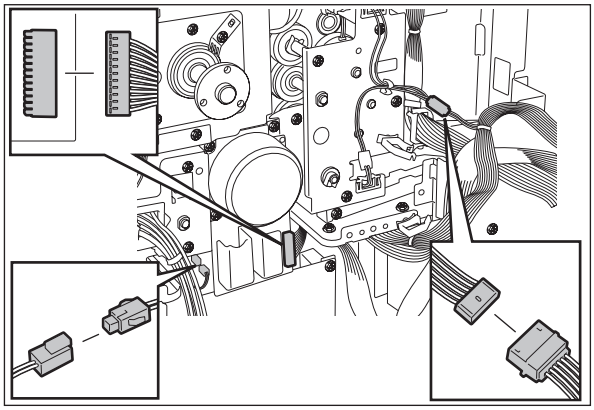


Fig. 9-11

(11) Remove 5 screws and take off the developer motor drive unit.

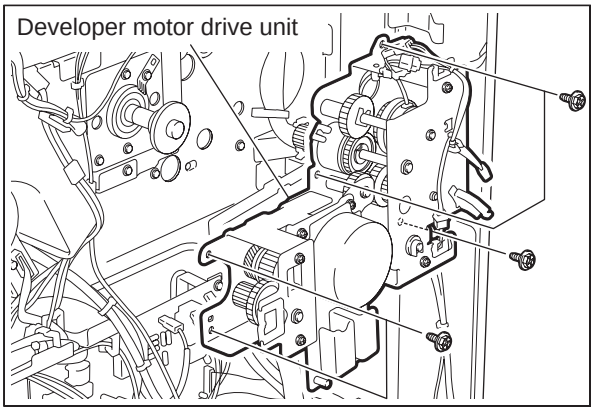


Fig. 9-12

[B] Developer motor (M11)

(1) Take off the developer motor drive unit (📖 P.9-9 "[A] Developer motor drive unit").
(2) Remove 4 screws and take off the developer motor.

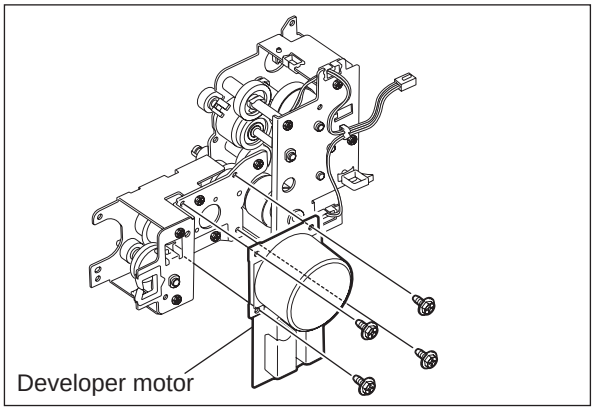


Fig. 9-13

[C] Black developer lifting clutch (CLT11)

(1) Take off the developer motor (📖 P.9-11 "[B] Developer motor (M11)").
(2) Remove 5 screws and take off the bracket.

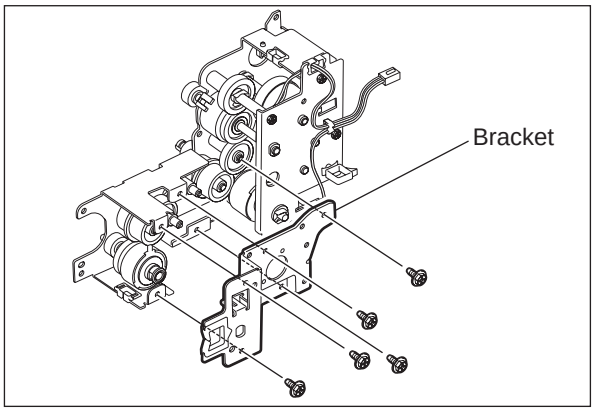


Fig. 9-14

(3) Disconnect 1 connector, remove 1 bushing and 1 gear, and then take off the black developer lifting clutch.

Note:
Place the stopper when installing the clutch.

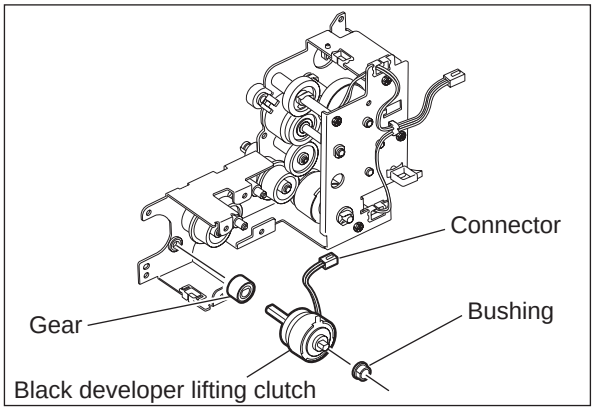


Fig. 9-15

[D] Color developer toner supply clutch (CLT8), color developer drive clutch (CLT9) and black developer drive clutch (CLT10)

(1) Take off the developer motor (P.9-11 "[B] Developer motor (M11)").
(2) Release the harness from 3 harness clamps.

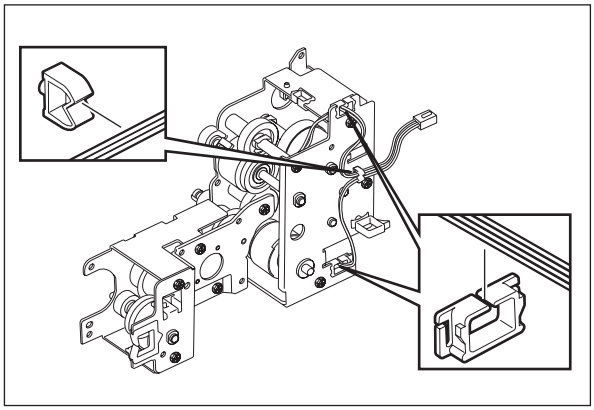


Fig. 9-16

(3) Remove 1 clip and1 bushing.
(4) Remove 4 screws and take off the bracket.

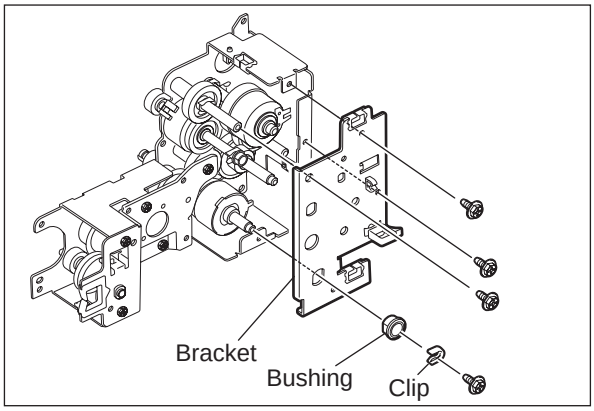


Fig. 9-17

(5) Disconnect 1 connector, remove 1 gear, 2 bushings and 1 clip, and then take off the color developer toner supply clutch.

Note:
Place the stopper when installing the clutch.

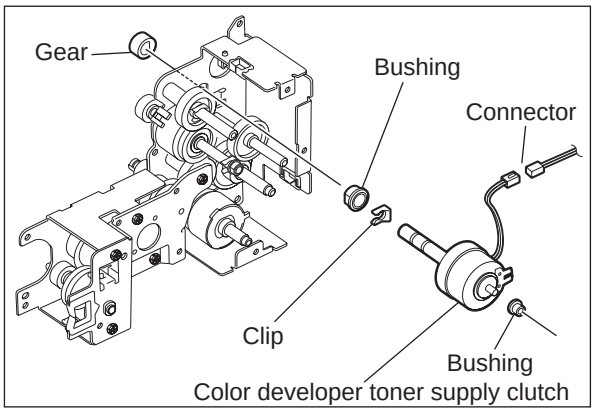


Fig. 9-18

(6) Disconnect 1 connector, remove 1 gear, 1 E-ring and 1 bushing, and then take off the black developer drive clutch.

Note:
Place the stopper when installing the clutch.

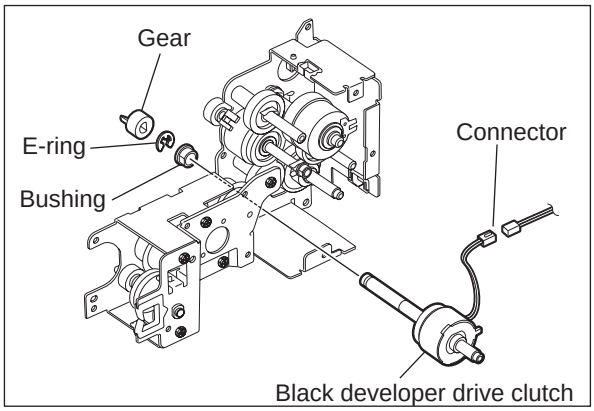


Fig. 9-19

(7) Remove 5 screws and take off the bracket.
(8) Remove 1 clip and 1 gear.

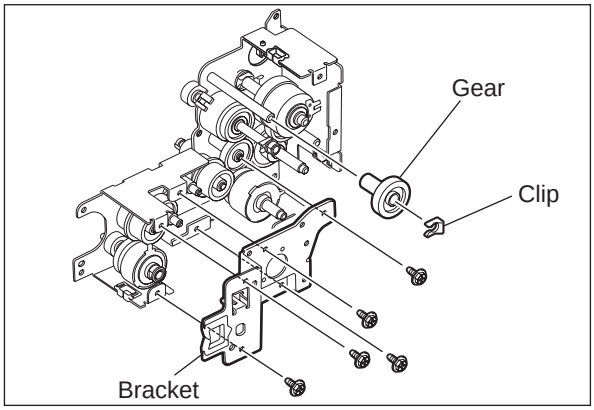


Fig. 9-20

(9) Remove 1 clip and 1 bushing. Remove 1 gear.
(10) Disconnect 1 connector and take off the color developer drive clutch.

Note:
Place the stopper when installing the clutch.

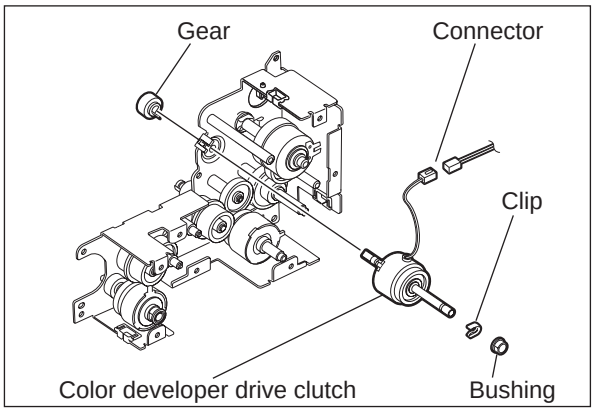


Fig. 9-21

9

[E] Transport motor drive unit

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Take off the right rear cover (📖 P.2-30 "[O] Right rear cover").
(3) Take off the right rear hinge cover (📖 P.2-31 "[P] Right rear hinge cover").
(4) Take off the SYS board case (📖 P.2-35 "[D] SYS board case").
(5) Remove 3 screws and take off the flywheel.
(6) Take off the IH board case (📖 P.16-34 "[N] IH board (IH) / IH board case").
(7) Take off the ozone exhaust fan with the ozone exhaust duct (📖 P.11-24 "[R] Ozone exhaust fan (M18)").
(8) Remove 1 screw and take off the bracket.

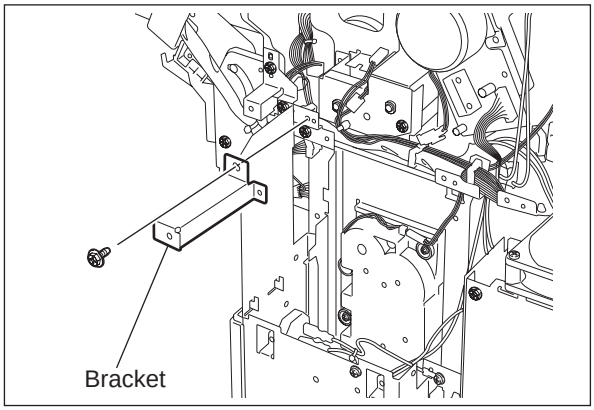


Fig. 9-22

(9) Remove 1 screw and take off the cover plate.

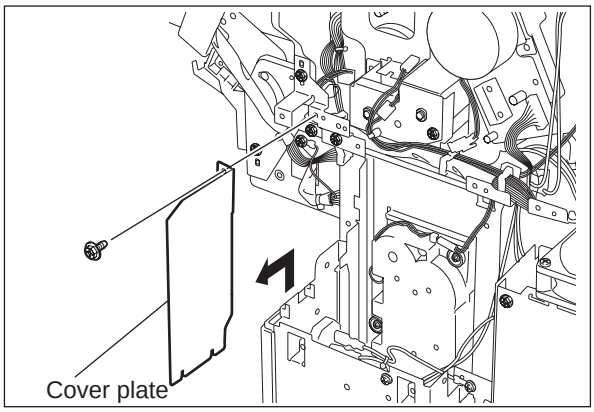


Fig. 9-23

(10) Remove 2 screws and take off the bracket.

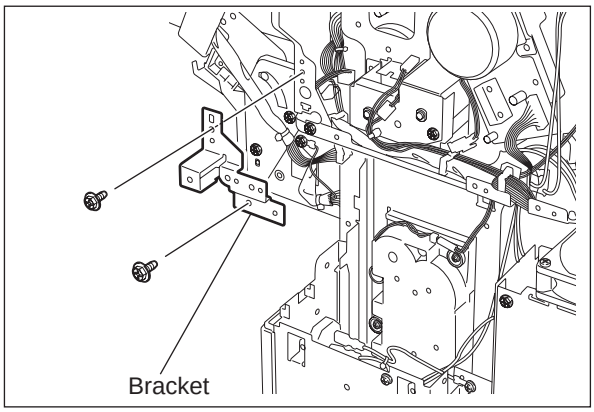


Fig. 9-24

(11) Take off the fuser unit (📖 P.16-19 "[A] Fuser unit").
(12) Remove 1 screw and take off the bracket.

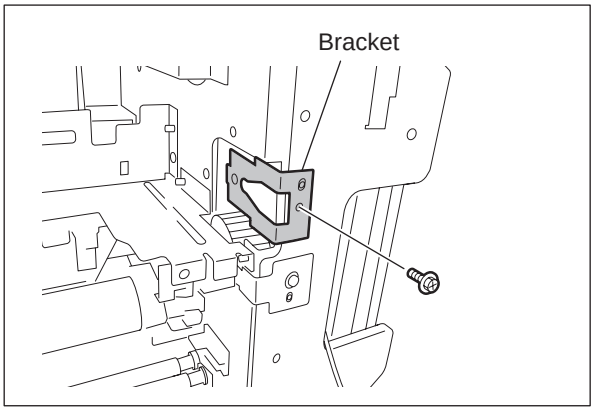


Fig. 9-25

(13) Loosen 1 setscrew and disconnect 1 connector.
(14) Release the harness from 1 harness clamp.

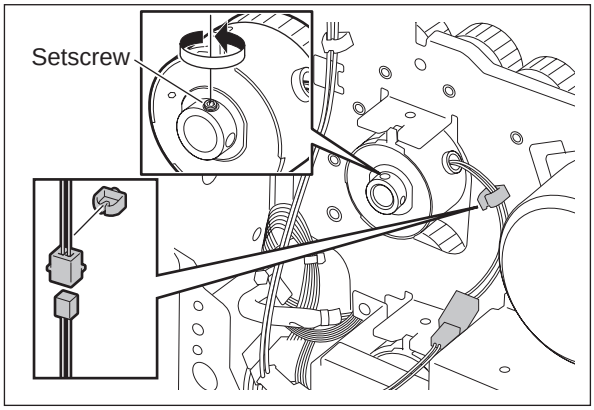


Fig. 9-26

(15) Take off the registration clutch.

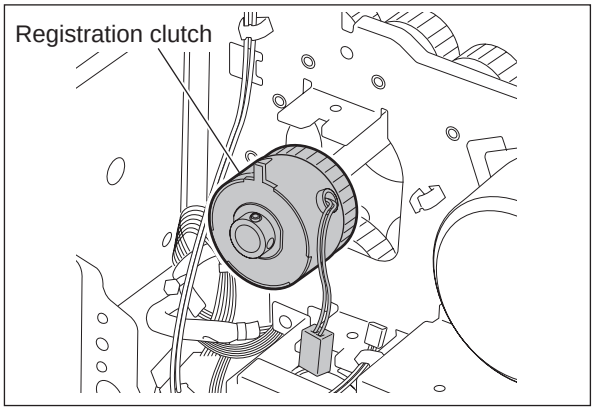


Fig. 9-27

Note:

Reassemble the registration clutch so as to match the end of the shaft with that of the clutch as shown in the right-hand figure.

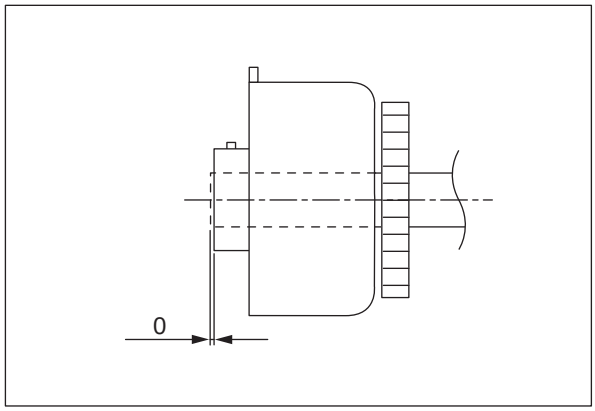


Fig. 9-28

(16) Disconnect 1 connector, remove 2 screws, and take off the bracket.

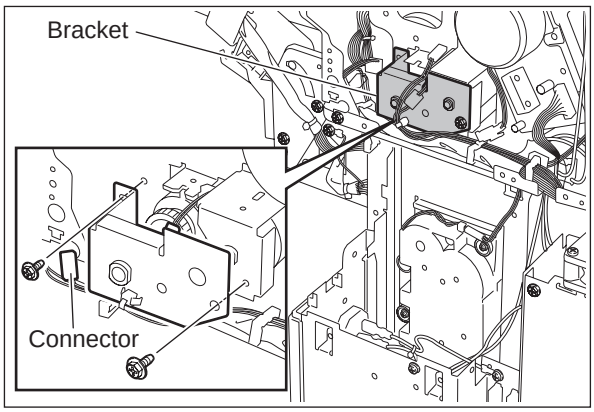


Fig. 9-29

(17) Loosen 1 setscrew, take off the upper transport clutch (High speed) with the gear.

Note:

Do not mix up the registration clutch and upper transport clutch (High speed) when installing them.

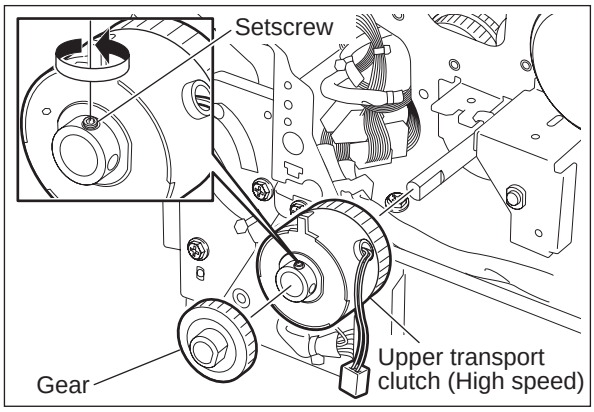


Fig. 9-30

(18) Disconnect 2 connectors and release the harness from 3 harness clamps.

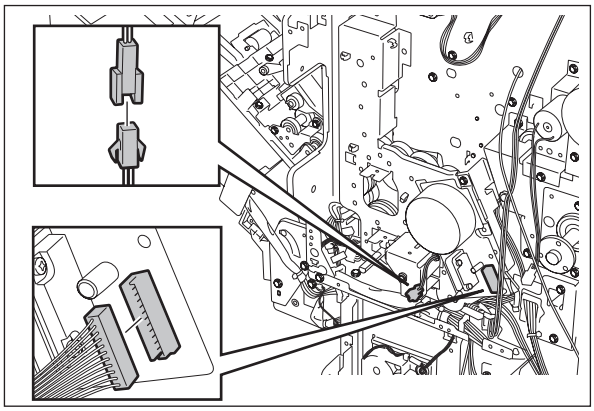


Fig. 9-31

(19) Remove 5 screws and take off the transport motor drive unit.

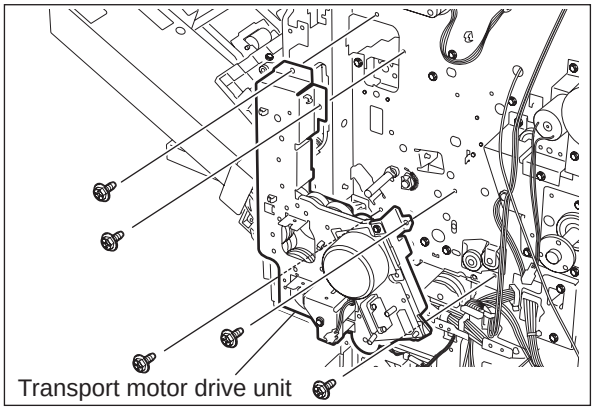


Fig. 9-32

(20) Remove 2 screws and take off the bracket.

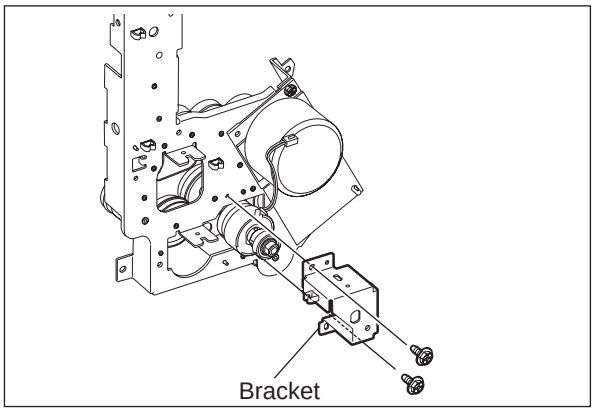


Fig. 9-33

(21) Disconnect 1 connector, remove 2 bushings, 1 gear and 2 clips. Remove one-way clutch and then take off the upper transport clutch (Low speed).

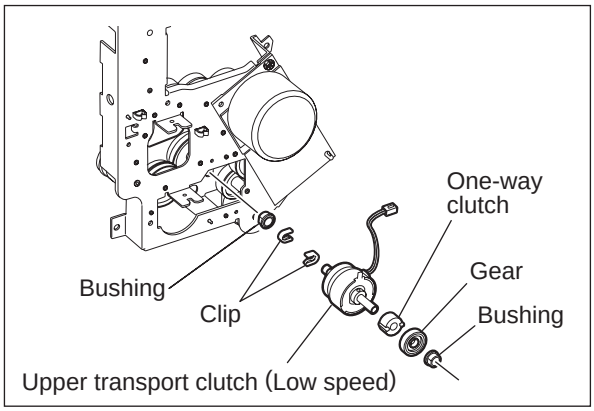


Fig. 9-34

(22) Remove 9 screws and take off the cover of the transport motor drive unit.

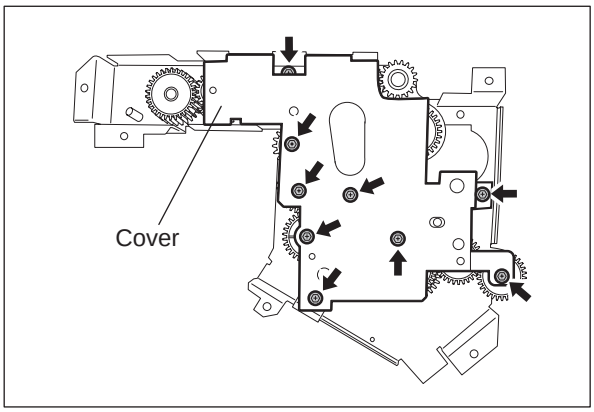


Fig. 9-35

[F] Transport motor (M9)

(1) Take off the ozone exhaust fan with the ozone exhaust duct (📖 P.11-24 "[R] Ozone exhaust fan (M18)").
(2) Disconnect 1 connector.
(3) Release 1 lock support, remove 2 screws, and take off the transport motor.

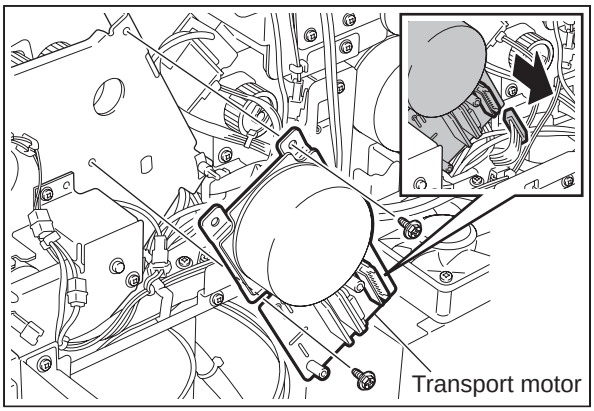


Fig. 9-36

[G] Main motor drive unit

(1) Take off the process unit (P.11-10 "[B] Process unit").
(2) Take off the rear cover-2 (P.2-32 "[S] Rear cover-2").
(3) Take off the LGC board case (P.2-38 "[F] LGC board case").
(4) Take off the SYS board case (P.2-35 "[D] SYS board case").
(5) Remove 3 screws and take off the flywheel.
(6) Take off the IH board case (P.16-34 "[N] IH board (IH) / IH board case").
(7) Take off the ozone exhaust fan with the ozone exhaust duct (P.11-24 "[R] Ozone exhaust fan (M18)").

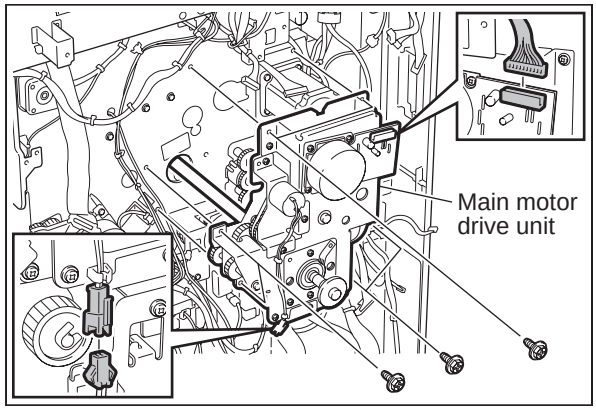


Fig. 9-37

Note:
Steps (2) to (7) can be omitted if the developer motor drive unit and the transport motor drive unit are already taken out.

(8) Disconnect 2 connectors and release the harness from 2 harness clamps.
(9) Remove 6 screws and take off the main motor drive unit.
(10) Remove 3 screws and take off the drum cleaner brush motor with the bracket.

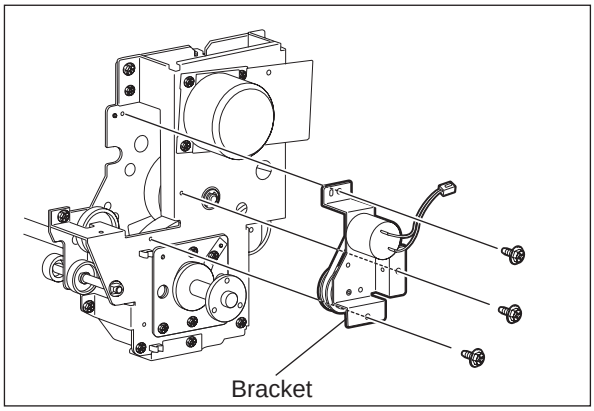


Fig. 9-38

(11) Remove 2 screws and take off the drum cleaner brush motor.

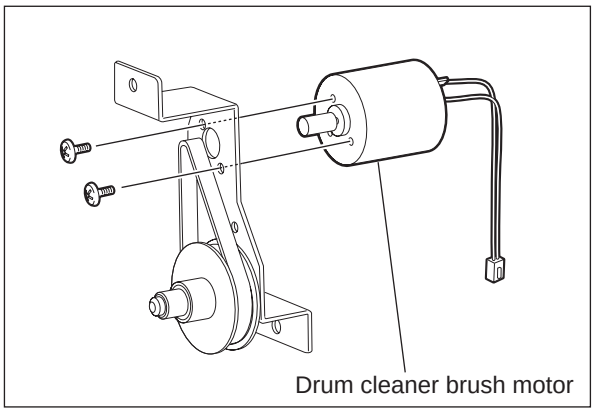


Fig. 9-39

(12) Remove 1 screw and take off the bracket.

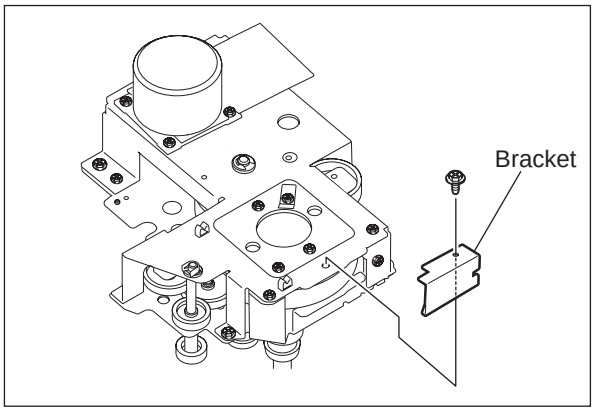


Fig. 9-40

(13) Remove 1 E-ring, 1 bearing, 1 clip and 1 bushing. Remove 5 screws and take off the gear cover.

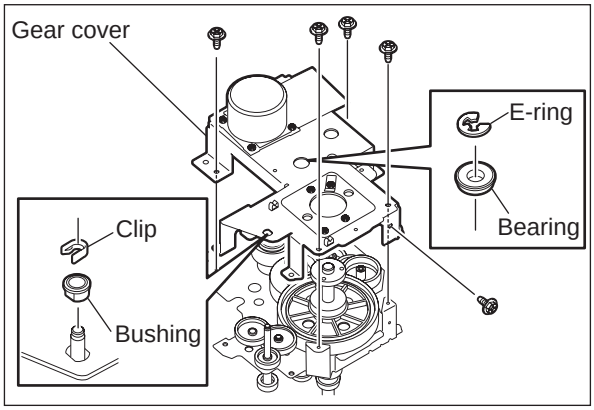


Fig. 9-41

[H] Main motor (M6)

(1) Take off the rear cover-2 (📖 P.2-32 "[S] Rear cover-2").
(2) Take off the LGC board case (📖 P.2-38 "[F] LGC board case").
(3) Take off the SYS board case (📖 P.2-35 "[D] SYS board case").
(4) Disconnect 1 connector, remove 4 screws and take off the main motor.

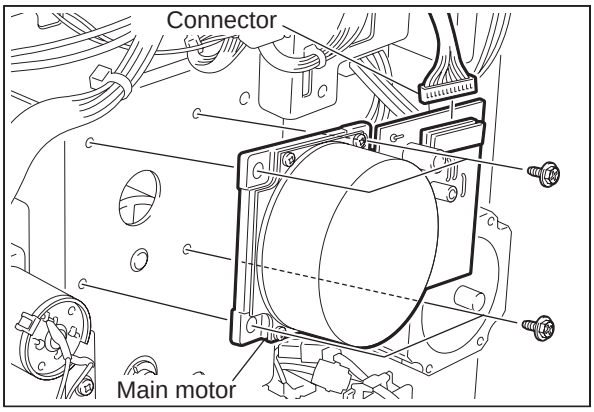


Fig. 9-42

10. PAPER FEEDING SYSTEM

10.1 General Descriptions

This chapter explains how the system works to pick up paper from the drawer or bypass tray and transport it to the 2nd transfer position.
The paper feeding system mainly consists of the pickup roller, feed roller, separation roller, transport roller, registration roller, bypass paper sensor (S35), drawer empty sensor (S29, 30), drawer paper stock sensor (S31, 32), bypass feed sensor (S36), drawer feed sensor (S23, 24), registration sensor (S22) and drive system for these components. The transport motor (M9) drives the above rollers.
Refer to chapter 9 for more details about the transport motor (M9) and its drive system.

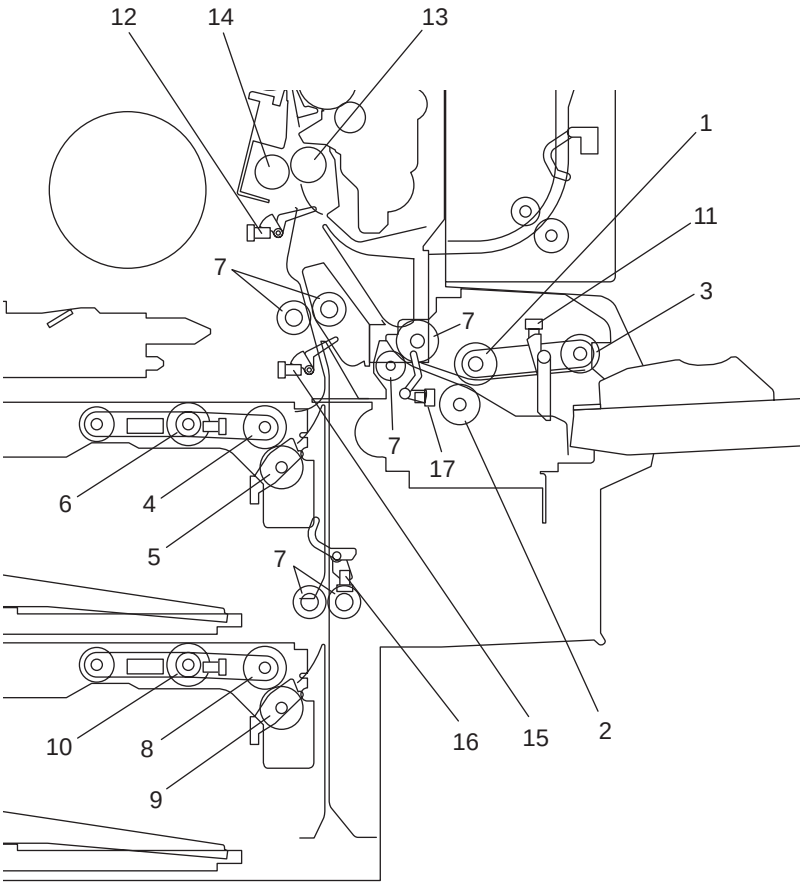


Fig. 10-1

No.	Name	No.	Name
1	Bypass feed roller	10	Lower drawer pickup roller
2	Bypass separation roller	11	Bypass paper sensor (S35)
3	Bypass pickup roller	12	Registration sensor (S22)
4	Upper drawer feed roller	13	Registration roller (rubber roller)
5	Upper drawer separation roller	14	Registration roller (metal roller)
6	Upper drawer pickup roller	15	Upper drawer feed sensor (S23)
7	Transport roller	16	Lower drawer feed sensor (S24)
8	Lower drawer feed roller	17	Bypass feed sensor (S36)
9	Lower drawer separation roller		

10.2 Construction

Feeding system		
Drawer feeding unit	Drawer pickup roller	PM parts
	Drawer feed roller	PM parts
	Drawer separation roller	PM parts
	Drawer feed clutch (CLT2, 3)	
	Drawer tray-up sensor (S27, 28)	
	Drawer empty sensor (S29, 30)	
	Drawer paper stock sensor (S31,32)	
Bypass unit	Bypass pickup roller	PM parts
	Bypass feed roller	PM parts
	Bypass separation roller	PM parts
	Bypass paper sensor (S35)	
	Bypass feed sensor (S36)	
	Bypass pickup solenoid (SOL3)	
	Bypass tray slide guide width detection PC board (SFB)	
	Bypass feed clutch (CLT6)	
Registration roller		
Transport roller		
Registration clutch (CLT12)		
Transport clutch (CLT13, 14, 15, 16)		
Drawer detection switch (S33, 34)		
Drawer feed sensor (S23, 24)		
Registration sensor (S22)		
Transport motor (M9)		
Tray-up motor (M10)		

10.3 Functions

1) Pickup roller (Drawers and bypass feed)
   This roller moves up and down and draws out the paper from the bypass tray or drawer and transport it to the feed roller.

2) Feed roller (Drawers and bypass feed)
   This roller is placed against the separation roller. It transports the paper from the pickup roller to the transport roller.

3) Separation roller (Drawers and bypass feed)
   This roller is placed against the feed roller. When two sheets of paper or more are transported from the pickup roller, the load of the torque limiter of the separation roller is heavier than the frictional force between the sheets. As the result, the separation roller is stopped and the lower paper is not advanced any further. When only one sheet is transported from the pickup roller, the separation roller rotates following the feed roller.

4) Transport roller (Drawers and bypass feed)
   This roller transports the paper sent from the feed roller to the registration roller.

5) Registration roller
   Paper transported from the transport roller is pushed against the registration roller which aligns the leading edge of the paper.
   Then, the registration rollers rotate to transport the paper to the transfer unit.

6) Bypass paper sensor (S35)
   This sensor detects if paper is set in the bypass tray. If it is, bypass feeding always comes before drawer feeding.

7) Empty sensor (Upper drawer (S29) / Lower drawer (S30))
   This is a transmissive-type sensor and detects the availability of paper in the drawer by using an actuator. When there is no paper in the drawer, the actuator blocks the light path of the sensor, and the sensor determines that there is no paper.

8) Paper stock sensor (Upper drawer (S31) / Lower drawer (S32))
   This is a transmissive-type sensor which detects the amount of the remaining paper in the drawer using an actuator. When the remaining paper is consumed and becomes around 100 sheets, the actuator blocks the light path for the transmissive-type sensor to notify that the paper is getting fewer.

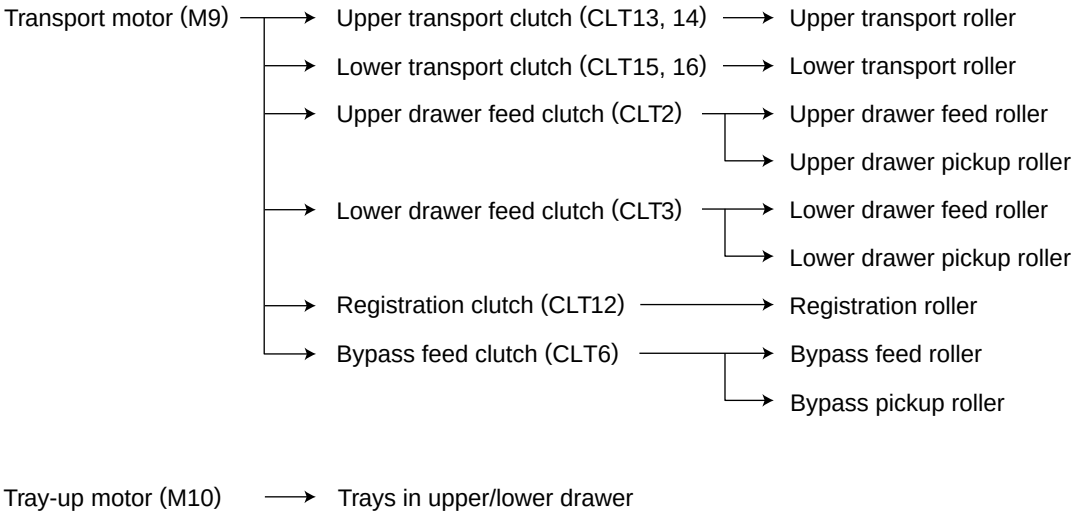
9) Feed sensor (Upper drawer (S23) / Lower drawer (S24) / bypass (S36))
   This sensor detects if the leading edge or trailing edge of the paper has passed the feed roller. It also detects jamming such as misfeeding.

10) Registration sensor (S22)
   This sensor detects that the leading edge of the paper has reached the registration roller and the trailing edge of the paper has passed the registration roller.

10.4 Description of Operation

10.4.1 Drive of rollers

The drive of each motor in the paper feeding area activates the paper transfer roller as follows.



10.4.2 Operation of bypass pickup roller

When the bypass pickup solenoid (SOL3) is turned ON, the plunger is pulled, and then the lever is rotated. The pickup arm is then brought down with its own weight. When the bypass pickup solenoid (SOL3) is turned OFF, the pickup arm is brought up by the spring force.
The driving force transmitted through the bypass feed clutch (CLT6) is transmitted to the bypass feed roller through the shaft and then to the bypass pickup roller through the timing belt. The roller is rotated by this driving force.

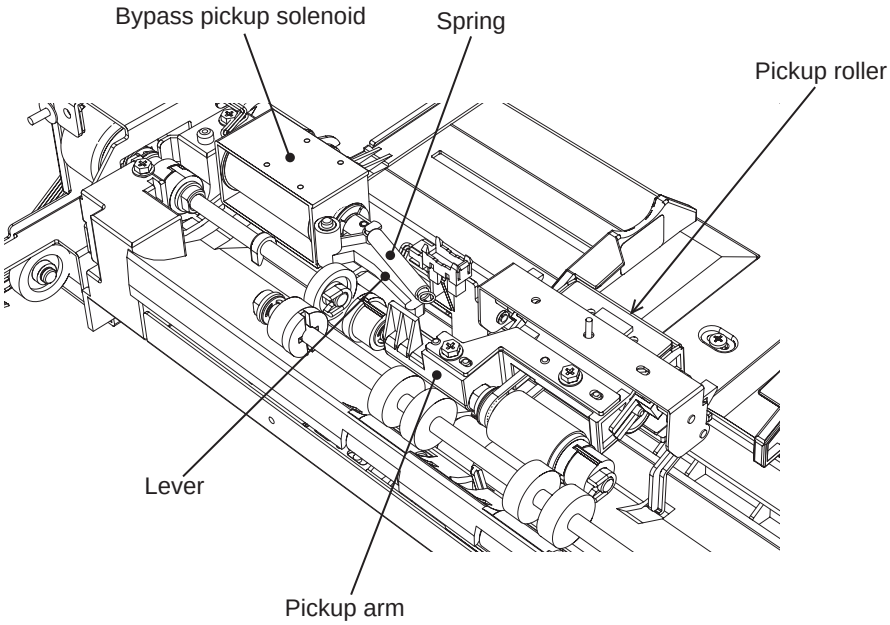


Fig. 10-2

10.4.3 Operation of drawer pickup roller

When the drawer is inserted, the protrusion at the rear side of the drawer moves up the lever (a) to the direction of A. The pickup roller and roller holder are then lowered by it's own weight.

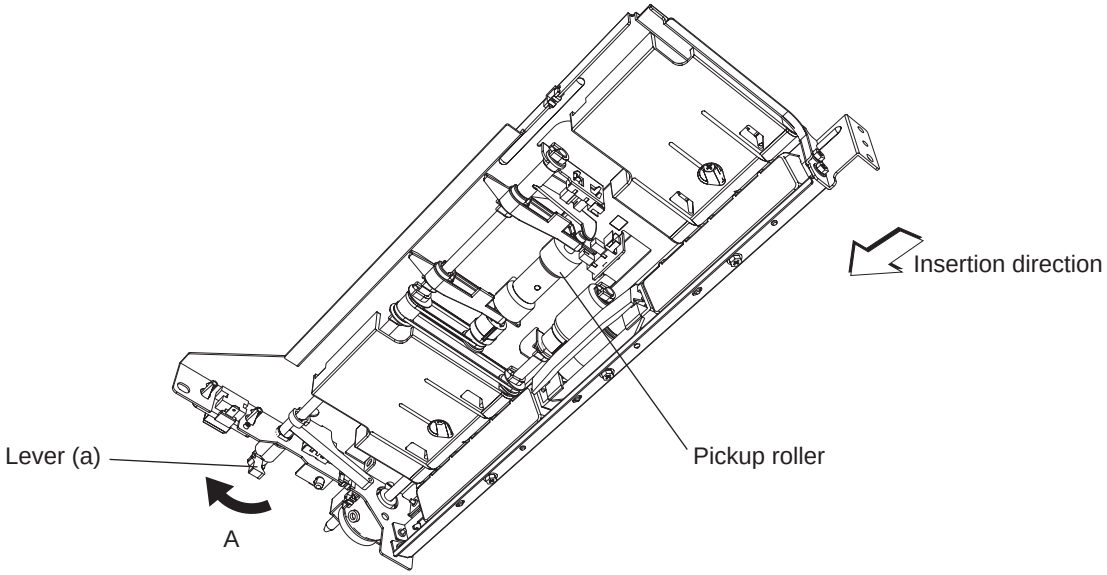


Fig. 10-3

10.4.4 Separation of paper

The separation roller in this equipment works to separate the sheets being fed. The separation roller unit consists of the feed roller, separation roller, spring joint, etc., as shown below.
The feed roller is rotated by the feed clutch in the direction of the white arrow at the same timing as the pickup roller rotation.
The figure at the bottom of this page shows how duplicate feeding is prevented: Since the friction between two sheets is small, the lower sheet is not transported any further while the upper sheet is transported by the feed roller in the direction of the black arrow.

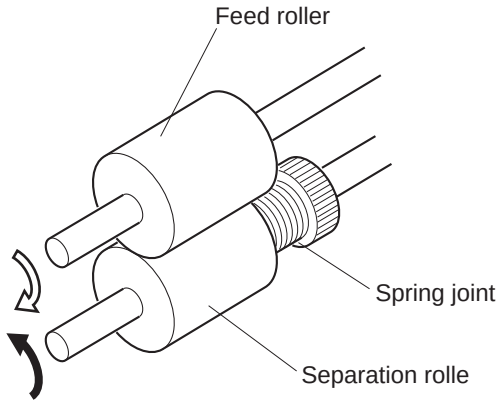


Fig. 10-4

[Example]
When only one sheet enters between the rollers: Since the transporting force of the feed roller is greater than the braking force of the separation roller, the separation roller follows the feed roller, making the sheet go forward to the registration roller.
When two sheets enter between the rollers at the same time:
Since the transporting force of the feed roller and the breaking force of the separation roller are greater than the frictional force between two sheets, the paper A is transported to the direction of the black arrow and the paper B is braked by the separation roller and is not transported any further.

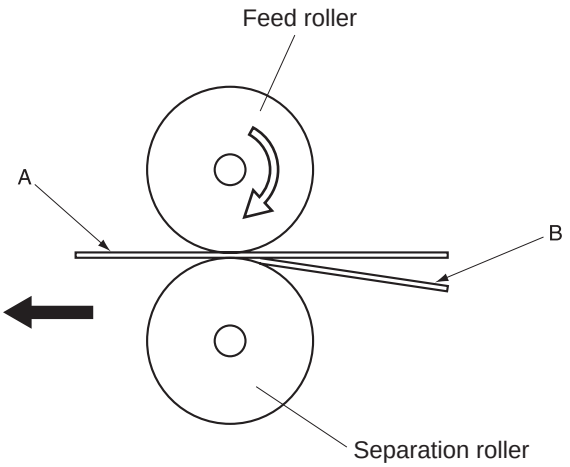


Fig. 10-5

10.4.5 General operation

[A] From power-ON to ready status

1) When the equipment is turned ON, the tray-up motor (M10) is activated and the upper drawer tray starts to rise. When the tray-up sensor (S27) is turned ON (L→H), the tray-up motor (M10) is turned OFF, and the tray is stopped. At this time, if the empty sensor (S29) is OFF (L), it is judged that there is no paper in the drawer.
   If the empty sensor (S29) is ON (H), there is paper in the drawer. The tray stops at raised position regardless of availability of paper. The tray-up motor (M10) then starts to rotate in reverse and the lower drawer is raised. The lower drawer is stopped in the same manner as the upper drawer, and the empty sensor (S30) detects if there is any paper in the drawer.

2) If the drawer is not completely inserted when the equipment is turned ON, the tray for that drawer is not raised. When the drawer is inserted completely, the tray is raised and checks the availability of the paper.

3) If either of the sensors on the transport path is ON (means there is paper on the transport path) when the equipment is turned ON, it is determined that a paper jam has occurred and no operation is enabled until the paper is removed.

[B] Ready status

1) After the tray is moved up and availability of paper is checked as described above, the equipment enters the ready status.
   At ready status, the tray remains at raised position.

2) When a drawer is inserted or removed at ready status, the tray is raised again to check the availability of paper.

[C] Bypass feeding

- The bypass paper sensor (S35) detects availability of paper.
- The bypass pickup solenoid (SOL3) is turned ON and the bypass pickup roller is lowered.
- The bypass feed clutch (CLT6) is turned ON and then the bypass pickup roller, bypass feed roller and bypass transport roller are rotated and start feeding.
- The leading edge of paper turns ON the bypass feed sensor (S36) and bypass pickup solenoid (SOL3) is turned OFF. Then the bypass pickup roller is raised.
- The leading edge of paper turns ON the registration sensor (S22) and the paper is aligned by the registration roller.
- The bypass feed clutch (CLT6) is turned OFF, and then the bypass pickup roller, bypass feed roller and bypass transport roller are stopped.
- The registration clutch (CLT12) is turned ON and the paper is transported to the 2nd transfer position.

[D] Drawer feeding

[D-1] Lower drawer

- The feed clutch (CLT3) and the transport clutch (high speed) (CLT14, 16) are turned ON, and the pickup roller, feed roller and transport roller are rotated to start feeding paper.
- Passing of the leading edge of the paper turns ON the lower drawer feed sensor (S24), then the feed clutch (CLT3) and transport clutch (high speed) (CLT14, 16) is turned OFF then back ON.
- Passing of the leading edge of the paper turns ON the registration sensor (S22) and the paper is aligned by the registration roller.
- The transport clutch (high speed) (CLT14, 16) is turned OFF and the transport roller is stopped.
- The registration clutch (CLT12) and transport clutch (low speed) (CLT13, 15) are turned ON and the paper is transported to the 2nd transfer position.

[D-2] Upper drawer

- The feed clutch (CLT2) and the transport clutch (high speed) (CLT14) are turned ON, and the pickup roller, feed roller and transport roller are rotated to start feeding paper.
- Passing of the leading edge of the paper turns ON the upper drawer feed sensor (S23), then the feed clutch (CLT2) and the transport clutch (high speed) (CLT14) are turned OFF then back ON.
- Passing of the leading edge of the paper turns ON the registration sensor (S22) and the paper is aligned by the registration roller.
- The feed clutch (CLT2) and the transport clutch (high speed) (CLT14) is turned OFF and the transport roller is stopped.
- The registration clutch (CLT12) and transport clutch (low speed) (CLT13) are turned ON and the paper is transported to the 2nd transfer position.

10.5 Drive Circuit of Tray-up Motor

Tray-up motor (M10): Driven by motor driver (TA8428) (upper/lower drawer)

Block diagram of TA8428

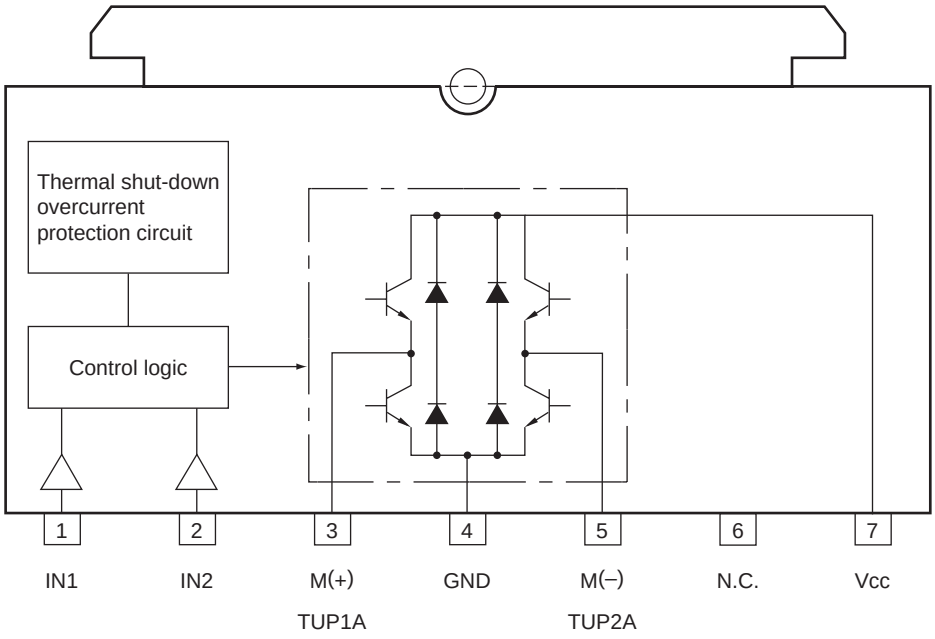


Fig. 10-6

IN1 and IN2 are input terminals to receive the signals from the gate array. The control logic, based on the signals from the gate array, controls ON/OFF of the motor rotation direction.

Input		Output		Remarks
IN1	**IN2**	**M(+)**	**M(-)**	
H	H	L	L	BRAKE
L	H	L	H	CCW
H	L	H	L	CW
L	L	OFF (high impedance)		STOP

10.6 Disassembly and Replacement

[A] Bypass unit

[A-1] Bypass unit

(1) Take off the right front hinge cover (📖 P.2-28 "[I] Right front hinge cover").
(2) Take off the right rear hinge covers (📖 P.2-31 "[P] Right rear hinge cover").
(3) Remove 1 screw of ground wires. Disconnect 1 connector and release the harnesses from 2 harness clamps.

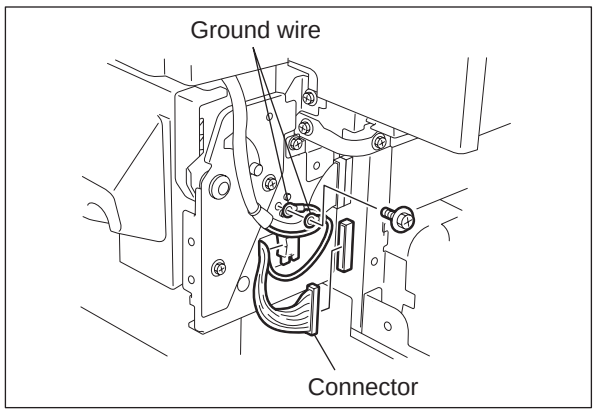


Fig. 10-7

(4) Remove 1 screw (M4*12). Open the bypass feed tray and take off the bypass feed front cover.

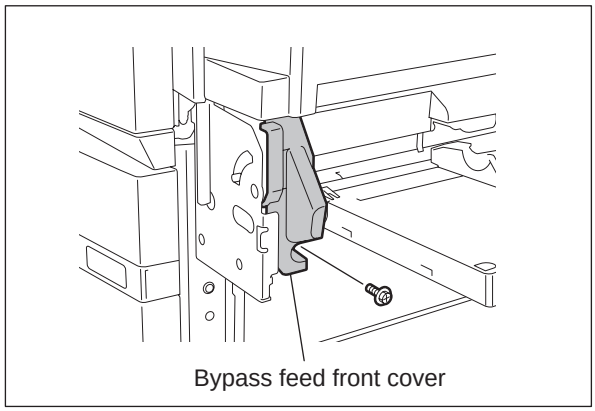


Fig. 10-8

(5) Remove 1 screw. Open the bypass feed tray and take off the bypass feed rear cover.

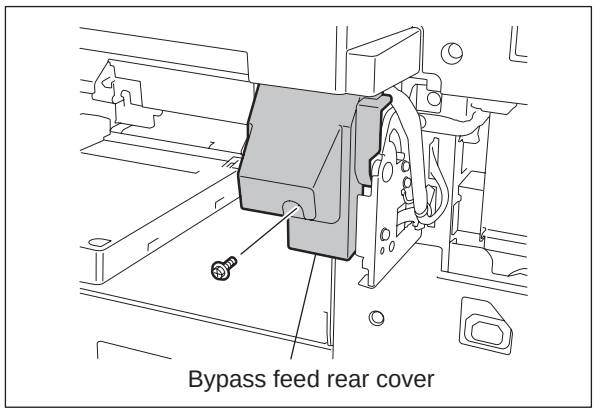


Fig. 10-9

(6) Remove 3 screws. Lift up the bypass unit and take it off toward you.

Note:

When installing the bypass unit, make sure that the ADU is closed in advance since the bypass unit occasionally does not slide smoothly.

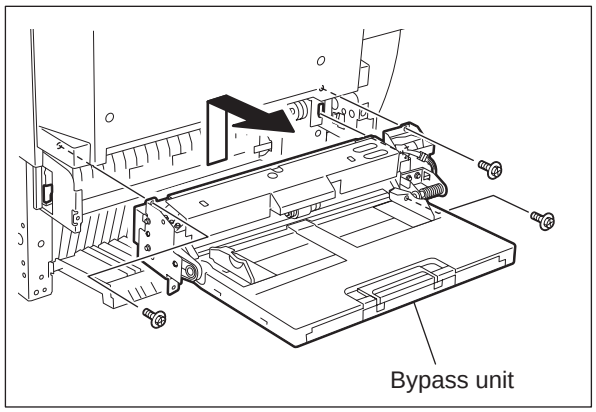


Fig. 10-10

[A-2] Hinge assembly

(1) Take off the bypass unit (P.10-9 "[A-1] Bypass unit").

(2) Disconnect 1 connector and release the harness from the harness clamp.

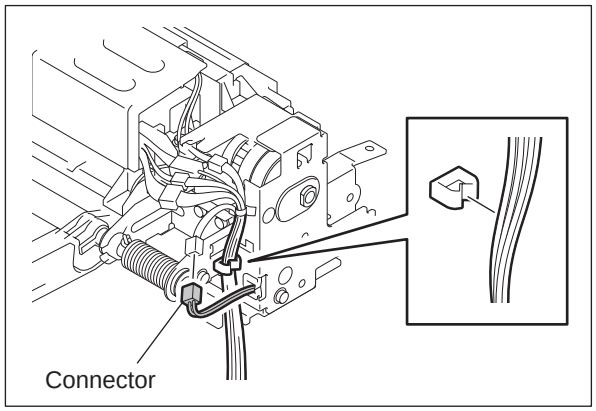


Fig. 10-11

(3) Remove 2 screws and slide the hinge assembly to take it off with the tray.

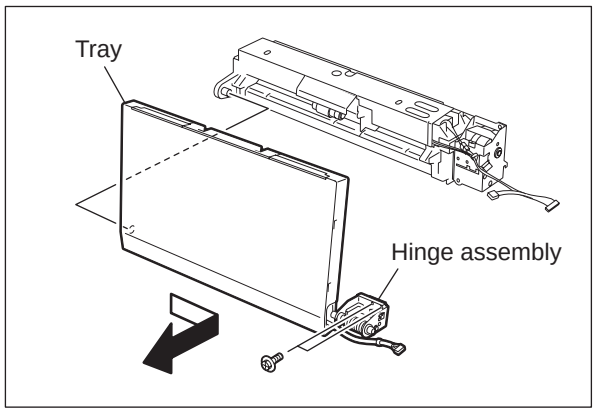


Fig. 10-12

(4) Pull out the hinge assembly from the bypass tray.

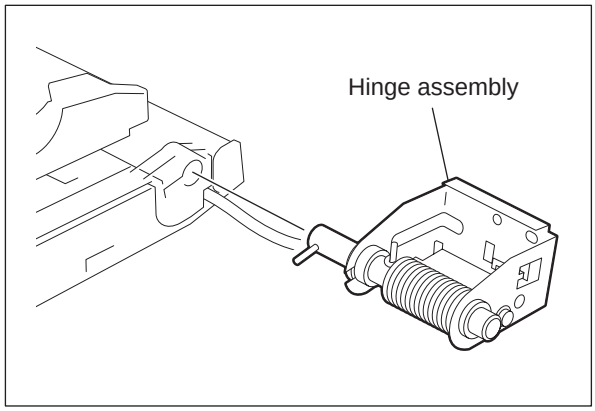


Fig. 10-13

[A-3] SFB board (SFB)

(1) Take off the hinge assembly (📖 P.10-10 "[A-2] Hinge assembly").
(2) Remove 3 screws, release 4 latches and 3 hooks, and take off bypass tray upper cover.

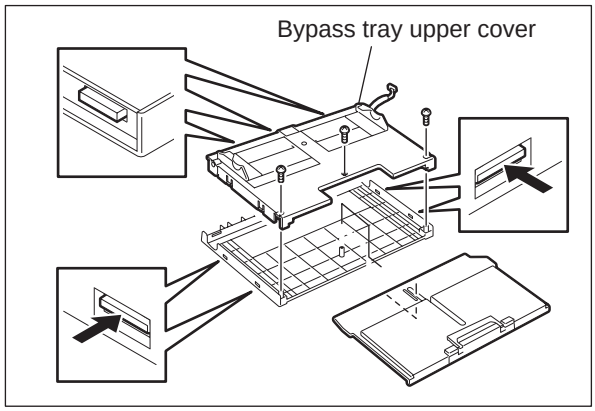


Fig. 10-14

(3) Remove 1 screw for the plate spring. And remove 1 screw on the tray side and take off the bracket.

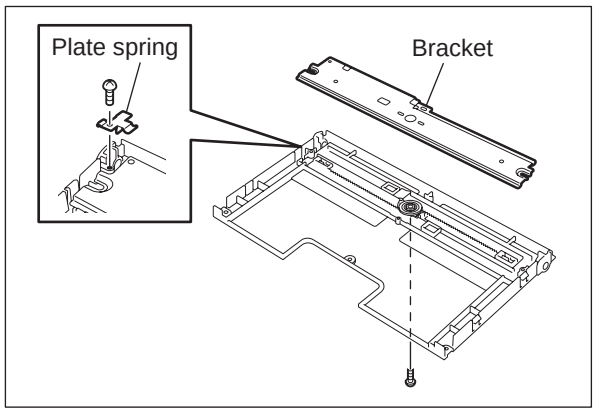


Fig. 10-15

Note:

Install the bracket so that its pointer is placed at the same position as before.

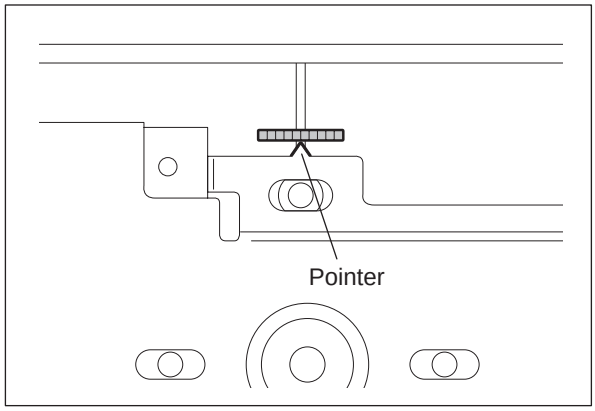


Fig. 10-16

(4) Disconnect 1 connector, remove 1 screw and take off the SFB board.

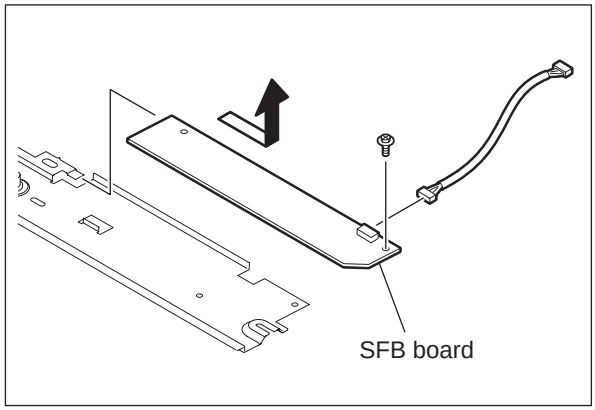


Fig. 10-17

[A-4] Bypass feed upper cover

(1) Take off the bypass unit (📖 P.10-9 "[A-1] Bypass unit").
(2) Remove 1 screw and slide the bypass feed upper cover to take it off.

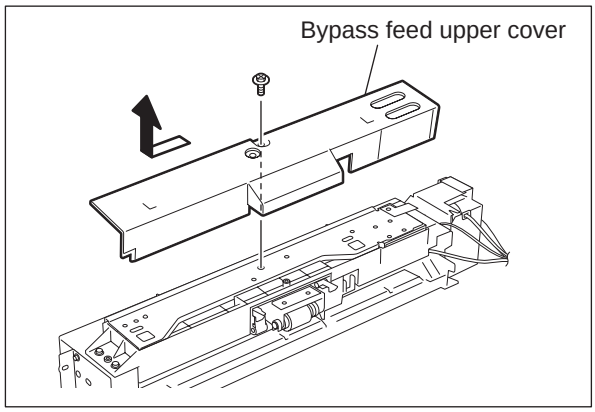


Fig. 10-18

[A-5] Bypass upper guide

(1) Take off the bypass feed upper cover (📖 P.10-12 "[A-4] Bypass feed upper cover").
(2) Remove 4 screws and take off the bypass upper guide.

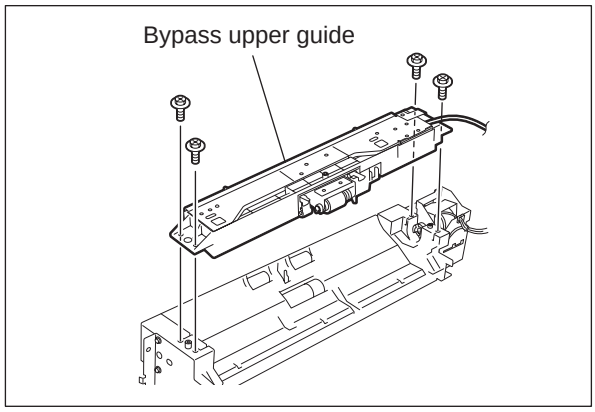


Fig. 10-19

[A-6] Bypass pickup solenoid (SOL3)

(1) Take off the bypass feed upper cover (📖 P.10-12 "[A-4] Bypass feed upper cover").
(2) Remove 4 screws and take off the upper plate.

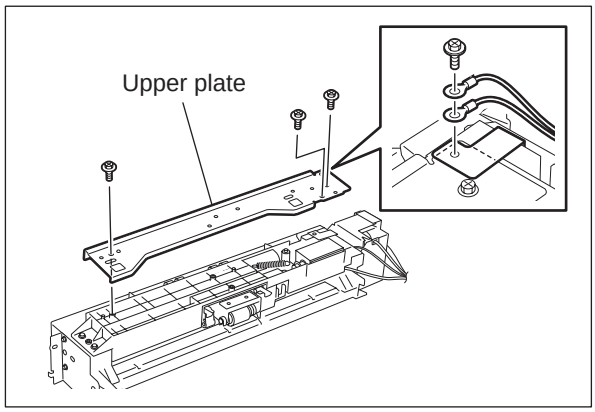


Fig. 10-20

(3) Remove 1 spring. Disconnect 1 connector and take off the bypass pickup solenoid with the solenoid arm.

