TOSHIBA

SERVICE MANUAL

DIGITAL PLAIN PAPER COPIER

DP1600/2000/2500



File No. 31100011

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TOSHIBA TEC CORPORATION

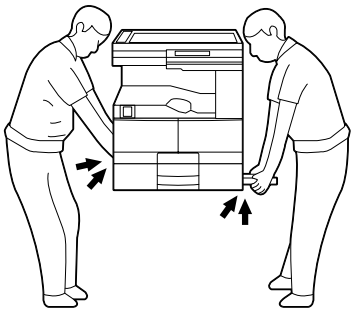
GENERAL PRECAUTIONS REGARDING THE INSTALLATION AND SERVICE FOR DP1600/2000/2500 SERIES

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

1. Transportation

- When transporting/installing the copier, employ two persons and be sure to use the positions as indicated below.
  The copier is fairly heavy and weighs approximately 50 kg (110 lb), therefore pay full attention when handling it.

4 portions



2. Installation

- Be sure to use a dedicated outlet with AC 115 or 120V/15A (220V, 230V, 240V/10A) or more for its power source.
- The copier must be grounded for safety.
  Never ground it to a gas pipe or a water pipe.
- Select a suitable place for installation.
  Avoid excessive heat, high humidity, dust, vibration and direct sunlight.
- Also provide proper ventilation as the copier 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") in the rear.
- After having installed the copier, be sure to push the carrying handles into the copier.

3. Service of Machines

- Basically, be sure to turn the main switch off and unplug the power cord during service.
- Be sure not to touch high-temperature sections such as the exposure lamp, the fuser unit, the damp heater and their periphery.
- Be sure not to touch high-voltage sections such as the chargers and the high-voltage transformer.
- Be sure not to touch rotating/operating sections such as gears, belts, pulleys, fans, etc.
- When servicing the machines with the main switch turned on, be sure not to touch live sections and rotating/operating sections. Avoid exposure to laser radiation.
- Use suitable measuring instruments and tools.

- Avoid exposure to laser radiation during servicing.
  - Avoid direct exposure to beam.
  - Do not insert tools, parts, etc. that are reflective into the path of the laser beam.
  - Remove all watches, rings, bracelets, etc. that are reflective.

4. Main Service Parts for Safety

- The breaker, door switch, fuse, thermostat, thermofuse, thermistor, etc. are particularly important for safety. Be sure to handle/install them properly.

5. Cautionary Labels

- During servicing, be sure to check the rating plate and the cautionary labels such as “Unplug the power cord during service”, “Hot area”, “Laser warning label” etc. to see if there is any dirt on their surface and whether they are properly stuck to the copier.

6. Disposition of Consumable Parts/Packing Materials

- Regarding the recovery and disposal of the copier, supplies, consumable parts and packing materials, it is recommended to follow the relevant local regulations or rules.

7. When parts are disassembled, reassembly is basically the reverse of disassembly unless otherwise noted in this manual or other related documents. Be careful not to reassemble small parts such as screws, washers, pins, E-rings, toothed washers in the wrong places.

8. Basically, the machine should not be operated with any parts removed or disassembled.

9. Precautions Against Static Electricity

- The PC board must be stored in an anti-electrostatic bag and handled carefully using a wristband, because the ICs on it may become damaged due to static electricity.

Caution: Before using the wrist band, pull out the power cord plug of the copier and make sure that there is no uninsulated charged objects in the vicinity.

Caution:	Dispose of used batteries and RAM-ICs including lithium batteries according to the manufacturer's instructions.
Attention:	Se débarrasser de batteries et RAM-ICs usés y compris les batteries en lithium selon les instructions du fabricant.
Vorsicht:	Entsorgung des gebrauchten Batterien und RAM-ICs (inklusive der Lithium-Batterie) nach Angaben des Herstellers.

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1. SPECIFICATIONS • ACCESSORIES • OPTIONS • SUPPLIES

1.1 Specifications

- Copy process ..... Indirect electrophotographic process (dry)
- Type ..... Desktop type (console type when the paper feed pedestal and Large capacity feeder are installed)
- Original table ..... Fixed table (the left rear corner used for standard original placement)
- Acceptable originals ..... Type: sheet, book, and 3-dimensional object.
  However, the automatic document feeder (option) only accepts sheets of paper (Multi-sheet: 50 - 105 g/m^2, or 13 - 29 lb/Single-sheet: 105 - 127 g/m^2, or 29 - 34 lb.), excluding carbon paper, pasted sheets and stapled sheets.
  Max size: A3/LD

- Copy speed

DP1600 series (Copies/min.)

Paper supply / Paper size	Upper cassette	PFU	PFP		LCF	Bypass feeding (SFB)	
			Upper cassette	Lower cassette (with CM)		No paper size designated	Paper size designated
A4, LT	16	16	16	-	-	9	16
A4-R	12	12	12	-	-	9	12
LT-R	13	13	13	-	-	9	13
B4	11	11	11	-	-	9	11
LG	11	11	11	-	-	9	11
A3, LD	9	9	9	-	-	9	9

DP2000 series (Copies/min.)

Paper supply / Paper size	Upper cassette	PFU	PFP		LCF	Bypass feeding (SFB)	
			Upper cassette	Lower cassette (with CM)		No paper size designated	Paper size designated
A4, LT	20	20	20	20	20	12	20
A4-R	16	16	16	16	-	12	16
LT-R	16	16	16	16	-	12	16
B4	14	14	14	14	-	12	14
LG	14	14	14	14	-	12	14
A3, LD	12	12	12	12	-	12	12

DP2500 series (Copies/min.)

Paper supply / Paper size	Upper cassette	PFU	PFP		LCF	Bypass feeding (SFB)	
			Upper cassette	Lower cassette (with CM)		No paper size designated	Paper size designated
A4, LT	24.6	24.6	24.6	24.6	24.6	14	24.6
A4-R	19	19	19	19	-	14	19
LT-R	20	20	20	20	-	14	20
B4	16	16	16	16	-	14	16
LG	16	16	16	16	-	14	16
A3, LD	14	14	14	14	-	14	14

* "-" shows "Cannot be used".
* The copy speeds in the above table are available when originals are manually placed for single-side, multiple copying.

• System copy speed (Copies/min.)

Copy mode		DP1600 series	DP2000 series	DP2500 series
Single-sided originals	1 set	1	15	18
↓	3 sets	14	18	21
Single-sided copies (Non sort)	5 sets	15	19	21
Single-sided originals	1 set	4	5	5
↓	3 sets	6	7	8
Two-sided copies (Sort)	5 sets	6	8	8
Two-sided originals	1 set	5	7	7
↓	3 sets	10	12	14
Single-sided copies (Sort)	5 sets	11	14	17
Two-sided originals	1 set	4	5	5
↓	3 sets	6	7	8
Two-sided copies (Sort)	5 sets	6	8	9

* Copy speeds include the first copy time.
They are available when the copy modes in the above table are selected and 10 LT-size originals are set in the automatic document feeder.

• Copy paper

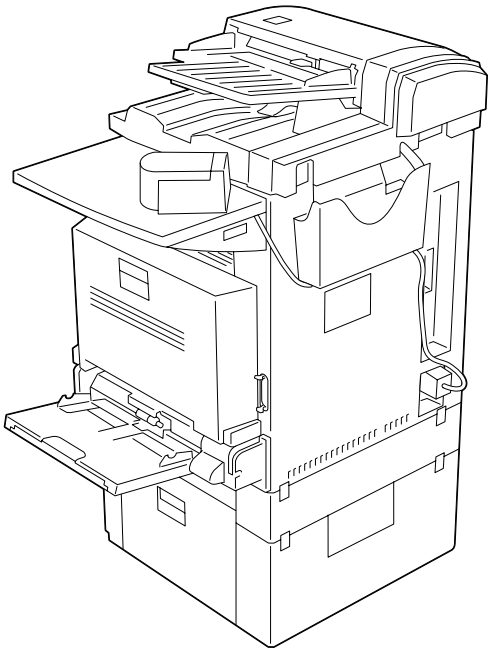
	Cassette	Duplexing	Bypass copy	Remarks
Size	A3 - A5-R, FOLIO LD - ST-R, COM		A3 - A5-R, FOLIO LD - ST-R, COM	
Weight	64 - 80 g/m^2 17 - 21 lbs		Continuous copy: 64 - 80 g/m^2, 17 - 21 lbs Single copy: 80 - 163 g/m^2, 21 - 43 lbs	
Special paper	—	—	Recommended OHP film/Thick paper	

- First copy time ..... DP1600 series: Less than 7.9 seconds (A4/LT, the Upper cassette, 100%, original placed manually)
  DP2000 series: Less than 7.0 seconds (A4/LT, the Upper cassette, 100%, original placed manually)
  DP2500 series: Less than 7.0 seconds (A4/LT, the Upper cassette, 100%, original placed manually)
- Warming-up time ..... DP1600 series: Less than 60 seconds
  DP2000 series: Less than 75 seconds
  DP2500 series: Less than 75 seconds
- Multiple copying ..... Up to 999 copies; entry by numeric keys
- Reproduction ratio ..... Actual ratio: 100%
  Zooming: 50 - 200% in increments of 1%
  25 - 400% in increments of 1%
  (for DP2000/2500 series; with original cover)
- Resolution/Gradation ..... Read: 600 dpi x 600 dpi
  Copy: 600 dpi x 600 dpi
  Printer: 1200 dpi x 600 dpi
  Fax: 16 dot/mm x 15.4 dot/mm (406 dpi x 392 dpi)
- Paper feeding ..... Automatic feeding: Copier's cassette 1 piece standard
  DP1600 series: Expandable up to 3 pieces by installing optional cassettes.
  DP2000/2500 series: Expandable up to 4 pieces by installing optional cassettes.
  PFU-optional (Stack height 60.5 mm, Equivalent to 550 sheets; 64 to 80 g/m^2 (17 to 21 lb.))
  PFP-optional (Stack height 60.5 mm, Equivalent to 550 sheets; 64 to 80 g/m^2 (17 to 21 lb.))
  LCF-optional (Stack height 165 mm, Equivalent to 1250 x 2 sheets; 64 to 80 g/m^2 (17 to 21 lb.))
  Bypass feeding (Stack height 16 mm, Equivalent to 100 sheets; 64 to 80 g/m^2 (17 to 21 lb.))
- Capacity of originals of automatic document feeder ... A4, A4-R, B5, B5-R, A5-R, LT, LT-R, ST-R: 50 sheets (with ADF)
  B4, Folio, LG, Comp, A3, LD: 50 sheets (with ADF)
  A4, A4-R, B5, B5-R, A5-R, LT, LT-R, ST-R: 100 sheets (with RADF)
  B4, Folio, LG, Comp, A3, LD: 100 sheets (with RADF)
- Toner supplying ..... Automatic toner sensor detection
- Density control ..... Automatic density mode and manual density mode selectable in 7 steps

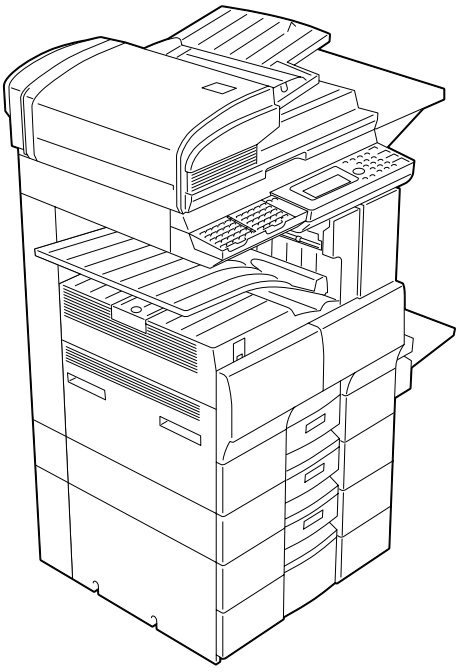
- Weight ..... Standard: 50 Kg (110 lb.) (with Process unit/Toner cartridge)
  Full system: 92 Kg (203 lb.) (DP1600 series)/
  124 Kg (273 lb.) (DP2000/2500 series)
- Power requirements 115VAC, 50Hz/60Hz
  120VAC, 50Hz/60Hz
  127VAC, 50Hz/60Hz
  220-240VAC, 50Hz/60Hz
- Power consumption ..... 1.4 KW or less
- Dimensions: ..... (W) x (D) x (H) mm

	DP1600 series	DP2000/2500 series
Standard	530 x 554 x 600 mm	530 x 554 x 600 mm
Standard + Original cover	530 x 554 x 643 mm	530 x 554 x 643 mm
Standard + ADF	530 x 554 x 731 mm	530 x 554 x 731 mm
Standard + RADF	545 x 599 x 772 mm	545 x 599 x 772 mm
Standard + ADU + RADF	607 x 599 x 772 mm	607 x 599 x 772 mm
Standard + Original cover + PFU	530 x 554 x 757 mm	530 x 554 x 757 mm
Standard + Original cover + PFU + PFP	530 x 554 x 1039 mm	530 x 554 x 1039 mm
Standard + Original cover + JSP	604 x 554 x 643 mm	604 x 554 x 643 mm
Standard + Original cover + SFB	801 x 554 x 643 mm	801 x 554 x 643 mm
Standard + Original cover + OCT	604 x 554 x 643 mm	604 x 554 x 643 mm
Standard + Original cover + Stapler	787 x 554 x 676 mm	787 x 554 x 676 mm
Standard + Original cover + Finisher	-----	957 x 554 x 643 mm

DP1600 series

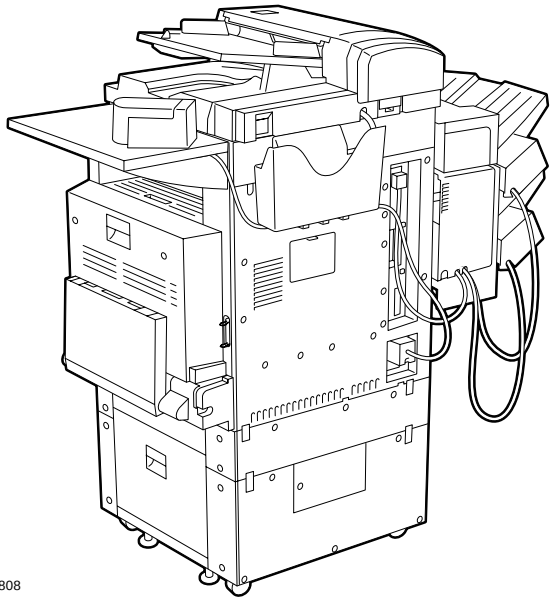


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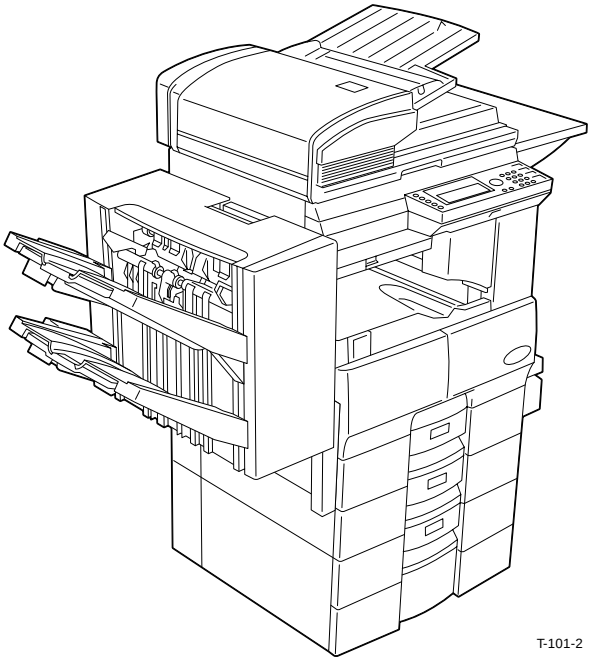


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DP2000/2500 series



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1.2 Accessories

Setup instructions	1pc.
Operator's manual	1pc.
Setup report	1pc. (for NAD and MJD)
Warranty sheet	1pc. (for NAD)
CS card	1pc. (for MJD)
Process unit	1pc.
Toner cartridge	1pc.
Operator's manual pocket	1pc.
Detouchable power cord	1pc.

* Machine version

NAD: North America

MJD: Europe

AUD: Australia

ASD: Asia

SAD: Saudi Arabia

TWD: Taiwan

CND: China

1.3 Options

Original cover	KA-1600PC
Paper feed pedestal-1 (PFP)	KD-1009, KD-1009-N
Automatic duplexing unit-1(ADU)	MD-0101, MD-0101-N
Automatic document feeder (ADF)	MR-2012, MR-2012N
Reverse automatic document feeder-1 (RADF)	MR-3011
Paper feed unit (PFU)	MY-1015, MY-1015-N
Cassette module (CM)	MY-1017, MY-1017-N (for DP2000/2500 series)
Large capacity feeder (LCF)	KD-1010 (for DP2000/2500 series)
Paper feed controller (PFC)	GH-1010, GH-1010N
Job separator (JSP)	MJ-5001, MJ-5001-N
Offset tray	MJ-5002, MJ-5002-N
Stack feed bypass (SFB)	MY-1016, MY-1016-N
Printer kit (Printer control)	GA-1030 (for DP1600 series)
Printer kit (Printer control)	GA-1031
Memory kit	GC-1050
Fax board kit	GD-1060-EU, GD-1060-NA, GD-1060-AU, GD1060-TW
Internet fax kit	GD-1070
NIC kit (Network interface card)	GF-1110
Staple with surface	KK-1600
Finisher	MJ-1011 (for DP2000/2500 series)

1.4 Replacement Units/Supplies

(1) Replacement units

Fuser unit	FUSER-1600-120, FUSER-1600-240 (for DP1600 series)
	FUSER-2500-120, FUSER-2500-240 (for DP2000/2500 series)
Transfer charger unit	MAIN-CH-1600

(2) Process unit

Process unit	PU-1600, PU-1600E, PU-1600D, PU-1600C

(3) Supplies

Toner cartridge	T-1600, T-1600E, T-1600D (for DP1600 series)
	T-2500, T-2500E, T-2500D (for DP2000/2500 series)

1.5 System List

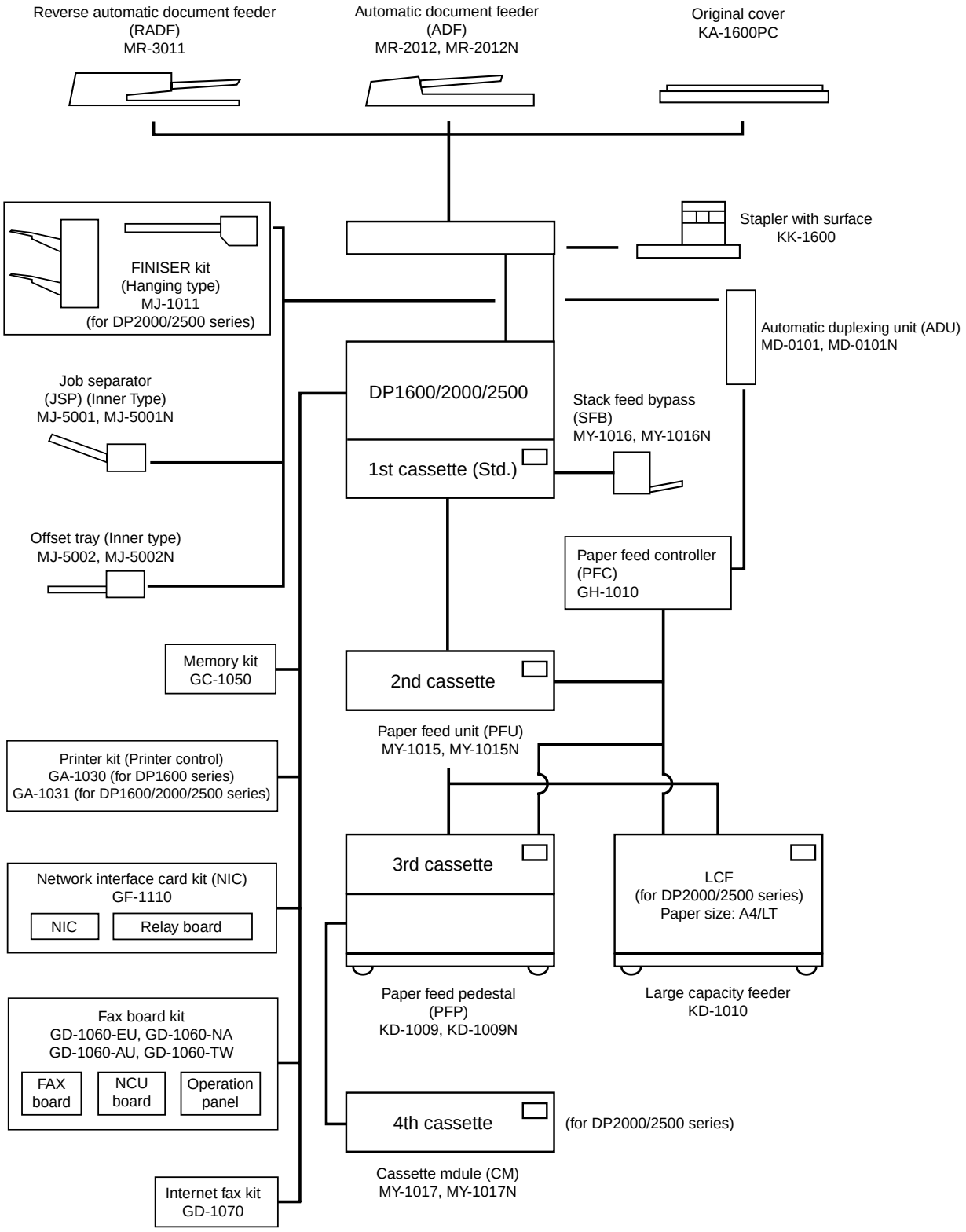


Fig. 1-5-1

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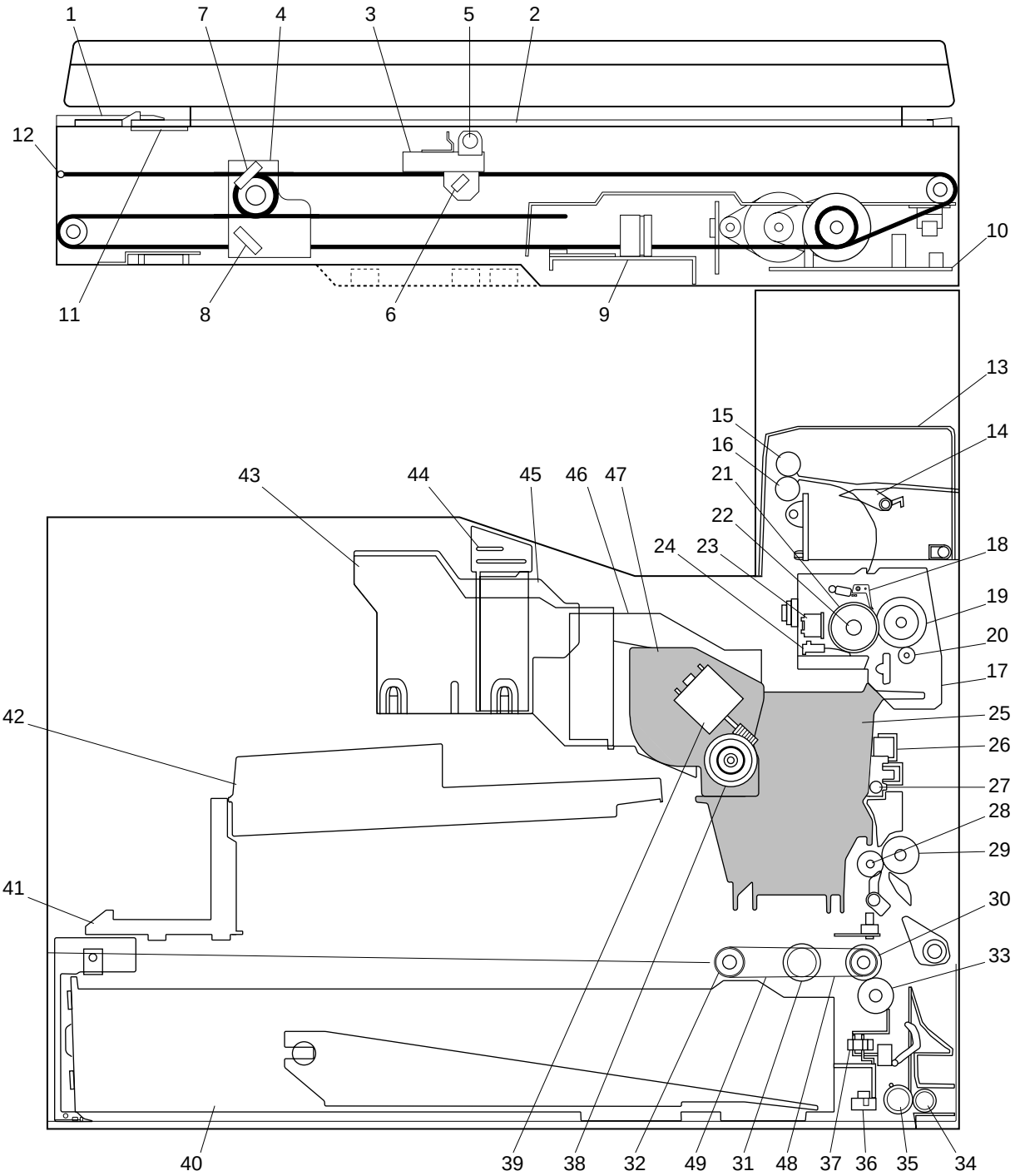
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2. OUTLINE OF THE MACHINE

2.1 Sectional View

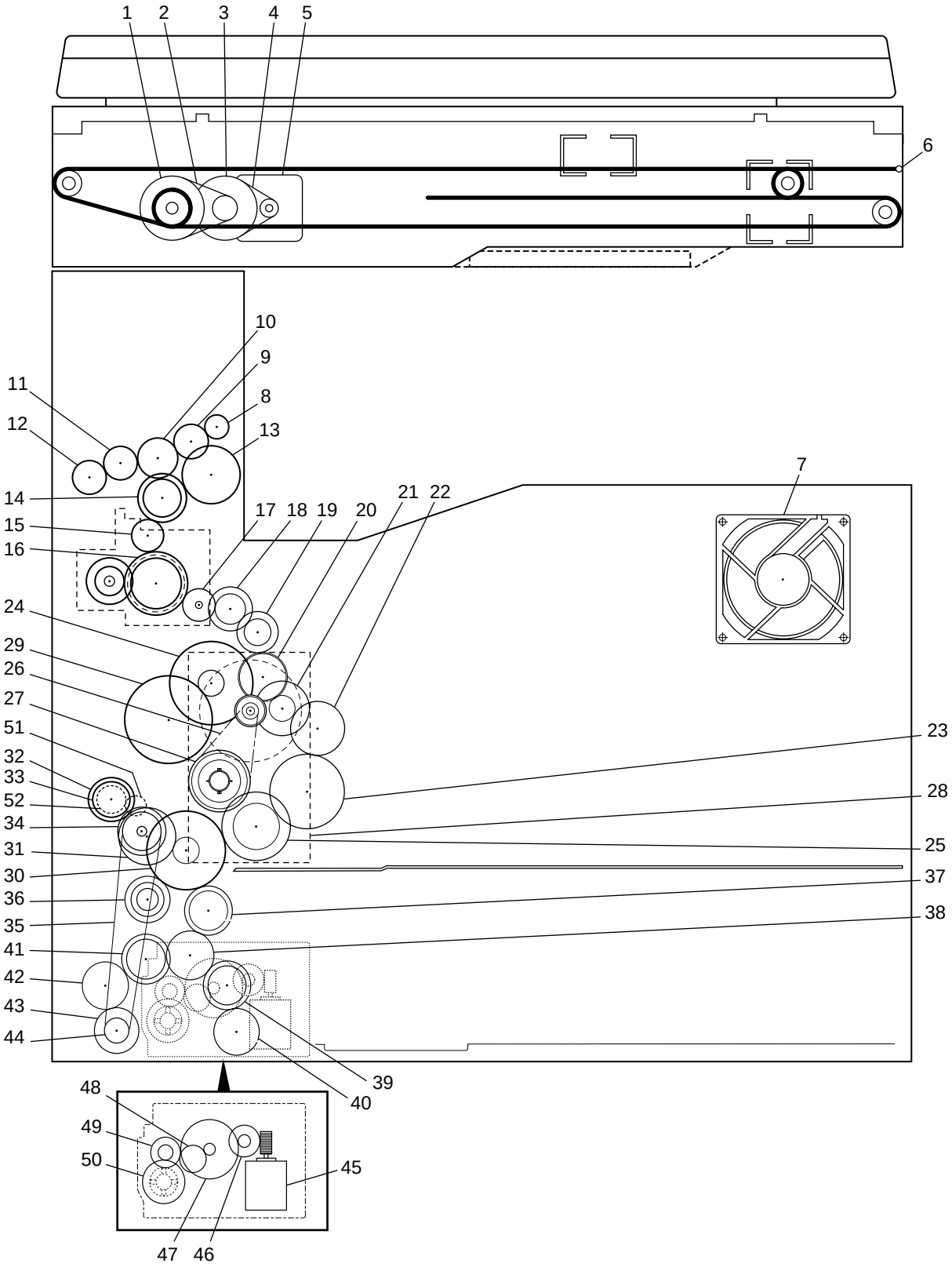
[A] Front view



1	ADF glass
2	Original glass
3	Carriage 1
4	Carriage 2
5	Exposure lamp
6	Reflecting mirror 1
7	Reflecting mirror 2
8	Reflecting mirror 3
9	CCD unit
10	Scanner control PWA
11	Shading sheet
12	Wire F
13	Exit cover
14	Scraper
15	Exit pinch roller
16	Exit roller
17	Fuser unit
18	Separation claw
19	Pressure roller
20	Cleaning roller
21	Heat roller
22	Heater lamp
23	Heater thermofuse
24	Heater thermistor 1/2
25	Process unit
26	Transfer charger
27	Transfer guide roller
28	Pinch roller
29	Registration roller
30	Feed roller
31	Pickup roller
32	Timing pulley
33	Separate roller
34	2nd pinch roller
35	2nd feed roller
36	Cassette slider
37	Cassette catch
38	Toner supply gear

39	Toner supply motor
40	Paper cassette (STD)
41	LSU stay
42	Laser scanner unit
43	Duct lower
44	Ozone filter cover/Ozone filter
45	Duct upper
46	Duct front
47	Toner cartridge
48	Timing belt 194
49	Timing belt 124

[B] Rear view

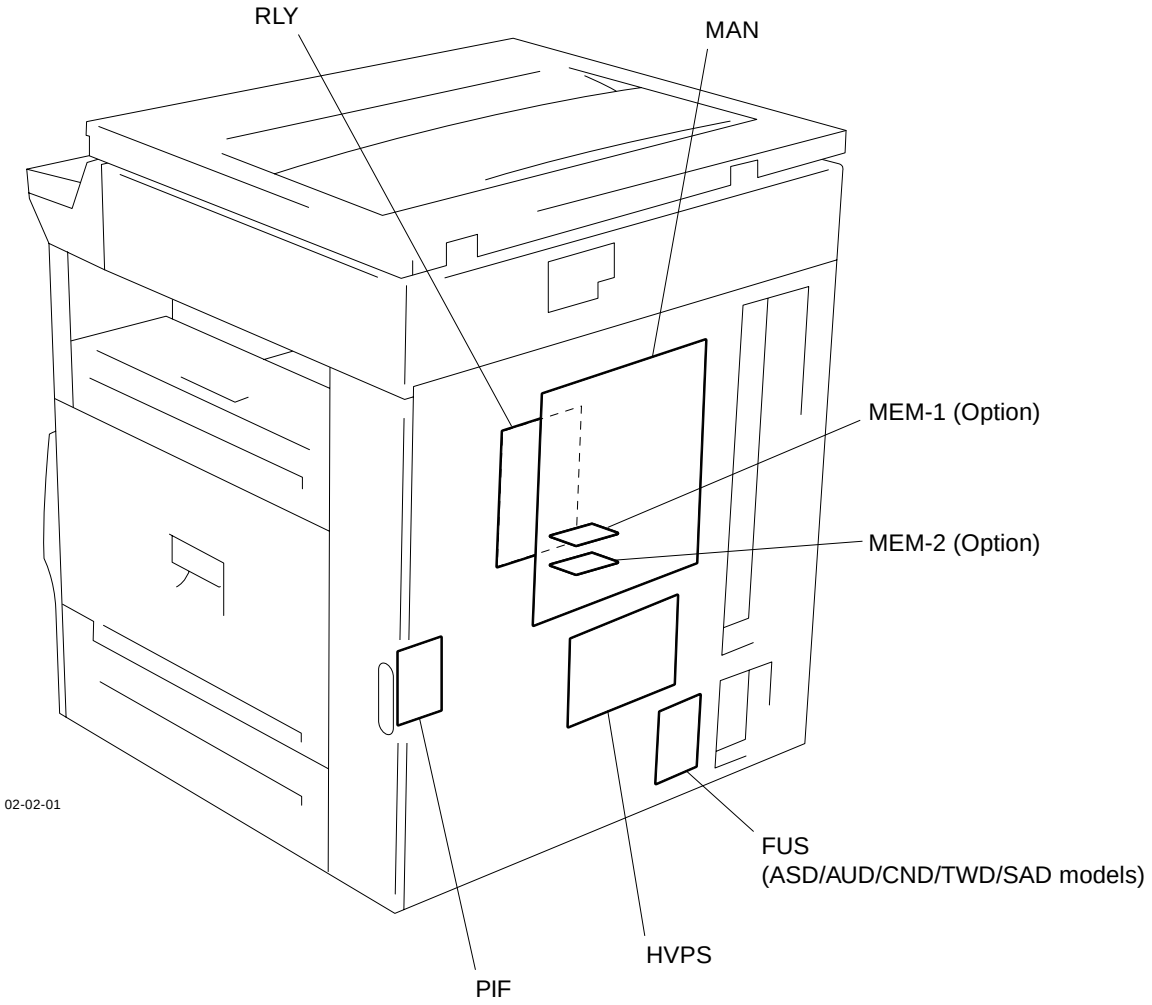

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1	Scanner drive gear
2	Timing belt 157
3	Scanner motor pulley
4	Timing belt 142
5	Scanner motor
6	Wire R
7	PS fan motor
8	Exit drive gear 1
9	Exit drive gear 2
10	Exit drive gear 3
11	Exit drive gear 4
12	Exit drive gear 6
13	Exit drive gear 5
14	Exit drive gear 7
15	HR drive gear 1
16	HR drive gear 2
17	HR drive gear 3
18	Transmission gear 1
19	Transmission gear 2
20	Main drive gear 1
21	Main drive gear 2
22	Main drive gear 3
23	Main drive gear 4
24	Main drive gear 5
25	Main drive gear 6
26	Timing belt 176
27	Developer drive pulley
28	Main motor
29	Drum drive gear
30	Transmission gear 3
31	Registration drive gear
32	Registration roller clutch
33	Cassette feed gear 1
34	Cassette feed gear 2
35	Timing belt 309
36	Pickup clutch
37	Cassette feed gear 3
38	Cassette feed gear 4
39	Cassette feed gear 5

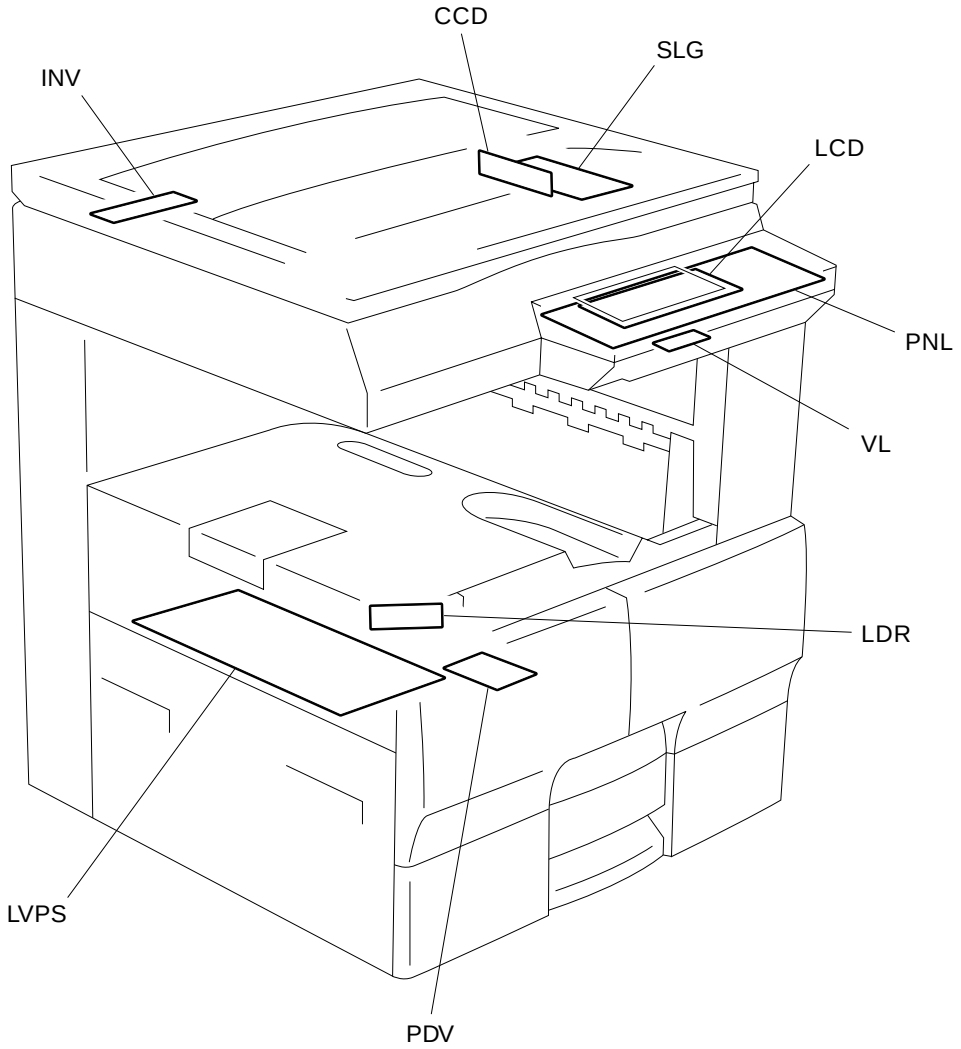
40	Cassette feed gear 6
41	Cassette feed gear 7
42	Cassette feed gear 8
43	2nd feed clutch
44	Clutch pulley
45	Tray-up motor
46	Tray-up gear 1
47	Tray-up gear 2
48	Tray-up gear 3
49	Tray-up gear 4
50	Tray-up gear 5
51	Pinch roller gear (DP2000/2500 series)
52	Registration wheel

2.2 Location of Electrical Parts

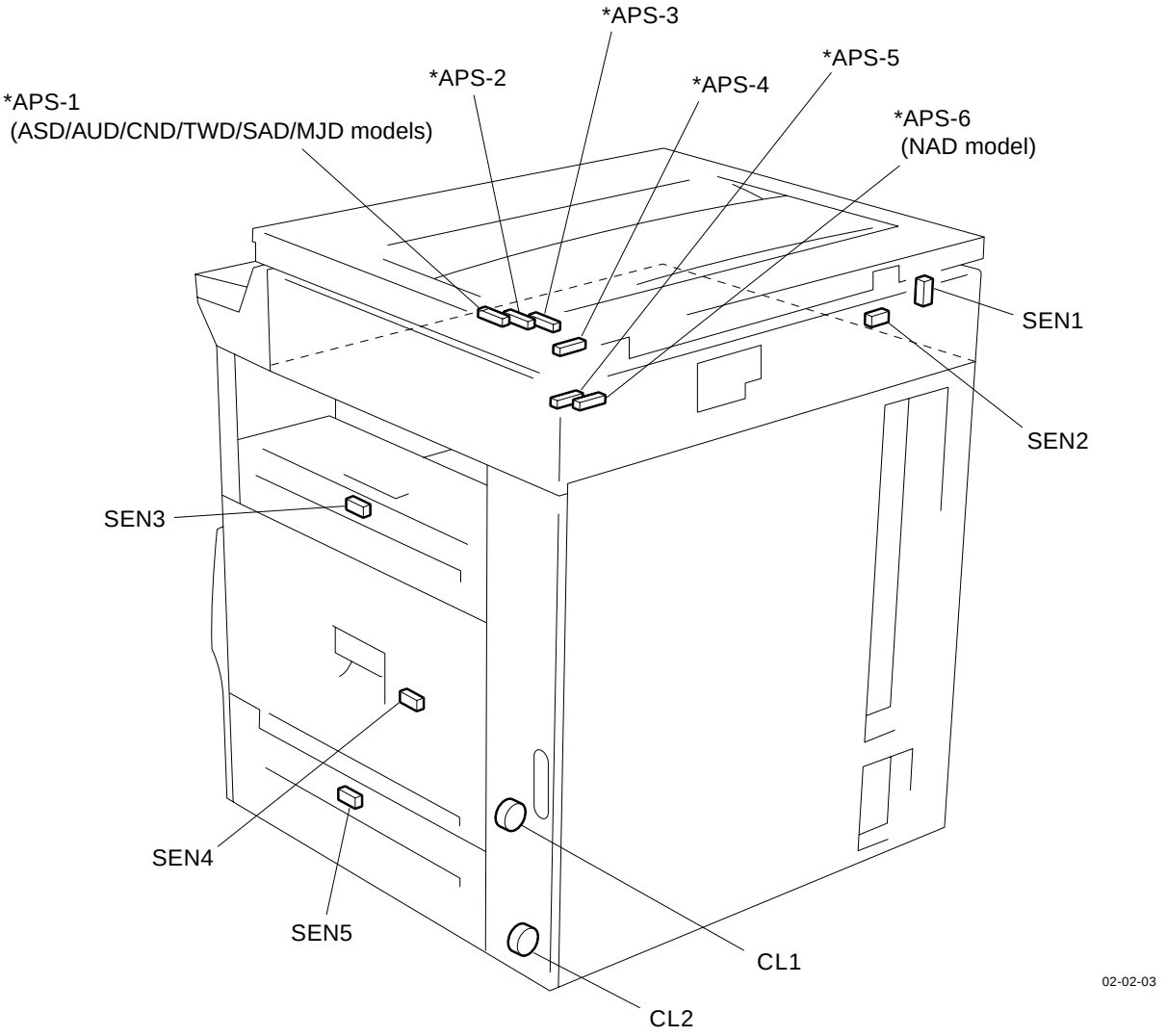
(A-1) Boards



(A-2) Boards

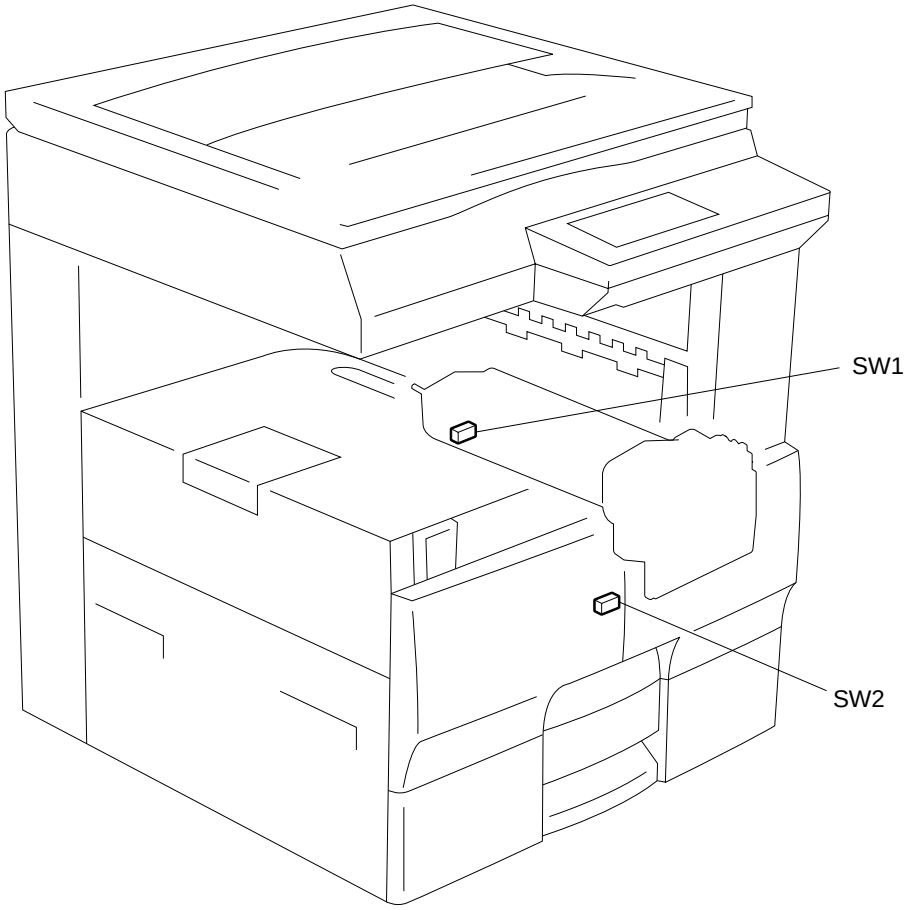


(B-1) Sensors, switches and clutches



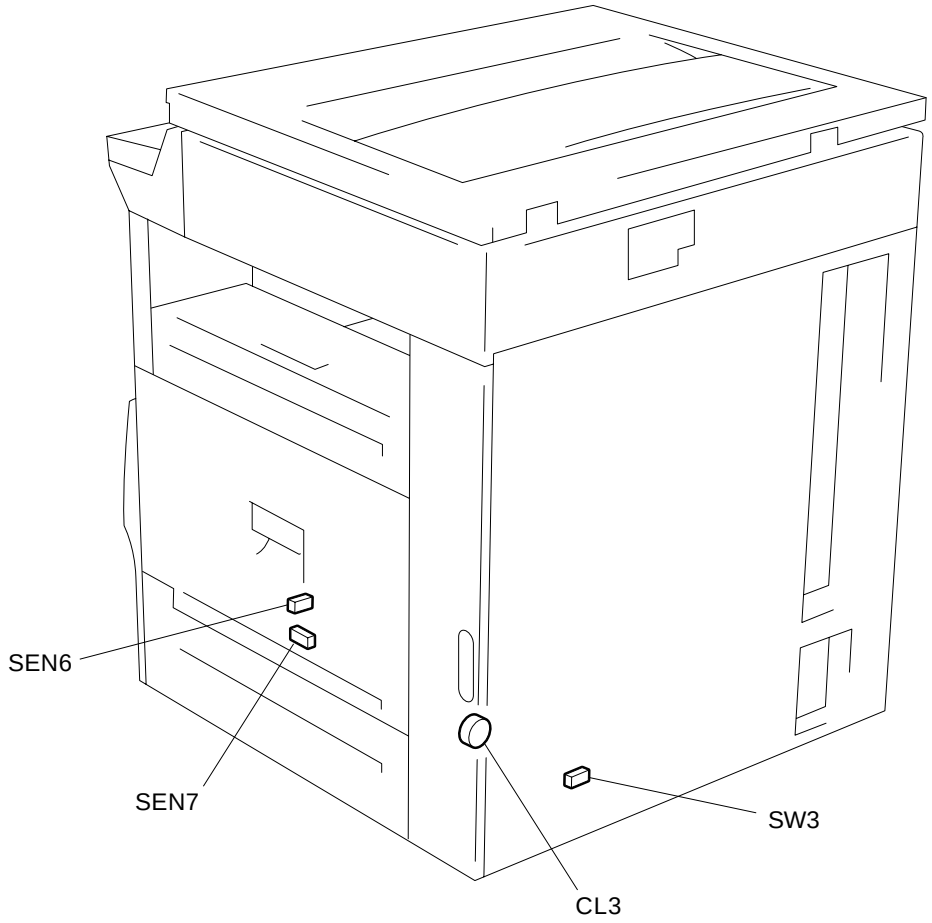
* : DP2000/2500 series

(B-2) Switches



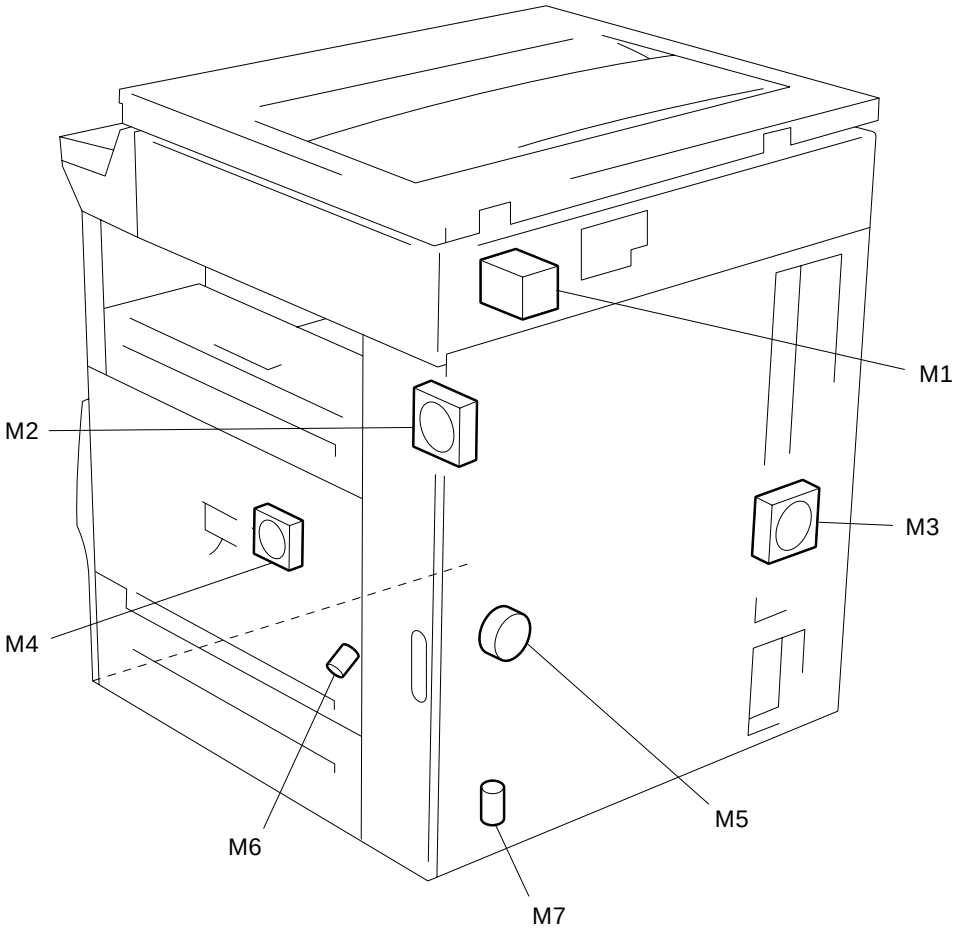
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(B-3) Sensors, switches and clutches



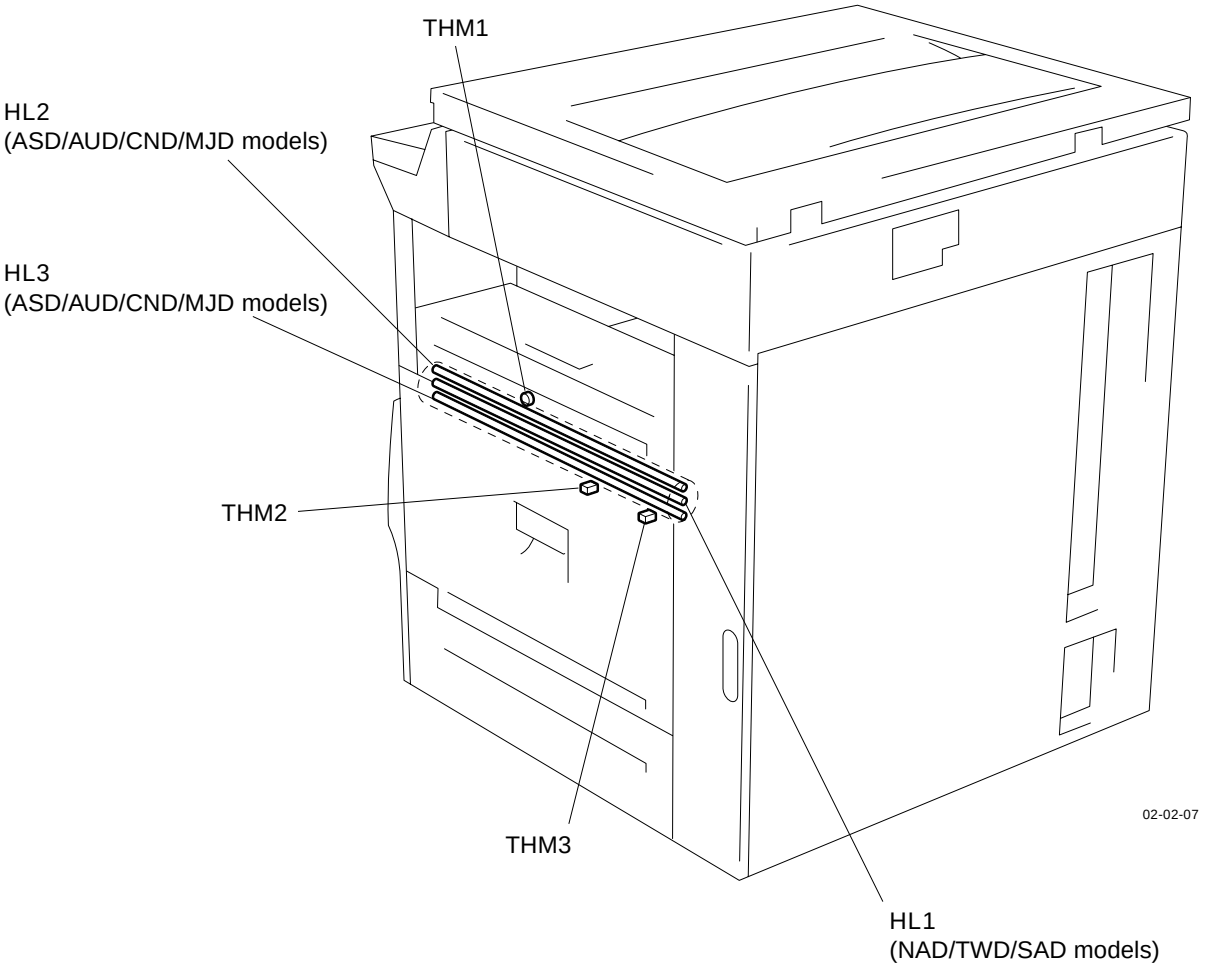
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(C-1) Motors

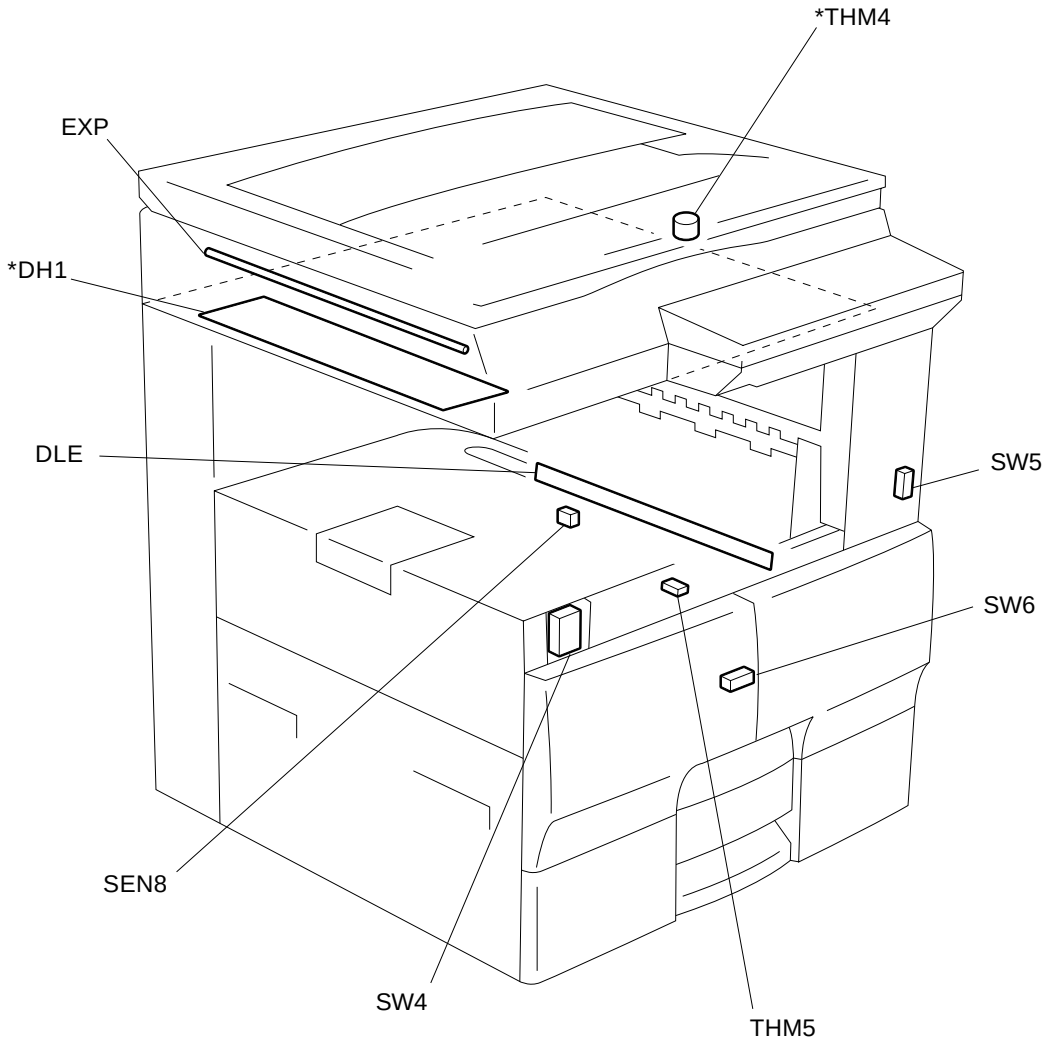


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(D-1) Thermofuse, thermistors and heaters



(D-2) Sensors, switches, thermofuse, thermistors, lamps and heaters



* : ASD/AUD/CND/TWD/SAD models

2.3 Symbols and Functions of Various Devices

(1) Boards

Symbol	Name	Function	Remarks
MAN	PWA-F-MAN Main PWA	PWA which controls the entire system.	(A-1)
RLY	PWA-F-RLY Relay PWA	PWA which relays signals between PWA and I/O.	(A-1)
PIF	PWA-F-PIF PC I/F PWA	PWA which locally connects the copier to a PC.	(A-1)
INV	INV-EXPO Inverter PWA	PWA which controls exposure when scanning a document.	(A-2)
CCD	PWA-F-CCD CCD PWA	PWA which controls the processing of CCD images.	(A-2)
SLG	PWA-F-SLG Scanner control PWA	PWA which controls the scanning optical system and ADF (MR-2012)/RADF (MR-3011) (Option).	(A-2)
LCD	LCD UNIT LCD PWA	LCD PWA	(A-2)
PNL	PWA-F-PNL-TO Operation panel PWA	Key switch PWA	(A-2)
VL	PWA-F-VR-TO LCD volume PWA	Variable resistor PWA for adjusting the LCD display darkness.	(A-2)
LDR	PWA-LDR Laser drive PWA	PWA which drives the laser.	(A-2)
PDV	PWA-PDV Polygonal motor drive PWA	PWA which drives the polygon motor.	(A-2)
MEM-1 MEM-2	PWA-F-MEM Optional memory PWA (GC-1050)	64 Mbyte expansion memory PWA. (Option)	(A-1)

(2) Sensors

Symbol	Name	Function	Remarks
APS-1 APS-2 APS-3 APS-4 APS-5	APS-1 APS-2 APS-3 APS-4 APS-5 APS (Automatic Paper Size detection) sensor	Detects the size of document. (DP2000/2500 series, ASD/AUD/CND/TWD/SAD/MJD models)	(B-1)
APS-2 APS-3 APS-4 APS-5 APS-6	APS-2 APS-3 APS-4 APS-5 APS-6 APS (Automatic Paper Size detection) sensor	Detects the size of document. (DP2000/2500 series, NAD model)	(B-1)
SEN1	HOME-SEN Home position sensor	Detects the first scanning position.	(B-1)
SEN2	ORCOV-SEN Original cover sensor	Detects the open/close state of the original cover.	(B-1)
SEN3	EXT-SEN Exit sensor	Detects the transport of paper at the exit section.	(B-1)
SEN4	FED-SEN Feed sensor	Detects the transport of paper at the developer.	(B-1)
SEN5	OCF-SEN 2nd feed sensor	Detects the transport of paper from the option cassette.	(B-1)
SEN6	PE-SEN Paper empty sensor	Detects the presence or absence of paper placed in the copier cassette.	(B-3)
SEN7	T-UP-SEN Tray-up sensor	Detects the lift-up of the tray.	(B-3)
SEN8	TNRE-SEN Toner empty sensor	Detects the toner density. (In Process unit)	(D-2)

(3) Switches

Symbol	Name	Function	Remarks
SW1	TC-SW Toner cartridge switch	Detects the presence of a toner cartridge.	(B-2)
SW2	FRCOV-SW Front cover switch	Detects the open/close state of the front cover.	(B-2)
SW3	CST-SW Paper cassette switch	Detects the open/close state of the copier cassette.	(B-3)
SW4	MAIN-SW Main switch	Power ON/OFF switch	(D-2)
SW5	SIIL-SW Interlock switch (Side cover)	Detects the open/close state of the side cover when removing a jam at the transfer section, etc. and cuts off the +24V power supply.	(D-2)
SW6	FRIL-SW Interlock switch (Front cover)	Detects the open/close state of the front cover when changing the toner cartridge, etc. and cuts off the +24V power supply.	(D-2)

(4) Motors

Symbol	Name	Function	Remarks
M1	SCN-MOT Scanner motor	Performs scanning for the optical system.	(C-1)
M2	PU-FAN Process unit FAN motor	Allows ozone to escape from the inside of the copier.	(C-1)
M3	POW-FAN Power supply unit FAN motor	Cools the inside of the copier.	(C-1)
M4	VCM-FAN Vacuum FAN motor	Sucks the developed paper from the drum.	(C-1)
M5	MD-MOT Main motor	Main drive motor to drive the entire system.	(C-1)
M6	TS-MOT Toner supply motor	Drives the auger in the toner cartridge and supplies toner to the process unit.	(C-1)
M7	T-UP-MOT Tray-up motor	Lifts up the tray of the copier cassette.	(C-1)

(5) Clutches

Symbol	Name	Function	Remarks
CL1	RGST-CLT Registration roller clutch	Transmits power to the registration roller.	(B-1)
CL2	OCF-CLT 2nd feed roller clutch	Transmits power to the 2nd feed roller of the option cassette.	(B-1)
CL3	PU-CLT Pickup roller clutch	Transmits power to the pickup roller and feed roller of the copier cassette.	(B-3)

(6) Thermofuse and thermistors

Symbol	Name	Function	Remarks
THM1	FUS-THM Heater thermofuse	Prevents abnormal overheat of the heater lamp.	(D-1)
THM2	HEA1-THM Heater thermistor 1	Detects the surface temperature of the heat roller.	(D-1)
THM3	HEA2-THM Heater thermistor 2	Detects the surface temperature of the heat roller end.	(D-1)
THM4	SCN-THM Scanner thermofuse	Keeps the scanner damp heater at a fixed temperature. (ASD/AUD/CND/TWD/SAD models)	(D-2)
THM5	DRM-THM Drum thermistor	Detects the surface temperature of the drum.	(D-2)

(7) Heaters and lamps

Symbol	Name	Function	Remarks
EXP	EXPO-LAMP Exposure lamp	A light source lamp for document scanning.	(D-2)
HL1	U900-HL Heater lamp U900	Fixes toner to the paper. (NAD/TWD/SAD models)	(D-1)
HL2	E400-HL Heater lamp E400	Fixes toner to the paper. (ASD/AUD/CND/MJD models)	(D-1)
HL3	E500-HL Heater lamp E500		(D-1)
DH1	SCN-DH-100 Scanner dump heater	Dehumidifies the inside of the scanner. (TWD model)	(D-2)
	SCN-DH-115 Scanner dump heater	Dehumidifies the inside of the scanner. (SAD model)	
	SCN-DH-230 Scanner dump heater	Dehumidifies the inside of the scanner. (ASD/AUD/CND models)	
DLE	PWA-F-DLE Discharge LED PWA	Removes residual charge on the drum surface. (In Process unit)	(D-2)

(8) Transformers

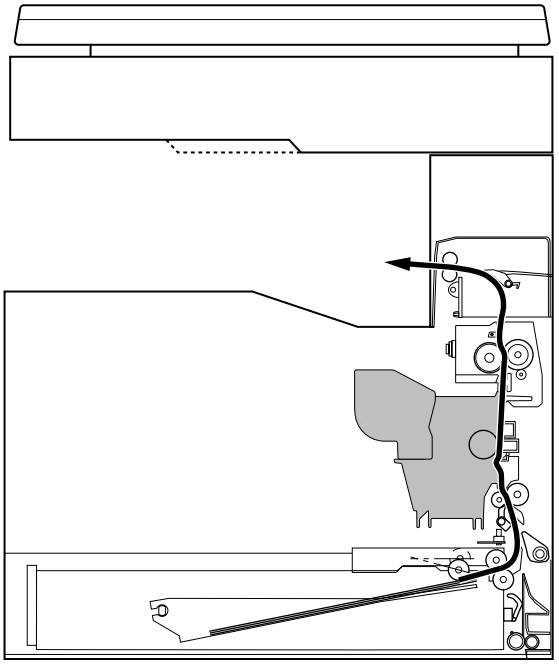
Symbol	Name	Function	Remarks
HVPS	PS-HVPS High voltage power supply unit	PWA which generates high voltage power.	(A-1)

(9) Others

Symbol	Name	Function	Remarks
LVPS	PS-LVPS-US Switching power supply unit	PWA which generates DC power. (NAD/TWD/SAD models)	(A-2)
	PS-LVPS-EU Switching power supply unit	PWA which generates DC power. (ASD/AUD/CND/MJD models)	(A-2)
FUS	PWA-F-FUS Fuser relay PWA	PWA which relays AC power to each damp heater. (ASD/AUD/CND/TWD/SAD models)	(A-1)

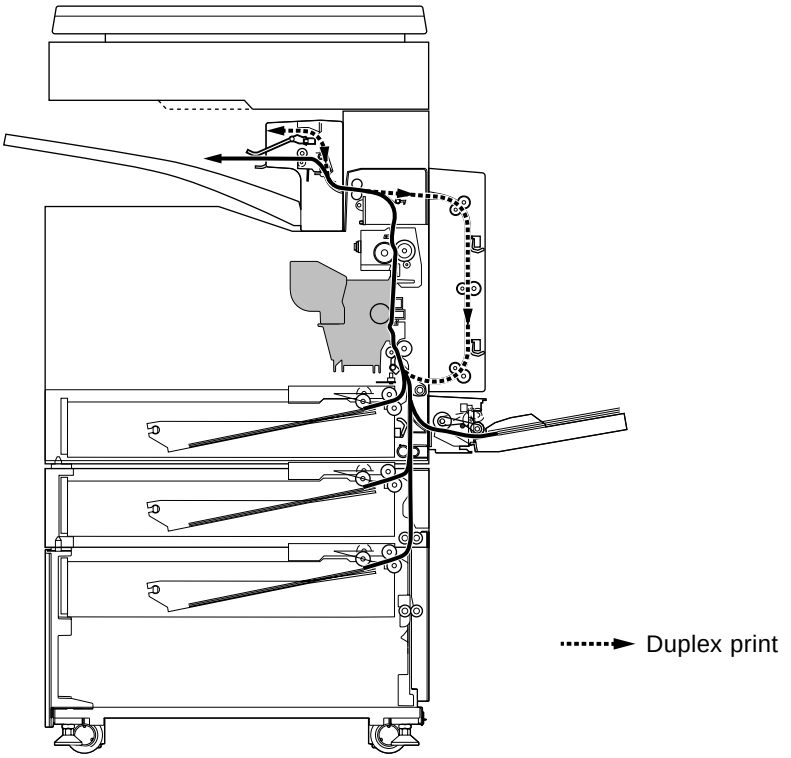
2.4 Copy Paper Path

2.4.1 Normal



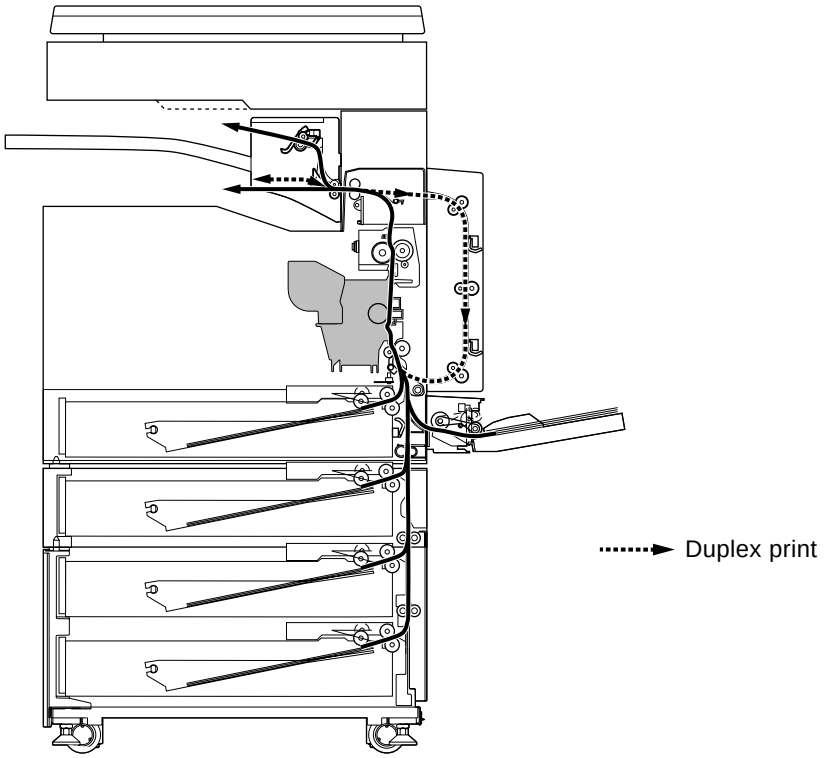
02-04-02

2.4.2 When the PFU, PFP, ADU, SFB and OCT are mounted



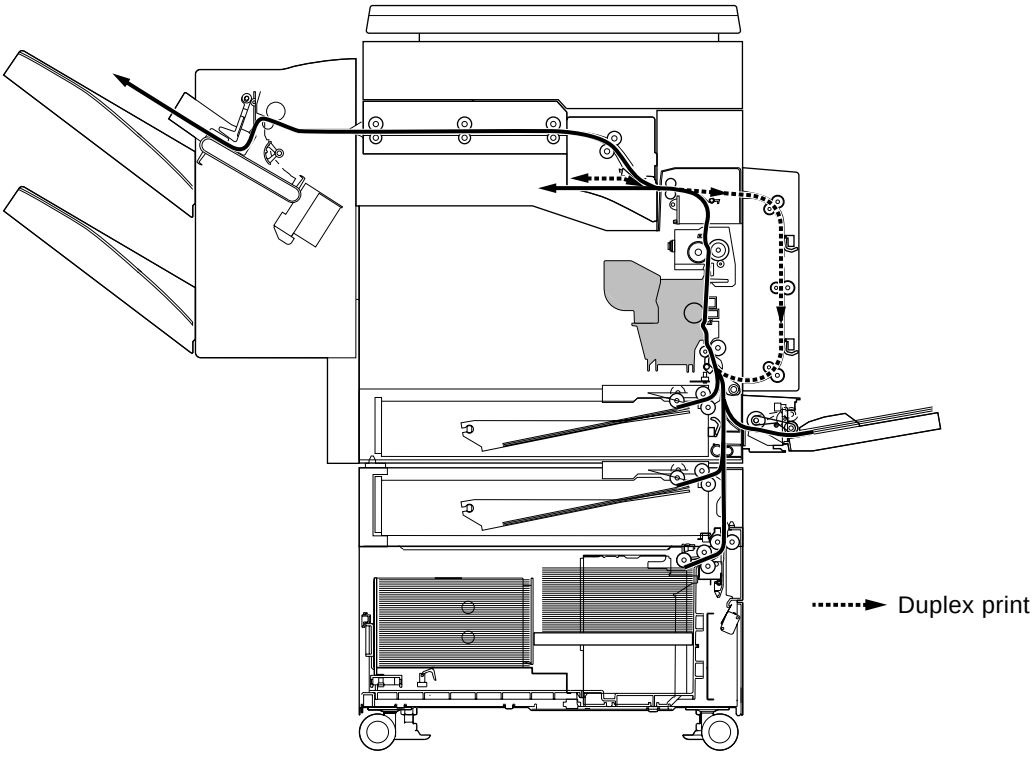
02-04-03

2.4.3 When the PFU, PFP, CM, ADU, SFB and JSP are mounted



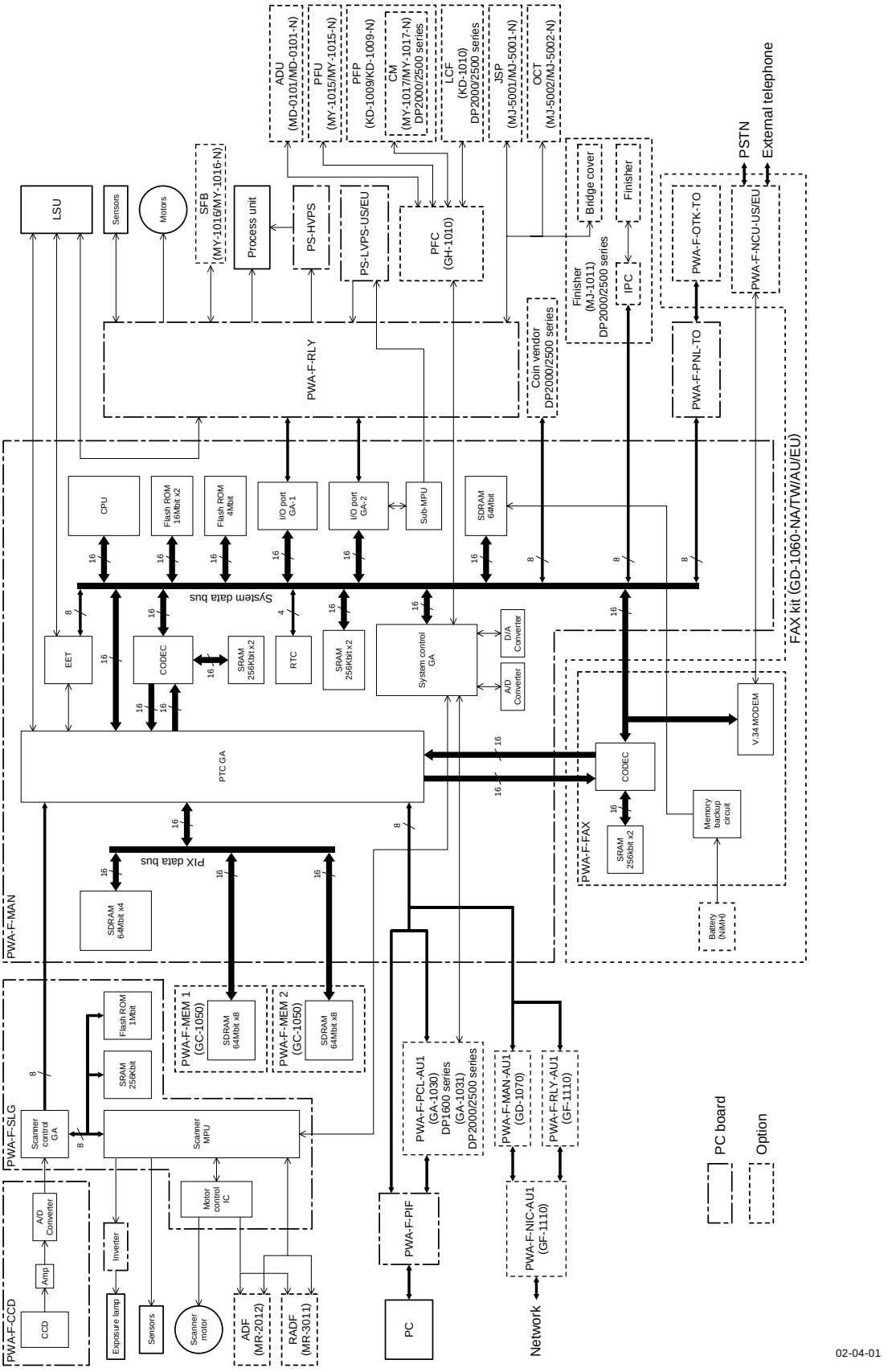
02-04-04

2.4.4 When the PFU, LCF, ADU, SFB and Finisher are mounted



02-04-05

2.5 System Block Diagrams



2.6 Removal and Reinstallation of Covers and PC Boards

2.6.1 Removal and reinstallation of covers

[A] Rear cover

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Remove 17 screws and detach rear cover.

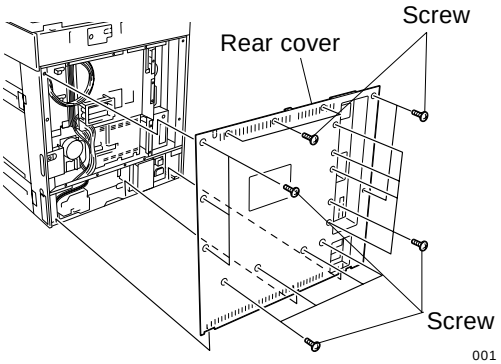


Fig. 2-6-1

[B] Top cover

1. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, detach it.
2. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
3. Detach the manual pocket.
4. Remove 3 screws, release hook, and detach top cover.

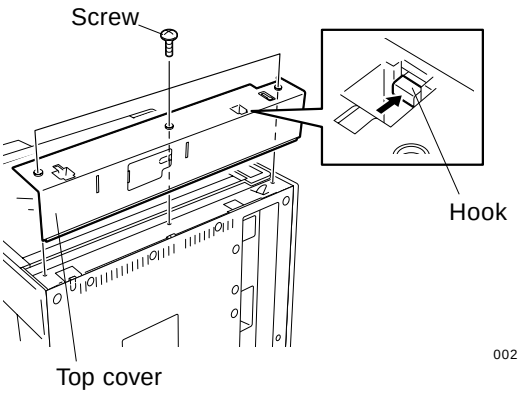


Fig. 2-6-2

[C] Scanner cover

1. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
2. Remove the cushion rubber at 3 places.

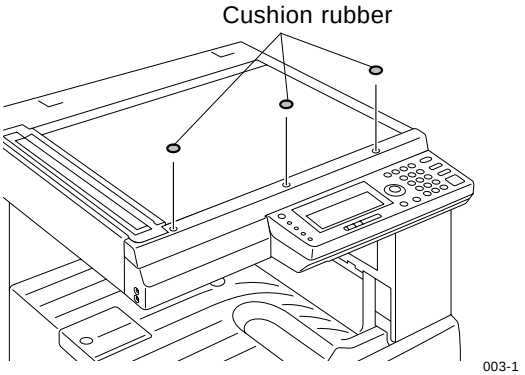


Fig. 2-6-3

3. Remove 3 screws and detach scanner cover.

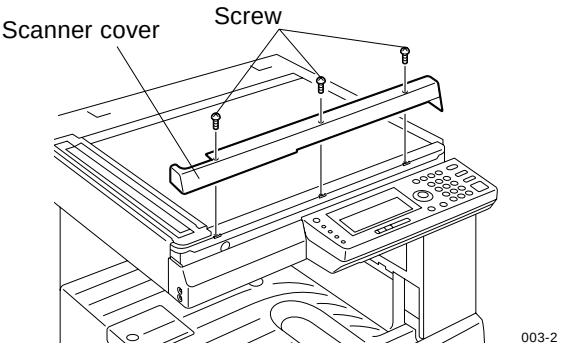


Fig. 2-6-4

[D] Top cover L

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate.
2. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, detach it.
3. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
4. Detach the manual pocket.
5. Detach top cover. (See Fig. 2-6-2)
6. Remove 2 screws, release 2 tabs, and detach top cover L by lifting in the direction of the arrow.

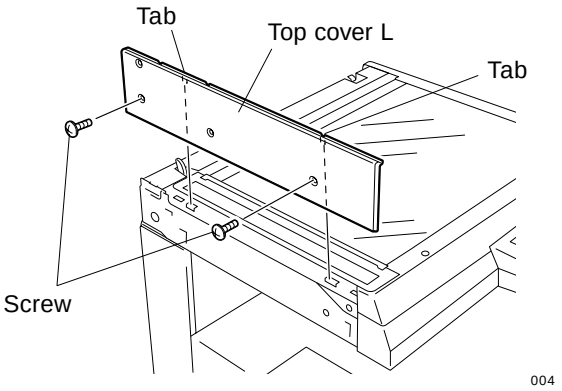


Fig. 2-6-5

[E] Top cover R

1. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, detach it.
2. If a STP (KK-1600) is attached to the copier, detach it.
3. Detach the manual pocket.
4. Detach top cover. (See Fig. 2-6-2)
5. Remove 3 screws, release 2 tabs, and detach top cover R by lifting in the direction of the arrow.

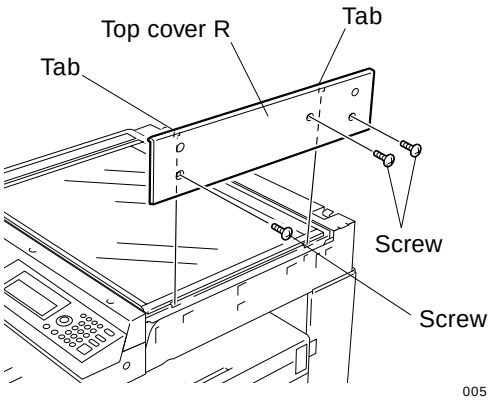


Fig. 2-6-6

[F] Control panel front cover

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate.
2. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
3. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
4. Remove one screw, release one tab, and detach control panel front cover.

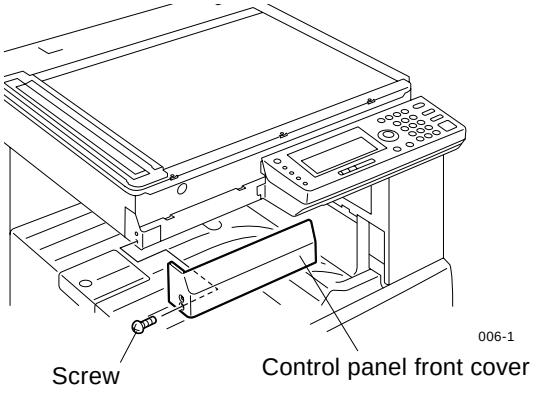


Fig. 2-6-7

[G] Control panel bottom cover

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate.
2. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
3. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
4. Detach control panel front cover.
   (See Fig. 2-6-7)
5. Remove 2 screws, release one tab, and detach control panel bottom cover.

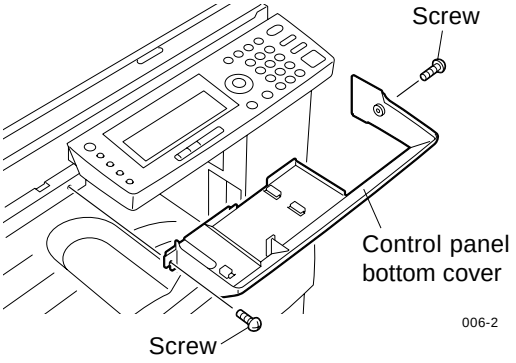


Fig. 2-6-8

[H] Control panel

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate.
2. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
3. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
4. Detach control panel front cover.
   (See Fig. 2-6-7)
5. Detach control panel bottom cover.
   (See Fig. 2-6-8)
6. Remove one screw and detach the ground wire.
7. Detach control panel harness.
8. Remove 2 screws at the lower part of control panel, release 2 hooks, and remove control panel.

Note: When attaching the control panel, secure it with the clamp to prevent the core from dropping.

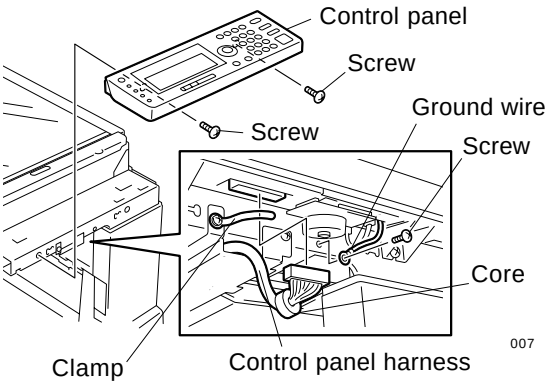


Fig. 2-6-9

[I] Ozone filter/ozone cover

1. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach the tray.
2. Lift ozone cover off while holding both sides.
3. Detach ozone filter.

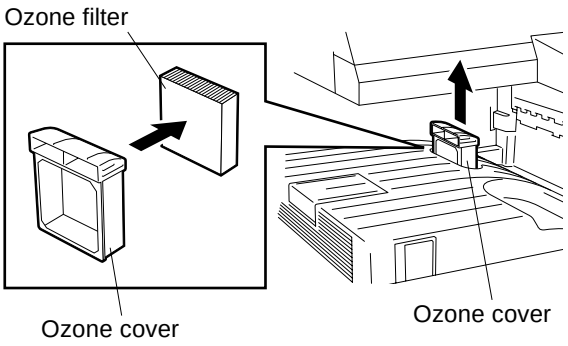


Fig. 2-6-10

[J] Paper tray cover

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. Detach the toner cartridge.
4. Detach ozone cover. (See Fig. 2-6-10)
5. Remove 3 screws, release 2 tabs, and detach power switch cover.
6. Detach paper tray cover.

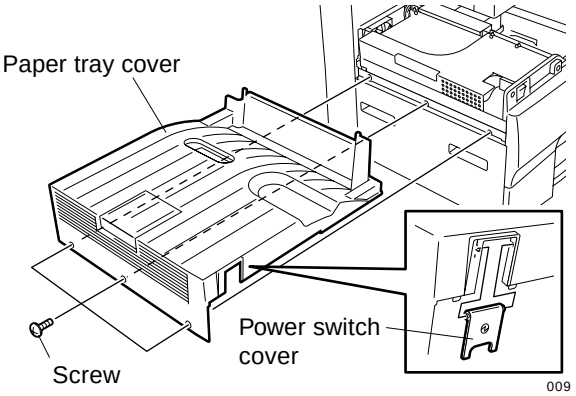


Fig. 2-6-11

[K] Paper cassette

1. Draw out paper cassette and lift it off in the direction of the arrow.

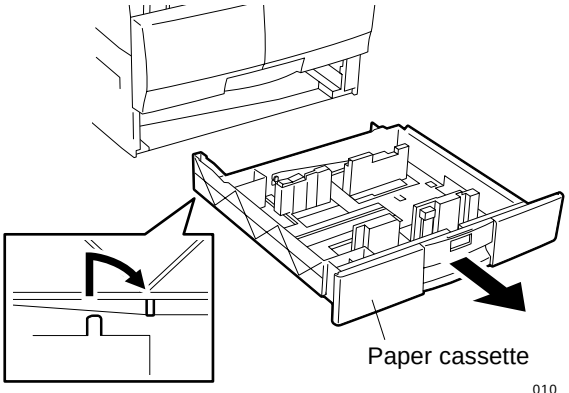


Fig. 2-6-12

[L] Left cover

1. If a Finisher (MJ-1011) is attached to the copier, detach it.
2. Remove 3 screws holding the paper tray cover. (See Fig. 2-6-11)
3. Take out the paper cassette.
4. Remove 4 screws and detach left cover.

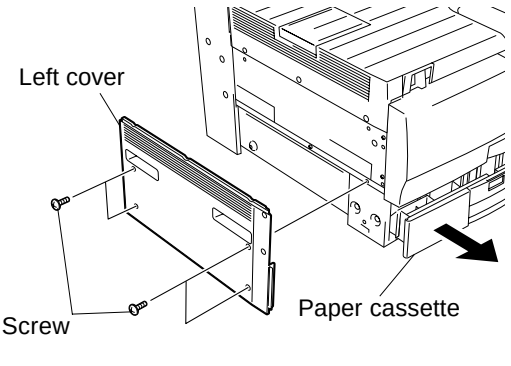


Fig. 2-6-13

[M] Left cover R

1. If a Finisher (MJ-1011) is attached to the copier, detach it.
2. Remove 3 screws holding the paper tray cover. (See Fig. 2-6-11)
3. Detach left cover. (See Fig. 2-6-13)
4. Remove one screw holding the top cover L.
5. Remove 3 screws, release one hook, and detach left cover R.

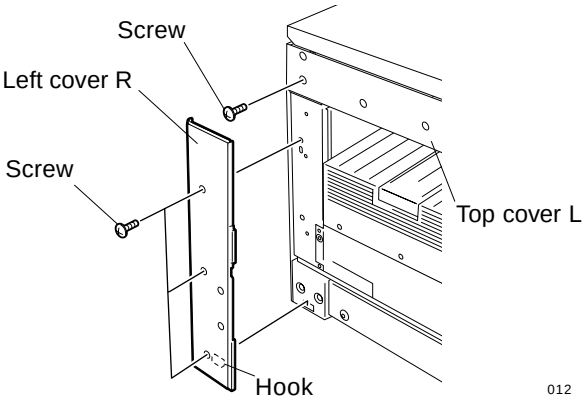


Fig. 2-6-14

[N] Right cover R

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Pull release lever and open side cover.
3. Remove 3 screws and detach right cover R.

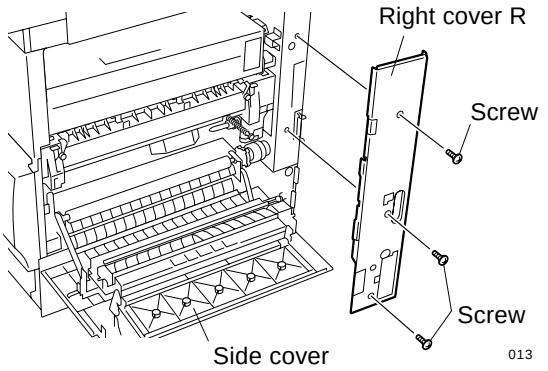


Fig. 2-6-15

[O] Side cover assembly

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Detach one connector and release the clamp.