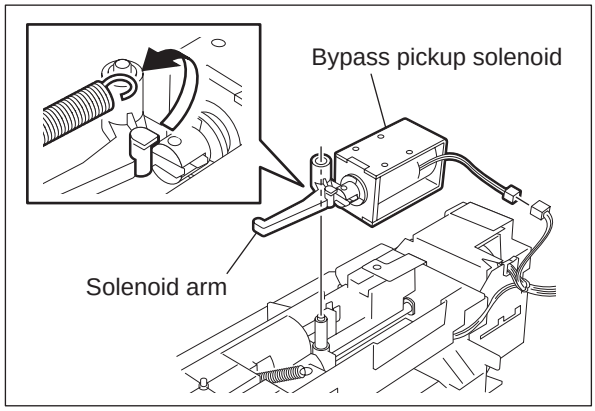


Fig. 10-21

[A-7] Bypass paper sensor (S35)

(1) Take off the bypass feed upper cover (📖 P.10-12 "[A-4] Bypass feed upper cover").
(2) Remove 4 screws and take off the upper plate.

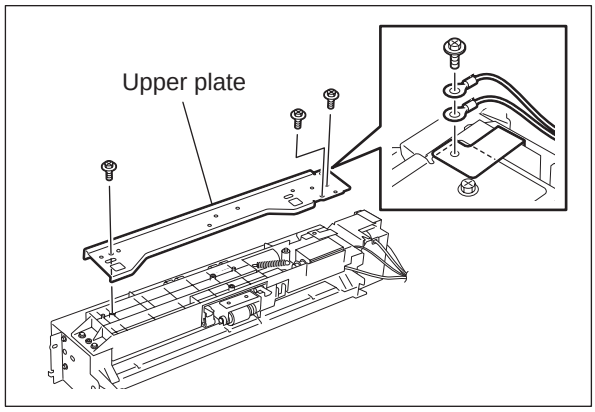


Fig. 10-22

(3) Take off the sensor arm.

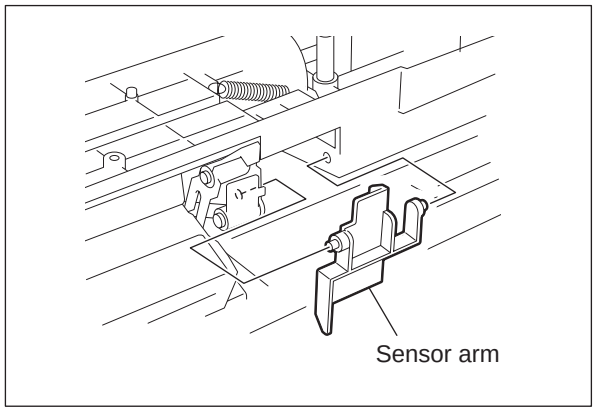


Fig. 10-23

(4) Disconnect the connector from the sensor and release the latch to take off the bypass paper sensor.

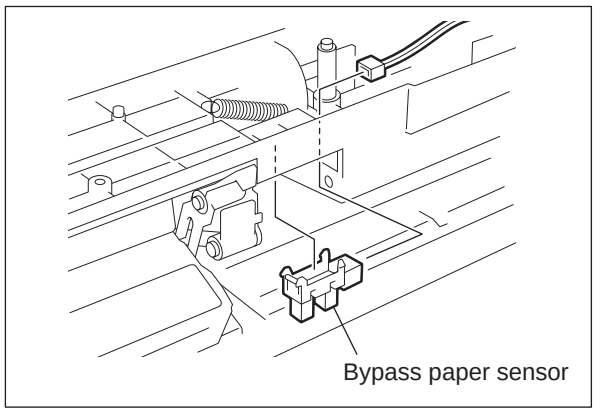


Fig. 10-24

[A-8] Bypass pickup roller PM

(1) Take off the bypass upper guide (📖 P.10-13 "[A-5] Bypass upper guide").
(2) Remove the clip, pull out the shaft and take off the bypass pickup roller.

Notes:

Make sure the following items when assembling the bypass pickup roller.

1. Set the timing belt to the pulley securely.
2. Do not put the wrong position when setting the timing belt.
3. Be sure to insert the clip into the groove of shaft.
4. Check that there is no stain such as oil on the surface of timing belt, the pulley and the roller.
5. Install the bypass pickup roller and the bypass feed roller in the correct direction.

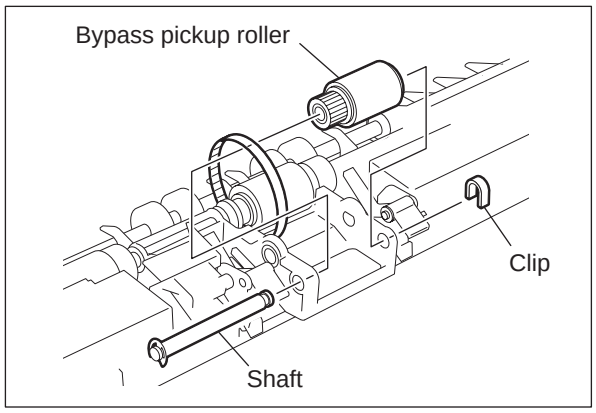


Fig. 10-25

[A-9] Bypass feed roller PM

(1) Take off the bypass upper guide (📖 P.10-13 "[A-5] Bypass upper guide").
(2) Remove the clip and take off the bypass feed roller.

Notes:

Make sure the following items when assembling the bypass feed roller.

1. Set the timing belt to the pulley securely.
2. Do not put the wrong position when setting the timing belt.
3. Be sure to insert the clip into the groove of shaft.
4. Check that there is no stain such as oil on the surface of timing belt, the pulley and the roller.
5. Install the bypass pickup roller and the bypass feed roller in the correct direction.

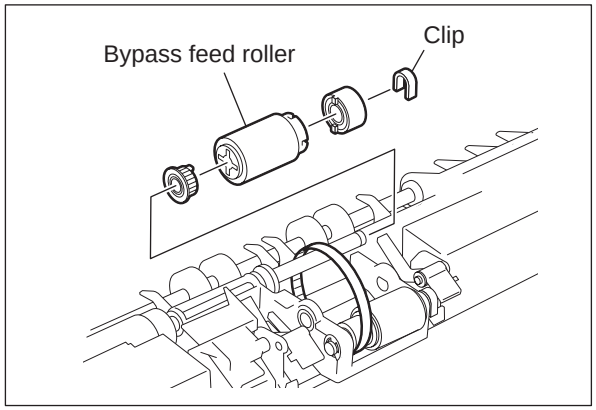


Fig. 10-26

[A-10] Bypass transport roller

(1) Take off the bypass upper guide (📖 P.10-13 "[A-5] Bypass upper guide").
(2) Remove the E-ring, pull out the shaft and take off the bypass transport roller.

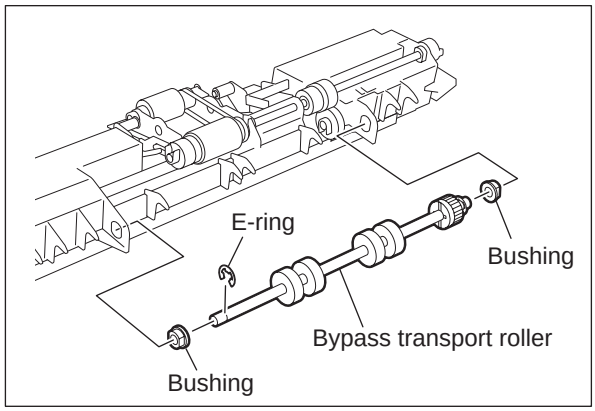


Fig. 10-27

[A-11] Bypass feed clutch (CLT6)

(1) Take off the bypass tray and hinge assembly (📖 P.10-10 "[A-2] Hinge assembly").
(2) Disconnect 1 connector and release the harness clamp.
(3) Remove the harness clamp.

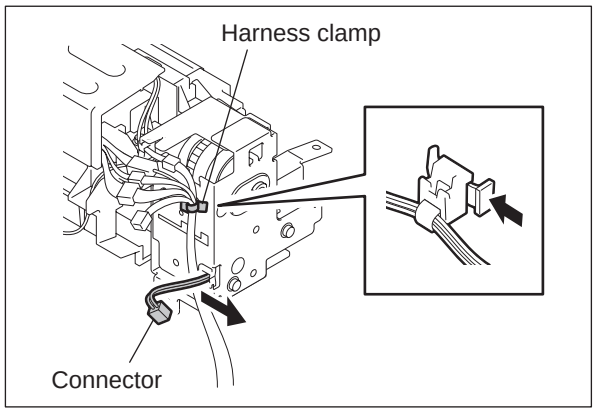


Fig. 10-28

(4) Remove 3 screws and take off the bracket.
(5) Remove the bushing and the bypass feed clutch.

Note:
Match the protruding portion of the clutch and bracket for assembling.

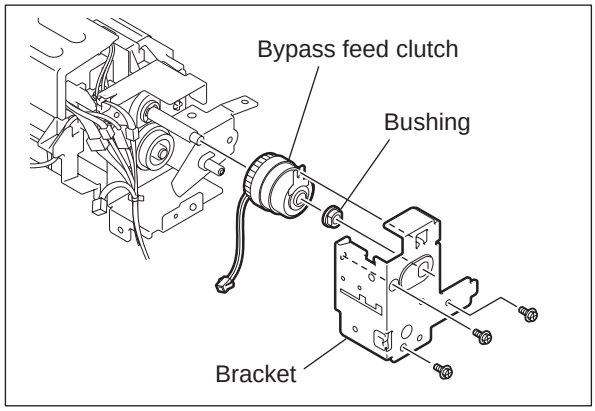


Fig. 10-29

[A-12] Bypass separation roller PM

(1) Take off the bypass unit (P.10-9 "[A-1] Bypass unit").
(2) Remove 3 screws and take off the lower plate.

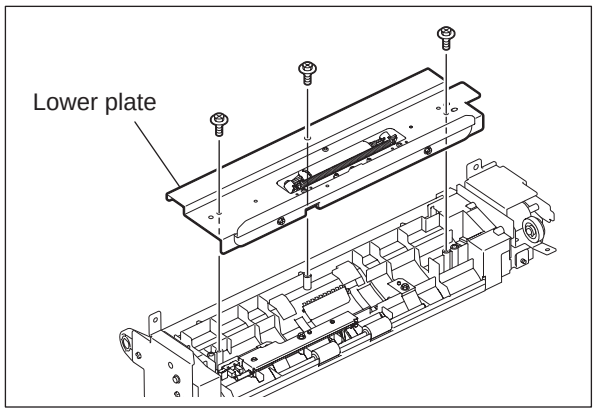


Fig. 10-30

(3) Take off the bypass separation roller assembly.

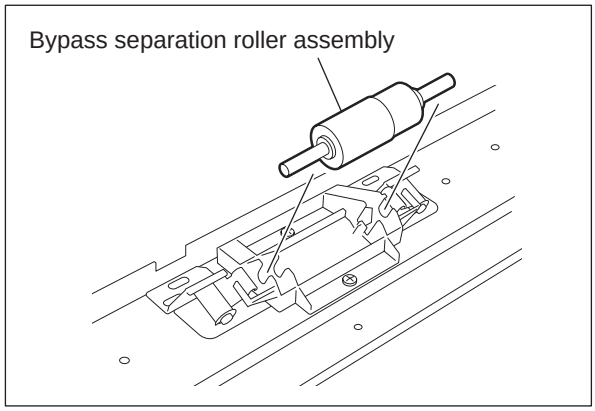


Fig. 10-31

(4) Detach the cover, the arbor, and the clutch spring from the shaft, and then take off the bypass separation roller.

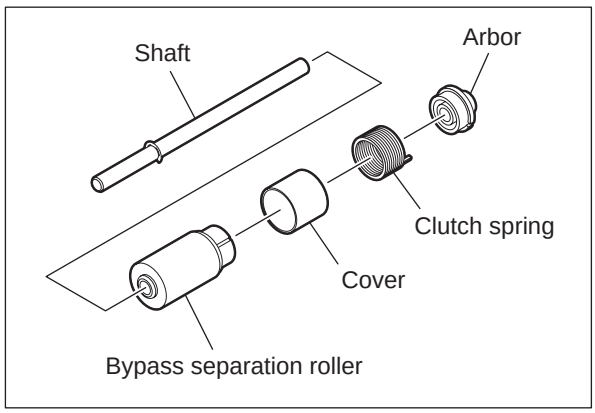


Fig. 10-32

[A-13] Bypass feed sensor (S36)

(1) Take off the bypass unit (📖 P.10-9 "[A-1] Bypass unit").
(2) Remove 3 screws and take off the lower plate.

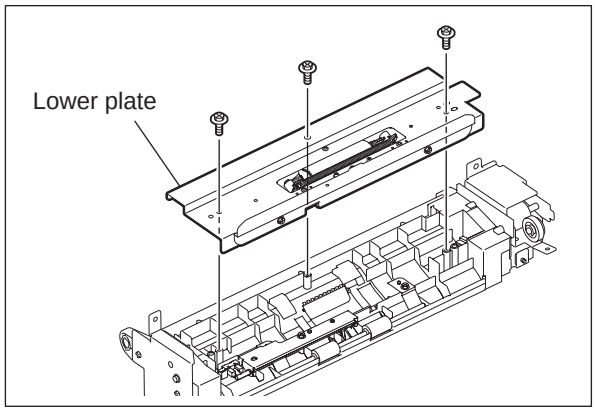


Fig. 10-33

(3) Disconnect 1 connector. Remove 1 screw and take off the sensor plate.

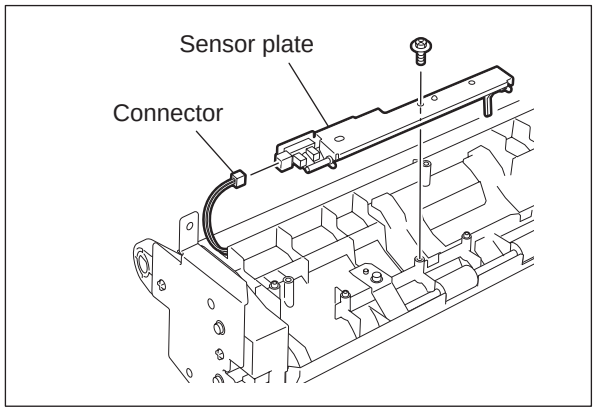


Fig. 10-34

(4) Release the latch to take off the bypass feed sensor.

Note:
Be careful not to come off the sensor arm and the sensor spring after taking off the sensor.

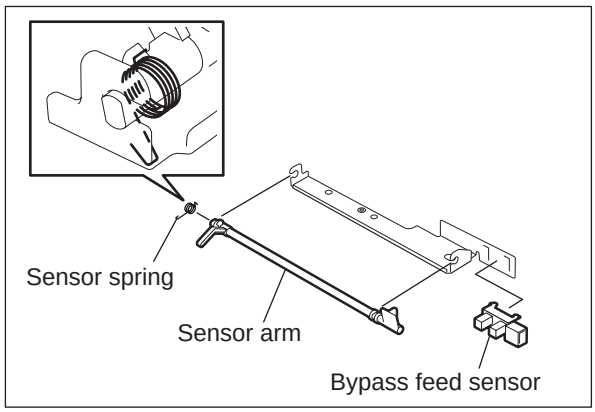


Fig. 10-35

[B] Drawer feeding unit

[B-1] Drawer feeding unit

(1) Take off the upper and lower drawers.
(2) Remove 1 screw and take off the drawer feeding unit by sliding it to the front side.

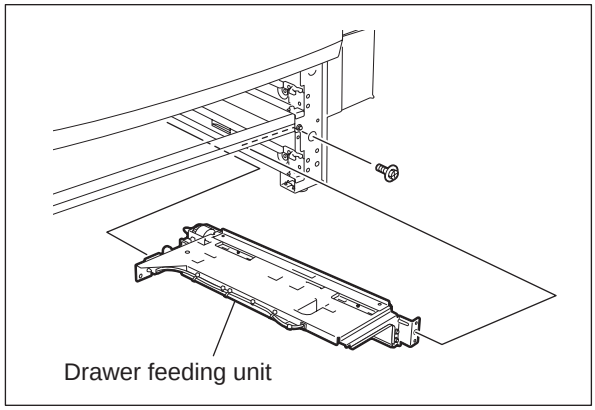


Fig. 10-36

[B-2] Tray-up sensor (S27/S28) / Empty sensor (S29/S30)

(1) Take off the drawer feeding unit (📖 P.10-19 "[B-1] Drawer feeding unit").
(2) Disconnect the connector and release the latch to take off the tray-up sensor.
(3) Disconnect the connector and release the latch to take off the empty sensor.

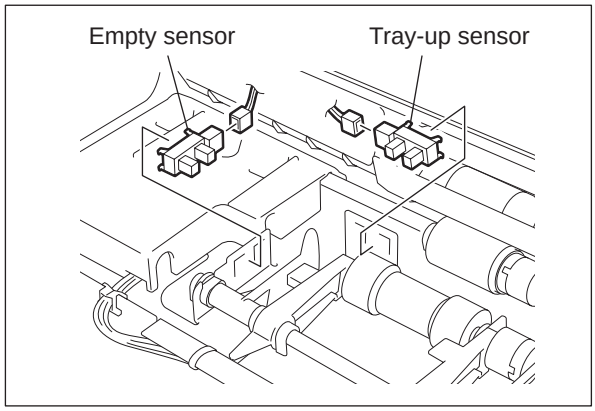


Fig. 10-37

[B-3] Paper stock sensor (S31/S32)

(1) Take off the drawer feeding unit (📖 P.10-19 "[B-1] Drawer feeding unit").
(2) Pull up the paper stock sensor arm.
(3) Disconnect the connector and release the latch to take off the paper stock sensor.

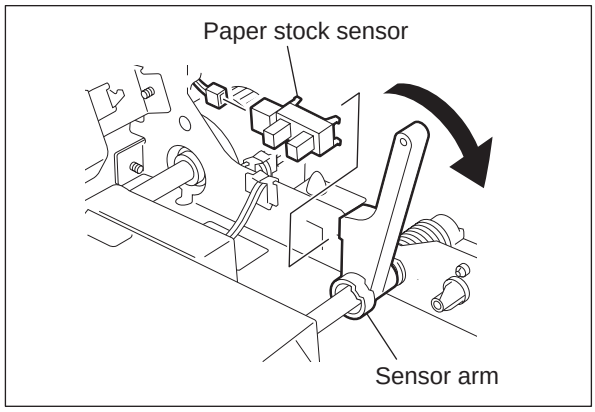


Fig. 10-38

[B-4] Separation roller PM

(1) Take off the drawer feeding unit (📖 P.10-19 "[B-1] Drawer feeding unit").
(2) Remove 1 screw and take off the separation roller holder.

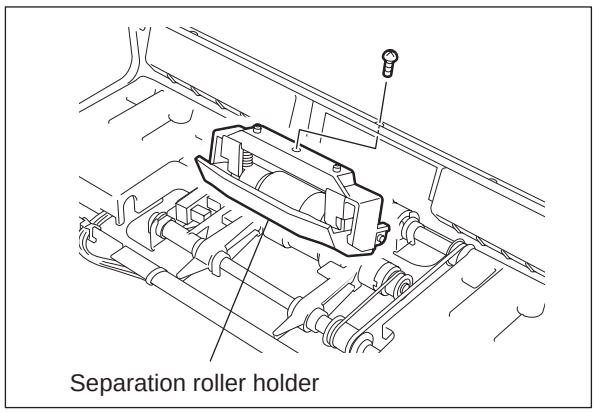


Fig. 10-39

(3) Detach the lever from the holder and take off the separation roller with the shaft.

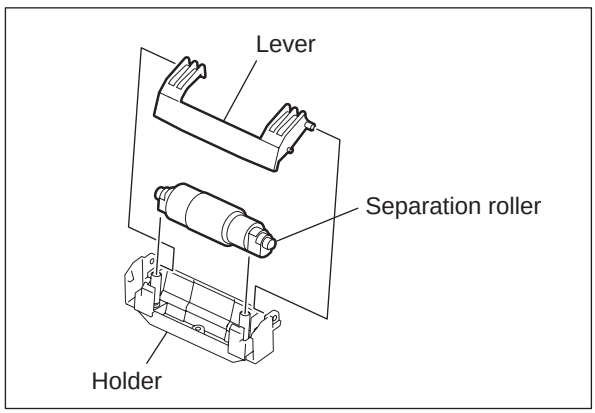


Fig. 10-40

(4) Detach the cover, the arbor and the clutch spring from the shaft, and then takeoff the separation roller.

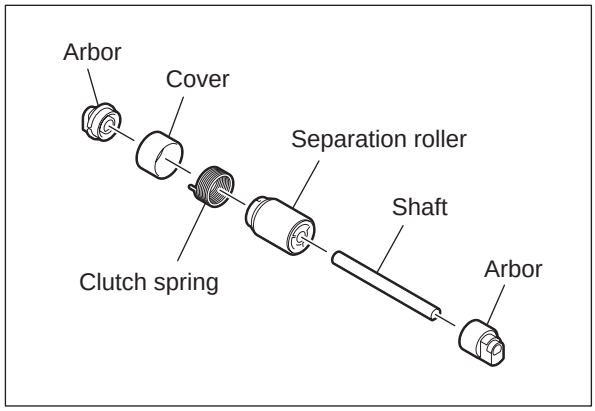


Fig. 10-41

[B-5] Feed roller (PM)

(1) Take off the separation roller holder (📖 P.10-20 "[B-4] Separation roller").
(2) Remove the clip and take off the feed roller.

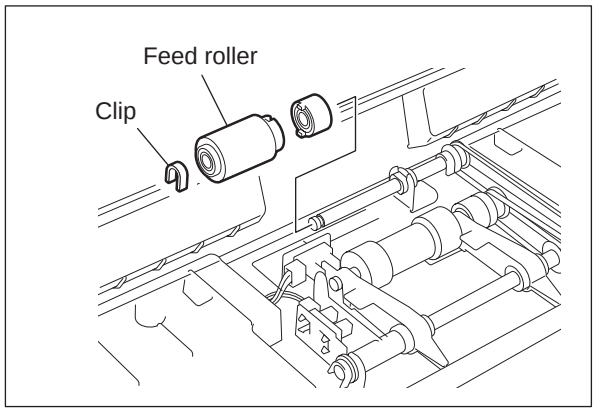


Fig. 10-42

[B-6] Pickup roller (PM)

(1) Take off the drawer feeding unit (📖 P.10-19 "[B-1] Drawer feeding unit").
(2) Remove the pickup roller assembly from the pickup arms and take off the belt.

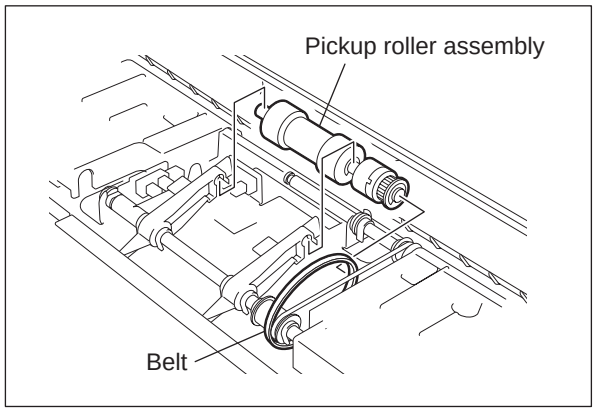


Fig. 10-43

(3) Remove 3 E-rings, pulley, one-way clutch and take off the pickup roller.

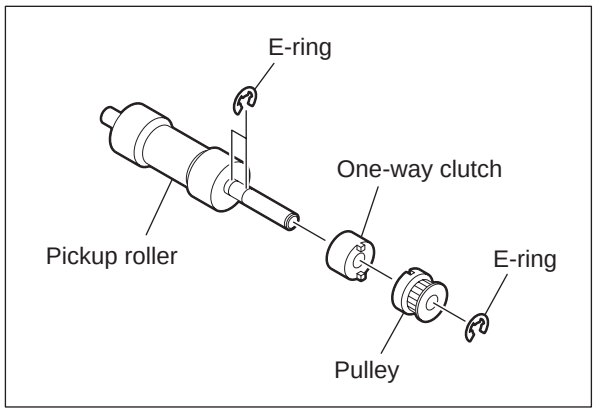


Fig. 10-44

[B-7] Drawer feed clutch (CLT2/CLT3)

(1) Take off the drawer feeding unit (📖 P.10-19 "[B-1] Drawer feeding unit").
(2) Disconnect the connector and release the harness from the harness clamp.

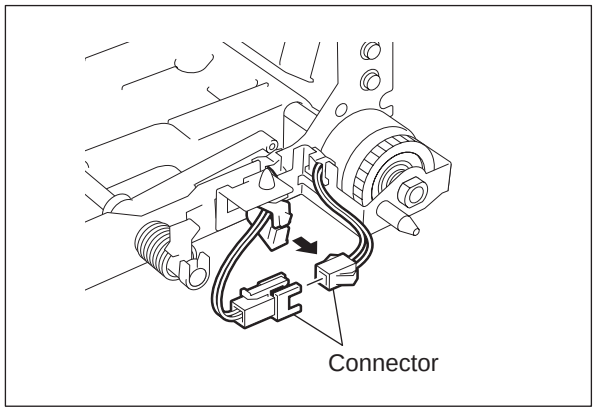


Fig. 10-45

(3) Remove 2 screws and take off the clutch bracket and bushing.

Note:
Match the protruding portion of clutch with the position shown in the figure for assembling

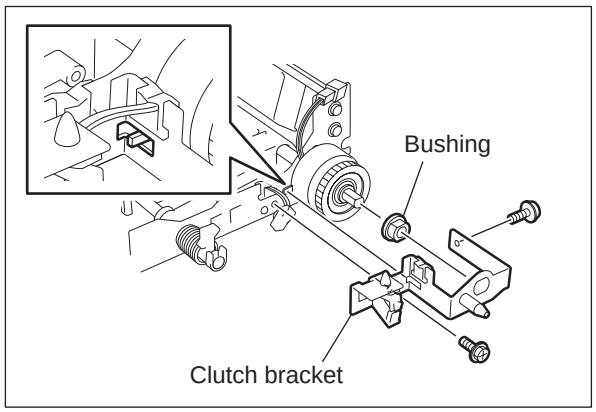


Fig. 10-46

(4) Loosen 1 setscrew and take off the drawer feed clutch.

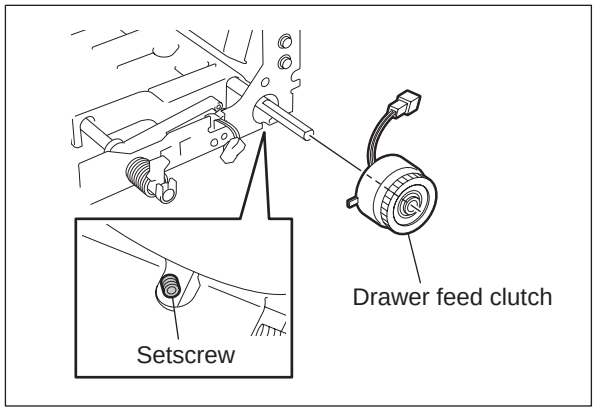


Fig. 10-47

Note:
Attach the clutch to the shaft referring to the figure at right.

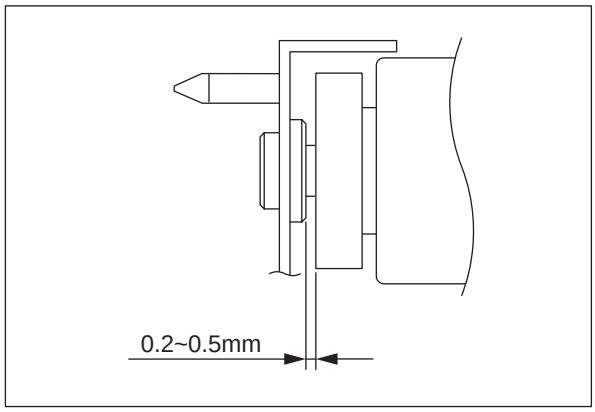


Fig. 10-48

[C] Tray drive unit

[C-1] Tray-up motor (M10)

(1) Remove the upper and lower drawers.
(2) Take off the filter bracket (📖 P.2-41 "[K] FIL board (FIL)").
(3) Disconnect 1 connector. Remove 4 screws and take off the tray drive unit.

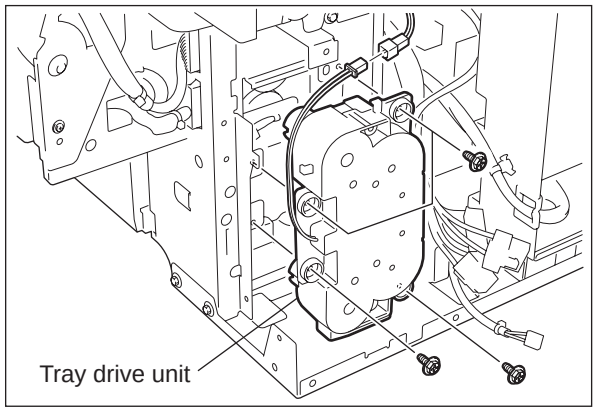


Fig. 10-49

(4) Place the unit with its coupling up and release 6 latches to take off the cover.

Note:
Be careful in taking off the cover because there is a spring in the tray drive unit.

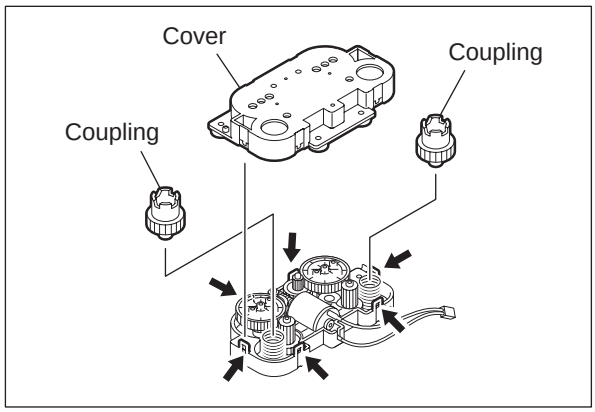


Fig. 10-50

(5) Take off the tray-up motor.

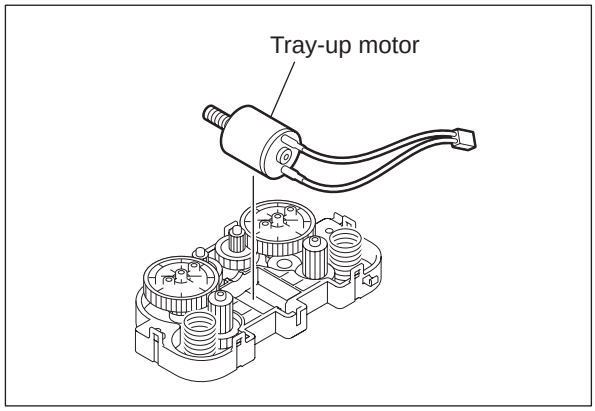


Fig. 10-51

Note:
Match the boss of the gear with the hole of the cover when installing the motor.

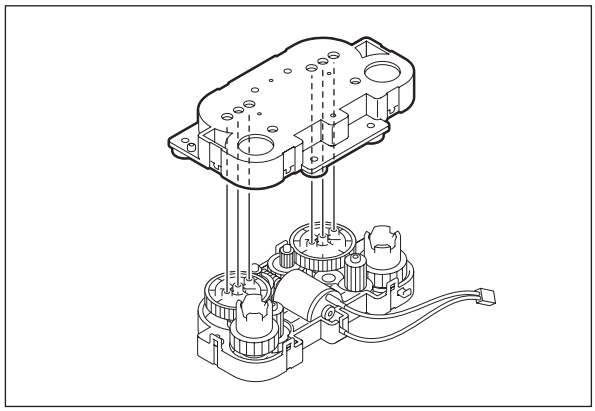


Fig. 10-52

[C-2] Tray drive unit

(1) Remove the upper and lower drawers.
(2) Take off the filter bracket (📖 P.2-41 "[K] FIL board (FIL)").
(3) Disconnect 1 connector. Remove 4 screws and take off the tray drive unit with the bracket.

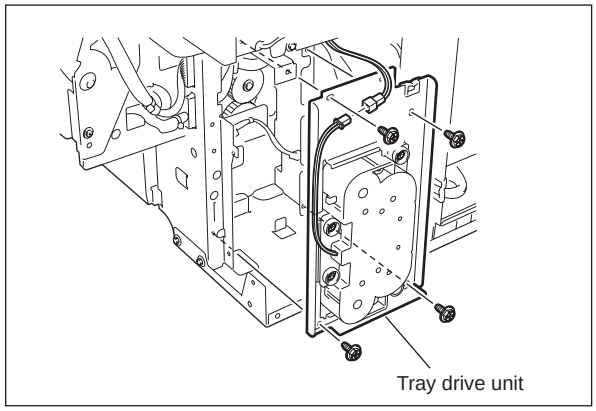


Fig. 10-53

[D] Transport clutch

[D-1] Lower transport clutch (High speed) (CLT16)

(1) Take off the tray drive unit with the bracket (📖 P.10-25 "[C-2] Tray drive unit").
(2) Remove 3 screws and take off the bracket.

Notes:
1. Do not push the transport roller shaft strongly when installing the bracket and tighten the screws in the order of A, B and C.
2. When the installation is finished, open the side cover and check if the transport roller rotates smoothly.

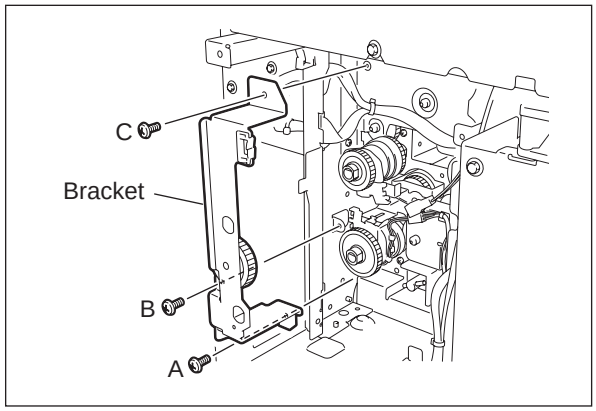


Fig. 10-54

(3) Disconnect 1 connector and take off the lower transport clutch (High speed).

Notes:
1. Hook the harness of the clutch onto the harness holder. Be sure that the harness is not tightened extremely.
2. When the clutch is being installed, be sure that the stoppers of the clutch and harness holder are placed at the right positions.

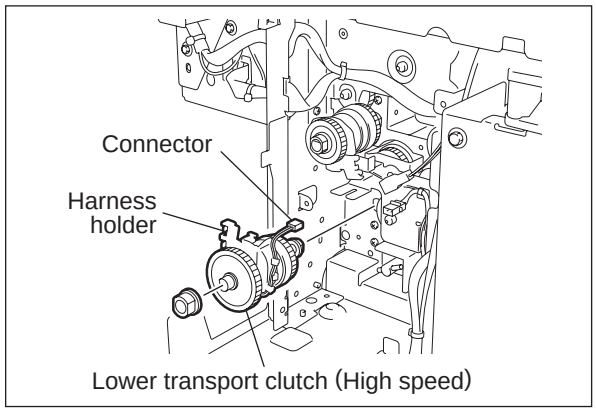


Fig. 10-55

[D-2] Lower transport clutch (Low speed) (CLT15)

(1) Take off the tray drive unit with the bracket (📖 P.10-25 "[C-2] Tray drive unit").
(2) Remove 3 screws and take off the bracket.

Notes:
1. Do not push the transport roller shaft strongly when installing the bracket and tighten the screws in the order of A, B and C.
2. When the installation is finished, open the side cover and check if the transport roller rotates smoothly.

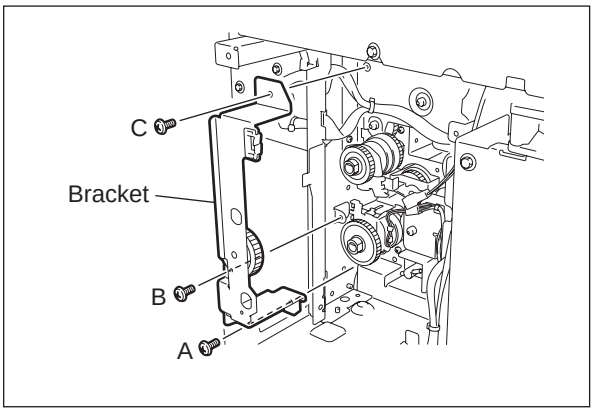


Fig. 10-56

(3) Take off the paper feed guide assembly (📖 P.10-27 "[F] Paper feed guide assembly").
(4) Remove 1 clip from the transport roller. Slide the transport roller to the rear side and remove it from the bushing on the front side. Then pull out the roller slantwise to the front side.

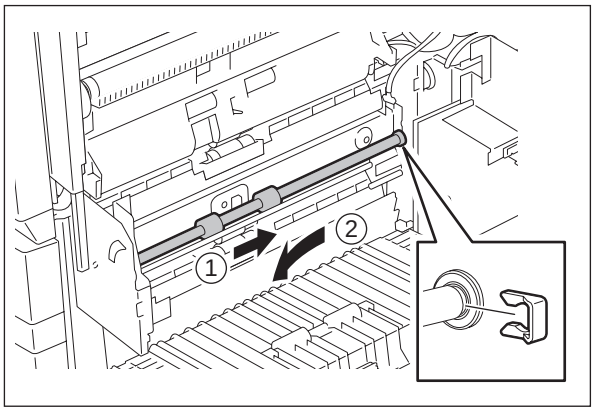


Fig. 10-57

(5) Disconnect 1 connector and take off the lower transport clutch (low speed).

Notes:
1. Hook the harness of the clutch onto the harness holder. Be sure that the harness is not tightened extremely.
2. When the clutch is being installed, be sure that the stoppers of the clutch and harness holder are placed at the right positions.

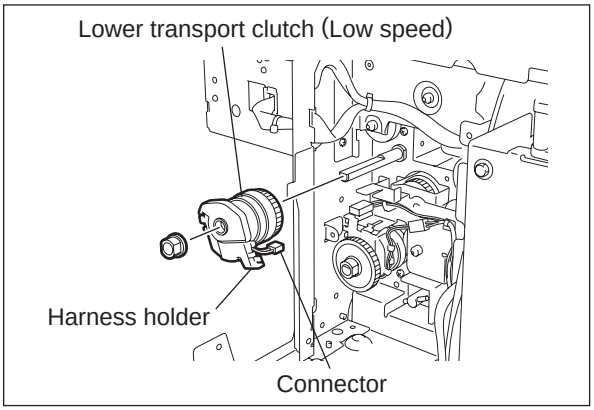


Fig. 10-58

[E] Pre-registration guide (Paper dust removal brush)

(1) Open the second transfer unit.
(2) Pull the knob and take off the pre-registration guide.

Note:
When taking off the pre-registration guide, pay attention not to drop the removed paper dust from the brush into the inside of the equipment.

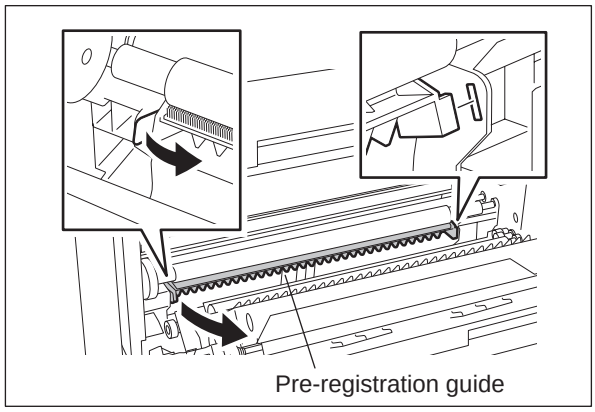


Fig. 10-59

[F] Paper feed guide assembly

(1) Take off the 2nd transfer unit
(📖 P.14-16 "[J] 2nd transfer unit").
(2) Remove 1 screw and take off the gear cover.

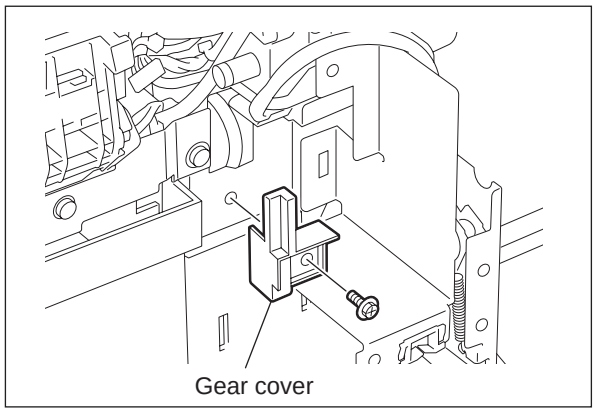


Fig. 10-60

(3) Open the side cover.
(4) Remove 6 screws and take off the stay.

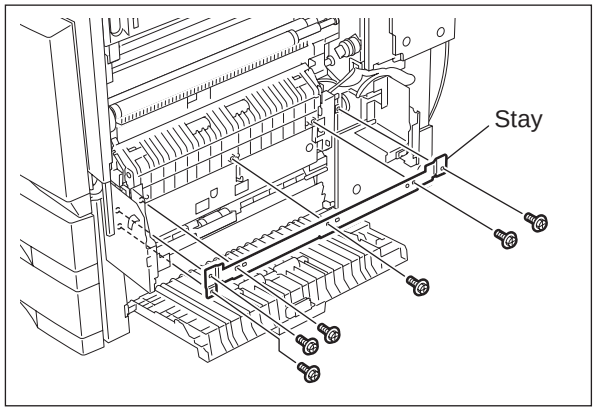


Fig. 10-61

(5) Release the cable from 3 hooks.
(6) Remove 3 screws and take off the paper feed guide assembly by sliding it to the rear side.

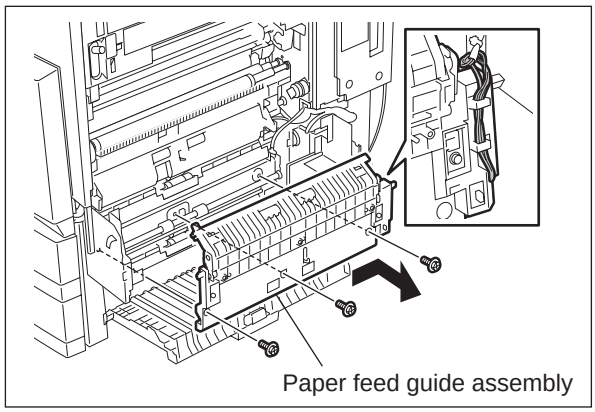


Fig. 10-62

[G] Registration guide

(1) Take off the pre-registration guide (📖 P.10-27 "[E] Pre-registration guide (Paper dust removal brush)").
(2) Take off the knob.

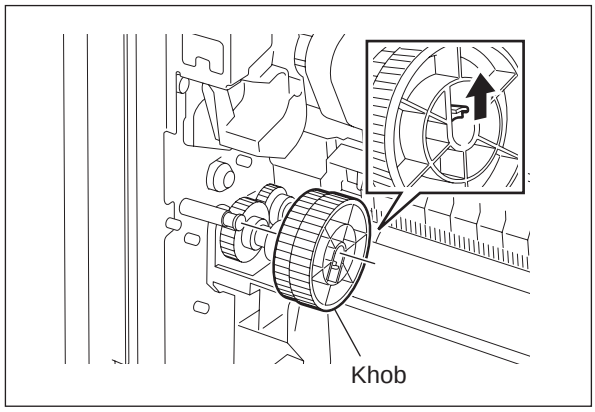


Fig. 10-63

(3) Take off the paper feed guide assembly (📖 P.10-27 "[F] Paper feed guide assembly").
(4) Remove 3 screws and take off the registration guide while lifting it up.

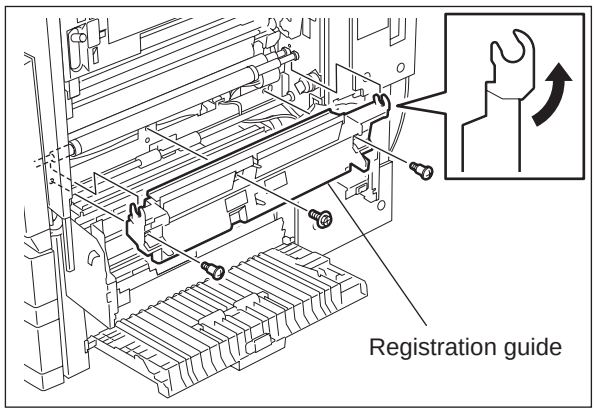


Fig. 10-64

[H] Lower drawer feed sensor (S24)

(1) Take off the paper feed guide assembly (P.10-27 "[F] Paper feed guide assembly").
(2) Remove the sticker and disconnect 1 connector. Release 2 latches and take off the lower drawer feed sensor.

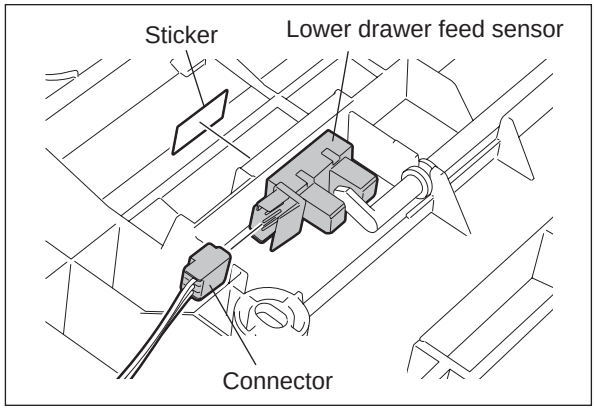


Fig. 10-65

[I] Side cover opening/closing switch (S44)

(1) Take off the paper feed guide assembly (P.10-27 "[F] Paper feed guide assembly").
(2) Disconnect 1 connector, release 2 latches, and take off the side cover opening/closing switch.

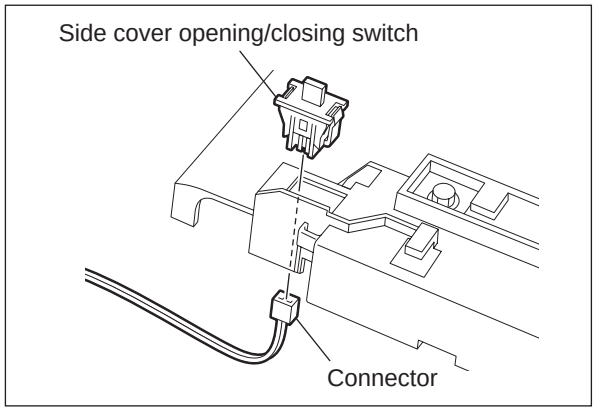


Fig. 10-66

[J] Upper drawer feed sensor (S23)

(1) Take off the registration guide (P.10-28 "[G] Registration guide").
(2) Remove 1 screw and take off the bracket.
(3) Remove the sticker and disconnect 1 connector. Release 2 latches and take off the upper drawer feed sensor.

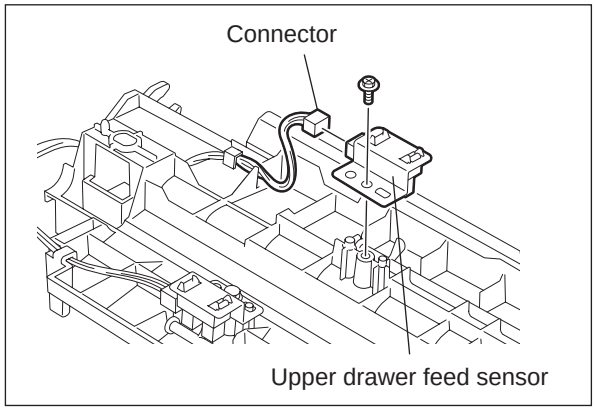


Fig. 10-67

[K] Registration sensor (S22)

(1) Take off the registration guide (📖 P.10-28 "[G] Registration guide").
(2) Remove 1 screw and take off the bracket.
(3) Remove the sticker and disconnect 1 connector. Release 2 latches and take off the registration sensor.

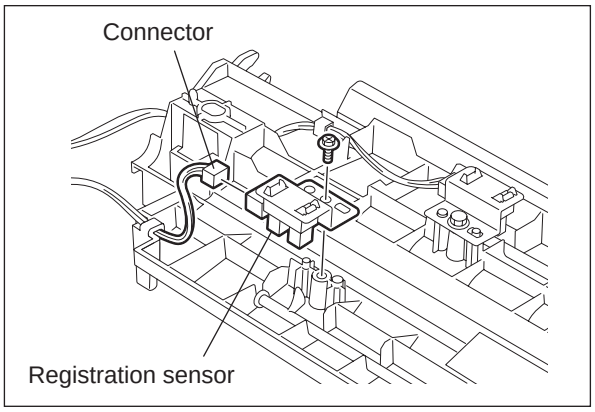


Fig. 10-68

[L] Registration roller

(1) Take off the front right cover (📖 P.2-28 "[J] Front right cover").
(2) Take off the registration guide (📖 P.10-28 "[G] Registration guide").
(3) Remove 2 screws and take off the bracket.

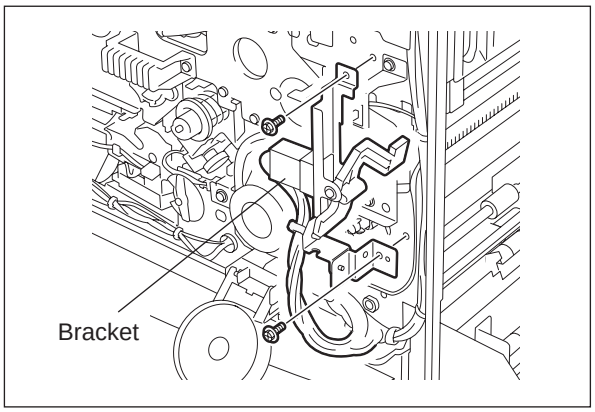


Fig. 10-69

(4) Remove 1 screw and take off the cover.

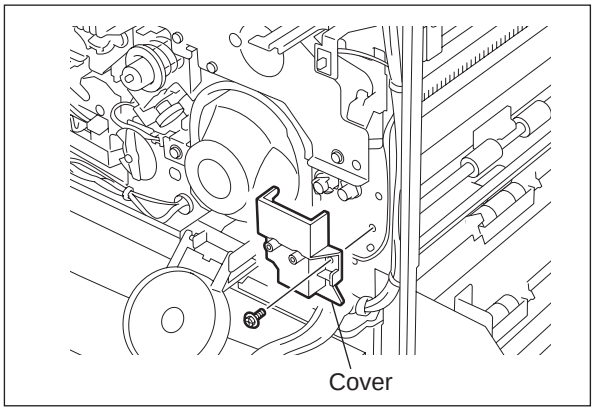


Fig. 10-70

(5) Take off the transport motor drive unit (P.9-14 "[E] Transport motor drive unit").
(6) Remove 1 clip and 1 bushing each from the front and rear sides.
(7) Take off the registration roller (rubber roller) while sliding it to the rear side.

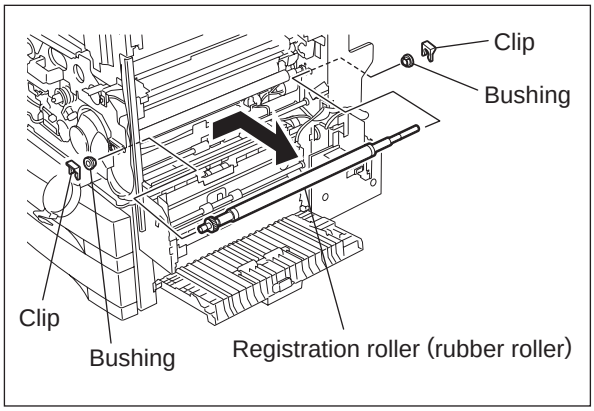


Fig. 10-71

(8) Remove 1 spring, 1 clip and 1 bushing each from the front and rear sides.
(9) Take off the registration roller (metal roller) while sliding it to the rear side.

Note:
When installing the springs, make sure not to mix up the front and rear side spring since they are different. The rear side spring is marked in black.

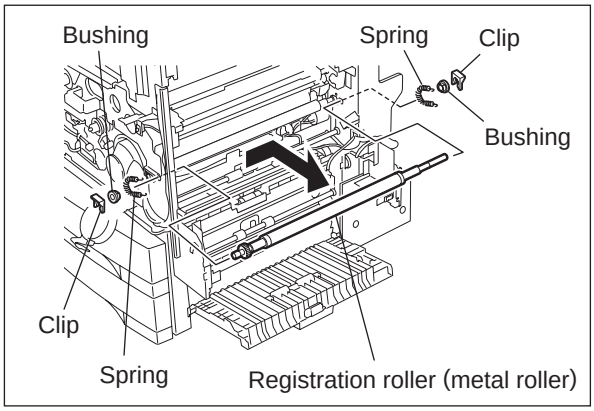


Fig. 10-72

[M] Intermediate guide (Paper dust removal brush)

(1) Loosen 1 screw and take off the intermediate guide by sliding to the rear side.

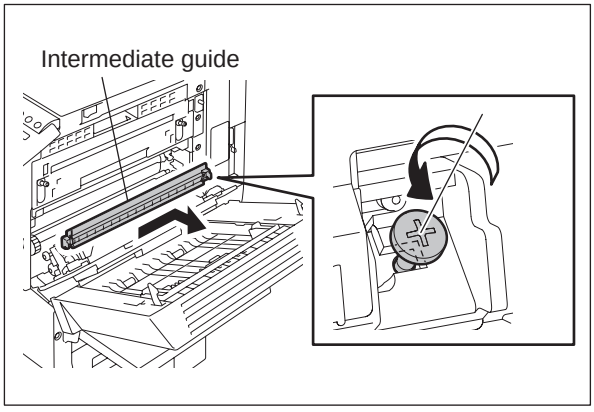


Fig. 10-73

Notes:

1. When the intermediate guide is being installed, be sure that the guide is not getting on the boss A.
2. Hook the center latch of the intermediate guide securely.

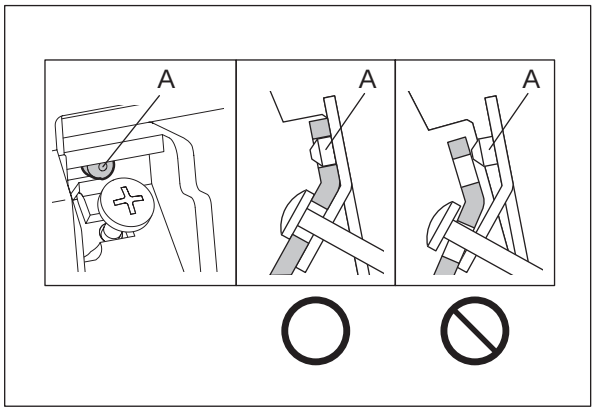


Fig. 10-74

11. DRUM RELATED SECTION

11.1 General Description

This chapter explains about the area around the drum, drum itself, image processing, their parts and control circuits.

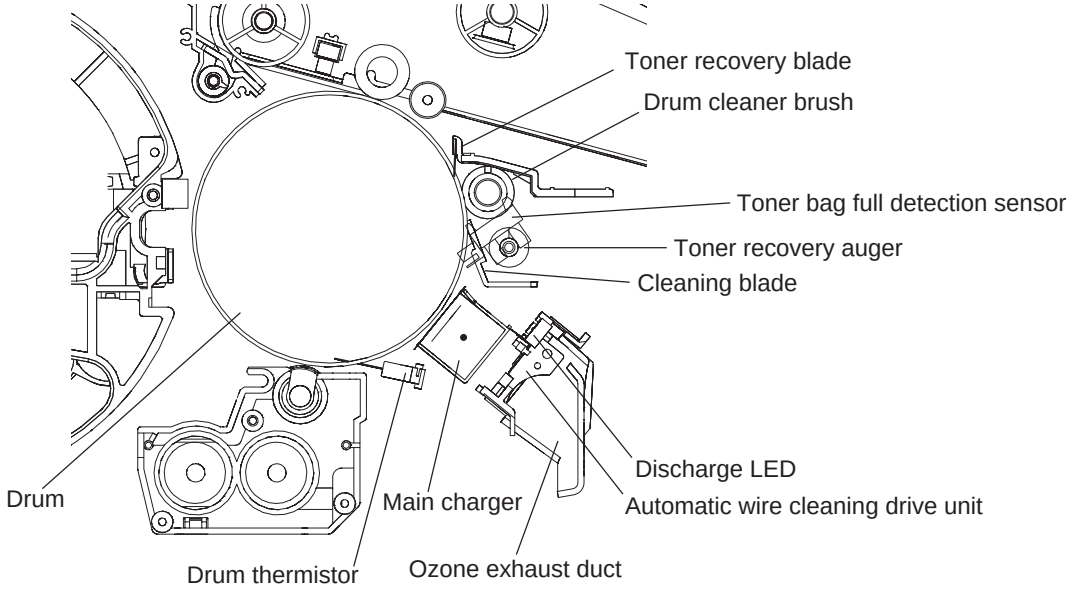


Fig. 11-1

11.2 Construction

Drum cleaner unit		
Drum		PM parts
Drum thermistor (THM4)		
Main charger unit	Main charger grid	PM parts
	Charger wire	PM parts
	Wire pad	PM parts
Cleaning blade		PM parts
Recovery blade		
Toner recovery auger		
Drum cleaning brush		PM parts
Discharge LED unit		
Discharge LED		
Ozone exhaust duct		
Automatic wire cleaning drive unit	Charger cleaner motor (M13)	
	Charger cleaner front position detection switch (S25)	
	Charger cleaner rear position detection switch (S26)	
Temperature/Humidity sensor (S19)		
Ozone filter		PM parts
Ozone exhaust fan (M18)		
Toner bag		PM parts
Toner bag full detection sensor (S20)		
High-voltage transformer		
Image quality sensor (S17)		Chapter 15

Note:
Drum cleaner unit is the process unit with the transfer belt unit removed.

11.3 Functions

1) Drum
   Drum is made of a cylindrical aluminum base coated with thin film of organic photoconductive substance.
   Photoconductive object becomes insulative (high electrical resistance) when it is not exposed to lights and becomes conductive (low electrical resistance) when it is exposed to lights. This object is called photoconductor.

2) Main charger
   Main charger consists of a metal rod case having insulated blocks at the both ends with the charger wire attached and the grid is set between them.
   When high voltage is applied to the charger wire, the surrounding air is charged (ionized). Then a flow of the ionized air into the drum applies the drum a charge as well. This phenomenon is called “corona discharge” and a control bias is applied to the grid to control the charging amount. Negative charge caused by the corona discharge is applied to the drum surface evenly in dark places.
   Charger wire is equipped with an automatic wire cleaner to clean the wire.

3) Drum thermistor (THM4)
   Since the photoconductive characteristic of the drum surface changes depending on the temperature of the drum surface, the drum thermistor detects the temperature of the drum surface and controls to gain the charging potential according to the environment.

4) Drum cleaner
   - Cleaning blade
     This blade is pressed against the drum surface with a constant force by pressure springs, and scrapes off the residual toner on the drum surface. Also it removes the positive charge on the photoconductive drum by applying negative charge on the blade.
   - Recovery blade
     This blade catches the toner scraped off by the cleaning blade.
   - Toner recovery auger
     This auger carries the residual toner scraped off to the toner bag.
   - Drum cleaner brush
     This brush roller prevents the residual toner and foreign matter adhering to the drum surface.

5) Discharge LED (ERS)
   Discharge is a process to decrease or eliminate the static electricity on the drum surface.
   The electrical resistance of the photosensitive layer is decreased by the light, and the residual charge on the drum surface is neutralized and eliminated (cleaned). Electrical potential of the drum surface is fixed to a certain amount before the drum is charged.

6) Toner bag
   This collects the residual toner scraped off on the drum surface by the cleaning blade and residual toner scraped off on the transfer belt by the transfer belt cleaning blade.

7) Toner bag full detection sensor (S20)
   The sensor detects the toner bag full when it is pushed by the toner recovery auger in the cleaner which is given a pressure from the used toner in the toner bag.
   “Toner bag full” is determined when the toner bag full detection sensors (S20) detects full of toner. Printing is interrupted upon the detection of “Toner bag full” status, however, the paper already fed is subject to be printed and exited. When the sensor is in trouble, “Toner bag full” is determined instead of “Call for service”. If “Toner bag full” status is not cleared, the sensor, harnesses and LGC board need to be checked.

8) High-voltage transformer
A circuit generates the output control voltage Vc of the main charger bias, main charger grid bias, 1st transfer roller bias, 2nd transfer roller bias, black developer bias, color developer bias and cleaning blade bias.

9) Temperature/humidity sensor (S19)
This sensor measures the environment inside the equipment. The values of the temperature and humidity detected inside the equipment are output to the LGC board.

11.4 Output Control Circuits of High-Voltage Transformer

- Outputs adjustment value of the main charger, transfer charger, and developer biases in the NVRAM to the gate array.
  ↓
- Outputs control voltage data from the gate array to the D/A converter.
  ↓
- Analog conversion by the D/A converter.
  ↓
- Outputs control voltage Vc to the main charger grid bias, 1st transfer roller bias, 2nd transfer roller bias, color developer bias and black developer bias transformer.
  ↓
- The main charger bias, 1st transfer roller bias, 2nd transfer roller bias, color developer bias and black developer bias transformers generate output current or voltage proportional to the control voltage Vc with the output ON signal.
  * Adjustment of the control voltage Vc (change of adjustment data) is performed in the Adjustment Mode (05).
  * Output value of the cleaning blade bias is fixed when the transformer board is shipped from the factory.
  * The output of the 1st transfer roller bias can be switched to that of the constant voltage or current with the switching signal. (It normally switched to the output of the constant voltage in printing.)

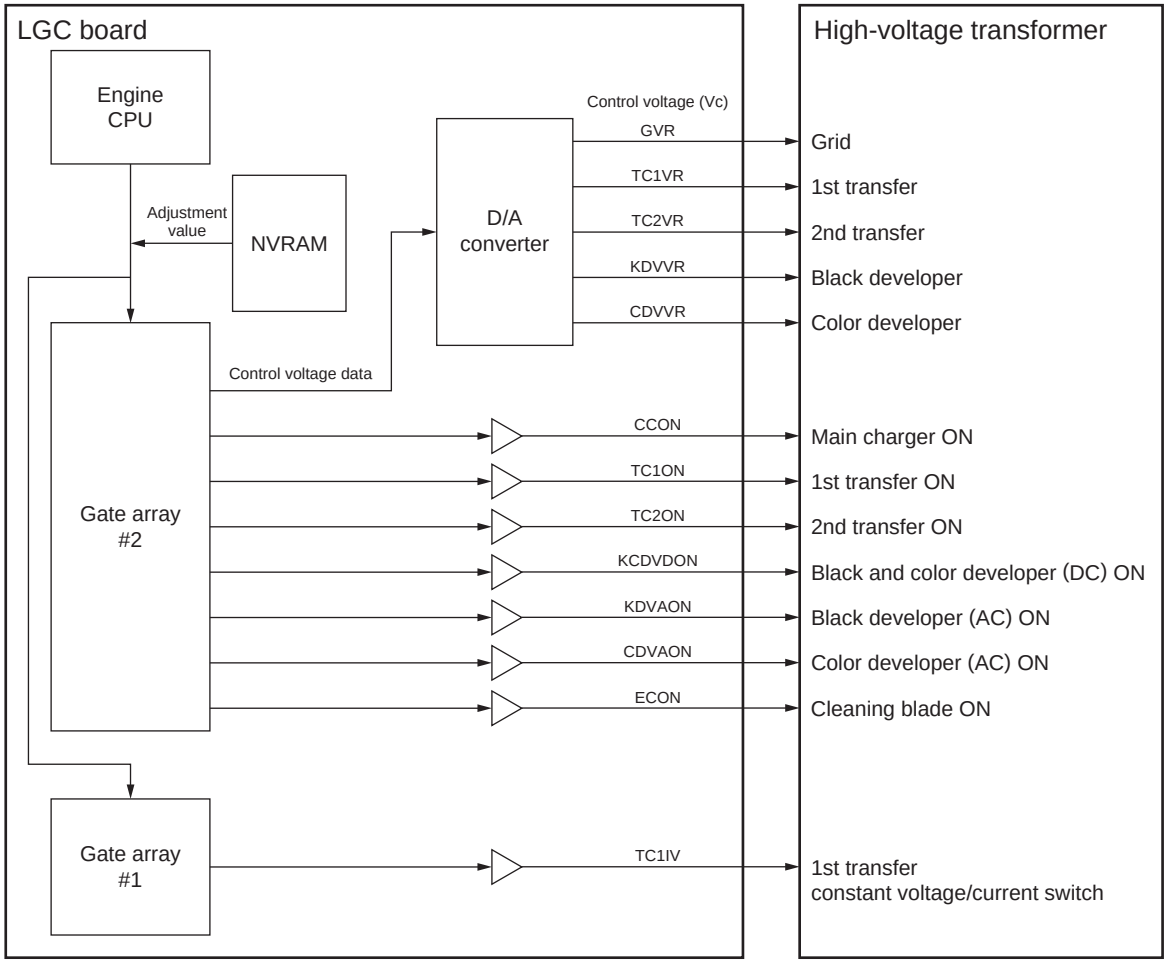


Fig. 11-2

11.5 Drum Temperature Detection Circuit

1) Purpose of the drum temperature detection circuit
   Since the photoconductive characteristic of the drum surface varies drastically depending on the surface temperature of the drum, this circuit detects the temperature of the drum surface to gain the charging potential according to the environment.

2) Configuration of the drum temperature detection circuit

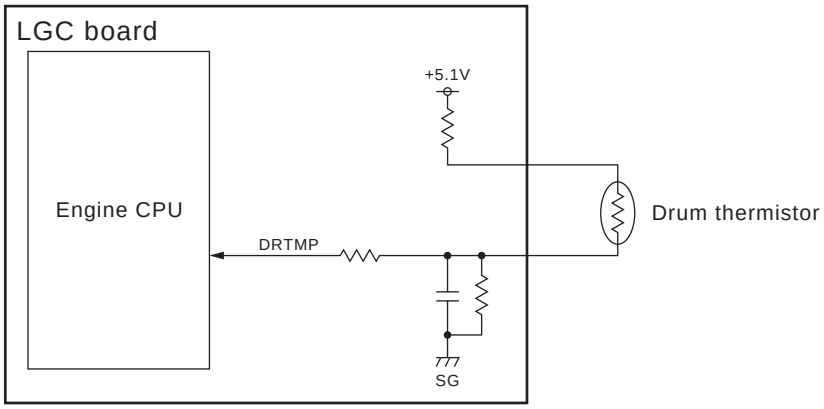


Fig. 11-3

11.6 Temperature/Humidity Sensor (S19)

11.6.1 General description

This sensor measures the temperature and humidity inside the equipment.