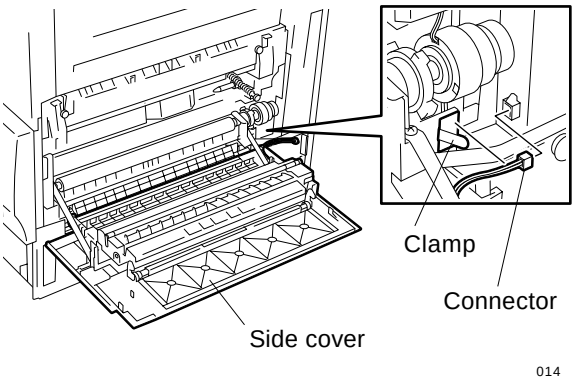


Fig. 2-6-16

4. Remove 2 screws securing stopper and guide pin, then detach paper guide B, spring and side cover assembly.

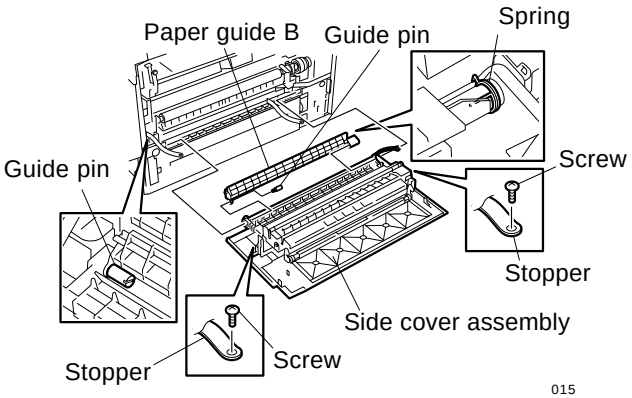


Fig. 2-6-17

[P] Right cover

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove 2 screws, release 2 hooks, and detach right cover.

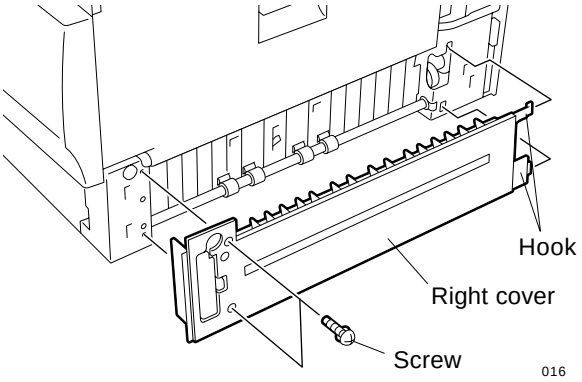


Fig. 2-6-18

[Q] Front frame cover F/R

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
4. If an ADU (MD-0101) is attached to the copier, open it.
5. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
6. Detach control panel front cover.
   (See Fig. 2-6-7)
7. Detach control panel bottom cover.
   (See Fig. 2-6-8)
8. Open side cover.
9. Open exit cover.

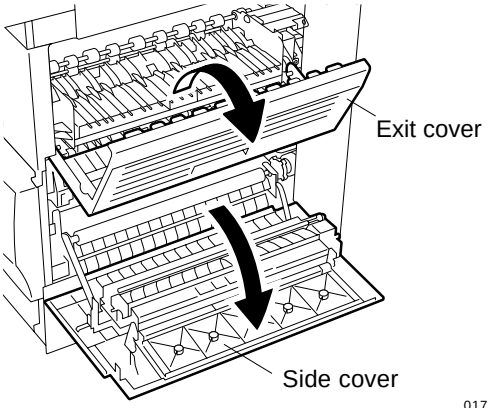


Fig. 2-6-19

10. Remove one screw, release 4 hooks, and detach front frame cover F and front frame cover R.

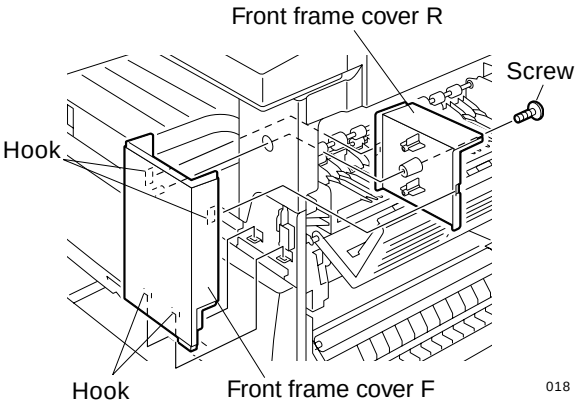


Fig. 2-6-20

[R] Exit cover

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
4. If an ADU (MD-0101) is attached to the copier, open it.
5. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
6. Detach control panel front cover.
   (See Fig. 2-6-7)
7. Detach control panel bottom cover.
   (See Fig. 2-6-8)
8. Detach front frame covers F and R.
   (See Fig. 2-6-19 and 2-6-20)
9. Remove stop ring and detach exit cover.

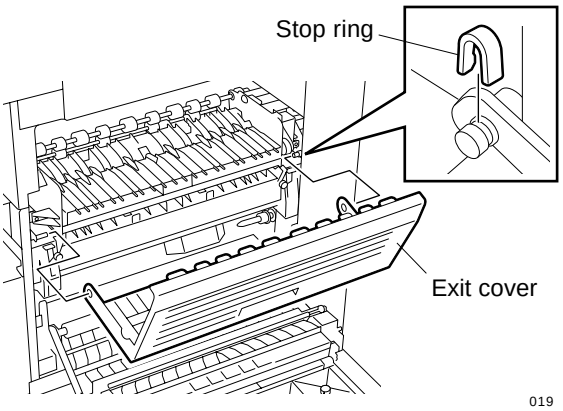


Fig. 2-6-21

[S] Inner cover

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. Remove one screw holding the top cover L.
4. Remove 2 screws holding the left cover R.
5. Detach ozone cover. (See Fig. 2-6-10)
6. Detach paper tray cover. (See Fig. 2-6-11)
7. Open side cover. (See Fig. 2-6-19)
8. Open exit cover. (See Fig. 2-6-19)
9. Remove one screw, release 4 hooks, and detach inner cover.

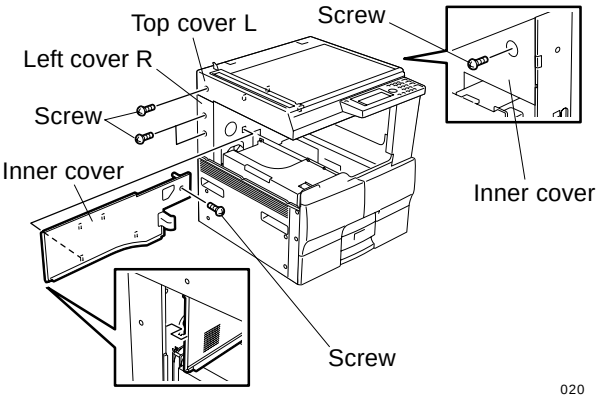


Fig. 2-6-22

[T] Front cover

1. Open front cover, release one hook, and detach front cover.

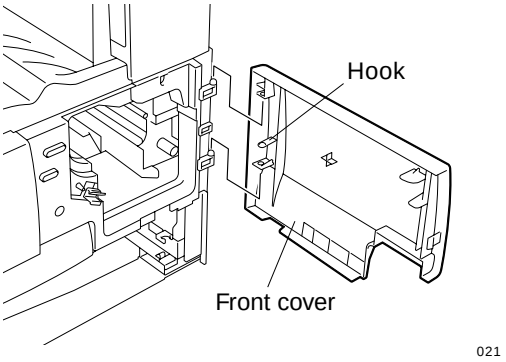


Fig. 2-6-23

[U] Main cover

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
4. Detach the toner cartridge.
5. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
6. Detach control panel front cover.
   (See Fig. 2-6-7)
7. Detach control panel bottom cover.
   (See Fig. 2-6-8)
8. Detach ozone cover. (See Fig. 2-6-10)
9. Detach paper tray cover. (See Fig. 2-6-11)
10. Detach front frame cover F and front frame cover R. (See Fig. 2-6-19 and 2-6-20)
11. Detach front cover. (See Fig. 2-6-23)
12. Remove 4 screws, release 2 hooks, and detach main cover.

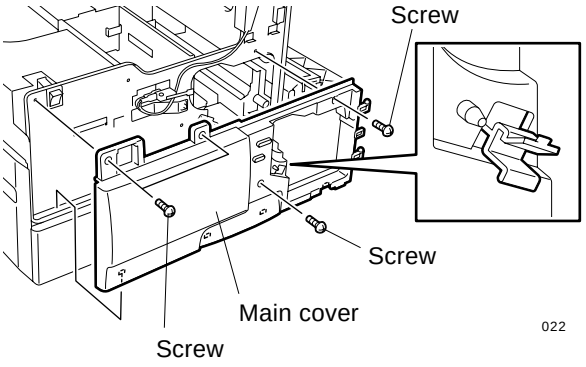


Fig. 2-6-24

2.6.2 Removal of PC boards

[A] MAIN PWA

Before removing the MAIN PWA, print the FUNCTION LIST for setup after MAIN PWA replacement. If it is unable to print it, use the FUNCTION LIST on the inside of the rear cover.

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach rear cover. (See Fig. 2-6-1)
4. If a FAX kit (GD-1600-NA/TW/EU/AU) is attached to the copier, detach the FAX PWA and NCU PWA.
5. If a PCL kit (GA-1030/GA-1031) or Memory (GC-1050) is attached to the copier, detach it.
6. If a NIC kit (GF-1110) or I-FAX (GD-1070) is attached to the copier, unplug the connectors for CN14 and CN17.
7. If finisher (MJ-1011) is attached to the copier, detach the finisher PWA.
8. Detach the connectors from MAIN PWA (CN4/CN8/CN9/CN18).
9. Remove 4 screws and remove MAIN PWA (CN15) from RELAY PWA (CN21).

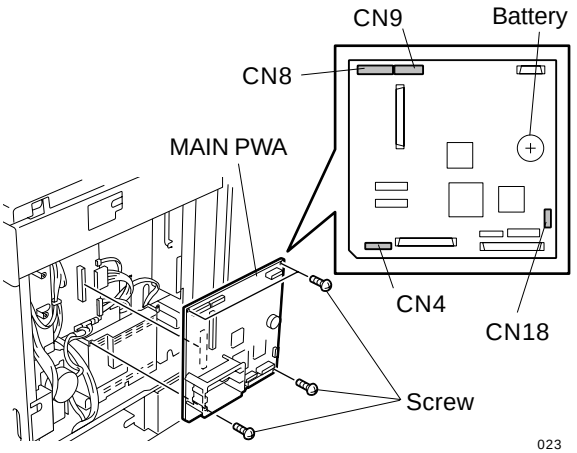


Fig. 2-6-25

[CAUTION]

There is a danger of a component explosion, if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Important: After the replacement of the MAIN PWA, set the copier according to the following procedures.

■ Settings after the replacement of the MAIN PWA

1. Downloading of the MAIN PWA firmware

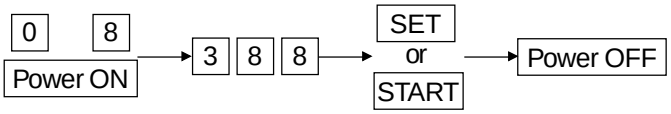
   For details, see chapter 5 of the Service Handbook.

2. Execution of 08-388 mode. (Reading of the total counter value)

   1: Turn on the main switch while pressing the [0] and [8] keys at the same time.

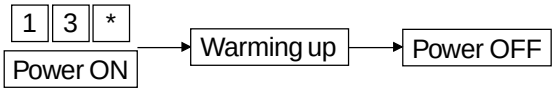
   2: When the "MC = " is displayed, enter 388 and press the [SET] or [START] key.

   3: When the "MC = 388" is displayed, turn off the main switch.



3. RAM Clear with the [1], [3], and [*] keys.

   While pressing the [1], [3], and [*] keys at the same time, turn on the main switch. When the Warming up display appears, turn off the main switch.

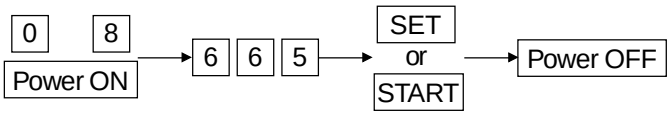


4. Execution of 08-665 mode (05: adjustment clear/08: programming clear)

   1: Turn on the main switch while pressing the [0] and [8] keys at the same time.

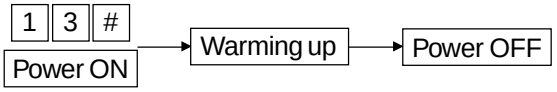
   2: When the "MC= " is displayed, enter 665 and press the [SET] or [START] keys.

   3: When the "MC=665" is displayed, turn off the main switch.



5. RAM Clear with the [1], [3], and [#] keys.

   While pressing the [1], [3], and [#] keys at the same time, turn on the main switch. When the Warming up display appears, turn off the main switch.

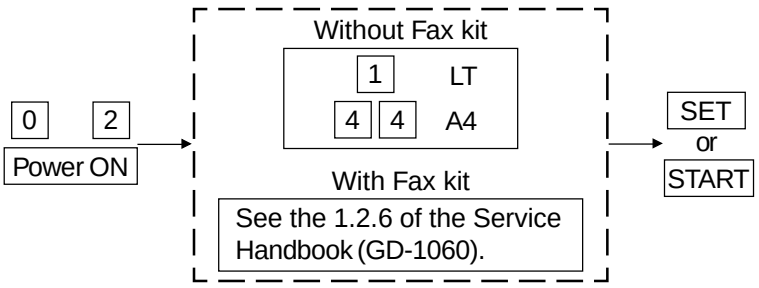


6. Download the scanner PWA firmware, if necessary, after confirming the version of it.

7. Settings for the country code and region code

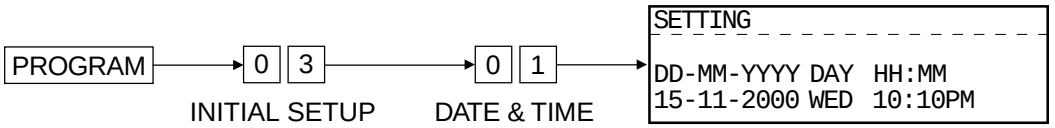
   1: Turn on the main switch while pressing the [0] and [2] keys at the same time.

   2: When the “Country code = 0” is displayed, enter the country and region codes, and press the [SET] or [START] key.



8. Settings for the date and time

   For details, see chapter 5 of the Operator's Manual.



9. Writing in memory (entering the drum counter value)

   For the setting values, refer to the FUNCTION LIST printed before replacing the MAIN PWA, or the FUNCTION LIST on the inside of the rear cover of the copier. For the setting procedures, refer to section 1.2.5 of the Service Handbook.

10. Entering the adjustment value for the printing position

    Enter the setting value for the following eighteen items.

    For the setting values, refer to the FUNCTION LIST printed before replacing the MAIN PWA, or the FUNCTION LIST on the inside of the rear cover of the copier. For the setting procedures, refer to sections 1.2.1 and 1.2.2 of the Service Handbook.

    1: 05-205 (Developer bias DC adjustment)
    2: 05-210 (Grid voltage initial value adjustment)
    3: 05-220 Transfer H
    4: 05-221 Transfer C
    5: 05-233 Separation H
    6: 05-234 Separation C
    7: 05-235 Separation L
    8: 05-400 (Printer primary scanning reproduction ratio)
    9: 05-410 (Laser start position)
    10: 05-421 (Printer secondary scanning reproduction ratio)
    11: 05-440 (Leading edge)
    12: 05-430 (Top margin)
    13: 05-431 (Left margin)
    14: 05-432 (Right margin)
    15: 05-433 (Bottom margin)
    16: 08-401 (Drum control counter)
    17: 08-446 Transfer ON position
    18: 08-447 Transfer OFF position

11. Sensor test in the [1] [3] test mode.

    1: Confirm whether the attached options are reflected on the bit information correctly.

    2: Refer to 1.2.4 of the Service Handbook.

12. SRAM test/DRAM test/Clock IC test/CODEC test mode.

    For details, see chapter 8 of the Operator's Manual.

[B] RELAY PWA

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach rear cover. (See Fig. 2-6-1)
4. If a FAX kit (GD-1600-NA/TW/EU/AU) is attached to the copier, detach the FAX PWA and NCU PWA.
5. If a PCL kit (GA-1030/GA-1031) or Memory (GC-1050) is attached to the copier, detach it.
6. If a NIC kit (GF-1110) or I-FAX (GD-1070) is attached to the copier, unplug the connectors for CN14 and CN17.
7. If finisher (MJ-1011) is attached to the copier, detach the finisher PWA.
8. Remove MAIN PWA. (See Fig. 2-6-25)
9. Detach all the connectors from RELAY PWA.
10. Remove 4 screws and remove RELAY PWA.

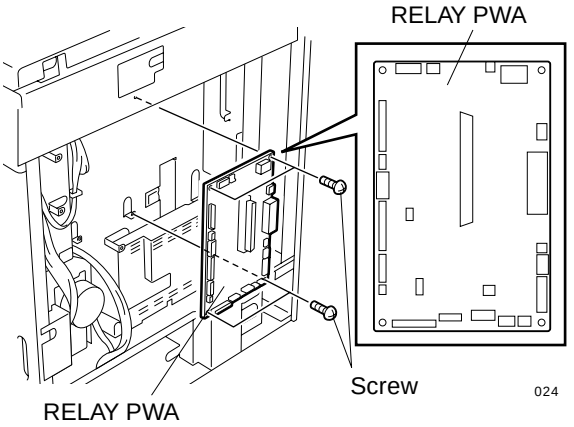


Fig. 2-6-26

[C] PC I/F PWA

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach rear cover. (See Fig. 2-6-1)
4. Remove one screw, detach PC I/F PWA cover, and detach the connector.
5. Remove 2 screws and remove PC I/F PWA.

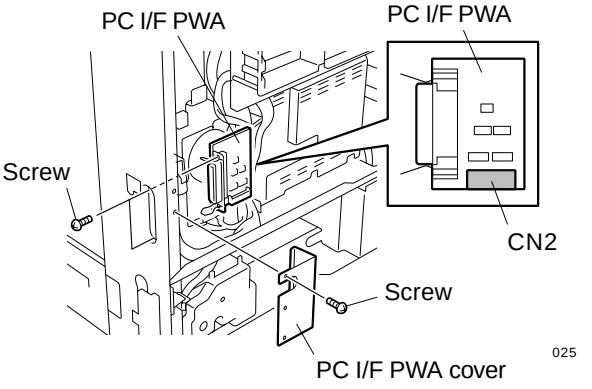


Fig. 2-6-27

[D] High voltage power supply

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach rear cover. (See Fig. 2-6-1)
4. If a PCL kit (GA-1030/GA-1031) is attached to the copier, detach it.
5. If a NIC kit (GF-1110) or I-FAX (GD-1070) is attached to the copier, unplug the connectors for CN14 and CN17.
6. Remove 2 screws, release 2 clamps, and detach HVPS cover.
7. Detach all the connectors, remove 4 screws, then remove high voltage power supply.

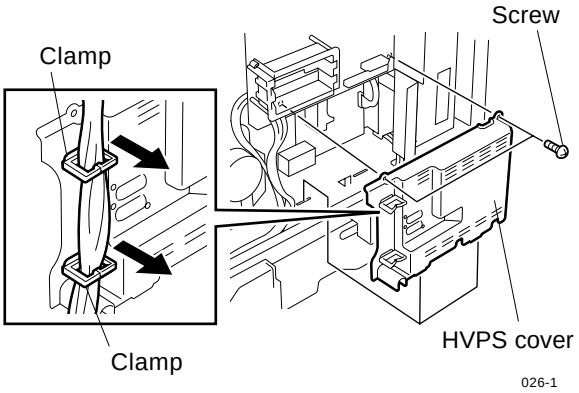


Fig. 2-6-28

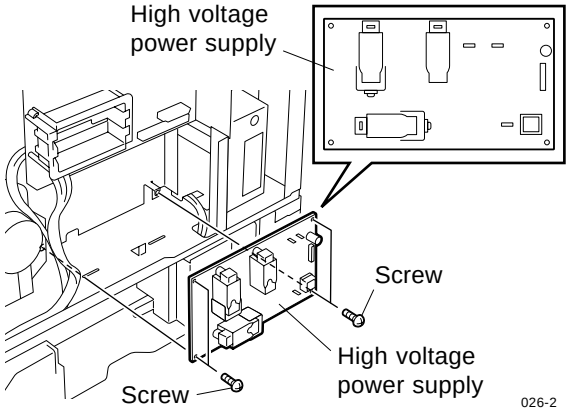


Fig. 2-6-29

[E] LVPS

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. Detach the toner cartridge.
4. Detach ozone cover. (See Fig. 2-6-10)
5. Detach paper tray cover. (See Fig. 2-6-11)
6. Loosen 5 screws.
7. Remove one screw and detach LVPS cover.
8. Detach all the connectors and release one clamps.
9. Remove 3 screws and remove LVPS.

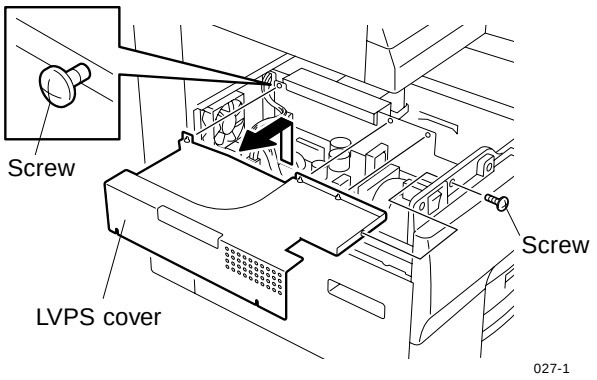


Fig. 2-6-30

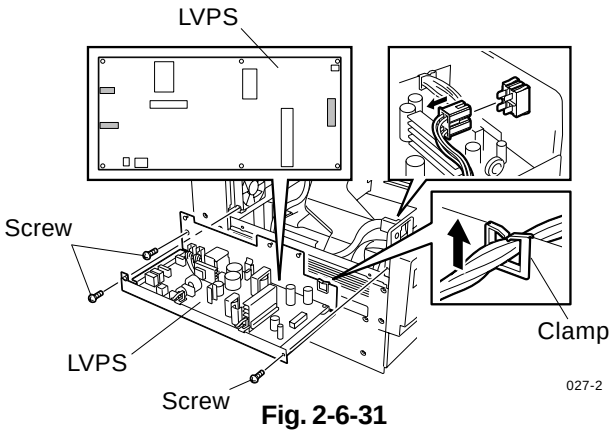


Fig. 2-6-31

[F] FUS PWA

(TWD/SAD/ASD/AUD/CND models)

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach rear cover. (See Fig. 2-6-1)
4. Remove one screw and detach FUS PWA cover.

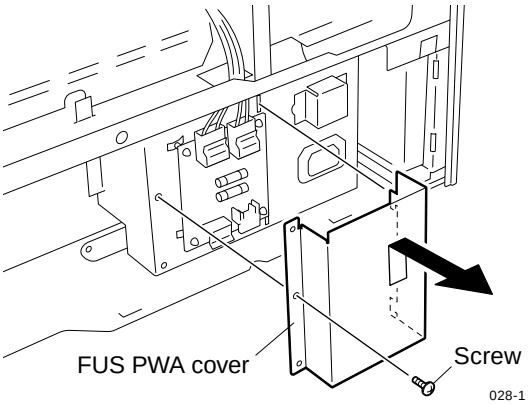


Fig. 2-6-32

5. Detach all the connectors from FUS PWA.
6. Release 4 locking supports and remove FUS PWA.

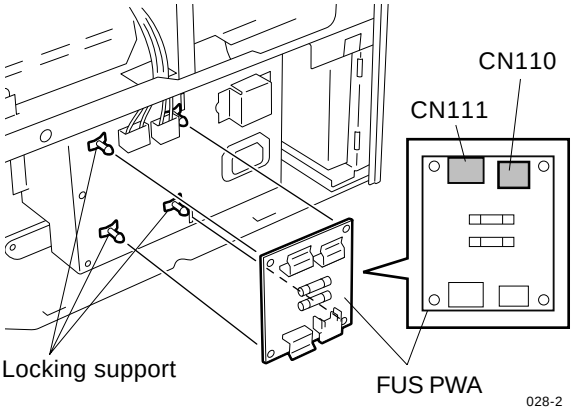


Fig. 2-6-33

3. COPYING PROCESS 3-1

3.1 Copying Process 3-1
3.2 Details of Copying Process 3-2
3.3 List of Copying Process Conditions 3-9

3. COPYING PROCESS

3.1 Copying Process

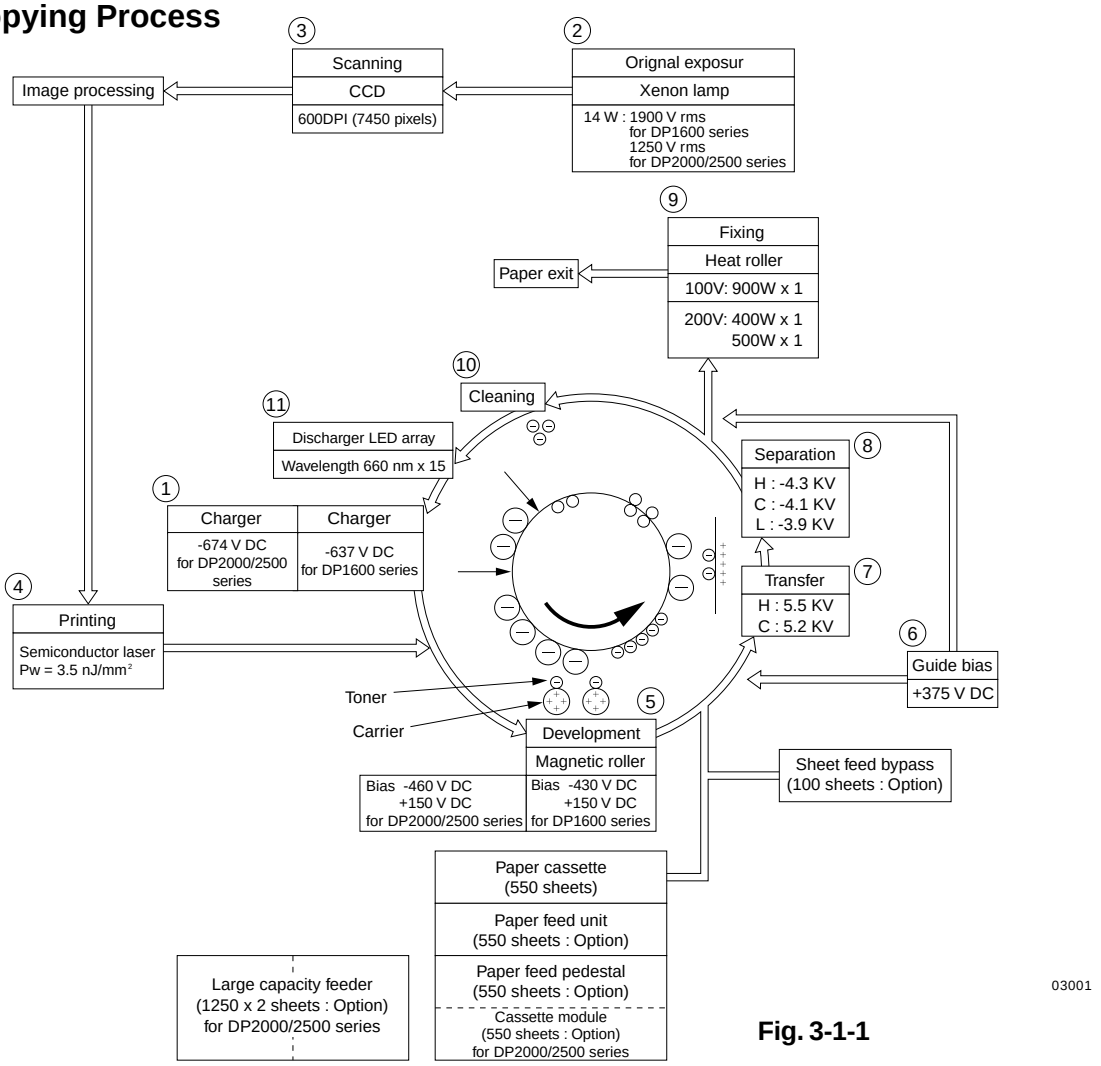


Fig. 3-1-1

① Charging: Negatively charges the surface of the photosensitive drum.

↓

② Original exposure: Images are converted to optical signals.

↓

③ Scanning: Image optical signals are converted to electrical signals.

↓

④ Printing: Image electrical signals are converted to optical signals (for laser emission) and exposed on the photosensitive drum.

↓

⑤ Development: ⊖ toner adheres to the surface of the photosensitive drum and forms a visible image.

↓

⑥ Transfer bias: Increases transfer efficiency.

↓

⑦ Transfer: Transfers the visible image from the drum onto the transfer (copy) sheet.

↓

⑧ Separation: Separates the transfer sheet, along with the toner, from the drum

↓

⑨ Fixing: Fixes the toner on the transfer sheet by applying heat and pressure.

↓

⑩ Cleaning: Mechanically removes any remaining toner on the drum.

↓

⑪ Discharger LED array: Discharges any remaining ⊖ charge from the drum.

3.2 Details of Copying Process

(1) Photosensitive Drum

The photosensitive drum has two layers, an outer and an inner layer. The outer layer is a photoconductive layer that uses an organic photoconductive carrier (OPC), and the inner layer is an aluminum, conductive cylindrical drum.

The resistance held by the drum material changes (increases, decreases) according to the strength of the light incident to the photoconductive carrier.

(Example)

- When incident light is strong, the resistance decreases (photosensitive drum becomes a carrier).
- When incident light is weak, the resistance increases (photosensitive drum becomes an insulator).

[Formation of Electrostatic Latent Image]

The minus potential on the drum surface corresponding to black areas of the original are removed by the charging, scanning, printing and discharging processes (described later), and the minus potential remains on areas corresponding to white areas of the original.

The image on the drum resulting from this minus potential is called a “latent image” as it cannot be seen directly by the human eye.

(2) Charging

"Charging" is the process of uniformly applying a charge to the surface of the photosensitive drum.

The minus corona discharge of the charger wire is controlled by the grid to charge the drum surface to a uniform minus potential.

The drum surface potential is determined by the potential of the grid, and the grid is determined by the grid control circuit inside the transformer.

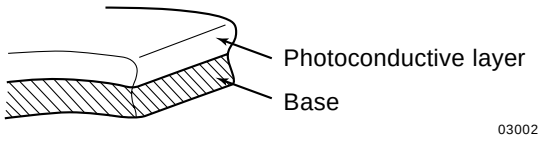


Fig. 3-2-1 Structure of the photosensitive drum

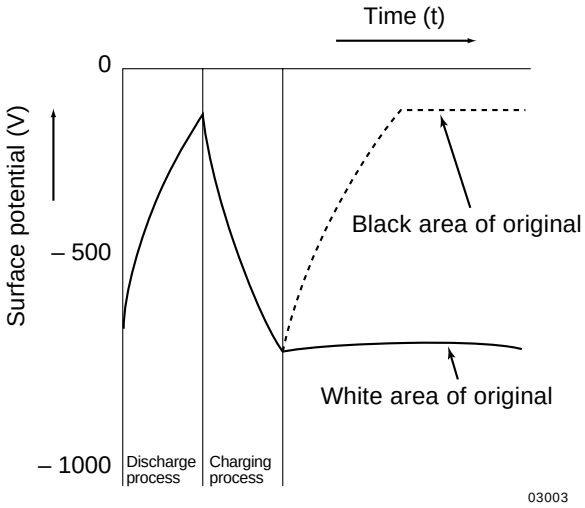


Fig. 3-2-2
Electric potential of the photosensitive drum

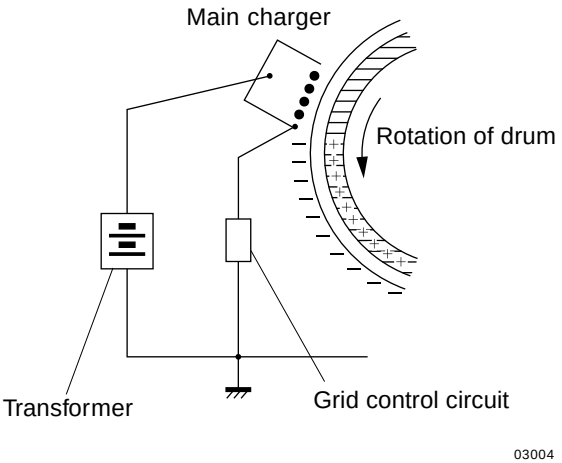


Fig. 3-2-3

(3) Scanning:

"Scanning" is the process of directing light at the original, and converting light reflected from the original to electrical signals.

Light reflected from the original is picked up by a CCD (charged coupled device), the image information held by that light is converted to electrical signals (image signals), and the image signals are sent to the image processor.

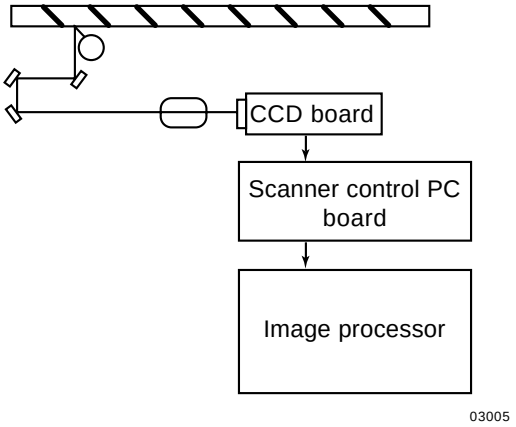


Fig. 3-2-4

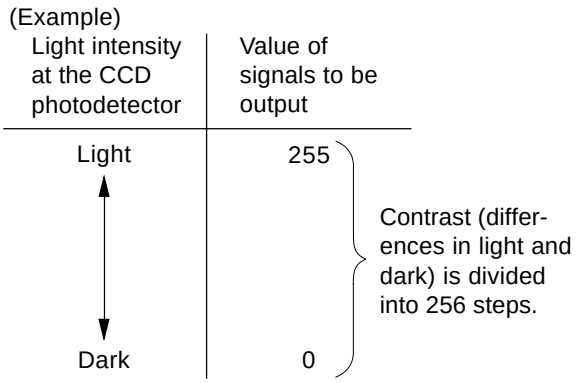


Fig. 3-2-5

(4) Printing

"Printing" is the process of converting the image signals sent from the image processor to optical signals, and exposing these optical signals on photosensitive drum.

Image signals from the image processor are converted to optical signals, and these optical signals are exposed by a semiconductor laser to form a static latent image on the photosensitive drum.

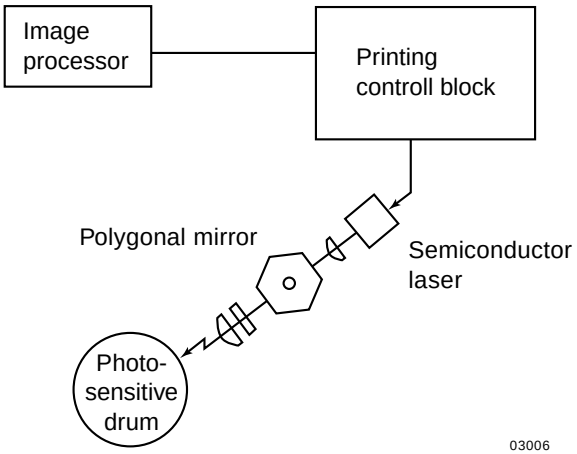


Fig. 3-2-6

(5) Development

- "Developing" is the process of converting the electrostatic latent image to an image visible to the human eye.

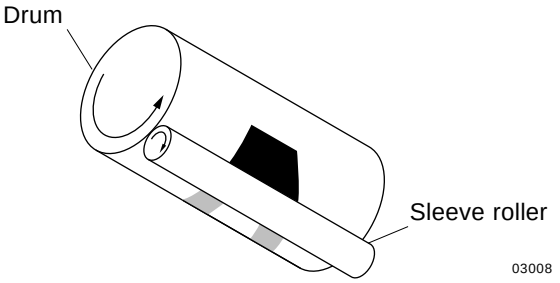


Fig. 3-2-7

The developing agent is fed to the surface of the photosensitive drum by the magnetic rollers, and impressed on the rollers. Toner in the developer agent attaches to areas on the photosensitive drum having a potential lower than the developer bias (reverse developing method).

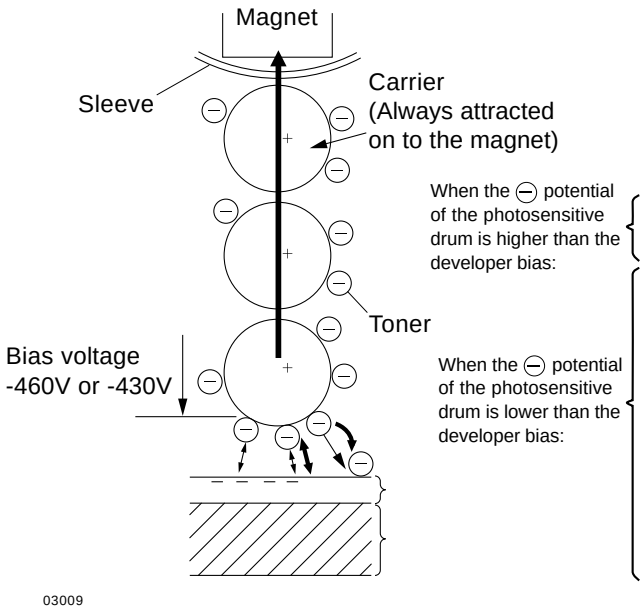


Fig. 3-2-8

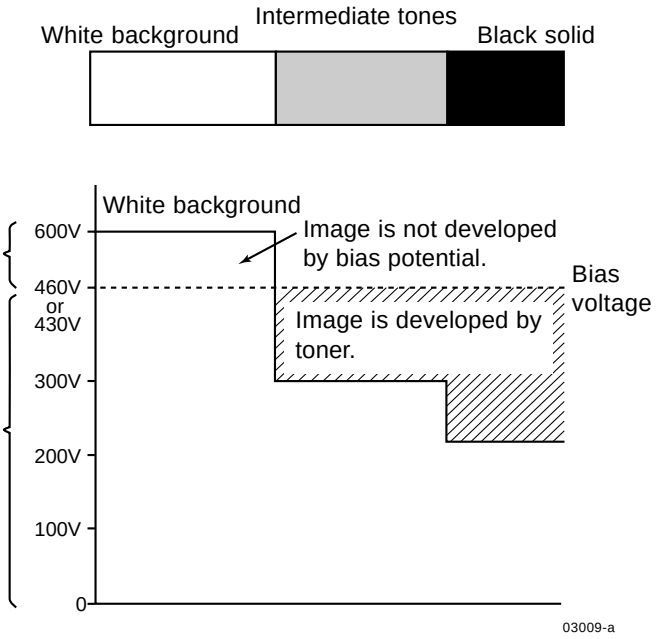


Fig. 3-2-9

- Switching of developing bias polarity
  Fogging is reduced by switching the bias of negative ⊖ voltage charged areas to positive ⊕ polarity (approx. +150V).

- About Developing Agent
  Toner and carrier are mixed. The toner is charged to minus polarity, and the carrier is charged to plus polarity by friction caused by stirring.
  Toner: Comprises plastic and Magnetite.
  Carrier: Ferrite

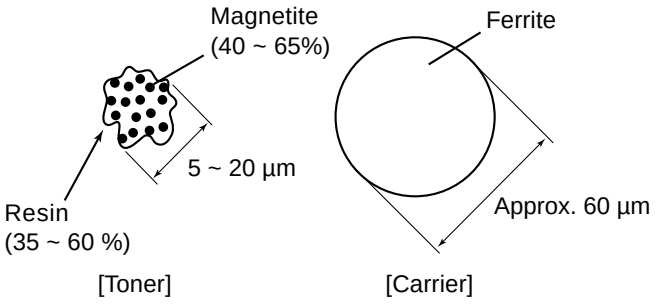


Fig. 3-2-10

• Magnetic roller

- Magnetic brush development -

The South and North poles are arranged, as shown in the figure on the right inside the magnetic roller. The developer material contacts the drum forming a brush.

||

This is caused by the lines of magnetic force between the South and North poles.

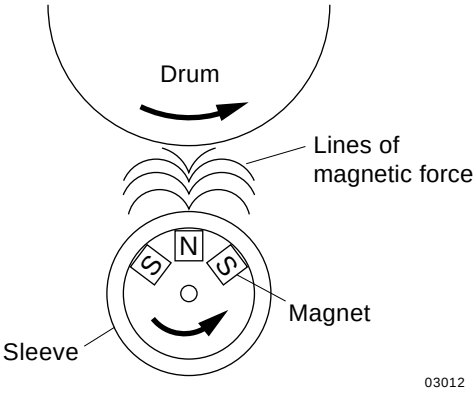


Fig. 3-2-11

(6) Transfer

- This process transfers the (visible) image developed on the drum surface by the toner onto the paper.
- Method: Corona discharge (reverse polarity of toner) is caused by the transfer charger to happen to paper passing between the drum and the transfer charger.

↓

The toner moves from the drum surface onto the paper.

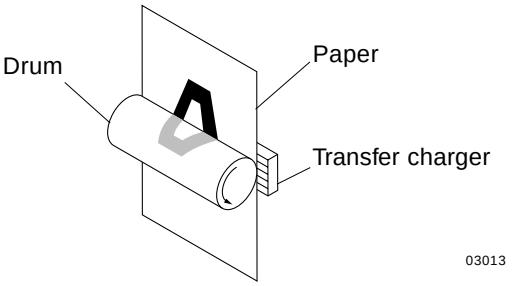


Fig. 3-2-12

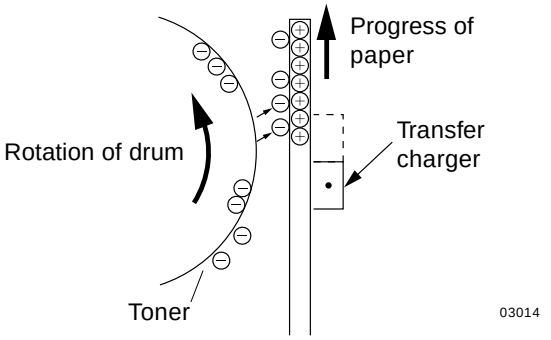


Fig. 3-2-13

* For smooth transfer, this machine features a transfer bias stage.

The transfer bias process prevents the charge of the transfer charger from flowing to the paper feed pinch roller and paper transfer guide plate through the paper by applying the bias voltage (375V DC) to the paper feed pinch roller and paper transfer guide plate. This is done to improve transfer efficiency. Normally, the corona discharge is applied by a voltage of 5.2 kV DC. However, to improve transferability at the leading edge of the paper, a higher output (5.5 kV DC) is applied to the leading edge of the paper.

(7) Separation

- At the transfer process, the sheet of paper becomes temporarily attached to the drum due to static electricity. The separation process separates the paper from the drum.
- Method: A negative ⊖ DC bias is applied to the separation charger.

↓

The negative charge on the paper is decreased.

↓

The electrostatic attraction between the paper and the drum weakens.

↓

The paper is separated from the drum by its own weight.

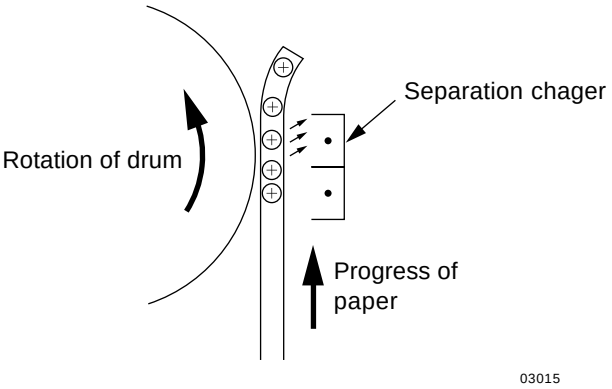


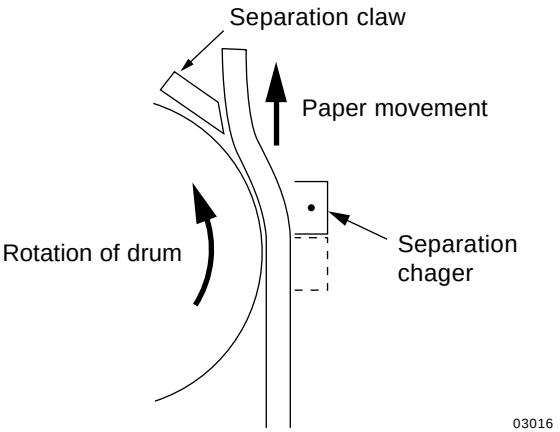
Fig. 3-2-14

* Output is controlled as follows to obtain satisfactory separability and transferability.

Position of Paper in Relation to Transfer Point	Separation Output
Leading edge	-4.3 KV DC
Trailing edge	-3.9 KV DC

Reference

- Combined use of separation charger and separation claw.
  To prevent the copy paper from failing to be separated during the operation, due to incomplete transfer charging, incomplete separation charging, or absorption of moisture, and thus jamming up the cleaner, a separation claw mechanically separates any copy paper which fails to be separated.



(8) Fixing

The toner on the paper is melted by applying heat and fixed on the paper.

Method: Melting point of the toner (main component: resin) is 100°C - 110°C.