11.6.2 Construction

Temperature/humidity control circuit is configured as follows:

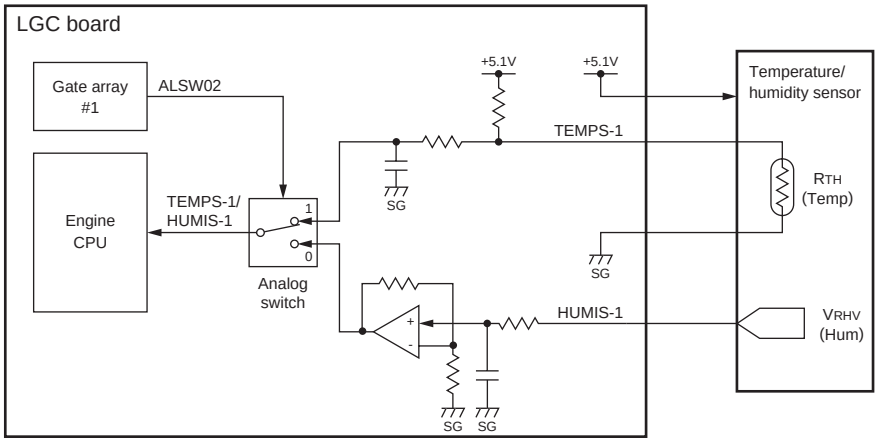


Fig. 11-4

11

11.7 Charger Wire Cleaner

11.7.1 Operation

This equipment includes an automatic cleaning function with a motor drive to automatically clean off the toner adhered on the charger wire. The drive from charger cleaner motor (M13) is transmitted to the wire cleaner through the timing belt and the wire cleaner contacted by the charger wire shuttles between the both ends of charger wire. The waiting position (home position) of the wire cleaner is at the front side. The wire cleaner and charger wire are not contacted each other at the waiting position.

The cleaning movement is performed in the cases as follows:

1) When the power is turned ON
2) When recovered from the energy saving mode
3) When opening/closing the front cover
4) When the specified number of pages has been printed out (default value: 1,000 pages) from the last cleaning (If the number of pages has reached the setting value during continuous printing, the cleaning movement is performed upon the completion of this printing job.)

11.7.2 Construction

1) Charger cleaner motor (M13)
   This motor is a DC brush motor and supplies the drive to the wire cleaner. When the motor rotates in reverse, the wire cleaner shifts to the rear side. Also when the motor rotates normally, the wire cleaner shifts to the front side.

2) Charger cleaner front position detection switch (S25)
   This switch detects whether the wire cleaner has reached to the front position (home position) or not.The wire cleaner is always waited at this position except during cleaning movement.

3) Charger cleaner rear position detection switch (S26)
   This switch detects whether the wire cleaner has reached to the rear position or not. When this switch is turned ON, the charger cleaner motor (M13) rotates normally. Then the wire cleaner shifts to the front position (home position).

11.7.3 Drive circuit

The circuit configuration is as shown below.

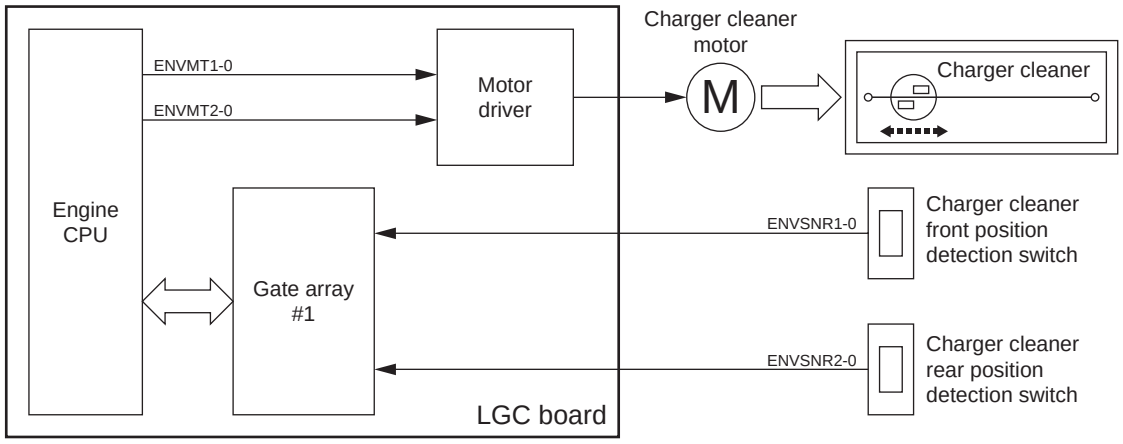


Fig. 11-5

Signal level of motor circuit

Signal	Motor			
	OFF	Reverse rotation	Normal rotation	Brake
ENVMT1-0 Wire cleaner drive signal-1	L	L	H	H
ENVMT2-0 Wire cleaner drive signal-2	L	H	L	H

Signal level of switching circuit

Signal	Level	
	L	H
ENVSNR1-0 Charger wire cleaner front position detection signal	Charger wire cleaner is at the front position	Charger wire cleaner is at the position other than the front position
ENVSNR2-0 Charger wire cleaner rear position detection signal	Charger wire cleaner is at the rear position	Charger wire cleaner is at the position other than the rear position

11.8 Disassembly and Replacement

[A] Toner bag PM

(1) Open the front cover and take off the toner bag.

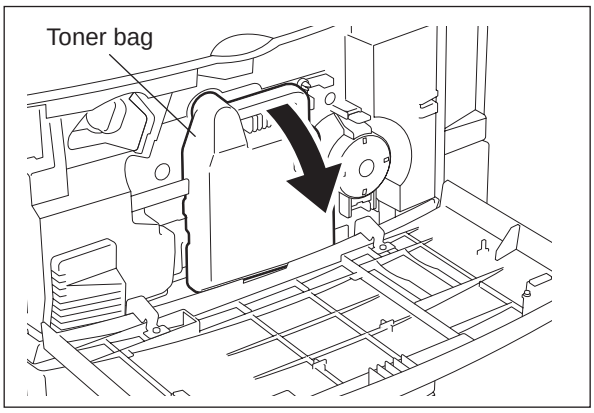


Fig. 11-6

[B] Process unit

(1) Take off the toner bag.
(📖 P.11-10 "[A] Toner bag")
(2) Take off the black developer unit cover.

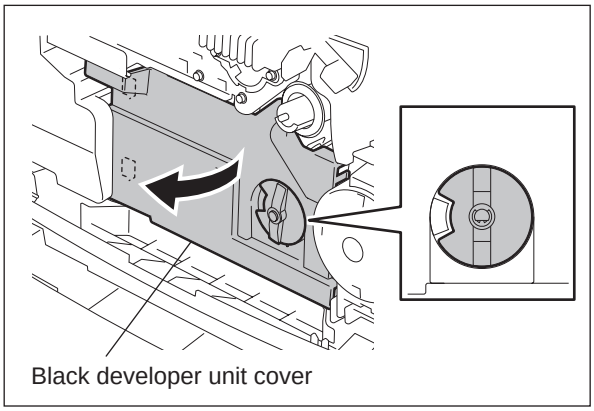


Fig. 11-7

(3) Open the toner cartridge holder. Then remove 2 screws and take off the center inner cover.

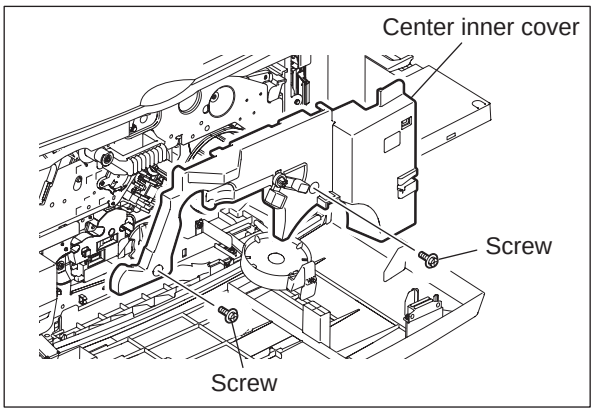


Fig. 11-8

(4) Remove 1 screw and lay down the interlock switch bracket completely toward you.

Note:
If the interlock switch bracket does not lie down completely, pull the harness a little and then try to lay it down.

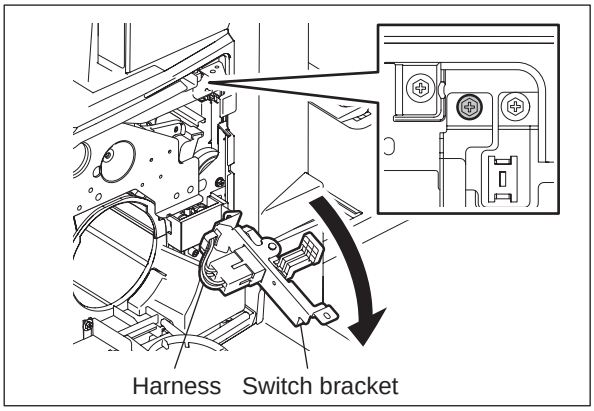


Fig. 11-9

(5) Disconnect 3 connectors and remove 2 screws.

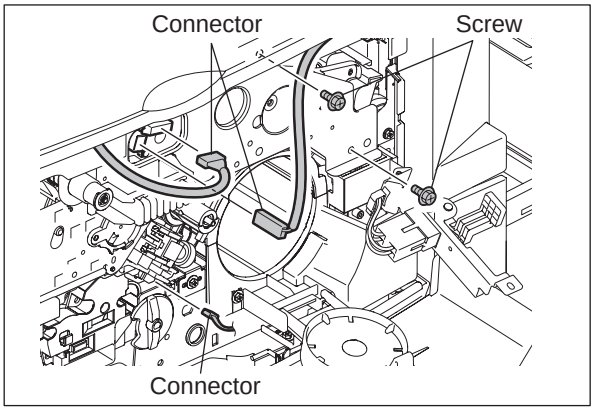


Fig. 11-10

(6) Loosen 2 screws and take off the process unit by pulling it toward you.

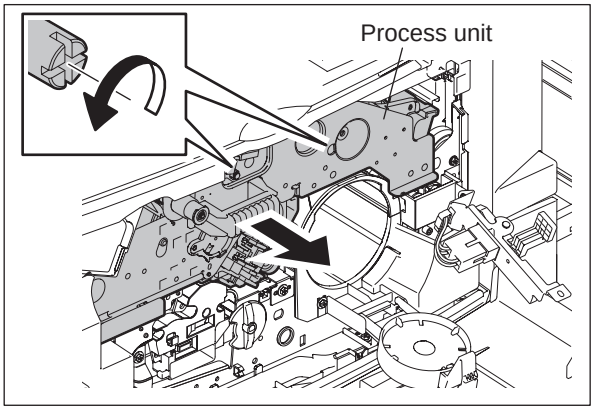


Fig. 11-11

Note:

Hold A, B, C and D as shown in the right-hand figure when handling the process unit.

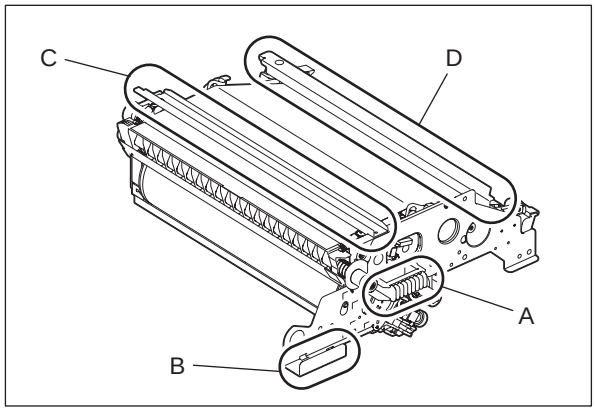


Fig. 11-12

Note:

At the installation of the process unit, if it cannot be fully inserted, the couplings which transmit driving force to the transfer belt may be interfering with the unit. Perform the following check, and then install the process unit again.

1. Rotate the transfer belt drive couplings on the rear frame of the equipment counterclockwise by 180 degrees.

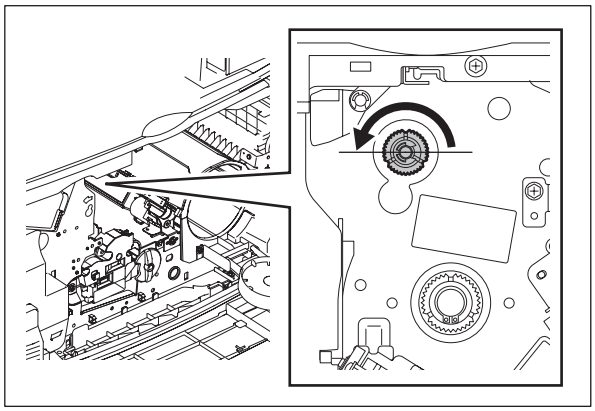


Fig. 11-13

2. Push all of the 3 transfer belt drive couplings on the rear frame to the inside, and check if they have slid back to their original position.

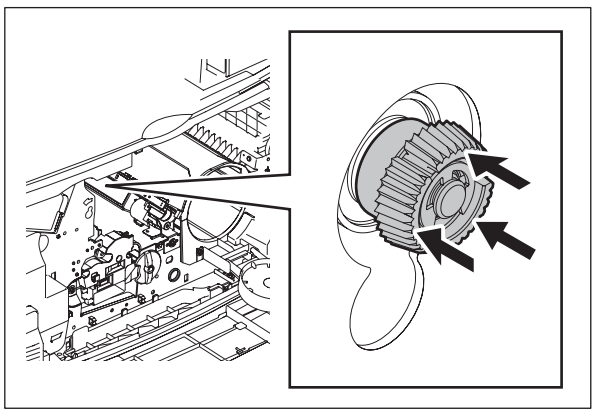


Fig. 11-14

3. Push all of the 3 transfer belt drive couplings on the rear frame toward the center of the shaft, and check if these couplings are engaged with the shaft correctly.

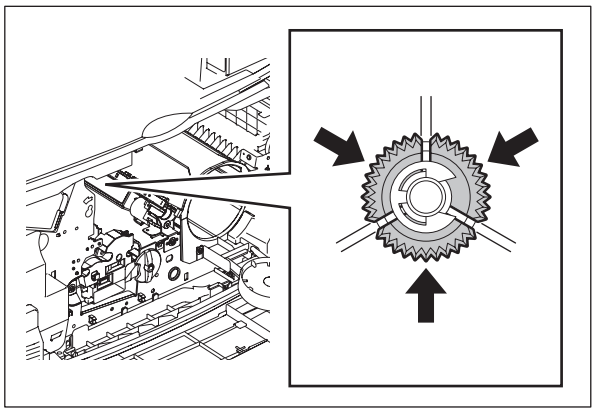


Fig. 11-15

4. Check if there is any breakage, deformation or looseness of the transfer belt drive couplings on the transfer belt unit.

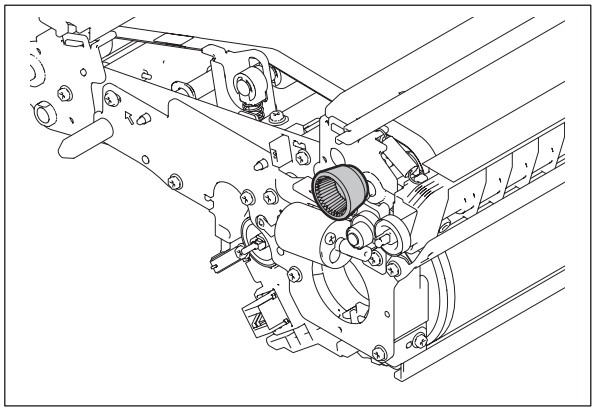


Fig. 11-16

[C] Drum PM

(1) Take off the process unit (📖 P.11-10 "[B] Process unit").
(2) Take off the main charger unit (📖 P.11-15 "[D] Main charger unit").
(3) Remove 1 screw on the front side and 1 screw on the rear side. Then loosen 1 screw on the front side and disconnect 1 connector.

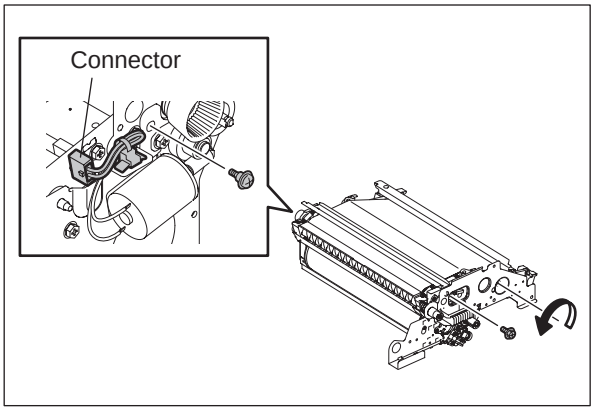


Fig. 11-17

(4) Lift up the transfer belt unit and insert the screw removed in step (3) into the screw hole on the front side.

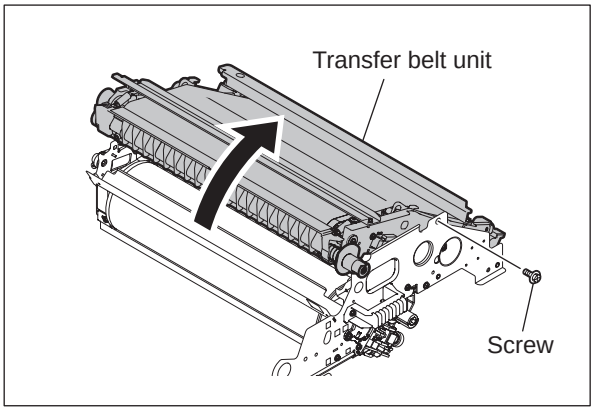


Fig. 11-18

(5) Loosen 1 screw and take off the drum stay.

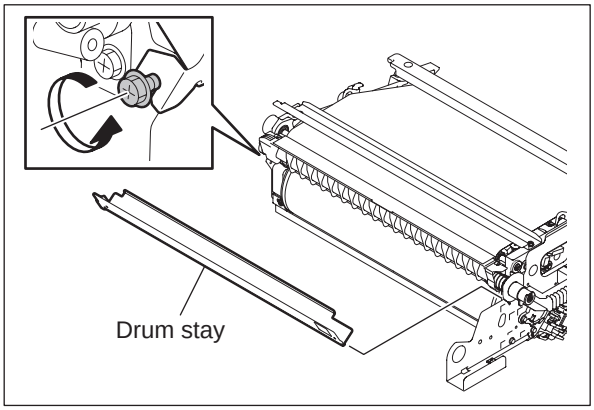


Fig. 11-19

(6) Remove 2 screws and take off the bushing of the drum.

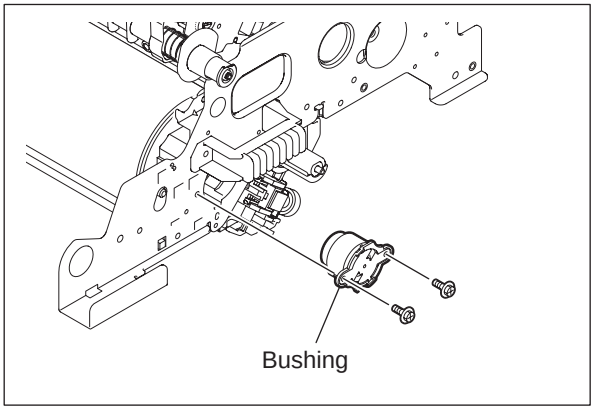


Fig. 11-20

(7) Take off the drum.

Notes:

1. Be sure not to touch, spit or scratch on the drum surface.
2. Avoid a direct sunlight onto the drum. Move it to a dark place as soon as it is taken off.
3. Be sure not to touch the drum thermistor.
4. Be sure not to touch or scratch the edge of the cleaning blade.

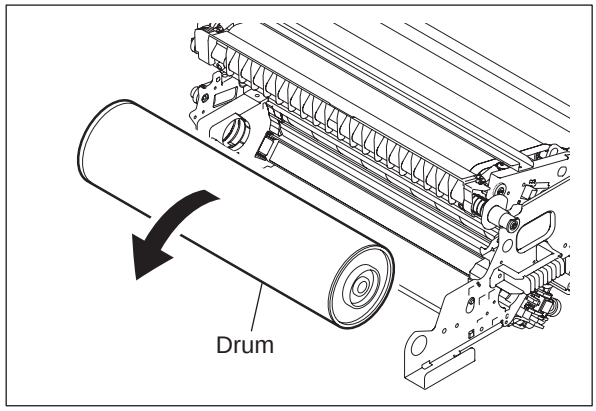


Fig. 11-21

[D] Main charger unit

(1) Take off the process unit
(📖 P.11-10 "[B] Process unit").
(2) Rotate the gear counterclockwise for 1 round or more.
(3) Release 2 latches and take off the main charger unit.

Note:

Be sure not to touch or damage the drum surface.

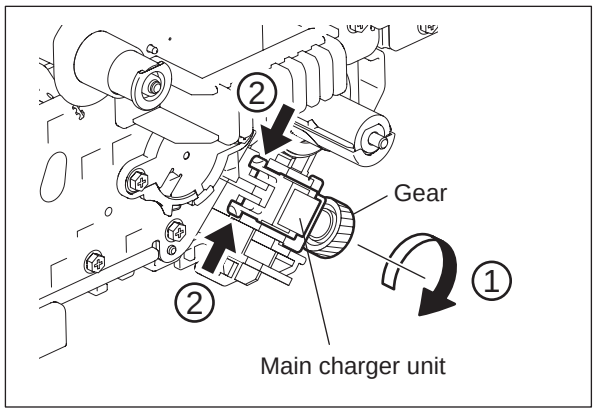


Fig. 11-22

Note:

When the main charger unit is being installed, rotate the gear counterclockwise for 1 round or more and install it while the holder arm is being pulled completely inside.

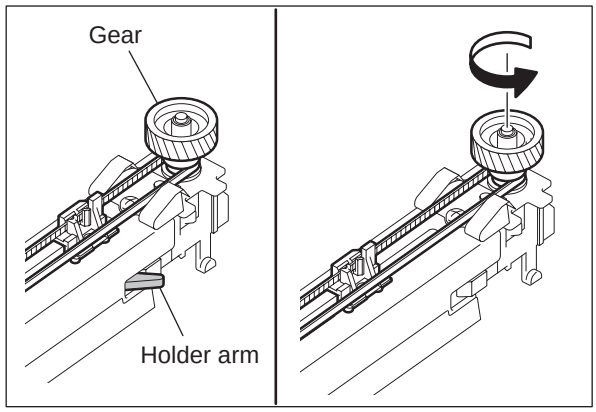


Fig. 11-23

[E] Main charger grid PM

(1) Take off the grid by pushing the terminal head on the front side.

Note:
Do not touch the mesh area of the grid.

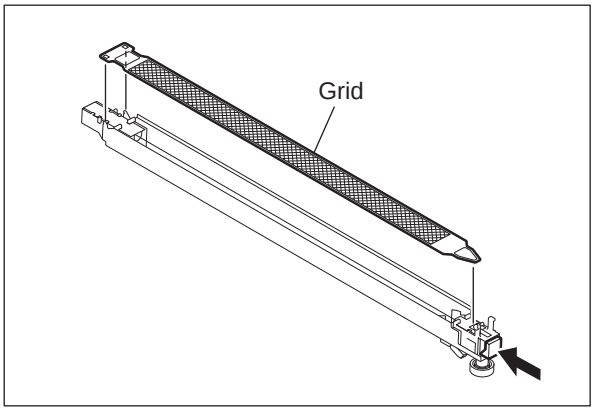


Fig. 11-24

[F] Charger wire PM

* Tungsten wire (length: 373 mm, diameter: 0.06 mm)

(1) Take off each terminal cover on both front and rear sides.

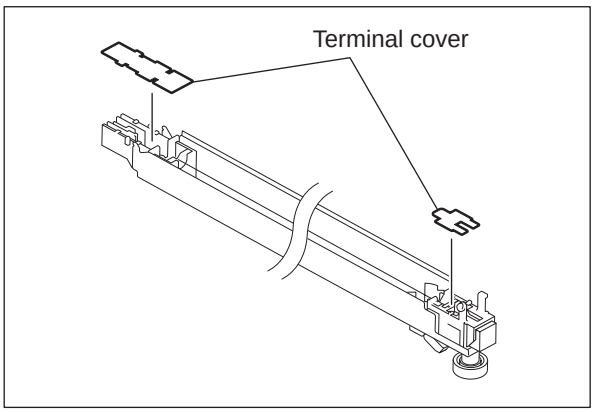


Fig. 11-25

(2) Take off 1 terminal and remove 1 spring. Then take off the charger wire.

Notes:
When the charger wire is being installed, pay attention to the following:

1. Insert the each edge of the wire securely into each V-groove on both front and rear sides.
2. Do not twist the wire.
3. Do not touch the wire directly with bare hands.

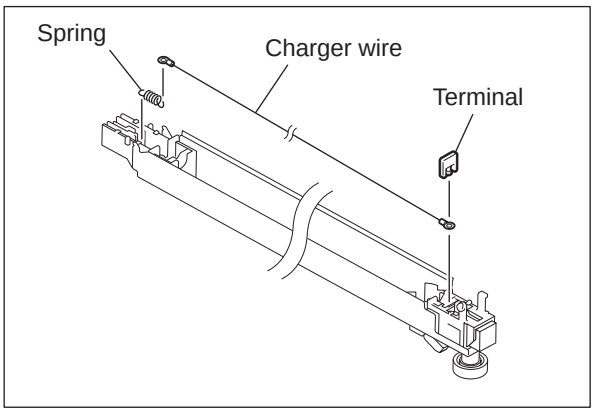


Fig. 11-26

[G] Wire pad PM

(1) Take off the charger wire
(📖 P.11-16 "[F] Charger wire").

Note:
When the wire pads are being installed, be sure that pads are installed in a proper direction.

(2) Release 1 latch and take off the wire pad.

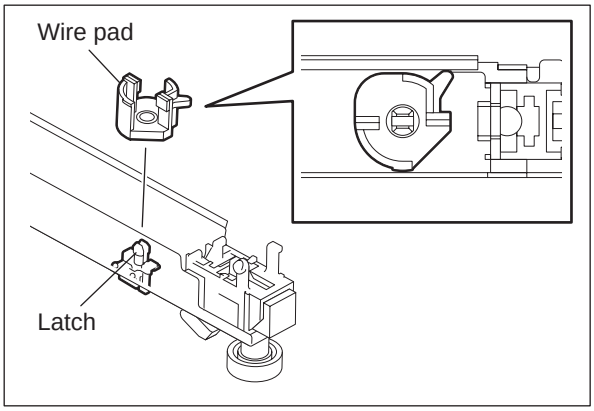


Fig. 11-27

(3) Remove 1 screw and take off the pad guide.

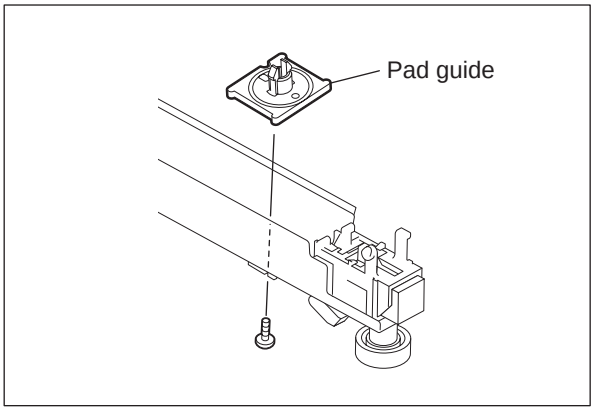


Fig. 11-28

(4) Take off the base.

Note:
When the base is being installed, be sure that the base and the belt are engaged in the same manner as they were before being taken off. It is recommended to mark off the position of each before they are taken off.

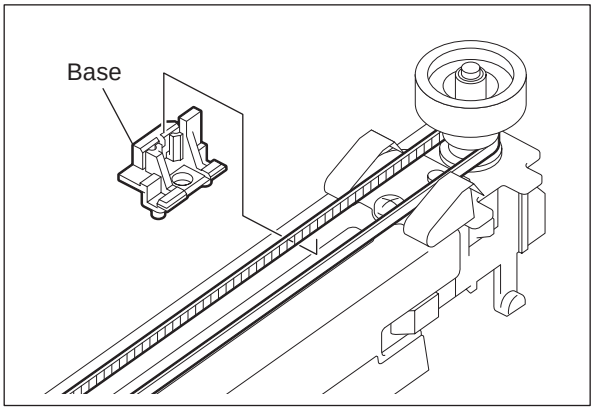


Fig. 11-29

[H] Drum cleaning blade PM

(1) Take off the transfer belt unit (📖 P.14-8 "[A] Transfer belt unit / Transfer belt cleaning unit").
(2) Take off the main charger unit (📖 P.11-15 "[D] Main charger unit"]).
(3) Take off the drum (📖 P.11-13 "[C] Drum").
(4) Remove 3 screws and take off the drum cleaning blade.

Note:
Be sure not to touch or scratch the edge of the cleaning blade.

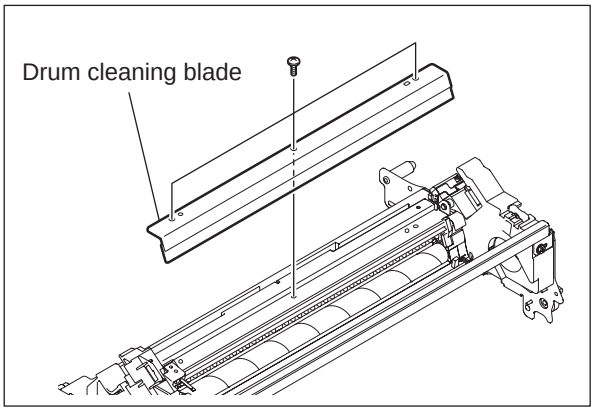


Fig. 11-30

[I] Recovery blade

(1) Take off the drum (📖 P.11-13 "[C] Drum").
(2) Take off the recovery blade.

Notes:
1. When the recovery blade is being attached, clean the attaching side of the cleaner side, and then attach the blade paying attention not to deform it.
2. Attach the recovery blade by pushing it to the step of the attaching part.
3. When the blade has been attached, press the attached part securely with your fingers so that it will not be removed.

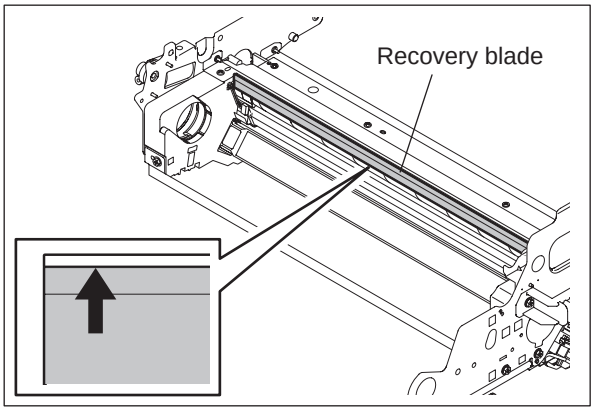


Fig. 11-31

[J] Drum cleaning brush PM

(1) Take off the drum cleaning blade (📖 P.11-18 "[H] Drum cleaning blade").
(2) Rotate the lever to unlock it, and then pull out the lever.

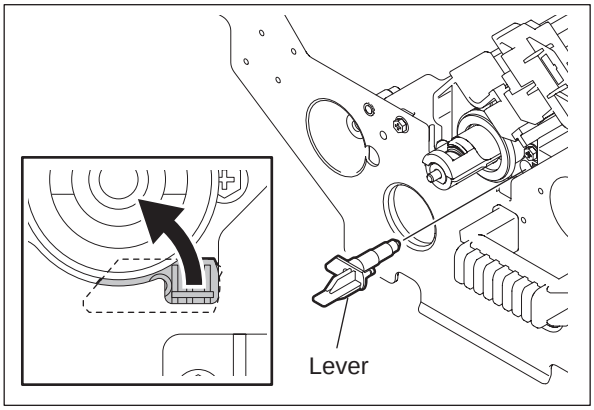


Fig. 11-32

(3) Take off the drum cleaner brush.

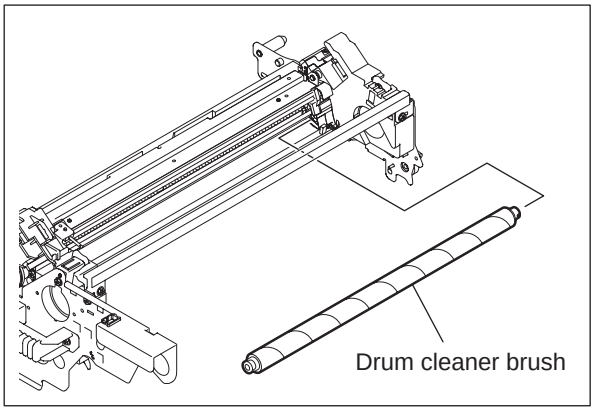


Fig. 11-33

[K] Drum thermistor (THM4)

(1) Take off the transfer belt unit (📖 P.14-8 "[A] Transfer belt unit / Transfer belt cleaning unit").
(2) Take off the drum (📖 P.11-13 "[C] Drum").
(3) Take off the main charger unit (📖 P.11-15 "[D] Main charger unit").
(4) Remove 1 screw and disconnect the connector. Then take off the drum thermistor with its bracket.

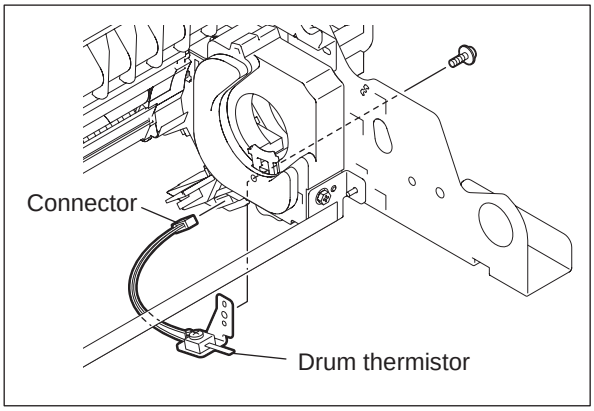


Fig. 11-34

(5) Remove 1 screw and take off the drum thermistor.

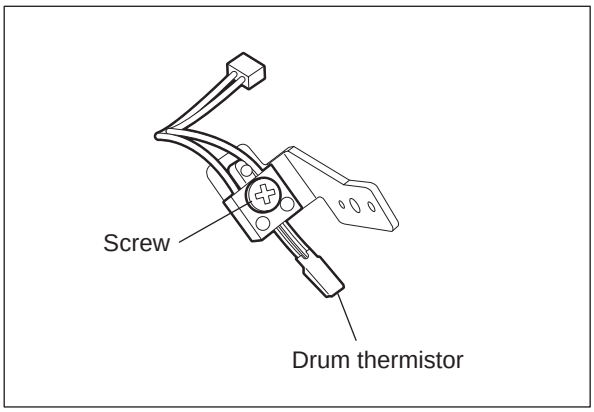


Fig. 11-35

[L] Discharge LED (ERS)

(1) Take off the process unit (📖 P.11-10 "[B] Process unit").
(2) Remove 2 screws and lift up the discharge LED unit.
(3) Disconnect 2 connectors and take off the discharge LED unit.

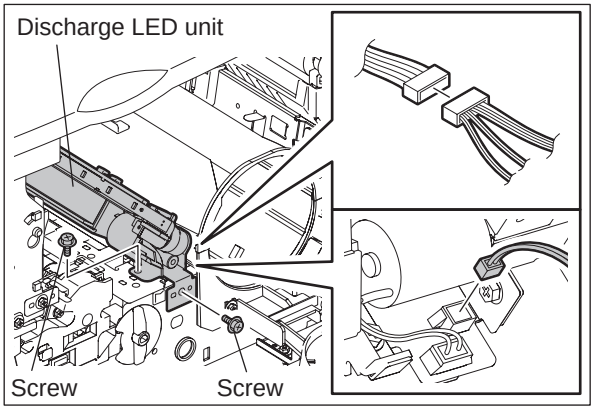


Fig. 11-36

(4) Disconnect 1 connector and take off the discharge LED.

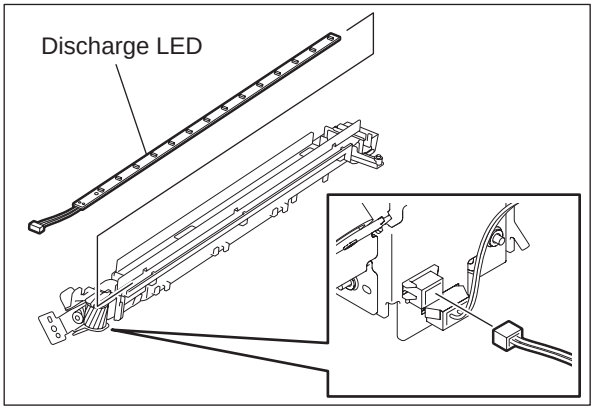


Fig. 11-37

[M] Charger cleaner motor (M13)

(1) Disconnect 2 connectors and remove 1 screw. Then take off the charger cleaner motor unit.

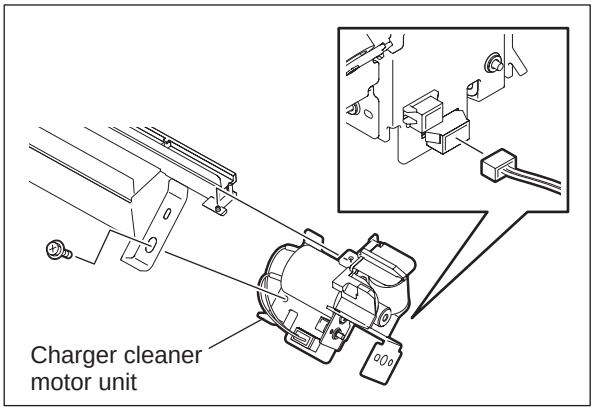


Fig. 11-38

(2) Remove 1 screw and take off the gear bracket.
Remove 1 screw and take off the motor guide.

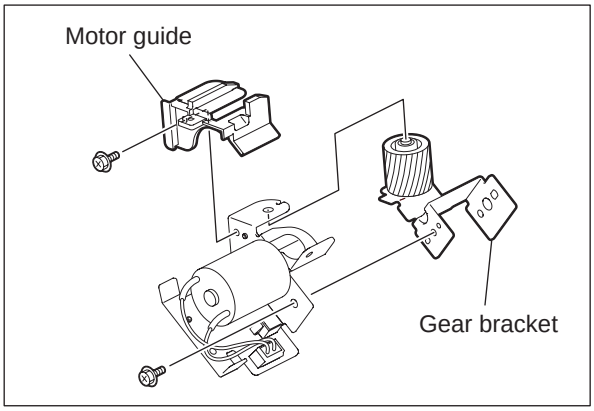


Fig. 11-39

(3) Disconnect 1 connector and remove 2 screws. Then take off the charger cleaner motor from the motor bracket by rotating it upward.

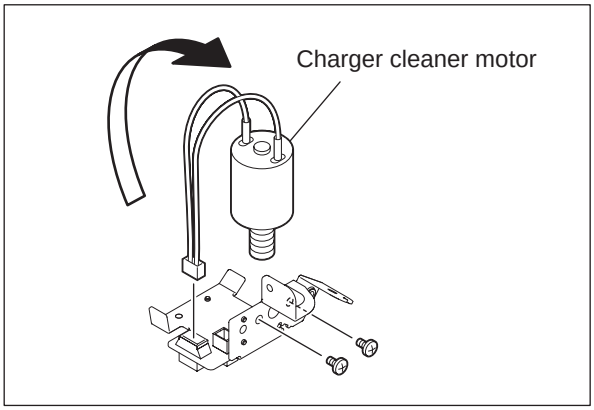


Fig. 11-40

[N] Charger cleaner position detection switch (S25/S26)

(1) Take off the discharge LED unit (📖 P.11-20 "[L] Discharge LED (ERS)").
(2) Remove 1 screw and separate the discharge LED unit into 2 sections.

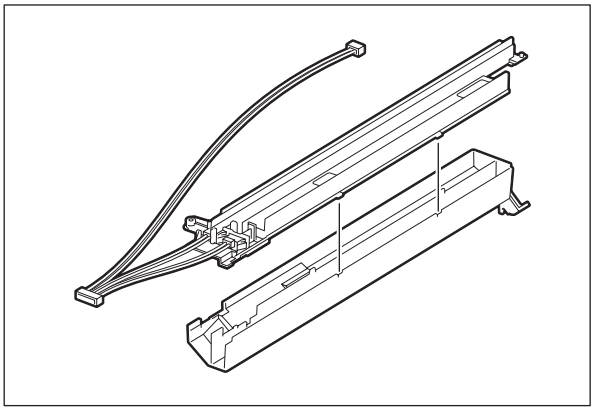


Fig. 11-41

(3) Release 2 latches and take off the front position switch arm.
(4) Remove 1 screw and take off the rear position switch arm.

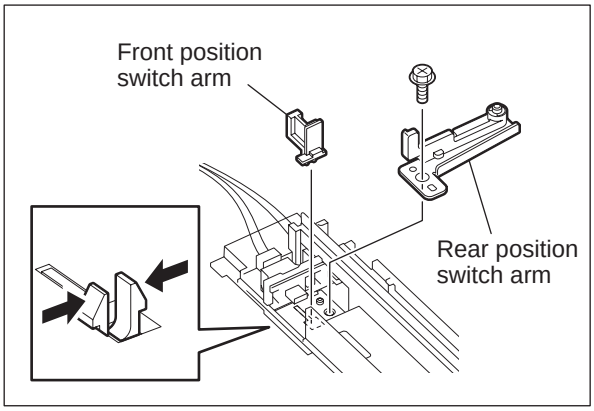


Fig. 11-42

(5) Disconnect 2 connectors and take off the front position detection switch and the rear position detection switch.

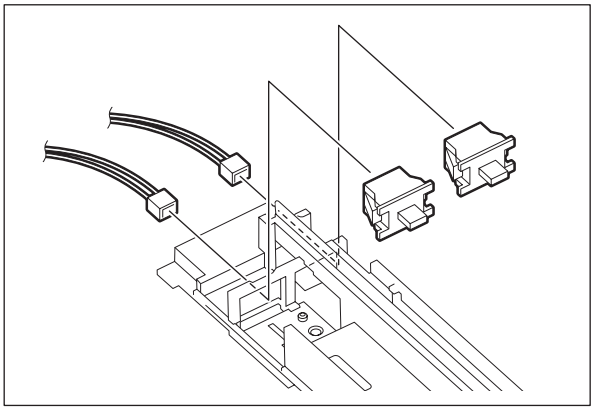


Fig. 11-43

[O] Toner bag full detection sensor (S20)

(1) Take off the process unit
(📖 P.11-10 "[B] Process unit").
(2) Disconnect 1 connector and remove 1 screw. Then take off the toner bag full detection sensor with its bracket.

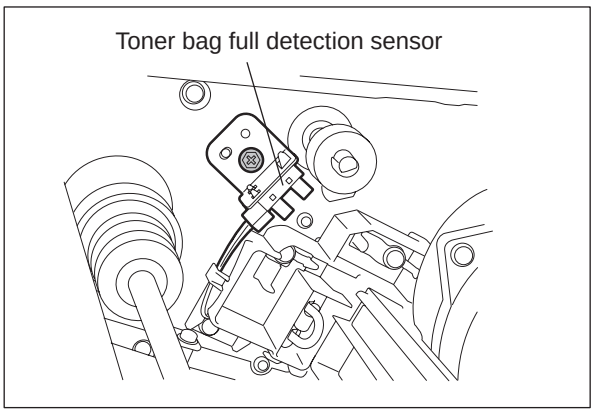


Fig. 11-44

[P] Temperature/humidity sensor (S19)

(1) Take off the front cover (📖 P.2-25 "[A] Front cover").
(2) Take off the front lower cover (📖 P.2-26 "[E] Front lower cover")
(3) Take off the inner tray (📖 P.2-26 "[C] Inner tray").
(4) Take off the left cover (📖 P.2-29 "[K] Left cover").
(5) Remove 2 screws and take off the left inner cover.

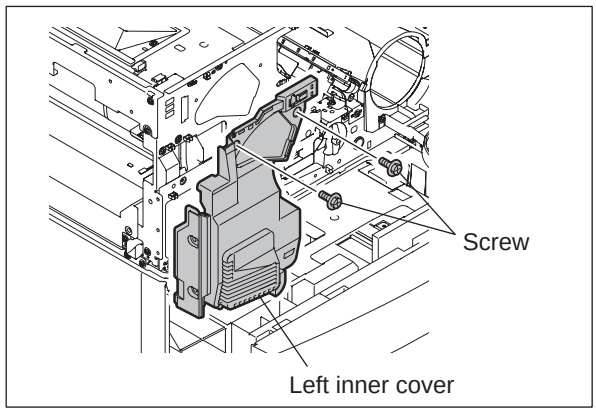


Fig. 11-45

(6) Disconnect 1 connector and release 2 latches. Then take off the temperature/ humidity sensor.

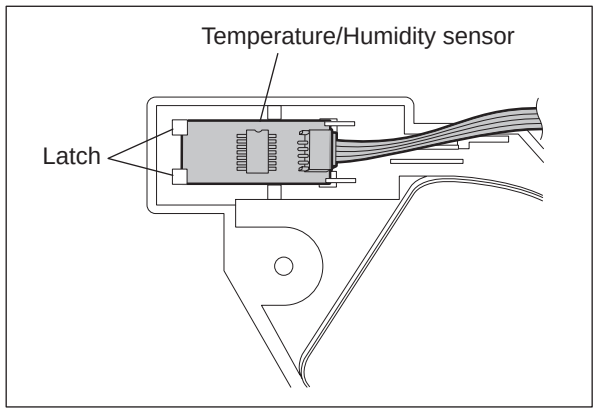


Fig. 11-46

[Q] Ozone filter (PM)

(1) Remove 1 screw and take off the cover.
(2) Take off the ozone filter.

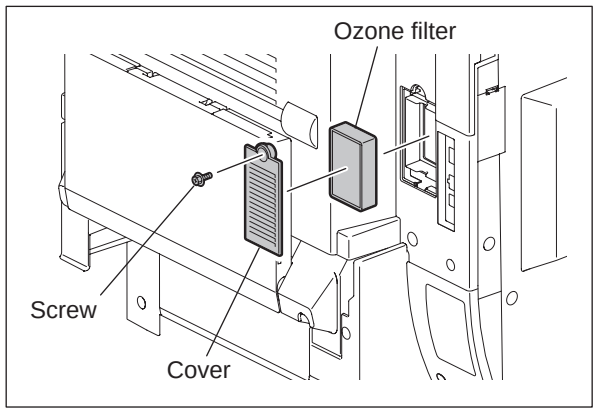


Fig. 11-47

[R] Ozone exhaust fan (M18)

(1) Take off the ozone filter
(📖 P.11-23 "[Q] Ozone filter").
(2) Take off the right upper cover
(📖 P.2-28 "[H] Right upper cover").
(3) Take off the right rear hinge cover
(📖 P.2-31 "[P] Right rear hinge cover").
(4) Take off the IH terminal cover
(📖 P.2-30 "[N] IH terminal cover").
(5) Take off the right rear cover
(📖 P.2-30 "[O] Right rear cover").
(6) Take off the rear cove-2
(📖 P.2-32 "[S] Rear cover-2").
(7) Take off the SYS board case.
(📖 P.2-35 "[D] SYS board case")
(8) Take off the flywheel.
(📖 P.9-9 "[A] Developer motor drive unit")
(9) Disconnect 1 connector and remove 3 screws. Then take off the ozone exhaust fan with its duct.
(10) Release 6 latches and take off the duct. Then take out the ozone exhaust fan.

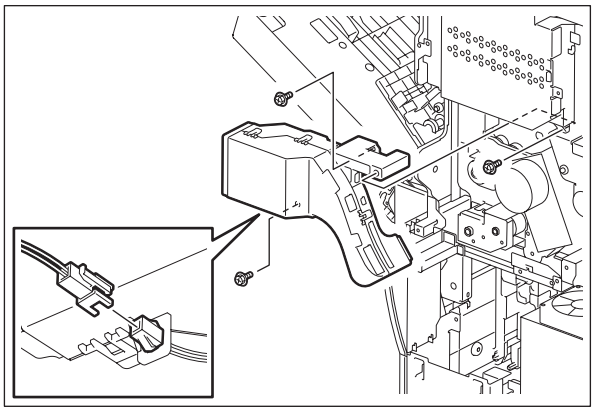


Fig. 11-48

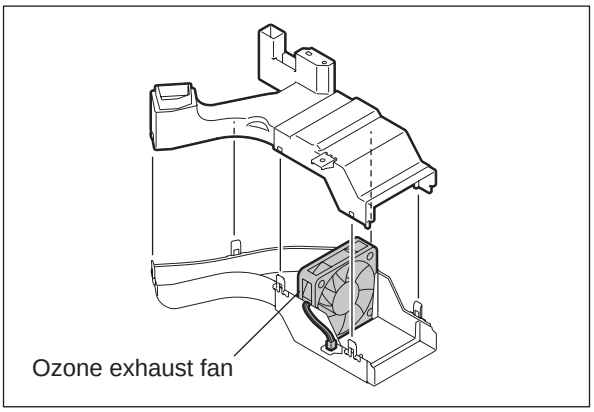


Fig. 11-49

12. DEVELOPER UNIT

12.1 General Description

In this equipment, the three color developers (Y, M and C) are installed in the revolver unit and the black developer is installed independently separated from the revolver unit. This special structure ensures the improved printing productivity at the Black Mode. When developing color images (Y, M or C), the black developer unit escapes contacting with the drum. When developing black images, each color developer unit escapes from the drum by rotating the revolver and the black developer unit contacts with the drum instead.
The developer motor (M11) drives the lifting movement and developer sleeve rotation of the black developer unit, and also the toner supply and developer sleeve rotation of the color developer unit. Chapter 9 in this manual describes more.

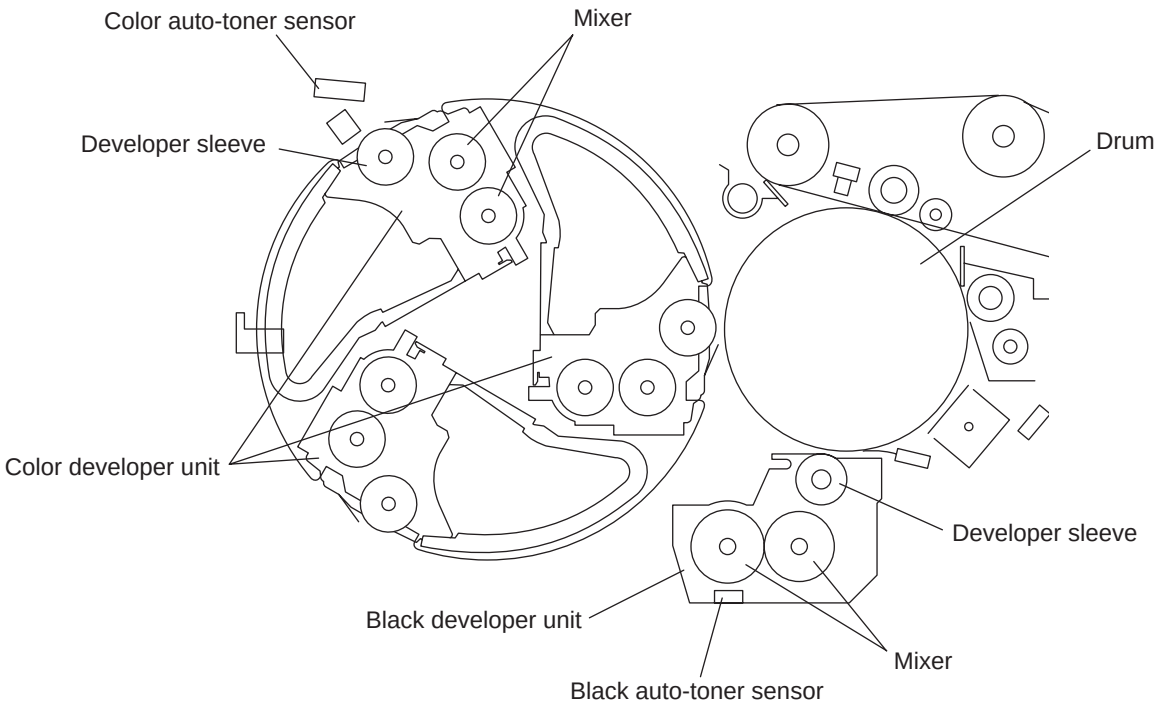


Fig. 12-1

12.2 Construction

1) Black developer section

Black toner cartridge		
Black toner supply section		
Black toner supply unit	Black toner cartridge switch (S14)	
	Toner motor (M3)	
Black toner supply auger unit		
Black developer unit		
Mixer unit		
Developer sleeve (Magnetic roller)		
Doctor blade		
Black auto-toner sensor (S13)		
Developer material		PM parts
Black developer drive section		Chapter 9
Developer motor (M11)		Chapter 9
Black developer drive clutch (CLT10)		Chapter 9
Black developer lifting section		
Developer motor (M11)		Chapter 9
Black developer lifting clutch (CLT11)		Chapter 9
Black developer contact position detection sensor (S11)		
Black developer contact timing detection sensor (S12)		

2) Color developer section

Revolver unit		Chapter 13
Color developer unit	Mixer unit	
	Developer sleeve (Magnetic roller)	
	Doctor blade	
	Developer material	PM parts
Color toner cartridge		
Color developer toner supply auger		
Color toner cartridge sensor (S9)		Chapter 13
Color auto-toner sensor (S10)		
Color auto-toner sensor shutter solenoid (SOL1)		
Color developer drive section		Chapter 9
Color developer toner supply clutch (CLT8)		Chapter 9
Color developer drive clutch (CLT9)		Chapter 9

12.3 Black Toner Cartridge Drive Unit

12.3.1 General descriptions

The black toner cartridge is filled with black toner, and supplies the toner to the black developer unit by rotating the toner cartridge with the drive of the toner motor. The black toner cartridge detection switch ensures that the black toner cartridge is in rotation by detecting the protrusion of the toner cartridge. Also, the auto-toner sensor detects whether the toner cartridge is empty by detecting the toner density ratio of the black developer unit.

12.3.2 Toner motor (M3)

The toner motor supplies toner to the black developer unit from the toner cartridge. It is driven by the motor driver IC (TA8428K) through an overcurrent protection device. The overcurrent protection device is mounted to protect the toner motor and toner motor driver. When the motor abnormality occurred and the motor drive current exceeding the specified level surged, internal resistance of the overcurrent protection device becomes high to cut off the current.
Its circuit configuration is shown below.

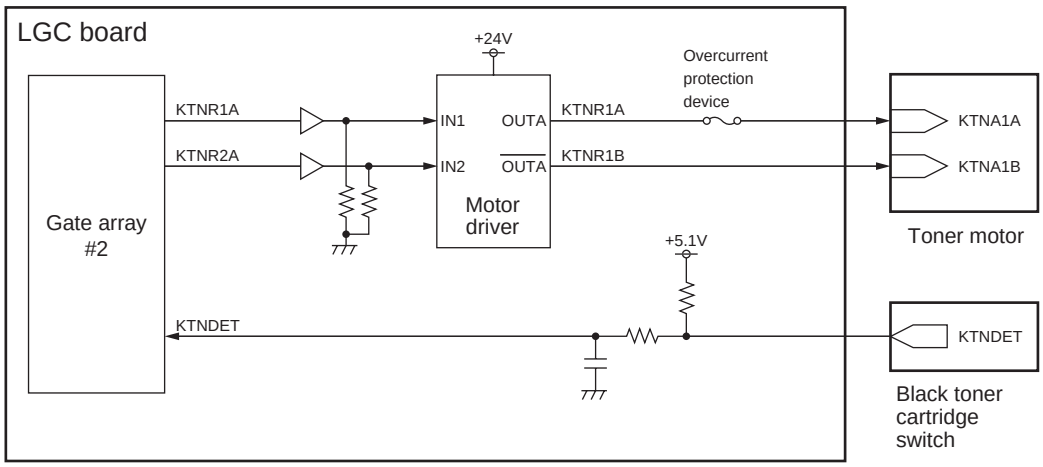


Fig. 12-2

Signal level for motor circuit

Signal		State
KTNA1A	**KTNA1B**	
L	L	OFF
L	H	CW (when supplying toner)
H	L	CCW (detecting cartridge installation)
H	H	Brake

12.4 Black Developer Unit

12.4.1 Functions

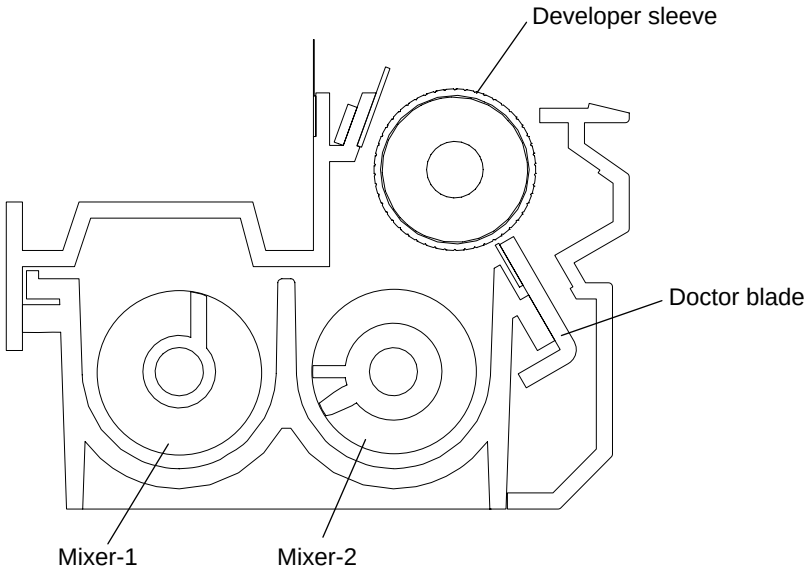


Fig. 12-3

1) Black developer material
   The developer material consists of the carrier and toner. The carrier is made of electrically conductive ferrites which is 30-100 µm and the toner is made of the resin particle which is 5-20 µm.
   Since the developer material deteriorates after a long time use, periodic replacements are needed.

2) Mixer unit
   The carrier and toner are frictionized each other when the developer material is stirred. Then the carrier is positively charged (+) and the toner is negatively charged (–), and the toner is adhered by the electrostatic force.

3) Developer sleeve (Magnetic roller)
   These aluminum rollers have magnets inside. The developer material is pulled by these magnets to form a magnetic brush. The magnets are fixed at their position so only the sleeve rotates. By this rotation, the developer material is transported to the developer sleeve. Then the magnetic brush formed at the developer sleeve sweeps over the drum surface and thus development is performed.

4) Doctor blade
   The doctor blade controls the amount of the developer material from the developer sleeve so that the magnetic brush of the developer material can contact with the drum surface properly.

5) Black auto-toner sensor (S13)
   To print out a precise image, the proportion (toner density ratio) of the carrier and the toner in the developer material needs to be always constant. The magnetic bridge circuit in the black auto-toner sensor (S13) detects the toner ratio in the developer material. This sensor supplies the toner from the toner cartridge.

12.4.2 Black developer unit drive section

The developer motor (M11) drives the black developer unit. Connection and disconnection of the developer motor drive is made by ON/OFF of the black developer drive clutch (CLT10). The drive is connected when it is ON and disconnected when it is OFF.

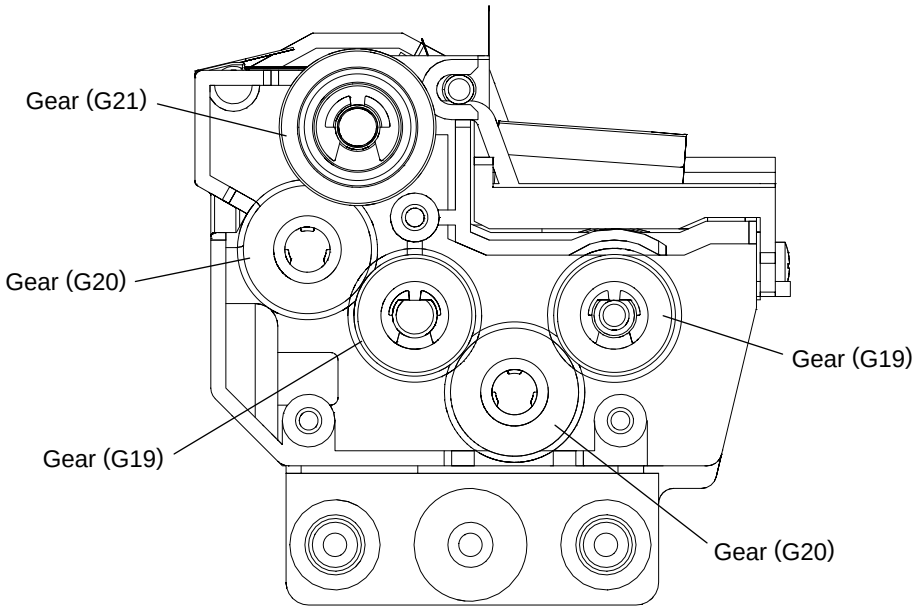


Fig. 12-4

12.4.3 Black auto-toner sensor circuit

1) Functions of auto-toner circuit
   - Detection of the toner density in the developer material
     - Density lowered → Toner supplied
   - Detection of the toner being empty in the toner cartridge

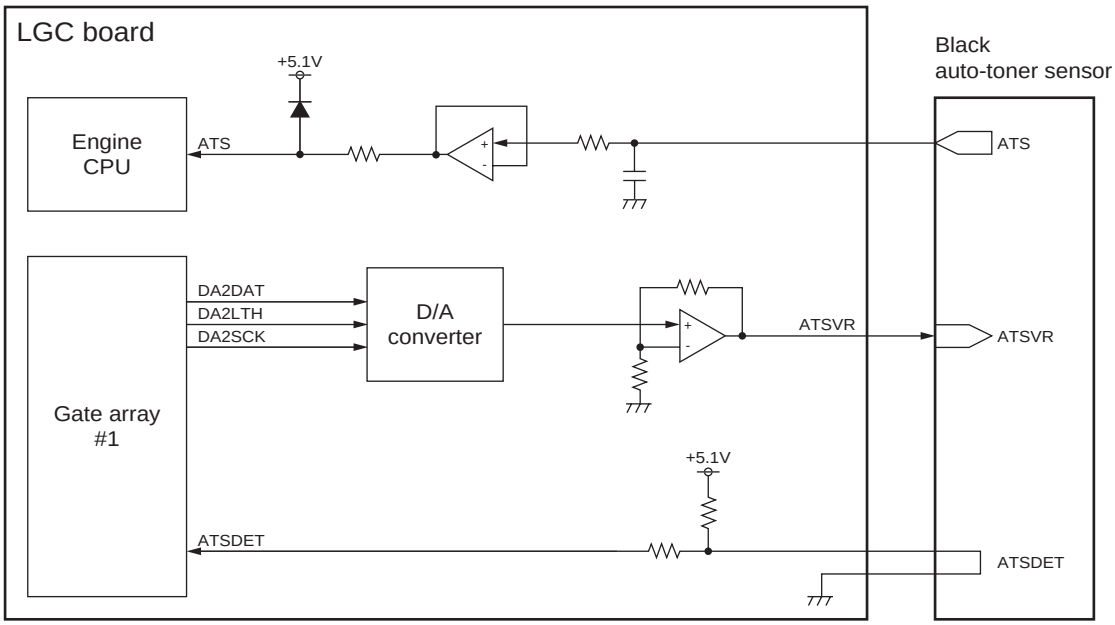


Fig. 12-5

2) Functions of the black auto-toner sensor
   - Initializing function: When unpacking and replacing the developer material
     The automatic adjustment is made so that the output of the auto-toner sensor (input value of the engine CPU) will be 2.45V to 2.55V for the toner density of new developer material.
   - Toner density stabilizing function: During the printing operation
     Through the following phases, the toner density is kept constant.
     Toner is consumed.
     → Toner density decreases.
     → Output change of the auto-toner sensor is detected depending on the humidity.
     → Drives toner motor.
     → Supplies toner to the developer unit from the toner cartridge.
   - Toner-empty detection/clear function:
     Detects toner being empty in the toner cartridge.
     Drives toner motor.
     → Output of the auto-toner sensor is not changed.
     → Toner density is not changed.
     → Detects toner being empty.
     Toner-empty clear
     Drives toner motor.
     → Supplies toner from the toner cartridge.
     → Output of the auto-toner sensor changes.
     → Toner density recovers to its normal value.
     → “Toner-empty” is cleared.

3) Operations of black auto-toner sensor
The black auto-toner sensor is composed of the following circuits.

Drive winding:
Magnetic head (primary side) with a high-frequency magnetic field, which forms a magnetic circuit in the developer material

Detection winding:
Receiving the changes in the magnetic resistance of the developer material via a magnetic circuit (secondary side)

DC conversion circuit:
Converting the high-frequency output from the detection winding to a DC signal (auto-toner output ATS)

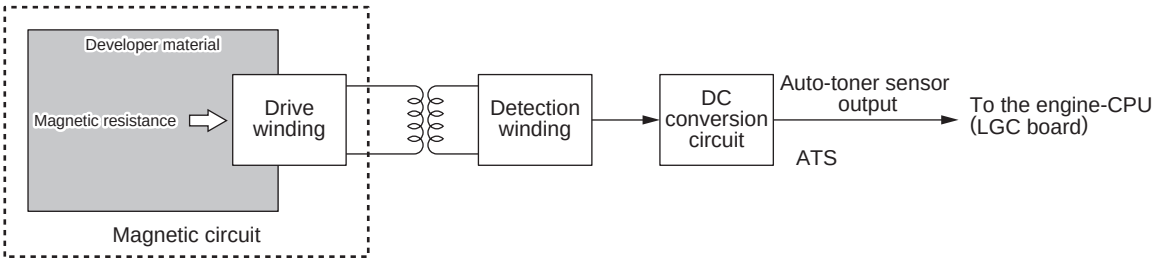


Fig. 12-6

When the toner density is low:
Toner ratio to the carrier in the developer material decreases.
→ Magnetic resistance decreases.
→ Detection output increases.
→ Auto-toner output V_{ATS} increases.

When the toner density is high:
Toner ratio to the carrier in the developer material increases.
→ Magnetic resistance increases.
→ Detection output decreases.
→ Auto-toner output V_{ATS} decreases.

12.4.4 Black developer unit lifting mechanism

1) General descriptions
   In the black developer unit, the drive from the developer motor (M11) is transmitted to cam with the black developer lifting clutch (CLT11) and this promotes the lifting movement of the black developer unit to contact or release against the photoconductive drum. When developing color images, (Y, M or C), the black developer unit escapes contact with the drum. When developing black images each color developer unit releases from the drum by rotating its revolver and the black developer unit contacts with the drum instead.
   Black developer contact position detection sensor (S11) detects whether the black developer unit is at the developing position or at the escape position.

2) Construction
   - Black developer lifting clutch (CLT11)
     An electromagnetic clutch contacts or releases the black developer unit against the drum. The clutch movement lifts the developer unit up and down by rotating the cam.

   - Black developer contact position detection sensor (S11)
     Detects whether the black developer unit is at the contact position or release position. This sensor detects the shield plate. “L” is output when contacting and “H” is output when releasing.

   - Black developer contact timing detection sensor (S12)
     Controls the black developer lifting clutch (CLT11). This sensor outputs reference timing signals for controlling ON/OFF of the black developer lifting clutch (CLT11). “H” is output when releasing and “L” is output when contacting. The sensor controls the power supply to turn OFF the clutch after detecting the output alteration (“L” to “H” or “H” to “L”).

12.5 Color Developer Unit

12.5.1 Functions

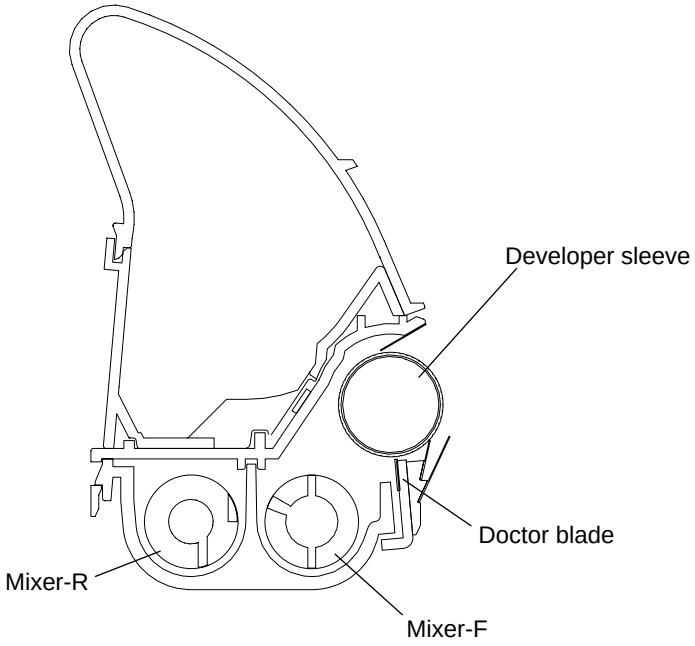


Fig. 12-7

1) Color developer material
The developer material consists of the carrier and toner. The carrier is made of electrically conductive ferrites which is 30-100 µm and the toner is made of the resin particle which is 5-20 µm. Since the developer material deteriorates after a long time use, periodic replacements are needed.

2) Mixer unit
The carrier and toner are frictionized each other when the developer material is stirred. Then the carrier is positively charged (+) and the toner is negatively charged (–), and the toner is adhered by the electrostatic force.

3) Developer sleeve (Magnetic roller)
These aluminum rollers have magnets inside. The developer material is pulled by these magnets to form a magnetic brush. The magnets are fixed at their position so only the sleeve rotates. By this rotation, the developer material is transported to the developer sleeve. Then the magnetic brush formed at the developer sleeve sweeps over the drum surface and thus development is performed.

4) Doctor blade
The doctor blade controls the amount of the developer material from the developer sleeve so that the magnetic brush of the developer material can contact with the drum surface properly.

5) Color toner cartridge
The color toner cartridge and the color developer units are fitting each other to prevent misinstallation of the color toner cartridge. Therefore, the revolver unit has no device preventing misinstallation.

12.5.2 Color developer unit drive section

The developer motor (M11) drives the color developer unit. Connection and disconnection of the developer motor (M11) drive is made by ON/OFF of the color developer drive clutch (CLT9). The drive is connected when it is ON and disconnected when it is OFF. The transmitted drive operates the mixers.

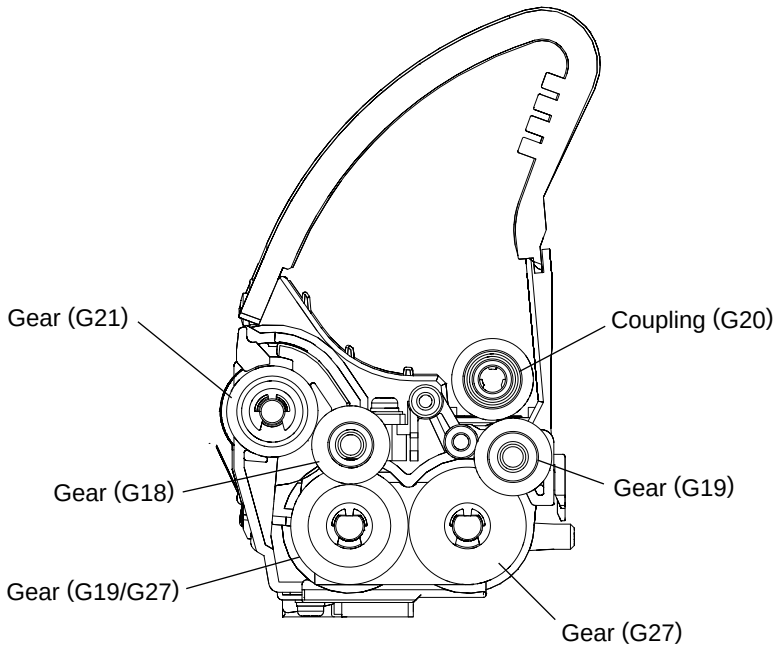


Fig. 12-8

12.5.3 Color auto-toner sensor circuit

1) General descriptions

The color auto-toner sensor detects the toner amount on the color developer sleeve with the reflection- type photosensor, differing from the black auto-toner sensor. Light-receiving elements of diffuse reflection in this sensor detect the toner amount on the sleeves with the light amount reflected from the sleeve surface. It detects the toner amount at the first forward position from the developing position.

When the toner runs out, it supplies the toner from the toner cartridge with the color toner supply auger driven by the color developer toner supply clutch.

Also, the color auto-toner sensor has a shutter which opens and closes by the solenoid. It prevents stain to the sensor and calibrates the sensor with the reflection from the shutter.

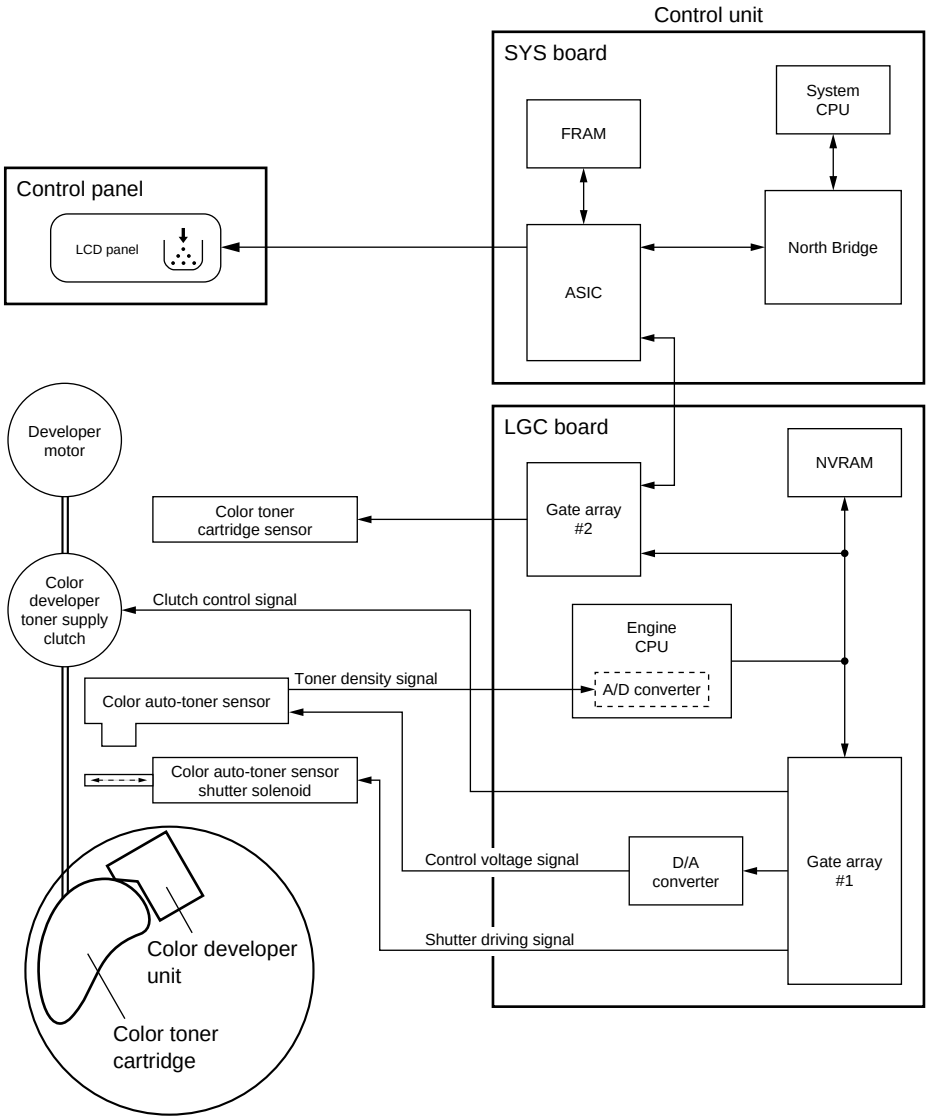


Fig. 12-9

2) Functions of the color auto-toner sensor

- Initializing function: When unpacking or replacing developer material
  This sensor automatically adjusts the light amount of sensor to make the detected value of toner density of new developer material by auto-toner sensor equal to the fixed value. Also, the detected value by the reference plate is stored in memory after this adjustment.

- Toner density stabilizing function:
  The difference between the toner density on the sleeve and the toner density at the initialization mentioned above is detected. Then the difference is adjusted to maintain the density at a certain level.
  The detected value of auto-toner sensor is corrected in comparison with the detected value by the reference plate not to be affected with temperature, stain and deterioration.
  Through the following phases, the toner density is kept constant.
  Toner is consumed.
  → Toner density decreases.
  → Output change of the auto-toner sensor is detected at the preceding position to the developing position.
  → Drives the developer motor at the developing position.
  → Drives the color developer toner supply clutch.
  → Supplies the toner for a specified period of time.
  → The same procedure is repeated for other two colors.

- Toner-empty detection/clear function:
  Detects toner being empty in the toner cartridge.
  Drives toner motor.
  → Output of the auto-toner sensor is not changed.
  → Toner density is not changed.
  → Detects toner being empty (Toner-empty detection function).

  Clears toner-empty.
  Drives toner motor.
  → Supplies toner from the toner cartridge.
  → Output of the auto-toner sensor is changed.
  → Toner density recovers to its normal value.
  → “Toner-empty” is cleared. (Toner-empty clear function)

3) Operations of the color auto-toner sensor

When the toner density is low:
Toner ratio to the carrier in the developer material decreases.
→ The light reflection amount decreases.
→ Detection output (voltage) decreases.

When the toner density is high:
Toner ratio to the carrier in the developer material increases.
→ The light reflection amount increases.
→ Detection output (voltage) increases.

12.5.4 Color toner supply

1) The color developer unit whose toner needs to be supplied moves to the developing position.

2) The developer unit is driven and the toner is supplied for a regulated period of time.

3) The drive is stopped and the unit moves to the color toner density detection position to detect the density.

4) When the toner density detected is higher than the regulated value, it moves to the escape position. When the toner density detected is lower than the regulated value, it repeats the procedure 1 to 3 for five times. If the toner density is still lower than the regulated value, it is judged as “toner empty” and the unit moves to the escape position.

5) Procedure 1 to 4 is repeated for other color developer units when the toner supply is needed.

12.6 High-Voltage Transformer Output Control Circuit

Developer bias is supplied from high-voltage power supply to the developer sleeve and the toner image on the developer sleeve is transferred onto the photoconductive drum.
A color developer bias and a black developer bias are output separately.
Each developer bias consists of DC and AC which has an independent ON/OFF control. At DC, D/A converter adjusts the level of output value in both color and black modes since each mode has a different control condition.

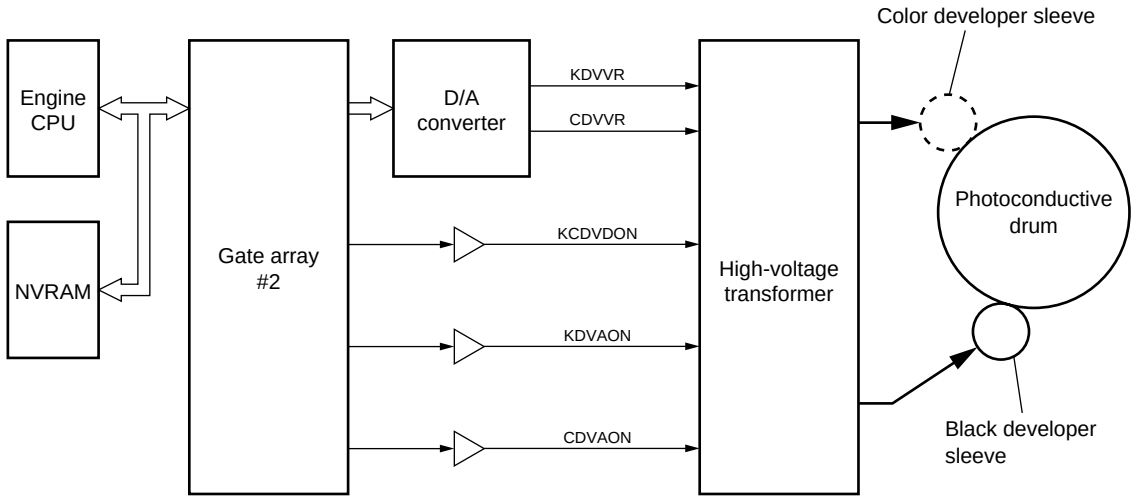


Fig. 12-10

- Outputs adjustment value of the developer bias (DC) in the NVRAM to the gate array.
  ↓
- Outputs control voltage data from the gate array to the D/A converter.
  ↓
- Analog conversion by the D/A converter.
  ↓
- Outputs control voltage Vc to the developer bias transformer.
  ↓
- The developer bias transformer generates output voltage proportional to the control voltage Vc by ON signed.
  * Adjustment of the control voltage Vc (change of adjustment data) is performed in the adjustment mode.

12.7 Disassembly and Replacement

[A] Black developer unit

[A-1] Black developer unit

(1) Open the front cover and take out the toner bag (📖 P.11-10 "[A] Toner bag").
(2) Turn the black developer unit lifting lever to the position where a clock hand could be at 9 o'clock and take off the black developer unit cover.

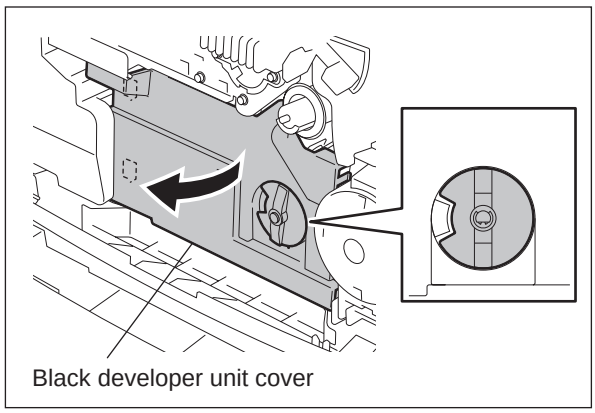


Fig. 12-11

(3) Disconnect 2 connectors.

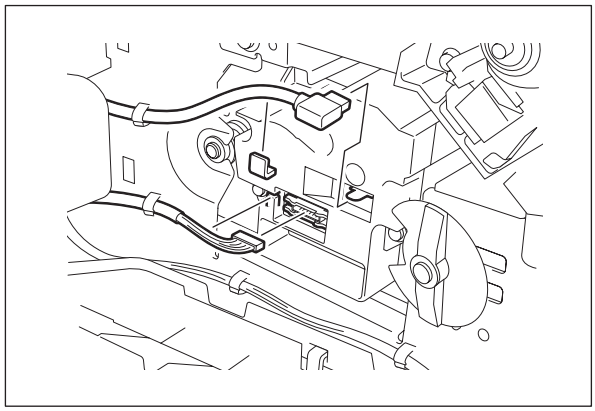


Fig. 12-12

(4) Remove 1 screw and pull out the black developer unit.

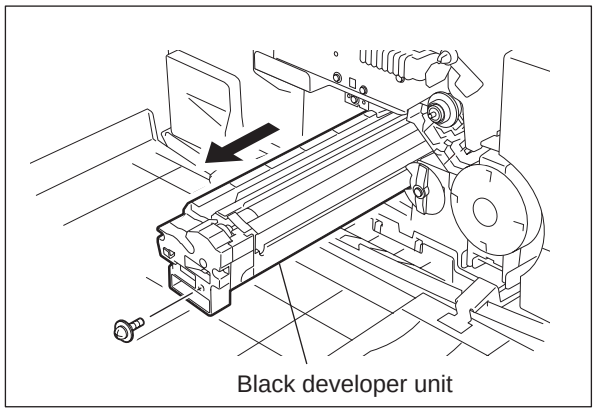


Fig. 12-13

[A-2] Developer material PM

(1) Take off the black developer unit (📖 P.12-15 "[A-1] Black developer unit").
(2) Remove 2 screws and take off the upper cover.

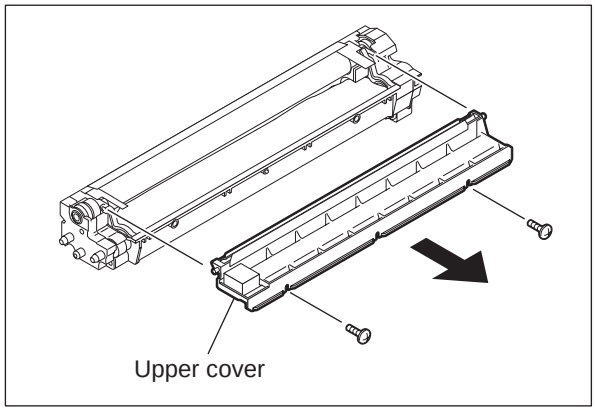


Fig. 12-14

(3) Discharge the developer material.

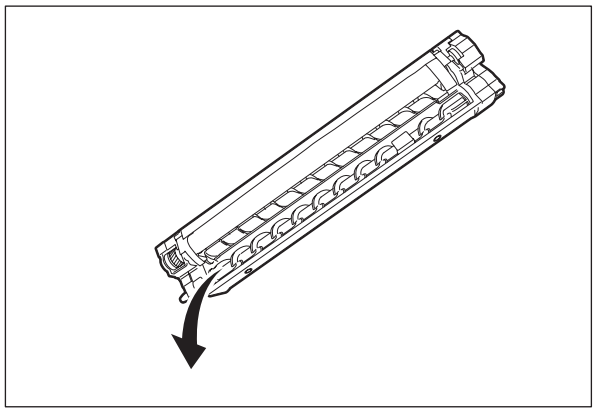


Fig. 12-15

(4) Pour the developer material.

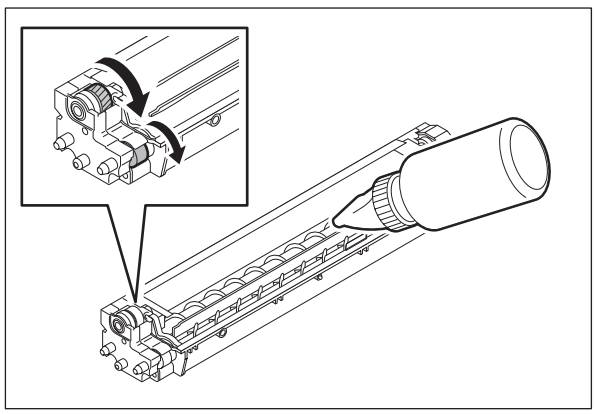


Fig. 12-16

Note:

When installing the upper cover, make sure the urethan seal is covered by the upper cover.

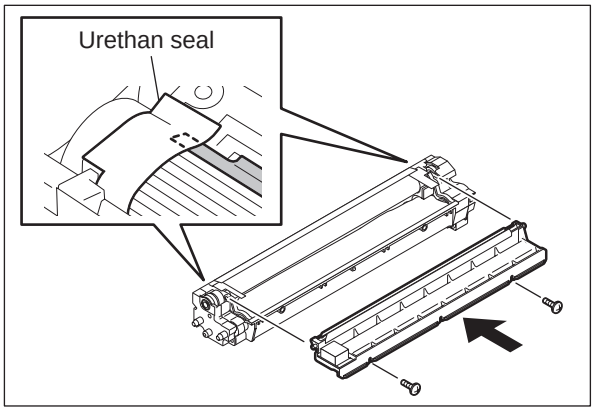


Fig. 12-17

[A-3] Black auto-toner sensor (S13)

(1) Discharge the developer material (📖 P.12-16 "[A-2] Developer material").
(2) Disconnect 1 connector, remove 1 screw and take off the auto-toner sensor.

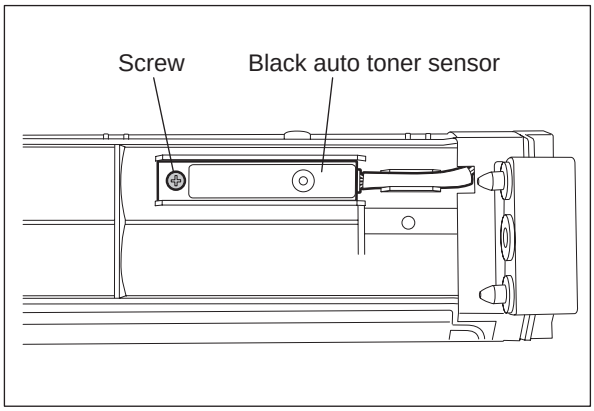


Fig. 12-18

[A-4] Doctor blade

(1) Discharge the developer material (📖 P.12-16 "[A-2] Developer material").
(2) Remove 2 screws, release 1 hook and take off the right cover.

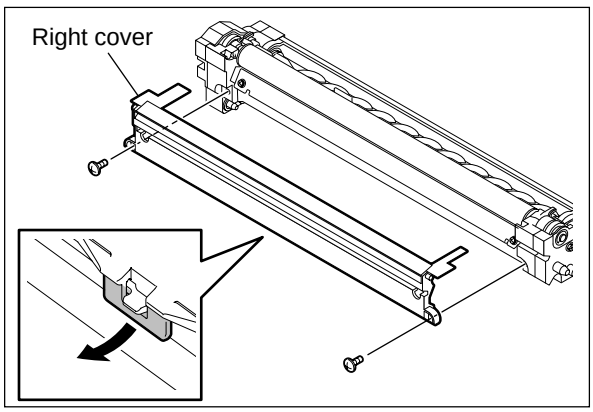


Fig. 12-19

(3) Remove 2 screws and take off the doctor blade.

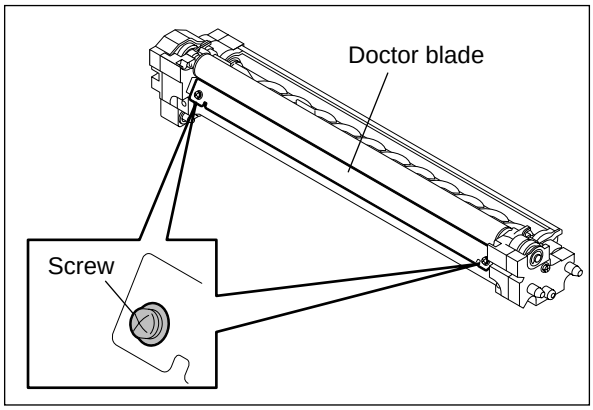


Fig. 12-20

[A-5] Developer sleeve

(1) Discharge the developer material (📖 P.12-16 "[A-2] Developer material").
(2) Take off the right cover (📖 P.12-17 "[A-4] Doctor blade").
(3) Remove 3 screws. Disconnect 1 connector and take off the front cover.

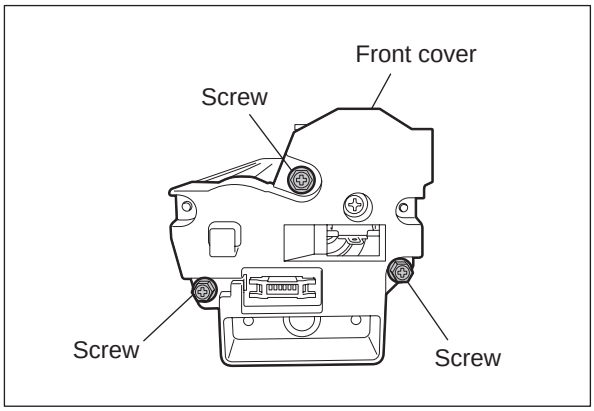


Fig. 12-21

(4) Remove 1 screw and take off the polarity adjustment plate.

Note:
Before disassembling, record (mark if any) the scale pointed by the polarity adjustment lever. Then match the polarity adjustment plate at the scale previously recorded when reassembling.

(5) Remove 1 screw and take off the bracket.

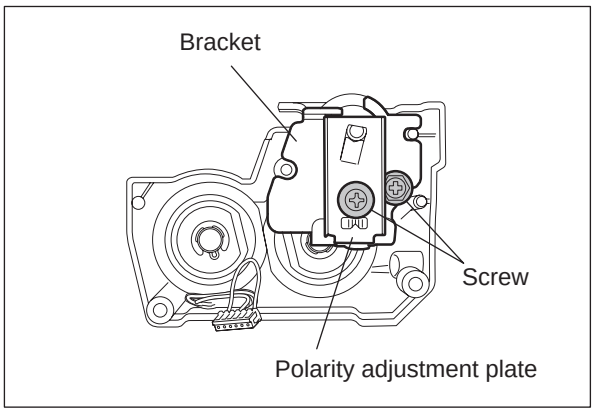


Fig. 12-22

(6) Remove 3 screws and take off the rear cover.

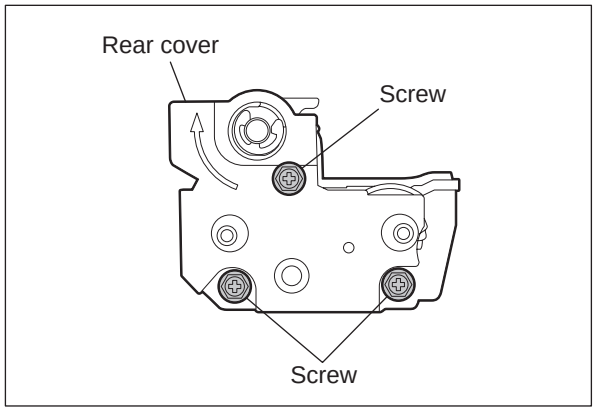


Fig. 12-23

(7) Front side: Remove the following parts installed on the shaft of the developer sleeve in order: Bushing, collar, roller (bearing-1), E-ring, bearing-2 and oil seal.

* Procedure for replacing an oil seal:
📖 P.12-32 "Fig. 12-63 "

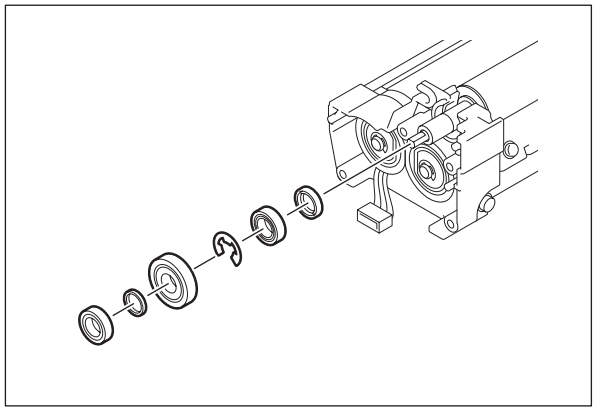


Fig. 12-24

(8) Rear side: Remove the following parts installed on the shaft of the developer sleeve in order: E-ring, bushing, collar, roller (bearing-1), E-ring, gear, pin, bearing-2 and oil seal.

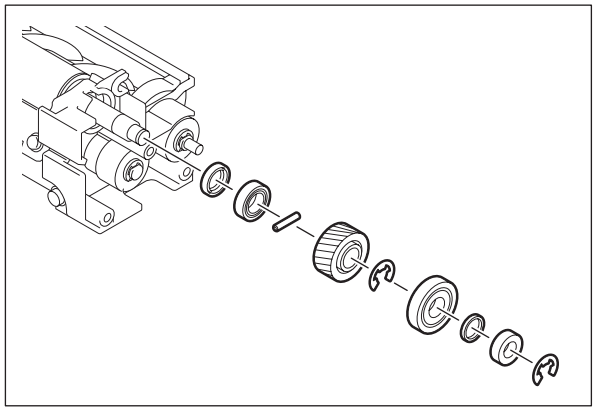


Fig. 12-25

(9) Take off the developer sleeve.
* Procedure for replacing an oil seal:
📖 P.12-32 "Fig. 12-63 "

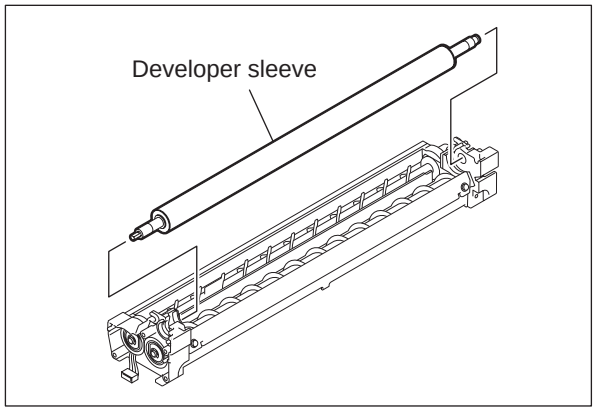


Fig. 12-26

[A-6] Mixer

(1) Discharge the developer material
(📖 P.12-16 "[A-2] Developer material").
(2) Take off the developer sleeve
(📖 P.12-18 "[A-5] Developer sleeve").
(3) Front side: Remove the following parts installed on the shaft of each mixer in order: E-ring, bushing-1 and bushing-2.
* Procedure for replacing an oil seal:
📖 P.12-32 "Fig. 12-63 "

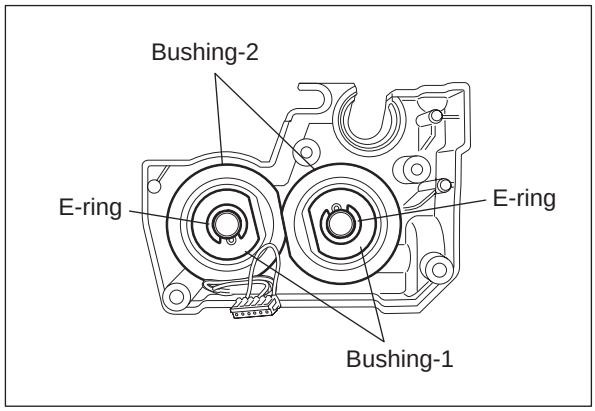


Fig. 12-27

(4) Rear side: Remove the following parts installed on the shaft of each mixer in order: E-ring, gear, bearing and oil seal.
* Procedure for replacing an oil seal:
📖 P.12-32 "Fig. 12-63 "

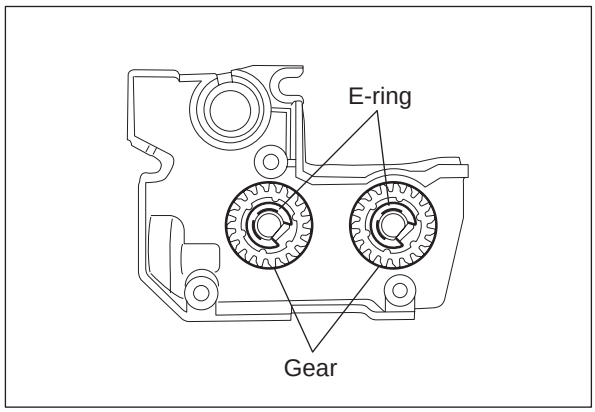


Fig. 12-28

(5) Take off the mixer from the hole of front side.

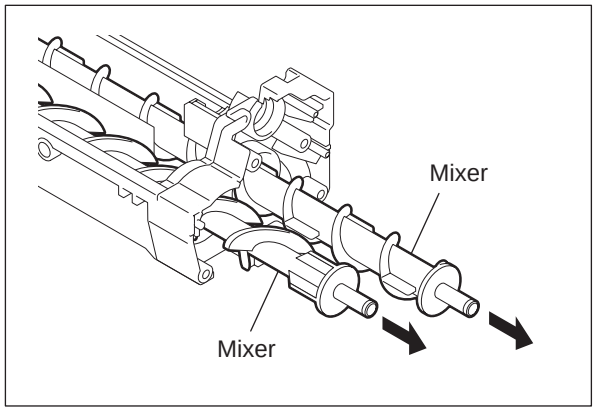


Fig. 12-29

[B] Color developer unit

[B-1] Color developer unit

(1) Rotate the revolver to the toner cartridge replacement position.

Notes:

Perform the operation on the control panel.

1. 1. In the [USER FUNCTION] menu: [USER FUNCTION] → [USER] → [GENRAL] → [REPLACE TONER CARTRIDGE]
2. In the Test Mode (03):
   03-452: Yellow toner cartridge moves to the replacement position.
   03-453: Magenta toner cartridge moves to the replacement position.
   03-454: Cyan toner cartridge moves to the replacement position.

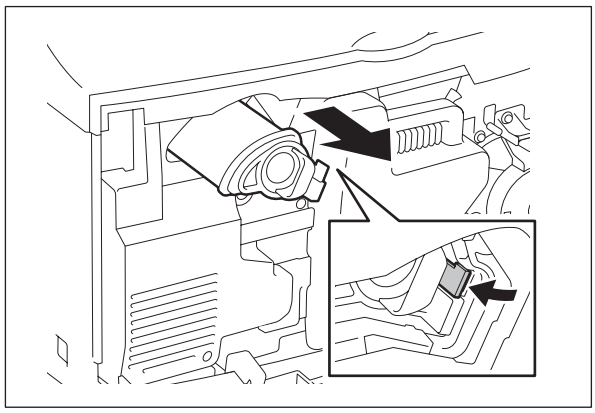


Fig. 12-30

(2) Open the front cover and take off the color toner cartridge while pressing the lever.

(3) Take off the left cover (P.2-29 "[K] Left cover").

(4) Lift up the revolver lock lever and rotate the revolver manually until it is locked.

Notes:

1. Do not touch the sleeve with bare hands.
2. When rotating the revolver automatically, start up the equipment in the Test Mode (03) and use the following codes.
   03-455: Yellow developer unit moves to the replacement position.
   03-456: Magenta developer unit moves to the replacement position.
   03-457: Cyan developer unit moves to the replacement position.

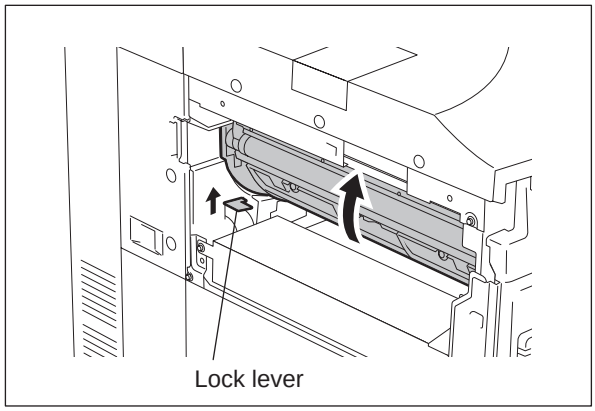


Fig. 12-31

(5) Loosen 2 screws on each holder and take off the holder on both sides of the color developer unit.

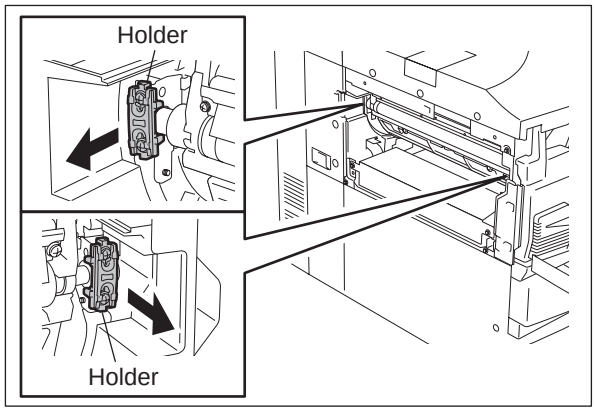


Fig. 12-32

(6) Take off the color developer unit.

Note:

If the other color developer units still need to be replaced, repeat steps (4) to (6). When rotating the revolver manually, push down the revolver lock lever and rotate the revolver slightly, and then pull up the lever again.

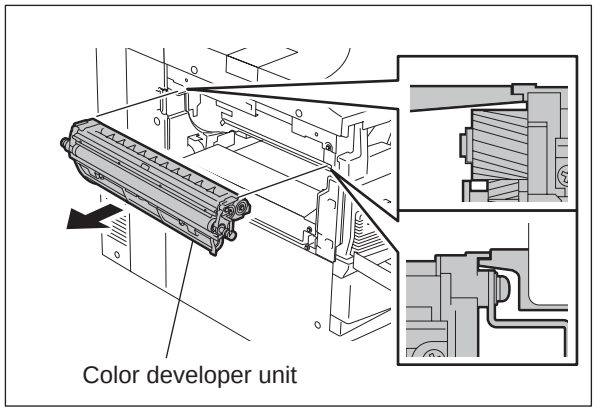


Fig. 12-33

[B-2] Developer material PM

(1) Remove 2 screws, release 5 hooks and take off the toner holder by rotating it.

Notes:

1. Do not try to release the hooks forcibly.

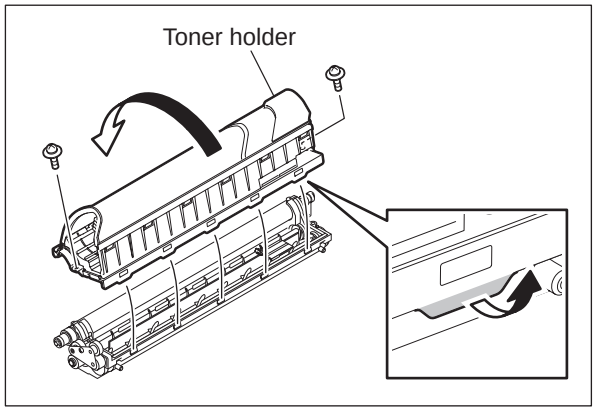


Fig. 12-34

2. When installing the toner holder, rotate the holder with hooking the magnet roller side of it.

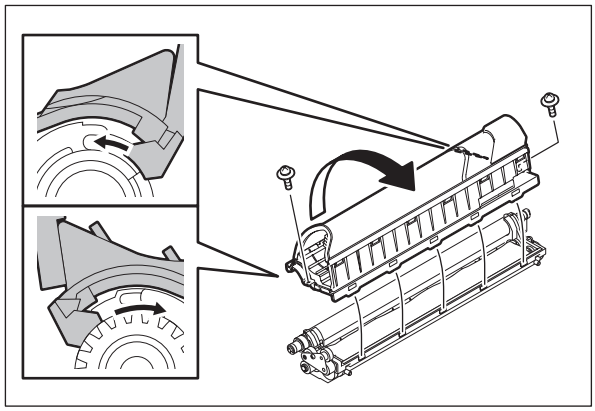


Fig. 12-35

3. When installing the toner holder, be careful not to peel the seal.

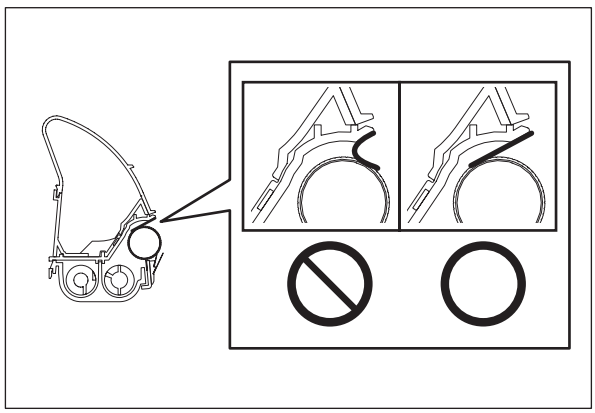


Fig. 12-36

(2) Discharge the developer material.

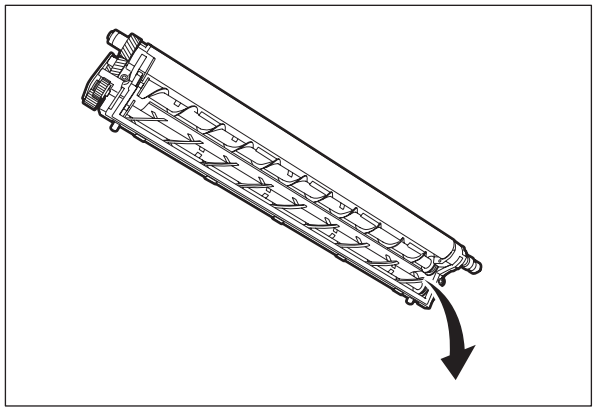


Fig. 12-37

(3) Pour the developer material.

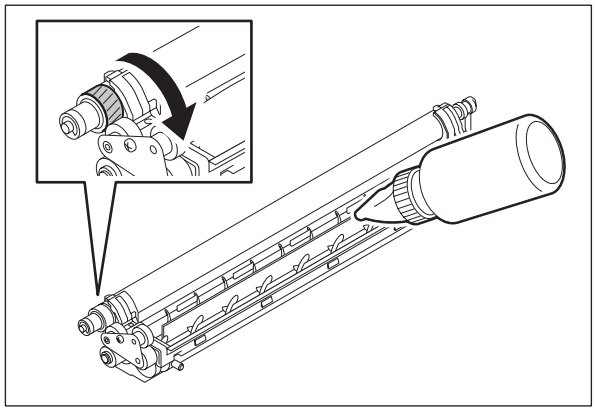


Fig. 12-38

[B-3] Doctor blade

(1) Discharge the developer material (📖 P.12-23 "[B-2] Developer material").
(2) Remove the urethane seal.
(3) Remove 2 screws and take off the doctor blade.

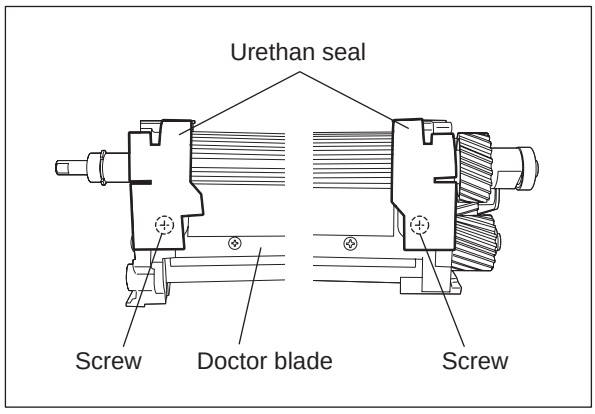


Fig. 12-39

[B-4] Developer sleeve

(1) Discharge the developer material (📖 P.12-23 "[B-2] Developer material").
(2) Remove the urethane seal (📖 P.12-24 "[B-3] Doctor blade").
(3) Front side: Remove 1 screw and take off the polarity adjustment plate.

Note:
Before disassembling, record (mark if any) the scale pointed by the polarity adjustment lever. Then match the polarity adjustment plate at the scale previously recorded when reassembling.

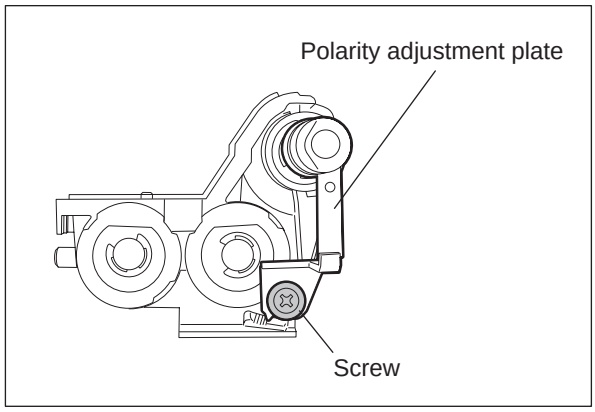


Fig. 12-40

(4) Remove the following parts installed on the shaft of the developer sleeve in order: C-ring, bearing-1, C-ring, E-ring, bearing-2 and oil seal.
* Procedure for replacing an oil seal: 📖 P.12-32 "Fig. 12-63 "

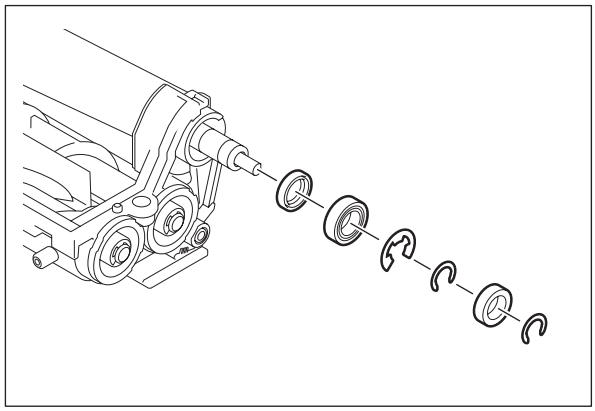


Fig. 12-41

(5) Rear side: Remove 1 screw and take off the gear assembly.

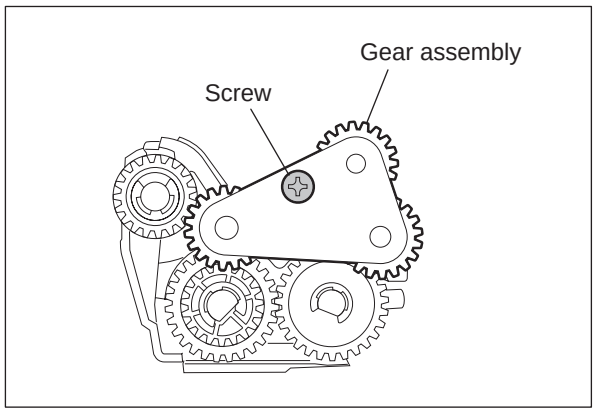


Fig. 12-42

(6) Remove the following parts installed on the shaft of the developer sleeve in order: E-ring, bearing, gear, bearing and oil seal.
* Procedure for replacing an oil seal:
P.12-32 "Fig. 12-63 "

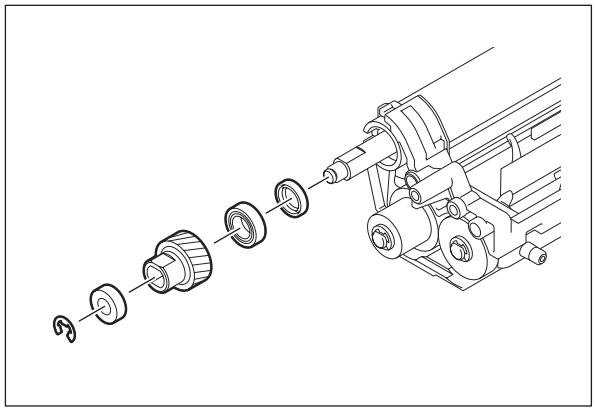


Fig. 12-43

(7) Take off the developer sleeve.

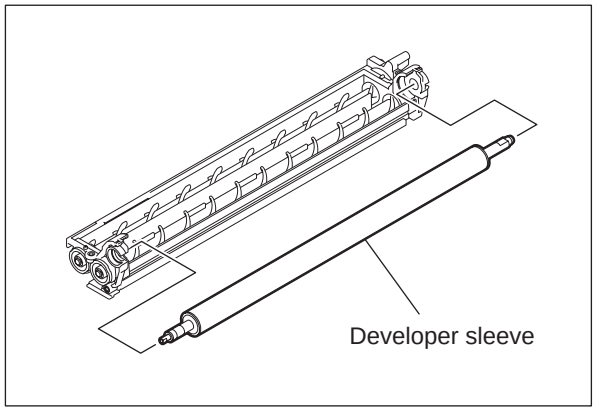


Fig. 12-44

[B-5] Mixer

(1) Discharge the developer material
(P.12-23 "[B-2] Developer material").
(2) Take off the developer sleeve
(P.12-25 "[B-4] Developer sleeve").
(3) Front side: Remove the following parts in order: E-ring, bushing-1 and bushing-2.
* Procedure for replacing an oil seal:
P.12-32 "Fig. 12-63 "

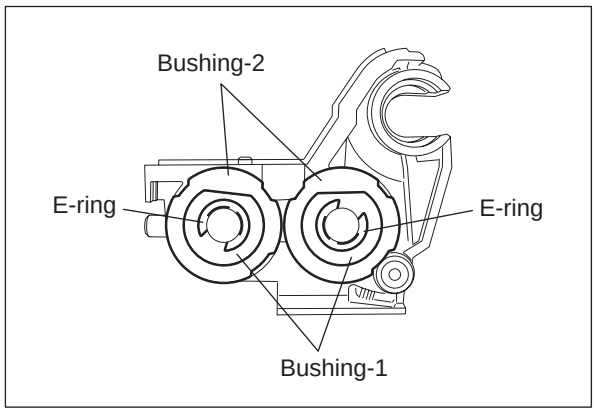


Fig. 12-45

(4) Rear side: Remove the following parts in order: E-ring, gear, bearing or bushing, and oil seal.
* Procedure for replacing an oil seal:
📖 P.12-32 "Fig. 12-63 "

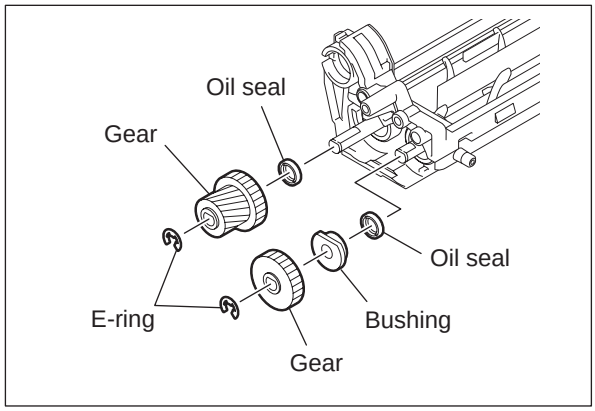


Fig. 12-46

(5) Take off the mixer from the hole of front side.

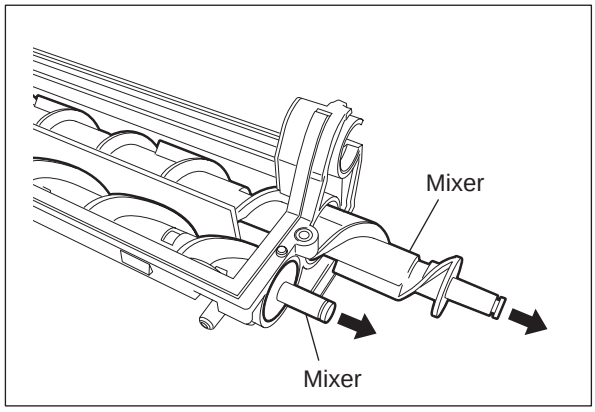


Fig. 12-47

[C] Black developer lifting unit

(1) Take off the black toner supply unit (📖 P.12-28 "[D] Black toner supply unit").
(2) Remove 2 springs.

Note:
The springs on both front and rear sides differ in the active coils (length of spring). When installing, pay attention to its active coils (length of spring).
Front side: 20 (longer)
Rear side: 18 (shorter)

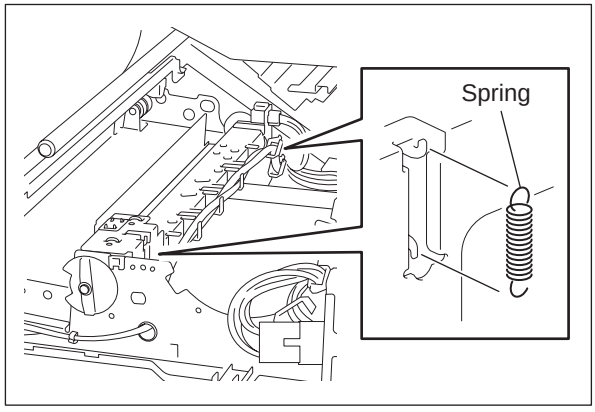


Fig. 12-48

(3) Remove 2 screws to take off the black developer lifting unit and turn it over.

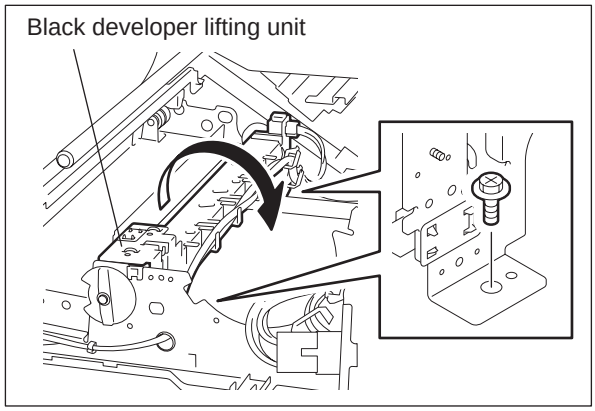


Fig. 12-49

(4) Remove the seal. Disconnect 1 connector. Release the latches and take off the black developer contact position detection sensor.
(5) Remove the seal. Disconnect 1 connector. Release the latches and take off the black developer contact timing detection sensor.

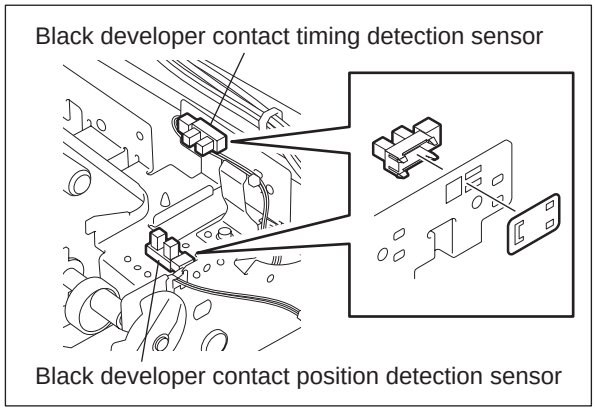


Fig. 12-50

[D] Black toner supply unit

(1) Take off the front right cover (📖 P.2-28 "[J] Front right cover").
(2) Take off the black developer unit (📖 P.12-15 "[A-1] Black developer unit").
(3) Take off the discharge LED unit (📖 P.11-20 "[L] Discharge LED (ERS)").
(4) Take off the laser optical unit (📖 P.8-11 "[A] Laser optical unit").
(5) Take off the black toner cartridge.
(6) Remove 1 screw and take off the toner case.

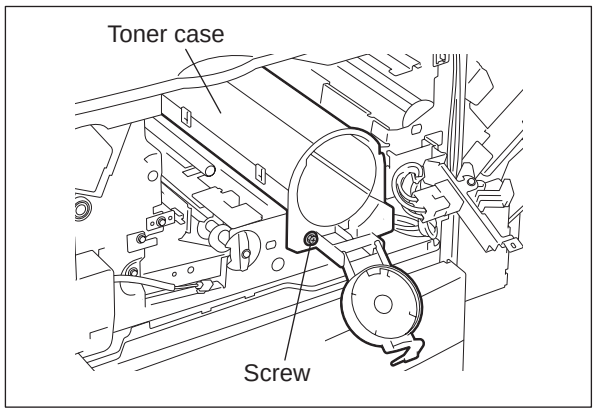


Fig. 12-51

(7) Remove 2 screws and disconnect 2 connectors.

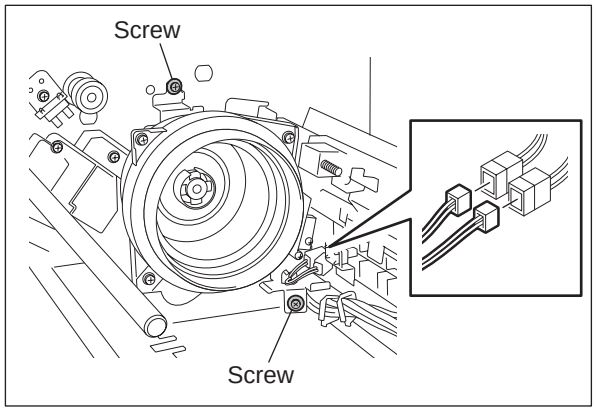


Fig. 12-52

(8) Take off the toner supply unit by lifting up and pulling out toward you to release it from the catch.

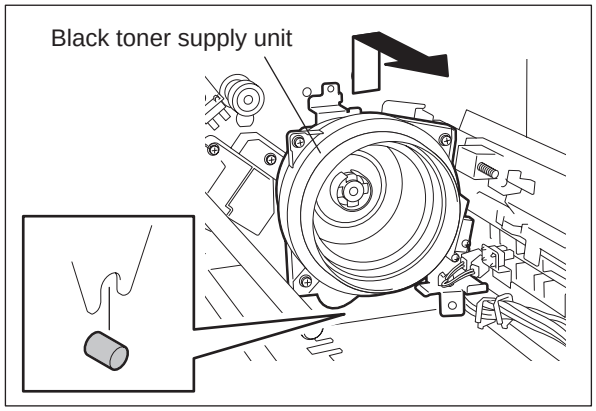


Fig. 12-53

(9) Remove 1 screw and take off the black toner cartridge switch with the whole bracket.

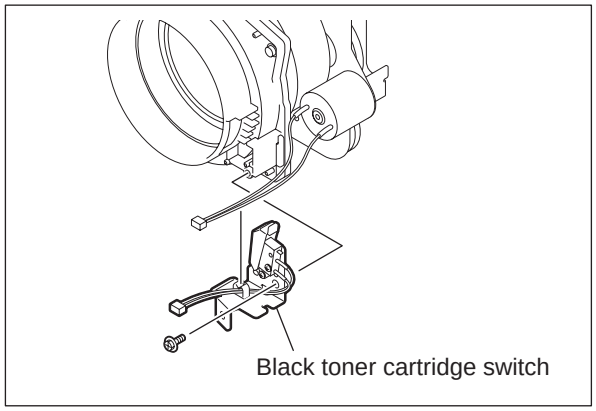


Fig. 12-54

(10) Remove 2 screws and take off the toner motor.

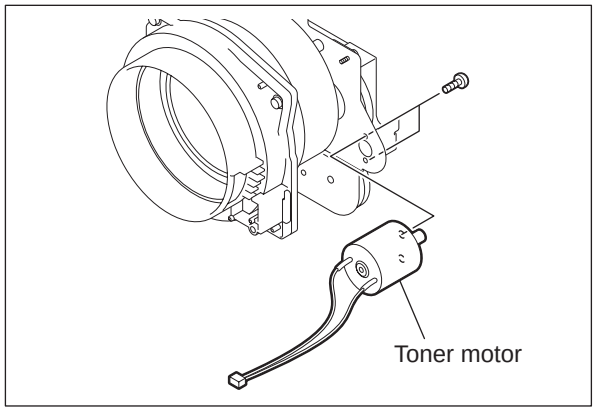


Fig. 12-55

[E] Black toner supply auger unit

(1) Take off the black toner supply unit (📖 P.12-28 "[D] Black toner supply unit").
(2) Take off the black developer lifting unit (📖 P.12-27 "[C] Black developer lifting unit").
(3) Remove 1 screw and take off the rail.

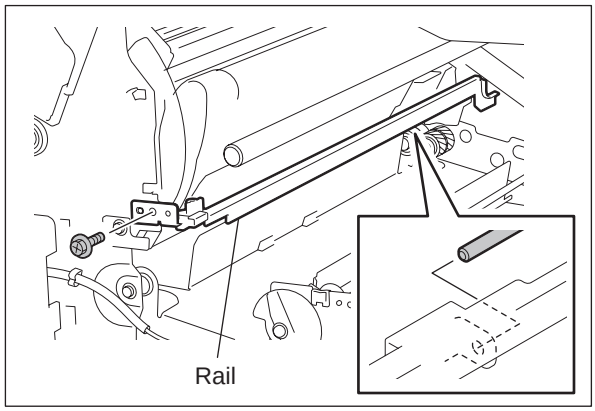


Fig. 12-56

(4) Remove 2 screws and take off the black toner supply auger unit.

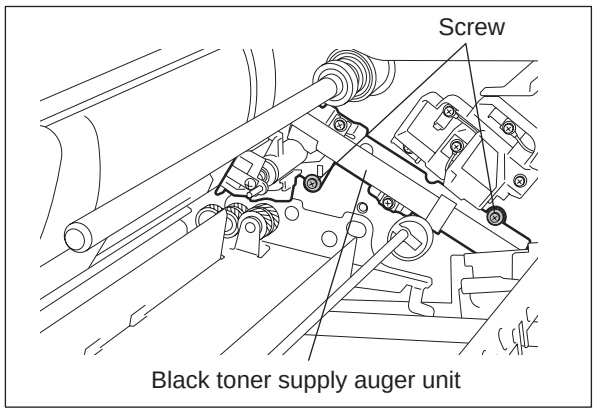


Fig. 12-57

[F] Color auto-toner sensor (S10) / Color auto-toner sensor shutter solenoid (SOL1)

(1) Take off the maintenance tray (📖 P.2-25 "[B] Maintenance tray").
(2) Disconnect 1 connector. Loosen 2 screws and then take off the color auto-toner sensor unit.

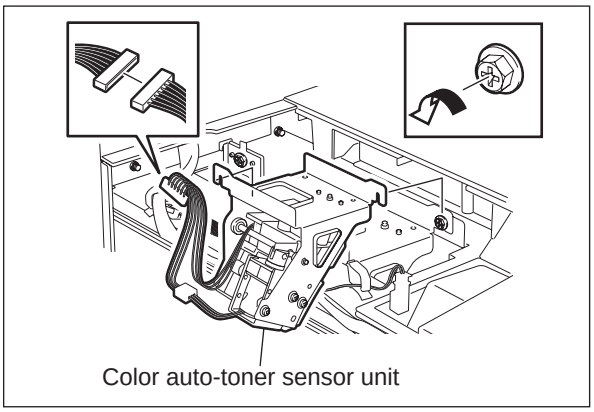


Fig. 12-58

(3) Disconnect 1 connector, remove 2 screws and take off the color auto-toner sensor shutter solenoid.

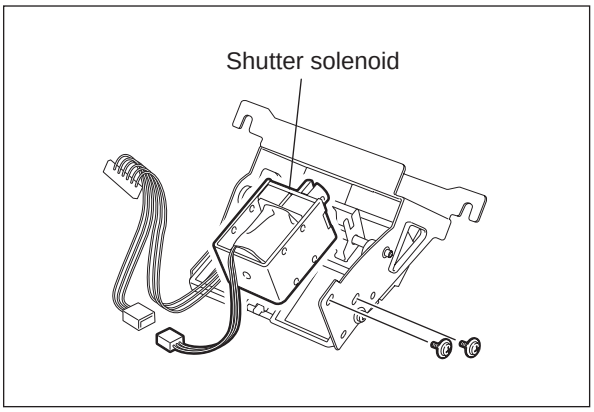


Fig. 12-59

(4) Remove 2 screws and 1 spring and take off the stay.

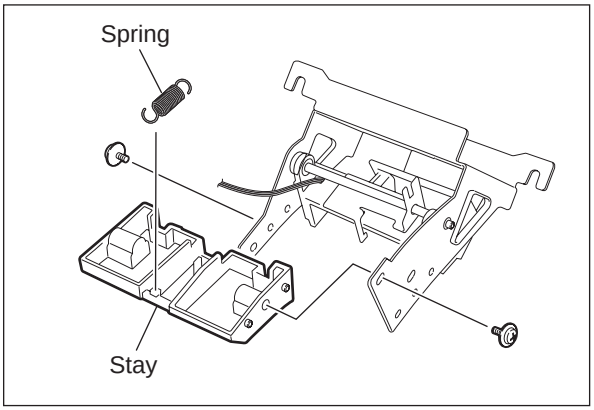


Fig. 12-60

(5) Remove 1 E-ring and shaft and then take off the color auto-toner sensor case.

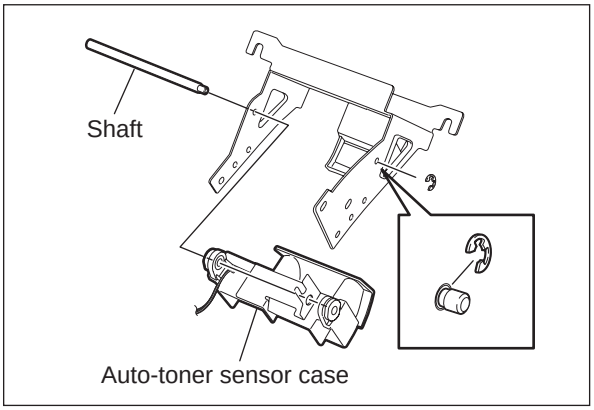


Fig. 12-61

(6) Remove 2 screws and take off the color auto-toner sensor.

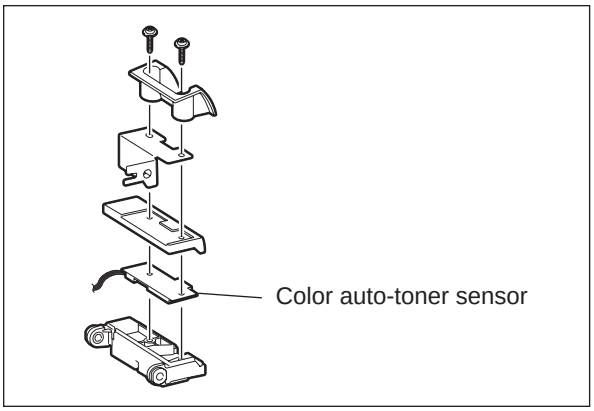


Fig. 12-62

<<Procedure for replacing an oil seal>>

- Take off the oil seal by hooking out its inside with a fine screwdriver and such.
- Push in a new oil seal parallel to the frame, bushing and so on with paying attention to its direction (as shown by the figure at right).
- Spread the grease (Alvania No.2; about 2-ricegrain's amount) all around the inside diameter.