↓

(Heat) A heat roller with a surface temperature melts the toner.

plus +

(Pressure) A pressure roller pressured by a spring solidifies the toner.

↓ ⇩

(Fixing) Heat and pressure are applied to the paper going through the two rollers.

||

The toner on the paper becomes fixed.

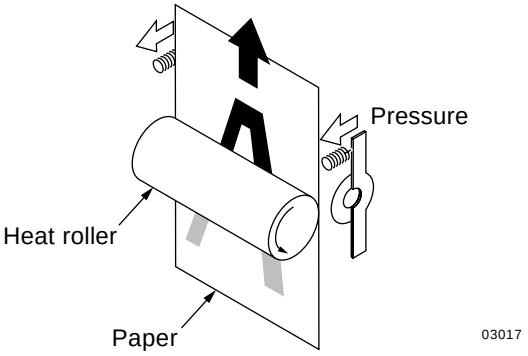


Fig. 3-2-15

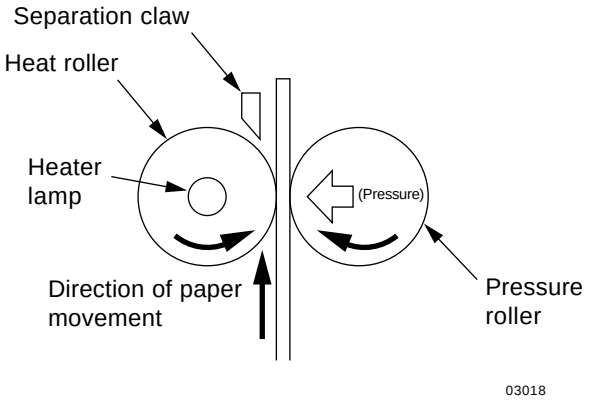


Fig. 3-2-16

(9) Cleaning

This process collects any toner remaining on the drum.

Method: The edge of a urethane rubber blade (main blade) is placed against the drum surface.

↓

This blade scrapes off the remaining toner from the drum.

↓

Another blade collects the scraped toner (recovery blade).

↓

The drum surface is cleaned.

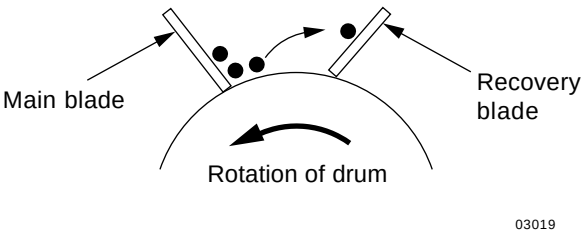


Fig. 3-2-17

(10) Discharge

Erases any electric charge remaining on the drum after transfer.

If discharge is not performed:

↓

The electric charge remains on the drum surface.

↓

The potential of the drum surface becomes uneven at charging for the next copy.

↓

The copy image is doubled (the previous image remains).

Method: Discharge LED array illuminates the entire drum surface.

↓

The drum becomes a conductor.

↓

Since the drum is grounded, the electric charge escapes.

↓

The drum is ready for the next copy.

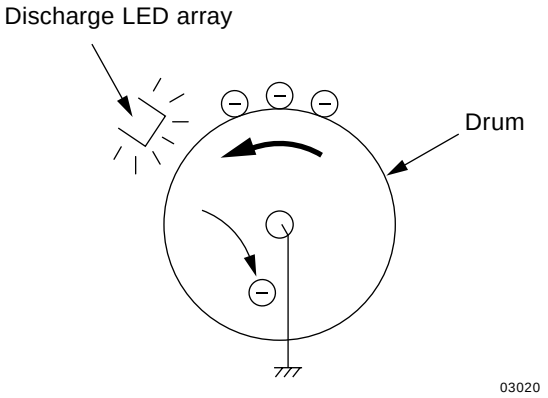


Fig. 3-2-18

3.3 List of Copying Process Conditions

Process	DP1600	DP2000/2500
1. Drum	OPC ø30	
(1) Sensitivity	Highly sensitized, high copy volume drum	
(2) Surface potential	-637 V DC	-674 V DC
2. Main charger	Scolotron system (constant current)	
	Variable grid output (constant voltage)	
3. Exposure		
(1) Light control	Automatic exposure and manual 7-step LCD setting	
(2) Light source	Laser scan (adjustment not needed)	
4. Development		
(1) Developer roller	With magnetic roller inside	
(2) Auto-toner	Toner end sensor	
(3) Toner replenishment	Toner cartridge system	
(4) Toner-empty detection	Toner end sensor	
(5) Toner	T-1600	T-2500
(6) Developing material	D-1600	
(7) Developer bias	-430 V DC, output adjustable (at printing) +150 V DC fix (others)	-460 V DC, output adjustable (at printing) +150 V DC fix (others)
5. Transfer bias	Adjustment not needed	
6. Transfer	Adjustable output (constant current) using the digital keys	
7. Separation	Adjustable output (constant current) using the digital keys	
8. Discharge		
(1) Discharging position	Discharge by exposure after cleaning	
(2) Discharge lamp	Discharge by red LED	
9. Cleaning		
(1) System	Blade system	
(2) Recovered toner	Non-reusable	

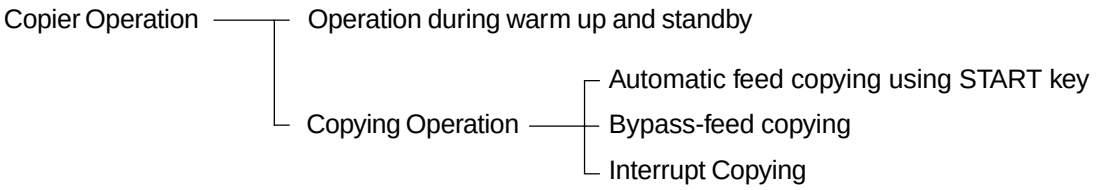
MEMO

4. COPIER OPERATION 4-1

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4. COPIER OPERATION

4.1 Operation Outline



4.2 Description of Operation

4.2.1 Warming up

(1) Initialization

Ž Turn on the power switch.

- The message “Please wait” appears on the display.
- The PS fan motor operates and the process unit fan motor operates at low speed.
- Initialization of optical unit

  The carriage moves to the home position and then stops.

  The peak position is detected as the carriage moves.

  The Exposure lamp lights and the peak is detected (Shading sheet is detected).

  The Exposure lamp goes off.
- Initialization of paper feed mechanism

Each tray is lifted. (It will not move if it has already been lifted.)

(2) When the temperature of the heat roller has been sufficiently stabilized, the copy quantity shows “1” and the word “READY” appears.

4.2.2 Standby

There are the following four kinds of power save functions:

1) Low Power — Lowers the heater to a fixed temperature.
2) Sleep — Turns the heater OFF.
3) Super Power Save — Turns the main CPU OFF.
4) Weekly Timer — Controls the Sleep mode for each day of the week.

1) Low Power

The Low Power mode function lowers the heater temperature to a fixed temperature after the set time has elapsed, to save power consumption. The standard mode switches to the Low Power mode if no operation has been performed for a fixed time. The standard switching time is 15 minutes. The time taken before such switching can be changed (1 min. to 240 min.). The Low Power mode is deactivated when you press the START key or an effective key under READY on the display or open and close the platen, while in the Low Power mode. When the Low Power mode is deactivated, the program performs the following two operations.

- Returns the display for the Low Power mode to the normal display.
- Returns the fusing temperature to the fusing temperature for standby.

2) Sleep

The Sleep mode function turns the heater power OFF after the set time has elapsed, to save power consumption. The Low Power mode switches to the Sleep mode if no operation has been performed for a fixed time. If the Low Power function is invalid, program so that such switching takes place from the standard mode to the Sleep mode. The standard switching time is 15 minutes. The time taken before such switching can be programmable (3 min. to 240 min.). The Sleep mode is deactivated when you press the START key or an effective key under READY on the display or open and close the platen, while in the Sleep mode. The Sleep mode will not switch to the Low Power mode.

3) Super Power Save

The Super Power Save mode function turns the CPU OFF to save power consumption. This mode is switched to when you press the SUPER ENERGY SAVER key or when the Sleep mode timer stops. When the Super Power Save mode is activated, the power of the main CPU turns OFF so that each device is not controlled and the panel is not displayed on, either. The LED of the SUPER ENERGY SAVER key only is lit. The standard mode is restored from the Super Power Save mode when you press the SUPER ENERGY SAVER key again, open and close the platen, or open and close the document feeder (ADF or RADF) or loading a document into the document feeder (ADF or RADF) if installed. At this time, the power of the main CPU is turned on so that the operation begins with the same processing as when the power is turned ON.

4) Weekly Timer

The Weekly Timer function controls the Sleep mode for each day of the week. You can program this function on the panel and determine the ON/OFF time (in minutes) for each day of the week from Sunday through Saturday (one week). The Weekly Timer function itself can also be turned ON or OFF. Even if the time is set, the Weekly Timer function does not work unless the function is ON.

4.2.3 Automatic feed copying using the START key

1) Press the START key.
2) The polygon motor and main motor start operation. At the same time, development bias positive output begins and the discharge LED turns ON. The exhaust fan begins to turn at high speed. Paper separation bias output turns ON (Low).
3) After the main motor reaches a constant speed, charge output begins.
4) A specified time after the charge output has begun, the development bias output is switched to negative. At the same time, paper separation bias output is turned OFF.
5) After the polygon motor has reached a constant speed, the laser is forced to turn OFF for synchronizing the UFE.
6) Paper pickup begins.
7) A required time after the feed sensor has turned ON, registration roller drive begins.
8) Laser exposure begins. At the same time, paper separation bias output is turned ON (High).
9) Transfer output turns ON (High). When a specified time has elapsed, the transfer output is switched to Mid.
10) Transfer guide bias output turns ON. At the same time, the paper separation bias output is switched to Low. When a specified time has elapsed, the paper separation bias is switched to Mid.
11) In a specified time after the feed sensor has turned OFF, the paper separation bias output is switched to Low.
12) In a specified time after the feed sensor has turned OFF, the registration roller drive is stopped.
13) In a specified time after the paper separation bias output has been switched to Low, the transfer output is switched to OFF.
14) The paper separation bias output is switched to High in a specitied period of time after the transfer output is turned OFF.
15) When a specified time has elapsed, the transfer guide bias is turned OFF.
16) In a specified time after the exit sensor has turned OFF, the charge is turned OFF and the paper separation bias output switched to OFF at the same time.
17) The polygon motor and main motor turn OFF.
18) The development bias output is reversed and paper separation bias output is turned ON (Low). At the same time, the laser enable output is turned OFF.
19) The development bias output is turned OFF after a specified time, and the paper separation bias output and the discharge LED output are turned OFF at the same time.

4.2.4 Bypass-feed copying

Select Bypass Tray with the Paper Supply key on the display.

(1) Place paper in the bypass tray and adjust the document guides F and R to the paper width. The feed sensor turns ON and the word “Ready for bypass feeding” appears.

(2) Press the START key. The message changes from “Ready for bypass feeding” to “COPYING.” The polygon motor operates. The main motor operates, the process unit fan motor rotates at high speed, and the discharge lamp lights. The drum, developer, heat roller, and exit roller move.

4.2.5 Interrupt copying

(1) Press the INTERRUPT key. The INTERRUPT key is illuminated and the message “Job interrupted” appears. The present copy operation is stopped temporarily. The copy mode automatically becomes the interrupt copy mode.

(2) Interrupt copying takes place.

(3) After the interrupt copying ends, the work “READY” appears. When INTERRUPT key is pressed again, the illumination of the INTERRUPT key turns off and the copier is restored to its state prior to the interruption. The message “Ready to resume job“ appears.

(4) Press the START key and the operation prior to the interruption is resumed.

4.3 Fault Detection

Errors are roughly classified into the following three kinds:

4.3.1 Classification of faults

A) Warning error

An abnormal condition which can occur even during normal operation, such as a paper empty state. After stoppage, the operation can be resumed. It can occur even during non-operation.

Display
- Add paper
- Toner is low
- Drum life warning

B) Jam error

An error where the copier can be restored when the operator removes the cause of the abnormal condition from the machine.

Display
- Toner empty
- Check process
- Misfeed in copier
- Misfeed in doc. feeder
- Misfeed in duplexer
- Misfeed in finisher
- Misfeed in bypass

C) Error subject to service call

An error which has detected that the machine cannot be operated. In this case, turn the power OFF.

Display
- Call for service

4.3.2 Explanation of faults

A)-1 Add paper

This error occurs when the sensor in the cassette tray detects the absence of paper.

Cause of occurrence : No paper is loaded into the cassette or the cassette is not correctly installed in the copier.
(This error message is also displayed when the cassette tray is not lifted due to a fault of the lift-up motor, etc.)

Reset procedure : The error state can be reset by supplying paper or installing the cassette again.

A)-2 Toner is low

This error occurs when the toner sensor detects the insufficiency of toner.

Reset procedure : Supply toner.

B)-1 Misfeed in copier

This error message is displayed when a paper jam has occurred in the transport path. There are the following six kinds of jams including those for the installation of options.

① FEED JAM

When paper is fed from the cassette of the copier, the sensors feed sensor and exit sensor turn ON and OFF, in order. At this time, if the feed sensor or exit sensor does not turn ON for a fixed time, a FEED JAM will be assumed.

- If the time taken from the moment when the registration clutch turns ON to the moment when the exit sensor turns ON exceeds 3.02 seconds, the message “Misfeed in copier” will be displayed.
- If the time taken from the moment when the registration clutch turns ON to the moment when the feed sensor turns OFF exceeds 5.38 seconds, the message “Misfeed in copier” will be displayed.

Reset procedure : Open the side cover and remove the paper to turn the sensor OFF, then close the side cover.

② EXIT JAM

When paper is fed from the cassette of the copier, the sensors feed sensor and exit sensor turn ON and OFF, in order. At this time, if the exit sensor does not turn OFF for a fixed time after the feed sensor of the copier has turned OFF, an EXIT JAM will be assumed.

- If the time taken from the moment when the feed sensor turns OFF to the moment when the exit sensor turns OFF exceeds 3.12 seconds, the message “Misfeed in copier” will be displayed.

  Reset procedure : Open the side cover and remove the paper to turn the sensor OFF, then close the side cover.

The following are jams which can occur when options are installed.

③ SFB

When paper is loaded into the SFB, the SFB feed sensor detects the presence of paper. The SFB clutch motor turns ON to pick up the paper. At this time, if the feed sensor of the copier does not detect the presence of paper even after a fixed time has elapsed, SFB miss feed will be assumed and the message “Misfeed in bypass” will be displayed.

Reset procedure : Remove the jammed paper and remove all the paper remaining in the tray of the SFB to turn OFF the SFB feed sensor.

④ ADU

When performing duplex copying, the one-side-printed paper passes through the ADU. At this time, if the sensors (2 pcs.) in the ADU do not turn ON for a fixed time, ADU miss feed will be assumed and the message “Misfeed in duplexer” will be displayed.

Reset procedure : Open the ADU and remove the jammed paper to turn OFF the ADU sensors, then close the cover.

⑤ PFU

With the PFU installed, if paper feed from the PFU is selected, the exit sensor detects the presence or absence of paper. Press the START button to turn ON the PFU clutch motor to pick up the paper. At this time, if the exit sensor of the copier does not turn ON for a fixed time, PFU miss feed will be assumed and the message “Misfeed in copier” will be displayed.

Reset procedure : Open the PFU cover or copier side cover and remove the jammed paper.

⑥ PFP

With the PFP installed, if paper feed from the PFP is selected, the PFP paper feed sensor Upper (Lower) sensor detects the presence or absence of paper. The one in parentheses applies when the cassette module is installed. Press the START button to turn ON the PFP clutch motor to pick up the paper. At this time, if the PFP paper feed sensor Upper (Lower) sensor does not turn ON for a fixed time, PFP miss feed will be assumed and the message “Misfeed in copier” will be displayed.

Reset procedure : Open the PFP cover or copier side cover and remove the jammed paper.

B)-2 Clear misfed document

With the optional ADF or RADF installed, this message is displayed when a document jam has occurred.

Reset procedure : Open the ADF cover or RADF cover and remove the jammed document.

B)-3 Toner empty

When a fixed number of sheets are printed after a Toner Low state has been detected, a Toner Empty state will be assumed to stop the printing. If a Toner Empty state occurs, printing cannot be performed until toner is supplied.

Reset procedure : Supply toner.

B)-4 Check process

This message is displayed when some trouble has occurred in the process unit. It is also displayed when the life of the process unit has been reached.

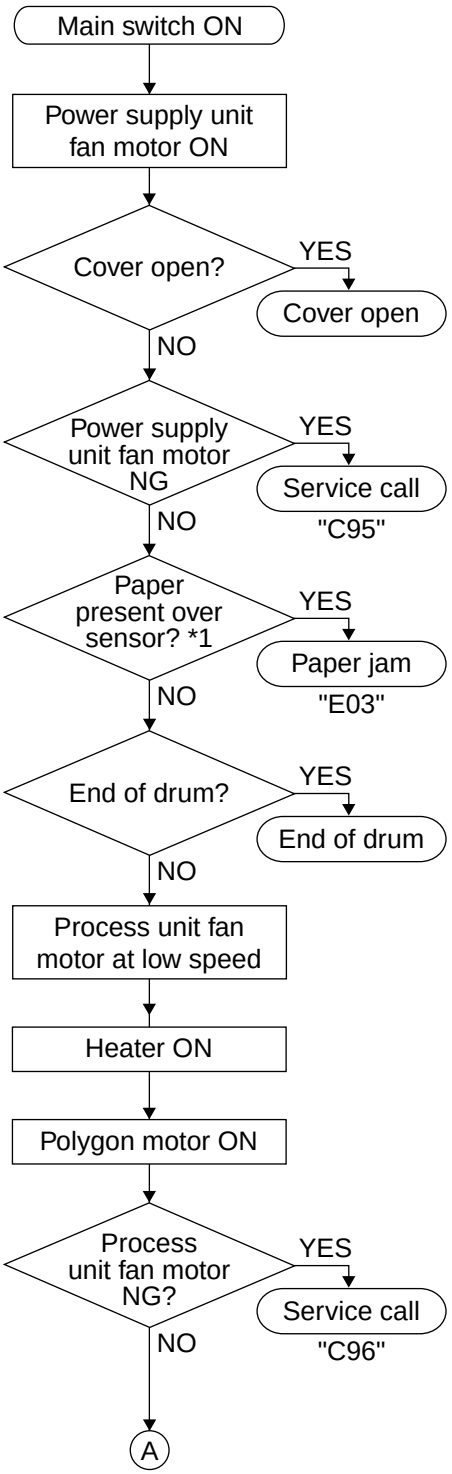
Reset procedure : Remove and install the process unit or replace it.

C) Call for service

If this message is displayed, none of the operations can be performed. When you press the CLEAR/STOP key and 8 key at the same time while the message is displayed, the error code will appear on the display. The explanation of the error code is written in the “SERVICE HANDBOOK.”

4.4 Flow Charts

4.4.1 At power ON time



*1 hinds of sensors

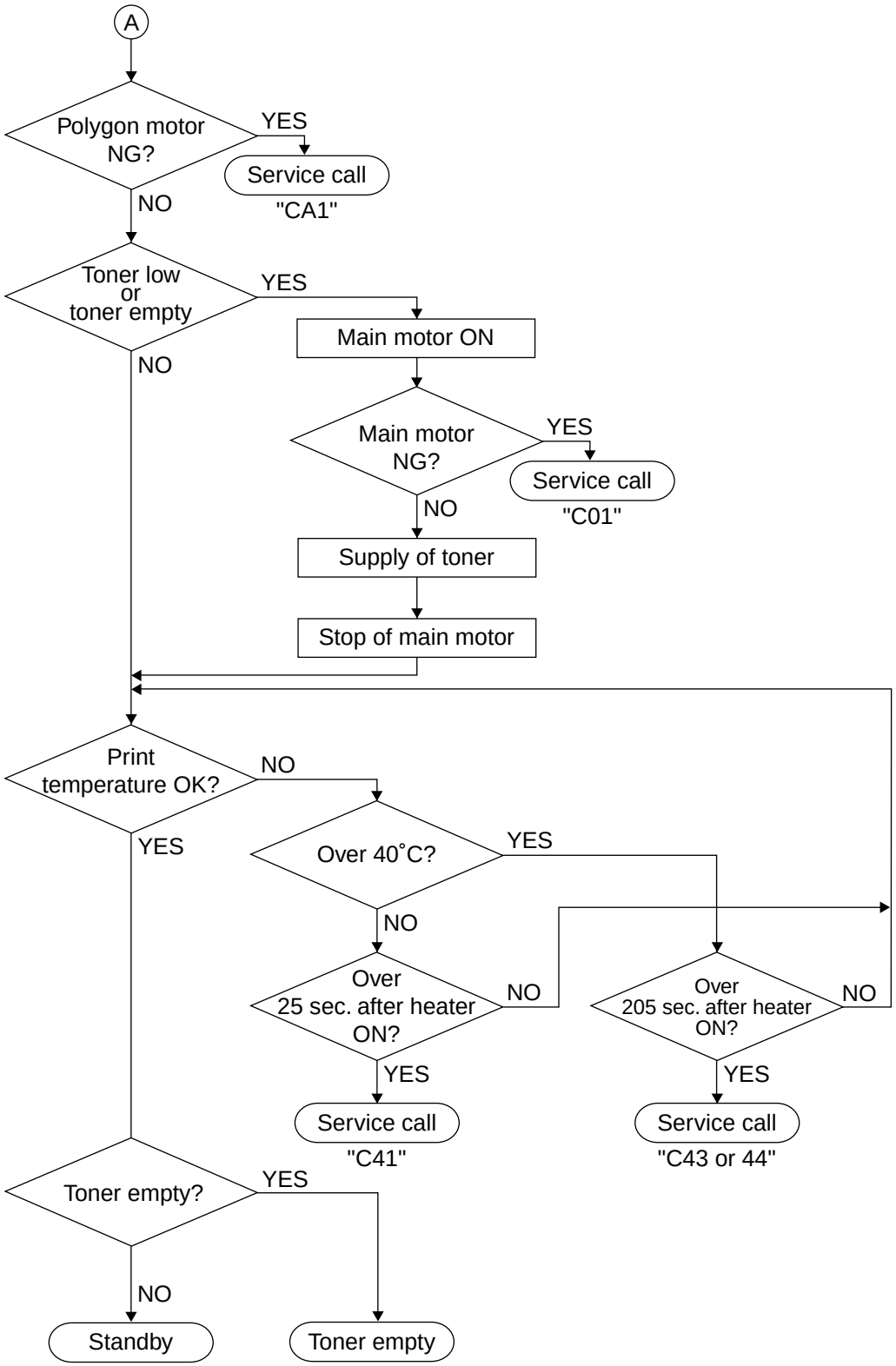
Feed sensor

Exit sensor

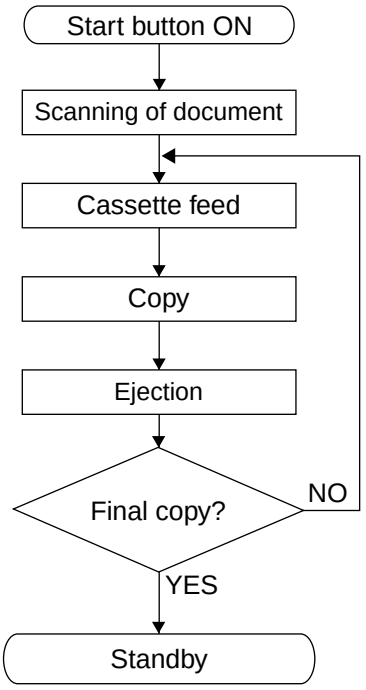
Option cassette feed sensor
(with PFU/PFP installed)

PFP paper feed sensor (Upper)
(with PFP installed)

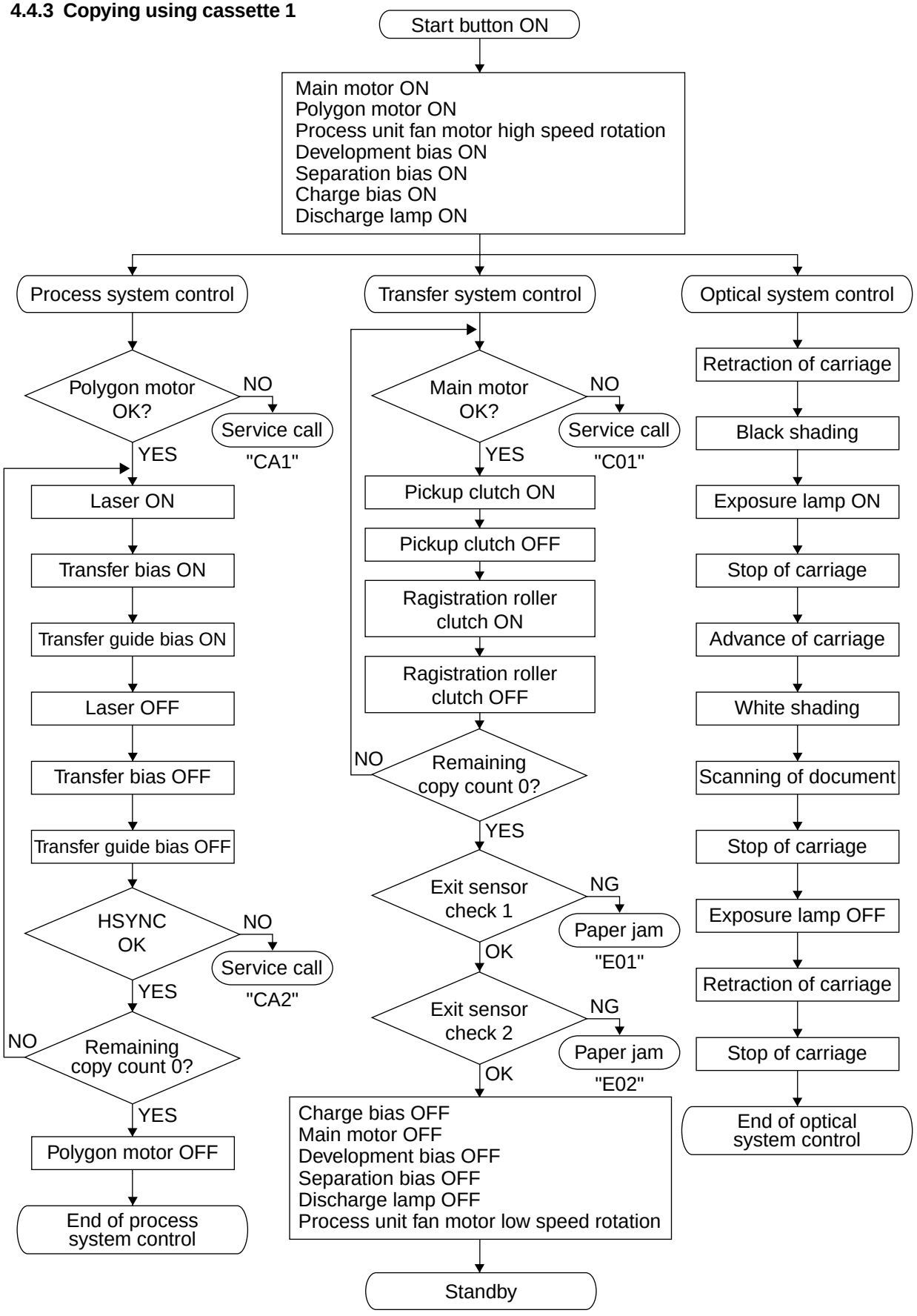
ADU paper jam sensor (Upper/Lower)
(with ADU installed)


A
Polygon motor NG?
YES
Service call
"CA1"
NO
Toner low or toner empty
YES
Main motor ON
NO
Main motor NG?
YES
Service call
"C01"
NO
Supply of toner
Stop of main motor
Print temperature OK?
NO
YES
Over 40˚C?
YES
NO
Over 25 sec. after heater ON?
NO
YES
Service call
"C41"
Over 205 sec. after heater ON?
NO
YES
Service call
"C43 or 44"
Toner empty?
YES
NO
Standby
Toner empty

4.4.2 Copying at platen (Simplex → Simplex)



4.4.3 Copying using cassette 1



5. DISPLAY UNIT 5-1

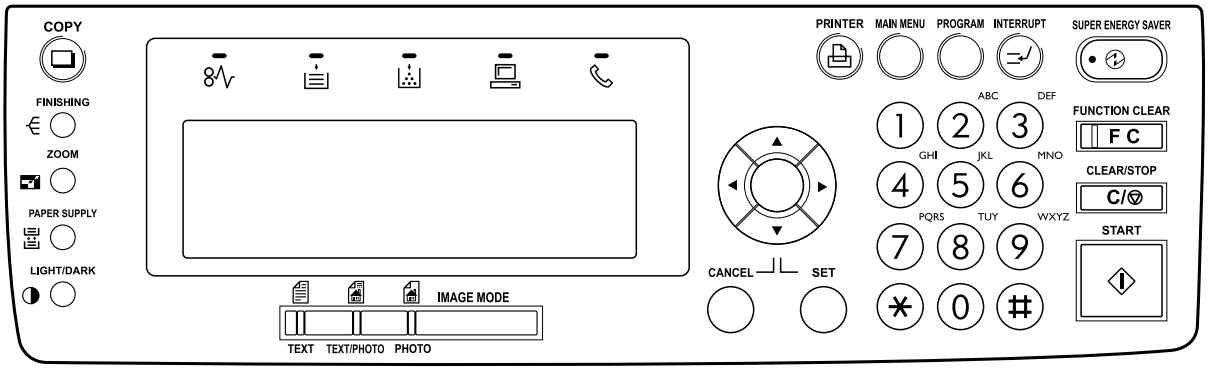
5.1 Detailed Drawing of the Control Panel and the Display Panel 5-1
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5. DISPLAY UNIT

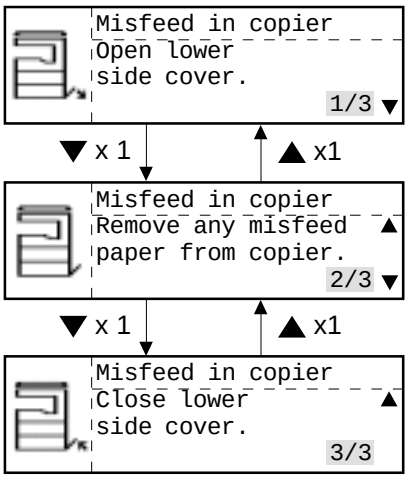
5.1 Detailed Drawing of the Control Panel and the Display Panel

The display unit consist of key switches for copier operation/selection of each mode, LEDs, and a LCD displaying the copier state or message.

When the operator's attention is needed, a graphic symbol and a message indicating that particular condition is Displayed in the LCD panel.



Layout of the control panel



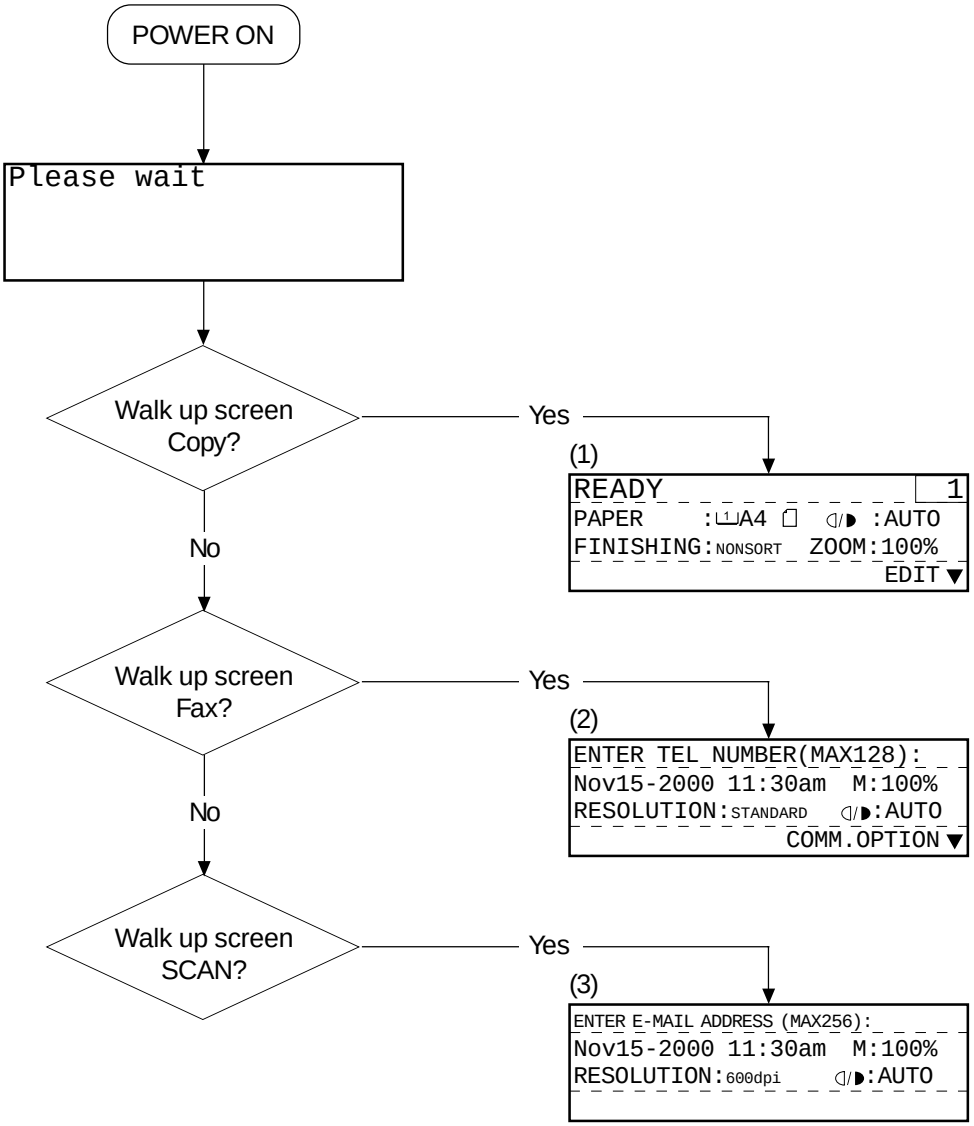
LCD panel display calling for operator's attention

(In case of PFU JAM Clearance)

5.2 Items Shown on the Display Panel

5.2.1 Display during normal copying

No.	Message	Condition of machine	Notes
1	Wait warming up	Being warmed up • Displayed after the main switch is turned ON up until the machine becomes ready for copying. Fig. 5-2-1.	• When the main switch comes ON, the quantity and reproduction ratio of copies are indicated, or example, as "1", "100%".
2	READY	Standby for copying • The machine is ready for copying and operator's instructions on copying conditions can be input. • Returns to the default condition if no key is pressed for the setting time of auto clear timer.	• Copy quantity indicator shows "1". When a digital key is pressed, that number indicates the set quantity. • The set quantity can be cleared to "1" by pressing the CLEAR/STOP key. • Bypass copying is possible.
3	COPYING	Now copying. • Displayed by pressing the START key. • Copy quantity indicator becomes "ex. 3 → 2 → 1 → 3" and copying is completed.	• After completion of copying, the copy quantity indicator returns to the initially set number.
4	Saving energy	Energy saver conditions.	• Reset by pressing the any key except the SUPER ENERGY SAVER key.
5	Select original size	Platen sort copying standby state.	• When using original cover.
6	-----	Timer off • No message is displayed in the display panel.	• Press the any key to clear.



Note: "Scan" does not exist when GA-1030/1031, GD-1060, GF-1110 and GD-1070 are not attached.

Fig. 5-2-1 Wait warming up

5.2.2 Display in the event of faulty conditions

No.	Message	Condition of machine	Notes
7	Cassette 1 empty	Indication of lack of paper. • Indicates when there is no paper in cassette. A in Fig. 5-2-2. • Bypass copying is possible.	• Supply paper to the selected cassette. • Select another cassette.
8	Toner empty	Indication of lack of toner. • B in Fig. 5-2-3 is displayed when the toner in the toner cartridge becomes empty. • When this message is displayed, it is not possible to copy.	• Reset after the toner is supplied and the front cover is closed.
9	Misfeed in bypass	Bypass paper jamming (SFB). • Paper jams at the bypass guide. C in Fig. 5-2-4.	The machine returns to normal conditions automatically when the paper out is pulled from the bypass guide.
10	Misfeed in copier (Copier machine)	Paper jammed in the machine. • D in Fig 5-2-5.	Remove the paper jammed in the copier by following the messages.
11	Misfeed in copier (LCF)	Cassette (LCF) paper misfeed. • Paper supplied from the cassette does not reach the aligning sensor in a set time. E in Fig. 5-2-6.	Remove the paper jammed in the copier by following the message.
12	Misfeed in doc. feeder (ADF)	Original jammed • An original is jammed in the ADF. F in Fig. 5-2-7	Open the ADF jam access cover and the ADF unit, and remove the jammed original.
13	Misfeed in finisher (Finisher)	Paper jammed in the sorter. G in Fig. 5-2-8 .	Remove the paper jammed in the sorter and open and close the front cover for once.
14	Misfeed in duplexer (ADU)	Paper jammed in the ADU. H in Fig. 5-2-9.	Remove the paper jammed in the copier by following the message.
15	Call for service	Some part of the mechanism, motors, switches or sensors is abnormal.	Turn OFF the machine, remove the cause of the fault and turn the machine back ON.
16	Time for maintenance	Indication of PM cycle. • Displayed when it is time for preventive maintenance and inspection. • Capable of copying.	Maintenance and inspection by a qualified service technician.

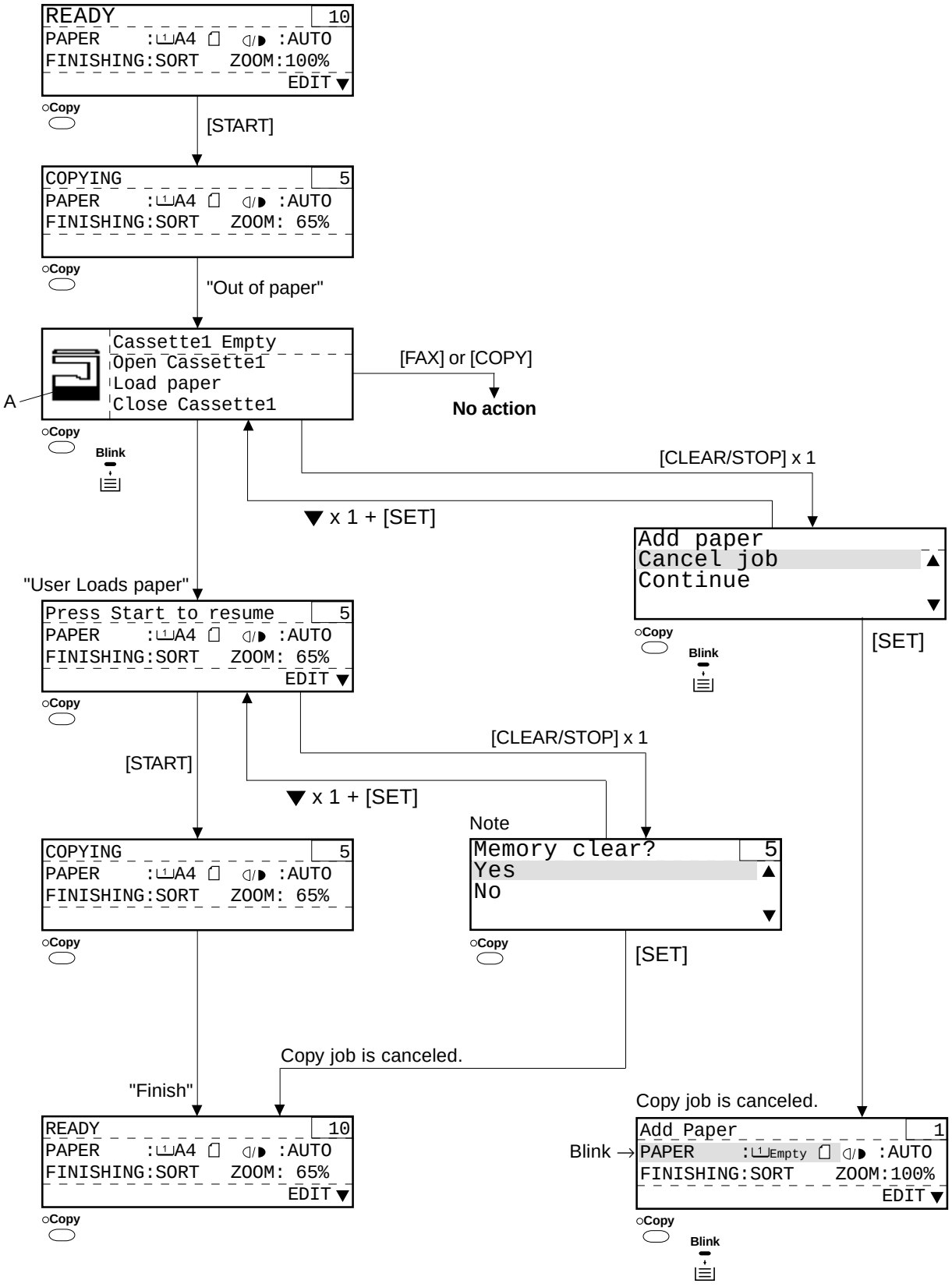


Fig. 5-2-2 Cassette 1 empty

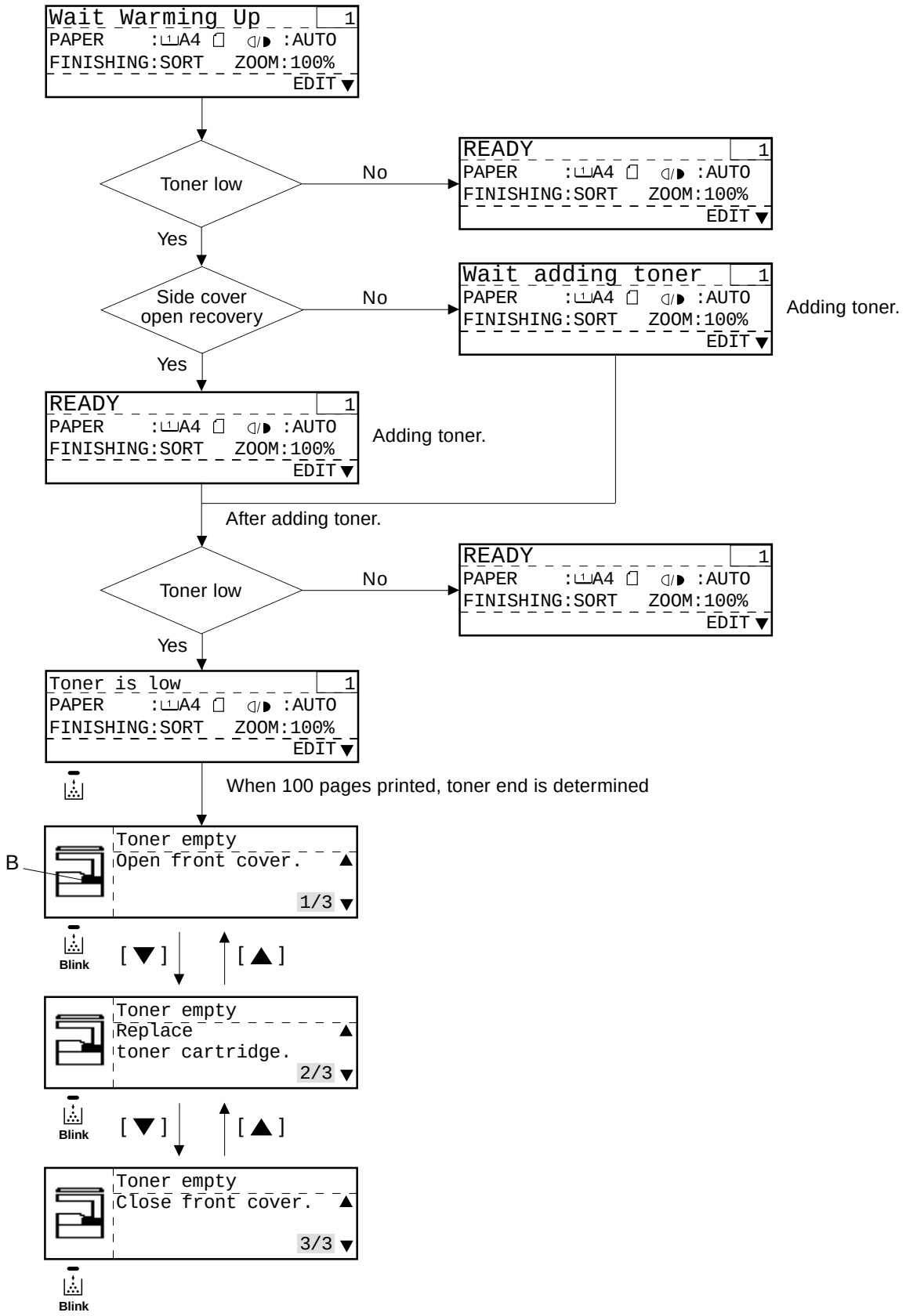


Fig. 5-2-3 Toner empty

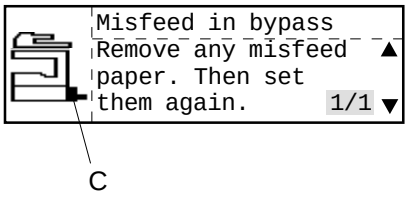


Fig. 5-2-4 Misfeed in bypass (SFB)

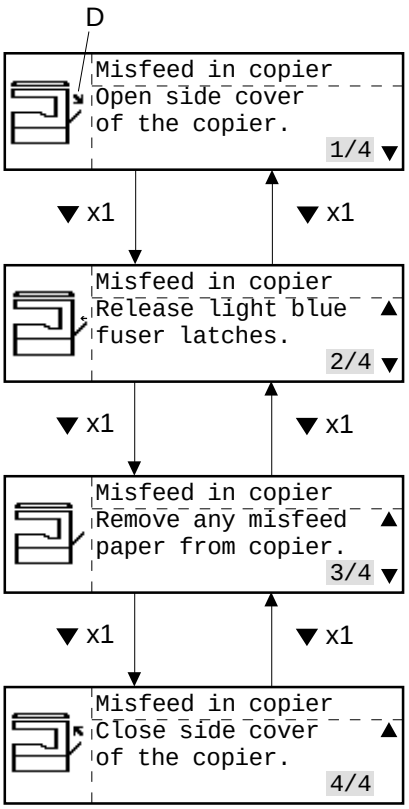


Fig. 5-2-5 Misfeed in copier

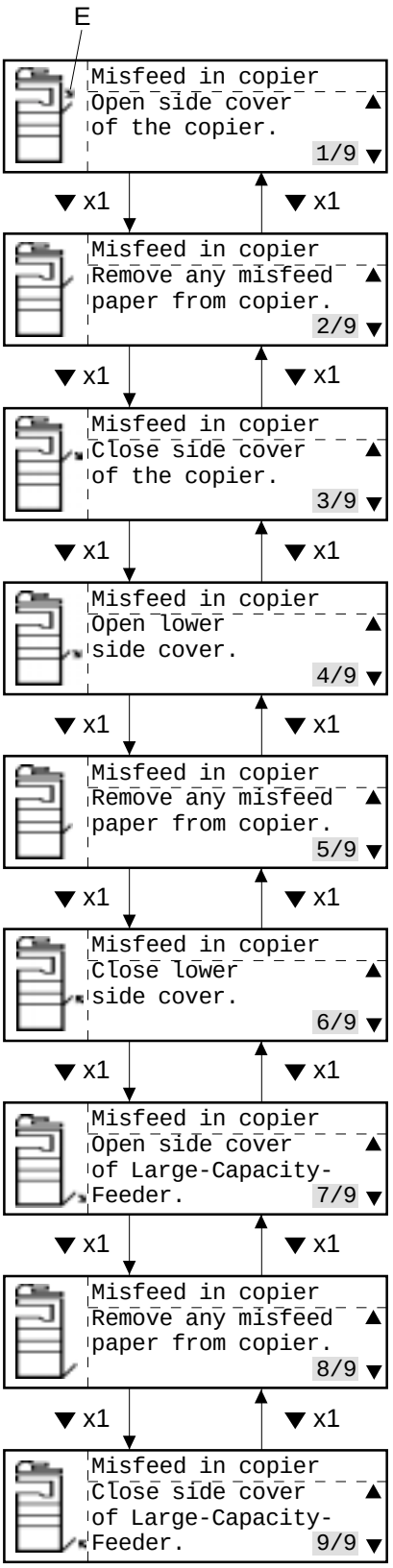


Fig. 5-2-6 Misfeed in copier (LCF)

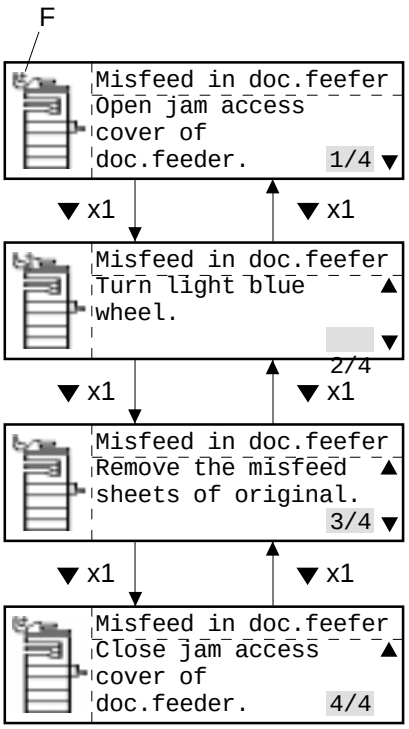


Fig. 5-2-7 Misfeed in doc. feeder (ADF)

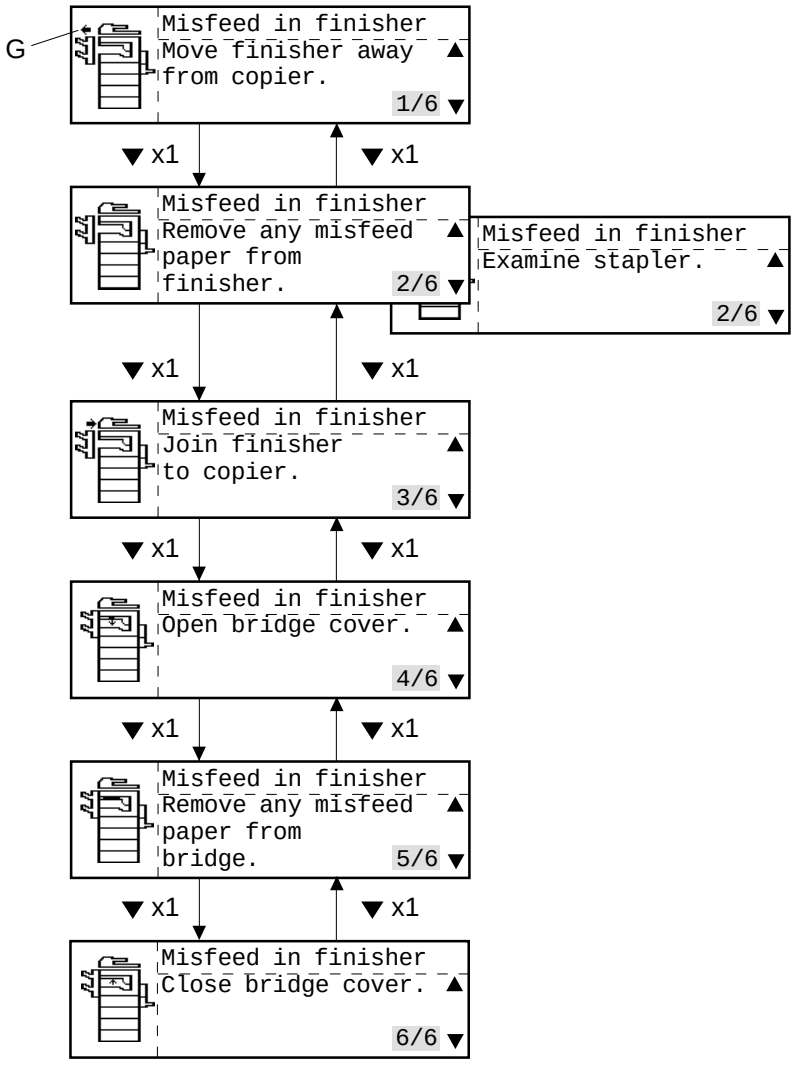


Fig. 5-2-8 Misfeed in finisher (Finisher)

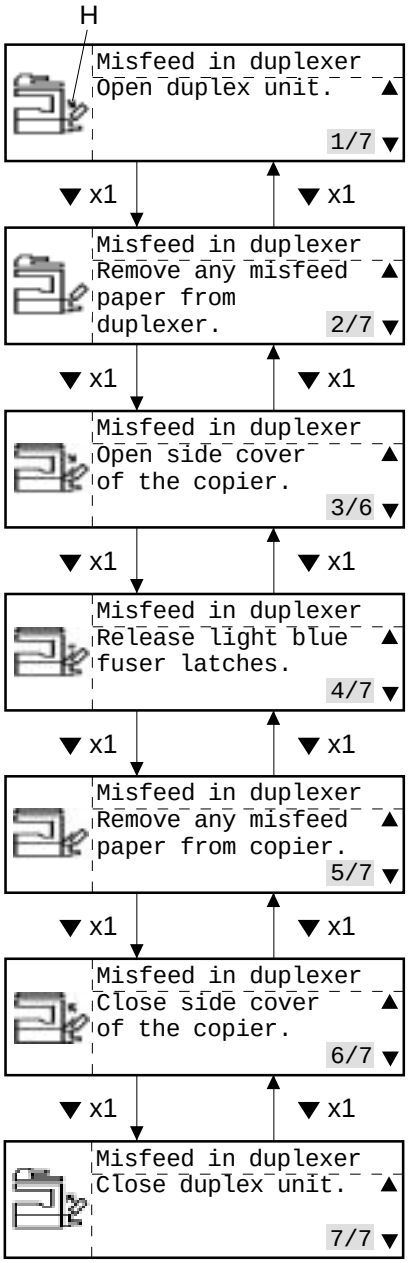


Fig. 5-2-9 Misfeed in duplexer (ADU)

5.3 Relation between Copier Conditions and Operator's Actions

Condition	START key	CLEAR/STOP key	FUNCTION CLEAR keys	Zoom keys	LIGHT/DARK key	PAPER SUPPLY key	Interrupt key	Energy saver key
Warm-up	○	○	○	○	○	○	-	-
Copy ready	○	○	○	○	○	○	○	○
Copying	-	○	-	-	-	-	○	-
Lack of paper	-	○	○	○	○	○	○	○
Lack of toner	-	-	-	-	-	-	-	-
Manual feed jammed	-	-	-	-	-	-	-	-
Toner bag replaced	-	-	-	-	-	-	-	-
Paper jammed in the unit	-	-	-	-	-	-	-	-
Serviceman call	-	-	-	-	-	-	-	-
Interrupted	○	○	○	○	○	○	○	-

○ : Performs the action or indication according to the operation

- : Ignores the operation

(1) Energy saver conditin is released by pressing the Super Energy saver key.

(2) Avoid switching the exposure during copy operation.

(3) Function of the Clear/Stop key are as follows according to the machine condition.

Copy operation ..... Stop the copy operation.

Except for case of copy operation ..... Press the key once to return the number placed to "1".

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5.4 Description of Operation

5.4.1 Dot matrix LCD circuit

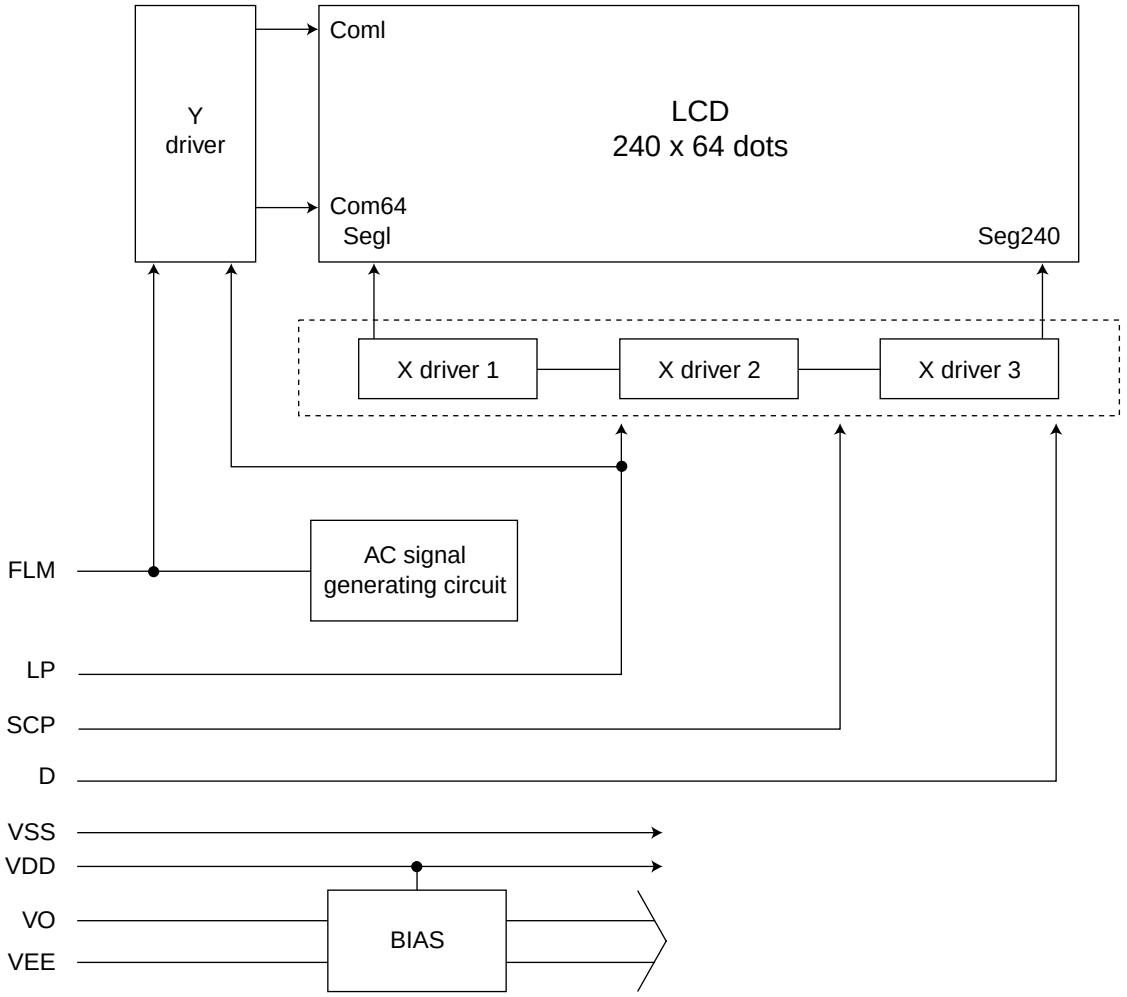
(1) Structure

The HLM6244 is an STN black & white mode transmission type LCD with a 240 X 64 dots display capacity. It includes driver LSI, a frame and PC board.

STN: Super Twisted Nematic



(2) Block diagram



(3) LCD drive operation

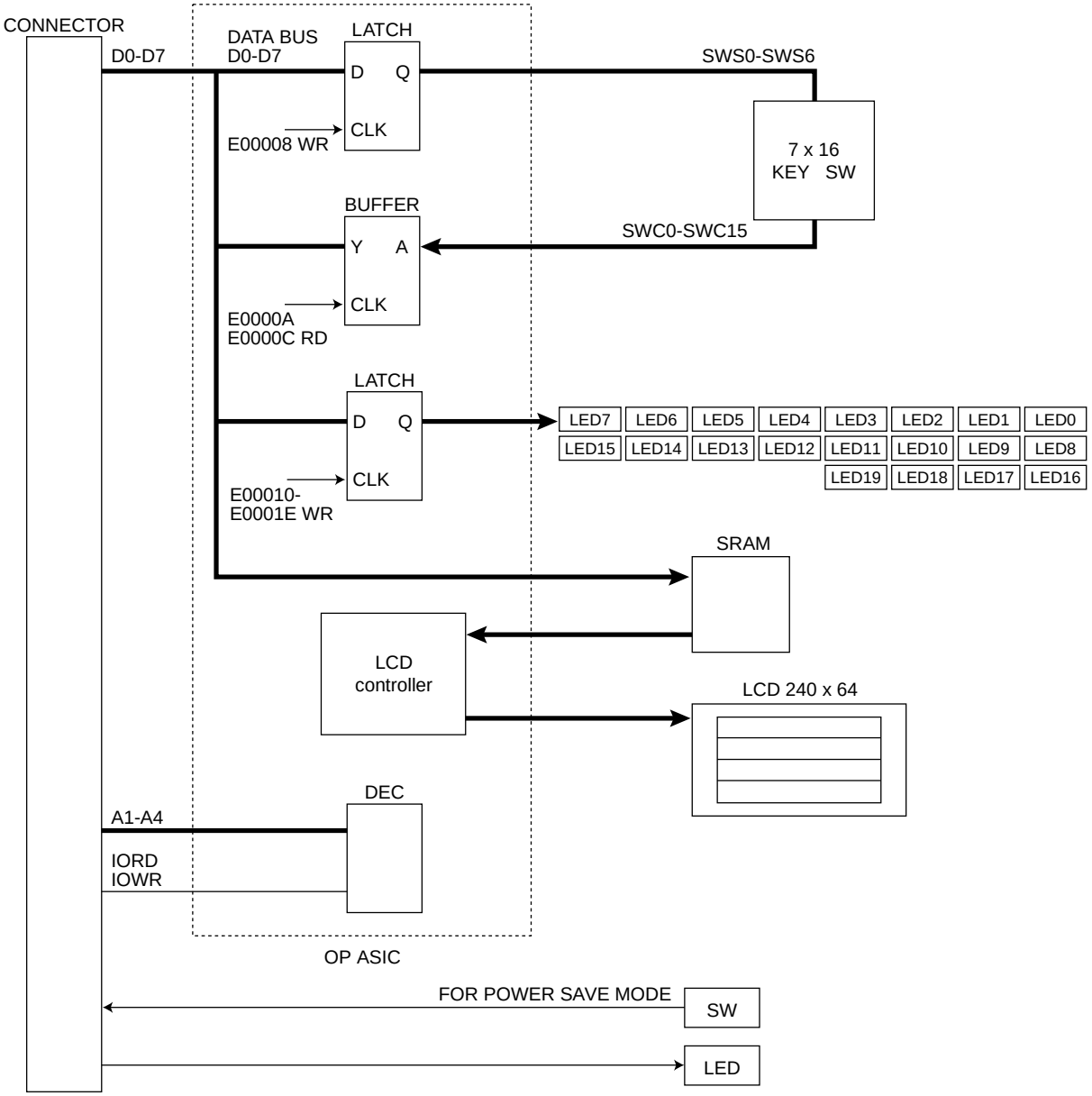
The following describes the drive operation to display the message “READY”.

① The Main CPU requests the data for displaying “READY” from the PROM.

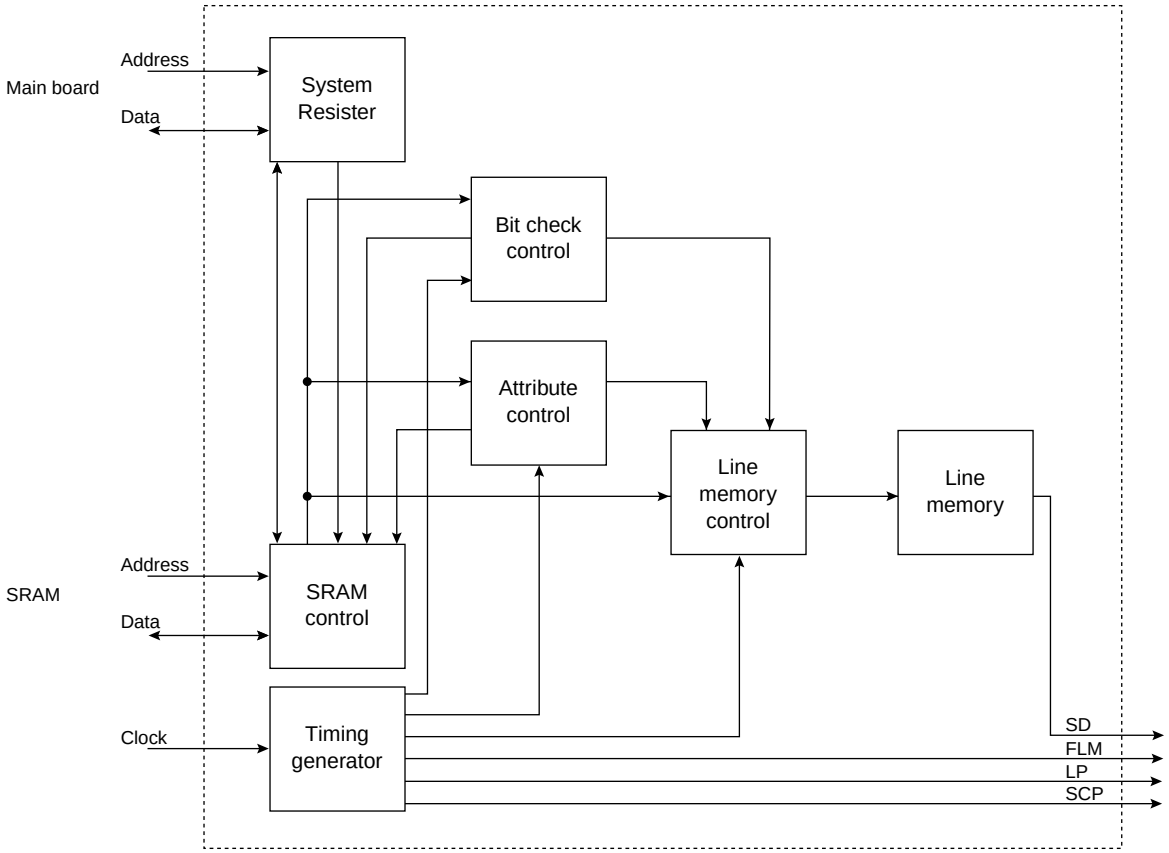
② The PROM outputs the data for displaying the message to the Main CPU.

③ The Main CPU writes to RAM the data to be displayed on the LCD.

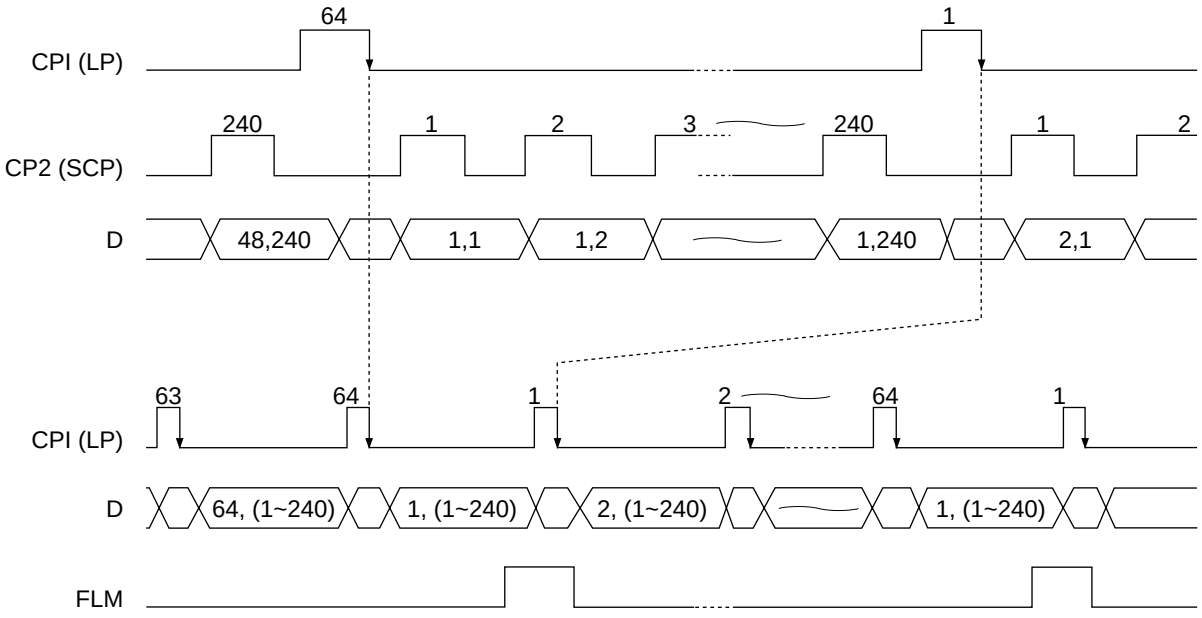
④ The LCD controller/driver reads the display data from RAM, and outputs
The data to the LCD.



(4) LCD Controller Block Diagram

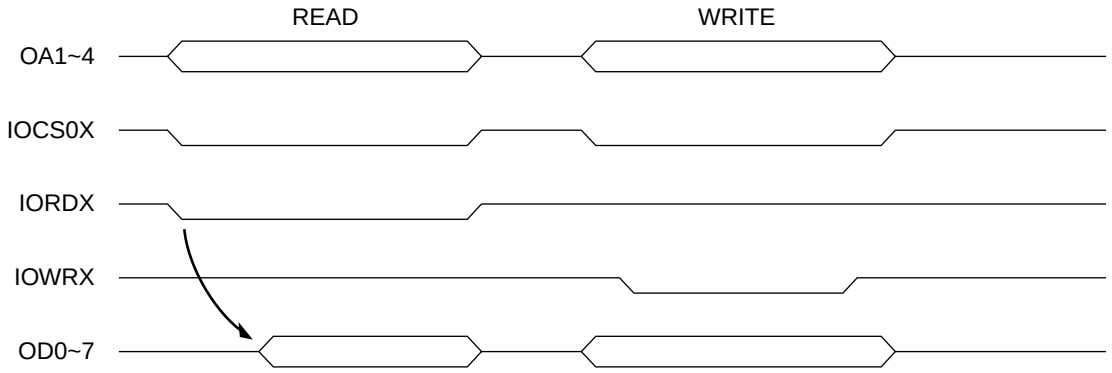


(5) Data Transmission Method



5.4.2 LED display circuit

(1) Timing chart of LED display

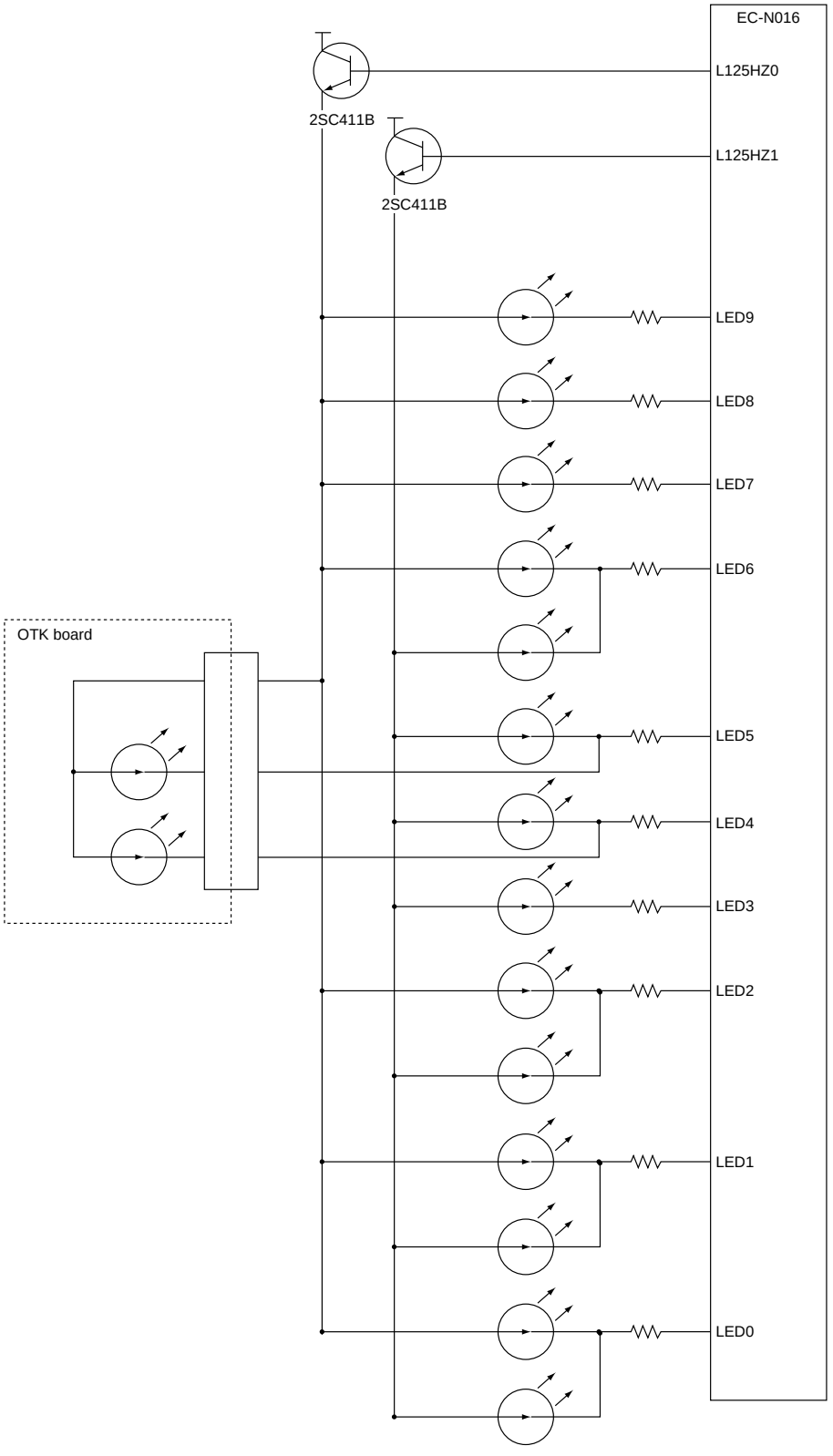


(2) The circuit is controlled ad shown below.

① The transistor connected to the LED anode is ON.

② The output connected to the cathode of the LED is the level “L”.

The LED comes ON when both ① and ② above are satisfied.



6. IMAGE PROCESSING 6-1

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6. IMAGE PROCESSING

6.1 Introduction

The following diagram shows the processes on the digital copier, from the scanning of the original up to transfer onto the photosensitive drum.

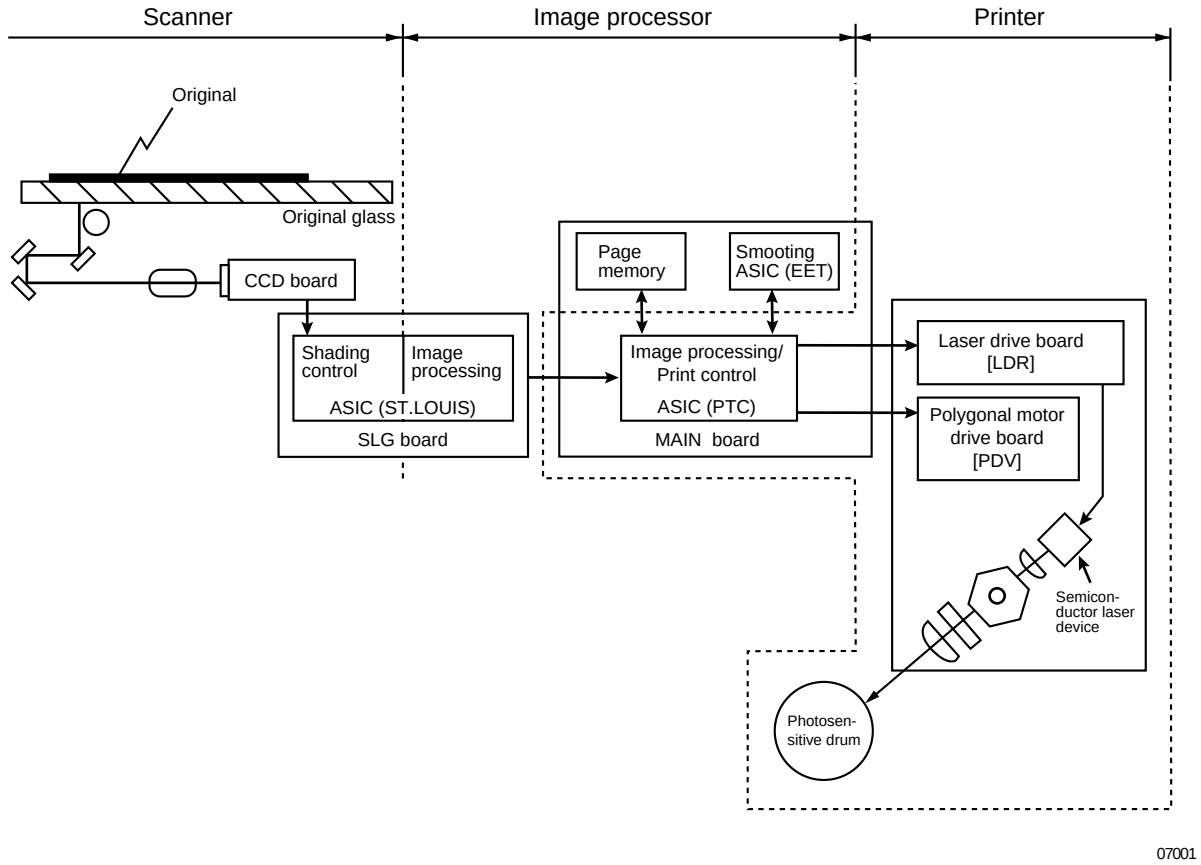


Fig. 6-1-1

The following table describes the board and its functions for image processing.

Board	No. of ASIC	Function
SLG Board	1	High quality image processing, image memory editing, editing processing, gamma correction processing, tone processing, and external output systems interface
MAIN Board	2	Image area control, laser relation control, smooting processing

6.2 Image Processing Circuit

(1) Outline

This digital copier scans optically the original placed on the original glass and reads an original image using the CCD (charge coupled device), and converts the image into electrical signals. The electrical signals are A/D converted into digital signals and output from the CCD board as image signals. The image signals from the CCD board are input to the image processing section where shading correction (compensation for variance in the CCD or the light source) and various image-processing operations are performed. The results are output to the printer.

(2) Image Processing Circuit on the SLG Board

The SLG board contains an image processing ASIC which implements the following functions.

<Functions>

High quality image processing, image memory editing, editing processing, gamma correction processing, tone processing and external output system interface

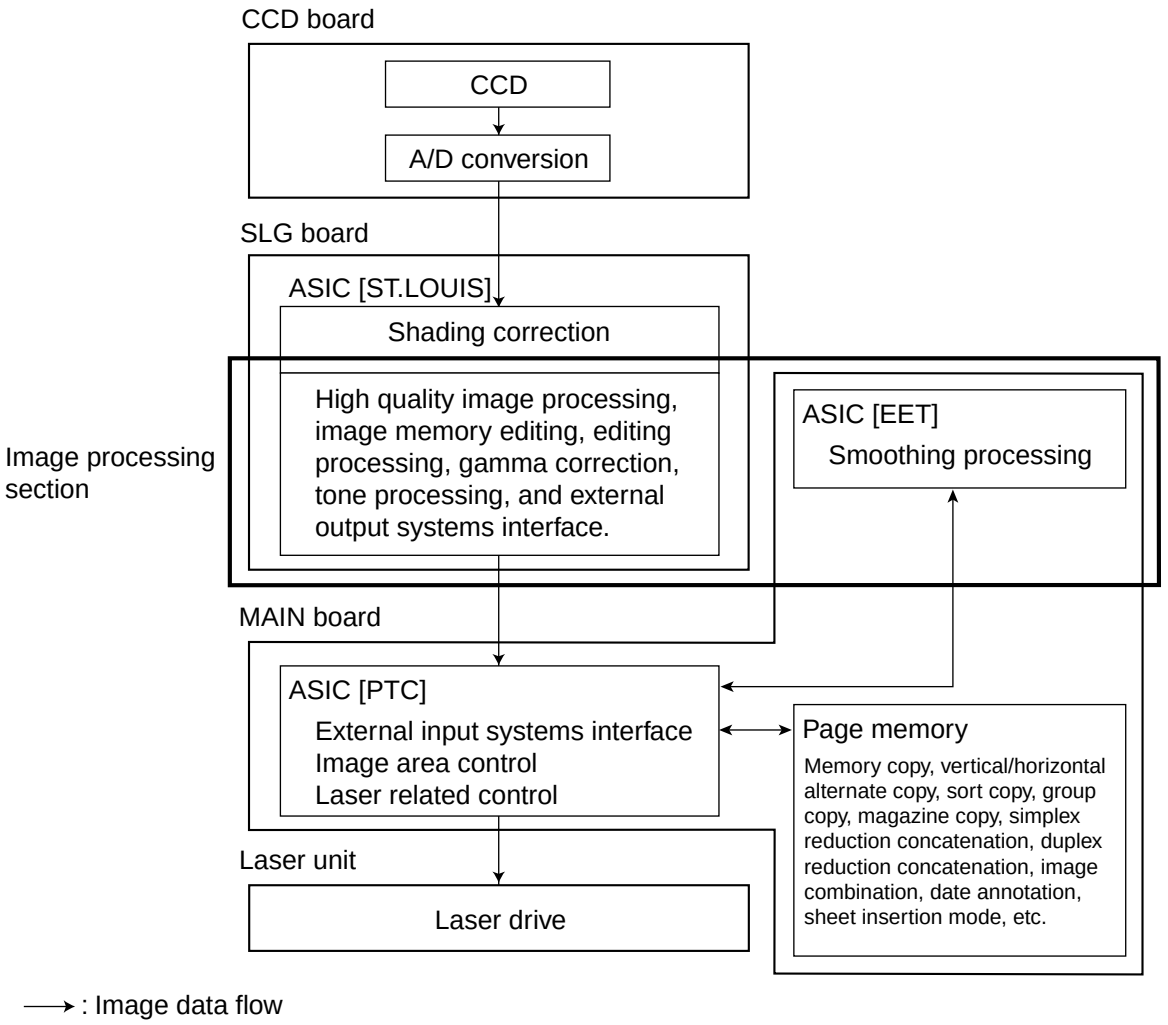


Fig. 6-2-1

07002

6.3 SLG Board

6.3.1 Features

(1) The image processing ASIC is controller by the CPU on the SLG board.

(2) The SLG board implements the following image processing functions.

- High quality image processing
- Image memory editing
- Editing processing
- Gamma correction processing
- Tone processing
- External output systems interface

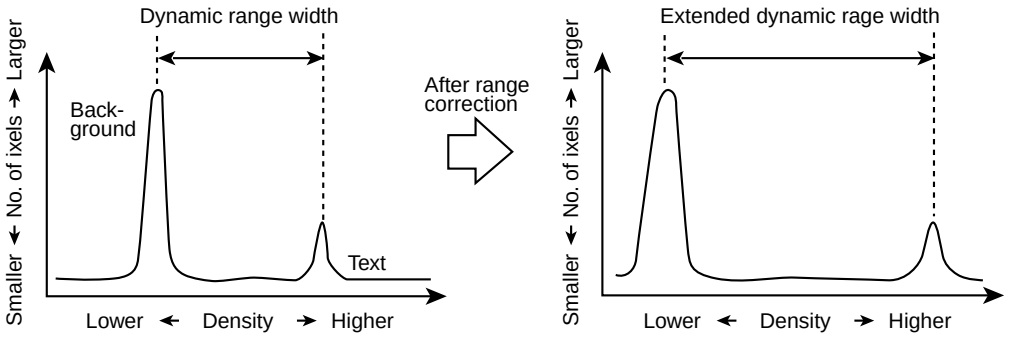
6.3.2 Functions of the image processing circuit

The image processing ASIC installed on the SLG board implements the following functions.

(1) High quality image processing

A. Range correction

This function converts the image signal to density range width and corrects it to match each original. When making a copy of originals with a certain level of background such as newspapers, this function can reduce the background density.



07003

Fig. 6-3-1 Histogram

(2) Filtering

This function uses a low-pass filter circuit and a high-pass filter circuit.

(a) Low-pass filter circuit

By averaging the differences between the target pixel and its adjacent ones, the circuit eliminates image and electrical noise as well as restricts moire to obtain an image with high reproducibility of the original.

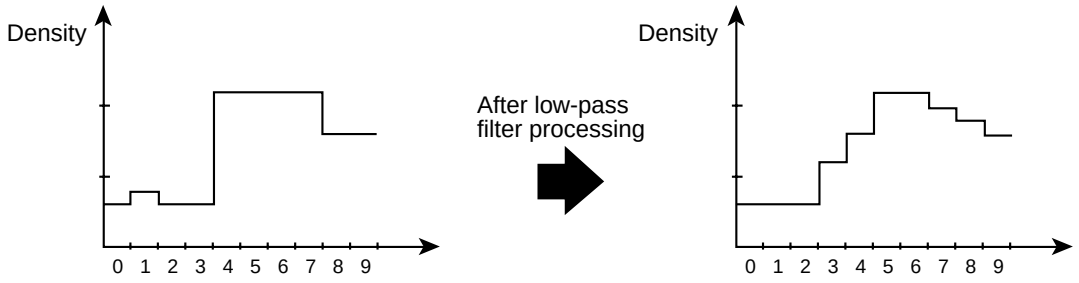
For example, assuming the density of the target pixel position to be x, and the densities of its front and back positions to be a and b, respectively, the density of the target pixel position x' after low-pass filter operation is given as follows.

For (3 x 1) matrix:

a	x	b

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

The above operation is performed for all pixel positions to accomplish high original reproducibility. The following figure shows the low-pass filtering processing on the primary scanning pixel.

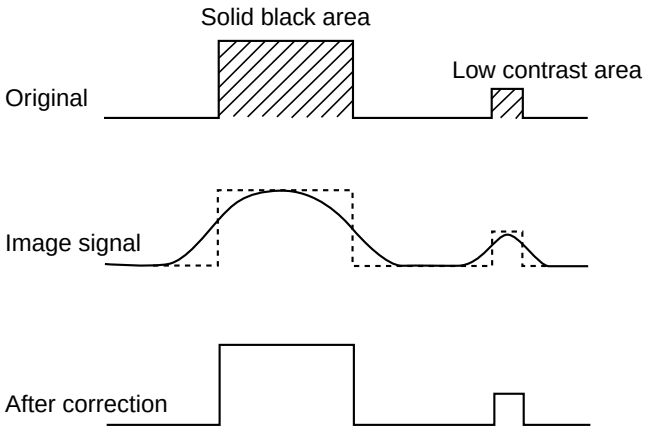


07005

(b) High-pass filter circuit

When an original with sharp image edges (text originals, etc.) is optically scanned and its image signals are output through the CCD, the edges tend to become dull due to the characteristics of the lens used and other reasons.

To compensate for this phenomenon, edge enhancement operation is performed on the differences in density between the target pixel and its adjacent ones to obtain an image with high reproducibility of the original.



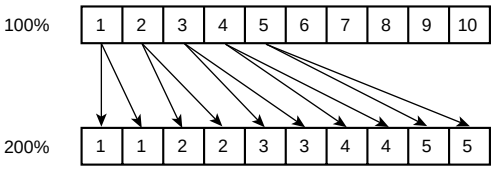
(3) Image memory editing

Editing functions such as enlargement/reduction and mirror image are performed using line memory. The line memory is used for storing one line of pixel data in the primary scanning direction, and updated with new pixel data each time the next line is scanned.

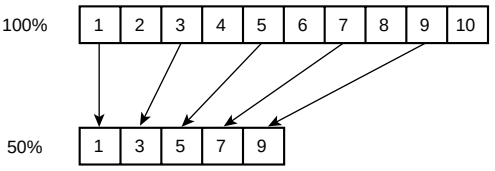
(a) Enlargement/reduction

This function is accomplished by using line memory control in a part of operations.

<Example> Enlargement



<Example> Reduction



(b) Mirror image

This function reverses the right side and the left side in the primary scanning direction of the original and outputs this reversed image.

(4) Editing processing

This function reverses image data from negative to positive or vice versa on the entire area.

(5) Gamma correction

This function corrects input/output characteristics of the scanner/printer to obtain image signals having input/output characteristics suitable for the copy mode.

(6) Tone processing

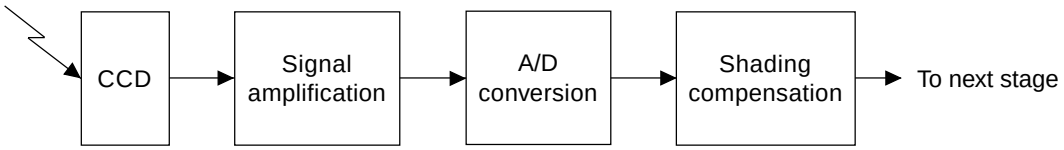
This function processes tone to faithfully reproduce halftone images such as photographs.

(7) External output systems interface

This function controls output interface of the MAIN board.

6.4 Scanner

Light reflected from the original surface is picked up by the CCD (Charge Coupled Device) where photo-voltaic conversion is carried out. By photo-voltaic conversion, optical image data are converted to electrical signals. These analog electrical signals are then converted to digital signals by A/D conversion, and the required image processing is carried out on these digital signals.



(1) Photo-voltaic conversion

Optical signals from the original are converted to electrical signals by the CCD device. For details, see Chapter 7, 6-1.

(2) Signal amplification

After conversion by the CCD, the electrical signals are amplified.

(3) A/D conversion

Analog signals are converted to digital signals.

(4) Shading correction

The signals picked up by the CCD device are compensated. For details, see Chapter 7, 6-2.

6.5 Printer

Image signals processed on the Main board are processed on the print-control ASIC and the laser drive board on the same Main board. Then, they are laser-controlled for the write operation.

(1) Setting of effective image area ..... • The top, bottom, left and right margins are set.

(2) Synchronization Clock Generation block of horizontal synchronizing signal (HSYNC) ..... • HSYNC and the reference clock signal at printer block synchronized with the signal.

(3) Laser drive block ..... • ON/OFF control of the semiconductor laser and APC (Auto Power Control) control.