Note:

Wipe off the grease which has run off to the inner side of the oil seal.

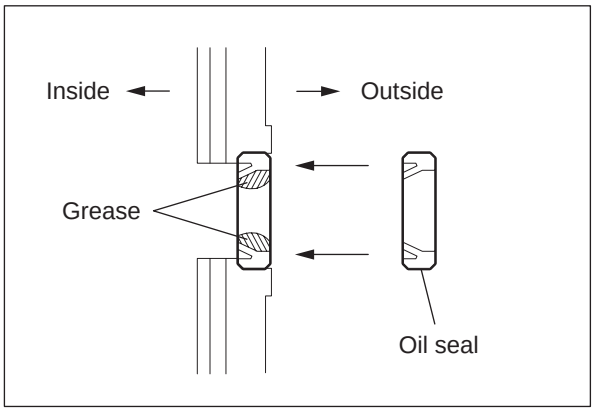


Fig. 12-63

13. REVOLVER UNIT

13.1 General Description

The revolver unit has three colors (yellow, magenta and cyan) of developer units and three colors of toner cartridges inside. The revolver rotates 120 degrees in a clockwise direction to move each color developer unit to the developing position, and thus color development is performed. At black development, the revolver rotates to move them to the escape position not to contact with the photoconductive drum.

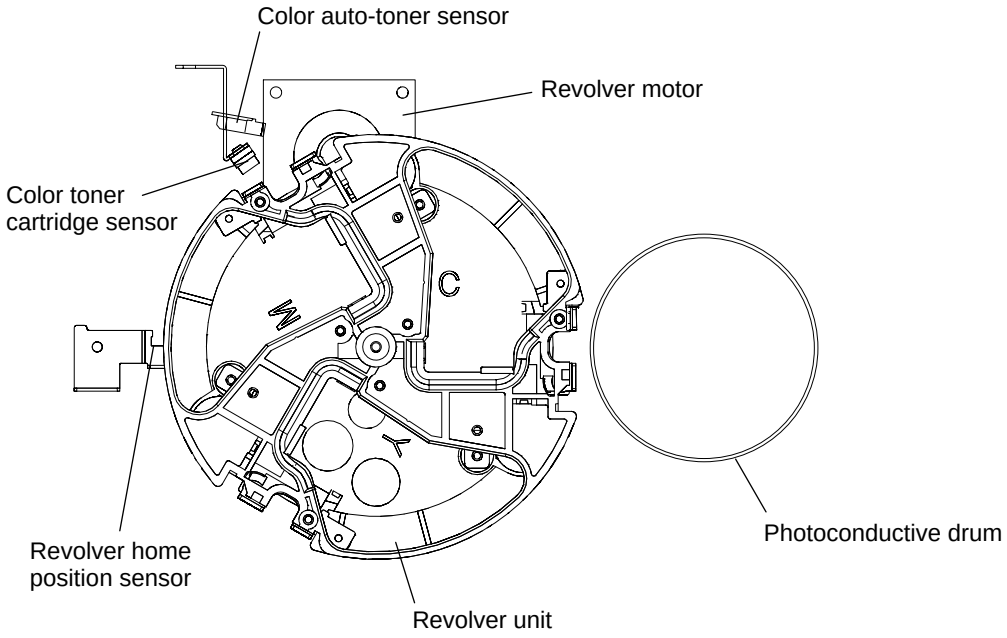


Fig. 13-1

13

13.2 Construction

This chapter explains about the following units, parts and control circuits related to the revolver unit. Refer to Chapter 12 for the color developer unit (P.12-9 "12.5 Color Developer Unit") and Chapter 9 for the developer motor drive unit (P.9-6 "9.4 Developer Motor (M11)").

- Revolver unit
- Revolver motor
- Revolver home position sensor
- Color toner cartridge sensor

13.3 Functions

1) Revolver motor (M12)
   The revolver unit rotates with the drive of the revolver motor (M12) (two-phase stepping motor). The revolver home position sensor (S8) detects its home position.

2) Developer motor drive unit
   The developer motor (M11) drives the color developer unit and the toner supply auger in the revolver unit. This drive is connected and disconnected by the color developer unit drive clutch (CLT9) and the color developer toner supply clutch (CLT8). Only the color developer unit at the developing position is driven by this motor.

3) Color developer unit
   The color developer units must be in the revolver unit to perform color development. Since the revolver unit has no device to detect misinstallation, be careful not to install the wrong unit. Refer to Chapter 12 for details.

4) Color toner cartridge sensor (S9)
   This sensor detects the installation fault of the color toner cartridge. It is an optical reflection sensor detecting the installation fault with the reflecting light from the reflection section. The color toner cartridge is detected at the toner cartridge replacement position.

5) Revolver home position sensor (S8)
   This sensor is a transmissive type light sensor detecting the revolver unit home position. The position detection is performed at initialization. "Call for service" if it does not detect the position in a specified period of time.

13.4 Drive of Revolver Unit

The drive from the revolver motor (M12) is transmitted to the gear at the external layer of the revolver unit rear side. Then the revolver unit rotates clockwise.

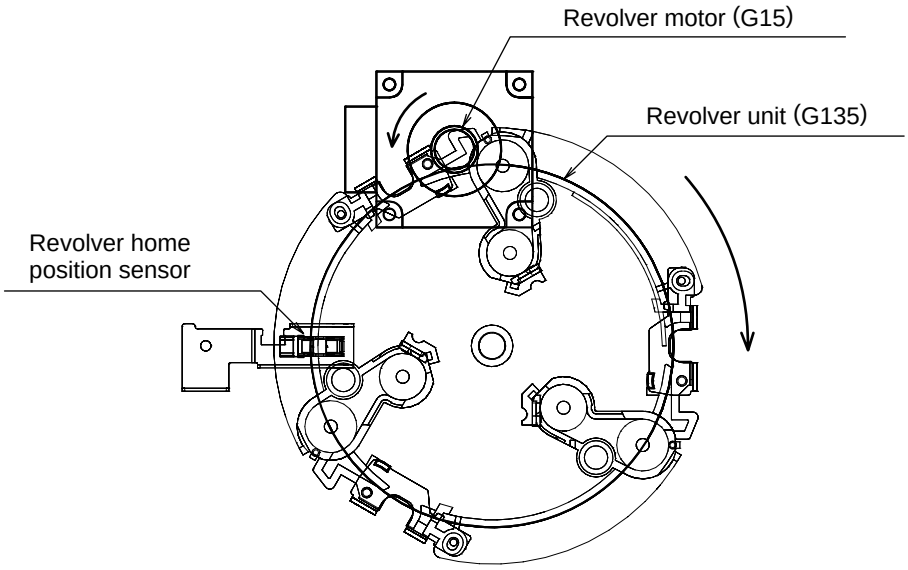


Fig. 13-2

13.5 Revolver Motor Drive Circuit

The revolver motor (two-phase stepping motor) drives over the DRV board circuit.

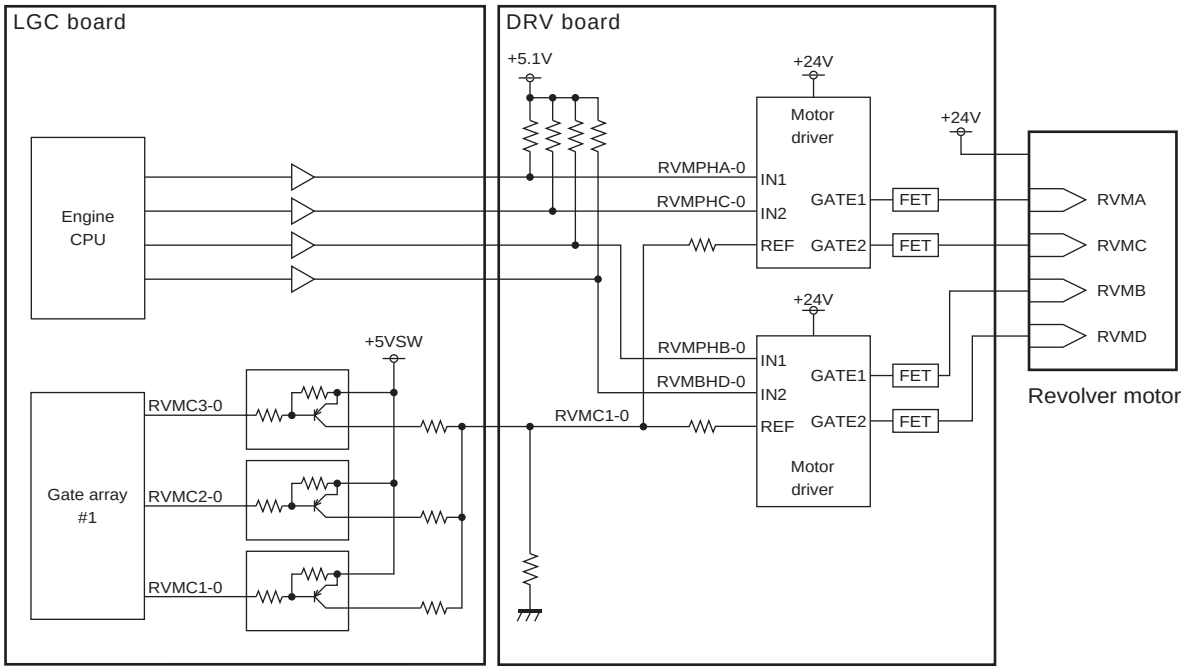


Fig. 13-3

13

13.6 Operation

13.6.1 Home position detection

The revolver unit detects its home position at every warming-up after the power is turned ON or the front cover is opened/closed since this unit is driven by the stepping motor. The home position is the point where the revolver home position sensor (S8) detects the shielded part in the revolver unit.

13.6.2 Escape position movement

The color developer units (C, M and Y) are escaped from the developing position when developing black image by rotating the revolver unit. This escaping movement is performed after every home position detection. The escape position is where these color developer units are during warming-up. The movement always starts from the escape position when printing starts.

13.6.3 During warming-up

The home position detection and escape position movement are performed consecutively during warming-up. Then the revolver unit operations such as toner supply and image quality control are performed according to the conditions of the equipment.

13.6.4 During printing

The revolver unit moves in order, as follows:
Escape position (black image development)→Cyan image developing position → Magenta image developing position→Yellow image developing position→Escape position (printing completed) In addition to the basic movement mentioned above, the revolver operations such as toner supply and image quality control are performed according to the conditions of the equipment.

1) Image quality control is performed immediately before the printing operation according to the conditions of the equipment.

2) The revolver unit stays at the escape position to perform the black image development.

3) The revolver unit moves to the cyan image developing position after the completion of black image development.

4) The cyan developer unit is driven and performs developing. At the same time, the density of magenta toner is detected and the detection result is stored in memory.

5) The revolver unit moves to the magenta image developing position after the completion of cyan image development.

6) The magenta developer unit is driven and performs developing. At the same time, the density of yellow toner is detected and the detection result is stored in memory.

7) The revolver unit moves to the yellow developing position after the completion of magenta image development.

8) The yellow developer unit is driven and performs developing. At the same time, the density of cyan toner is detected and the detection result is stored in memory.

9) The revolver unit moves to the escape position to perform black image development after the completion of yellow image development.

10)If any of color toner is judged as the low density, the revolver unit supplies the toner.

11)Procedure 2 to 10 is repeated when printing more than 1 page.

12)Printing finishes. Image quality control is performed according to the conditions of the equipment.

13.6.5 Color toner supply

1) The color developer unit whose toner needs to be supplied moves to the developing position.

2) The developer unit is driven and the toner is supplied for a regulated period of time.

3) The drive is stopped and the unit moves to the color toner density detection position to detect the density.

4) When the toner density detected is higher than the regulated value, it moves to the escape position. When the toner density detected is lower than the regulated value, it repeats the procedure 1 to 3 for five times. If the toner density is still lower than the regulated value, it is judged as “Toner empty” and the unit moves to the escape position.

5) Procedure 1 to 4 is repeated for other color developer units when the toner supply is needed.

13.6.6 During image quality control

1) A black test pattern is formed on the transfer belt while the revolver unit is at the escape position.

2) The revolver unit moves to the cyan developing position after the completion of the black image development and a cyan test pattern is formed.

3) It moves to the magenta developing position after the completion of the cyan image development and a magenta test pattern is formed.

4) It moves to the yellow developing position after the completion of the magenta image development and a yellow test pattern is formed.

5) It moves to the escape position after completion of the yellow image development.

6) The image quality sensor (S17) reads the image density of four colors and feedbacks to the image quality control.

7) Procedure 1 to 7 is repeated for one to six times until the specified gradation characteristic and image density are obtained.

13.7 Disassembly and Replacement

[A] Color toner cartridge sensor (S9)

(1) Take off the maintenance tray (📖 P.2-25 "[B] Maintenance tray").
(2) Disconnect 1 connector. Loosen 1 screw and take off the color toner cartridge sensor with the whole bracket.

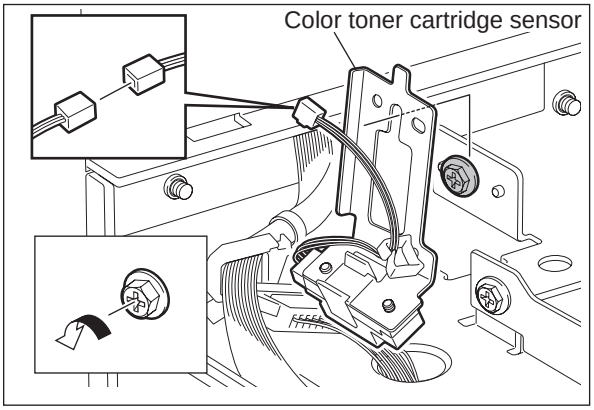


Fig. 13-4

(3) Disconnect the connector and remove 1screw and then take off the toner cartridge sensor.

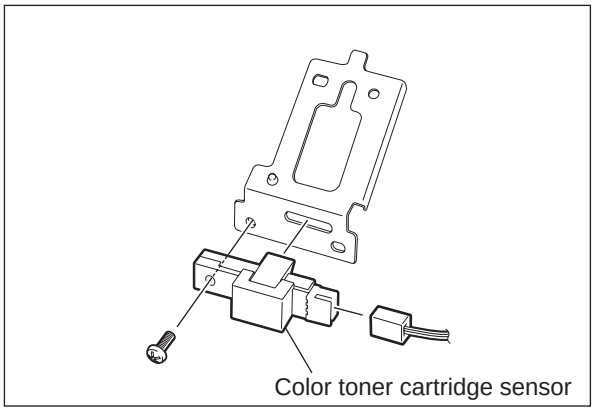


Fig. 13-5

[B] Internal cooling fan (M20)

(1) Take off the inner tray (📖 P.2-26 "[C] Inner tray").
(2) Disconnect 1 connector and remove 2 screws. Then take off the internal cooling fan together with the duct.

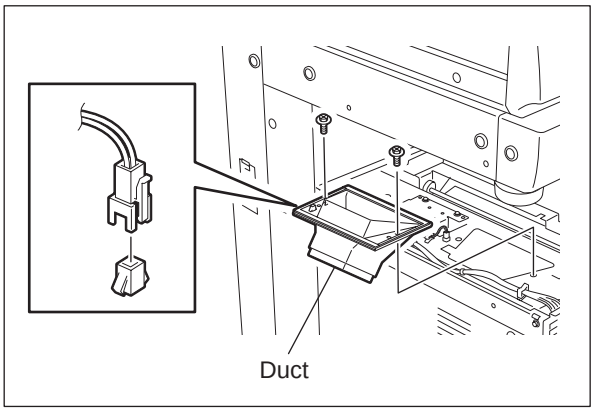


Fig. 13-6

(3) Disconnect 1 connector and remove 2 screws. Then take off the internal cooling fan.

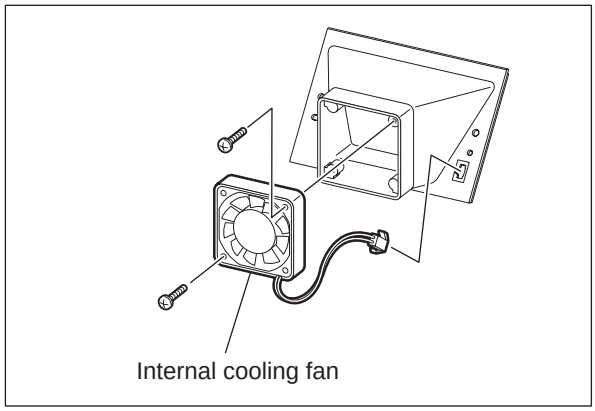


Fig. 13-7

[C] Revolver home position sensor (S8)

(1) Take off the left cover (P.2-29 "[K] Left cover").
(2) Disconnect 1 connector and remove 1 screw. Then take off the revolver home position sensor with the whole bracket.

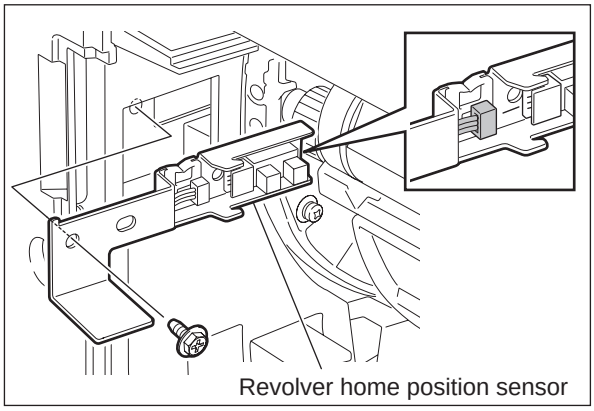


Fig. 13-8

[D] Revolver motor (M12)

(1) Take off the LGC board case (P.2-38 "[F] LGC board case").
(2) Disconnect 1 connector and remove 2 screws and take off the revolver motor.

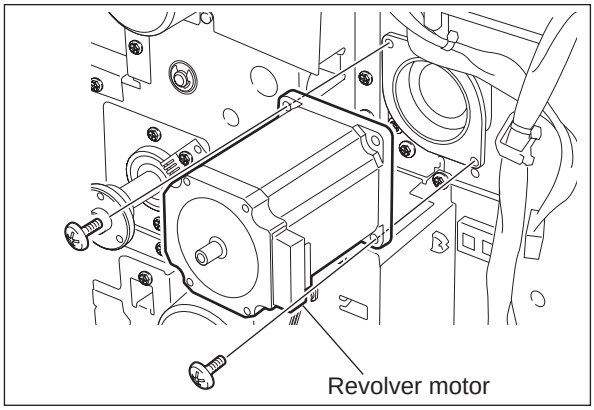


Fig. 13-9

[E] Color developer unit drive gear / Color toner supply drive gear

(1) Take off the color developer unit (📖 P.12-21 "[B] Color developer unit").
(2) Remove 1 screw, release 1 latch and take off the holder. Then take off the color developer unit drive gear and color toner supply drive gear.

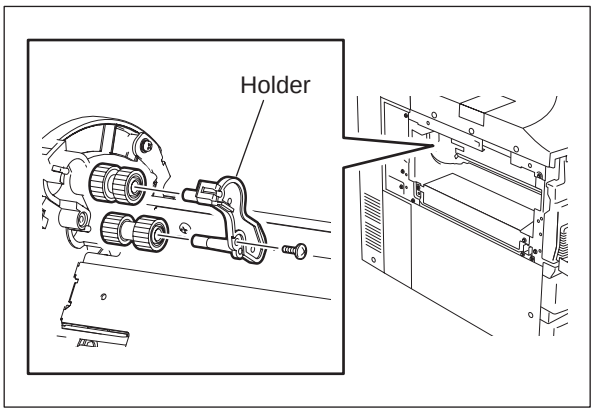


Fig. 13-10

Notes:
1. When installing, insert the shaft of the holder into the revolver unit securely.
2. Apply the grease to the shaft after the replacement of the gears.

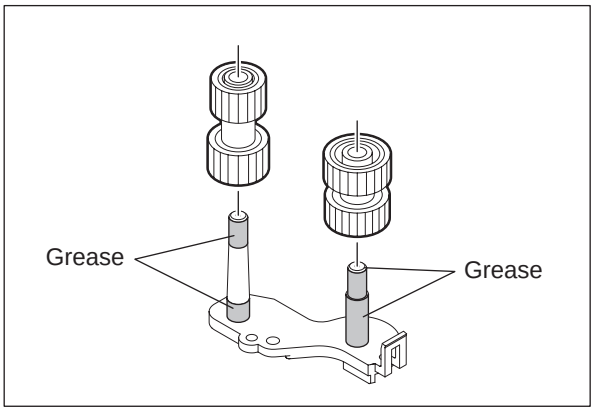


Fig. 13-11

[F] Revolver unit

(1) Take off all of the color developer units (📖 P.12-21 "[B] Color developer unit").
(2) Take off the process unit (📖 P.11-10 "[B] Process unit").
(3) Take off the left inner cover (📖 P.11-23 "[P] Temperature/humidity sensor (S19)").
(4) Take off the left rear cover (📖 P.2-29 "[M] Left rear cover").
(5) Take off the color auto-toner sensor (📖 P.12-31 "[F] Color auto-toner sensor (S10) / Color auto-toner sensor shutter solenoid (SOL1)").
(6) Take off the color toner cartridge sensor (📖 P.13-8 "[A] Color toner cartridge sensor (S9)").
(7) Take off the internal cooling fan (📖 P.13-8 "[B] Internal cooling fan (M20)").
(8) Take off the revolver home position sensor (📖 P.13-9 "[C] Revolver home position sensor (S8)").
(9) Take off the laser optical unit (📖 P.8-11 "[A] Laser optical unit").
(10) Release 2 latches take off the laser cooling duct cover (rear side).
(11) Pull out the handle. Remove 2 screws and take off the laser cooling duct cover (front side).

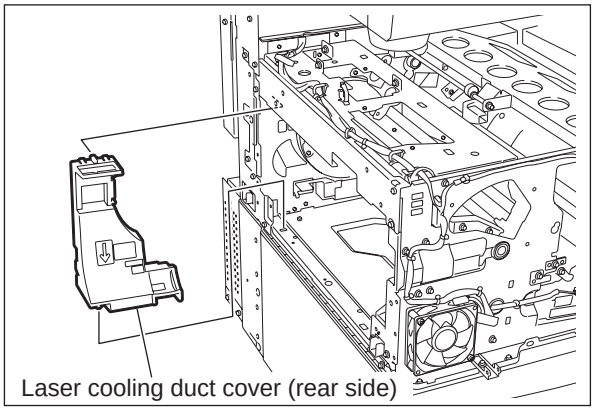


Fig. 13-12

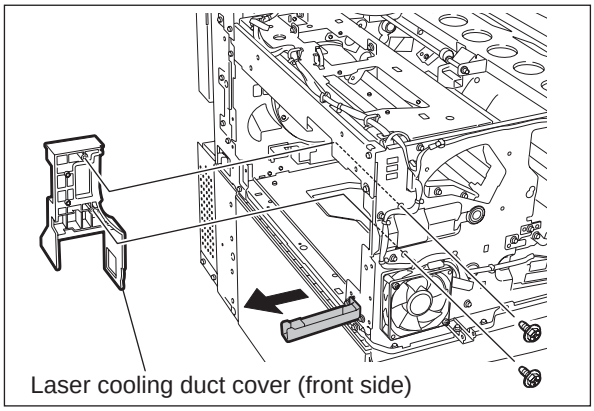


Fig. 13-13

13

(12) Remove 6 screws and take off the bracket.

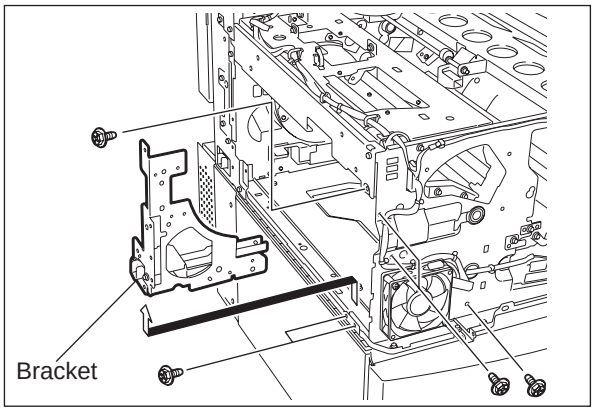


Fig. 13-14

(13) Remove 4 screws and take off the stay.
(Remove 1 of 4 screws from the rear side of the equipment.)

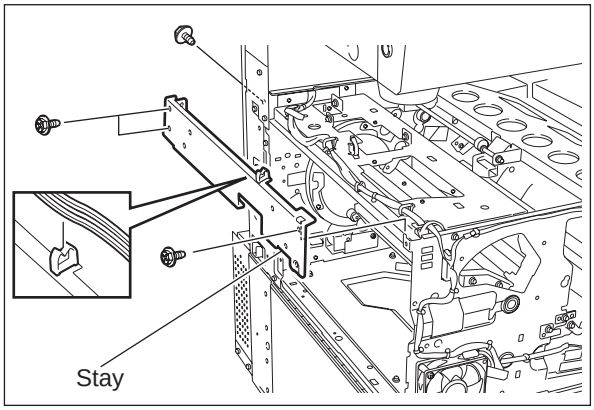


Fig. 13-15

(14) Remove 3 screws and take off the bracket.

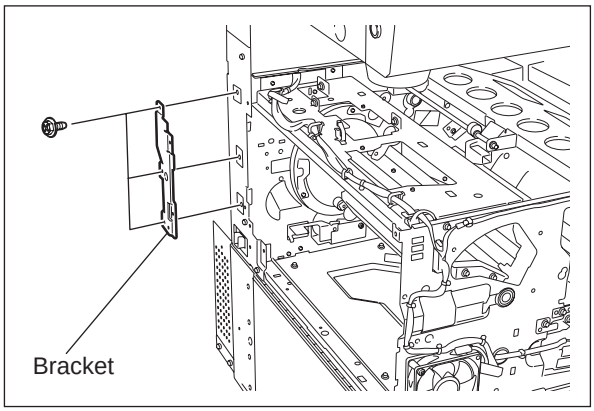


Fig. 13-16

(15) Remove the stopper attached on the front side of the revolver unit rotary shaft.
(16) Push in the bearing to the inside of the frame and come it off from the frame.

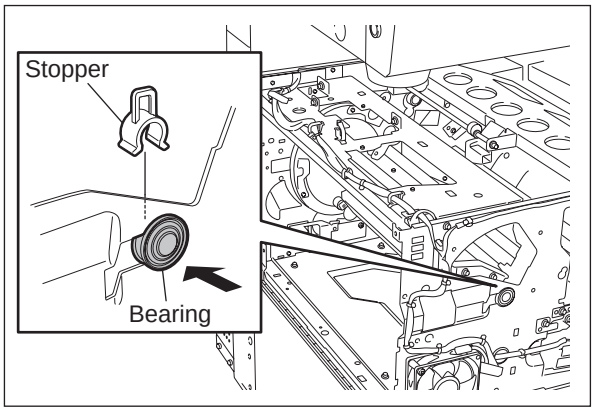


Fig. 13-17

(17) Slide the revolver unit to the front and take off the revolver unit.

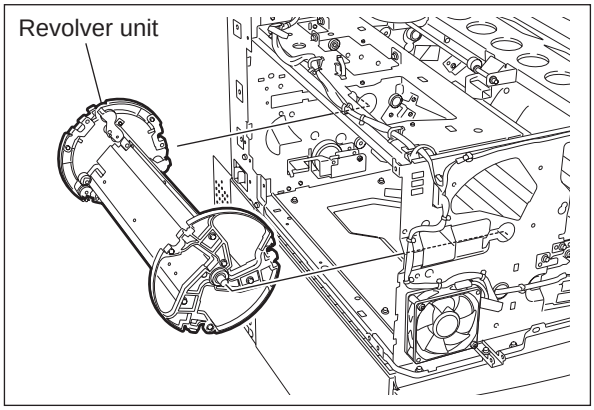


Fig. 13-18

13

14. TRANSFER UNIT

14.1 General Descriptions

The transfer unit transfers the toner image formed on the photoconductive drum to the transfer belt, and then transfers it to the paper. The transfer of the toner image from the photoconductive drum to the transfer belt is called 1st transfer and the transfer from the transfer belt to the paper is called 2nd transfer.

To reproduce a color image, maximum four color images are overlaid on the transfer belt and the overlaid image is then transferred to the paper. Namely, the transfer belt turns four times for printing of one image.

The transfer belt rotates with the main motor (M6) drive.

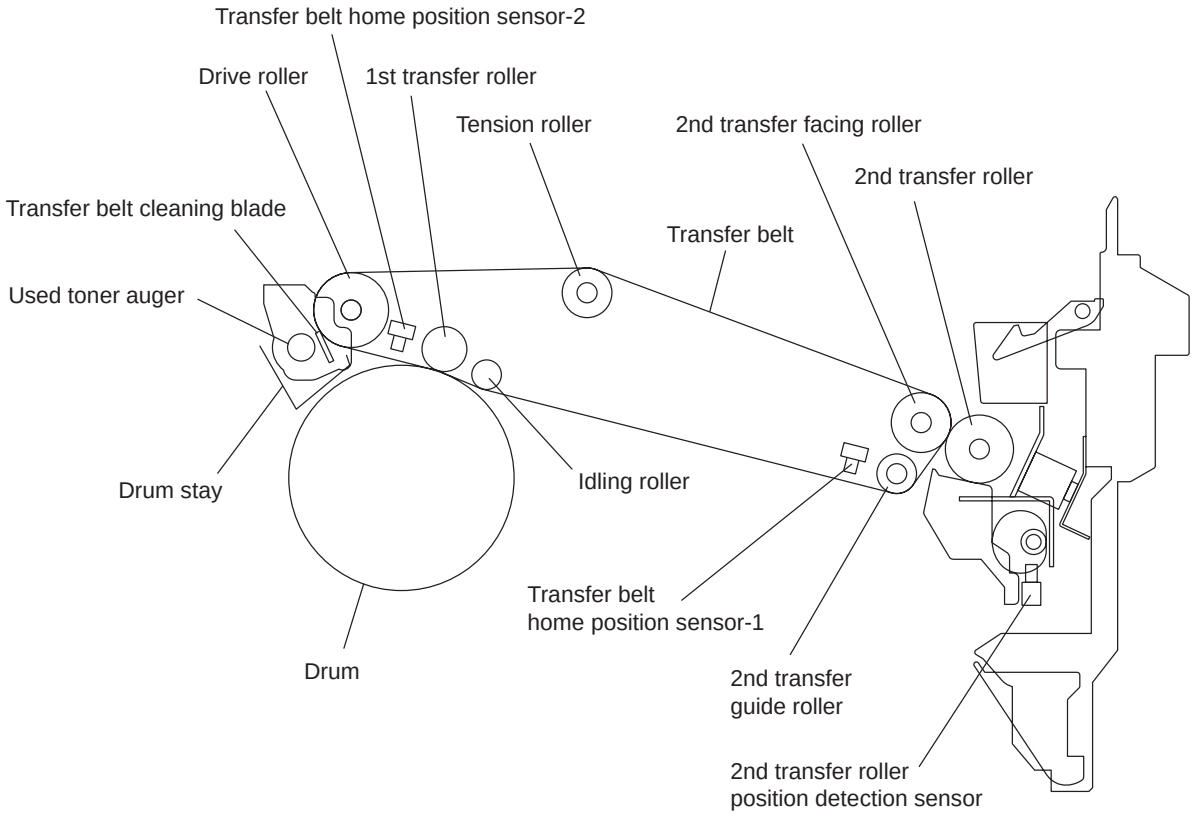


Fig. 14-1

14.2 Construction

Process unit		
Transfer belt unit	Transfer belt	
	1st transfer roller	
	Tension roller	
	Drive roller	
	2nd transfer facing roller	
	2nd transfer guide roller	
	Idling roller	
	Transfer belt home position sensor-1 (S15)	
	Transfer belt home position sensor-2 (S16)	
Transfer belt cleaning unit	Transfer belt cleaning blade	PM parts
	Used toner auger	
	Transfer belt cleaning unit side seal-F	PM parts
	Transfer belt cleaning unit side seal-R	PM parts
	Transfer belt cleaning unit side mylar-F	PM parts
	Transfer belt cleaning unit side mylar-R	PM parts
Transfer belt cleaner auger motor (M2)		
Transfer belt cleaner clutch (CLT1)		
2nd transfer unit		
2nd transfer roller		PM parts
2nd transfer roller contact clutch (CLT5)		
2nd transfer roller position detection sensor (S18)		

14.3 Functions

1) Transfer belt
The transfer belt is made by forming resin which has an electrical resistance with high precision. The main motor (M6) drive rotates the transfer belt drive roller and that makes to rotate the transfer belt as well.

2) 1st transfer roller
When the 1st transfer bias from high-voltage power supply is applied, the toner is transferred from photoconductive drum to the transfer belt. The spring presses to contact the transfer belt with the photoconductive drum.

3) Transfer belt cleaning blade
Removes the residual toner, paper dust or foreign objects on the transfer belt surface. Transfer belt cleaner clutch (CLT1) performs contact/release movement.

4) Transfer belt cleaner clutch (CLT1)
Performs contact/release movement between the transfer cleaning blade and transfer belt. This clutch is driven by the transmitted drive from the developer motor (M11).

5) Used toner auger
Transports the scraped residual toner and paper dust to the toner bag. The transfer belt cleaner auger motor (M2) drives this auger.

6) Drive roller
Rotates the transfer belt. This roller is driven by the transmitted drive from the main motor (M6). In addition contacts the transfer belt cleaning blade to the transfer belt easily. Also retains the contacting position of the transfer belt and the photoconductive drum.

7) Tension roller
Applies the tensile force to the transfer belt with its spring.

8) Idling roller
Retains the contacting position of the transfer belt and the photoconductive drum.

9) 2nd transfer facing roller
This roller contacts the 2nd transfer roller with the transfer belt between these rollers and nip the paper.

10) Transfer belt home position sensor-1 and 2 (S15, S16)
Detects the home position of transfer belt. This reflection type sensor detects the reflection tape inside of the transfer belt.

11) 2nd transfer roller
When the 2nd transfer bias from high-voltage power supply is applied, the toner is transferred from the transfer belt to the paper.

12) 2nd transfer roller contact clutch (CLT5)
This clutch is an electromagnetic clutch which contacts or releases the 2nd transfer roller to the transfer belt. The 2nd transfer roller contacts when this clutch turns ON and releases when it turns OFF. Since the transport motor is its drive source, the clutch needs to be ON as long as they are contacting.
It also controls the clutch not to turn more than 180 degrees by the spring and stopper.

13)2nd transfer roller position detection sensor (S18)

This sensor is a photointerrupter detecting whether the 2nd transfer roller is at its contacting position or releasing position.

14.4 Outline of 1st transfer

1) The transfer belt contacts with the photoconductive drum. Power voltage is applied through the 1st transfer roller and it transfers the toner onto the transfer belt.
2) The transfer belt home position sensor-2 (S16) detects its home position and overlays four color images.
3) When the transfer of the toner image from the transfer belt to the paper is completed in 2nd transfer, residual toner on the transfer belt is scraped off by the transfer belt cleaning blade.

14.5 Outline of 2nd transfer

1) The 2nd transfer roller stays at the released position from the transfer belt in 1st transfer.
2) Upon the completion of 1st transfer, the 2nd transfer roller moves to the transfer position.
3) After an electrode bias is applied on the 2nd transfer roller, the toner image is transferred from the transfer belt to the paper.
4) Upon the completion of 2nd transfer, the 2nd transfer roller escapes to the releasing position.

14.6 High-Voltage Transformer Output Control Circuit

High-voltage power supply outputs the voltage of positive/negative polarity.
When the voltage of positive polarity is supplied to the 2nd transfer roller, the toner will be supplied from the intermediary belt to the paper.
When the voltage of negative polarity is supplied to the 2nd transfer roller, the toner on the 2nd transfer roller is transferred to the transfer belt reversely. The toner on the transfer belt is eliminated by the cleaning unit and thus cleaning of the 2nd transfer roller is performed.

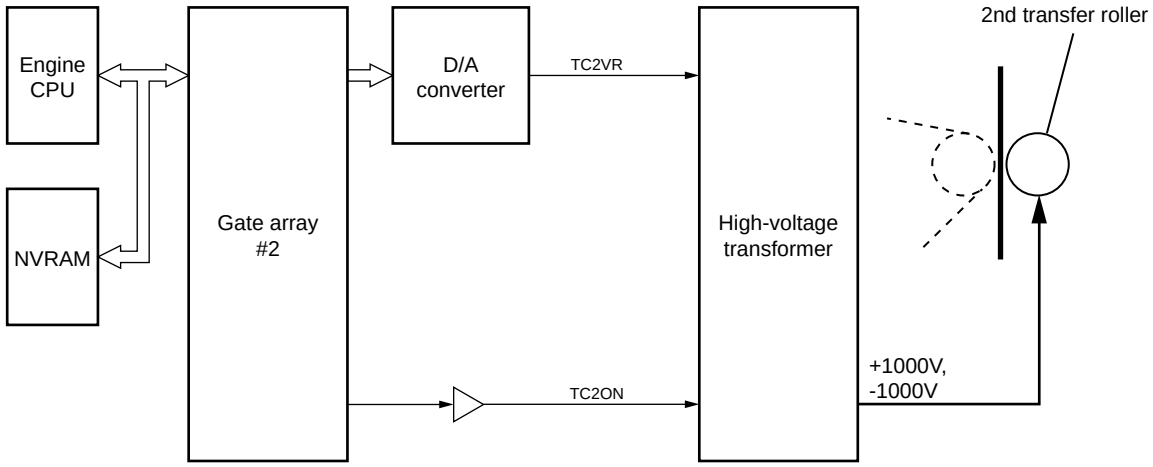


Fig. 14-2

14.7 Disassembly and Replacement

[A] Transfer belt unit / Transfer belt cleaning unit

Note:
It is recommended to wear gloves to avoid a direct touch on the belt surface.

(1) Take off the process unit (📖 P.11-10 "[B] Process unit").
(2) Remove 2 screws on the front side.

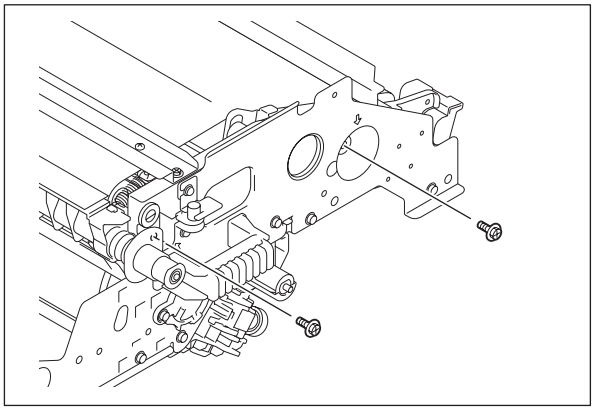


Fig. 14-3

(3) Remove 2 screws (shoulder screw) on the rear side.
(4) Disconnect 1 connector on the rear side.

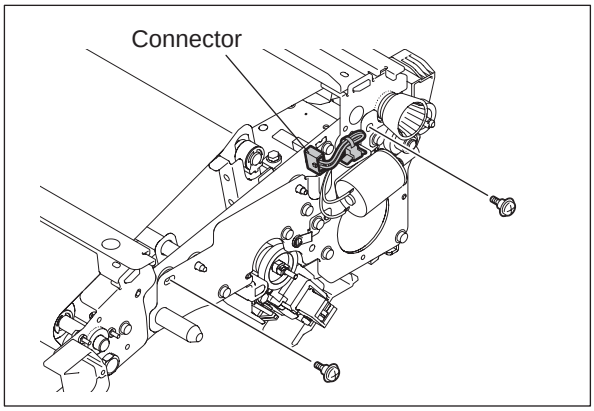


Fig. 14-4

(5) Take off the transfer belt.

Note:
When the transfer belt unit is being installed, screw the unit by pressing it downward.

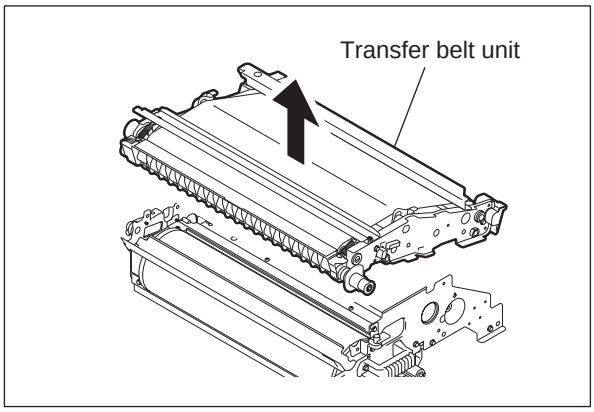


Fig. 14-5

(6) Remove 1 screw and take off the left rail.

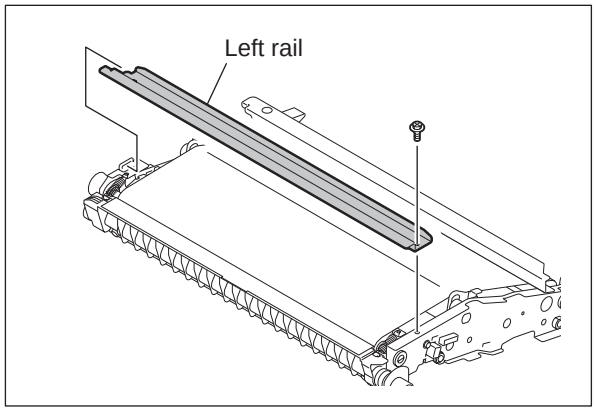


Fig. 14-6

(7) Remove 2 springs.

Note:
Make sure that the spring is not installed incorrectly or deformed.

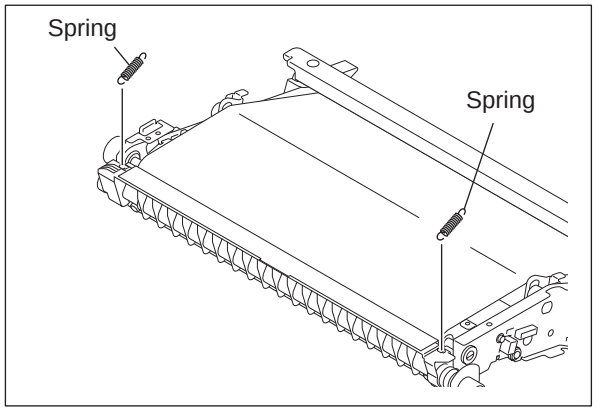


Fig. 14-7

(8) Remove 1 screw and take off the bracket.

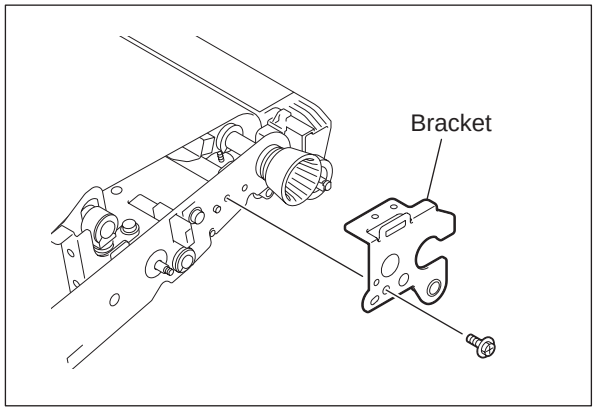


Fig. 14-8

(9) Take off the transfer belt cleaning unit.

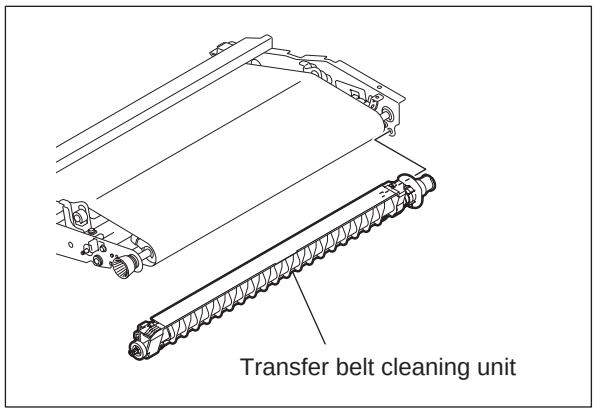


Fig. 14-9

[B] Transfer belt

Note:
It is recommended to wear gloves to avoid a direct touch on the belt surface.

(1) Take off the transfer belt cleaning unit (📖 P.14-8 "[A] Transfer belt unit / Transfer belt cleaning unit").
(2) Remove 1 screw and take off the right rail.

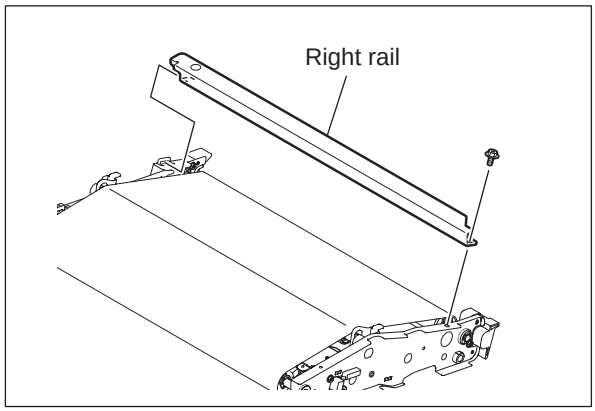


Fig. 14-10

(3) Remove 1 screw on the front side and 1 screw on the rear side. Then lay down the tension roller.

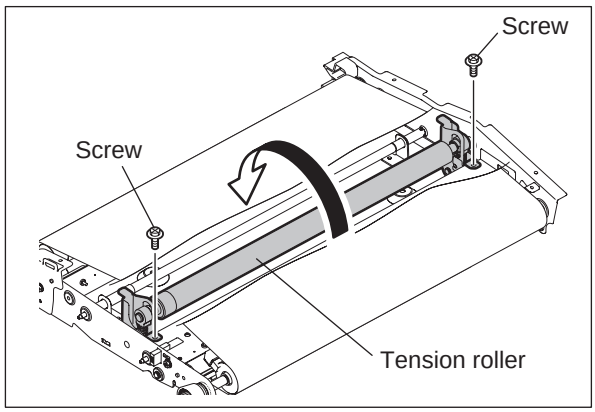


Fig. 14-11

(4) Remove 1 screw and take off the bracket on the rear side.

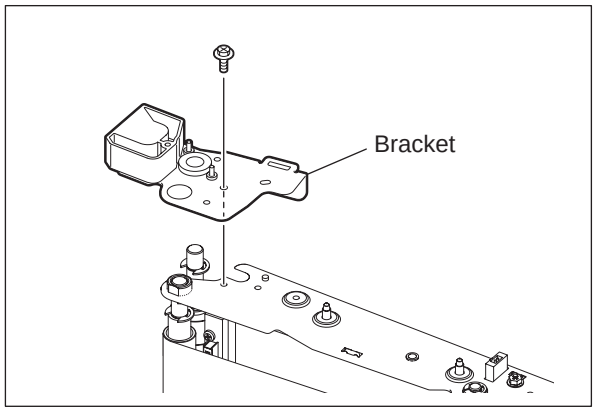


Fig. 14-12

(5) Pull the bearing attached on the 2nd transfer facing roller out of the hole and then insert it into the adjacent hole.

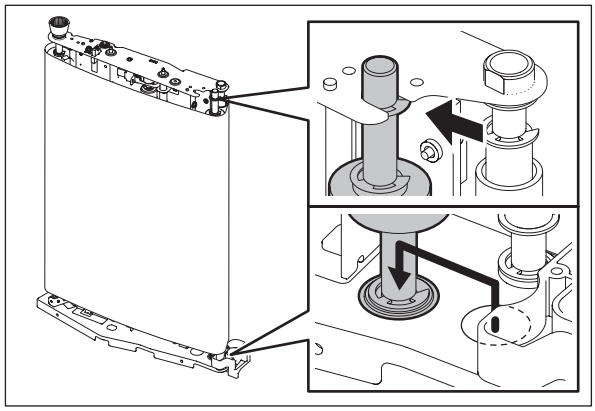


Fig. 14-13

(6) Pull out the transfer belt.

Notes:

1. Install the transfer belt in the middle so that it does not move to one side.
2. Install the transfer belt with the reflection tape on the inner side of the belt come at the rear side.
3. Do not touch the belt surface directly with bare hands.
4. Be sure not to scratch the belt surface.
5. When the belt is being replaced, clean its drive roller, 2nd transfer facing roller, tension roller, idling roller and 2nd transfer guide roller with alcohol.
6. Check if the flange on both ends of the transfer belt does not run on the rollers.

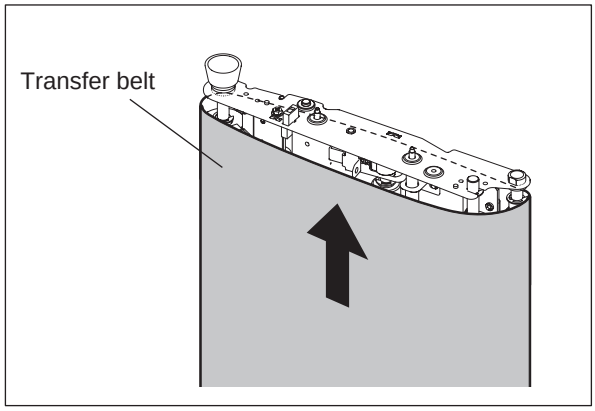


Fig. 14-14

[C] 1st transfer roller

(1) Take off the transfer belt (📖 P.14-10 "[B] Transfer belt").
(2) Remove 1 screw.
(3) Take off the holder on the rear side and take off the 1st transfer roller.

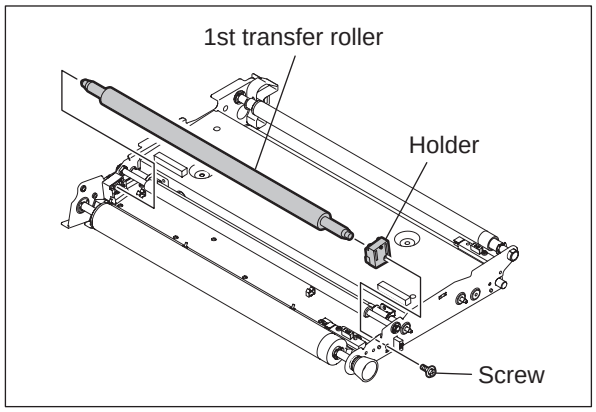


Fig. 14-15

[D] Transfer belt home position sensor-1 (S15)

(1) Take off the transfer belt (📖 P.14-10 "[B] Transfer belt").
(2) Remove 1 screw and take off the cover.

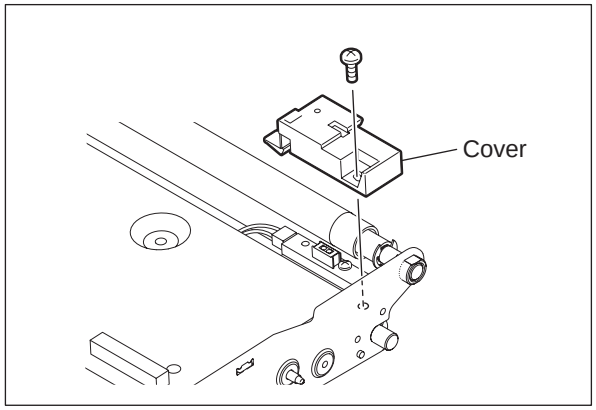


Fig. 14-16

(3) Disconnect 1 connector and remove 1 screw. Then take off the transfer belt home position sensor-1.

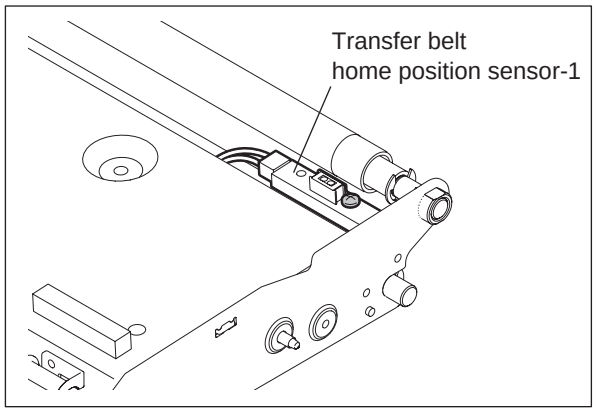


Fig. 14-17

[E] Transfer belt home position sensor-2 (S16)

(1) Take off the transfer belt
(📖 P.14-10 "[B] Transfer belt").
(2) Remove 1 screw and take off the cover.

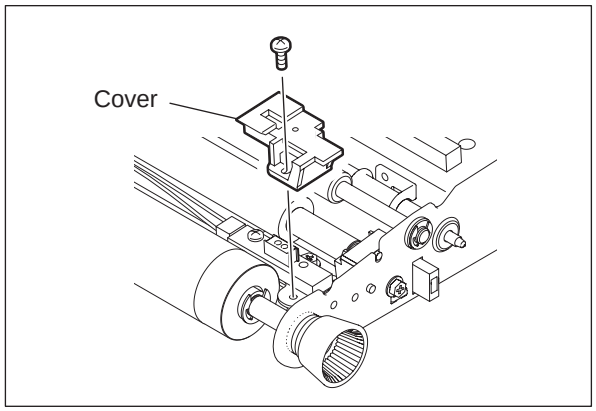


Fig. 14-18

(3) Disconnect 1 connector and remove 1 screw. Then take off the transfer belt home position sensor-2.

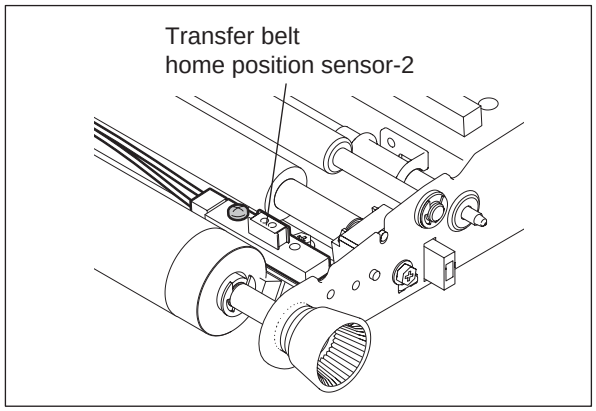


Fig. 14-19

[F] Drum stay

(1) Take off the process unit
(📖 P.11-10 "[B] Process unit").
(2) Loosen 1 screw and take off the drum stay.

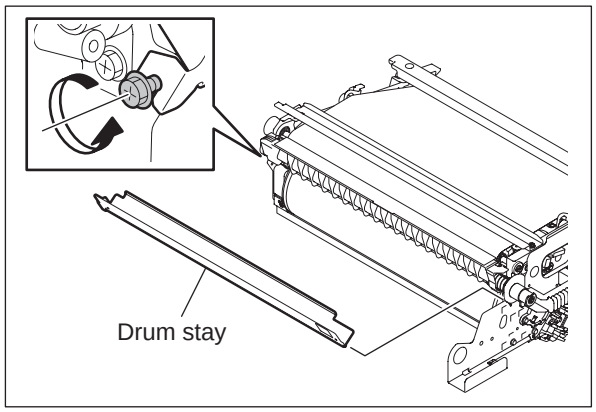


Fig. 14-20

[G] Transfer belt cleaning blade PM / Blade seal PM / Blade mylar PM

(1) Take off the transfer belt cleaning unit (📖 P.14-8 "[A] Transfer belt unit / Transfer belt cleaning unit").
(2) Remove 2 screws and take off the transfer belt cleaning blade.

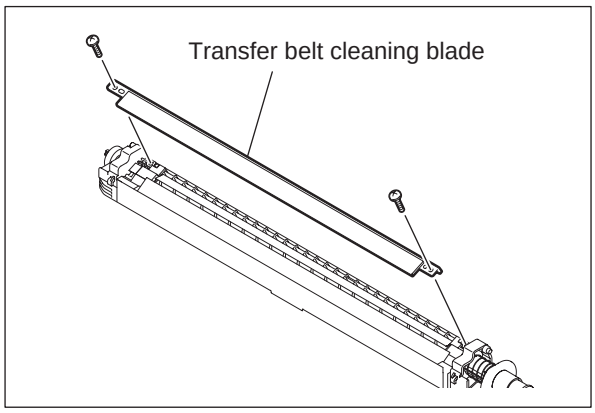


Fig. 14-21

(3) Remove the blade seals (both front and rear sides).

Notes:
1. When the blade seals are being attached, attach them on the position shown in the figure at right (by slightly pushing it to the direction of the arrow).
2. Be sure that the attached blade seals come at the bottom side of the recovery blade.

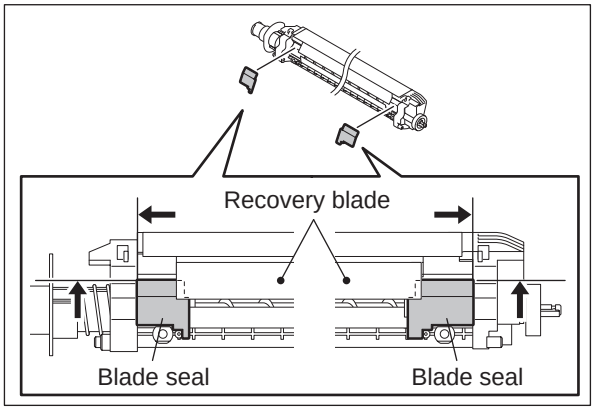


Fig. 14-22

(4) Remove the blade mylars (both front and rear sides).

Notes:
1. When both the blade mylars are being attached, attach them on the position shown in the figure at right (by slightly pushing it to the direction of the arrow).
2. Be sure that the attached blade mylars come at the bottom side of the recovery blade and the blade sheet.

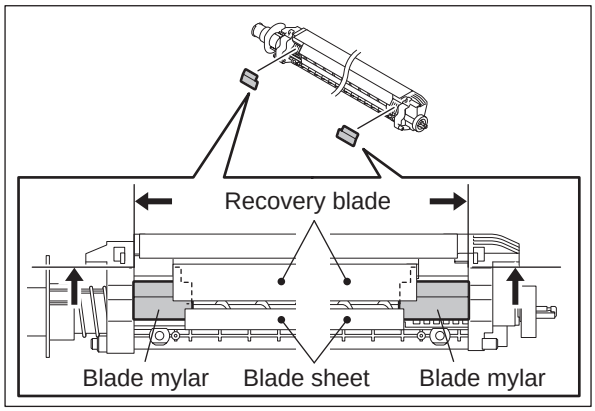


Fig. 14-23

[H] Transfer belt cleaner auger motor (M2)

(1) Take off the process unit (📖 P.11-10 "[B] Process unit").
(2) Disconnect 1 connector and remove 1 harness clamp itself.
(3) Remove 2 screws and take off the transfer belt cleaner auger motor with its bracket.

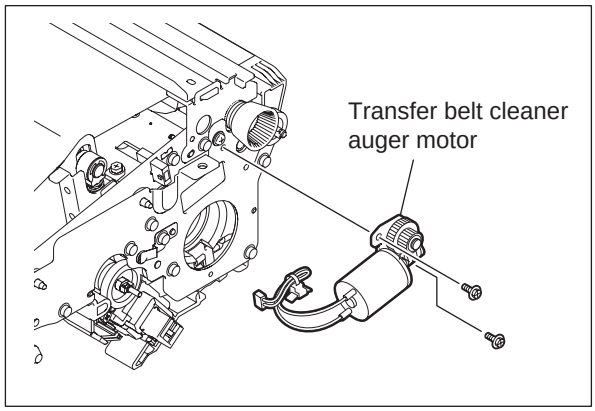


Fig. 14-24

(4) Remove 2 screws and take off the transfer belt cleaner auger motor from its bracket.

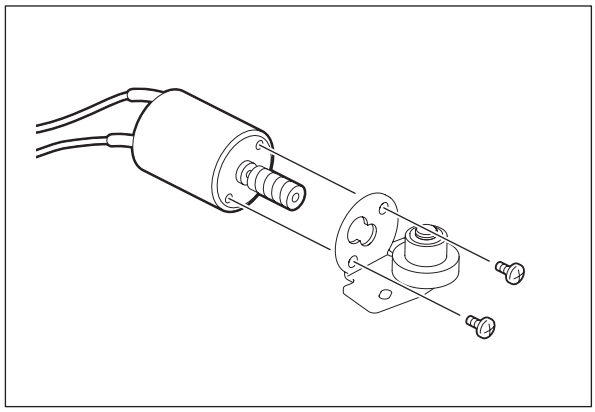


Fig. 14-25

[I] 2nd transfer roller (PM)

(1) Open the 2nd transfer unit.
(2) Remove 1 clip, 1 collar (with bearing), 1 washer and 1 bushing (with bearing) on the front side of the 2nd transfer roller.
(3) Remove 1 clip and slide 1 bushing (with bearing) on the rear side of the 2nd transfer roller.
(4) Take off the 2nd transfer roller.

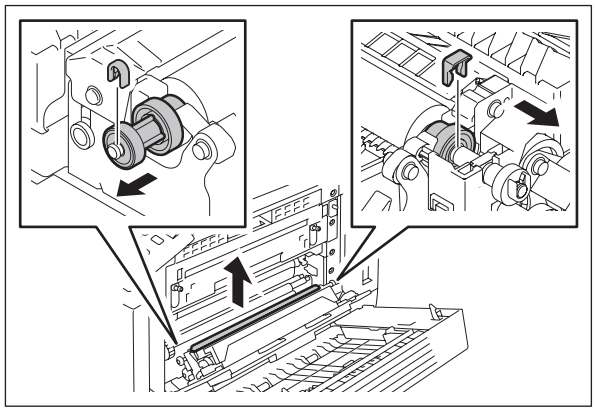


Fig. 14-26

(5) Remove 1 clip, 1 collar (with bearing), 1 washer, 1 holder and 1 bushing (with bearing) from the rear side of the 2nd transfer roller.

Note:
A spring is fit in the holder. When the roller is reassembled, make sure that the spring is not installed incorrectly or deformed.

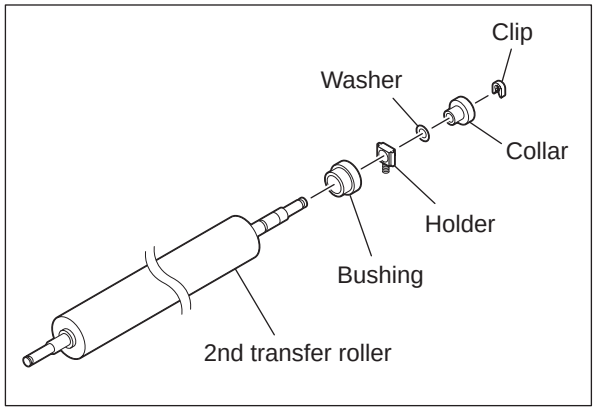


Fig. 14-27

[J] 2nd transfer unit

(1) Take off the right front hinge cover (📖 P.2-28 "[I] Right front hinge cover").
(2) Remove 2 screws and take off the hinge pin.

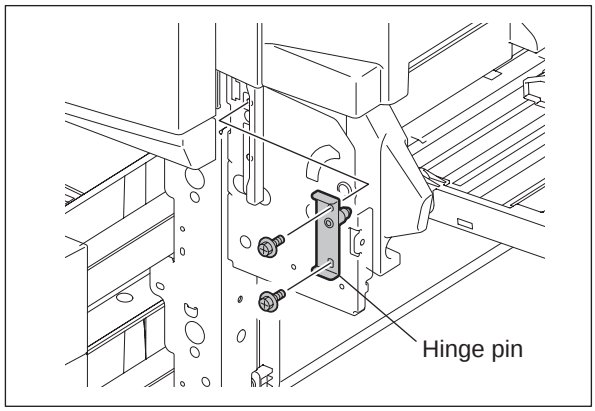


Fig. 14-28

(3) Open the 2nd transfer unit.
(4) Disconnect 1 connector and release the harness clamp.
(5) Remove 3 screws and take off the 2nd transfer gear unit.

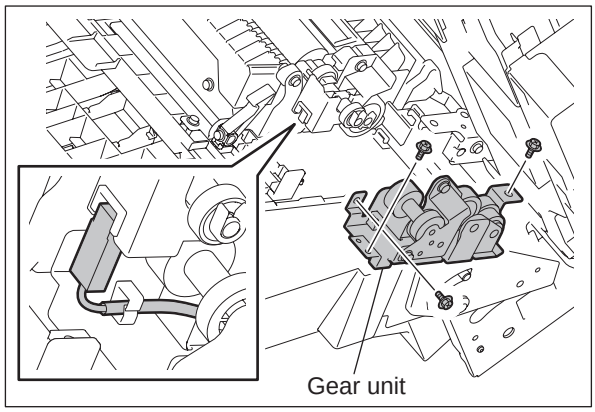


Fig. 14-29

(6) Take off the 2nd transfer unit.

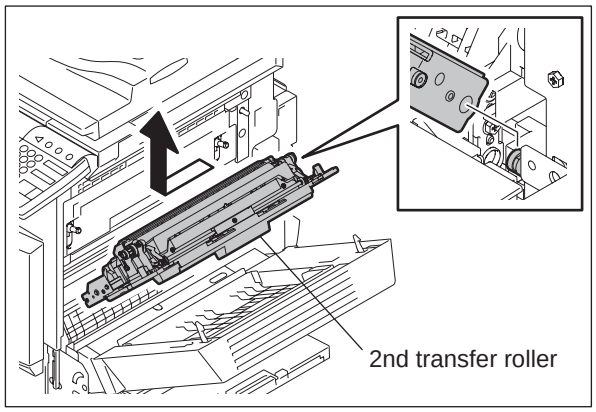


Fig. 14-30

[K] Case

(1) Take off the 2nd transfer unit
(📖 P.14-16 "[J] 2nd transfer unit").
(2) Take off the 2nd transfer roller
(📖 P.14-15 "[I] 2nd transfer roller").
(3) Remove 2 screws and take off the pre-transfer guide.

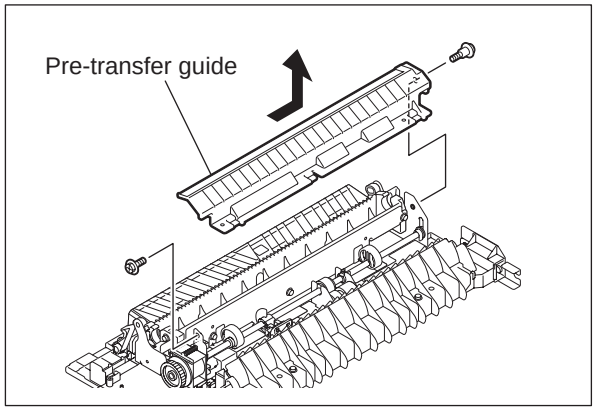


Fig. 14-31

Note:
When the pre-transfer guide is being installed, be sure that 3 tabs of the guide come underneath the bracket (metal plate).