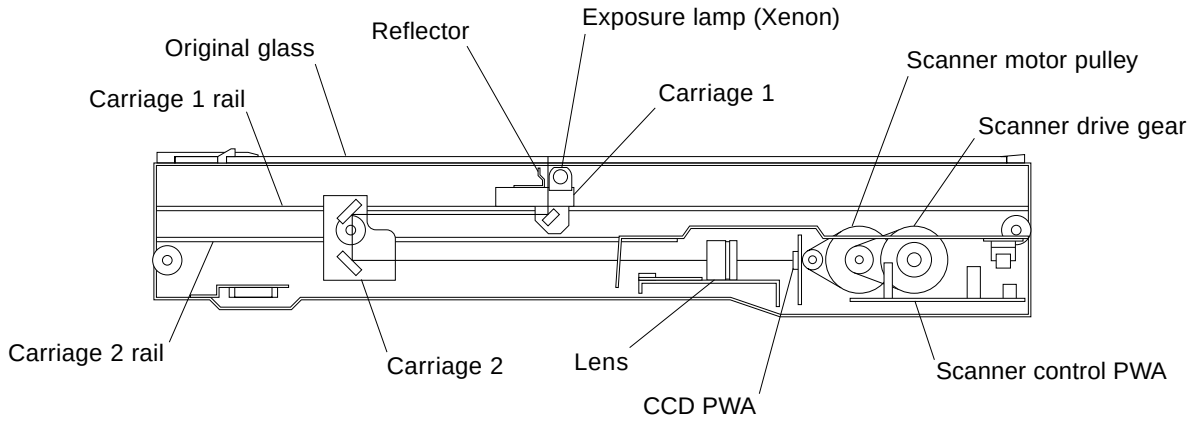
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7. SCANNER

7.1 Functions

In this copier's scanner, light is directed at the surface of the original, and the light reflected from the original projects to the CCD (Charge Coupled Device) by means of mirrors, lens and a slit. Photo-voltaic conversion by this CCD converts optical image data to electrical signals. These resultant analog signals undergo A/D conversion to be converted to digital signals. These digital signals undergo various compensation processes to create the required image. These digital signals are computed and processed, and then sent to the printer.



08-01-01

7.2 Configuration

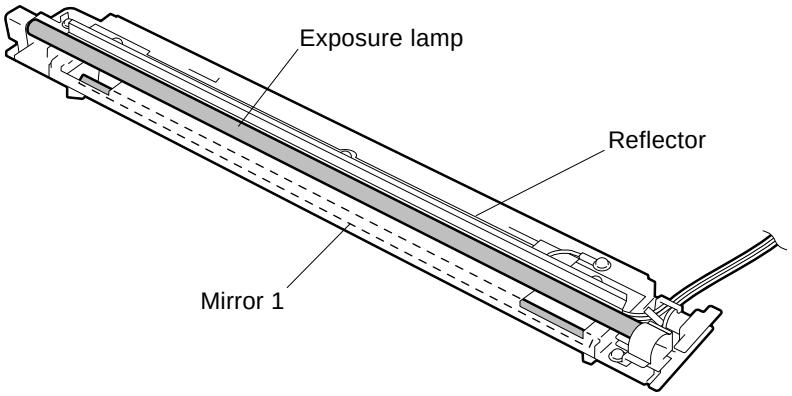
The following describes the configuration of the optical system and the purpose of its components.

(1) Original glass

The original glass is for placing the original. The original is illuminated by light from the exposure lamp passing through the original glass.

(2) Carriage 1

Carriage 1 is driven by the scanning motor to scan the original, and is made up of the following parts:



Carriage 1

08-02-01

a. Exposure lamp

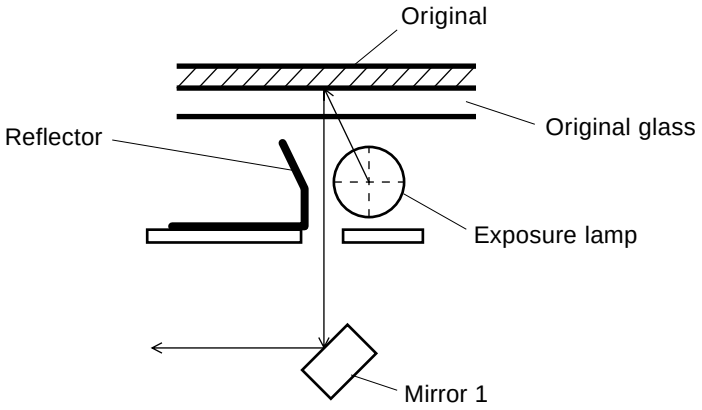
The exposure lamp emits the light for illuminating the original. (Xenon lamp)

b. Reflector

The reflector is for efficiently directing light from the exposure lamp onto the surface of the original.

c. Mirror 1

Mirror 1 is for guiding light reflected from the original to mirror 2. Mirror 2 is described later on.

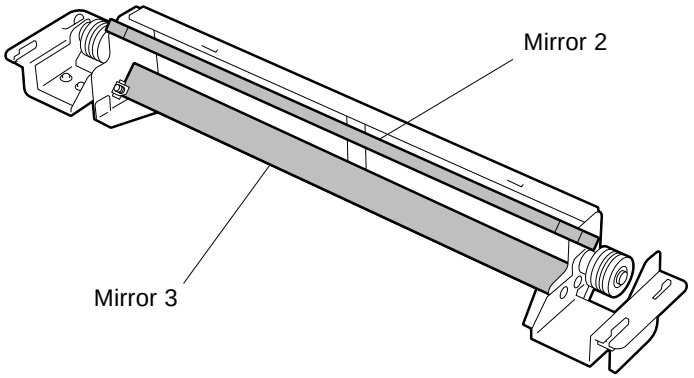


08-02-02

(3) Carriage 2

Carriage 2 leads light reflected from mirror 1 to the lens by mirrors 2 and 3, and is made up the following:

Carriage 2 is driven by a scanning motor in the same way as carriage 1, and scans at a speed half that of carriage 1. (The distance that the carriage scans is half that of carriage 1.)



Carriage 2

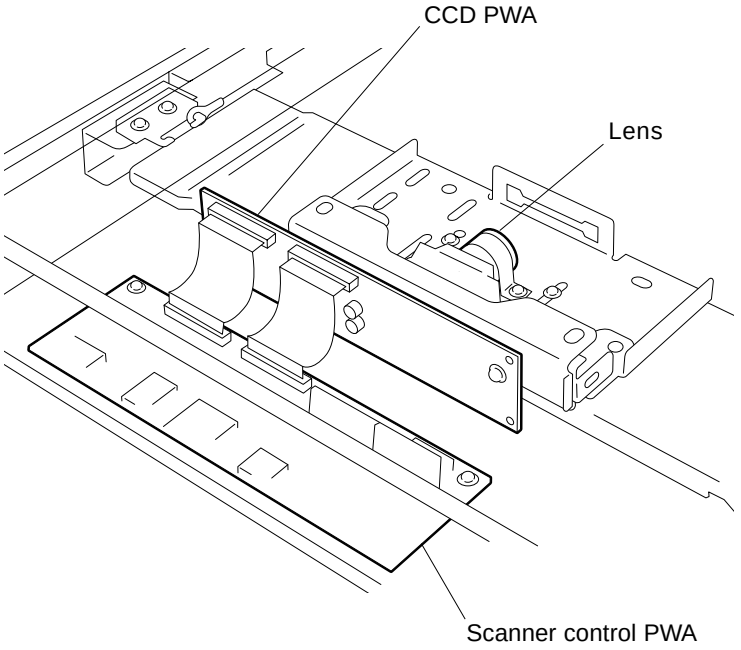
08-02-03

(4) Lens → CCD

Light reflected from mirror 3 is projected to the CCD. The CCD is located at the focal point of a fixed lens.

(5) CONTROL

The Image processing board performs image processing (amplification, mixing and A/D conversion of electrical signals obtained by photo-voltaic conversion by the CCD).

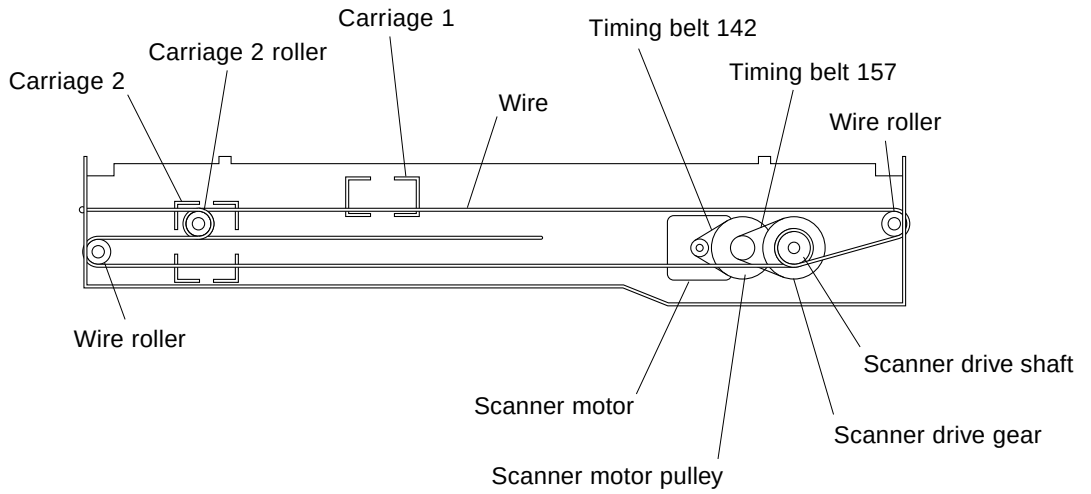


08-02-04

(6) Automatic original detection unit (DP2000/2500 series)

The automatic original detection unit (APS sensor) uses sensors located in front of the lens cover and on the base frame for detection of the size of the original without the process of scanning.

7.3 Scanner Motor Operation

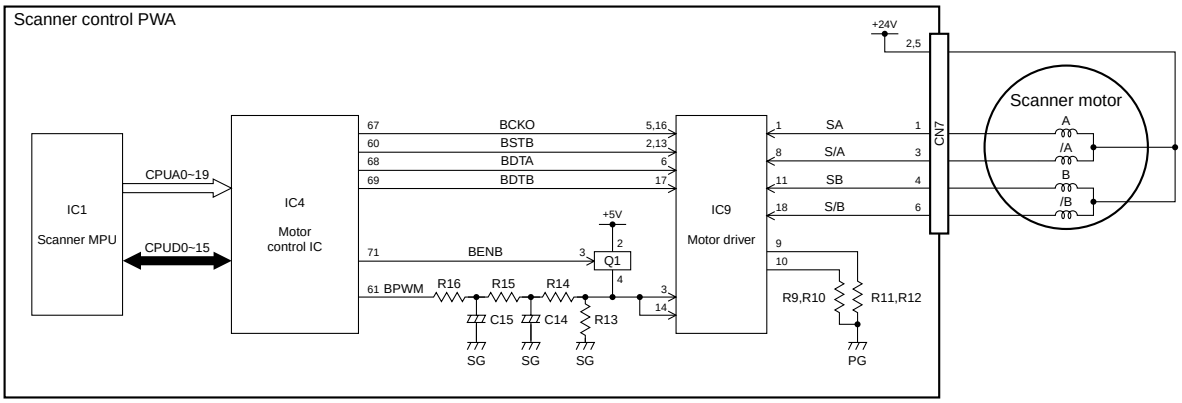


Rotation of the scanner motor is transmitted to carriages 1 and 2 via the timing belt and carriage drive wire. First of all, carriages 1 and 2 moves to the home position. Home position is detected by carriage 1 passing the home position sensor. Carriages 1 and 2 then scan the original when the [START] key on the control panel is depressed.

7.4 Scanner Motor Drive Circuit

The drive circuit is mainly comprised of the following:

- Scanner MPU(IC1)
- Motor control IC (IC4)
- Motor driver (IC9)
- Current detection resistors (R9 to R12)



08-04-01

- Process of Excitation -

① IC4 turns the BENB signal to the HIGH level to turn off Q1.

② IC4 sends the BPWM signal (current value setting signal) to IC9.

③ IC4 sends BCKO (Clock Signal), BDTA/BDTB (Serial Data Signal A/B), and BSTB (Strobe Signal) to IC9 based on the register settings (rotational direction (CW/CCW), excitation method (2-/1-2-/W1-2-/2W1-2-Phase), and clock (double-edge/single-edge)).

④ IC9 allows current to flow through each phase of the motor (A, /A, B, /B) based on the timing of BCKO, BDTA, BDTB, and BSTB, thereby driving the motor.

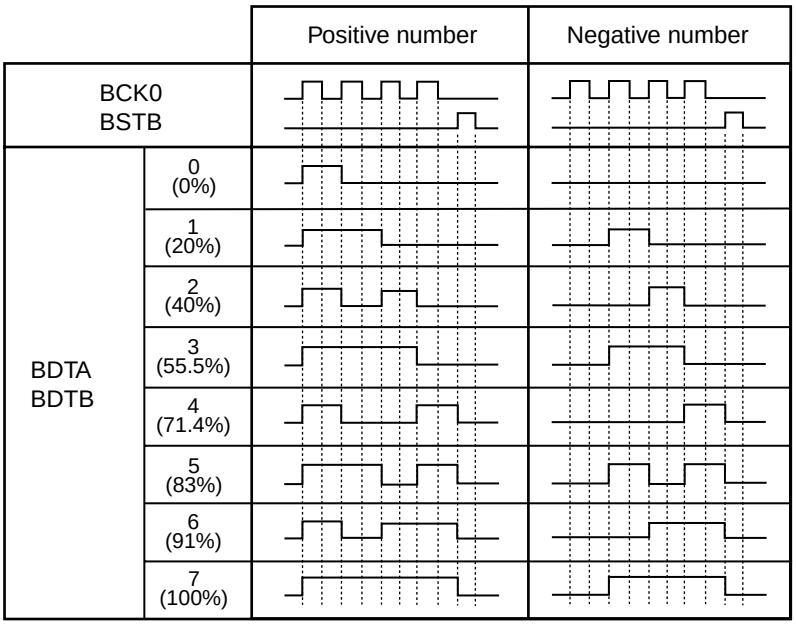
⑤ The current flowing through the motor flows from R9 to R12 to generate voltage. This voltage is compared with the voltage set by the BPWM signal in IC9 and the current to flow through the motor is controlled based on its result.

The relations between the motor drive condition and each output of the BDTA/B signal, BCKO signal, and BSTB signal are shown below.

Relations between motor drive condition and output signal pattern

Excitation method	Rotation direction	Serial Data	Output signal pattern																													
			Reset	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
2	CW	BDT	4				-4								-4								4								4			
		BDTB	4					4							-4								-4								4			
	CCW	BDTA	4				4								-4								-4								4			
		BDTB	4					-4							-4								4								4			
1-2	CW	BDTA	4		-0				-4				-7					-4			0				4			7				4		
		BDTB	4			7				4				-0				-4				-7				-4			0				4		
	CCW	BDTA	4		7				4				0					-4			-7				-4			-0				4		
		BDTB	4			0				-4				7				-4			0				4			7				4		
W1-2	CW	BDTA	4		2		-0		-2		-4		-6		-7		-6		-4		-2		0		2		4		7		6		5	
		BDTB	4		6		7		6		4		2		0		-2		-4		-6		-7		-6		-4		-2		0		2		4
	CCW	BDTA	4		6		7		6		4		2		0		-2		-4		-6		-7		-6		-4		-2		-0		2		4
		BDTB	4		2		0		-2		-4		6		-7		-6		-4		-2		-0		2		4		6		7		6		5
2W1-2	CW	BDTA	4	3	2	1	-0	-1	-2	-3	-4	-5	-6	-7	-7	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	7	7	6	5	4
		BDTB	4	5	6	7	7	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-7	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
	CCW	BDTA	4	5	6	7	7	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-7	-7	-6	-5	-4	-3	-2	-1	-0	1	2	3	4
		BDTB	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-7	-7	-6	-5	-4	-3	-2	-1	-0	1	2	3	4	5	6	7	7	7	6	5	4

Output signal pattern



08-04-02

7.5 Exposure Lamp Control

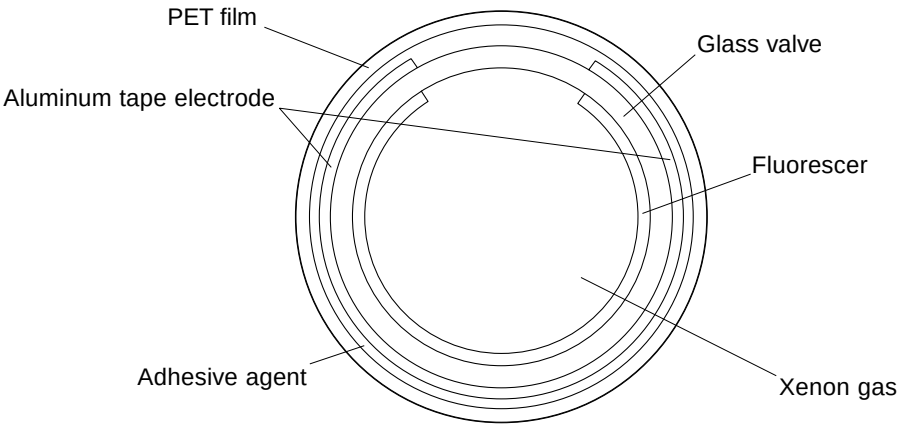
7.5.1 Exposure lamp

External electrode type Xenon fluorescent lamp is used as an exposure lamp in this copier.

(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.

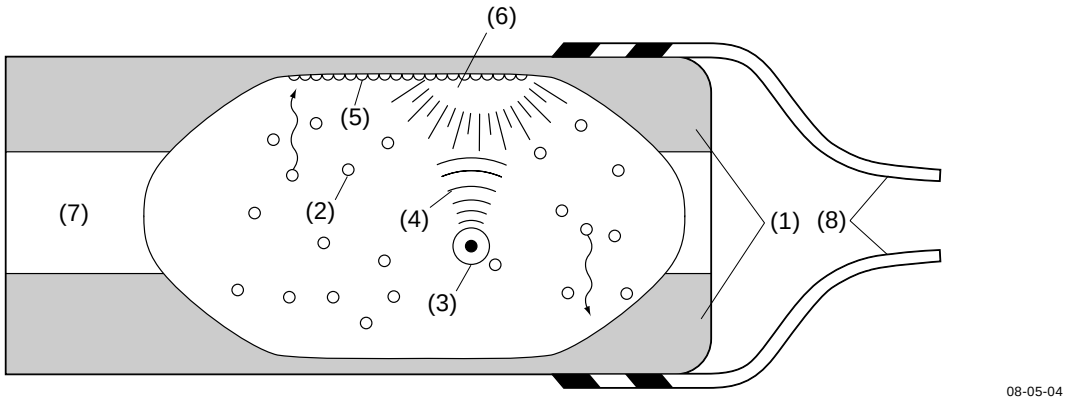


(2) Behavior inside the lamp

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 ray
(5)Fluorescer (6)Visible light (irradiated from the opening to outside the pipe)
(7)Opening (8)Harness

7.5.2 Exposure Lamp Control Circuit

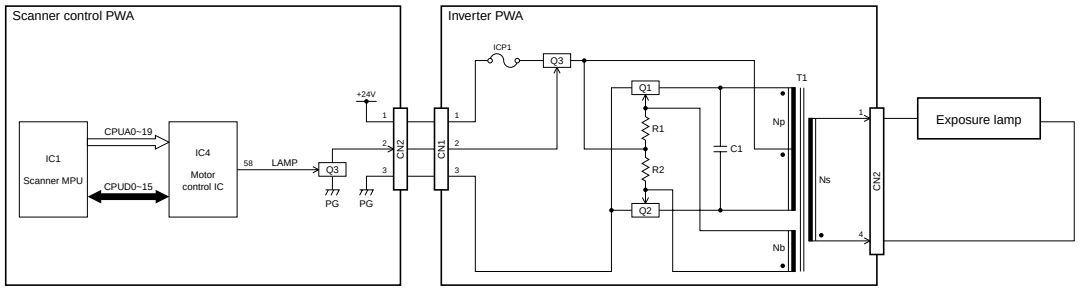
This circuit is made up of the motor control IC (IC4), and the transformer, capacitor and other peripheral elements on the Inverter PWA and controls the lighting of the exposure lamp.
The circuit configurations are different on the DP1600 series and DP2000/2500 series.

DP1600 series

① The motor control IC (IC4) turns the LAMP signal to the HIGH level.
② The transistor (Q3) turns on and the LAMP signal turns to the GND level.
③ The transistor (Q3) on the Inverter PWA turns on to apply +24V to the Inverter PWA.
④ The transistors (Q1, Q2) are biased by the starting resistors (R1, R2). At this time, either of Q1 and Q2 turns on due to the transistor characteristics.

The following explains a case where Q1 has turned on.
If Q2 has turned on, Q1 and Q2 should be substituted for each other.

⑤ Bias voltage of Q1 is produced in the Nb winding of the transformer (T1) to allow Q1 to completely turn on. At this time, Q2 turns off because it is reverse biased.
⑥ When current flows through T1, the primary circuit resonates due to the Np winding and capacitor (C1). This causes the bias voltage of the Nb winding to be reversed.
⑦ Q1 turns off due to the reverse bias voltage and Q2 turns on.
As Q1 and Q2 turn on and off alternately in this way, high-frequency voltage is produced in the primary circuit of T1. This voltage is boosted by the Np winding and Ns winding and supplied to the exposure lamp for lighting.



08-05-01

DP2000/2500 series

① The motor control IC (IC4) turns the LAMP signal to the HIGH level.

② The transistor (Q3) turns on and the LAMP turns to the GND level.

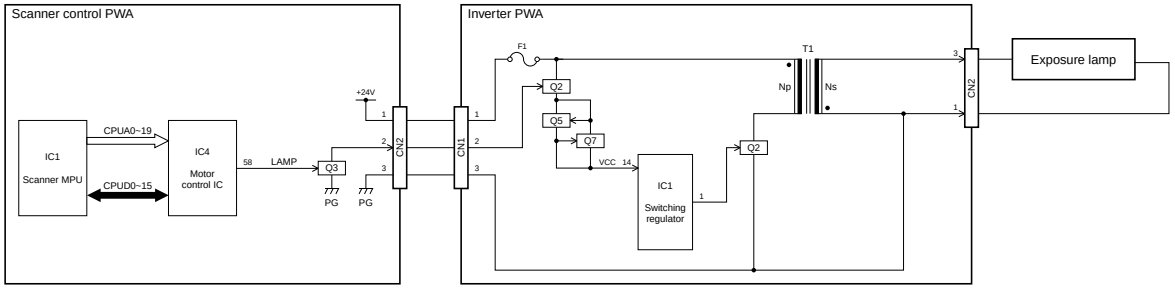
③ The transistor (Q3,Q5,Q7) on the Inverter PWA turns on to apply +24V to the switching regulator IC(IC1).

④ IC1 turns on FET (Q1).

⑤ Current flows through the Np winding of the transformer (T1) where energy is accumulated.

⑥ IC1 turns off Q1. At this time, the energy accumulated in winding Np is supplied from the Ns winding of the secondary circuit as electric power. As IC1 turns on and off Q1 in this way, high-frequency electric power is supplied from the secondary circuit of T1 and fed to the exposure lamp for lighting.

IC1 monitors the input voltage and controls the on/off time in response to the fluctuation in the input voltage. It shortens the on time of Q1 when the input voltage rises, and extends the on time of Q1 when the voltage drops.

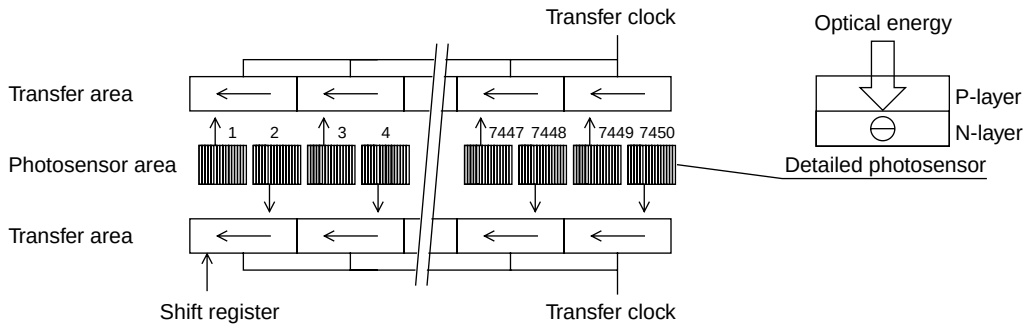


7.6 General Description of CCD control

7.6.1 Photo-voltaic conversion

The purpose of photo-voltaic conversion is to form electrical signals corresponding to the intensity of light reflected from the original. A CCD (Charge Coupled Device) is used for photo-voltaic conversion. CCDs are single-chip photo-voltaic conversion device in which several thousands of photosensing elements several microns square are arranged in a single line. This copier uses a CCD having 7,450 of these photosensing elements.

The photosensor comprises a P-layer, N-layer semiconductor. Optical energy generates a (-) (minus) charge on the P-layer proportional to the optical energy and irradiation time. The charge generated at the photosensor is transferred to the transfer area, shifted from right to left in the figure below according to the transfer clock, and is output from the CCD. During this operation, the reaction speed of the CCD is slow (it takes time for the charge to be transferred by the shift register), so even-numbered and odd-numbered image signals are output in parallel.



Principle of CCD Photo-Voltaic Conversion

08-06-01

7.6.2 Shading compensation

The following problems effect the voltage values obtained by photo-voltaic conversion by the CCD:

① As a light distribution of light source is varied.

② The reflected light is collected by a lens (the light path is shortest at the CCD center and longest at the ends), there is a difference in the intensities of light reaching the CCD.

③ The photo-voltaic capacities of each of the 7,450 CCD elements are uneven.

Consequently, these problems must be compensated. This is called "shading compensation." Shading compensation involves normalizing optical energy according to the following equation based on already known scanned black data and white data, and compensating for uneven illuminance of the image data and device unevenness.

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

where,

k: Coefficient

S: Image data before compensation

K: Black data (in black memory)

W: White data (in white memory)

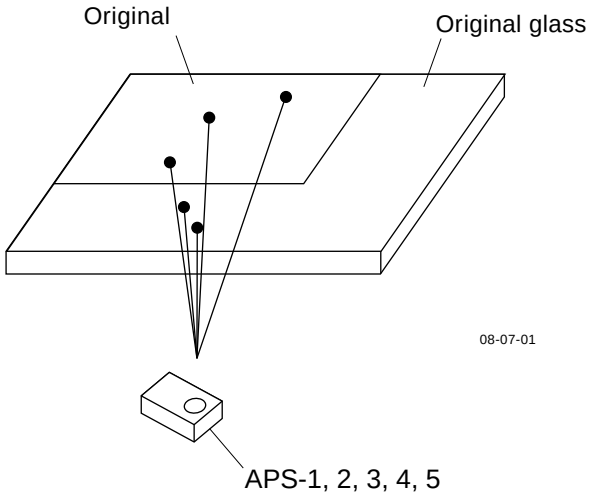
7.7 Automatic Original-Size Detection Circuit (DP2000/2500 series)

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

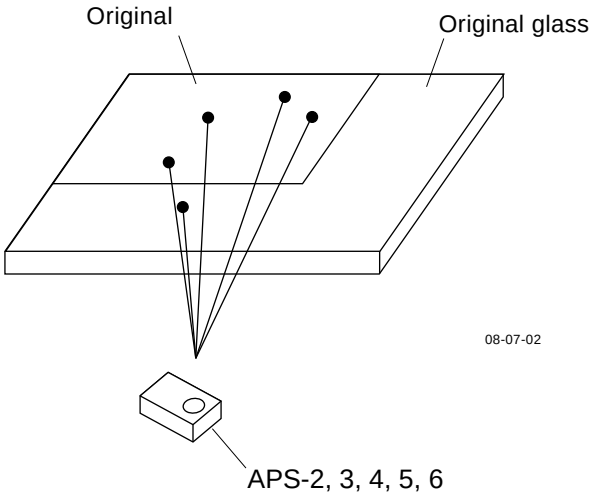
7.7.1 Principle of original-size detection

The reflection-type photosensors are located on the base frame of the optical unit. Each photosensor comprises an infrared light emitting diode (LED, light-emitting side) and a phototransistor (light-receiving side). When an original is placed on the original glass, the light emitted by the LED's is reflected by the original and led to the phototransistor. In this way, the presence or absence of an original is detected by whether reflected light exists or not.

[ASD/AUD/CND/TWD/SAD/MJD models]



[NAD model]



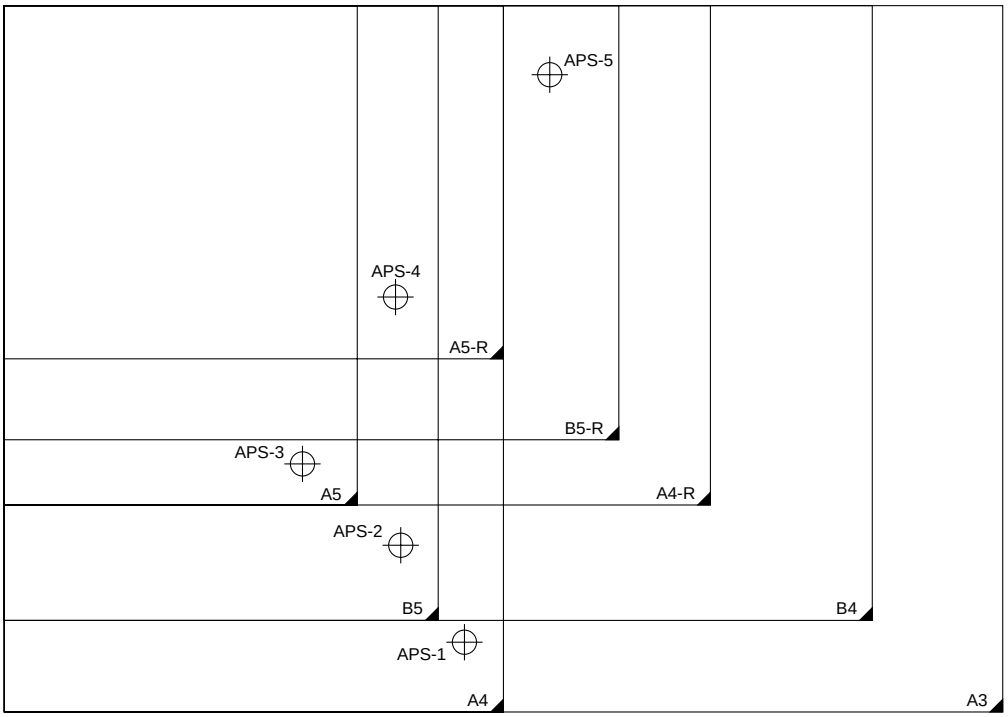
7.7.2 Original size detection

(1) If the copier is set in the original size detection mode, the carriage 1 is set at its home position.

(2) Detection is performed in an instant when the platen cover is opened, each sensor receive the reflecting light and the condition of a matrix shown in (4) are satisfied.

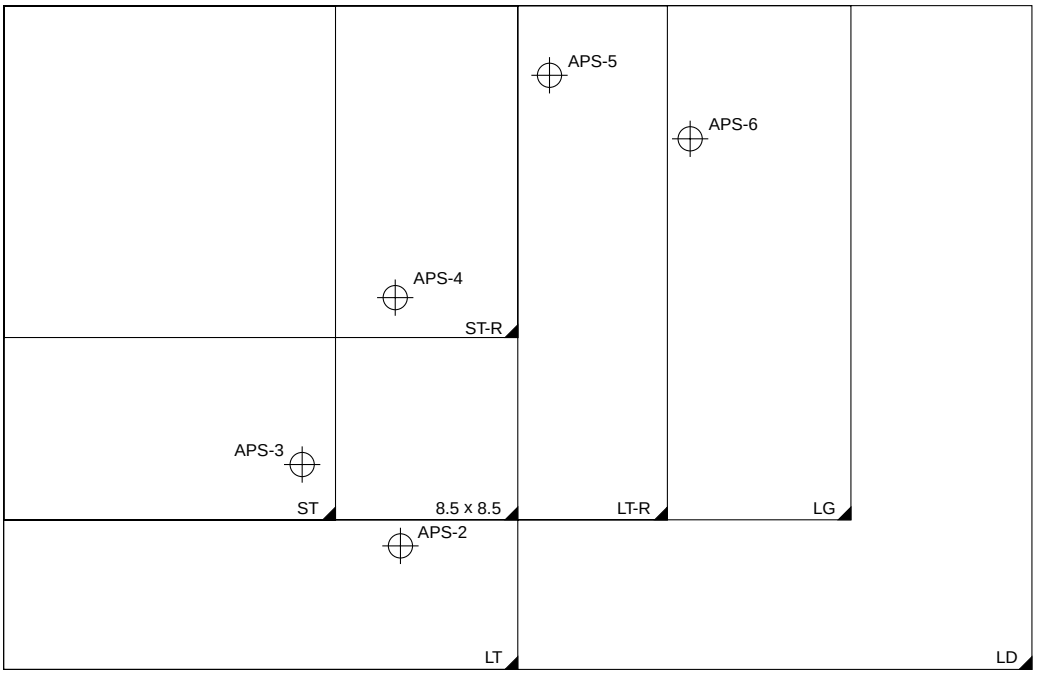
(3) Original size detection is performed when the output signals from each sensor are input to the scanner MPU (IC1) on the scanner control PWA.

[ASD/AUD/CND/TWD/SAD/MJD models]



08-07-03

[NAD model]



08-07-04

(4) Original size is determined by a combination of the presence/absence of the original at the each locations stated in step (3). Combination charts for size determination of ASD/AUD/CND/TWD/SAD/MJD models and NAD model are shown below.

[ASD/AUD/CND/TWD/SAD/MJD models]

	1 beam sensor (No.)				
	APS-1	APS-2	APS-3	APS-4	APS-5
A3	○	○	○	○	○
B4		○	○	○	○
A4	○	○	○	○	
A4-R			○	○	○
B5		○	○	○	
B5-R				○	○
A5			○		
A5-R				○	

○ : Original presence

blank : Original absence

[NAD model]

	1 beam sensor (No.)				
	APS-2	APS-3	APS-4	APS-5	APS-6
LD	○	○	○	○	○
LG		○	○	○	○
LT	○	○	○		
LT-R		○	○	○	
8.5 x 8.5		○	○		
ST		○			
ST-R			○		

○ : Original presence

blank : Original absence

* Original cover sensor=OFF

- Following judgement is performed by the APS sensor output signal.

  Size decision : The scanner MPU (IC1) sends the detected document size to the Main PWA as a size signal.

  Size not fixed : The scanner MPU sends a no-document signal to the Main PWA.

  The carriage-1 is stay on the standby position even though the reproduction ratio is changed when original size is changed.

* Original cover sensor SW=ON

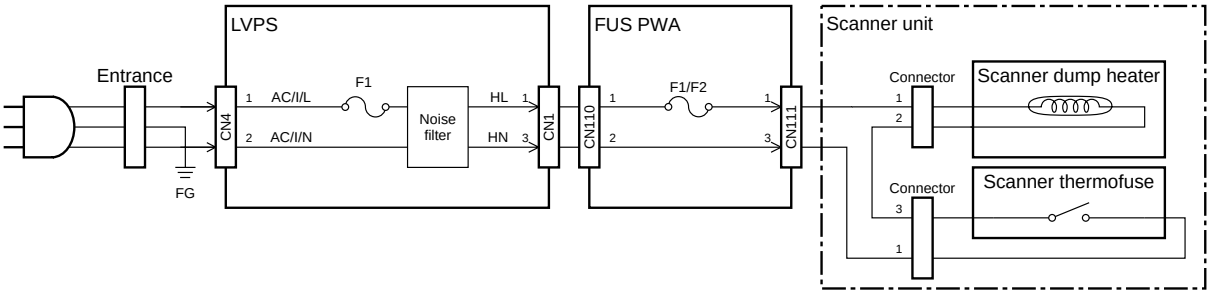
- Keep the recognized original size (or no original state) just before the original cover sensor is turned on regard-less the APS sensor output signal.

7.8 Damp Heater Control Circuit (ASD/AUD/CND/TWD/SAD models)

When the machine is stopped for hours, the scanner damp heater heats the inside of the scanner to prevent dew condensation on the original glass inner side surface, mirror, lens, and shading correction plate.

The scanner damp heater operates on AC power input from the entrance to generate heat. A scanner thermofuse is connected to the AC power supply line in series with the scanner damp heater. The scanner thermofuse detects the temperature inside the scanner unit and supplies or shuts off the AC power to the scanner damp heater according to the detected temperature.

The scanner thermofuse turns ON at 21.1°C or under, and turns OFF at 29.1°C or above. The AC power from the entrance is always delivered while this machine is connected to the commercial power outlet, regardless of the ON/OFF state of the main switch.



8. PRINTING 8-1

8.1 General Description 8-1
8.2 Structure 8-2
8.3 Laser Diode 8-6
8.4 Disassembly and Replacement 8-7

8. PRINTING

8.1 General Description

The laser scanner unit reflects the laser beam by the polygonal mirror motor and irradiates it in the scanning direction of the drum through the fθ correction lens. As the drum rotates, an electronic image is formed on the drum.

The laser scanner unit consists of the following:

- Laser unit which outputs a laser beam.
- Polygonal mirror which moves the laser beam in the scanning direction of the drum.
- fθ correction lens which makes uniform the rate at which the laser beam reflected by the polygon mirror reaches the drum.
- Polygonal mirror motor drive PWA which controls the polygonal mirror motor.
- Laser drive PWA which controls the laser beam.
- Hsync detection mirror, lens and Hsync detector which detect the Hsync signal on which the first printing position for every scanning is based.

The laser scanner unit is precisely adjusted and assembled in a clean room to avoid the entry of dust which can cause trouble. For that reason, the laser scanner unit cannot be disassembled or adjusted in the field.

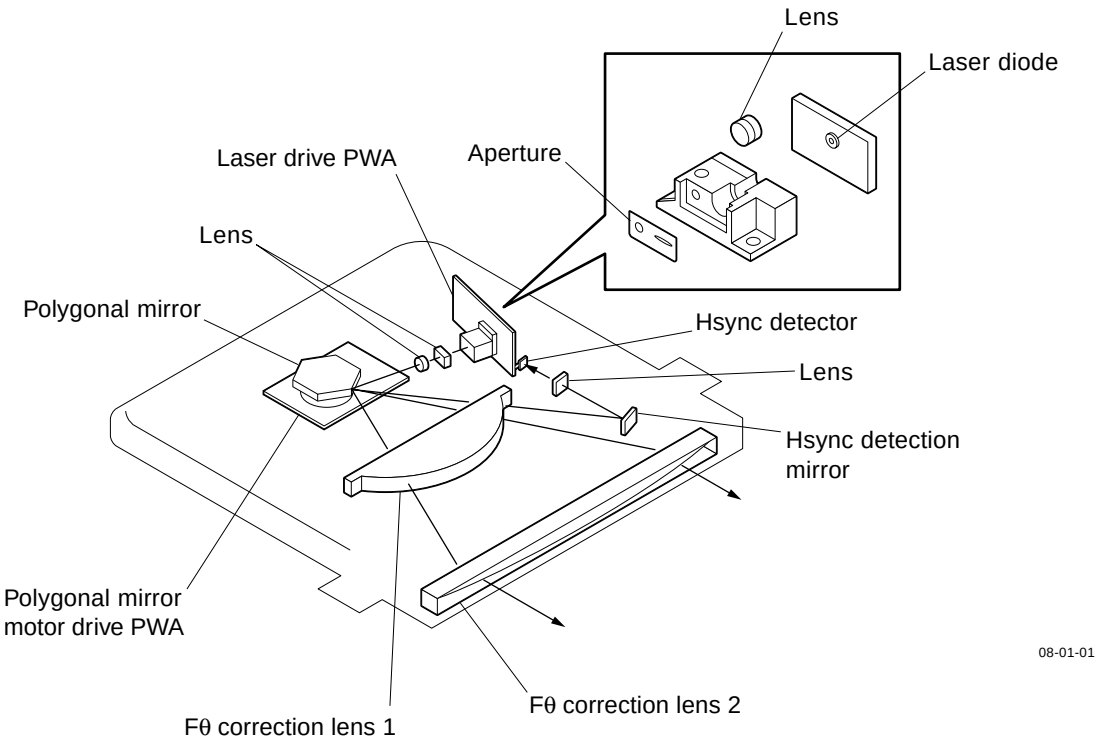


Fig. 8-1-1

8.2 Structure

(1) Laser Unit

The laser unit comprises a laser diode, finite lens and aperture.

① Laser diode

The laser diode is compact, efficient, low-price, operates on lower power, and has a long life. However, it is sensitive to heat.

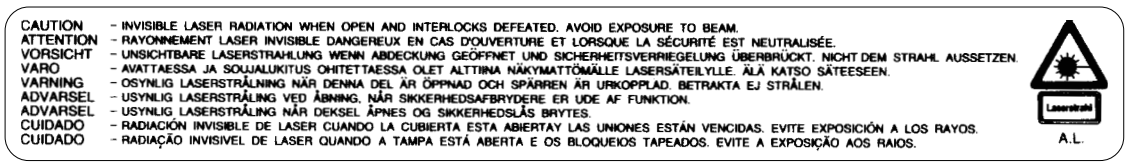
Laser diode controls emission of laser beams based on the laser control (ON/OFF) signals from the laser drive board.

② LASER SAFETY

The beam of the semiconductor laser is itself extremely weak (about 5 mW), but focusing the parallel rays results in an increase in energy to which extended exposure is hazardous.

The laser optical system of the digital plain paper copier is encased in metal which in turn is housed in the external cover. There is thus no risk of leaks during use, nor during normal servicing. Note, however, that the laser beam is not visible, and extreme care must be exercised when servicing involves focusing the laser. Such operations are hazardous and must not be attempted unless you are specifically trained to work in this area.

The warning label shown below is attached on the PU guide assembly.



08-02-01

Fig. 8-2-1

[CAUTION]

- Do not insert tools that are highly reflective into the path of the laser beam.
- Remove all watches, rings, bracelets, etc.

(2) Polygonal-Mirror Motor Unit

The polygonal-mirror motor unit comprises a polygonal mirror and a polygonal-mirror motor.

① Polygonal-mirror motor

The polygonal-mirror motor rotates the polygonal mirror at high speed.

The DC motor controls the rotation speed of the mirror as follows:

DP1600 series

600 dpi : 20,527.56 rpm

400 dpi : 13,382.60 rpm

DP2000/2500 series

600 dpi : 27,874.016 rpm

400 dpi : 18,582.677 rpm

② Polygonal mirror

The laser beams emitted from the laser diode are reflected by this mirror. As the polygonal mirror is rotated by the polygonal-mirror motor, the direction of the reflected laser light moves in sync with the rotation. The direction of movement is the primary scanning direction of the image with each single scan ending in one plane of the polygonal mirror.

As the polygonal mirror has six planes, six scans are completed in one rotation of the polygonal mirror.

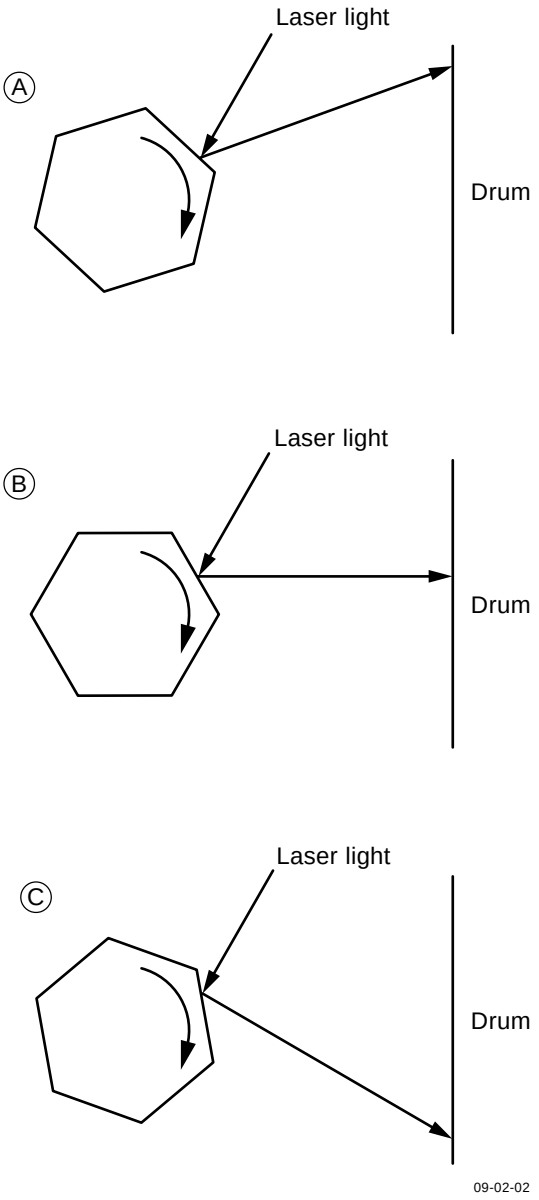


Fig. 8-2-2

One scan is completed by completion of steps Ⓐ to Ⓒ. One scan is carried out on one plane of the polygonal mirror. Six scans can be carried out with one rotation of the polygonal mirror.

(3) Lenses 1 and 2

These lenses perform the following compensations on the laser light reflected by the polygonal mirror.

① Equidistant scanning

The reflected laser light on the polygonal mirror is scanned at the same angle, because the polygonal mirror is rotated at the same speed. That is, when the scan is completed, the dot-pitch on the drum becomes the wide spaces at the both edges and the narrow spaces in the center. So, in order to regularize intervals of dots, laser light is compensated so that it is scanned on the drum at equal speeds.