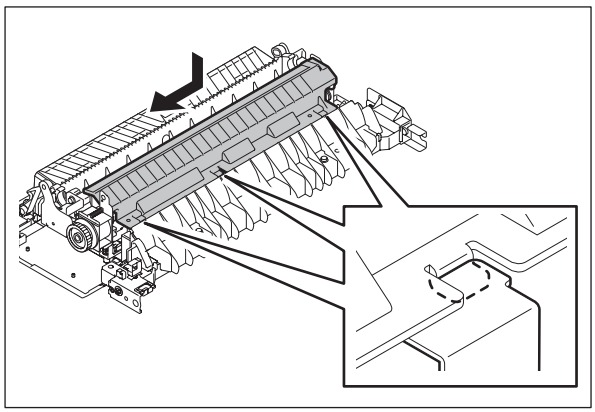


Fig. 14-32

(4) Remove 1 screw and the pin on the front side.
(5) Remove 1 screw and the pin on the rear side.
(6) Take off the case.

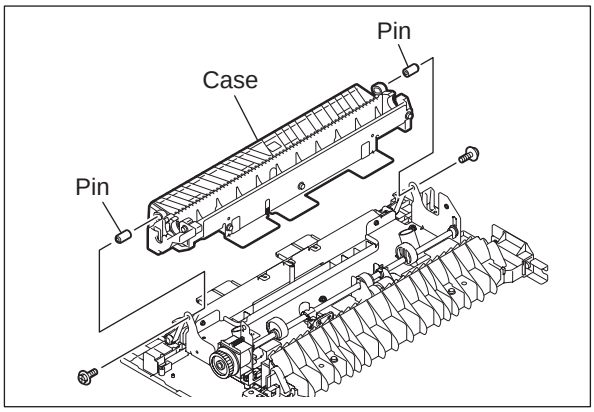


Fig. 14-33

[L] 2nd transfer roller position detection sensor (S18)

(1) Take off the case (📖 P.14-17 "[K] Case").
(2) Disconnect 1 connector and release 2 latches and take off the 2nd transfer roller position detection sensor.

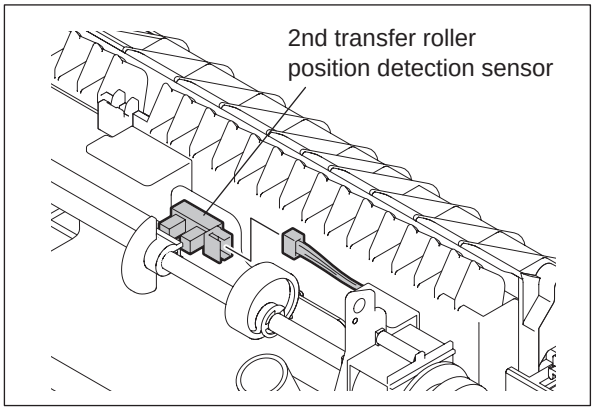


Fig. 14-34

Note:
When reassembling the 2nd transfer camshaft unit, make sure to align the phase of the partial gear and the cam as shown in the figure. If the partial gear is incorrectly installed in a 180-degree reversed position, an operation abnormality (CEC0: 2nd transfer belt position detection abnormality) may occur.

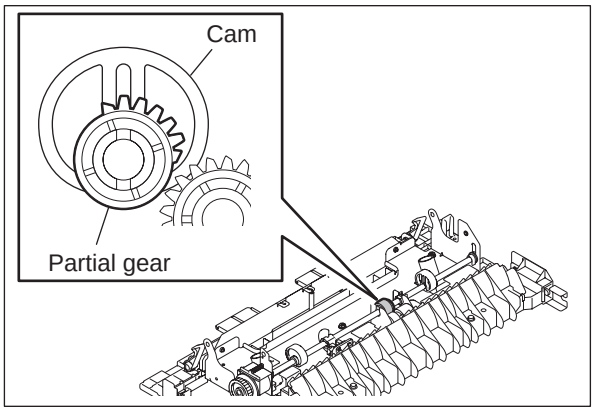


Fig. 14-35

[M] 2nd transfer roller contact clutch (CLT15)

(1) Open the 2nd transfer unit.
(2) Disconnect 1 connector and release the harness clamp.
(3) Remove 3 screws and take off the 2nd transfer gear unit (P.14-16 "[J] 2nd transfer unit").
(4) Disconnect 1 connector. Remove 1 clip and take off the 2nd transfer roller contact clutch.

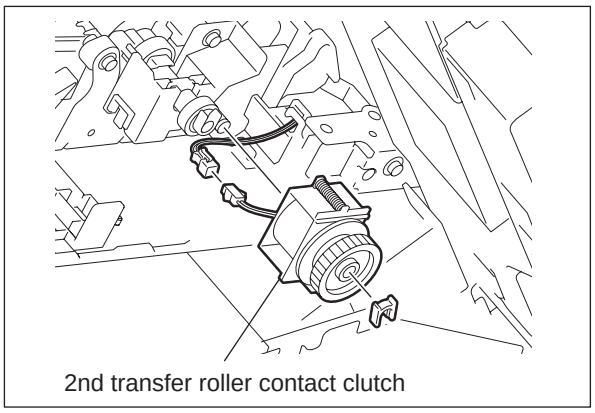


Fig. 14-36

[N] Transfer belt cleaner clutch (CLT1)

(1) Take off the inner tray (P.2-26 "[C] Inner tray").
(2) Disconnect the connector. Remove 1 clip and slide the bushing to the rear side.

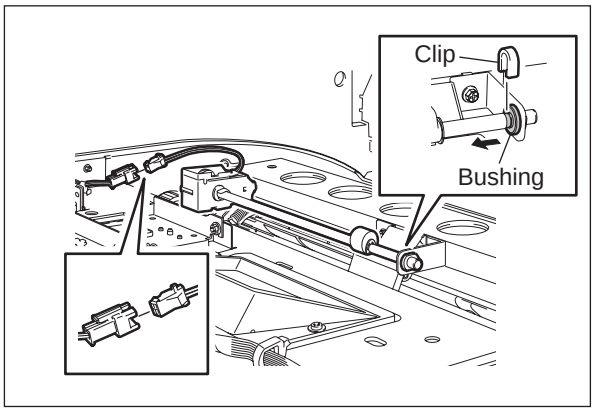


Fig. 14-37

(3) Take off the transfer belt cleaner clutch.

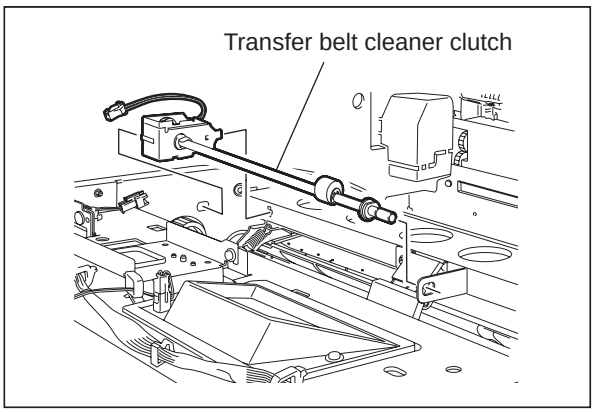


Fig. 14-38

15. IMAGE QUALITY CONTROL

15.1 General Description

In this equipment, image quality is controlled by the image quality sensor (S17). At this control, image forming conditions are automatically adjusted so as to minimize the change in the image density or tone reproduction caused by the fluctuation of working environment or life of supply items.
At first, the image quality sensor (S17) operates to output reflected light amount voltage when no toner image is formed on the transfer belt. The output voltage is then converted analog-to-digital to be output as the reflected light amount signal. The light source amount voltage of the sensor is adjusted to correspond with the value set in advance and the output value of reflected light amount signal at this adjustment is stored. This output value is considered as the reading of the belt surface. Next, the sensor outputs the reflected light amount signal when a test pattern is developed on the transfer belt. This output value is considered as the reading of the toner image.
The difference between the reading of the transfer belt and that of the toner image is defined as toner adhesion amount. Image forming conditions are determined in approximating this toner adhesion amount to the value set in advance.
In addition, a shutter operated by the solenoid is equipped on the light receiving/emitting surfaces to prevent stain to the sensor and to calibrate the sensor with the reflection from the shutter.

15.2 Principle of the Sensor

Image quality sensor (S17) projects light onto the transfer belt and the toner image (test pattern) developed on the transfer belt to output a voltage corresponding to the reflected light amount.
The output voltage is then converted analog-to-digital into reflected light amount signal. The CPU calculates the toner adhesion amount to control the image forming conditions.

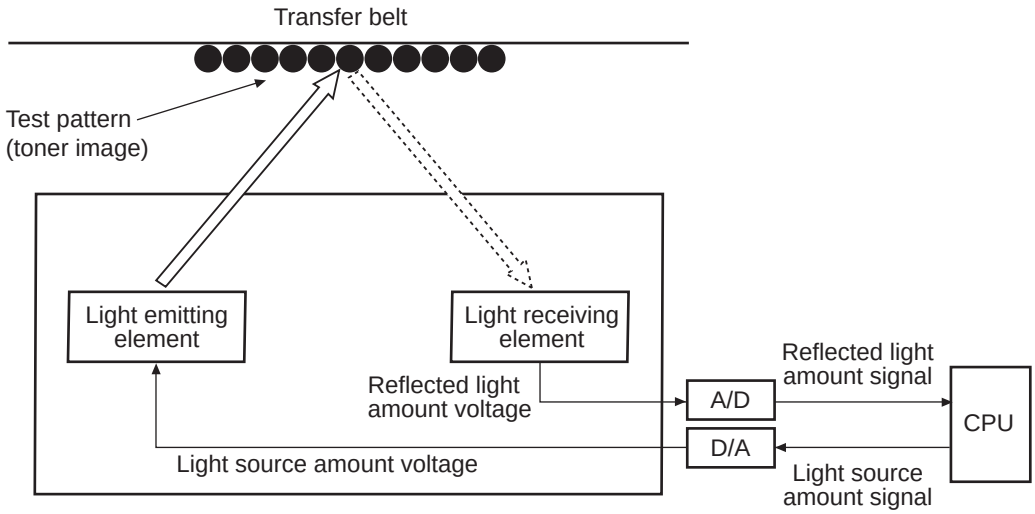
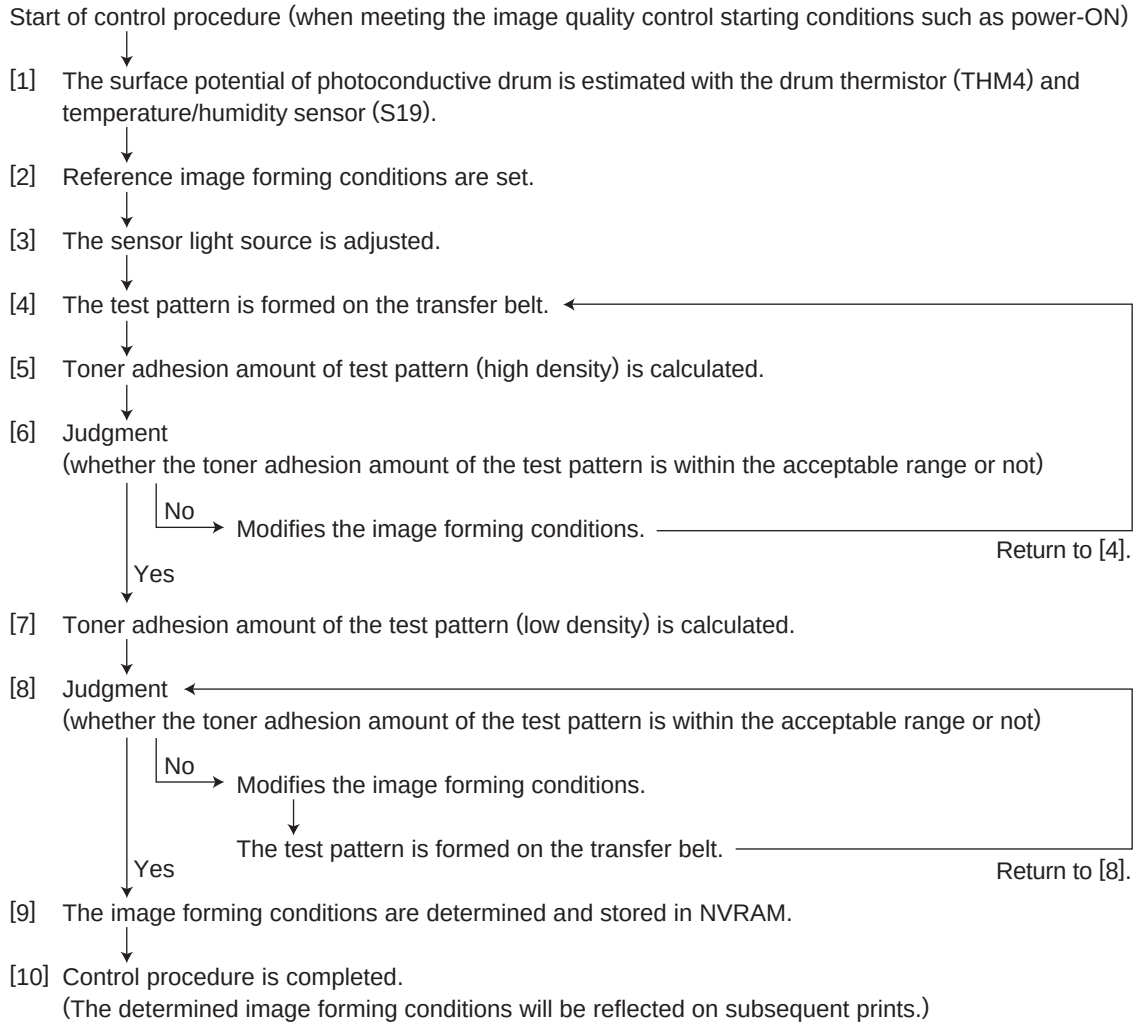


Fig. 15-1

15.3 Flow Chart of Control Procedure



15

15.4 Construction

Image quality sensor: (S17)	Projects the amount of light on the transfer belt and outputs the voltage corresponding to the reflected light amount from the transfer belt or the toner image on the transfer belt.
Image quality sensor:	Projects the amount of light on the transfer belt and outputs the voltage
D/A converter:	Converts light source amount signal into the voltage to the sensor.
Laser optical system:	Performs test pattern exposure (for toner image formation).
A/D converter:	Converts the output voltage from the sensor into digital values and outputs them to the CPU.
Image forming process:	Performs charging, laser exposing and developing processes.
CPU:	Performs steps [1] to [10] described previously.

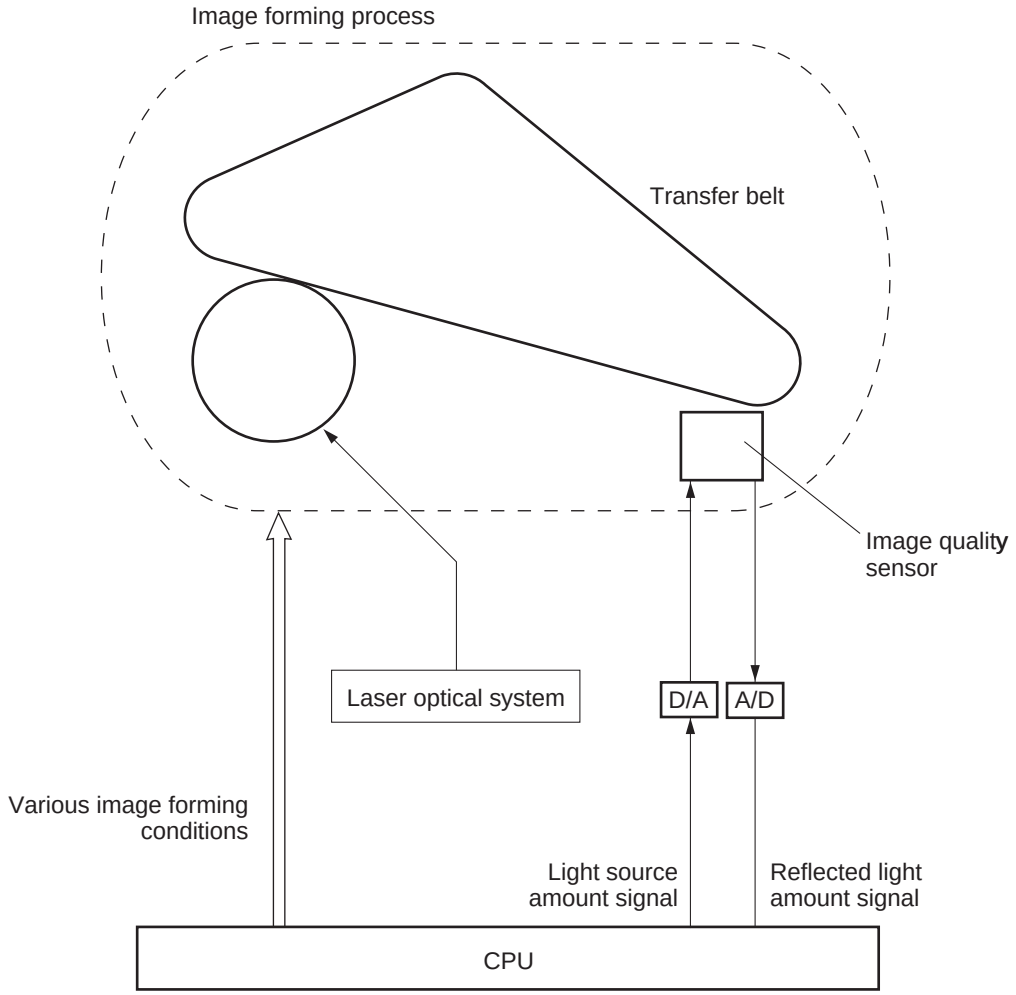


Fig. 15-2

15.5 Disassembly and Replacement

[A] Image quality sensor (S17) / Image quality sensor shutter solenoid (SOL1)

(1) Take off the fuser unit (P.16-19 "[A] Fuser unit").
(2) Take off the process unit (P.11-10 "[B] Process unit").
(3) Release the harness from the harness clamp and disconnect 2 connectors.
(4) Remove 2 screws and take off the image quality sensor holder.

Note:
Insert prongs of sensor holder to the hole of the plate securely when installing.

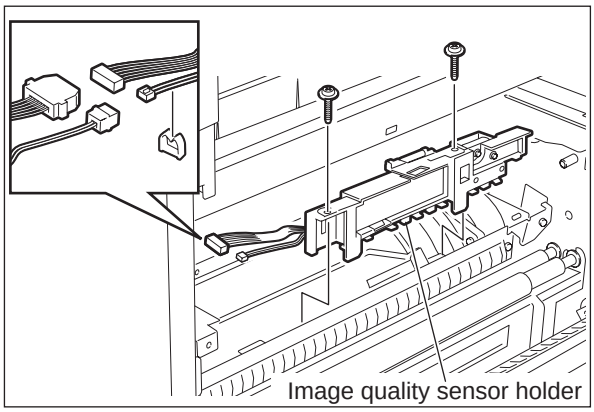


Fig. 15-3

(5) Disconnect 1 connector and remove 2 screws and then take off the image quality sensor.

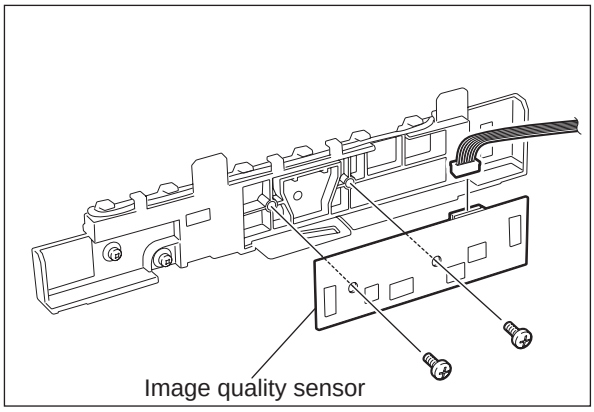


Fig. 15-4

(6) Remove 2 screws and take off the image quality sensor shutter solenoid.

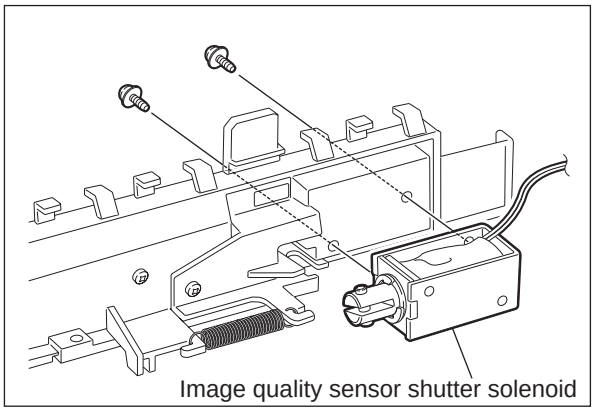


Fig. 15-5

16. FUSER UNIT / PAPER EXIT SECTION

16.1 General Description

Toner is fused by applying heat and pressure on the transferred image on the paper which is transported to the fuser unit. The paper is then transported to the inner tray, paper exiting options or ADU. The fuser unit consists of the IH coil (IH-COIL), fuser roller, pressure roller, fuser belt, separation roller, separation fingers, separation plate, cleaning roller, oil roller, thermistors (THM1, 2, 3), thermostat (THMO1), exit roller, exit sensor (S40), discharge brush, etc.

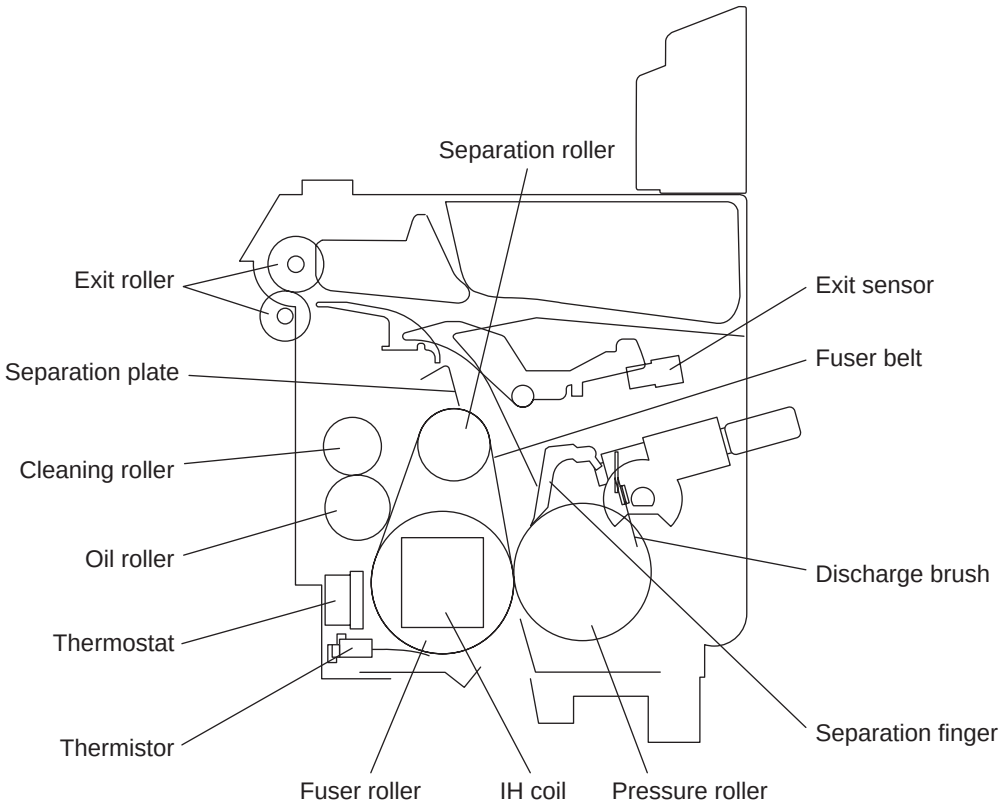


Fig. 16-1

16

16.2 Construction

Fuser unit		
IH coil (IH-COIL)		
Fuser roller		
Discharge brush		PM parts
Pressure roller		PM parts
Separation finger		PM parts
Fuser belt unit	Fuser belt	PM parts
	Fuser belt guide	PM parts
	Separation roller	
	Separation plate	
Cleaning unit	Oil roller	PM parts
	Cleaning roller	PM parts
Thermistor (THM1, 2, 3)		
Thermostat (THMO1)		
Exit roller		
Exit sensor (S40)		
Exit motor (M7)		
IH control PC board (IH)		
IH control board cooling fan (M17)		

16.3 Functions

1) IH coil (IH-COIL) (IH: Induction Heating)
   The IH coil (IH-COIL) is inside the fuser roller and applies the induction heating to the fuser roller. This IH coil (IH-COIL) is divided into two parts; the main IH coil heating the center of the fuser roller and the sub IH coil heating both ends of the fuser roller. Each part turns ON/OFF individually controlling the balance of electric supply so that the fuser roller can be kept at a certain temperature without wasting electric power on any paper size.

2) Fuser roller
   The fuser roller is a metal roller which generates heat spontaneously with eddy current produced by the electromagnetic induction of IH coil (IH-COIL). The fuser belt is heated by this self-heating of this roller, and then the toner is fused on the paper.

3) Pressure roller
   The pressure roller is a sponge roller which assures the nip amount between the fuser roller and fuser belt. The pressure arm and spring press the fuser roller and fuser belt.
   The toner is fused effectively by the pressure of this roller. This roller is driven by the transmitted drive from the transport motor (M9).

4) Fuser belt
   The fuser belt is hanged up between the fuser roller and separation roller and fuses the toner image on the paper transported by being heated.
   The thin fuser belt enables to reduce warming up time and mode changing time. To prevent the fuser belt from adhering toner, the surface of the fuser belt is fluorinated.

5) Separation roller
   The separation roller is an extra small sponge roller coated with the fluororesin tube. When the fuser belt is tensed and driven by the separation roller, the fuser roller drives the fuser belt and the paper between the fuser belt and pressure roller is separated from the fuser belt (belt separation method).

6) Separation fingers
   One separation finger is installed above the pressure roller to separate the paper stuck on the pressure roller.

7) Separation plate
   The separation plate is installed above the separation roller to cover the insufficient separation often occurs at color printing - the mode that the toner is much adhered.

8) Cleaning roller / Oil roller
   Silicone oil is contained inside of the oil roller to supply a proper amount of oil to the fuser belt, and this enables to remove the residual toner and paper dust (preventing offsetting phenomenon). Also, the cleaning roller is a metal roller which removes the residual toner and paper dust adhered on the oil roller.

9) Main thermistor (THM2) / Sub thermistor (THM3)
This thermistor detects the temperature of the fuser belt to maintain it in a certain temperature range (actually around 180°C) between the lower limit causing the poor fusing and the upper limit causing the high temperature offsetting. When the temperature of the fuser belt is lower than the preset temperature, it turns ON the power supply to the IH coil (IH-COIL), and when it is higher than the preset temperature, it cuts off the supply. The main thermistor (THM2) detects the temperature of the center part of the fuser belt and the sub thermistor (THM3) detects the temperature of the both ends of the fuser belt. It also detects the slight difference of the temperatures at the center and both ends of the fuser belt to control the balance of ON/OFF of the center/side parts of IH coil to keep the fuser belt at a certain temperature.

10) Front edge thermistor (THM1)
It detects the temperature abnormality at the both ends of the fuser belt. This area may be overheated without heat absorption by paper since paper does not pass through this area. This thermistor is not related to the temperature control of the fuser belt.

11) Fuser thermostat (THMO1)
The thermostat cuts off the power supply to the IH coil (IH-COIL) by opening itself if the fuser belt becomes abnormally hot as a result of the problem such as thermistor malfunction. The thermostat for this equipment is used to prevent abnormal operation. When the thermostat detects any abnormality, it must be replaced as well as the other damaged parts in the fuser unit.

12) Exit sensor (S40)
This sensor detects the arrival of the leading or trailing edge of the paper at the exit roller of the fuser unit. It also detects paper jams in the fuser unit paper exit section and trailing edge of paper turned over for duplex printing.

13) Exit motor (M7)
The exit motor (M7) is a stepping motor which drives the exit roller and bridge unit (option). It reduces the transport speed down to the range from 1/2 to 1/3 according to the type of paper such as OHP film or thick paper in color modes.

14) Exit roller
This roller transports the paper from the fusing section to the inner tray, paper exiting options or the ADU and is driven by the exit motor (M7).

15) Discharge brush
It is installed with the pressure roller contacting it in order to keep the surface potential on the roller even.

16.4 Operation

The fuser belt is located between the fuser roller and pressure roller. The fuser roller is pressed with the spring force from the pressure roller side, and it is rotated by the transport motor (M9) drive. The fuser belt also rotates simultaneously. Then the paper transported to the fuser unit is hold between the fuser belt and pressure roller and the toner is fused on the paper with heat and pressure. After this, the separation fingers, separation roller and separation plate separate the paper from the fuser belt. Then the paper is transported to the inner tray, paper exiting options or ADU through the exit roller. In addition, the IH coil (IH-COIL) in the fuser roller does not structurally rotate.
The main and front edge thermistor (THM2, 1) control the temperature of fuser roller and sub thermistor (THM3) detect the temperature abnormalities of fuser roller. If the temperature becomes excessively high, the fuser thermostat is opened to stop the power supply to the IH coil (IH-COIL).
When transporting OHP film or thick paper in color modes, the transport speed is lowered to the range from 1/2 to 1/3 in order to improve fusing efficiency. The exit motor (M7) which drives the exit roller is decelerated at the same time.

16.5 Heater Control Circuit

16.5.1 Configuration

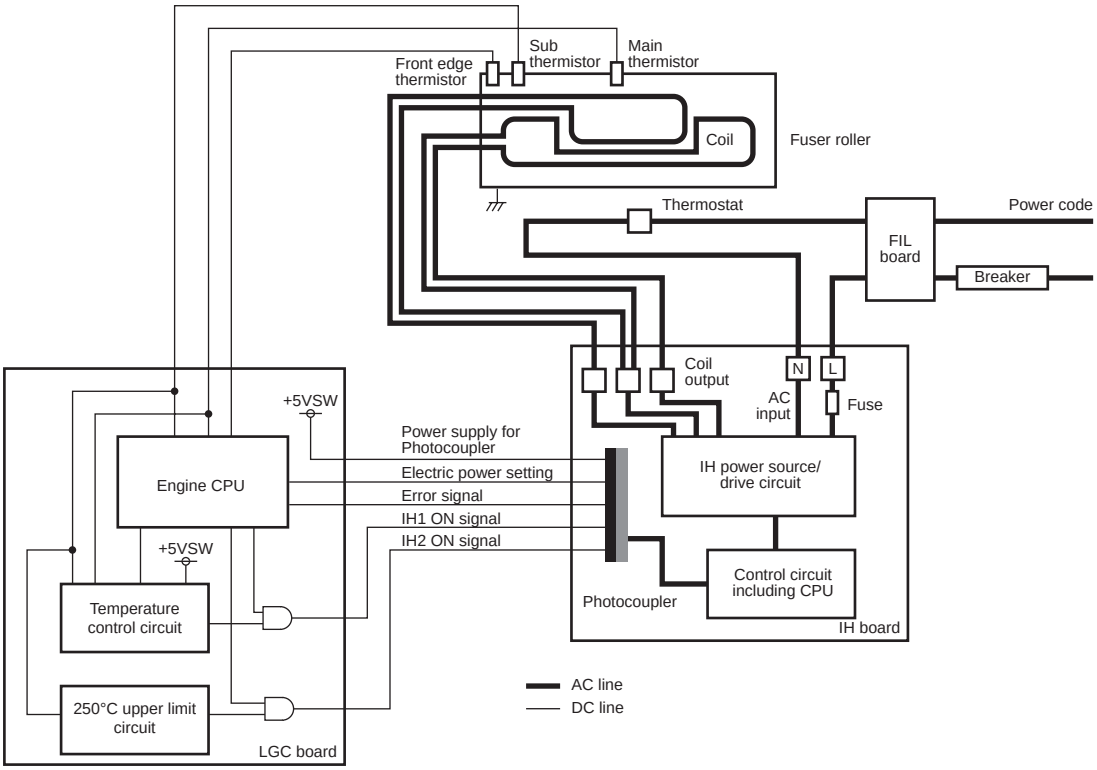


Fig. 16-2

16.5.2 Heating principle of IH Heater

The magnetic field is generated by applying a high frequency current to the IH coil inside the fuser roller, which then generates the eddy current in it. When the eddy current flows, the Joule heat is generated by the resistance element of the fuser roller, which is then heated. In the IH coil method, the thermal efficiency is higher than the lamp method because the fuser roller is directly heated.
IH coil is divided into two parts to decrease the temperature difference between the center and both ends of the fuser roller.

Image of Current Flowing form A to B

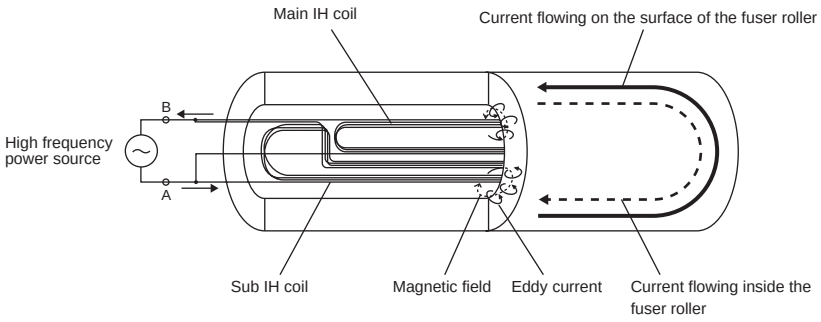


Fig. 16-3

Block diagram of IH board

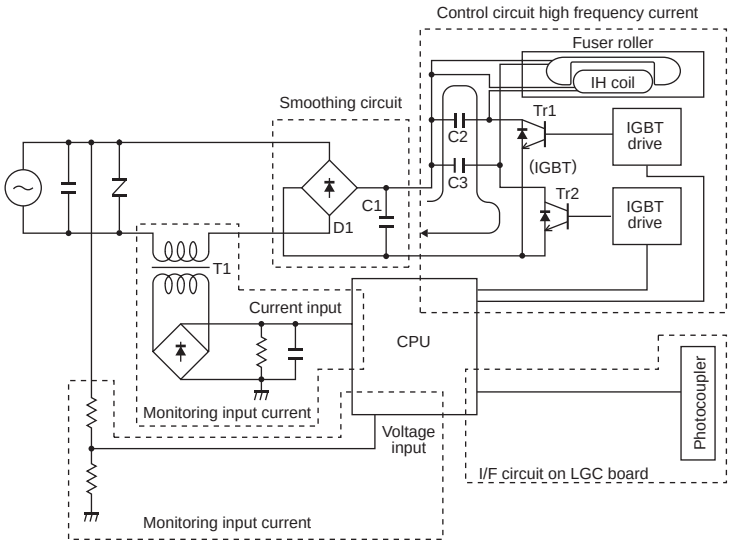


Fig. 16-4

16

16.5.3 IH control circuit interface

The IH control circuit uses a photocoupler as an insulation against the secondary circuit.
The interface signals are as follows.

CN No.	Name of single	Direction	Definition
CN455-2	+5VSW	LGC to IH	-
CN455-3	H1PWR1		Switching signal of power setting
CN455-4	H1PWR2		
CN455-5	H1PWR3		
CN455-6	H2PWR1		
CN455-7	H2PWR2		
CN455-8	H2PWR3		
CN455-1	IH2 ON	LGC to IH	IH coil energization permitting signal
CN456-1	IH1 ON		
CN456-4	H1ERR1	IH to LGC	IH status signal (📖 P.16-10 "16.5.5 Abnormality in the IH control circuit")
CN456-5	H1ERR2		
CN456-2	SG	LGC to IH	-
CN456-3	IHDUTY		Duty ratio changing signal

16.5.4 Relation between system configuration and IH output

for NAD, SAD, TWD:

System configuration	Warming up (*2)	Ready	Printing	Energy saving mode	Automatically OFF	Warming up time
Equipment only	1160-1300W	800W	1080W	800W	OFF	Approx 40 sec.
Equipment and RADF (*1)			1020W			
Equipment, RADF (*1) and FIN	1160-1260W		960W			
Equipment, RADF (*1), FIN, and HPU						
Equipment, RADF (*1), FIN, HPU and LCF	1140-1240W		940W			
Equipment, RADF (*1), FIN, HPU, LCF and FAX						

for ASU, ASD, AUD, MJD, CND, KRD:

System configuration	Warming up (*2)	Ready	Printing	Energy saving mode	Automatically OFF	Warming up time
Equipment only	1160-1300W	700W	1240W	700W	OFF	Approx 40 sec.
Equipment and RADF (*1)			1180W			
Equipment, RADF (*1) and FIN	1160-1260W		1120W			
Equipment, RADF (*1), FIN, and HPU						
Equipment, RADF (*1), FIN, HPU and LCF	1140-1240W		1100W			
Equipment, RADF (*1), FIN, HPU, LCF and FAX						

* RADF: Reversing automatic document feeder, FIN: Finisher, HPU: Hole punch unit, LCF: Large capacity feeder, FAX: FAX unit

(*1) The wattage lowers 50 W more when the scanning is performed from the RADF during warming up.

(*2) AC power should be input voltage when the equipment is warming up (The lower the voltage is, the longer the warming up time becomes).

16.5.5 Abnormality in the IH control circuit

When an abnormality is detected in the IH control circuit, it stops the power supply to the IH coil and displays a message “Call for service”.

1) IH control circuit
   CPU output level of the IH control circuit changes depending on the condition of IH coil. This output level goes through the photocoupler into the gate array.

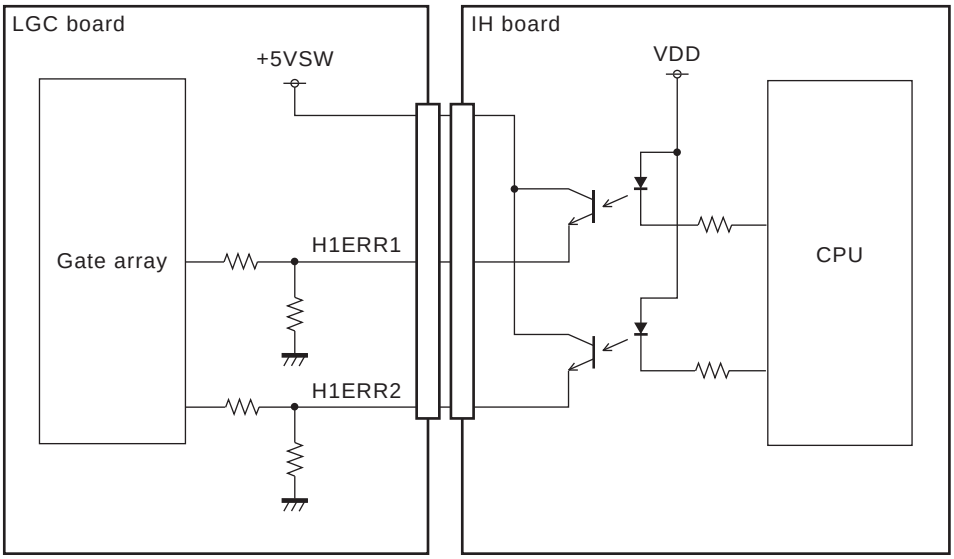


Fig. 16-5

2) Relation between IH status signal and IH errors
(L: Low level, H: High level).

Check timing	Signal		Status	Error code	Counter (08-400)
	H1ERR1	H1ERR2			
When the power is turned ON, or when both the front cover and jam access cover is closed	L	L	Abnormality detected at initialization * An abnormal status is detected at the initialization.	C471	11
On usual	L	L	Power voltage abnormality * AC power is not supplied to the IH board.	C472	12
	L	H	Switching element (IGBT) abnormality * Wire breakings, short-circuits abnormal fluctuations or overheating (= insufficient cooling) of IGBT	C480	15
			IH coil abnormality caused by continuously applied current * Current has been continuously applied to any one of the IH coils for 15 seconds or more		
	H	H	Input current lower limit abnormality * Wire breakings or improper installation of IH coil	C490	17
	H	L	No abnormality	-	-
Front cover or jam access cover is opened	L (Other than the above)	L	Power voltage abnormality when the cover is opened * An abnormal status is detected when the cover is opened	C475	10

16.5.6 Temperature detection section

To maintain the stable temperature of the fuser belt, the thermistor detects the temperature and controls ON/OFF of the IH coil. Output from the thermistors is used to detect the abnormality.

1) Relation between the thermistor output voltage and surface temperature of the fuser belt:

Output voltages of thermistors [V]	Surface temperatures of fuser belt [°C]
Approx. 0.30	40
Approx. 1.77	100
Approx. 3.28	150
Approx. 3.66	170
Approx. 3.81	180
Approx. 4.03	200

2) Control of the surface temperature of the fuser belt:

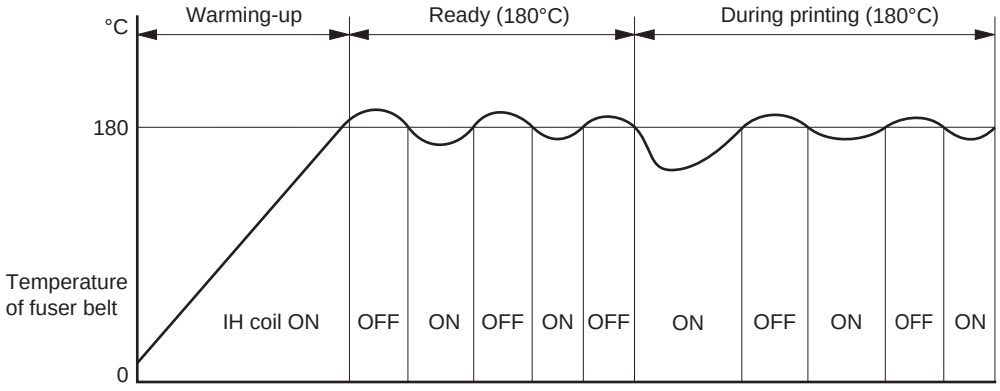


Fig. 16-6

3) Temperature control for the both ends of the fuser belt
During the continuous printing, the temperature of the both ends of the fuser belt (areas where the paper does not pass on) generally tend to be higher than that of the other areas (areas where the paper passes on). The temperature of the ends are detected by the front edge thermistor, and when it reaches 250°C, the heater is automatically turned OFF regardless of the temperature of the area where the paper passes on.

4) Temperature control at energy saving mode
This equipment has the following two types of temperature control for saving energy and returns to ready status to perform printing in each mode upon printing request.
The period of time from the printing request to this mode can be set in the Setting Mode (08) or by an from administrator.

Administrator setting procedure:
[USER FUNCTIONS] button → [ADMIN] (input of administrator's password) → [GENERAL] → [ENERGY SAVER]

Auto Power Save Mode (Setting Mode (08-205)):
When the printing is not performed in a specified period of time (default setting: 15 min.) after the previous printing is completed, the equipment enters to Auto Power Save Mode. ON/OFF of IH coil is controlled to maintain the fuser belt surface temperature at 100°C.

Auto Shut Off Mode (Setting Mode (08-206)):
When the printing is not performed in a specified period of time (default setting: e-STUDIO281c/351c: 60 min. / e-STUDIO451c: 90 min.) after the equipment entered to Auto Power Save Mode, the equipment then enters to Auto Shut Off Mode to turn OFF the IH coil.

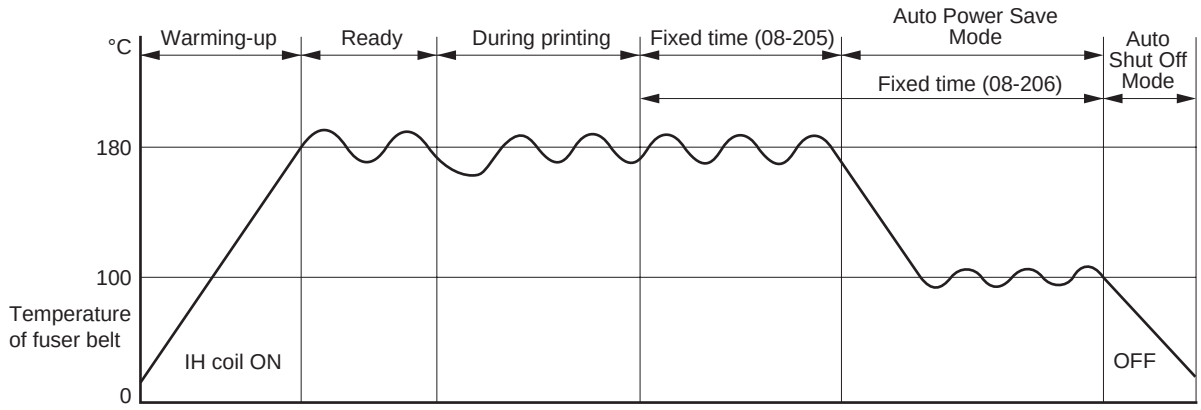


Fig. 16-7

16

5) Thermistor/heater status counter control

- To enhance the safety of the fusing section unit, engine-CPU provides the following protection: When the third [C411] error has occurred after two consecutive [C411] errors, the IH coil is not turned ON and error [C412] is displayed immediately even if an operator turns OFF the power and back ON. However, if the equipment goes into a ready state normally with the thermistor/ heater status counter "1" or below, the counter is cleared to "0".

- If the error codes [C411] to [C449] are displayed and still not cleared even though the thermistor, thermostat and IH coil have been repaired (and the power ON/OFF does not clear the error), check the Setting Mode (08-400) to set the thermistor/heater status counter to "0".

Remarks:

- The thermistor/heater status counter (Setting Mode (08-400)) never has values other than 0 to 29.
- If a service call (between [C471] and [C490]) occurs, the thermistor/heater status counter is automatically reset to "0" when the defect is repaired and the power is turned ON.

- If the IH coil does not turn ON and the service call [C411] or [C412] is displayed immediately after the power is ON, ensure the thermistor/heater status counter is "2" or over. If it is "2" or over, be sure to check the thermistor, thermostat and IH coil. Reset the counter to "0" after repairing them, then turn ON the power.

- If the thermistor/heater status counter is "30" or over (e.g., 31), the data in NVRAM or NVRAM itself may possibly have been ruined due to causes such as leakage from the chargers. Check the bias, high-voltage transformers and charge wires to see if any of them is defective, and also look through all the data in the NVRAM.

- When the thermistors detect overheating, the engine-CPU decides the error code and counter value of the fuser unit error status. After turning OFF each output (the IH coil, exposure lamp, control panel display, motors and so on), the engine-CPU turns OFF the power to protect the fuser unit.

  Error code: C449 ([C] and [8])
  Counter value of the fuser unit error status: 9, 19, 21, 22, 23, 25, 27, 29 (08-400)

  Thermistors continue detecting the abnormal temperature even after the error codes and counter values are decided. Even if the power is turned ON immediately, it is automatically turned OFF again when the surface temperature of the fuser roller is still higher than the abnormal temperature detected.
  Wait until the surface temperature of the fuser roller is lowered enough, and turn ON the power to check the counter value while it is turned OFF again. After confirming that it is the fuser unit abnormality, correct the abnormality and reset the counter value (08-400) to "0" to start up the equipment normally.

6) Temperature detection configuration

Thermistor is a device whose resistance decreases as it detects a higher temperature. Thus its input voltage to CPU changes and then CPU judges whether this change is normal or abnormal. If one of the fuser belt thermistors is broken, the control circuit judges that the fuser belt temperature is extremely low and keeps turning the IH coil ON. As a result, the fuser belt temperature rises, and possibly activates the thermostat which is a safety protection device. To prevent this in advance, CPU works to detect whether each thermistor is broken or not.

Also, the thermistors constantly check the temperature of IH coil to prevent it from excessive heating by IH circuit abnormality, LGC circuit abnormality or thermistor abnormality. The thermistors automatically turn OFF the power when the temperature of IH coil exceeds the specified temperature.

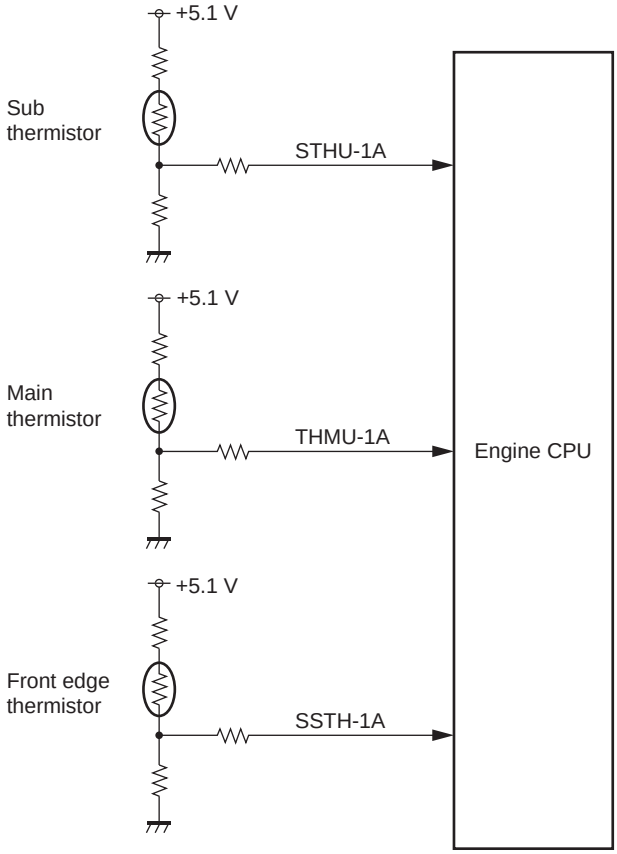


Fig. 16-8

16

7) Abnormality detection by the thermistors
The following table shows the conditions judging the fuser belt temperature abnormality and detecting timing.

Check timing	Condition	Temperature judged			Error code	Counter (08-400)	Error judging timing
		Main thermistor	Sub thermistor	Front edge thermistor			
Power ON	1	250°C or above	-	-	C449	9	Power ON
		-	250°C or above	-			
		-	-	250°C or above			
	2	40°C or below	150°C or above	-	C412	2	
		150°C or above	40°C or below	-			
Detecting 40°C	1	250°C or above	-	-	C449	19	On usual
		-	250°C or above	-			
		-	-	250°C or above			
	2	40°C or below	-	-	C412 (C411)	2 (1)	Fixed time
		-	40°C or below	-			
Detecting 100°C	1	250°C or above	-	-	C449	21	On usual
		-	250°C or above	-			
		-	-	250°C or above			
	2	100°C or below	-	-	C446 (C443)	6 (3)	Fixed time
		-	100°C or below	-			
Detecting 160°C	1	250°C or above	-	-	C449	21	On usual
		-	250°C or above	-			
		-	-	250°C or above			
	2	160°C or below	-	-	C446 (C443)	6 (3)	Fixed time
		-	160°C or below	-			
When pre-running end temperature is detected	1	250°C or above	-	-	C449	22	On usual
		-	250°C or above	-			
		-	-	250°C or above			
	2	Pre-running end temperature or below	-	-	C446 (C445)	6 (5)	Fixed time
		-	Pre-running end temperature or below	-			
During ready	1	250°C or above	-	-	C449	23	On usual
		-	250°C or above	-			
		-	-	250°C or above			
	2	40°C or below	-	-	C447	7	
		-	40°C or below	-			
		-	-	40°C or below			
During printing	1	250°C or above	-	-	C449	25	On usual
		-	250°C or above	-			
		-	-	250°C or above			
	2	40°C or below	-	-	C447	24	
		-	40°C or below	-			
		-	-	40°C or below			
At energy saving mode	1	250°C or above	-	-	C449	27	On usual
		-	250°C or above	-			
		-	-	250°C or above			

Check timing	Condi-tion	Temperature judged			Error code	Counter (08-400)	Error judging timing
		Main thermistor	Sub thermistor	Front edge thermistor			
At paper jam	1	250°C or above	-	-	C449	29	On usual
		-	250°C or above	-			
		-	-	250°C or above			

* The figures in the "Condition" field denote the priority of error checking.
* The figures in the "Error code" and "Counter" fields with parentheses denote that an error status has not yet been determined (= error status is detected only once).
* The pre-running end temperature may vary depending on the temperature of the environment in which the equipment is placed. When a temperature detected by the equipment is low (16°C or below) the pre-running end temperature set at 08-422 will be applied, and in all other cases, the temperature set at 08-411 will be applied.

16.6 Control Circuit of Exit Motor

The following is the control circuit of the exit motor.
The exit motor is a stepping motor. The motor is turned ON/OFF and the direction of its rotation is switched by controlling the output timing of pulse signal (A0, A1, B0, B1).

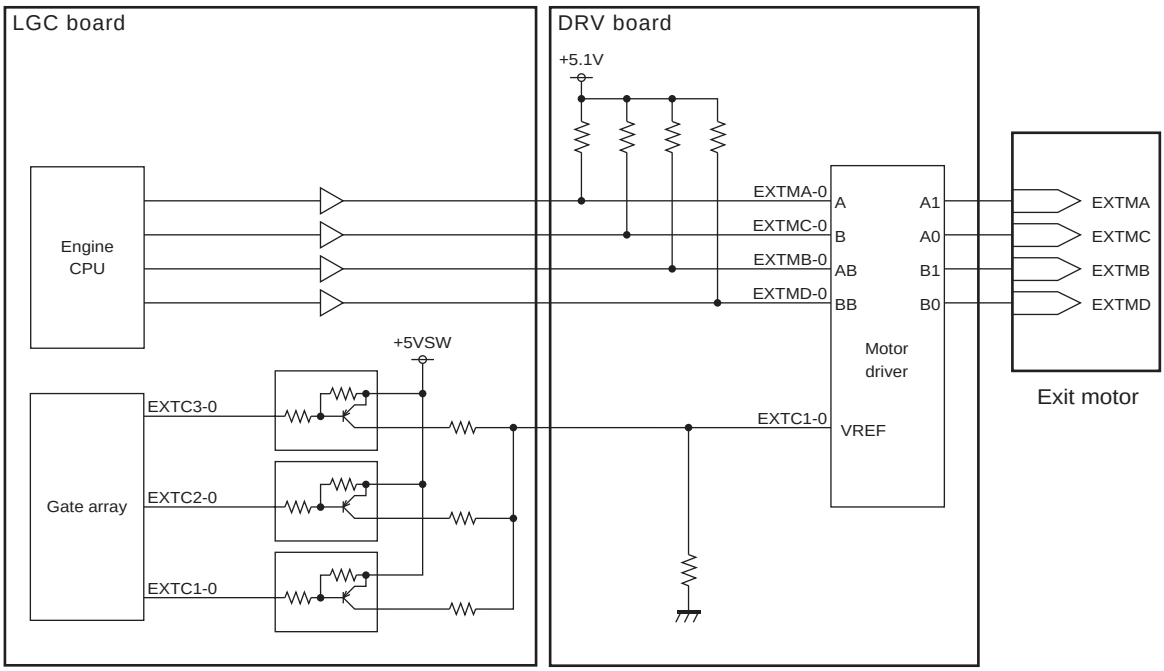


Fig. 16-9

16.7 Disassembly and Replacement

[A] Fuser unit

(1) Take off the IH terminal cover
(📖 P.2-30 "[N] IH terminal cover")
(2) Disconnect 2 connectors and 4 faston terminals.

Notes:
1. Make sure to hold the plastic part of the faston terminals when disconnecting them.
2. Make sure not to connect each terminal to the wrong position.

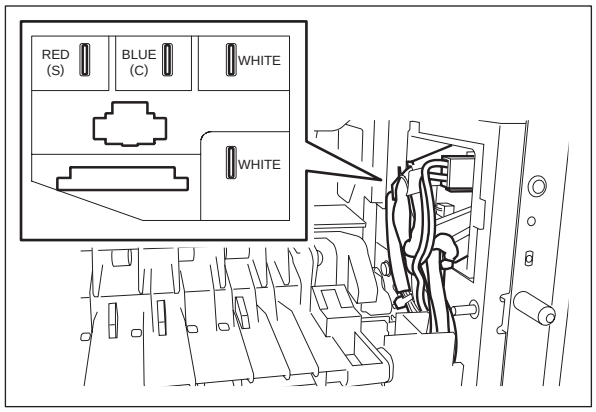


Fig. 16-10

(3) Remove 2 screws and take off the fuser unit.

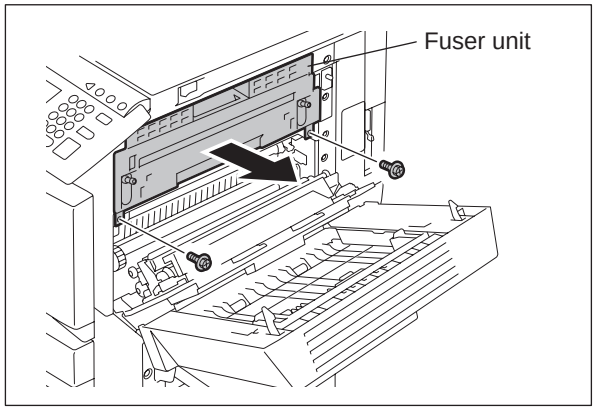


Fig. 16-11

[B] Oil roller (PM)

(1) Take off the fuser unit
(📖 P.16-19 "[A] Fuser unit").
(2) Open the jam access cover and transport guide.

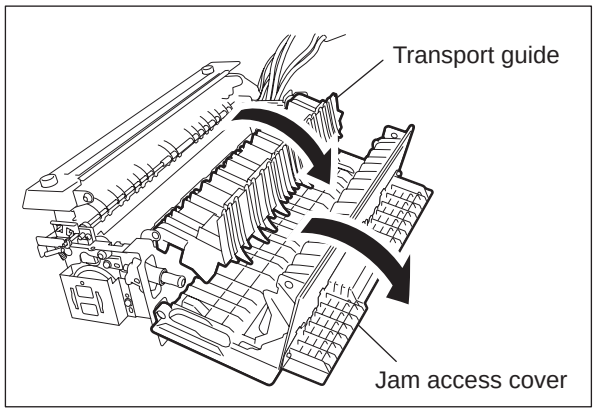


Fig. 16-12

(3) Remove 2 screws and take off the cleaning unit by lifting it up.

Note:
When installing, fit 2 protrusions on the bottom of the cleaning unit into the holes of the frame securely.

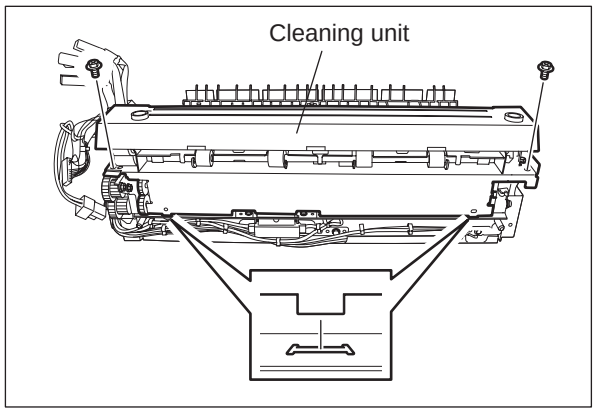


Fig. 16-13

(4) Remove spring (A) on each end of the oil roller.
(5) Take off the oil roller.

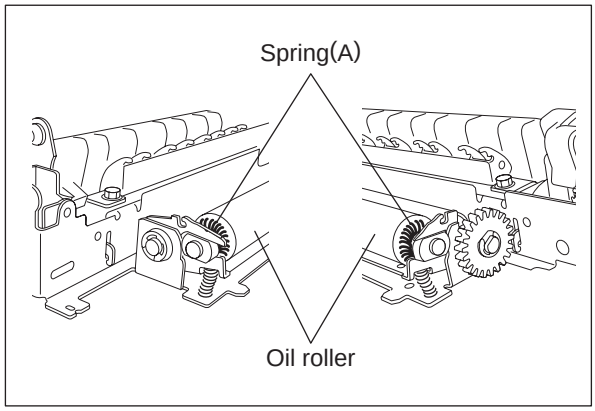


Fig. 16-14

(6) Remove 1 bushing from each side of the oil roller.

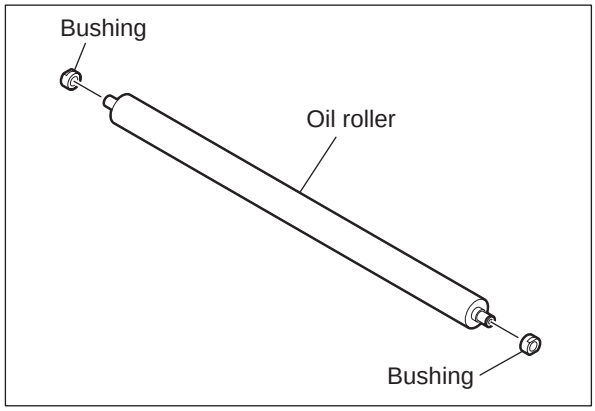


Fig. 16-15

Note:

Install the oil roller according to the marking on the frame (the shaft end with a groove should point at the rear side).

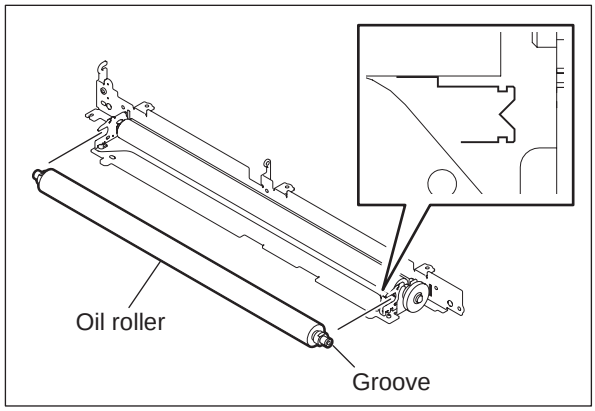


Fig. 16-16

[C] Cleaning roller (PM)

(1) Take off the oil roller from the cleaning unit (📖 P.16-19 "[B] Oil roller").
(2) Remove 1 E-ring and 1 bushing from the cleaning roller front side. Then take off the cleaning roller.
(3) Remove the spring (B) on each end of the frame.

Note:

When installing, make sure that the oil roller rotates smoothly by turning the gear (C) of the cleaning roller manually for a several times.

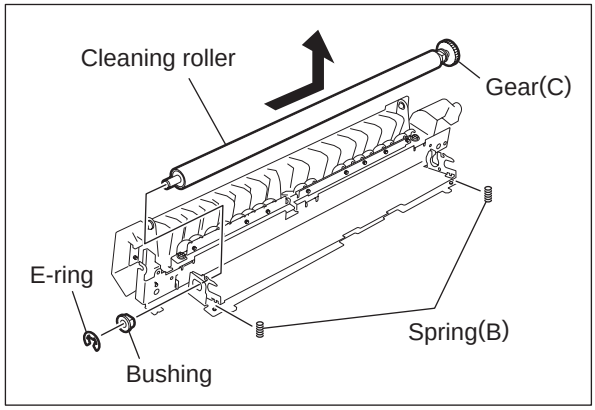


Fig. 16-17

(4) Remove 1 E-ring, the gear (C) and 1 bushing from the cleaning roller rear side.

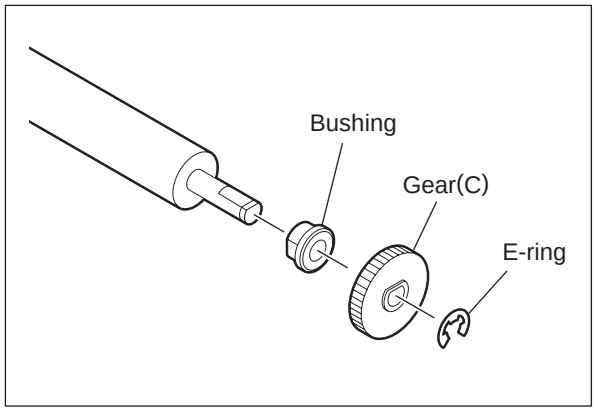


Fig. 16-18

[D] IH coil (IH-COIL)

(1) Take off the fuser unit.
(📖 P.16-19 "[A] Fuser unit")
(2) Release the harnesses from 8 harness clamps.

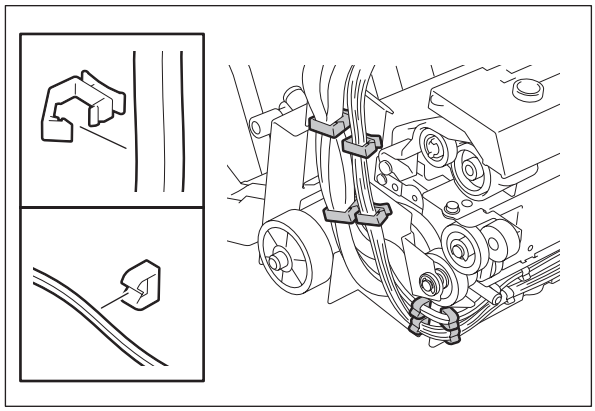


Fig. 16-19

(3) Remove 1 E-ring, 1 bushing and 2 screws.

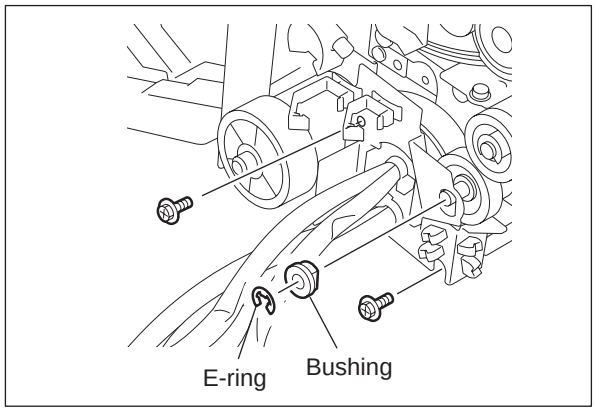


Fig. 16-20

(4) Pull out the bracket and IH coil.
(5) Take out the IH coil from the bracket.

Notes:

1. When installing, be sure to set the harnesses “C” and “S” of 4 harnesses on upper.
2. Make sure that there is not any scratch or break on the white tube on the IH coil.
3. Make sure that there is not any peeling or scratch on the harness tube.