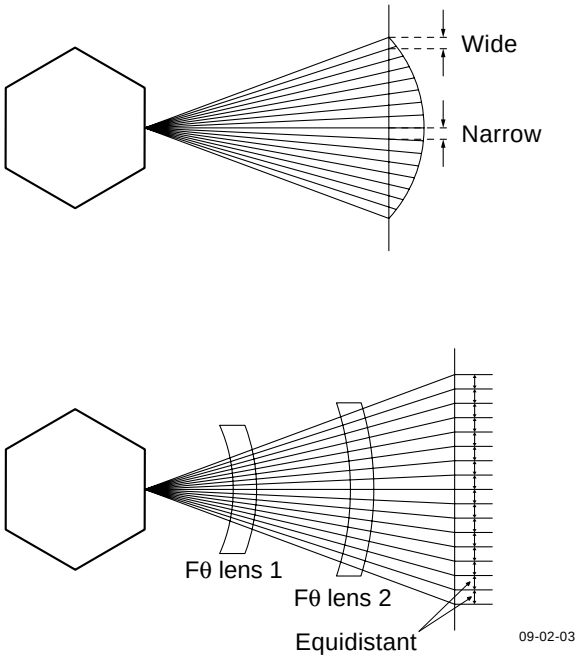


Fig. 8-2-3

② Pyramidal error compensation

The reflected face on polygonal mirror is tilted in either of two directions for the perfect vertical direction. Deviation of the laser light (for the perfect horizontal) caused by this reflected face's pyramidal error is compensated.

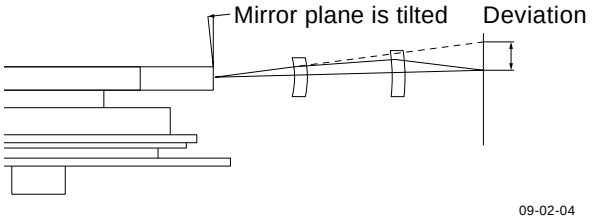


Fig. 8-2-4

③ The section's shape of the laser beam on the drum is compensated.

(4) HSYNC detection

The laser light, which is scanned by the any reflected face on the polygonal mirror, is reflected by the HSYNC detection mirror, and becomes incident to the PIN diode on the laser drive PWA. Then, the primary scanning synchronizing is formed by detection of the laser light.

(5) Laser Drive PWA

This control board has the following functions:

① APC control function (for compensating disparity in the laser intensity caused by temperature)

② Laser ON/OFF generating function

③ Function for generating synchronizing signals in the primary scanning direction

8.3 Laser Diode

The laser used in this copier is a GaAIAS type semiconductor laser. This semiconductor laser outputs in the single-horizontal mode, and its oscillation wavelength is about 780 nm. This semiconductor laser is powered by a + 5 V DC power supply, and its optical output is controlled to about 1mW. Output of a PIN diode for monitoring light output built into the semiconductor laser is used for controlling this.

The semiconductor laser has the optical forward-output current, and monitors the current characteristics shown in the figure on the right.

Emission of light is started when the forward current reaches or becomes greater than the threshold current. A monitor current proportional to the optical output is output. These threshold currents and monitor currents are each disparate due to the characteristics of each of the semiconductor lasers.

Optical output must be adjusted so that it is maintained at a constant value. Also, as the optical output of the semiconductor laser drops when its temperature increases, APC is also required to maintain the optical output at a constant value.

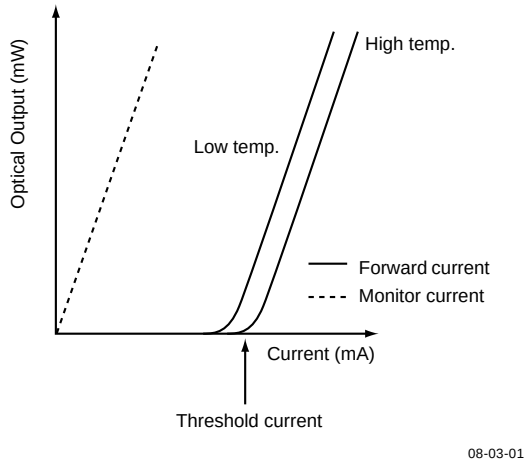


Fig. 8-3-1

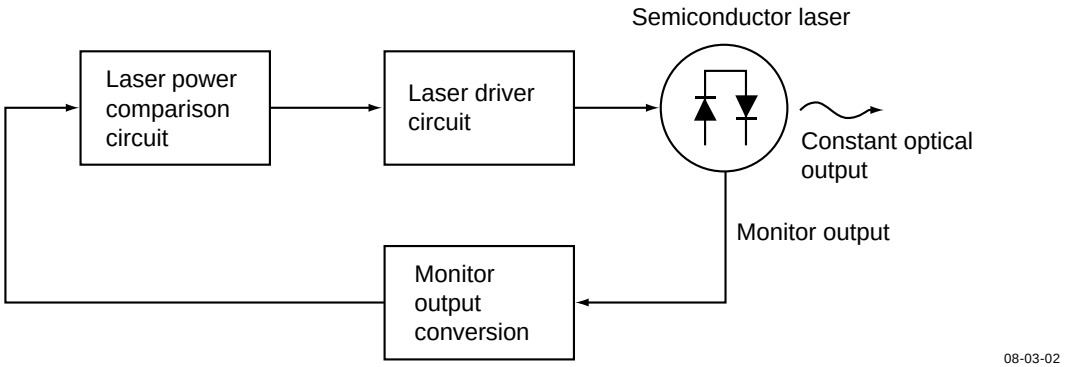


Fig. 8-3-2 Block diagram

Fig. 8-3-2 shows a block diagram of the semiconductor laser control circuit. The monitor output from the semiconductor laser is controlled for each of the semiconductor lasers beforehand so that a constant voltage is maintained when the optical output is 1 mW. After conversion, the voltages are fed back to the laser power comparison circuit. Here, comparison of the laser power voltage set to the control circuit is carried out for every single scanning. As a result, when the laser power is insufficient, the forward current is increased in the laser driver circuit, and alternatively when the laser power is excessive, the forward current is decreased so that the optical current is constant.

8.4 Disassembly and Replacement

[A] Laser scanner unit

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. Detach the toner cartridge.
4. Detach ozone cover. (See Fig. 2-6-10)
5. Detach paper tray cover. (See Fig. 2-6-11)
6. Remove LVPS. (See Fig. 2-6-30 and 2-6-31)
7. Release 2 hooks and remove duct assembly.

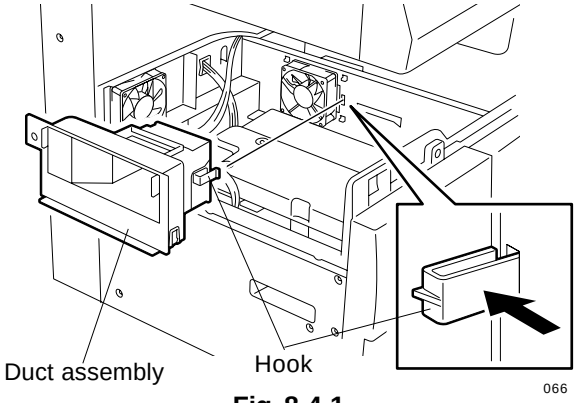


Fig. 8-4-1

8. Detach one connector, remove 3 screws, and take out laser scanner unit.
9. Detach the one connector and remove laser scanner unit.

[CAUTION]

To prevent electrostatic destruction, do not touch the connector pin when plugging or unplugging the connector.

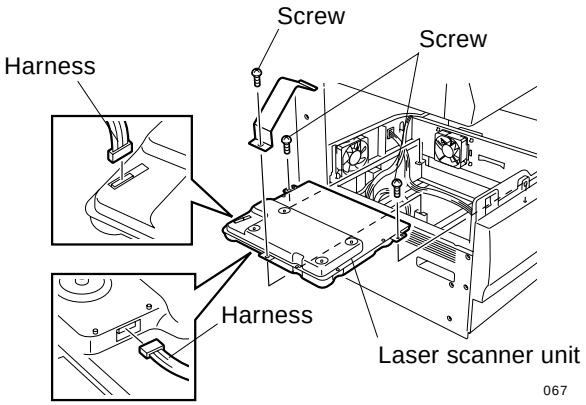


Fig. 8-4-2

Note: When the lens gets dirty, blow away the dirt with the blower.

MEMO

9. PAPER FEEDING SYSTEM 9-1

9.1 General Description 9-1
9.2 Construction 9-1
9.3 Drive Description 9-2
9.3.1 Pickup feed roller, feed roller and registration roller 9-2
9.3.2 Tray lift shaft 9-3
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9. PAPER FEEDING SYSTEM

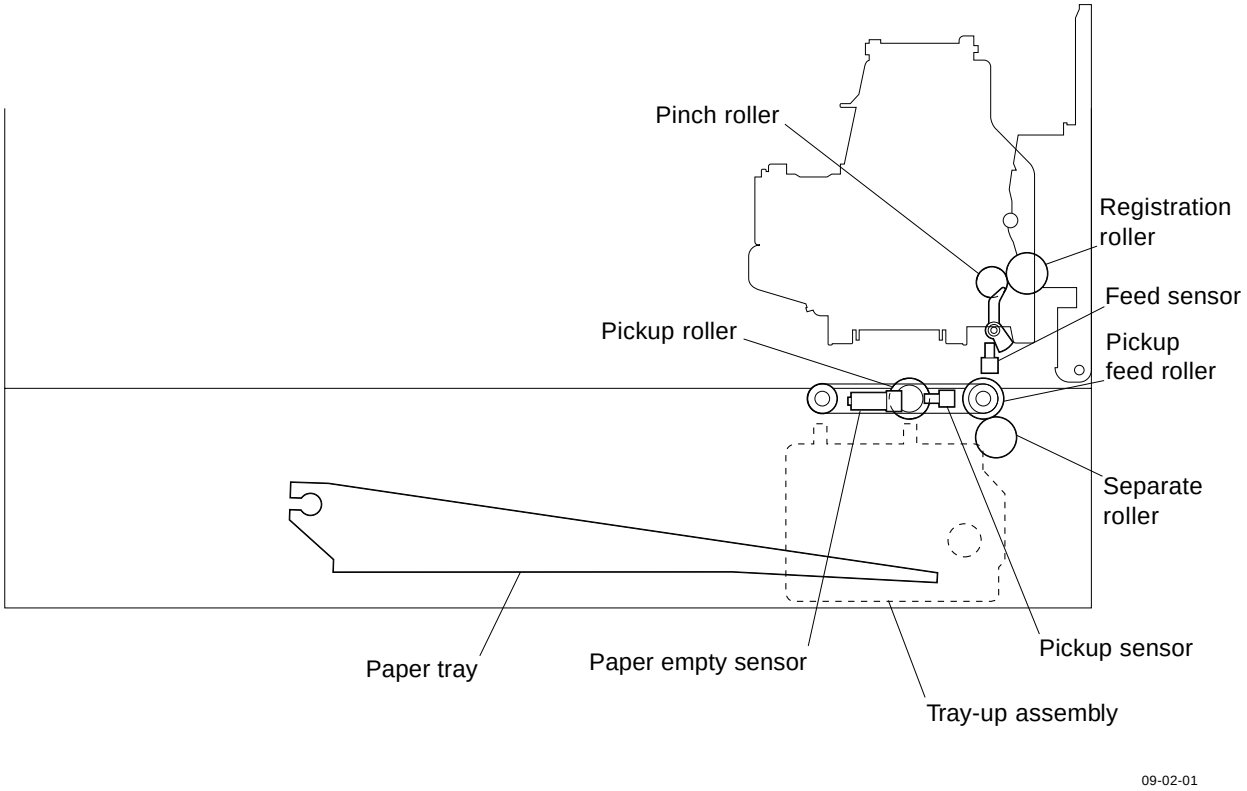
9.1 General Description

The paper feeding section feeds the paper from the paper cassette to the transfer section.

Driving of each of the paper feed and transport rollers is controlled by turning ON and OFF the clutches.

Each sensor detects the transport state of the paper.

9.2 Construction



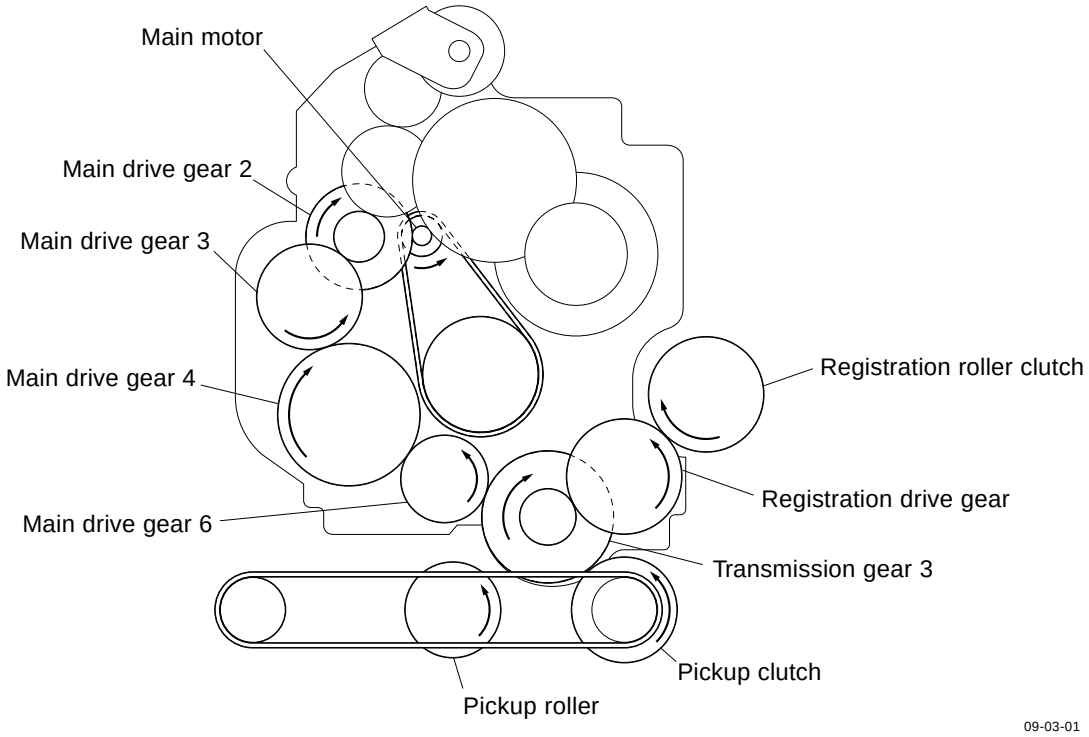
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The paper feeding system section consists of the following parts:

- Paper tray
- Tray-up assembly
- Pickup feed roller
- Pickup roller
- Paper empty sensor
- Pickup sensor
- Separate roller
- Feed sensor
- Registration roller
- Pinch roller

9.3 Drive Description

9.3.1 Pickup feed roller, feed roller and registration roller



The driving force of the main motor is transmitted to each clutch through each gear of the main drive gear assembly. As the pickup clutch is turned ON, the pickup feed roller turns. As the registration roller clutch is turned ON, the registration roller.

Main motor

↓

Main drive gear 2

↓

Main drive gear 3

↓

Main drive gear 4

↓

Main drive gear 6

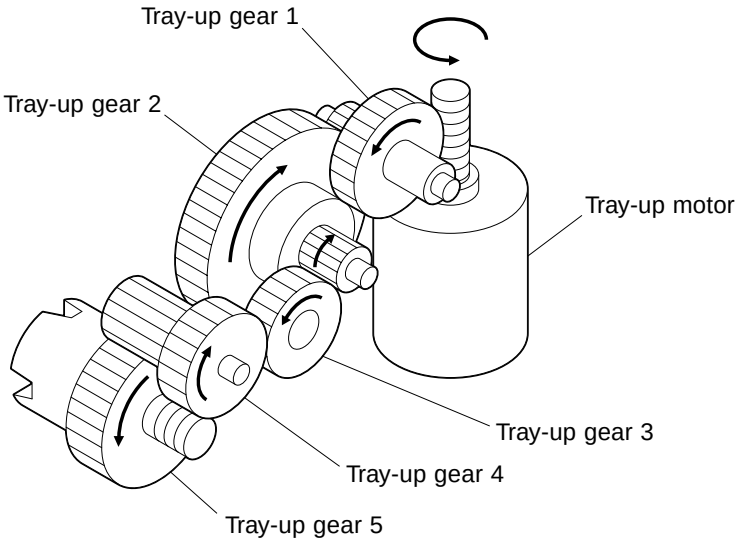
↓

Transmission gear 3 → Pickup clutch → Pickup feed roller → Pickup roller

↓

Registration drive gear → Registration roller clutch → Registration roller

9.3.2 Tray lift shaft

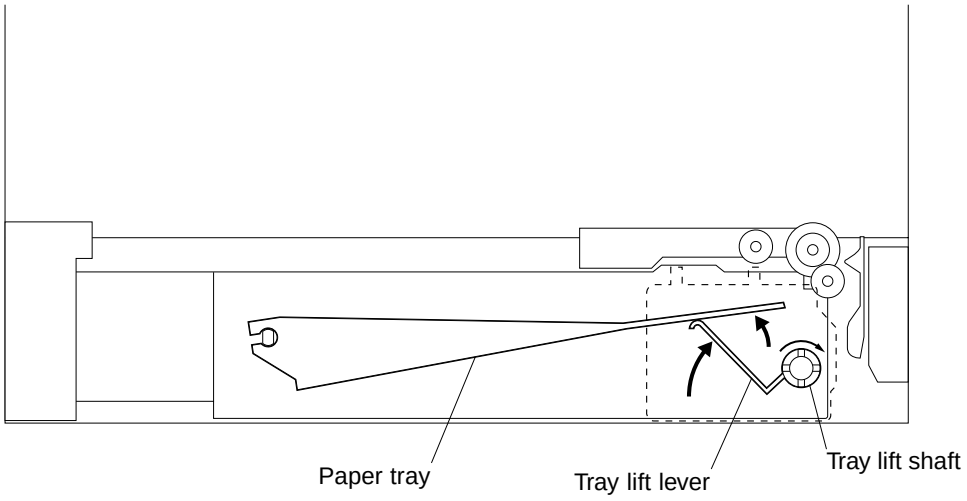


The driving force of the tray-up motor is transmitted to the tray lift shaft through each gear of the tray-up assembly to turn the tray lift shaft.

Tray-up motor
↓
Tray-up gear 1
↓
Tray-up gear 2
↓
Tray-up gear 3
↓
Tray-up gear 4
↓
Tray-up gear 5 → Tray lift shaft

9.4 Description of Operation

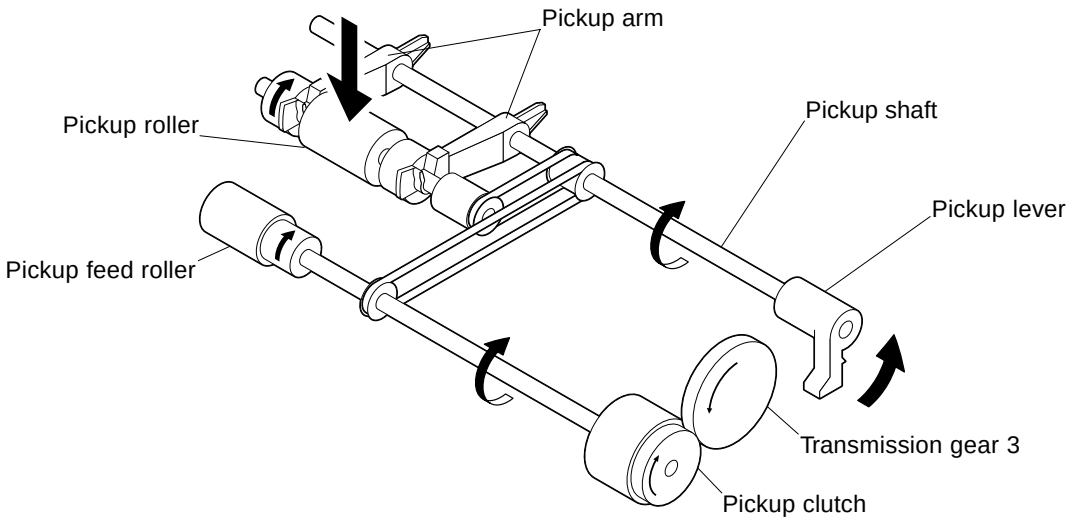
9.4.1 Tray section



09-04-01

As the tray-up motor of the tray-up assembly turns ON, the tray lift shaft turns through the lift gear. The rotation of the tray lift shaft causes the tray lift lever to lift the paper tray.

9.4.2 Paper feeding section



09-04-02

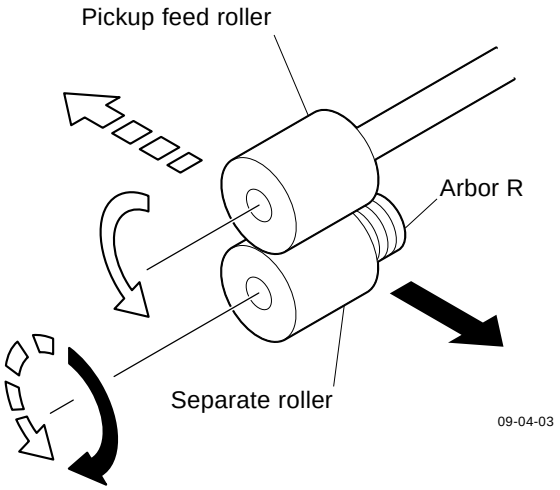
When the paper cassette is mounted, the pickup lever is pushed by the hook of the paper cassette in the direction of the arrow. As the pickup lever is pushed, the pickup shaft turns and the pickup arm and pickup roller descend of their own weight.

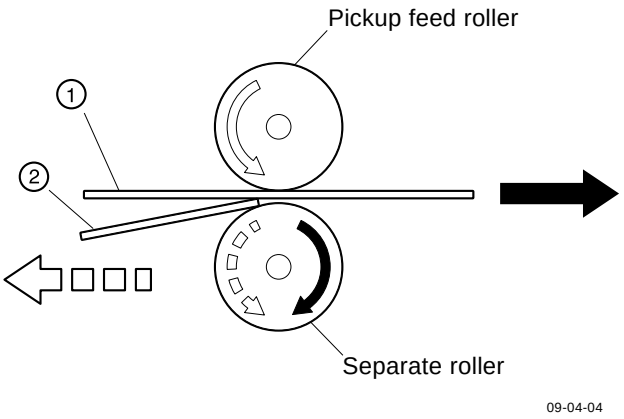
The driving force of the main motor is transmitted to the clutch through each gear of the main drive gear assembly. As the pickup clutch is turned ON, the pickup feed roller turns causing the pickup roller to turn through the belt.

9.4.3 Paper separation

Paper separation is performed by the pickup feed roller and separate roller in this machine. The separate roller is connected to its shaft through the arbor R (torque limiter). The pickup feed roller is rotated in the direction of the arrow ( ) at the same timing as the pickup roller by the main motor. The separate roller is driven in the direction of the arrow ( ) through the arbor R (torque limiter). But when there is no paper or only one sheet between the rollers, the friction between the rollers or that between the sheet and the separate roller is large enough to force the separate roller in the direction of the arrow ( ), cause a slip in the arbor R (torque limiter).

However, if multiple-sheet feeding occurs, since the friction between the sheets is small, the lower sheet is forcibly separated from the upper sheet and is sent back in the direction of the ( ) by the separate roller. The upper sheet is fed in the direction of the arrow ( ) by the feed roller.





Examples:

If only sheet of paper (1) arrive at the separate roller, the force of pickup feed roller, which is greater than that of the separate roller, causes the separate roller to rotate in the ( ) direction, sending the paper.

If two sheets of the paper ((1) and (2)) arrive at the separate roller, the force of the respective rollers is greater than the friction between sheets of paper, and the top sheet (1) is sent in the ( ) direction by the feed roller while the bottom sheet (2) is sent in the ( ) direction by the separate roller.

9.4.4 Cassette feeding operation

[A] From power-on to the ready state

(1) When the power is turned ON, the tray-up motor of the tray-up assembly turns ON to lift the paper tray of the paper cassette.

(2) When the paper tray pushes up the pickup roller to turn ON (L → H) the pickup sensor, the tray-up motor turns OFF. At this time, the presence or absence of paper is detected by the paper empty sensor.

(3) Even if the power is turned ON while the paper cassette is not mounted, the tray-up motor will not turn ON.

[B] Ready state

(1) When the paper tray of the paper cassette ascends and the presence or absence of paper is detected, the standby mode will be activated.

(2) When the paper cassette is removed while in the standby mode, the tray lift shaft is dislocated from the tray-up assembly, thereby causing the tray to descend. When the paper cassette is mounted again, the tray ascends causing the presence or absence of paper to be detected.

[C] Paper feeding

(1) When the pickup clutch is turned ON, the power of the main motor is transmitted to the pickup feed roller through each gear for rotation.

(2) The rotation of the pickup feed roller is transmitted to the pickup roller through the belt.

(3) The paper is transported from the paper cassette by means of the pickup roller and pickup feed roller.

(4) A fixed time after the feed sensor detects the top of paper, the registration roller clutch is turned ON.

(5) When the registration roller clutch is turned ON, the power of the main motor is transmitted to the registration roller through each gear for rotation.

(6) The paper is transported by means of the registration roller and pinch roller. Even if the paper has been transported askew, the paper is pressed to the registration roller during the time from the moment when the feed sensor turns ON to the moment when the registration roller clutch is turned ON to make the paper sag, thereby correcting it to be horizontal.

9.5 Function of Each Part

(1) Tray-up assembly

The tray-up assembly turns the tray lift shaft of the paper cassette to lift the paper tray.

(2) Pickup roller

The pickup roller transports the paper from the paper cassette. The power of the pickup feed roller is transmitted to the pickup roller through the belt for rotation.

(3) Pickup feed roller

The pickup feed roller transports the paper, which has been transported by the pickup roller, to the PU guide assembly. When the pickup clutch is turned ON, the power of the main motor is transmitted to the pickup feed roller for rotation.

(4) Separate roller

When two or more sheets of paper have been transported by the pickup roller, the separate roller allows only the top sheet of paper to pass due to the coefficient of friction between the pickup feed roller, paper, and separate roller. When a single sheet of paper has been transported, the separate roller turns by means of the power of the pickup feed roller.

(5) Pickup clutch

When transporting the paper from the paper cassette, the clutch is turned ON to transmit the power of the main motor to the pickup feed roller.

(6) Main drive gear assembly

The main motor gear assembly transmits the power of the main motor to the paper feed roller and feed roller.

(7) Main motor

The main motor is a power source for paper feed roller 1 and the feed roller.

(8) Registration roller

The registration roller transports the paper from the PU guide assembly to the development section. When the registration roller clutch is turned ON, the power of the main motor is transmitted to the registration roller for rotation.

(9) Registration roller clutch

When transporting the paper from the transfer section to the exit roller, the registration roller clutch is turned ON to transmit the power of the main motor to registration roller.

(10) Pinch roller

The pinch roller helps registration roller transport the paper. Pressed to registration roller by the spring, the pinch roller turns with the power of registration roller.

(11) Paper empty sensor

The paper empty sensor detects the presence or absence of paper in the paper cassette.

(12) Pickup sensor

The pickup sensor detects that the tray of the paper cassette has been lifted to the specified position. The tray is lifted until the pickup roller is pushed by the tray to turn OFF the pickup sensor.

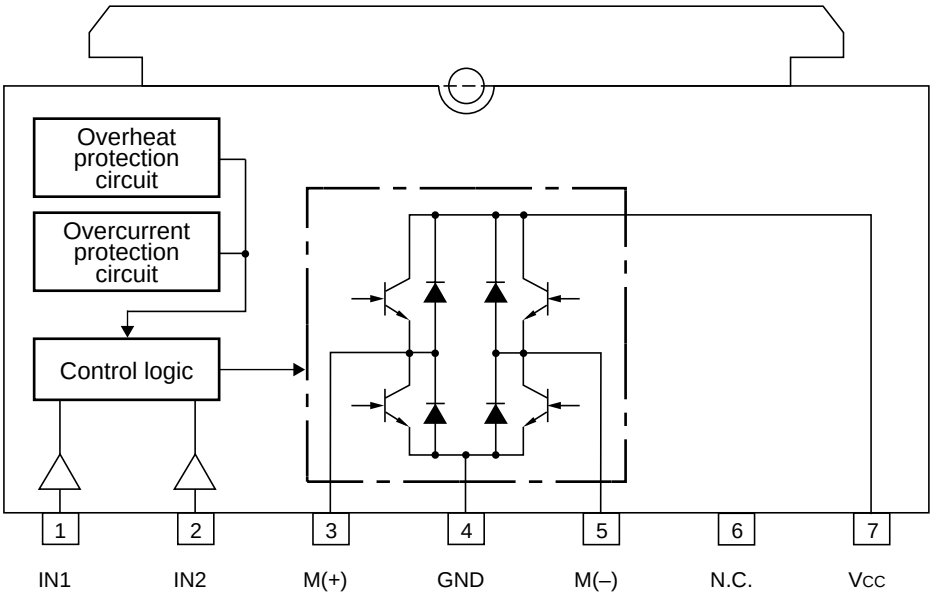
(13) Feed sensor

The feed sensor detects the transport of the paper by the PU guide assembly. Registration clutch turns ON a fixed time after the feed sensor detects the top of paper.

9.6 Tray-up Motor Drive Circuit

Tray-up motor : Driven by IC4 (PWA-F-RLY : TA8428K)

The block diagram of TA8428K is shown below.



IN1 and IN2 are input terminals for the signals from the I/O port GA-1. In the control section, the motor is controlled (ON and OFF) based on the signals from the I/O port GA-1. For the control, refer to the table below.

Input		Output		Description
IN1	IN2	M (+)	M (-)	
H	H	L	L	BRAKE
L	H	L	H	CCW (upward)
H	L	H	L	CW (downward)
L	L	OFF (high impedance)		STOP

9.7 Disassembly and Replacement

[A] Separate holder assembly

1. Remove paper cassette. (See Fig. 2-6-12)
2. Release 4 hooks and remove separate holder assembly.

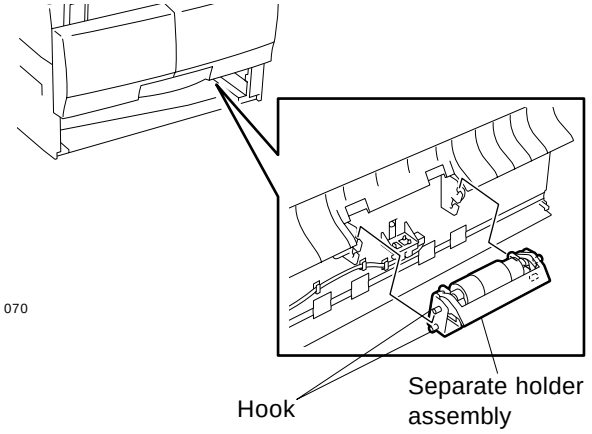


Fig. 9-7-1

[B] Separate roller

1. Remove paper cassette. (See Fig. 2-6-12)
2. Remove separate holder assembly. (See Fig. 9-7-1)
3. Lift separate roller lever and remove separate roller assembly.
4. Remove arbor F, draw out shaft, and remove separate roller, separate spring, arbor R, and spring cover in this order.

Notes: 1. To detach/attach the separate roller from/to the separate spring, rotate the separate roller in the direction of the arrow.

2. Since the separate spring is coated with oil, the separate roller should not to be touched by the separate spring.

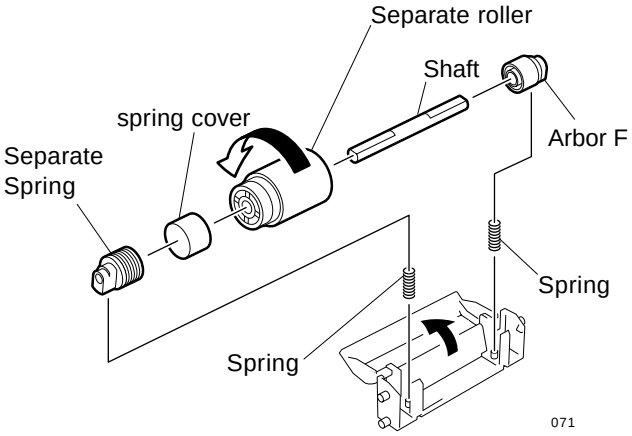


Fig. 9-7-2

[C] Tray-up assembly

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach rear cover. (See Fig. 2-6-1)
4. Remove 2 screws and release 2 clamps.
5. Detach the relay connector and remove tray-up assembly.

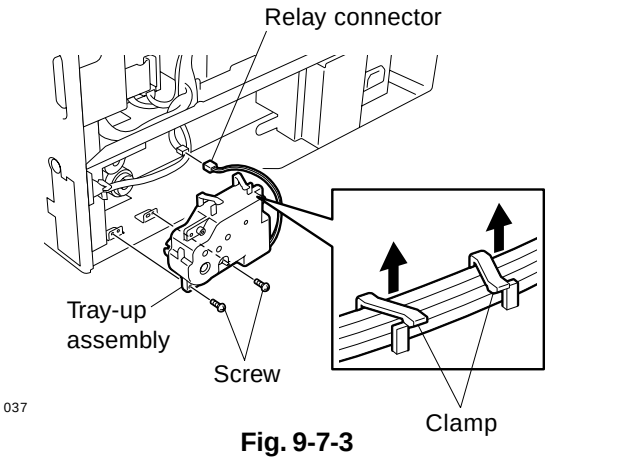


Fig. 9-7-3

[D] Pickup assembly

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Remove paper cassette. (See Fig. 2-6-12)
3. Detach right cover R. (See Fig. 2-6-15)
4. Remove separate holder assembly. (See Fig. 9-7-1)
5. Remove 2 screws and remove pickup assembly.

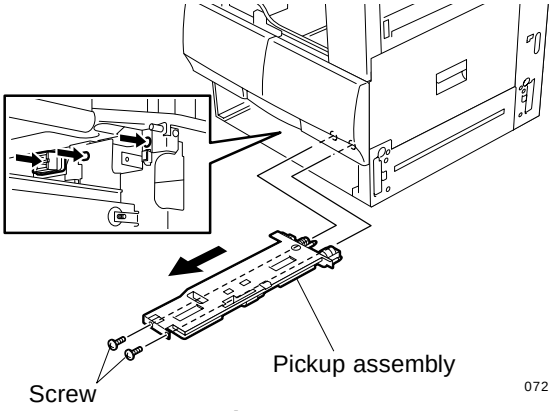


Fig. 9-7-4

[E] Pickup feed roller

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Remove paper cassette. (See Fig. 2-6-12)
3. Detach right cover R. (See Fig. 2-6-15)
4. Remove separate holder assembly. (See Fig. 9-7-1)
5. Remove pickup assembly. (See Fig. 9-7-4)
6. Remove stop ring and remove pickup feed roller.

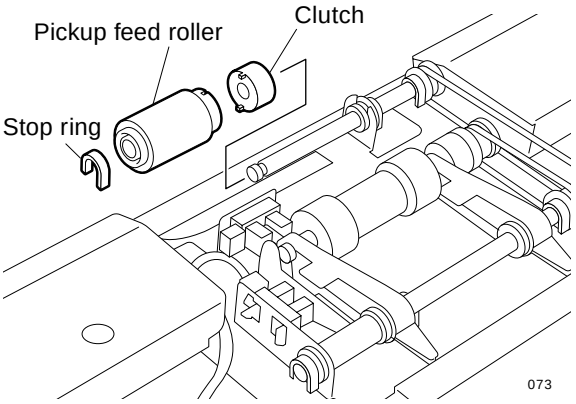


Fig. 9-7-5

[F] Pickup roller

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Remove paper cassette. (See Fig. 2-6-12)
3. Detach right cover R. (See Fig. 2-6-15)
4. Remove separate holder assembly. (See Fig. 9-7-1)
5. Remove pickup assembly. (See Fig. 9-7-4)
6. Release 2 hooks.
7. Release timing belt 124 and remove pickup roller shaft assembly.
8. Detach E-ring and remove pulley and clutch.
9. Detach 2 E-rings.

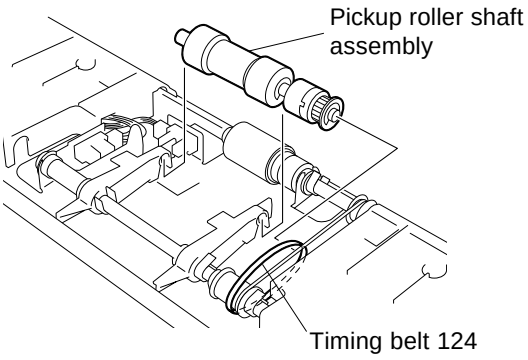


Fig. 9-7-6

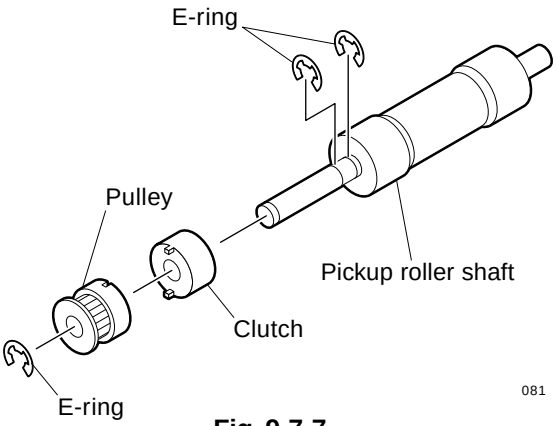


Fig. 9-7-7

MEMO

10. DRIVE SYSTEM 10-1

10.1 Construction of Drive System 10-1
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10. DRIVE SYSTEM

10.1 Construction of Drive System

The drive system drives the drum, developer, exit roller, heat roller, registration roller, cassette feed roller, and drive transmission gears of options.

They are driven by the main motor.

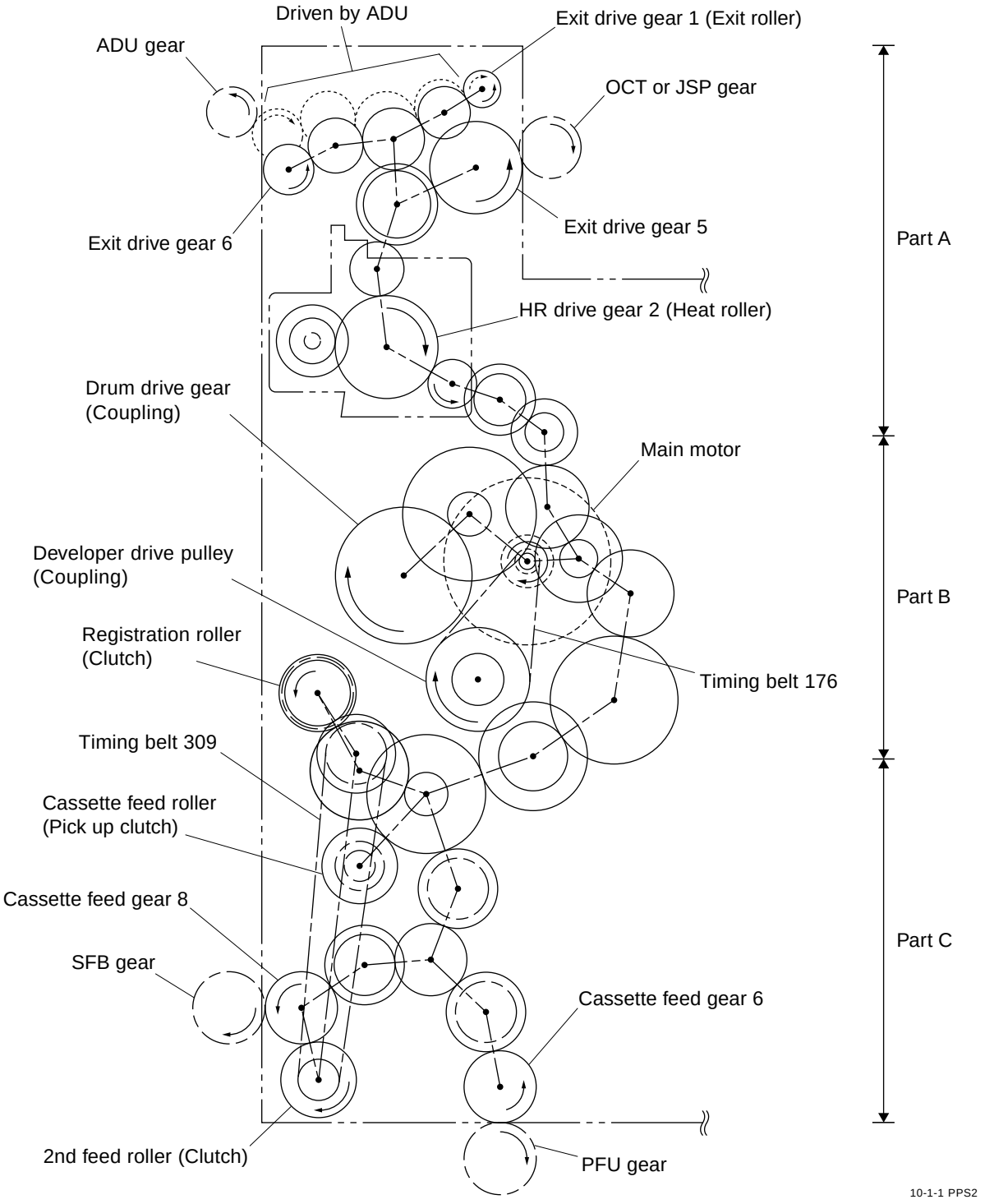


Fig. 10-1-1 Drive system (Rear side view)

10.2 Description of Operations

10.2.1 Part A

Part A drives the heat roller, feeds (ejects) paper, and transmits drive to the options (OCT, JSP, and Finisher).

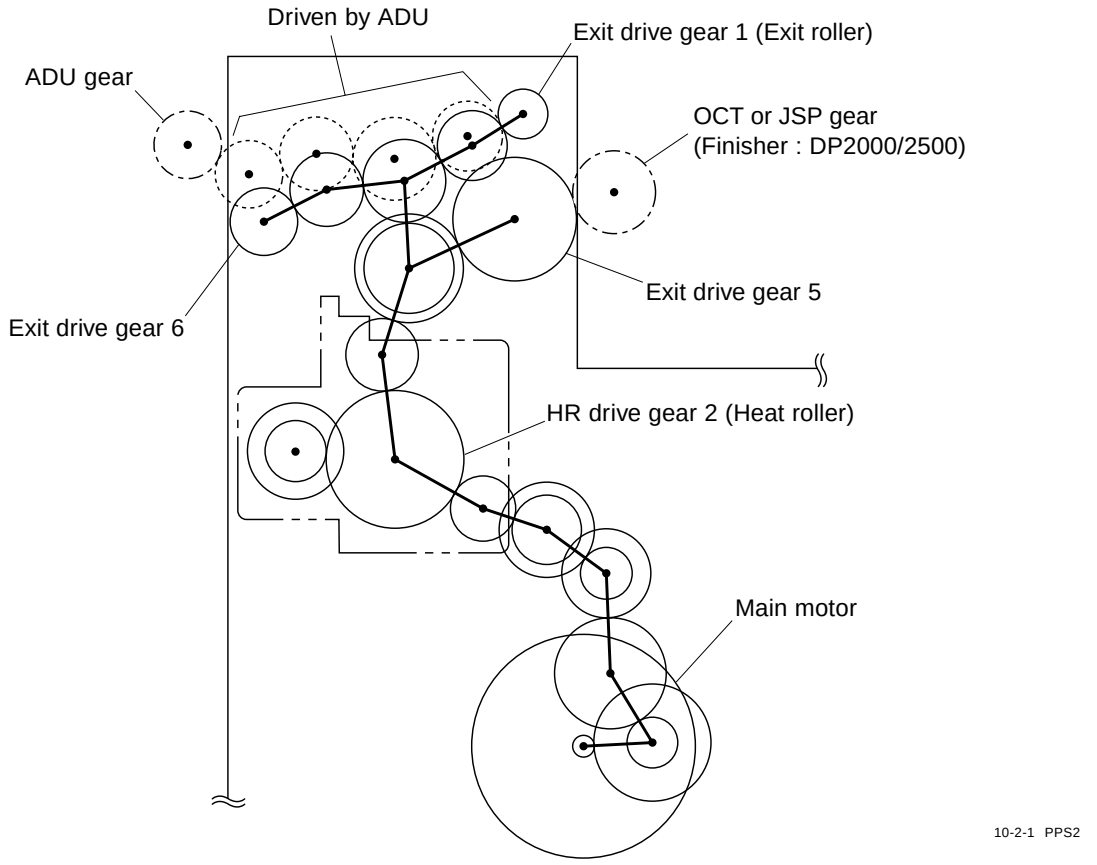


Fig. 10-2-1

- Heat roller drive ..... The driving gear train from the main motor drives the HR drive gear 2.
- Exit roller ..... The driving gear train from the main motor drives the exit drive gear 1. When the ADU is attached, the gear is always driven by the ADU motor (upper) to slide the gear.
- Exit drive gear 6 ..... The driving gear train from the main motor drives exit drive gear 6. This gear transmits the drive from the ADU to the exit roller while the ADU is attached. When the ADU is attached, the gear cuts off the drive from the main motor and starts to transmit the ADU drive. Therefore, the exit roller is always driven by the ADU even in one-side printing when the ADU is attached.
- Exit drive gear 7 ..... The driving gear train from the main motor drives exit drive gear 7. When connected to this gear, the OCT or JSP is driven. (Finisher: DP2000/2500 only)

10.2.2 Part B

Part B is comprised of the main dive gear assembly and the main motor, and drives the drum and the developer and transmits drive to Parts A and C.