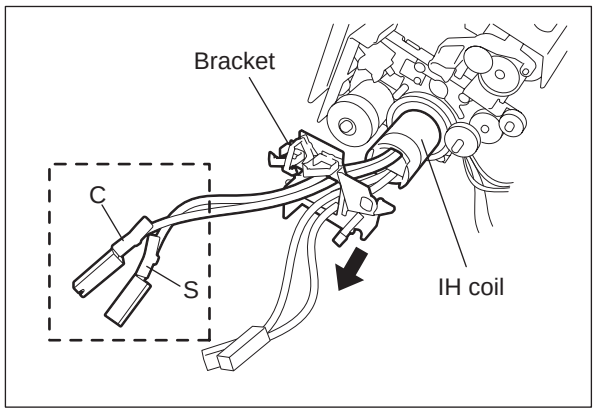


Fig. 16-21

[E] Fuser roller / Fuser belt guide PM

Note:
When installing/disinstalling the fuser roller, make sure not to remove the spring (shown in the figure at right) since the removal of this spring may have the fuser roller press to deform the thermistor.

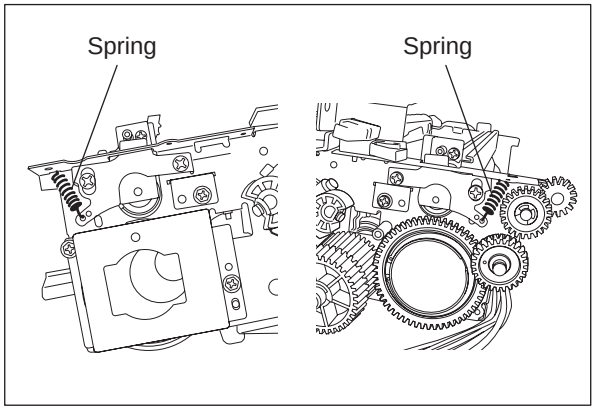


Fig. 16-22

(1) Remove the cleaning unit (📖 P.16-19 "[B] Oil roller").
(2) Remove the IH coil (📖 P.16-22 "[D] IH coil (IH-COIL)").
(3) Push down the pressure releasing levers on both sides.
(4) Remove 1 C-ring and 2 gears.

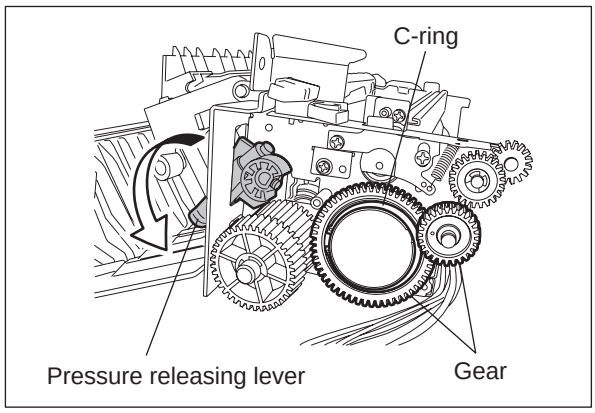


Fig. 16-23

(5) Remove 1 bearing.

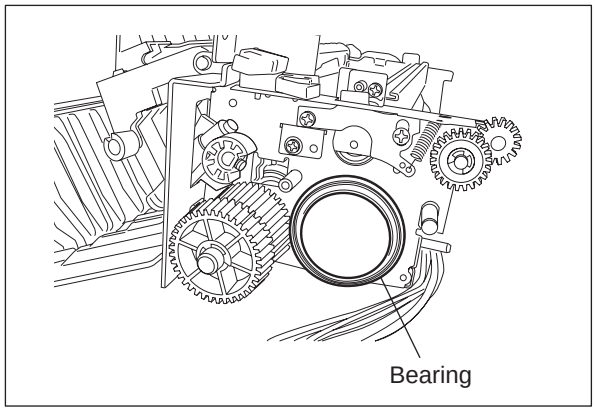


Fig. 16-24

(6) Insert a flat-head screwdriver into the slit of the fuser belt guide on the rear side. Then slide the plate while opening the slit by the flat-head screwdriver. Take off the fuser belt guide from the fuser roller.

Note:
Be careful not to scratch the fuser belt.

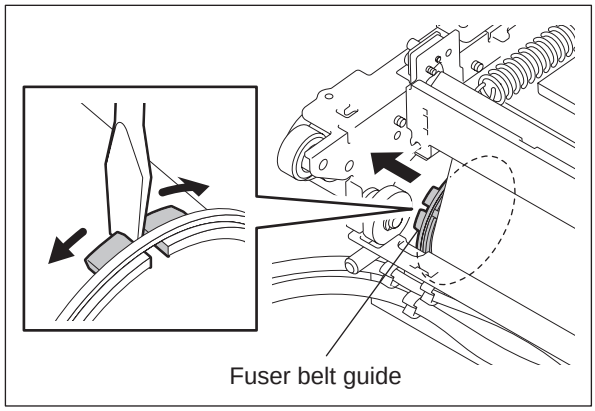


Fig. 16-25

(7) Remove 2 screws and take off the bracket.

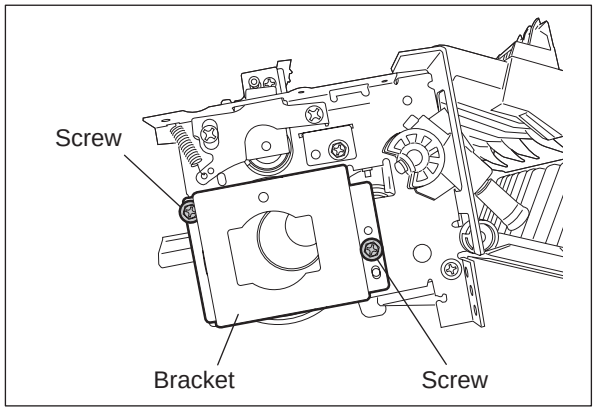


Fig. 16-26

(8) Take off the fuser roller.
(9) Remove 1 C-ring, 1 bearing and 1 fuser belt guide from the fuser roller front side.

Note:
When installing, make sure that the fuser belt guide securely fits in the fuser roller groove. Also, make sure that the ring on the fuser belt guide securely fits in the groove on the belt restricting plate.

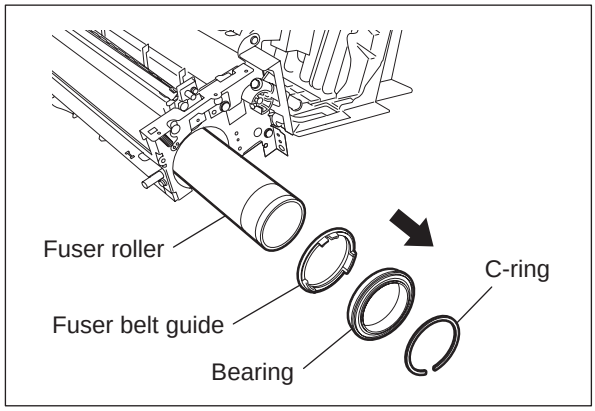


Fig. 16-27

[F] Fuser belt (PM)

(1) Take off the fuser roller
(📖 P.16-23 "[E] Fuser roller / Fuser belt guide").
(2) Lift up the fuser belt unit and take it off.

Note:
Be careful not to scratch the fuser belt. Lay the fuser belt on the clean place to prevent the belt from the dust.

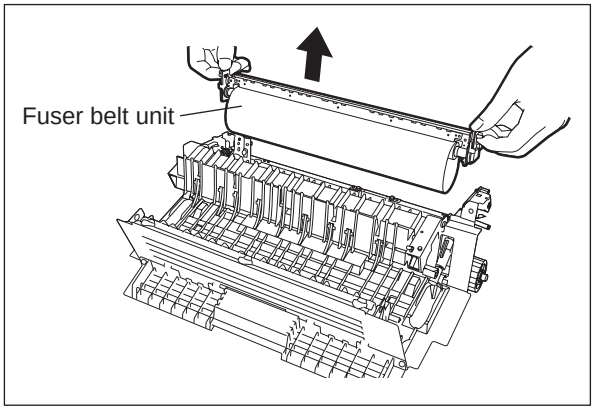


Fig. 16-28

(3) Remove 1 screw and take off the bracket on the front side.

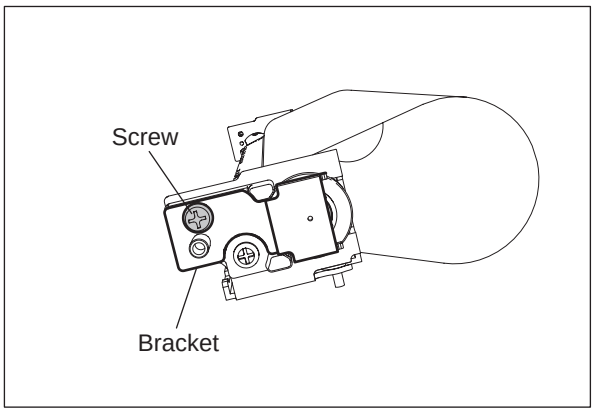


Fig. 16-29

(4) Remove 1 screw and take off the bracket on the rear side.

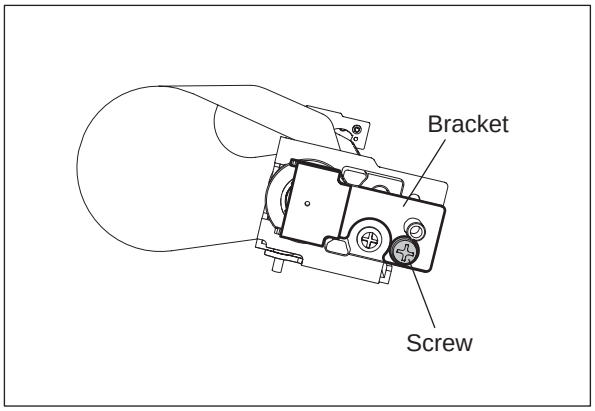


Fig. 16-30

(5) Remove 1 E-ring. Then remove 1 bearing.

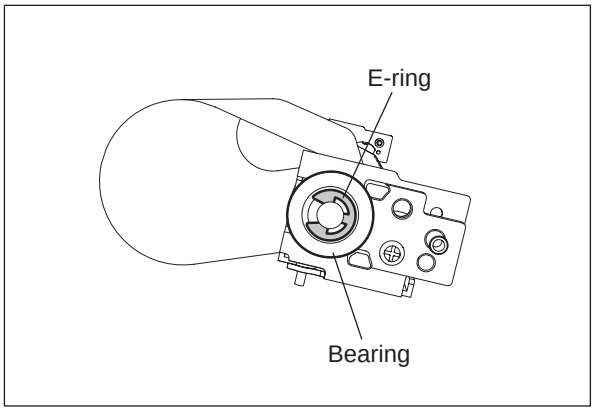


Fig. 16-31

(6) Lift up the separation roller by sliding it.
(7) Take off the fuser belt.

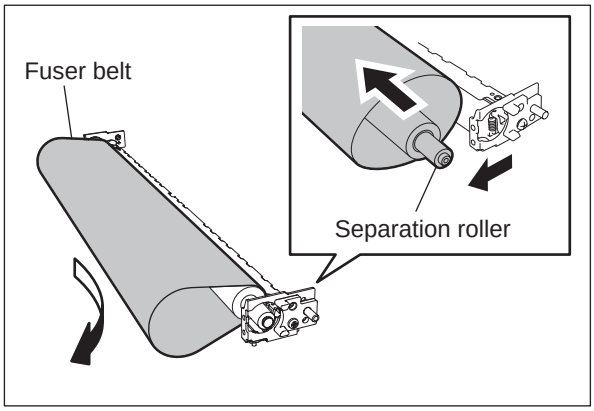


Fig. 16-32

Note:

When installing the fuser belt, place a sheet of paper between the separation plate and fuser belt in order to prevent the fuser belt from being scratched by the separation plate. Keep the paper between then until the fuser roller is installed.

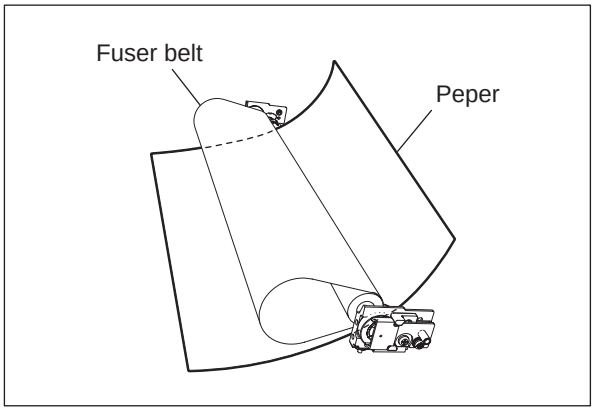


Fig. 16-33

[G] Separation finger PM

(1) Take off the fuser roller
(📖 P.16-23 "[E] Fuser roller / Fuser belt guide").

(2) Lift up the fuser belt unit and take it off.

Note:
Be careful not to scratch the fuser belt. Lay the fuser belt on the clean place to prevent the belt from the dust.

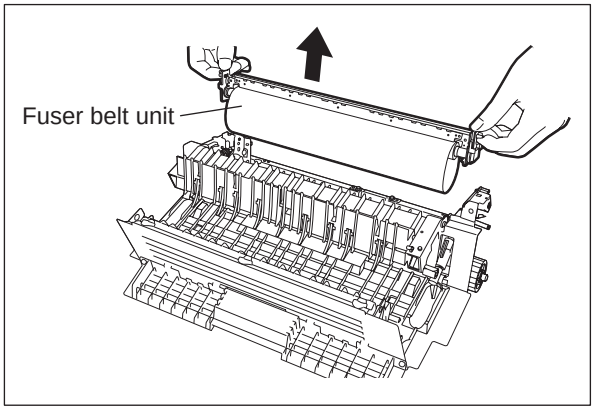


Fig. 16-34

(3) Confirm that the pressure releasing levers on both sides are up. Then loosen each 1 screw on both front and rear sides.

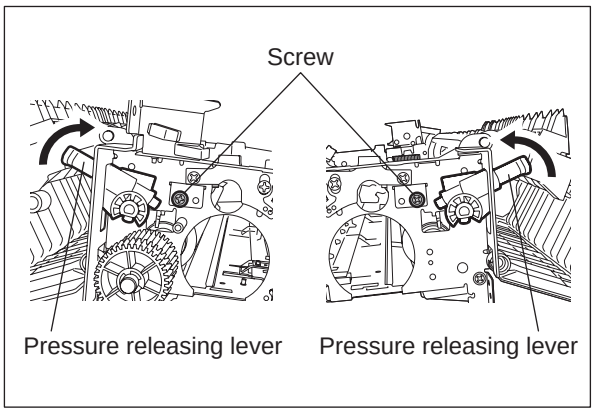


Fig. 16-35

(4) Remove 2 springs.

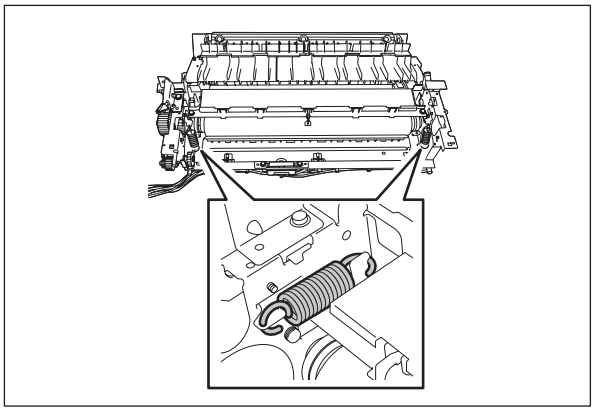


Fig. 16-36

(5) Remove 2 screws and take off the separation finger unit.

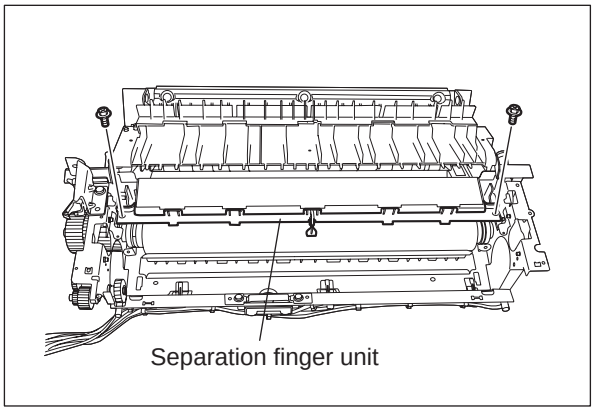


Fig. 16-37

(6) Remove the spring and separation finger.

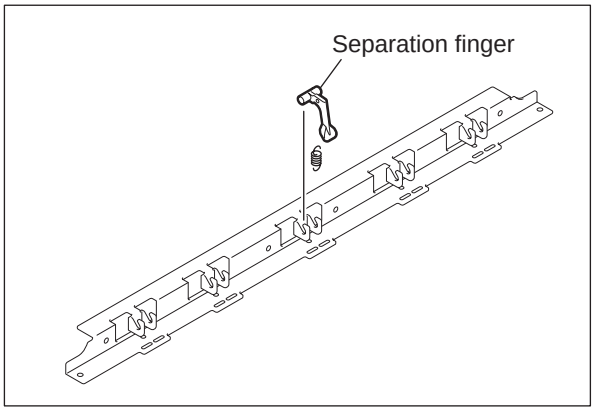


Fig. 16-38

[H] Pressure roller PM

(1) Take off the fuser belt unit (📖 P.16-25 "[F] Fuser belt").
(2) Take off the separation finger unit (📖 P.16-27 "[G] Separation finger").
(3) Take off the pressure roller.

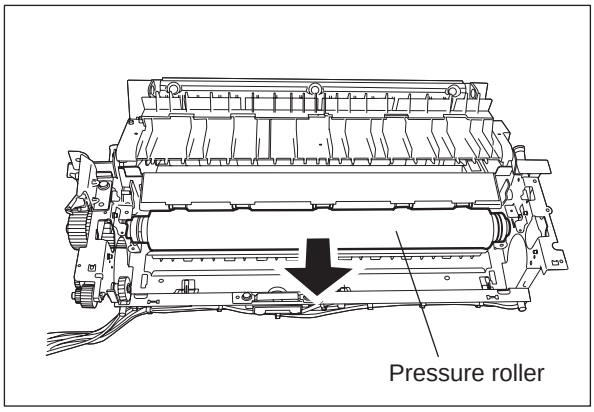


Fig. 16-39

(4) Remove each 1 ring, 1 bearing and 1 bushing on both front and rear sides of the pressure roller.

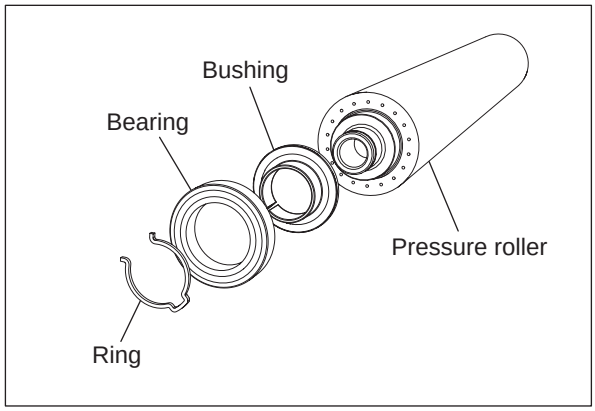


Fig. 16-40

[I] Thermostat (THMO1)

(1) Take off the fuser unit
(📖 P.16-19 "[A] Fuser unit").
(2) Remove 2 screws. Lift up the cleaning unit and take it off.

Note:
When installing, fit 2 protrusions on the bottom of the cleaning unit into the holes of the frame securely.

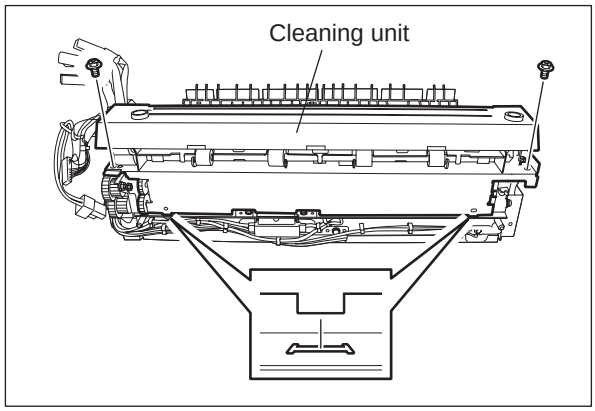


Fig. 16-41

(3) Release the harnesses from the harness clamps.
(4) Remove 2 screws and take off the thermostat unit.

Note:
Be careful not to scratch the fuser belt.

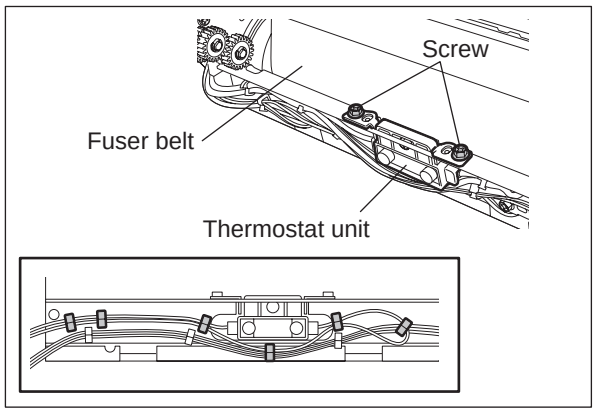


Fig. 16-42

(5) Remove 2 screws and take off the thermostat from the bracket.

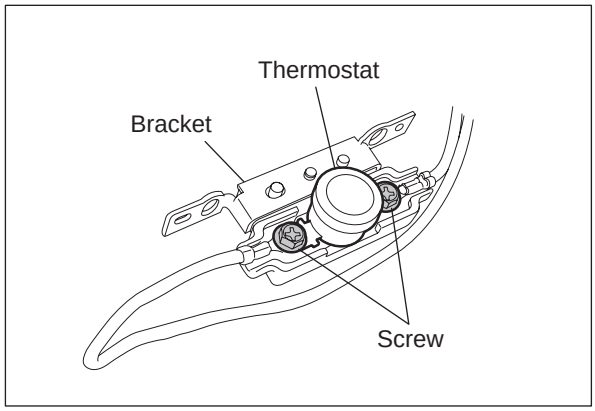


Fig. 16-43

Notes:

When installing, pay attention to the followings:

1. Make sure to fix the thermostat, and then harness terminal in order on the bracket.
2. Make sure to keep the gap between the fuser roller and thermostat is 0.7 mm to 2.0 mm while the fuser roller is pressed to the pressure roller.

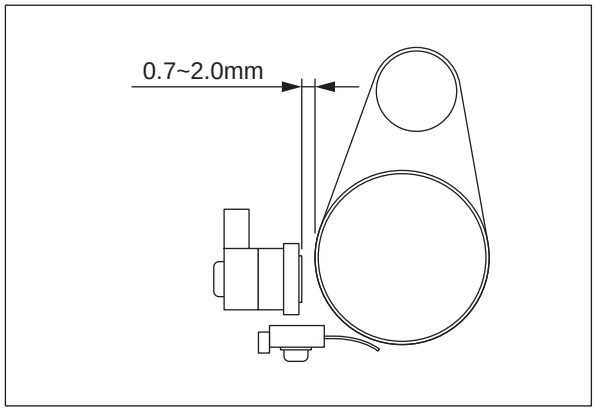


Fig. 16-44

[J] Thermistor (THM1, 2 , 3)

(1) Take off the fuser unit
(📖 P.16-19 "[A] Fuser unit").
(2) Remove 2 screws and take off the fuser unit entrance guide.

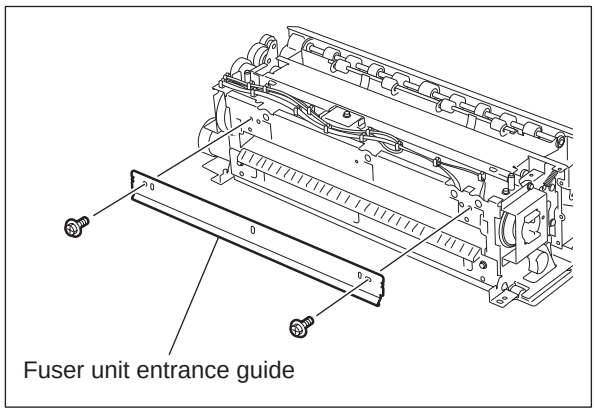


Fig. 16-45

(3) Remove 1 screw of each thermistor and take off total 3 thermistors.

Note:
When installing, be careful not to deform the thermistor. Also, make sure that the thermistor is in touch with the fuser belt.

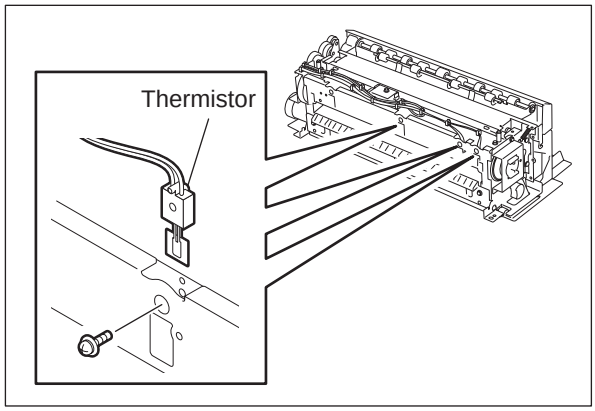


Fig. 16-46

[K] Exit sensor (S40) / Exit finger / Transport guide

(1) Take off the fuser unit
(📖 P.16-19 "[A] Fuser unit").
(2) Open the jam access cover and transport guide.
(3) Remove 3 screws and take off the cover (A).

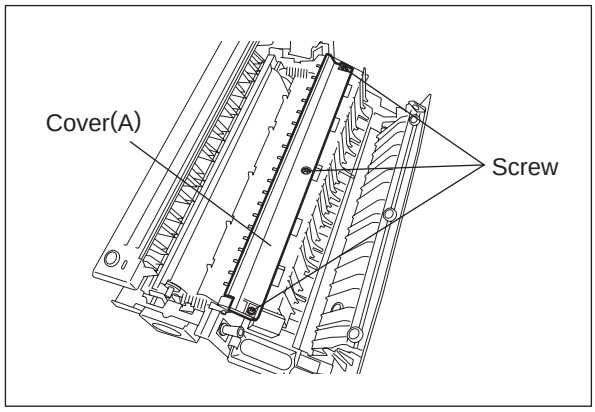


Fig. 16-47

(4) Remove 1 screw and bracket.
(5) Disconnect 1 connector and take off the exit sensor.
(6) Remove 1 spring.

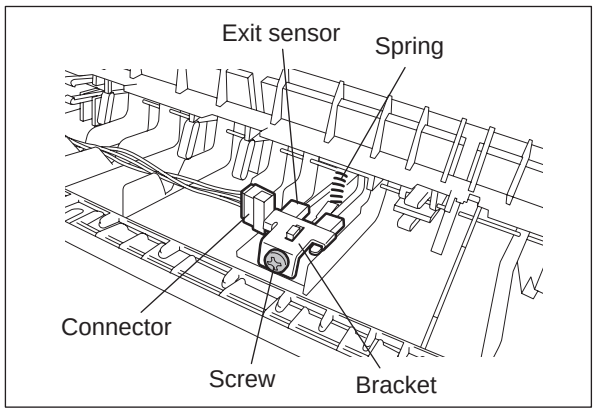


Fig. 16-48

(7) Remove 1 E-ring and pull out the shaft. Then remove 8 exit fingers and 1 actuator.

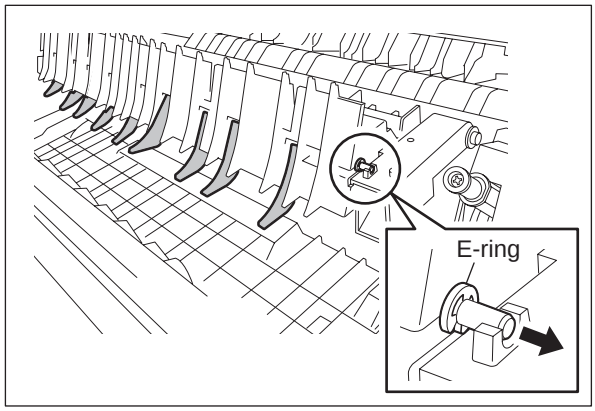


Fig. 16-49

(8) Remove 1 screw.
(9) Enlarge the frame and take off the transport guide.

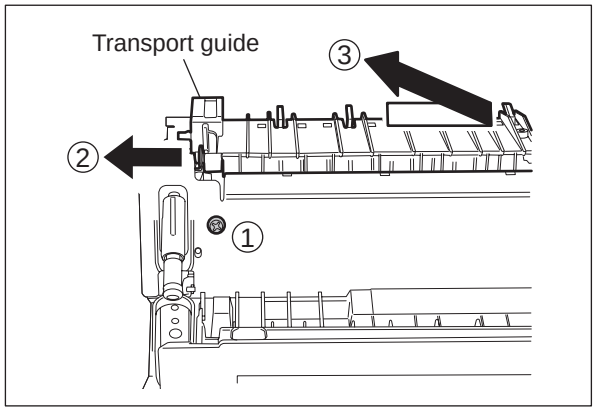


Fig. 16-50

[L] Exit roller

(1) Take off the fuser unit
(📖 P.16-19 "[A] Fuser unit").
(2) Open the jam access cover of the fuser unit.
(3) Remove 2 screws (one of the front side is a shoulder screw) and take off the exit roller cover.

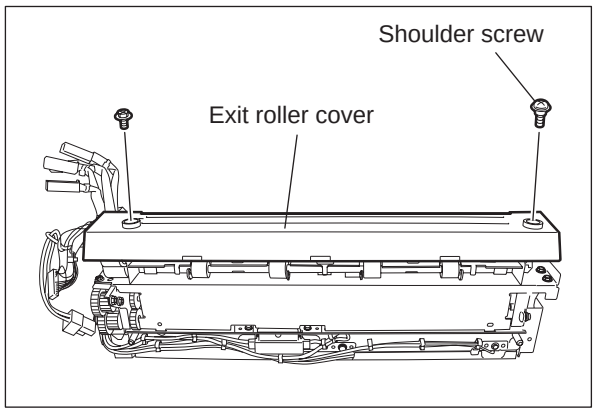


Fig. 16-51

(4) Remove 1 E-ring and 1 bushing from the exit roller front side.

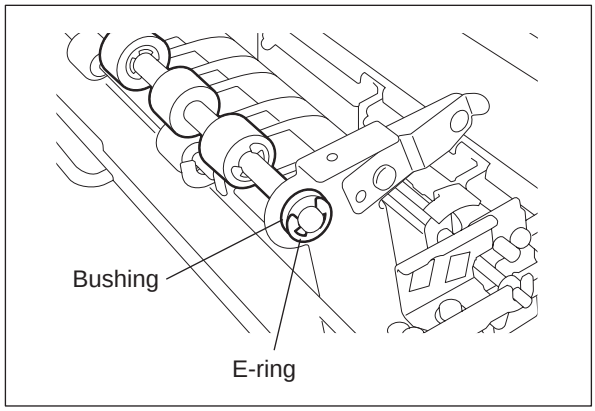


Fig. 16-52

(5) Remove E-ring, gear unit, E-ring and bushing in order from the exit roller rear side. Then take off the exit roller.

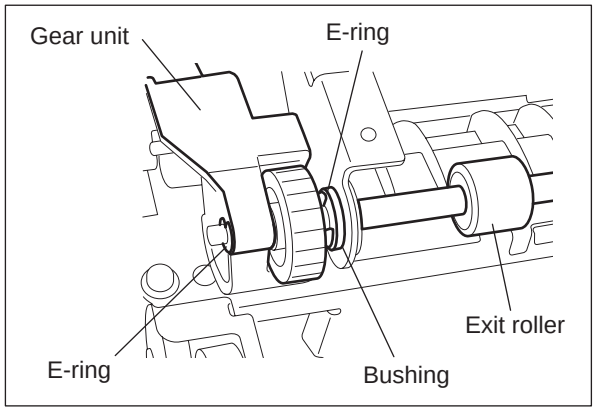


Fig. 16-53

[M] Discharge brush PM

(1) Take off the fuser unit (📖 P.16-19 "[A] Fuser unit").
(2) Remove 2 screws and take off the jam access cover.

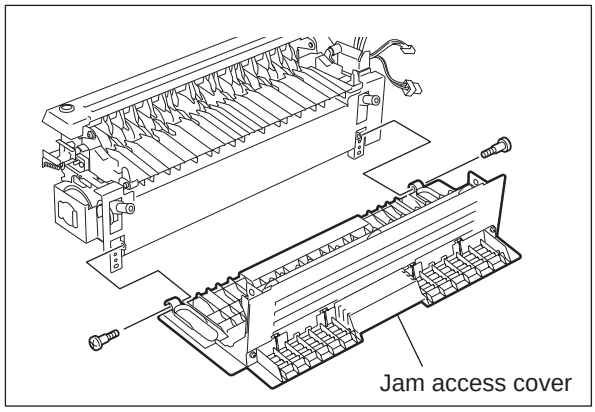


Fig. 16-54

16

(3) Remove 4 screws and take off the cover.

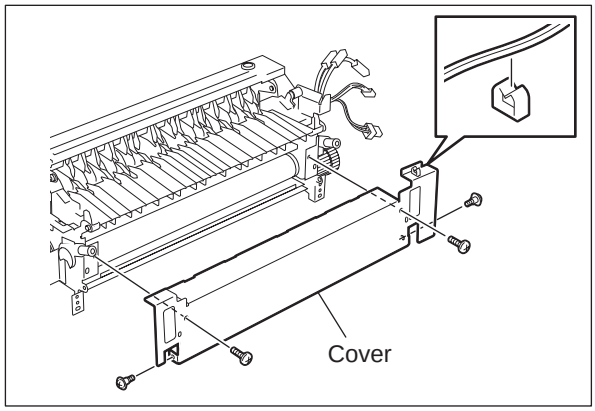


Fig. 16-55

(4) Remove 1 screw and take off the discharge brush.

Note:
Be careful not to scratch the fuser belt.

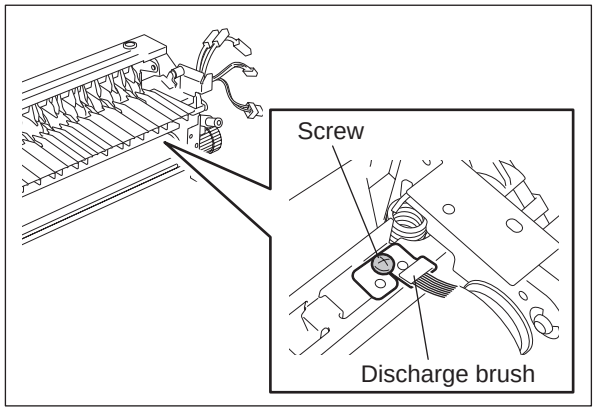


Fig. 16-56

[N] IH board (IH) / IH board case

(1) Take off the SYS board case
(📖 P.2-35 "[D] SYS board case").
(2) Take off the flywheel
(📖 P.9-9 "[A] Developer motor drive unit").
(3) Take off the right rear cover
(📖 P.2-30 "[O] Right rear cover").
(4) Disconnect 2 connectors and 4 faston terminal (📖 P.16-19 "[A] Fuser unit").
(5) Remove 3 screws and take off the IH board cover.

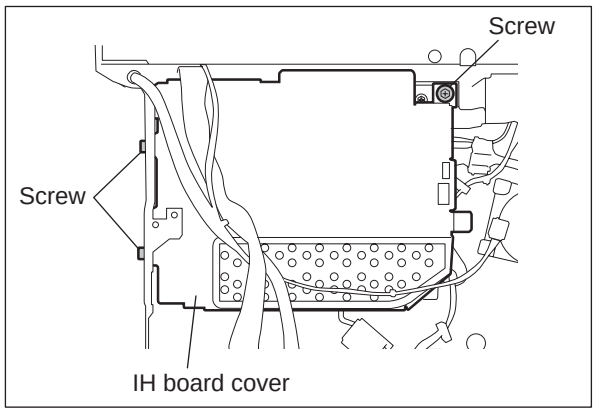


Fig. 16-57

(6) Disconnect 3 connectors, remove 2 screws and take off the IH board case.

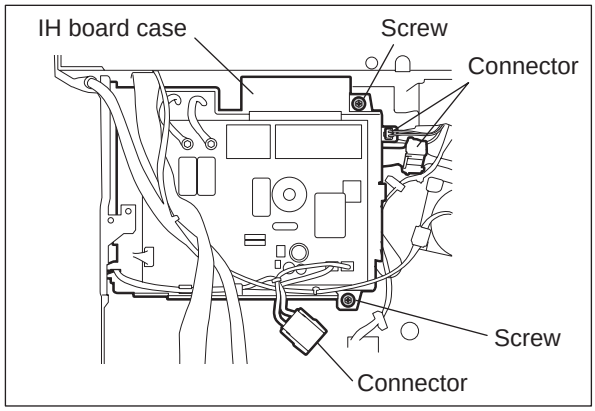


Fig. 16-58

(7) Disconnect 4 connectors, remove 7 screws and take off the IH board.

Notes:

1. Make sure not to connect each IH connection cable to the wrong position.
2. Tighten 4 screws of the IH connection cable completely (tightening torque: 1.17 - 1.56 N·m).
3. Since the IH board is a highvoltage section, make sure to disconnect the power cable at maintenance.

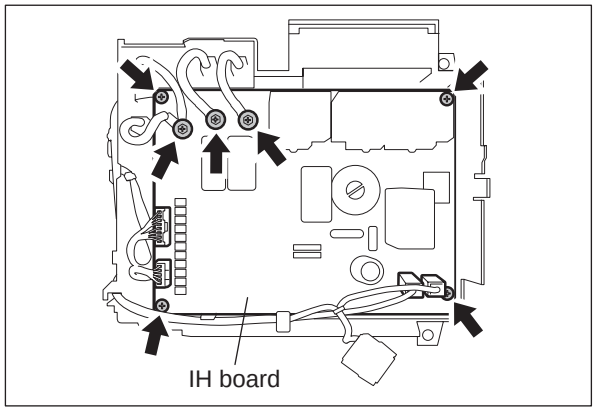


Fig. 16-59

[O] IH control board cooling fan (M20)

(1) Take off the IH board case (📖 P.16-34 "[N] IH board (IH) / IH board case").

(2) Remove 1 screw and take off the IH control board cooling fan cover.

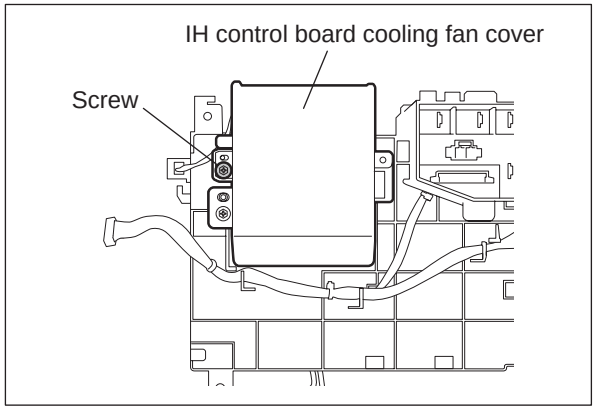


Fig. 16-60

(3) Disconnect 1 connector and take off the IH control board cooling fan.

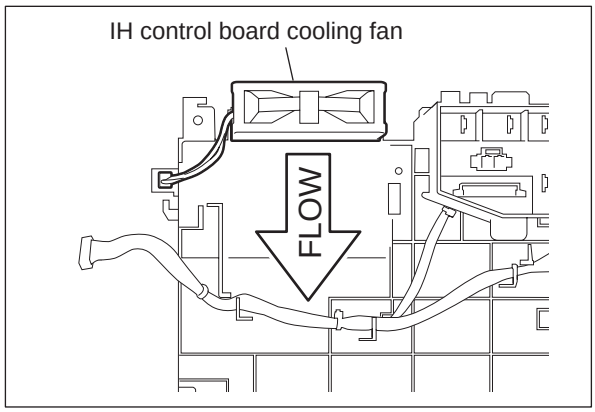


Fig. 16-61

[P] Exit motor (M7)

(1) Take off the fuser unit.
(📖 P.16-19 "[A] Fuser unit")
(2) Take off the IH board case.
(📖 P.16-34 "[N] IH board (IH) / IH board case")
(3) Disconnect 1 connector, remove 1 screw and take off the exit motor.

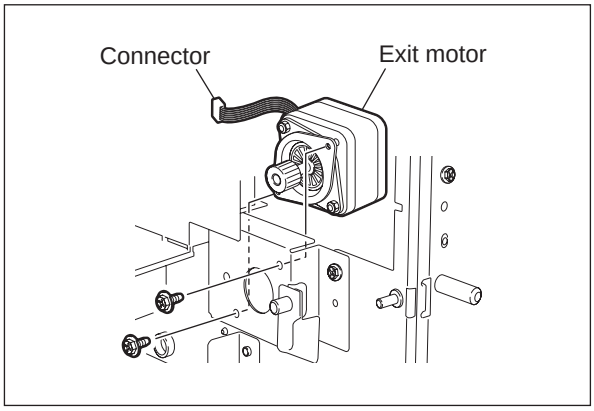


Fig. 16-62

Note:
When the exit motor is being installed, install it by sliding the motor to the left side to narrow the distance between the shafts of the gear.

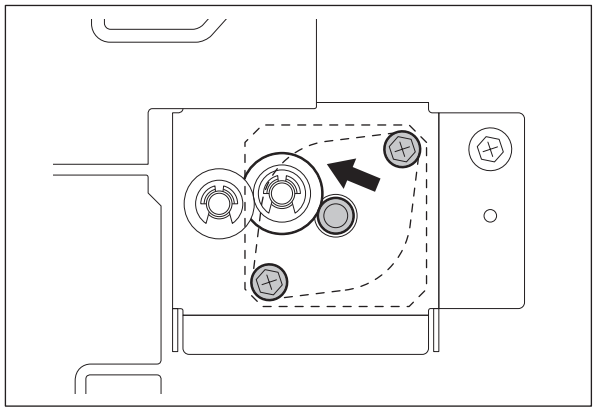


Fig. 16-63

17. AUTOMATIC DUPLEXING UNIT (ADU)

17.1 General Description

The Automatic Duplexing Unit (ADU) is a unit to automatically print on both sides of paper. A switch-back method using the exit roller is adopted for the ADU of this equipment.
A sheet of paper is switchbacked by the exit roller right after the printing operation (fusing operation) on one side is completed, and the reversed sheet is transported to the registration section for the other side of the sheet to be printed.
The ADU mainly consists of the transport rollers and their drive system, paper guide and ADU entrance / exit sensor.

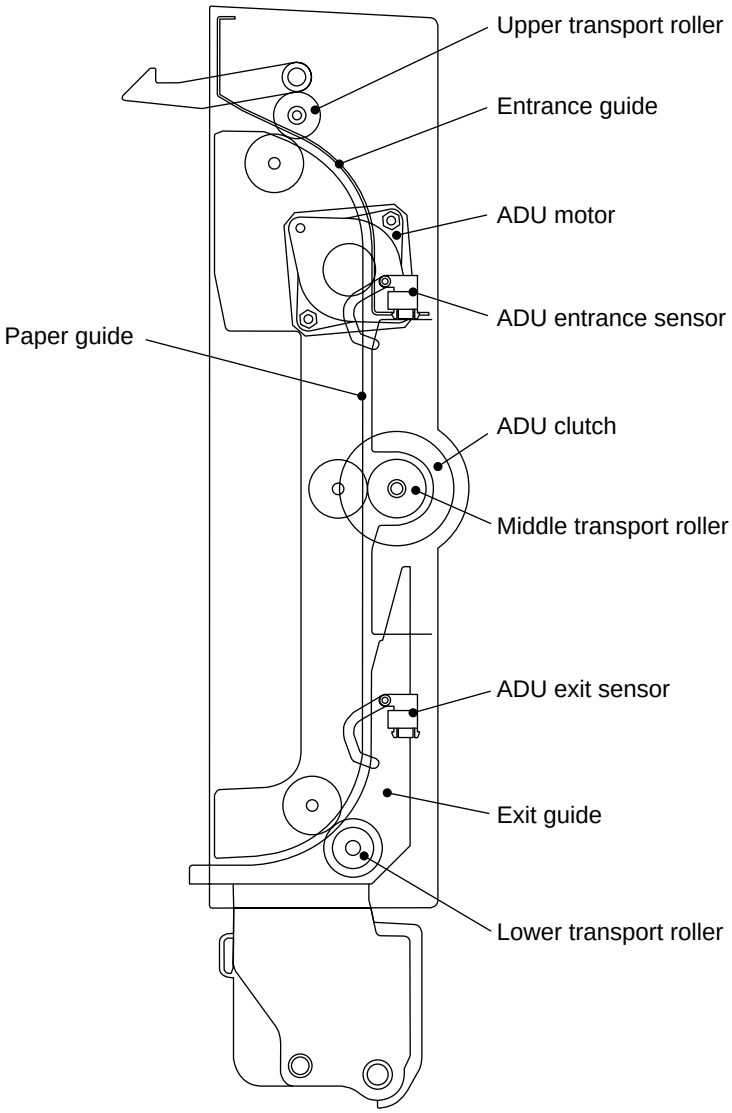


Fig. 17-1

17.2 Construction

Automatic Duplexing Unit (ADU)	
ADU motor (M5)	Stepping motor
ADU clutch (CLT7)	
ADU entrance sensor (S38)	
ADU exit sensor (S39)	
ADU opening/closing switch (S37)	
ADU driving PC board (ADU)	
Upper transport roller	
Middle transport roller	
Lower transport roller	

17.3 Functions

1) ADU motor (M5)
   This motor drives the ADU upper, middle and lower transport roller.

2) ADU clutch (CLT7)
   This clutch transfers the drive of the ADU motor (M5) to the upper and middle transport roller.
   When the ADU clutch (CLT7) is turned ON, the upper and middle transport roller starts rotating.

3) ADU entrance sensor (S38)
   This sensor detects input paper of the ADU transportation.

4) ADU exit sensor (S39)
   This sensor detects output paper of the ADU transportation.

5) ADU opening/closing switch (S37)
   This switch detects whether the ADU is open or not.

6) Upper transport roller / Middle transport roller / Lower transport roller
   This roller transports paper into the ADU.

17.4 Drive of ADU

When the ADU motor (M5) rotates to the direction A, the upper transport roller is rotated driven by the gears and belt. The ADU clutch (CLT7) is then turned ON and the middle transport roller and lower transport roller are rotated.

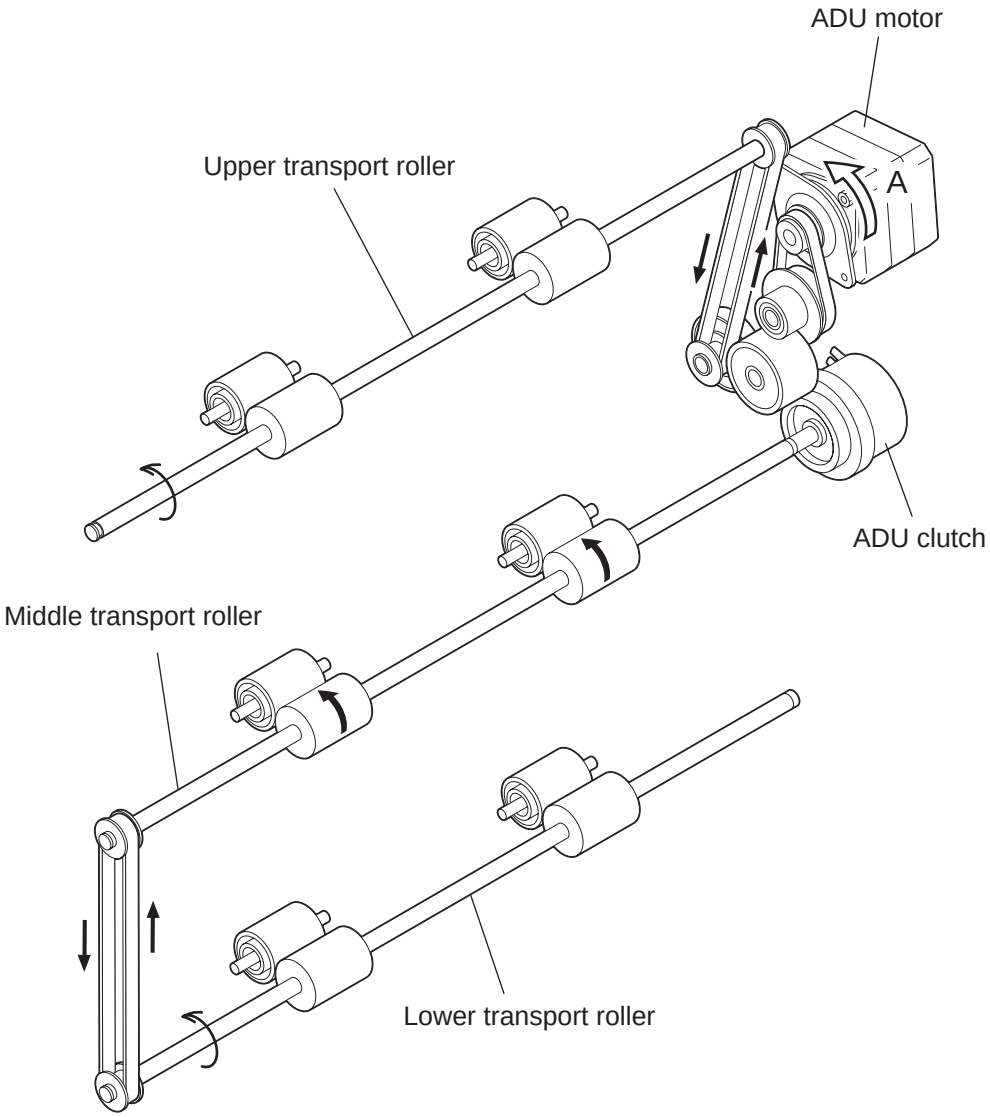


Fig. 17-2

17.5 Description of Operations

The back side printing (recording data of the back side of paper) is performed first by selecting duplex printing mode and pressing the [START] button. When the trailing edge of the paper passes the exit gate, the paper is switchbacked by the exit roller and transported into the ADU (the exit gate is closed with its own weight), and then the switchbacked paper is transported with acceleration. The transportation decelerates when the ADU exit sensor (S39) detects the paper. The front side printing (recording data of the front side of paper) is performed at the registration section. The paper passes through the exit gate again and is transported to the inner tray to complete duplex printing.

There are three methods of judging a paper jam: (1) whether the ADU entrance sensor (S38) is turned ON or not in a specified period of time after the switchback to the ADU started (E510). (2) whether the ADU exit sensor (S39) is turned ON or not in a specified period of time after the ADU entrance sensor (S38) is turned ON (E520). (3) whether the registration sensor (S22) is turned ON or not in a specified period of time after the paper feeding from the ADU to the equipment (E110).

If the ADU is opened during duplex printing, the ADU motor (M5) and ADU clutch (CLT7) are stopped, namely, ADU open jam occurs (E430).

The equipment is never to be stopped during printing by interruption in any case except paper jam or service call, if paper remains in the ADU.

The operation of the duplex printing differs depending on the size of the paper; single-paper circulation and alternateness circulation. The figures in the following pages show the circulating operations during duplex copying. The numbers in the figures indicate the page numbers.

1) Single-paper circulation
With the paper larger than A4/LT size, duplex printing (back-side printing→front-side printing) is performed for one sheet at a time as shown below.

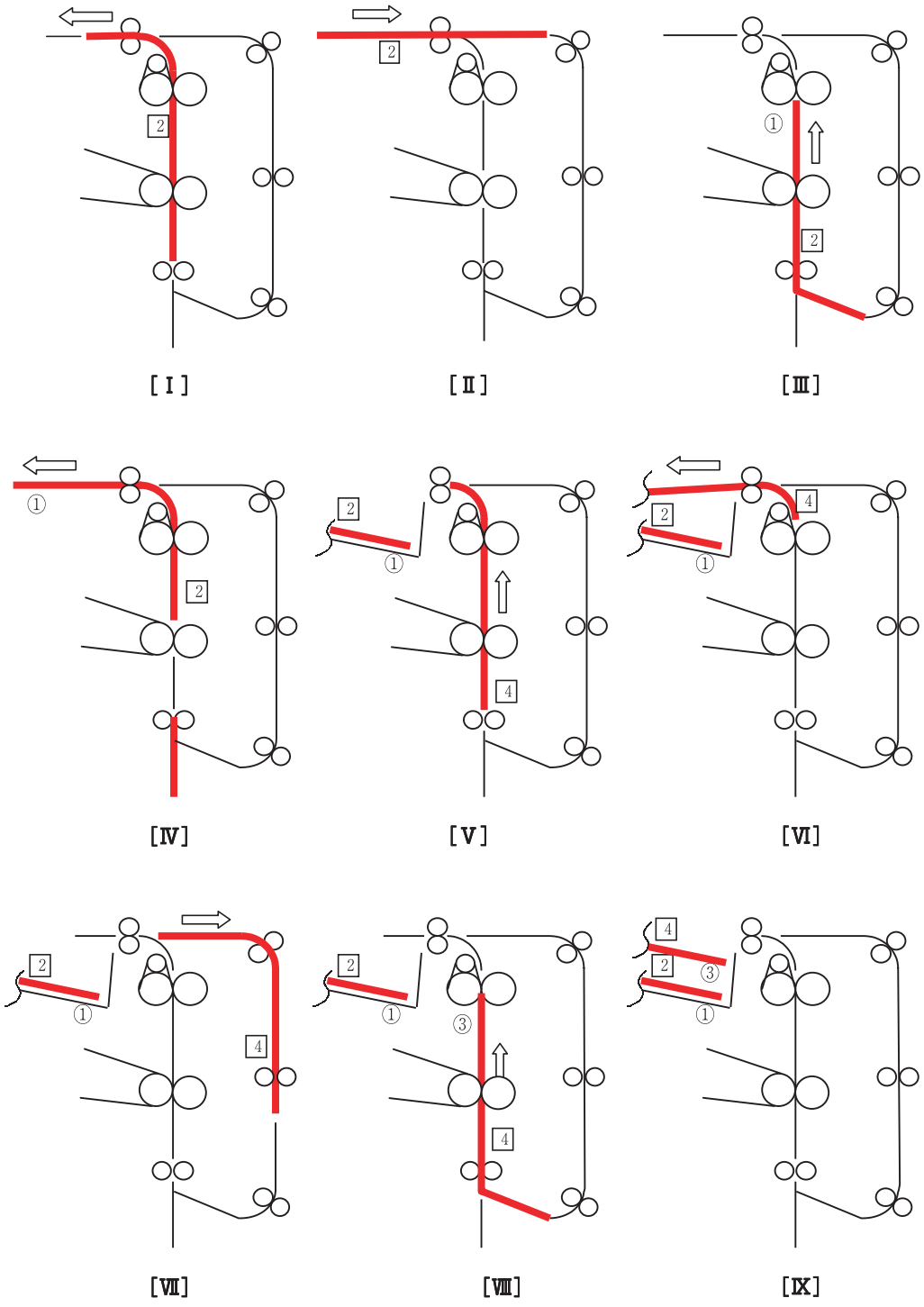


Fig. 17-3

2) Double-paper alternateness circulation
With A4/LT size paper or smaller, duplex printing is performed for two sheets at a time as shown below.
Back side of the 1st sheet→Back side of the 2nd sheet→Front side of the 1st sheet→Front side of the 2nd sheet

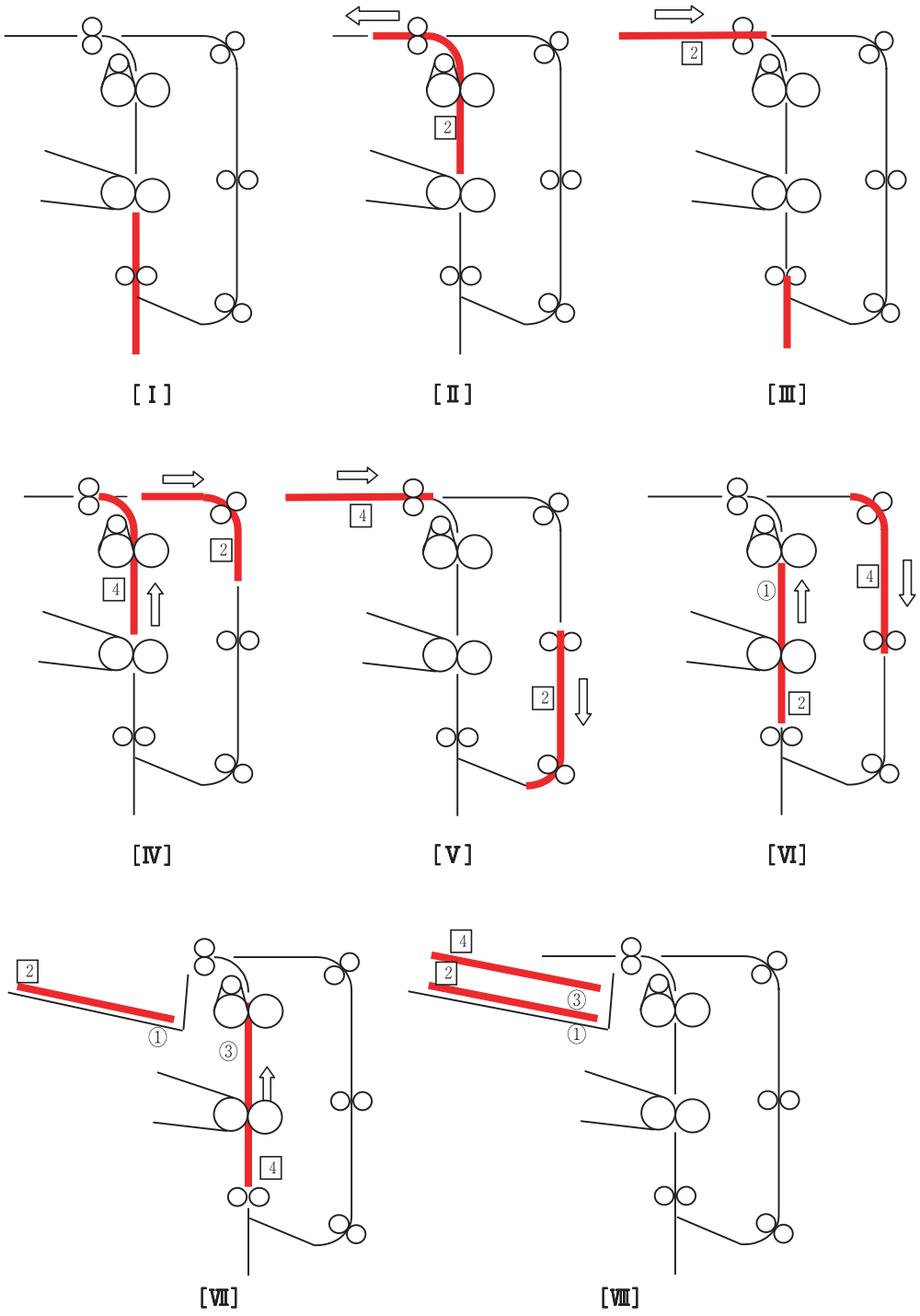


Fig. 17-4

3) Multiple-paper circulation

With more than one sheet of A4/LT size paper or smaller, duplex printing is performed as shown below in a following order:

(In case of 5 sheets)

Back side of the 1st sheet (2) → Back side of the 2nd sheet (4) → Front side of the 1st sheet (1) → Back side of the 3rd sheet (6) → Front side of the 2nd sheet (3) → Back side of the 4th sheet (8) → Front side of the 3rd sheet (5) → Back side of the 5th sheet (10) → Front side of the 4th sheet (7) → Front side of the 5th sheet (9)

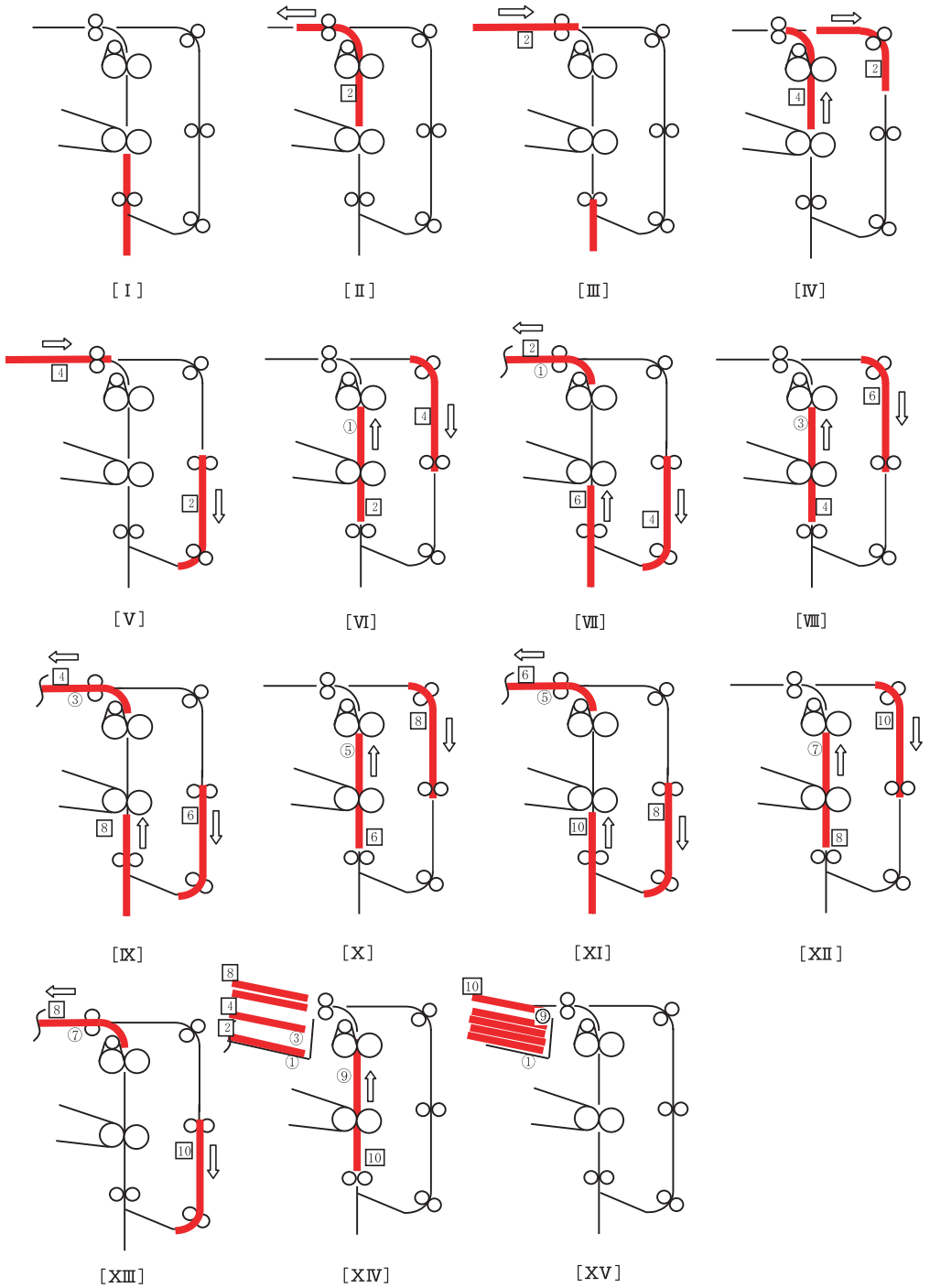


Fig. 17-5

Timing chart for duplex copying from upper drawer (A4, 3 sheets)

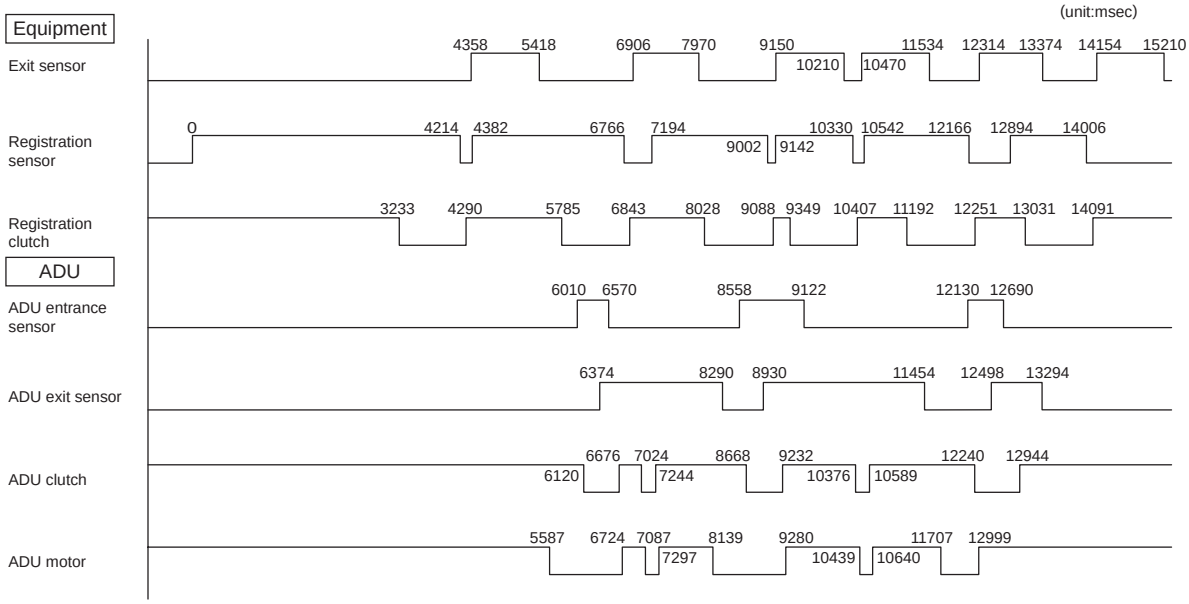


Fig. 17-6

Timing chart for duplex copying from upper drawer (A3, 1 sheet)

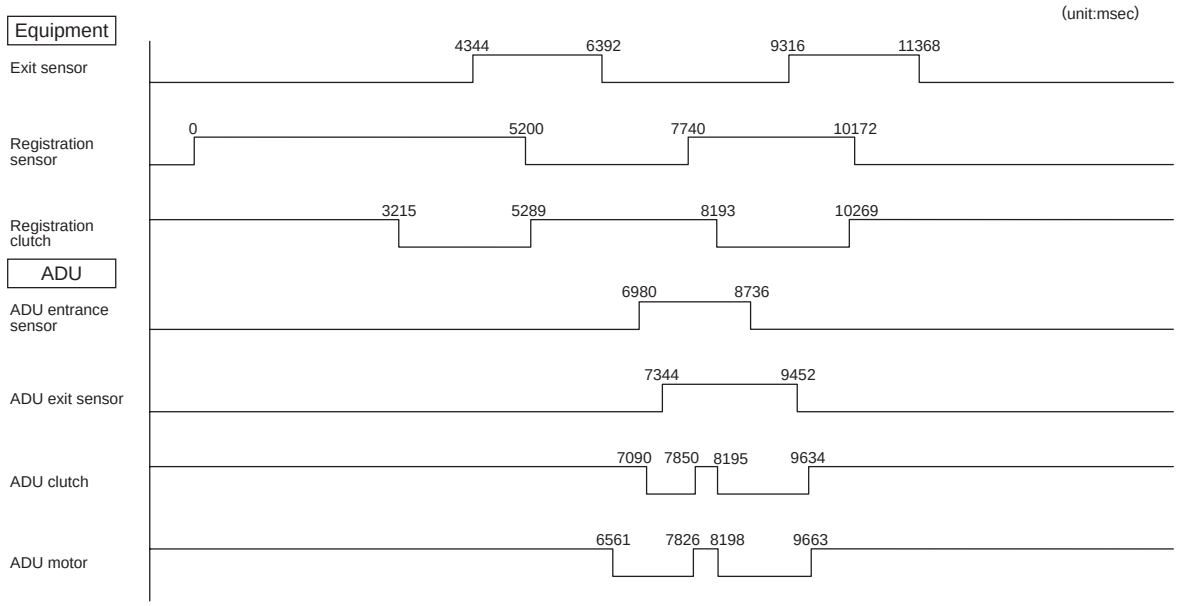
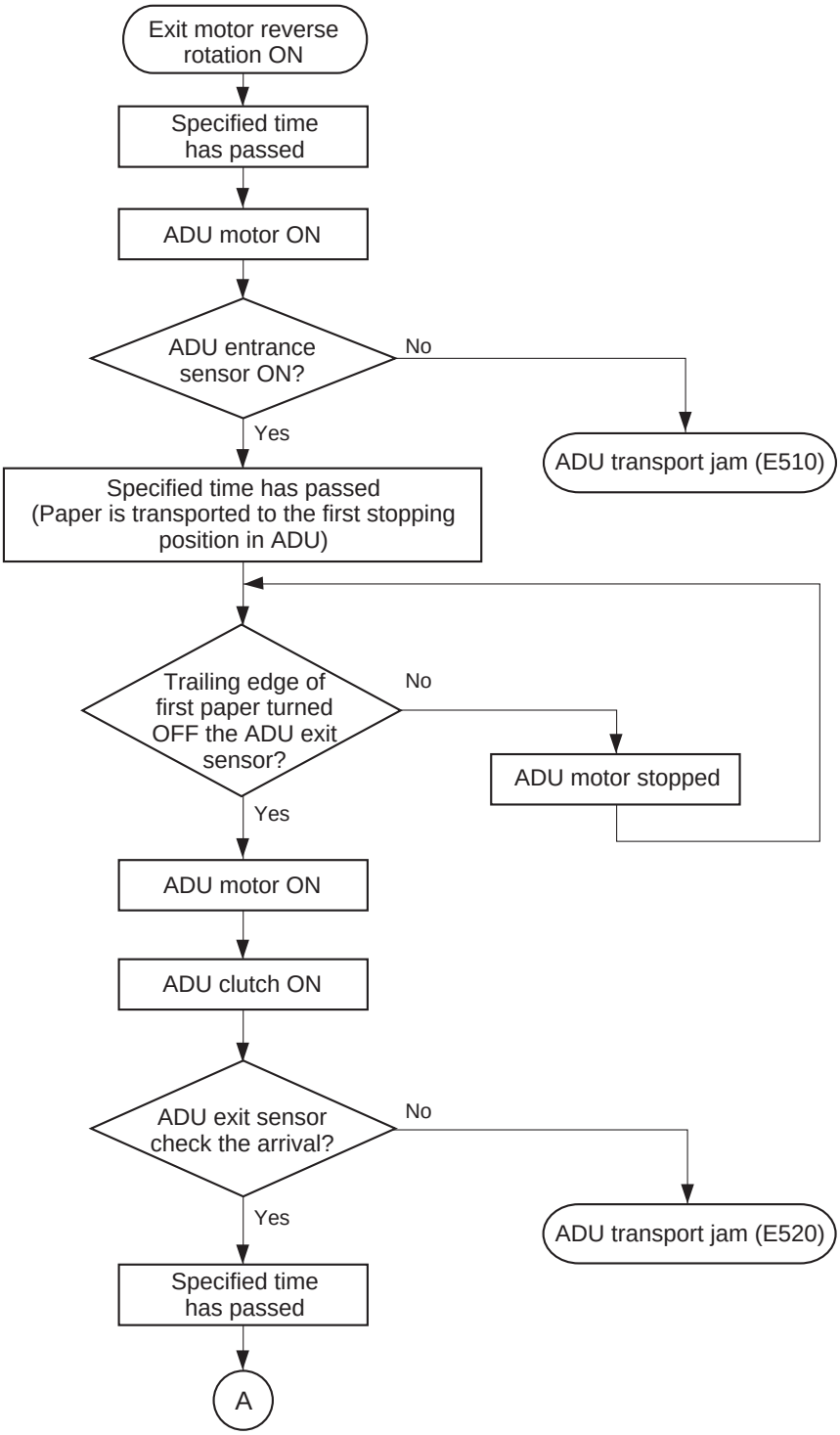
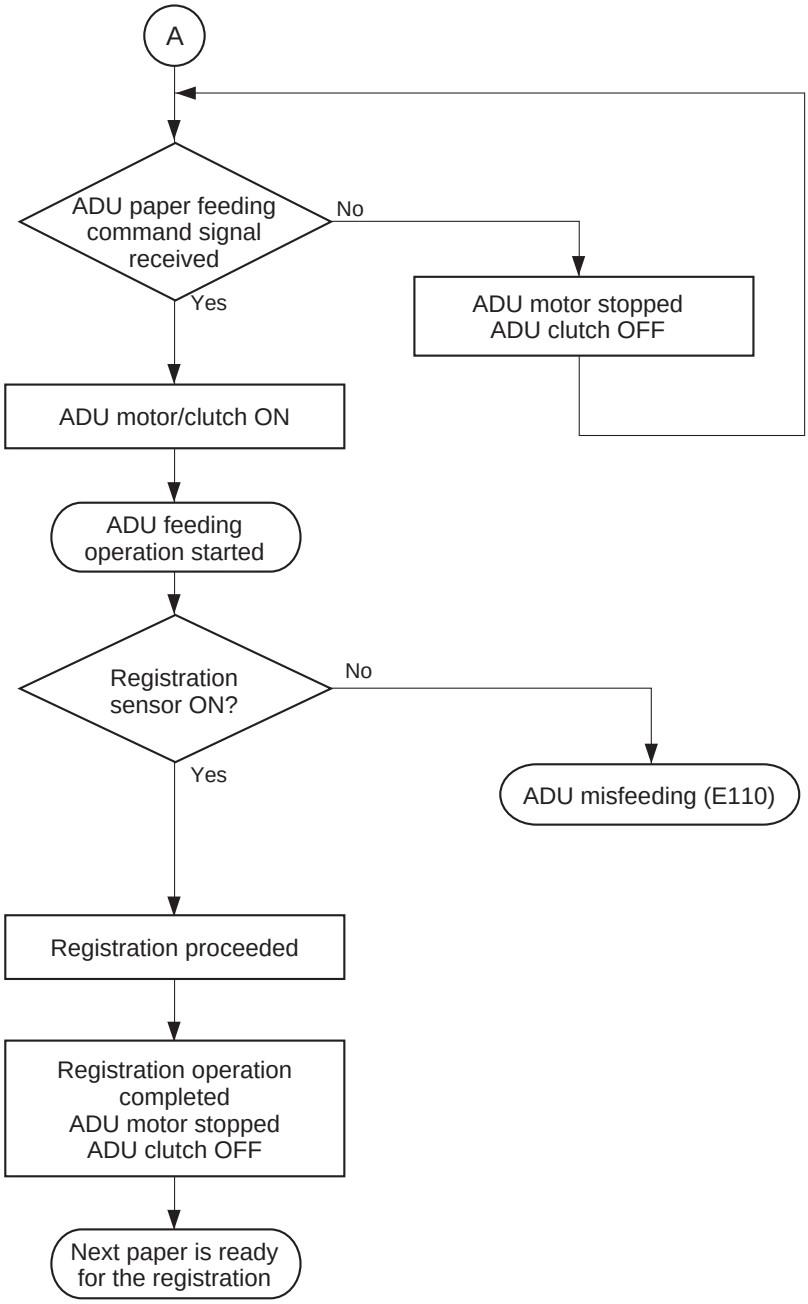


Fig. 17-7

17.6 Flow Chart





17.7 Disassembly and Replacement

[A] Automatic Duplexing Unit (ADU)

(1) Take off the right front hinge cover.
(📖 P.2-28 "[I] Right front hinge cover")
(2) Take off the right rear hinge cover.
(📖 P.2-31 "[P] Right rear hinge cover")
(3) Remove 1 screw (M4*12), open the bypass tray and take off the bypass feed front cover.

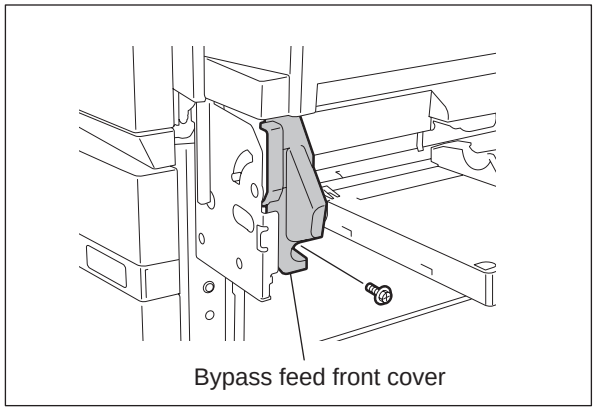


Fig. 17-8

(4) Disconnect 1 connector and remove 1 screw fixing the ground wires.
(5) Remove 2 screws and take off the bracket.

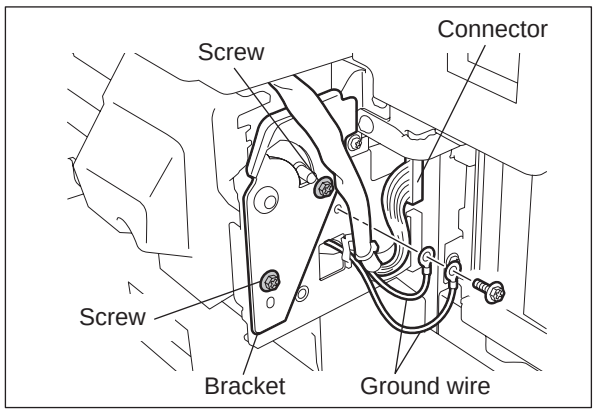


Fig. 17-9

(6) Open the ADU. Lift up the ADU a little and slide it to the rear side and take it off.

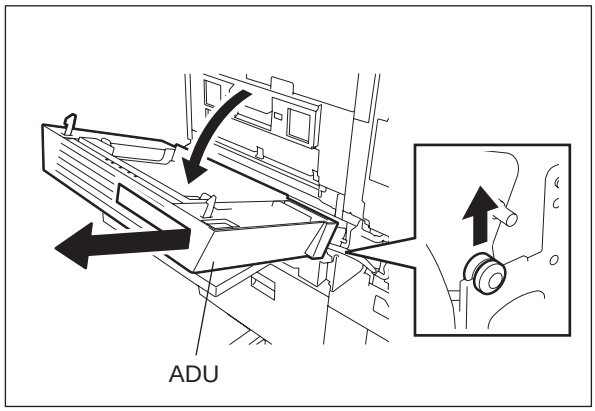


Fig. 17-10

[B] ADU inside rear cover

(1) Take off the ADU.
(📖 P.17-12 "[A] Automatic Duplexing Unit (ADU)")
(2) Remove 2 screws and take off the ADU inside rear cover.

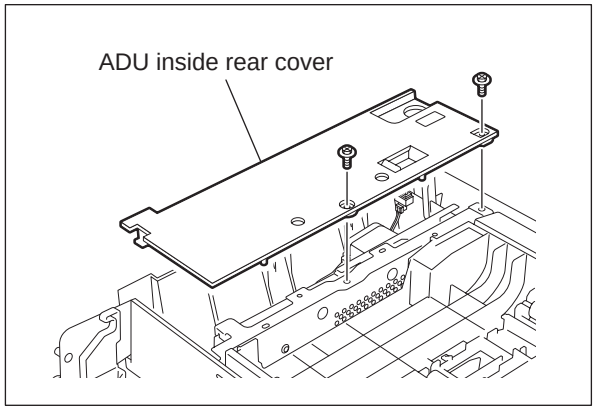


Fig. 17-11

[C] ADU opening/closing switch (S37)

(1) Take off the ADU.
(📖 P.17-12 "[A] Automatic Duplexing Unit (ADU)")
(2) Take off the ADU inside rear cover.
(📖 P.17-13 "[B] ADU inside rear cover")
(3) Disconnect the connector and release the latch to take off the ADU opening/closing switch.

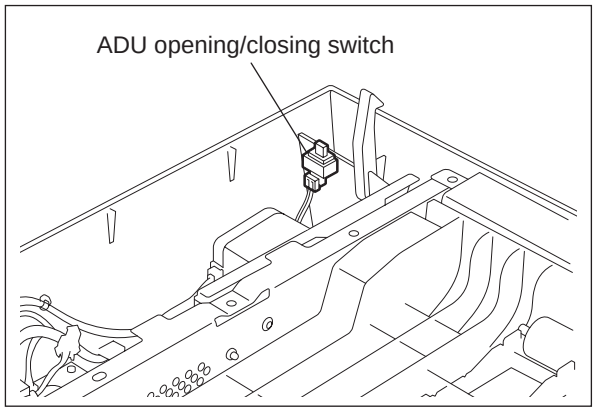


Fig. 17-12

[D] ADU board (ADU)

(1) Take off the ADU inside rear cover.
(📖 P.17-13 "[B] ADU inside rear cover")
(2) Disconnect 6 connectors from the ADU board. Release 3 lock supports and take off the ADU board.

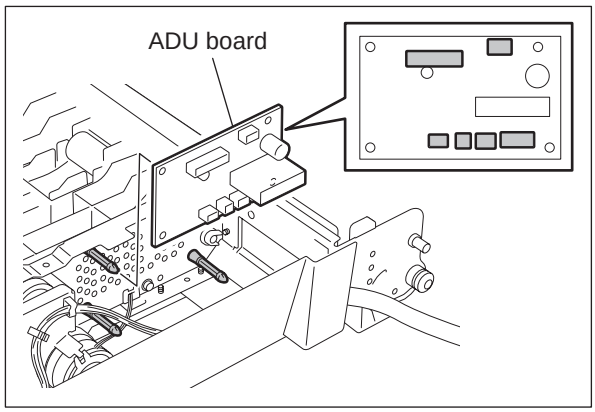


Fig. 17-13

[E] ADU cover

(1) Take off the ADU.
(📖 P.17-12 "[A] Automatic Duplexing Unit (ADU)")
(2) Take off the ADU opening/closing switch.
(📖 P.17-13 "[C] ADU opening/closing switch (S37)")
(3) Remove 4 screws and take off the ADU cover.

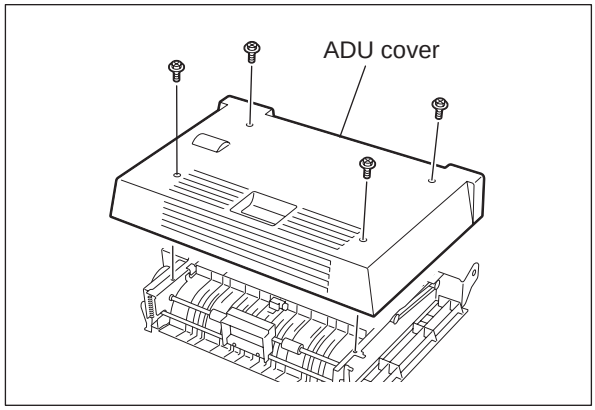


Fig. 17-14

[F] Paper guide

(1) Take off the ADU.
(📖 P.17-12 "[A] Automatic Duplexing Unit (ADU)")
(2) Release the fulcrum on the front side and take off the paper guide.

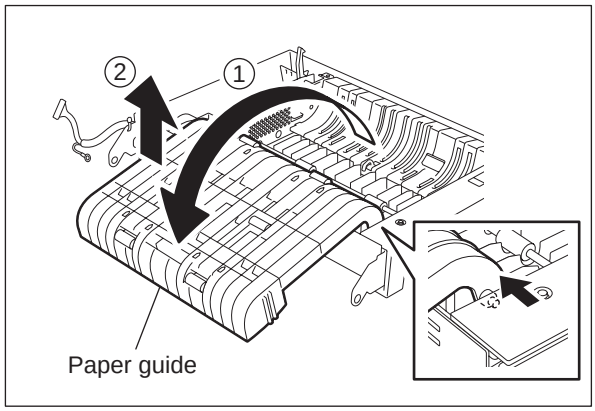


Fig. 17-15

[G] ADU clutch (CLT7)

(1) Take off the ADU cover.
(📖 P.17-14 "[E] ADU cover")
(2) Remove 1 E-ring and disconnect 1 connector. Then take off the ADU clutch.

Note:
When installing the E-ring, make sure that the latches of both ends of E-ring are on the flat part of the shaft.

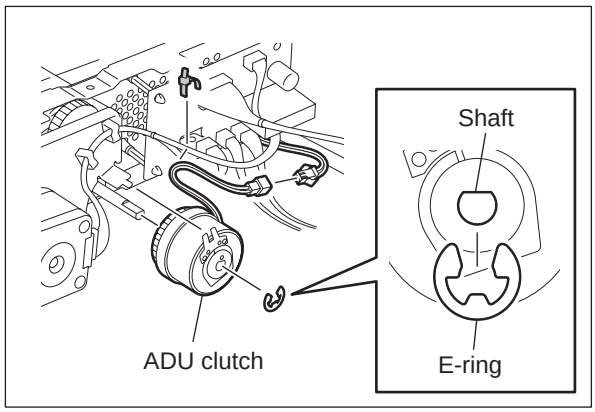


Fig. 17-16

[H] ADU motor (M5) / ADU drive unit

(1) Take off the ADU clutch.
(📖 P.17-14 "[G] ADU clutch (CLT7)")
(2) Remove the spring.

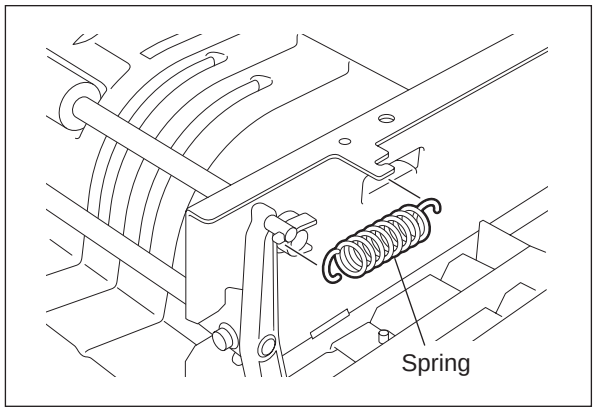


Fig. 17-17

(3) Remove 1 screw and take off the ADU rear latch.

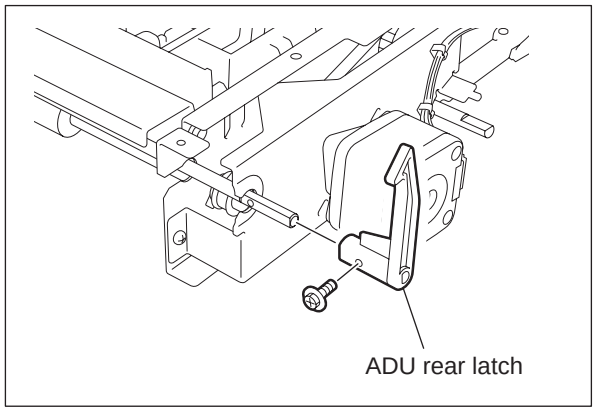


Fig. 17-18

(4) Disconnect 1 connector. Release the harness from 2 harness clamps. Remove 2 screws and take off the ADU drive unit.

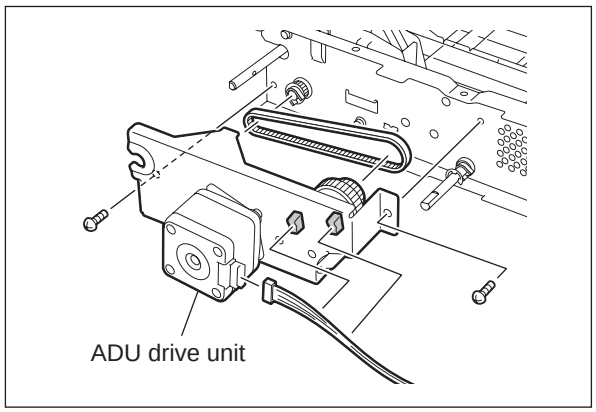


Fig. 17-19

(5) Remove 2 screws and take off the ADU motor.

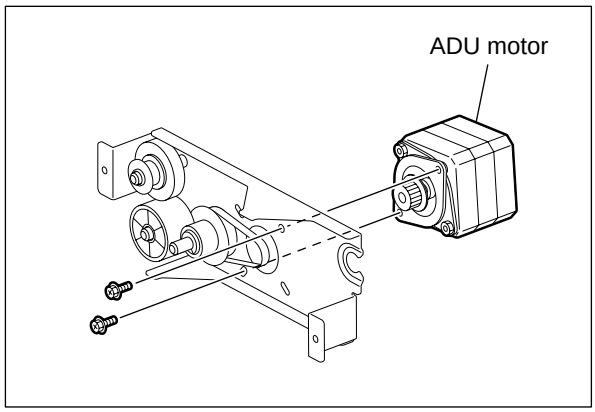


Fig. 17-20

(6) Take off the timing belt and 1 E-ring. Then take off the gears from the ADU drive unit.

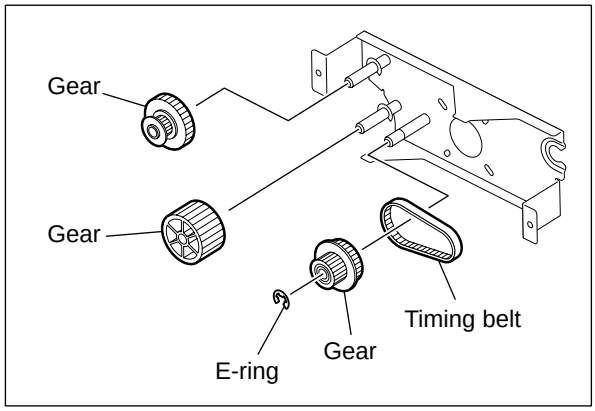


Fig. 17-21

[I] Upper transport roller

(1) Take off the ADU drive unit.
(📖 P.17-15 "[H] ADU motor (M5) / ADU drive unit")
(2) Remove 1 E-ring on the rear side. Then take off 1 pulley.

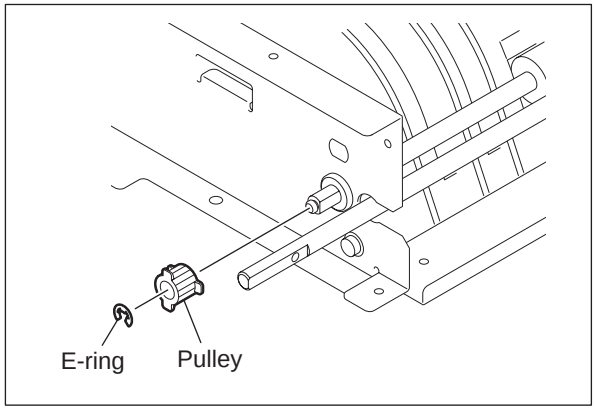


Fig. 17-22

(3) Remove 1 clip on the front side.
(4) Remove 2 bushings and take off the upper transport roller.

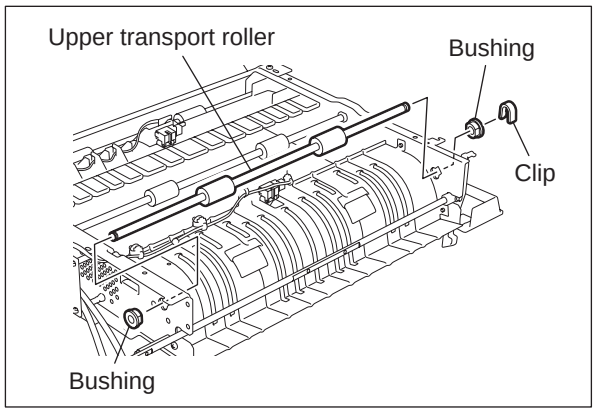


Fig. 17-23

[J] Middle transport roller

(1) Take off the ADU drive unit.
(📖 P.17-15 "[H] ADU motor (M5) / ADU drive unit")
(2) Remove 2 clips, 2 pulleys and 2 pins on the front side. Then take off the timing belt.

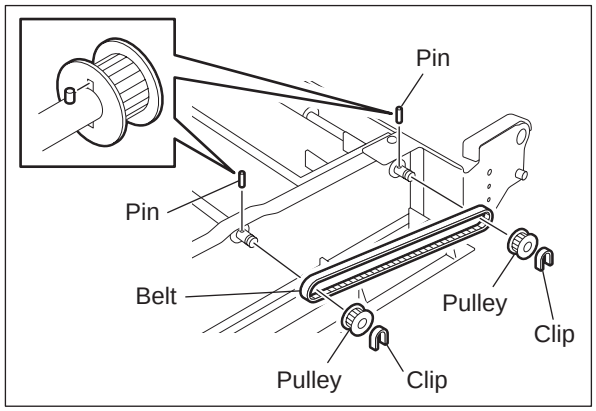


Fig. 17-24

(3) Remove 1 E-ring, 1 clip and 1 bushing on the rear side.
(4) Take off 1 bushing on the front side. Then take off the middle transport roller.

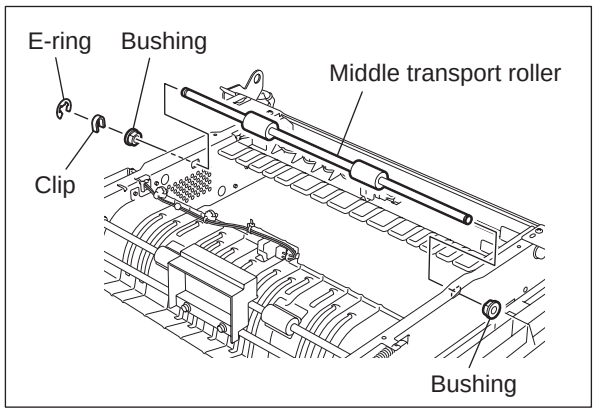


Fig. 17-25

[K] Lower transport roller

(1) Take off the ADU board.
(📖 P.17-13 "[D] ADU board (ADU)")
(2) Take off the ADU cover.
(📖 P.17-14 "[E] ADU cover")
(3) Remove 2 clips, 2 pulleys and 2 pins on the front side. Then take off the timing belt.

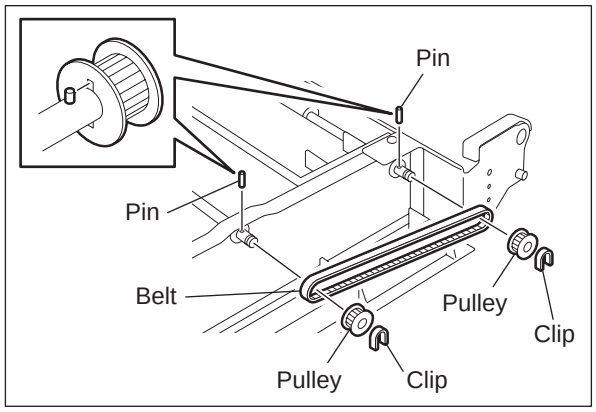


Fig. 17-26

(4) Remove 1 clip and 1 bushing on the rear side.
(5) Remove 1 bushing on the front side. Then take off the lower transport roller.

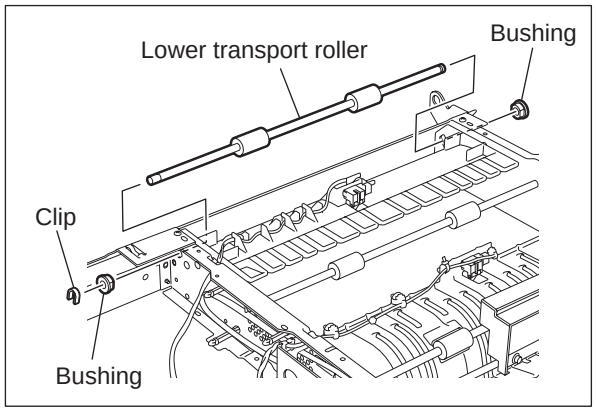


Fig. 17-27

[L] ADU entrance sensor (S38)

(1) Take off the ADU cover.
(📖 P.17-14 "[E] ADU cover")
(2) Disconnect 1 connector. Release the latches and take off the ADU entrance sensor.

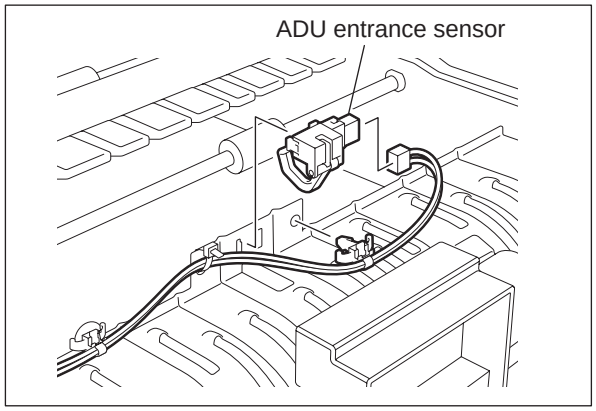


Fig. 17-28

[M] ADU exit sensor (S39)

(1) Take off the ADU cover.
(📖 P.17-14 "[E] ADU cover")
(2) Disconnect 1 connector. Release the latches and take off the ADU exit sensor.

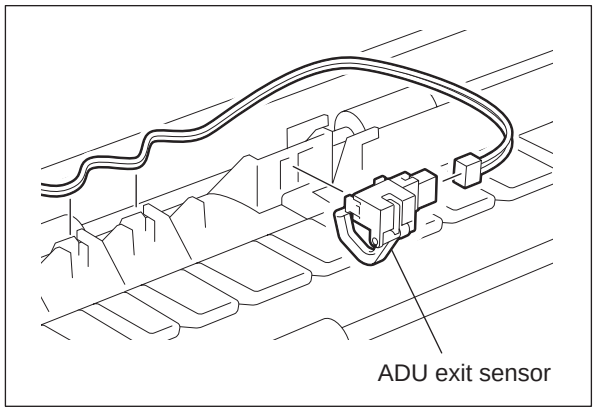


Fig. 17-29

18. POWER SUPPLY UNIT

18.1 Construction

The power supply unit consists of an AC filter and insulation type DC output circuits.

1) AC filter
   Eliminates noise from the outside and prevents the noise generated by the equipment from leaking to the outside.

2) DC output circuits
   Converts AC voltage input from outside to DC voltage and supplies it to each electric part. The DC voltage is divided into the following two lines.

   a. Main line: Power supply used in the entire equipment during image forming process. Three kinds of voltage (+3.3V, +5.1V and +12V) are output when the main switch of the equipment is turned ON.

   b. Cover switch line: Power supply used in the entire equipment during image forming process, being supplied via the door switch. Two kinds of voltage (+5.1VD and +24VD) are output only when the main switch of the equipment is turned ON and two covers (front cover and jam access cover) are closed.

18.2 Operation of DC Output Circuits

1) Starting line output
   When the main switch of the equipment is turned ON, power starts supplying to all the lines only when two covers (front cover and jam access cover) are closed.

2) Stopping line output
   When the main switch of the equipment is turned OFF, PER-DN signal is output after the instantaneous outage insurance time (20 ms or more) elapses and then the supply of each voltage stops. If the supply of voltage of the main line (+3.3VA, +5.1VA, +12VA) stops earlier than the 24V line does, it may cause the damage of the electron device on each control circuit. To prevent this, the supply of these voltages stops after the PWR-DN signal is output and the minimum retaining time (+3.3VA/ +5.1VA: 50 ms or more, +12VA: 5 ms or more) elapses.

3) Output protection
   Each output system includes an overcurrent and overvoltage protection circuits (a fuse and internal protection circuit). This is to prevent the defectives (damage or abnormal operation of the secondary circuit) which may be caused by an overcurrent due to a short circuit or an overvoltage due to a short circuit between different voltages. If the protection circuit is activated (except the case the fuse is blown out), remove the causes such as short-circuit. Turn ON the power again 1 minute later to clear the overcurrent protection.

18.3 Output Channel

The followings are three output channels which are not linked with the cover switch.

1) +3.3V

+3.3VA:	CN464 Pins 9, 10 and 11
	Output to the SYS board
+3.3VB:	CN464 Pins 15 and 16
	Output to the SYS board
+3.3VB:	CN466 Pin 3
	Output to the LGC board
+3.3VB:	CN467 Pins 17 and 18
	Output to the SLG board

2) +5.1V

+5.1VA:	CN464 Pins 21, 22, 23 and 24
	Output to the SYS board
+5.1VB:	CN464 Pin 19
	Output to the SYS board
+5.1VB:	CN466 Pin 1
	Output to the LGC board, PFP/LCF (via LGC board), Bridge unit (via LGC board)
+5.1VB:	CN467 Pins 5 and 6
	Output to the RADF
+5.1VB:	CN467 Pins 21 and 22
	Output to the SLG board
+5.1VB:	CN468 Pin 4
	Output to the finisher
+5.1VB:	CN469 Pin 5
	Output to the FIL board

3) +12V

+12VA:	CN464 Pin 5
	Output to the SYS board
+12VB:	CN464 Pin 3
	Output to the SYS board
+12VB:	CN466 Pin 16
	Output to the LGC board
+12VB:	CN471 Pin 1
	Output to the FAX unit

The followings are two output channels which are linked with the cover switch.

1) +5.1V

+5.1VD: CN466 Pin 11
Output to the LGC board

2) +24V

+24VD1: CN465 Pins 1 and 2
Output to the LGC board, Bridge unit (via LGC board)
+24VD1: CN469 Pins 1 and 2
Output to the PFP/LCF
+24VD1: CN470 Pin 1
Output to the power supply cooling fan
+24VD2: CN465 Pins 5 and 6
Output to the DRV board
+24VD3: CN467 Pins 1 and 2
Output to the RADF
+24VD4: CN467 Pins 10, 12 and 14
Output to the SLG board
+24VD5: CN468 Pin 2
Output to the finisher

Output voltage by the type of connector
Main switch line

Connector	Destination	Voltage
CN464	SYS board	+3.3VA, +3.3VB, +5.1VA, +5.1VB, +12VA, +12VB
CN466	LGC board, PFP/LCF (via LGC board), Bridge unit (via LGC board)	+3.3VB, +5.1VB, +12VB
CN467	SLG board, RADF	+3.3VB, 5.1VB
CN468	Finisher	+5.1VB
CN469	FIL board	+5.1VB
CN471	FAX unit	+12VB

Cover switch line

Connector	Destination	Voltage
CN465	LGC board, DRV board, PFP/LCF (via LGC board), Bridge unit (via LGC board)	+24VD1, +24VD2
CN466	LGC board	+5.1VD
CN467	SLG board, RADF	+24VD3, +24VD4
CN468	Finisher	+24VD5
CN469	PFP/LCF	+24VD1
CN470	Power supply cooling fan	+24VD1

18.4 Fuse

When the power supply secondary fuse is blown out, confirm that there is no abnormally with each part using the following table.

Voltage	Board/Unit	Part	Fuse type
+24VD1	LGC	Polygonal motor	F3:8A (Semi time-lag)
		Tray-up motor	
		ADU motor	
		Main motor	
		Developer motor	
		Transport motor	
		Drum cleaner brush motor	
		Transfer belt cleaner auger motor	
		Toner motor	
		Laser unit cooling fan	
		IH control board cooling fan	
		Ozone exhaust fan	
		Internal cooling fan	
		2nd transfer roller contact clutch	
		Bypass feed clutch	
		Registration clutch	
		Upper transport clutch (high speed)	
		Upper transport clutch (low speed)	
		Lower transport clutch (high speed)	
		Lower transport clutch (low speed)	
		Upper drawer feed clutch	
		Lower drawer feed clutch	
		ADU clutch	
		Color developer toner supply clutch	
		Color developer drive clutch	
		Black developer drive clutch	
		Black developer lifting clutch	
		Transfer belt cleaner contact clutch	
		Bypass pickup solenoid	
		Image quality sensor shutter solenoid	
		Color auto-toner sensor shutter solenoid	
		Discharge LED	
		Copy key card	
		Charger cleaner motor	
	Power supply	Power supply cooling fan	
	PFP/LCF		
	Bridge unit		
+24VD2	DRV	Revolver motor	F4:8A (Semi time-lag)
		Exit motor	
+24VD3	RADF		
+24VD4	SLG	Exposure lamp (lamp inverter)	F5:8A (Semi time-lag)
		CCD drive circuit (CCD board)	
		Scanner unit cooling fan	
		Scan motor	
+24VD5	Finisher		

18.5 Configuration of Power Supply Unit

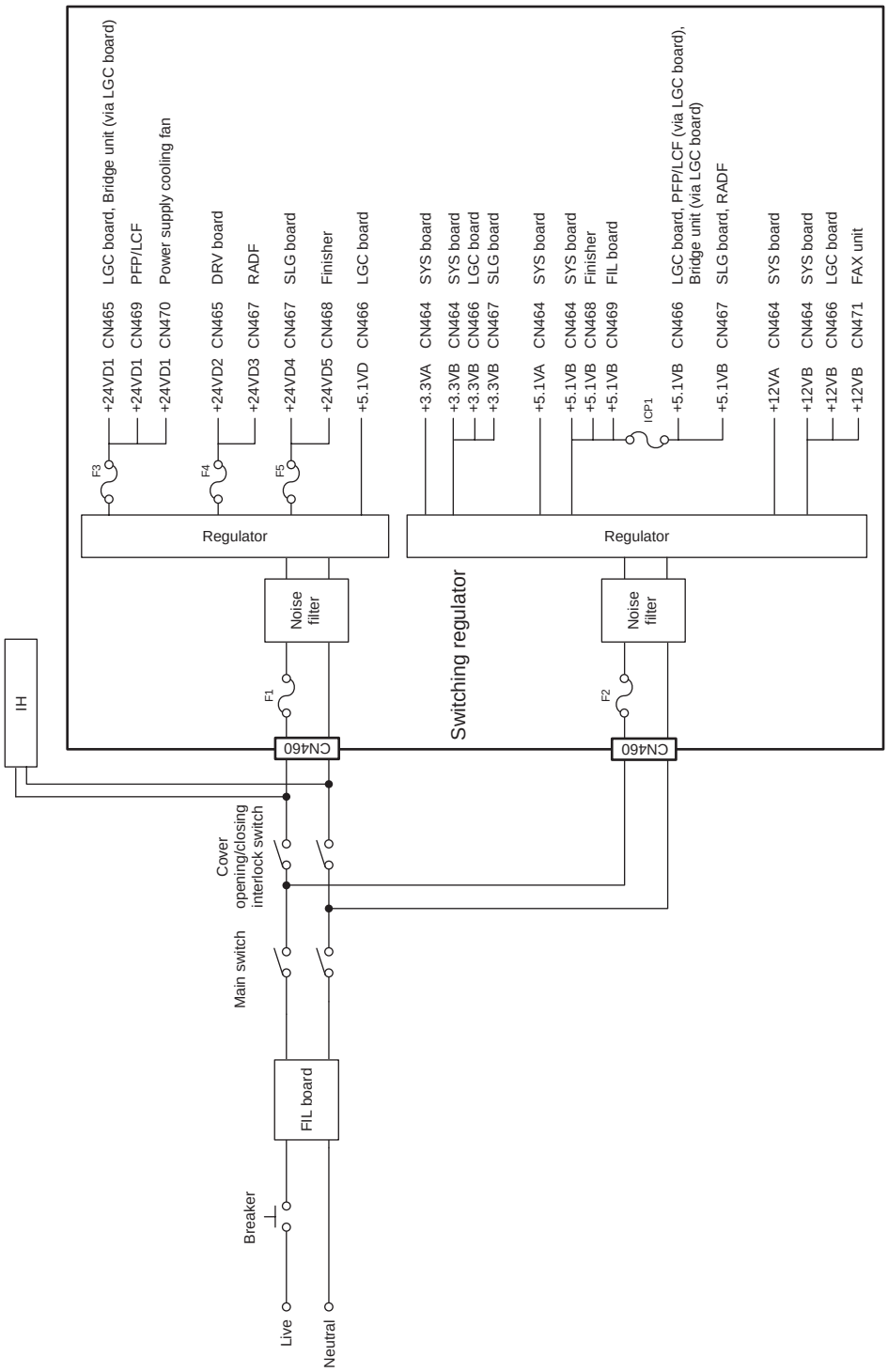


Fig. 18-1

18.6 Sequence of Power Supply

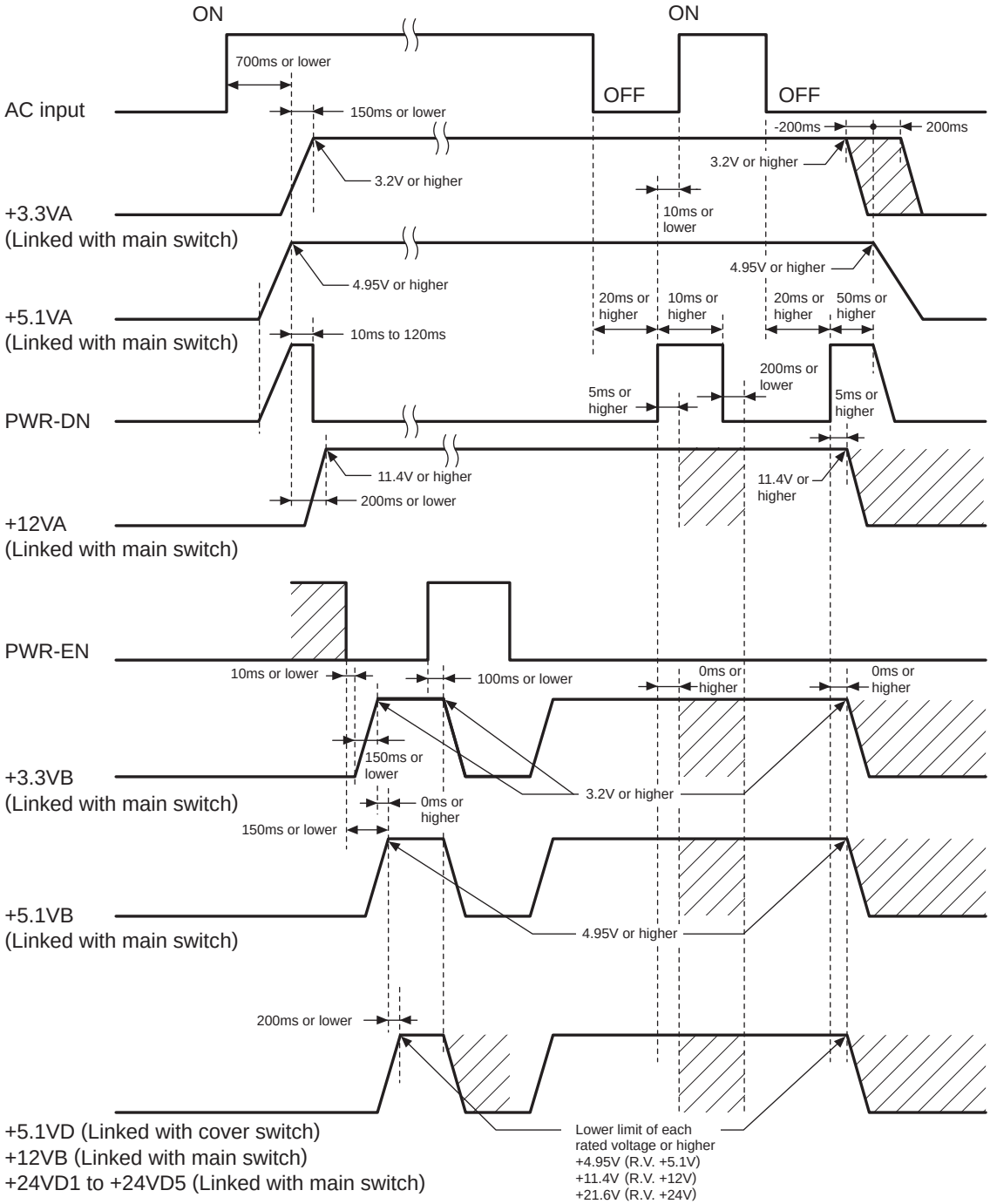


Fig. 18-2

18.7 AC Wire Harness

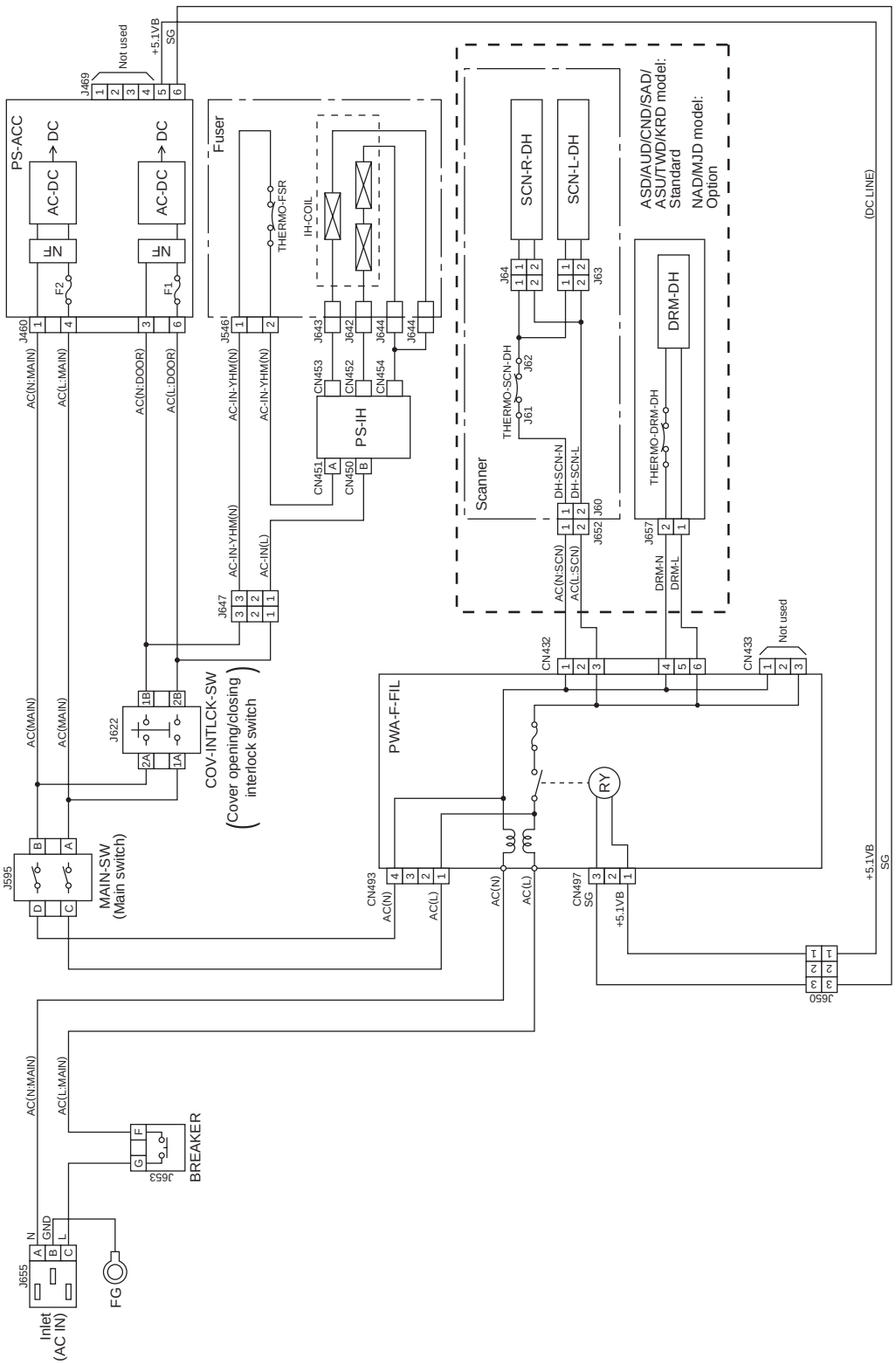


Fig. 18-3

19. PC BOARDS

1) PWA-F-SYS

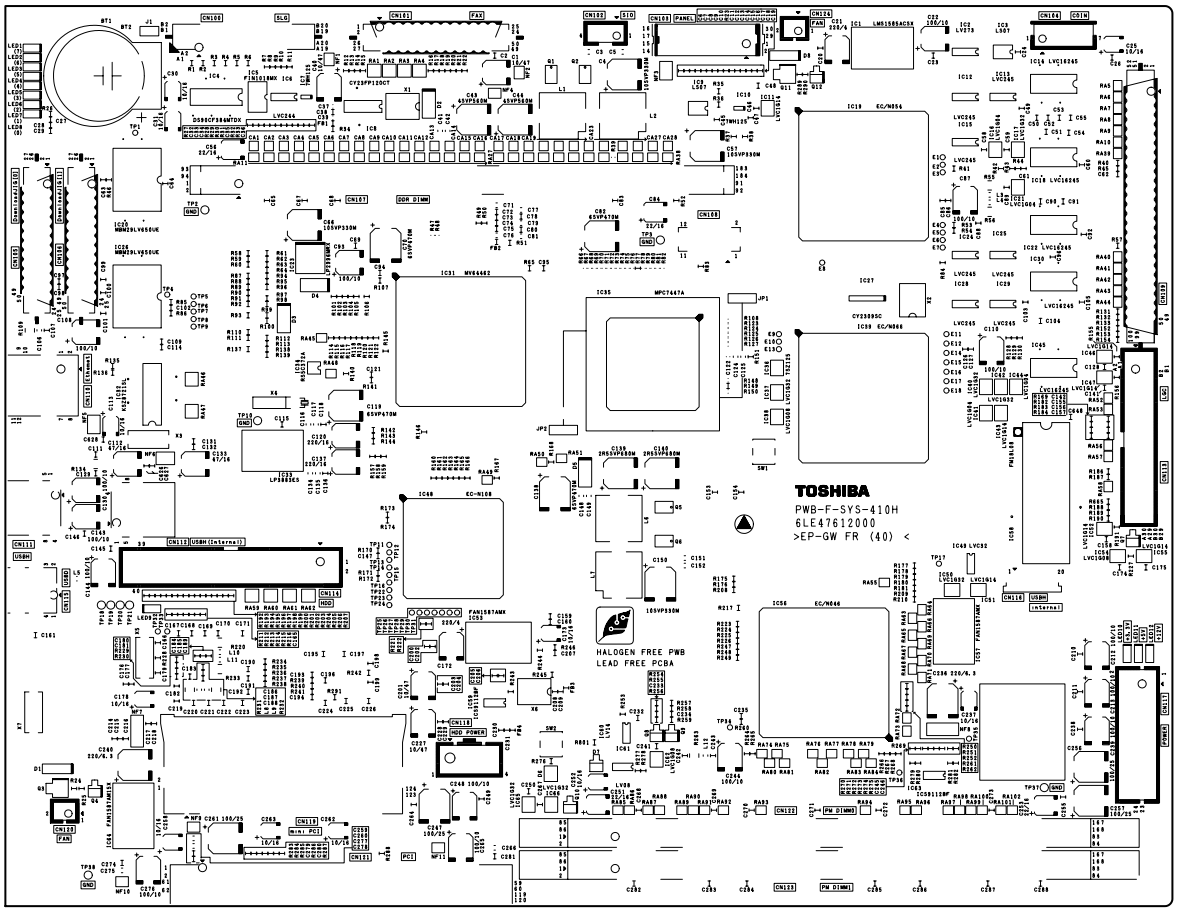


Fig. 19-1

2) PWA-F-LGC

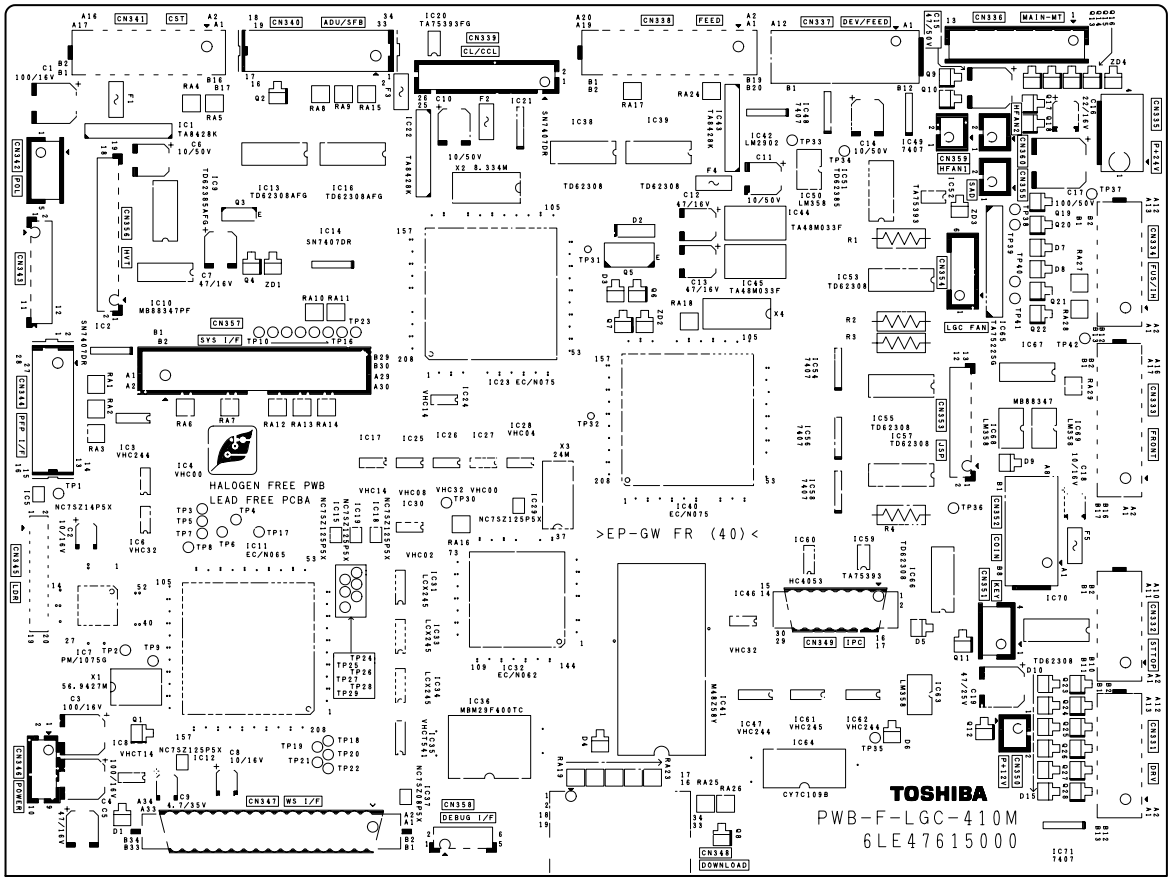


Fig. 19-2

3) PWA-F-SLG

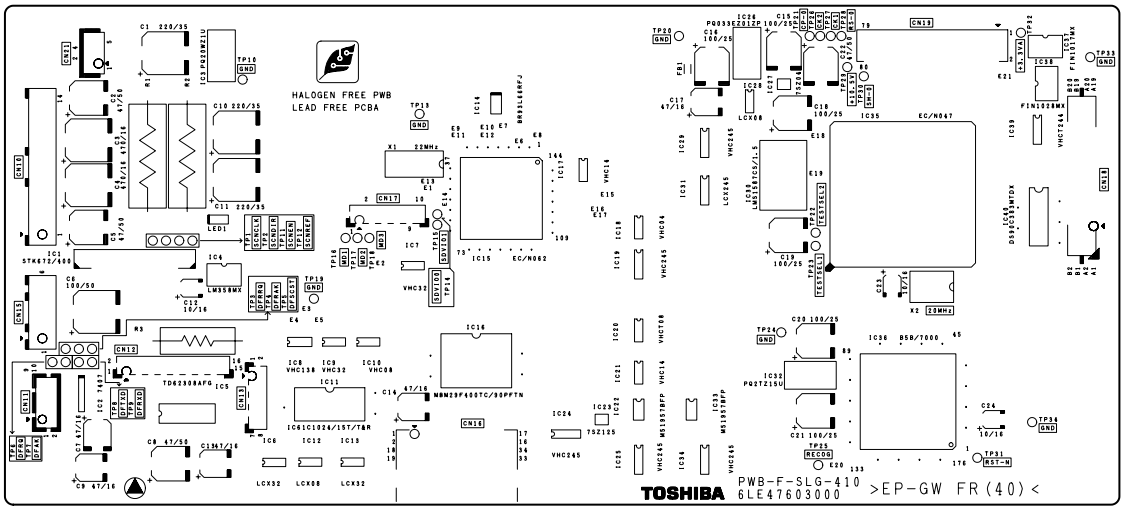


Fig. 19-3

4) PWA-F-CCD

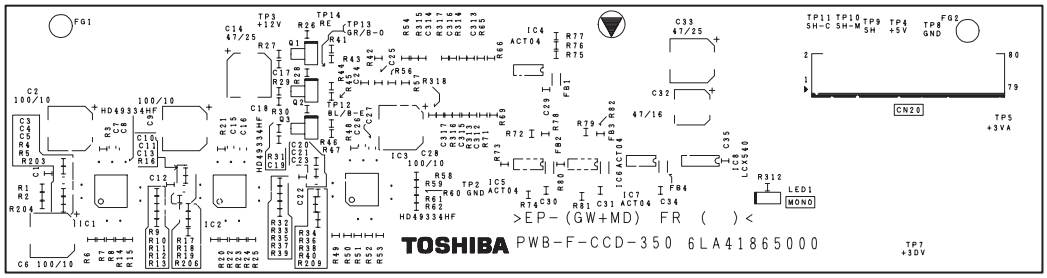


Fig. 19-4

5) PWA-F-DRV

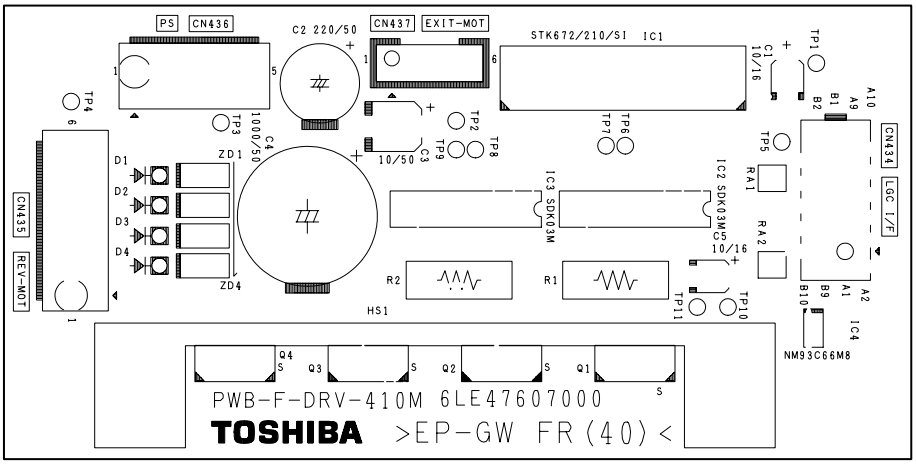


Fig. 19-5

19

6) PWA-F-LDR

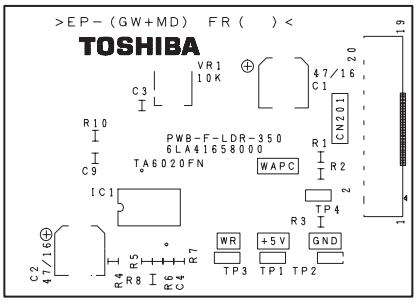


Fig. 19-6

7) PWA-F-SNS

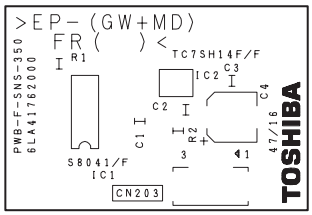


Fig. 19-7

8) PWA-F-ADU

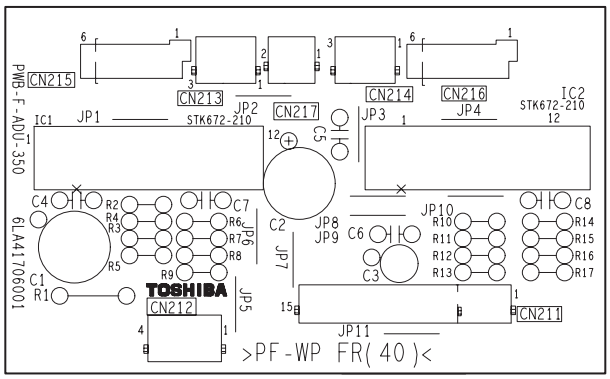


Fig. 19-8

9) PWA-F-DSP

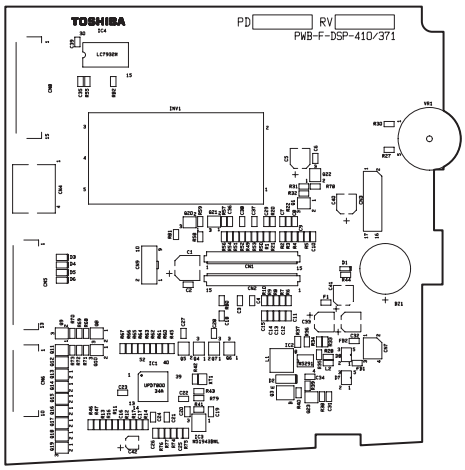


Fig. 19-9

10)PWA-F-KEY

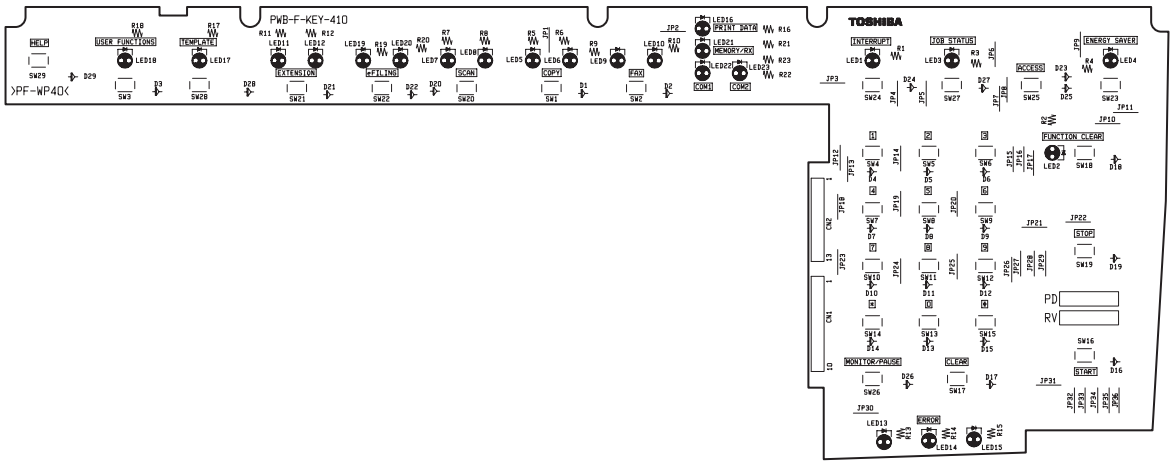


Fig. 19-10

11)PWA-F-FIL

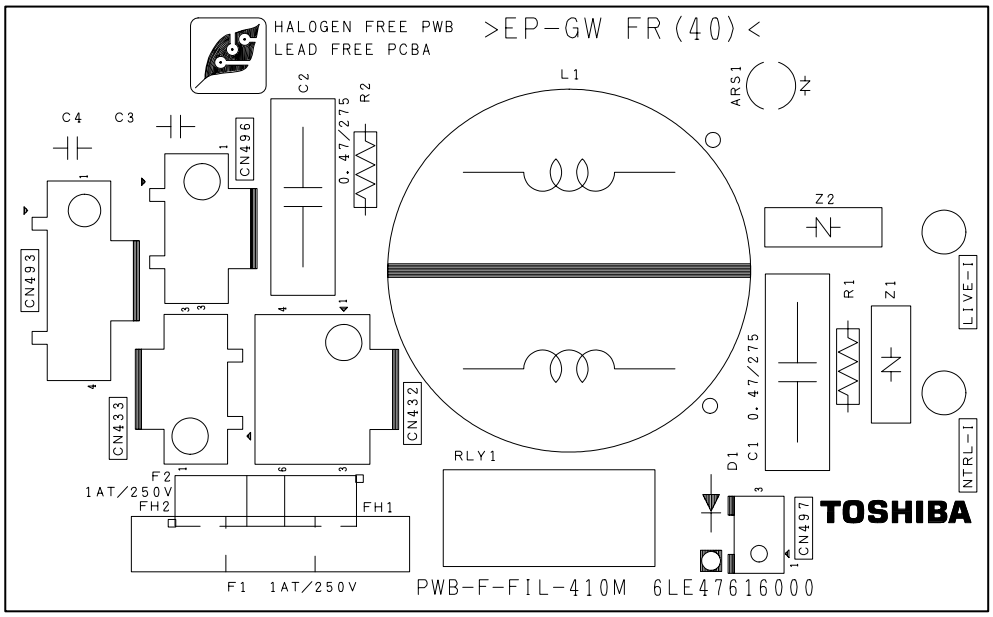


Fig. 19-11