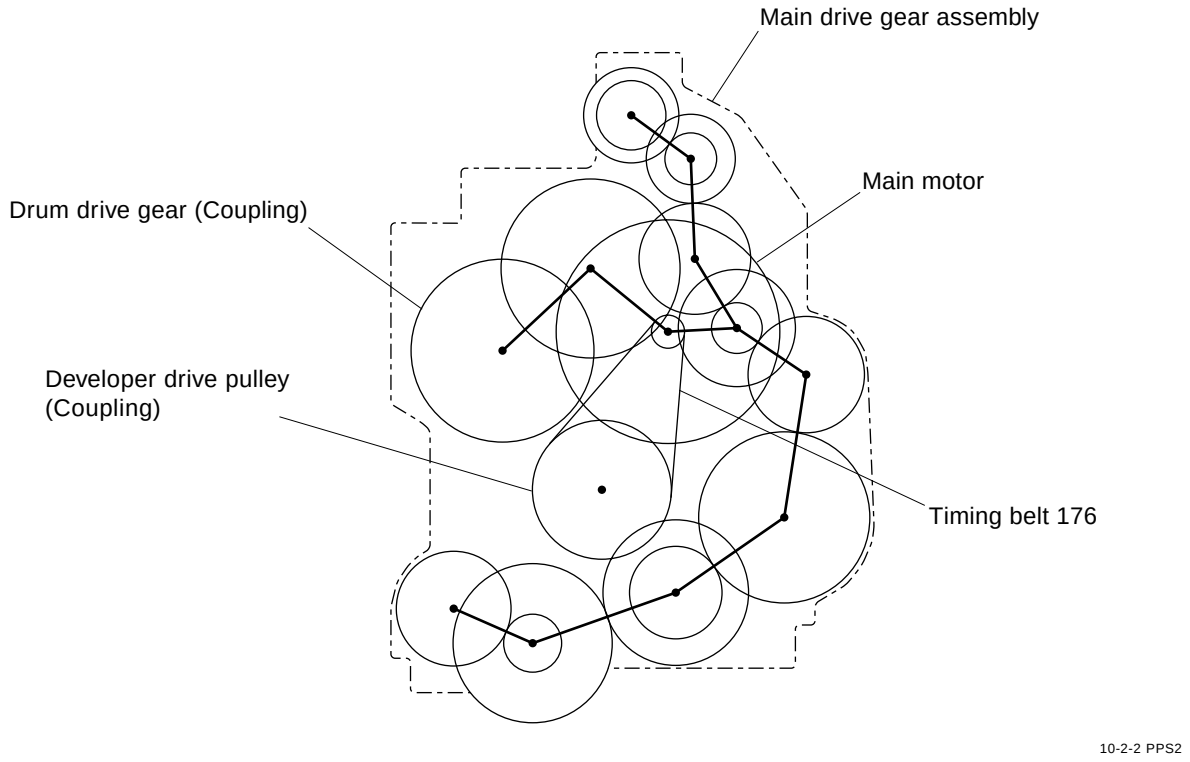


Fig. 10-2-2

- Drum Drive ..... The driving gear train from the main motor drives the drum drive shaft and coupling. The coupling part is fit to the drum, thereby driving the drum.
- Developer Drive ..... The main motor transmits the drive to the developer drive pulley via timing belt 176, causing the developer connected with the coupling to be driven.

10.2.3 Part C

Part C feeds (mainly supplies) paper and transmits drive to the options (SFB and PFU).

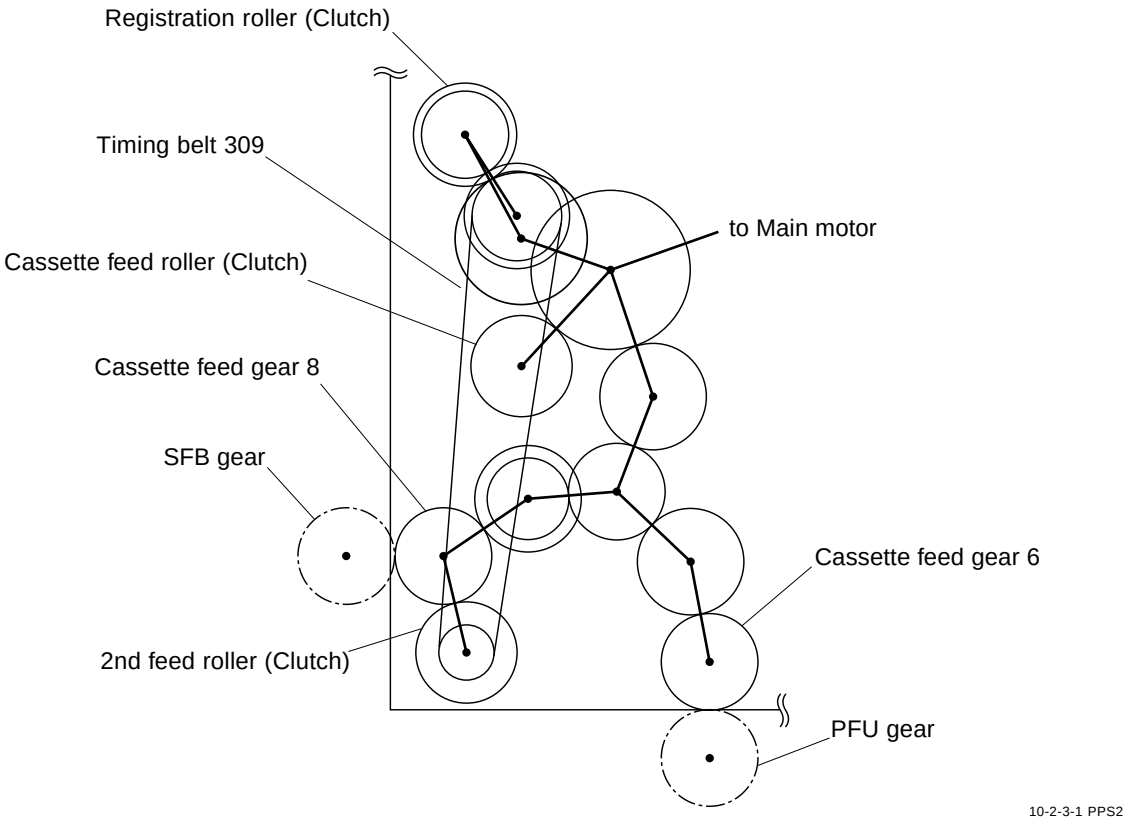


Fig. 10-2-3

- Registration roller ..... The driving gear train from the main motor drives the registration roller gear.
- Cassette feed roller ..... The driving gear train from the main motor drives the cassette feed roller gear.
- Cassette feed gear 8 ..... The driving gear train from the main motor drives cassette feed gear 8. When connected to this gear, the SFB is driven.
- Cassette feed gear 6 ..... The driving gear train from the main motor drives cassette feed gear 6. When connected to this gear, the PFU is driven.

- 2nd feed roller ..... The driving gear train from the main motor and the timing belt 309 drive the 2nd feed roller drive pulley. There are two systems on the 2nd feed roller drive, only by the gear and by the timing belt. When feeding the paper, the timing belt is used to drive (speed: DP1600 = 86.9 mm/sec, DP2500 = 118 mm/sec). When supplying the paper, the gear is used to drive (speed: DP1600 = 260 mm/sec, DP2500 = 260 mm/sec). Switching of the gear drive and timing belt drive is done by the clutch.

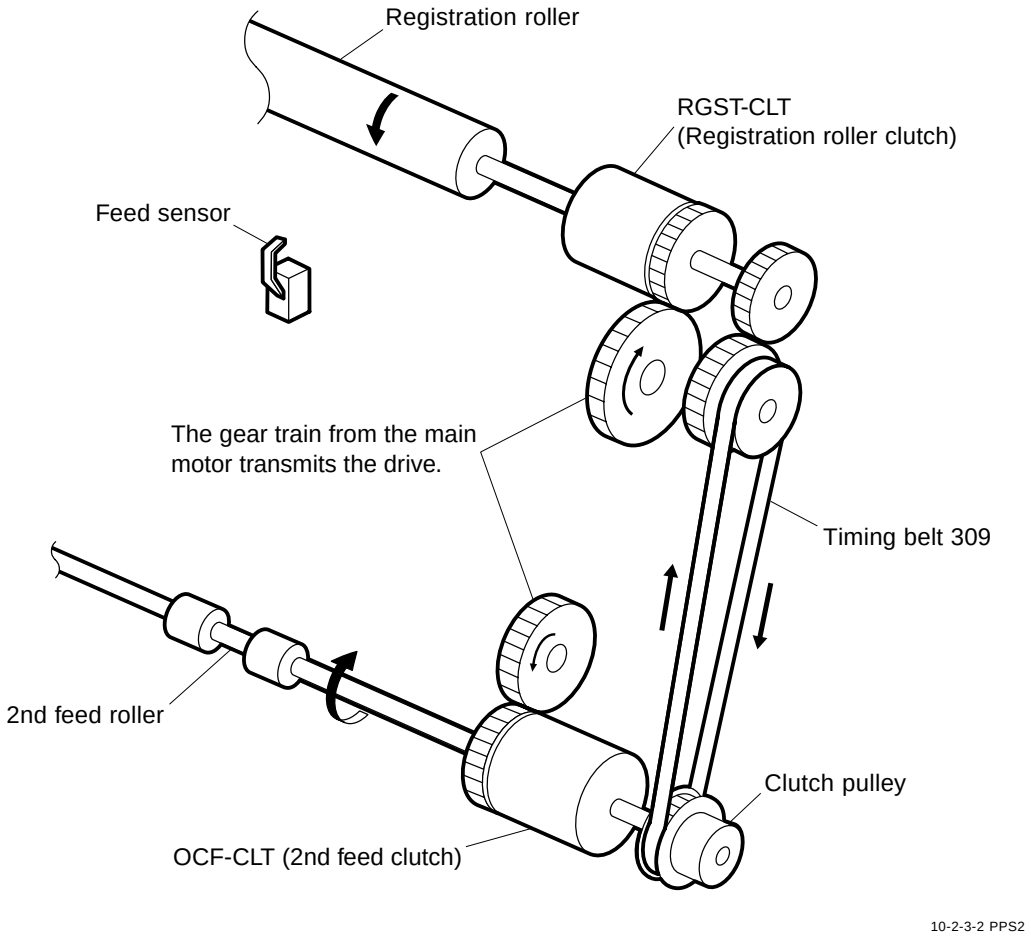


Fig. 10-2-4

When the main motor rotates, the drive is transmitted to the gears of the RGST-CLT and OCF-CLT clutches and these gears rotate. However, when the clutches are turned off, the respective rollers do not rotate.
When paper is picked up from the option cassette, the OCF-CLT is turned on, causing the 2nd feed roller to rotate. At this time, the clutch pulley prevents timing belt 309 from rotating. The registration roller does not rotate either, since the RGST-CLT is turned off.
When paper is fed into the paper path, the RGST-CLT is turned on, and the registration roller rotates. The OCF-CLT is turned off, and the timing belt rotates the 2nd feed roller.

10.3 Disassembly and Replacement

[A] Main drive gear assembly

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
4. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
5. Detach the toner cartridge and the process unit.
6. Detach rear cover. (See Fig. 2-6-1)
7. Detach ozone cover. (See Fig. 2-6-10)
8. Detach paper tray cover. (See Fig. 2-6-11)
9. Remove PC I/F PWA. (See Fig. 2-6-27)
10. Remove high voltage power supply. (See Fig. 2-6-28 and 2-6-29)
11. Release the spring.
12. Remove 2 screws, release the timing belt 309, and remove cassette feed gear 2 assembly.

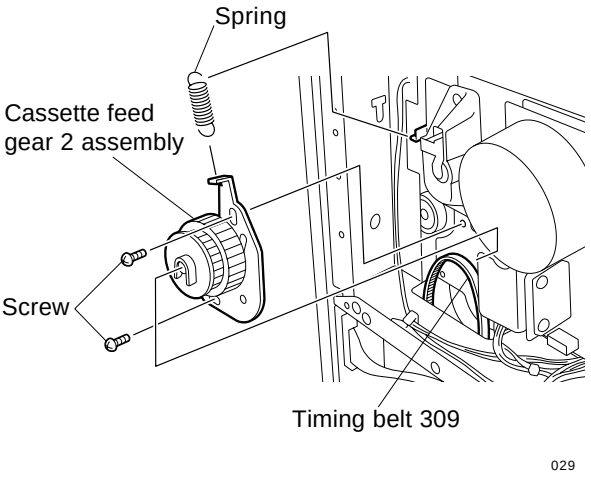


Fig. 10-3-1

13. If an ADU (MD-0101) is attached to the copier, open it.
14. Open side cover.

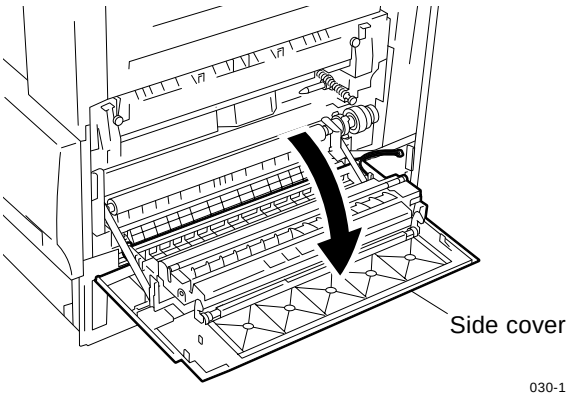


Fig. 10-3-2

15. Remove 2 screws.

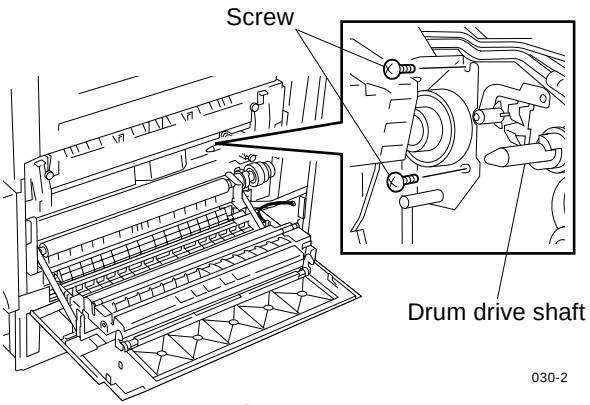


Fig. 10-3-3

16. Detach 2 connectors from the PWA.
17. Release the harness from inside the copier, remove 7 screws, and remove main drive gear assembly.

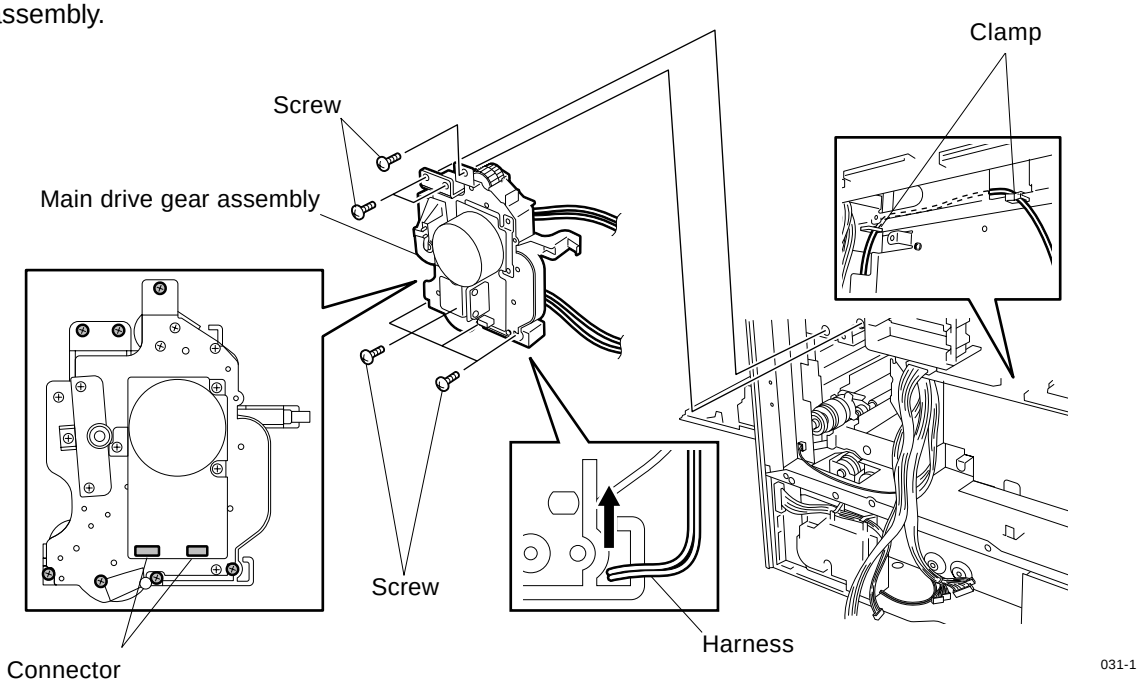


Fig. 10-3-4

[B] Main moter

(DP1600 series)

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and Junction block.
4. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
5. Detach the toner cartridge and the process unit.
6. Detach rear cover. (See Fig. 2-6-1)
7. Detach ozone cover. (See Fig. 2-6-10)
8. Detach paper tray cover. (See Fig. 2-6-11)
9. Remove PC I/F PWA. (See Fig. 2-6-27)
10. Remove high voltage power supply. (See Fig. 2-6-28 and 2-6-29)
11. Remove main drive gear assembly. (See Fig. 10-3-1 and 10-3-4)
12. Remove 3 screws and remove main motor.

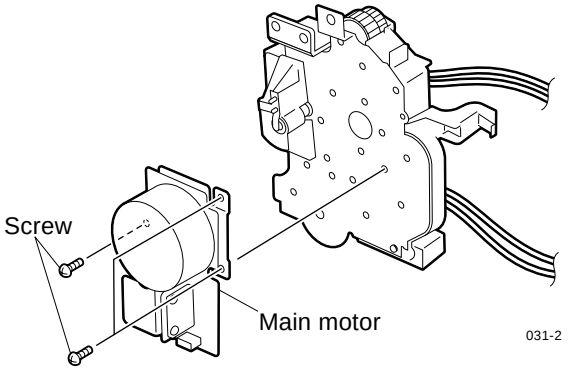


Fig. 10-3-5

■ Attaching the main motor

1. After attaching the main motor to the main drive gear assembly, remove the main drive gear cover assembly by removing the four screws.

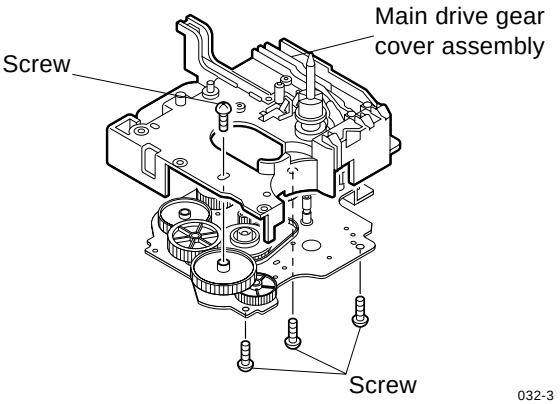


Fig. 10-3-6

2. Remove the gear to remove the spring.
3. Loosen 2 screws and attach timing belt 176.
4. Attach the spring and tighten 2 screws.
5. Attach the gear and then the main drive gear cover assembly.

Note: When the main drive gear assembly is attached, adjust it by referring to the Service Handbook. (See chapter 1.9)

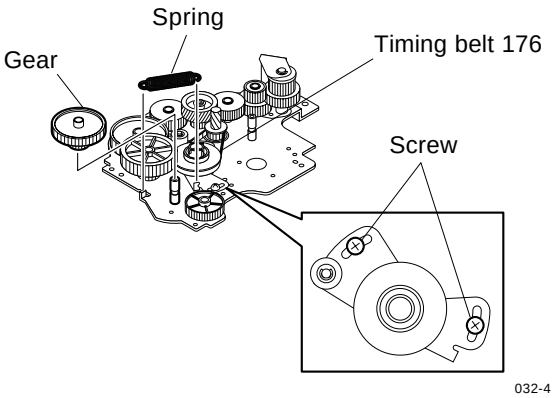


Fig. 10-3-7

(DP2000/2500 series)

1. If STP(KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach the toner cartridge and the process unit.
4. Detach rear cover. (See Fig. 2-6-1)
5. Remove PC I/F PWA. (See Fig. 2-6-27)
6. Remove 3 screws to remove the drum drive shaft holder.

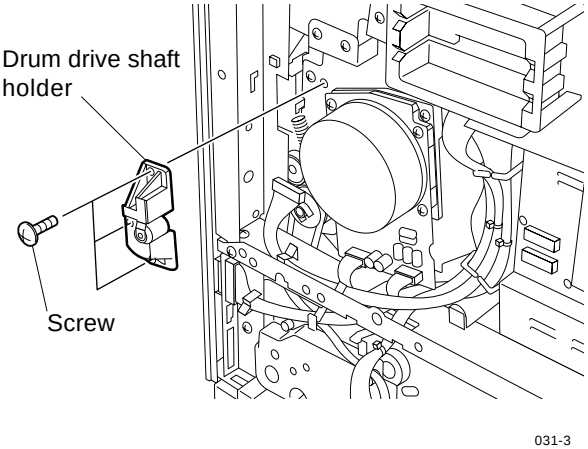


Fig. 10-3-8

7. Remove 2 screws. Remove the main motor by sliding it downward.

Notes: 1. After attaching the main motor, rotate the main motor to make sure that the coupling of the process unit rotates.

2. Seeing from the gap of the main drive gear cover assembly, confirm that the timing belt is securely installed.

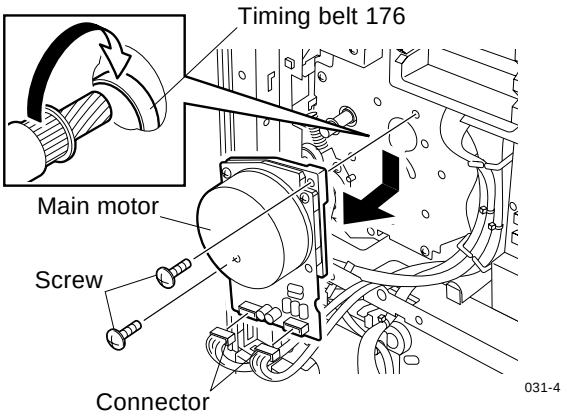


Fig. 10-3-9

[C] PU guide assembly

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
4. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
5. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
6. Detach the toner cartridge and the process unit.
7. Detach rear cover. (See Fig. 2-6-1)
8. Detach ozone cover. (See Fig. 2-6-10)
9. Detach paper tray cover. (See Fig. 2-6-11)
10. Detach right cover R. (See Fig. 2-6-15)
11. Remove paper guide B and side cover assembly. (See Fig. 2-6-16 and 2-6-17)
12. Remove PC I/F PWA. (See Fig. 2-6-27)
13. Remove high voltage power supply. (See Fig. 2-6-28 and 2-6-29)
14. Remove main drive gear assembly. (See Fig. 10-3-1 to 10-3-4)
15. Detach the harness and remove PU contact.

Note: If contact is found dirty, clean with a cotton swab.

16. Detach the relay connector and remove 7 screws.
17. Pull out the PU contact harness through the hole Fig. 10-3-11, release 2 tabs, and remove PU guide assembly.

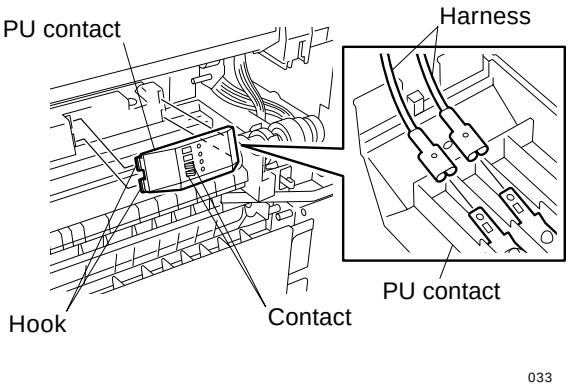


Fig. 10-3-10

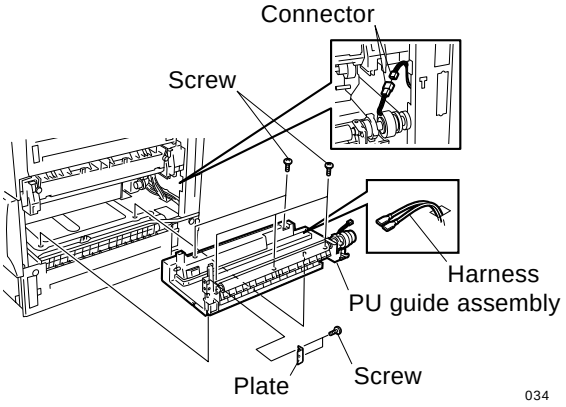


Fig. 10-3-11

[D] Registration roller

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach the toner cartridge and the process unit.
3. Detach right cover R. (See Fig. 2-6-15)
4. Loosen one screw, remove bushing plate and detach the relay connector.

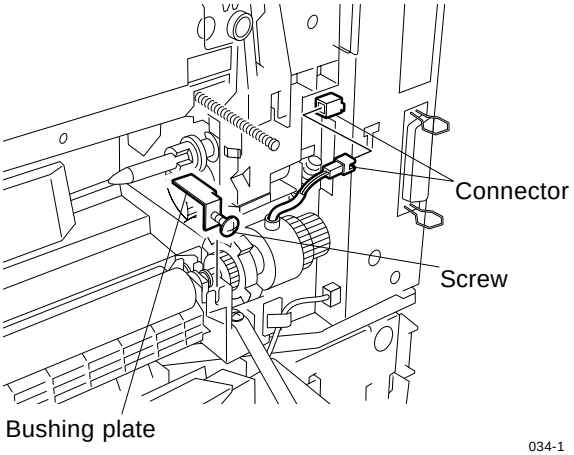


Fig. 10-3-12

5. Detach 2 stop rings, slide bushing in the direction of the arrow, and remove registration roller assembly.

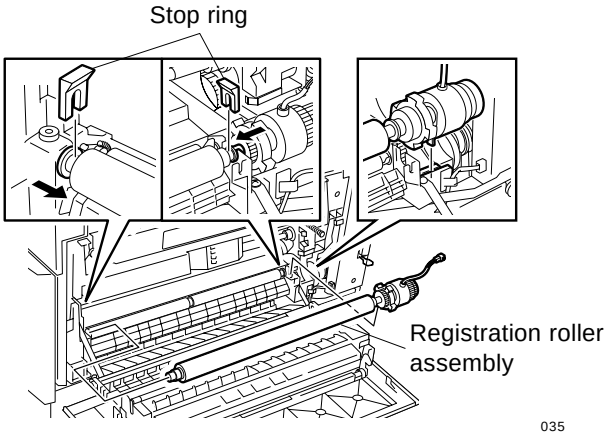


Fig. 10-3-13

6. Detach stop ring, and remove cassette feed gear 1, regiatration roller clutch, and regiatration wheel in this order.

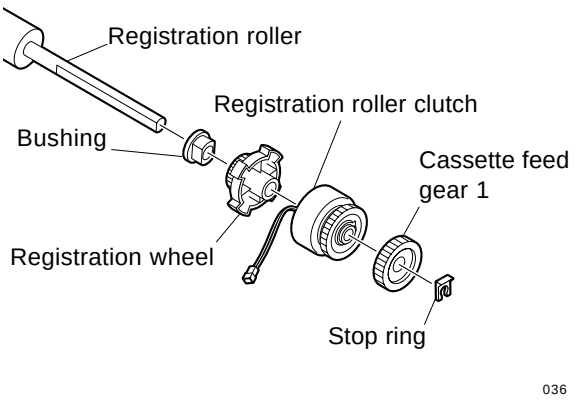
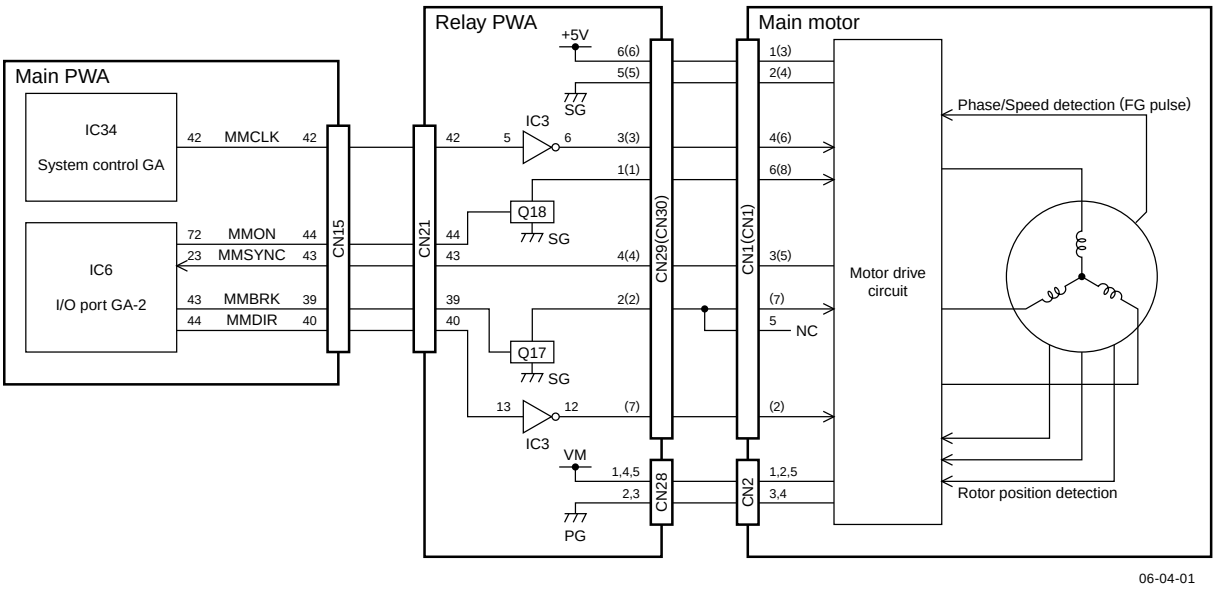


Fig. 10-3-14

10.4 Main Motor

10.4.1 Main motor drive



Values in ( ) are for DP2000/2500 series

(1) The system control GA (IC34) on the Main PWA sends the MMCLK signal to the main motor.

(2) **DP1600 series**

The I/O port GA-2 (IC6) on the Main PWA sends the MMON signal at “High” level to the main motor. This allows each excitation phase of the motor to be excited through the motor drive circuit to start rotation.

DP2000/2500 series

The I/O port GA-2 (IC6) sends the MMON signal at “High” level, MMDIR signal at “Low” level, and MMBRK signal at “High” level to the main motor. This allows each excitation phase of the motor to be excited through the motor drive circuit to start rotation.

(3) For the main motor, the motor drive circuit detects the rotor position in the motor and the rotational frequency (FG pulse). It compares the detected rotational frequency with the MMCLK signal in terms of phase and speed. It adjusts the excitation timing to eliminate the difference in each comparison and control the rotation of the motor. When the difference in each comparison is then eliminated and the rotation stabilizes, the main motor sends the MMSYNC signal at “Low” level to the I/O port GA-2.

(4) **DP1600 series**

To stop the rotation, the I/O port GA-2 turns the MMON signal to “Low” level, thereby stopping the main motor.

DP2000/2500 series

To stop the rotation, the I/O port GA-2 turns the MMBRK signal to “High” level, thereby braking the rotation of the main motor. Then, the I/O port GA-2 turns the MMON signal to “Low” level to stop the main motor.

10.4.2 Control signals

(1) MMCLK signal

Reference clock signal for rotational speed.

(2) MMDIR signal (DP2000/2500 series)

Rotational direction setting signal.

“Low” level: Rotates counterclockwise as viewed from the output shaft.

“High” level: Rotates clockwise as viewed from the output shaft.

(3) MMBRK signal (DP2000/2500 series)

Rotational brake signal.

“Low” level: Brake ON

“High” level: Brake OFF

(4) MMON signal

ON/OFF control signal for main motor.

“Low” level: OFF

“High” level: ON

(5) MMSYNC signal

Detection signal for rotational state.

“Low” level: Rotation at constant speed

“High” level: Rotation at non-constant speed

MEMO

11. DRUM-RELATED SECTION 11-1

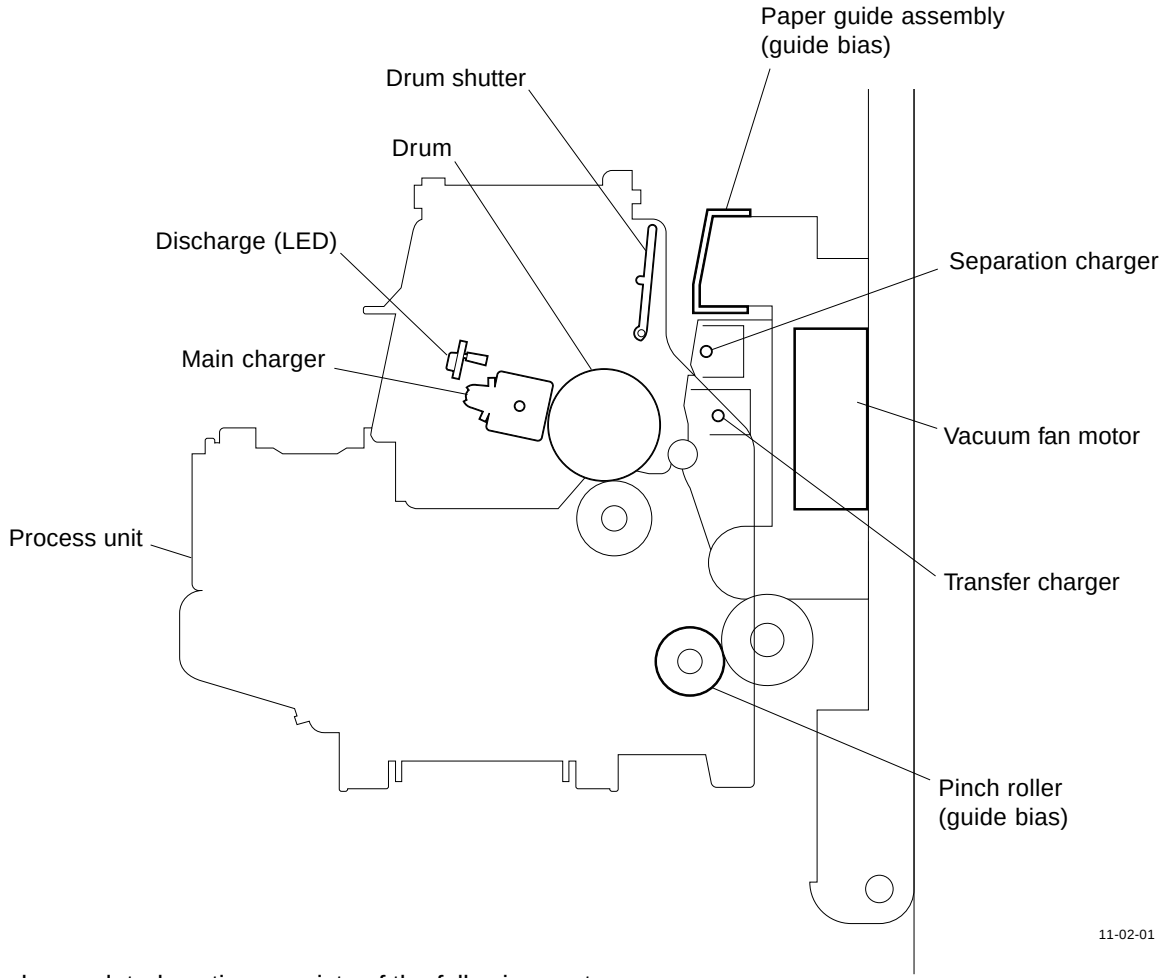
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11. DRUM-RELATED SECTION

11.1 General Description

The drum-related section performs discharging and charging to form an electrostatic latent image on the drum in the printing process. It also transfers a toner image on the drum to paper and separates the paper from the drum.

11.2 Construction

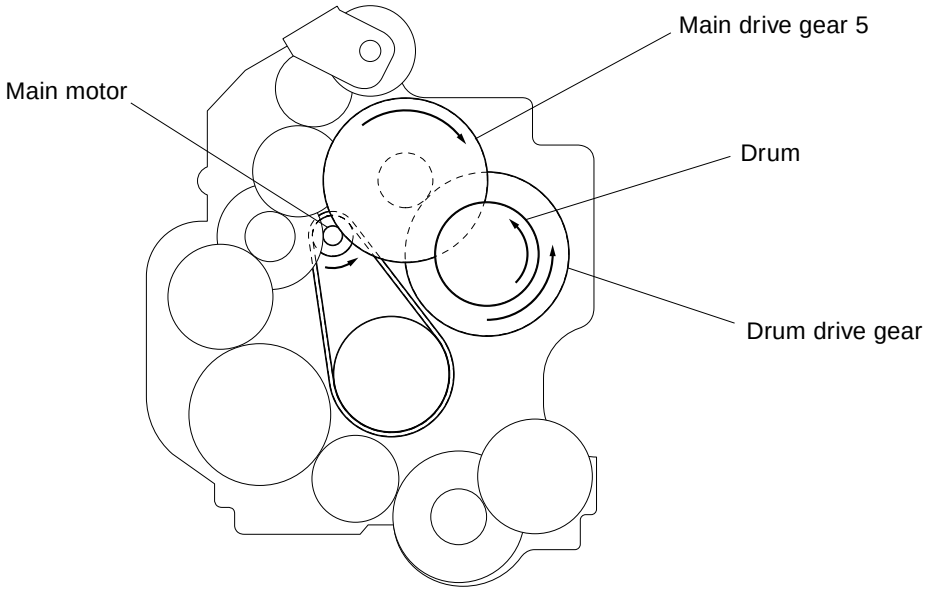


The drum-related section consists of the following parts:

- Drum
- Discharge LED
- Main charger
- Transfer charger
- Separation charger
- Drum shutter
- Paper guide assembly
- Vacuum fan motor

11.3 Drive Description

(1) Drum



11-03-01

The drum rotates as the driving force of the main motor is transmitted to it through each gear.

Main motor

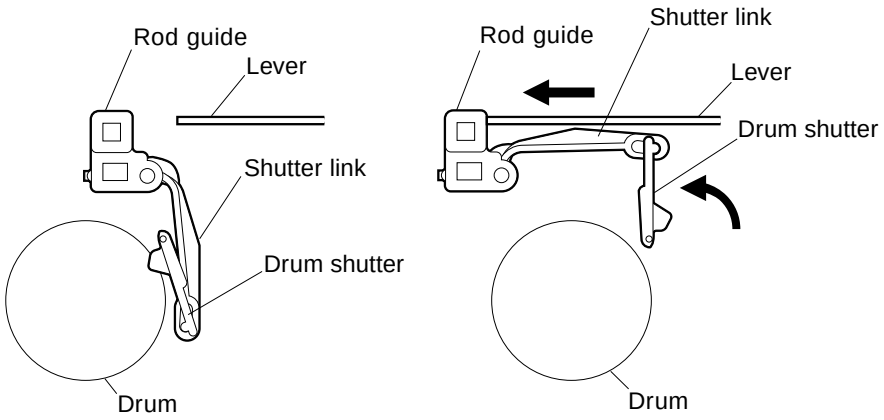
↓

Main drive gear 5

↓

Drum drive gear → Drum

(2) Drum shutter



11-04-01

(Drum shutter is closed.) (Drum shutter is opened.)

When the side cover assembly is closed, the lever of the fuser unit is pushed. Then, the lever pushes the rod guide so that the rod guide pulls the shutter link to open the drum shutter.

11.4 Function of Each Part

(1) Drum

The drum comprises a drum-shaped, Aluminum base coated with an organic photosensitive element (photoconductor) film. The principle of “Photoconductivity” indicates that insulating properties of the material are evidenced in the dark. Likewise, its conductive properties are evidenced in the presence of light.

(2) Main charger

Applies a negative electrostatic charge to the drum (through a high-voltage transformer). When high voltage is applied to this charger wire, the air around the wire is ionized (electrostatically charged). The ionized air is attracted to the drum’s surface. This phenomenon is referred to as “corona discharged.” In the dark, the surface of the drum is negatively (minus) charged using the principle of corona discharge.

(3) Discharge LED

Lower the electrical resistance of the photosensitive surface that was left over after the exposure and transfer processes. The discharge LED has two effects, a cleaning effect and “pre-exposure” effect. The cleaning effect neutralizes and eliminates the residual charge on the surface of the photosensitive element while the pre-exposure effect maintains a fixed photosensitive surface potential before the charging process is again initiated.

(4) Transfer charger

Transfer the toner on the drum to the copy paper. When high voltage is applied to this charger wire, the air around the wire is ionized (electrostatically charged). The ionized air is attracted to the backside of the copy paper. This phenomenon is referred to as “corona discharged.” The backside of the copy paper is positively (plus) charged using the principle of corona discharge.

(5) Paper guide assembly

Positive (plus) bias voltage is applied to the guide to prevent that the of translatability is lowered under the condition such as high humidity.

(6) Separation charger

Separates the copy paper with toner from the drum. When high voltage is applied to this charger wire, the air around the wire is ionized (electrostatically charged). The ionized air is attracted to the backside of the copy paper. This phenomenon is referred to as “corona discharged.” The backside of the copy paper is negatively (minus) charged using the principle of corona discharge. The electrostatic attraction between the paper and the drum weakens.

(7) Vacuum fan motor

Works to help separation of copy paper from the drum surface by sucking the air form the back side of the paper.

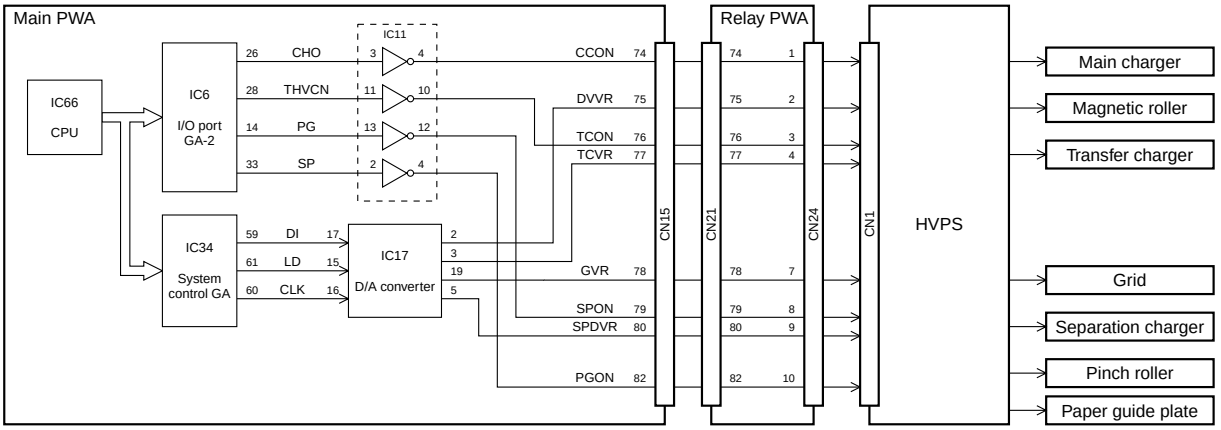
(8) Drum shutter

Mounted on the process unit, the drum shutter protects the surface of the drum. The drum shutter is opened only when the process unit is installed in the copier and the charger cover assembly is closed.

11.5 High Voltage Output Control Circuit

11.5.1 Outline

This section describes the control circuit for each bias voltage and current for charging, development, transfer, and separation.



11-05-01

11.5.2 Control method

Charging (Grid)

The CPU (IC66) loads reference voltage data for the grid into the register of the system control GA (IC34).

↓

The system control GA converts the data loaded into the register to a DI signal (ADC setting signal) in serial format and sends it to the D/A converter (IC17) at the timing of the CLK signal (transfer clock signal) and the LD signal (load data signal).

↓

The D/A converter converts the input data to a GVR signal (grid reference voltage signal) in analog form and sends it to the HVPS.

↓

The HVPS generates high voltage based on the voltage value of the GVR signal and delivers it to the grid.

Charging (Main charger)

The I/O port GA-2 (IC6) turns the CCON signal (main charger control signal) to “Low” level.

↓

The HVPS generates constant-current and delivers it to the main charger.

Development (Magnetic roller)

The CPU (IC66) loads reference voltage data for development bias into the register of the system control GA (IC34).

↓

The system control GA converts the data loaded into the register to a DI signal (ADC setting signal) in serial format and sends it to the D/A converter (IC17) at the timing of the CLK signal (transfer clock signal) and the LD signal (load data signal).

↓

The D/A converter converts the input data to a DVVR signal (development bias reference voltage signal) in analog form and sends it to the HVPS.

↓

The HVPS generates high voltage based on the voltage value of the DVVR signal and delivers it to the magnetic roller.

There are the following two cases where high voltage is delivered to the magnetic roller: the delivery of positive voltage (during initial operation) and the delivery of negative voltage (during printing operation). Only during the delivery of positive voltage, the development bias voltage is delivered or cut off synchronizing with the timing of the SPON signal (separation charger control signal). When the SPON signal is at "Low" level, the positive voltage is delivered.

Transfer (Transfer charger)

The CPU (IC66) loads reference voltage data for transfer bias into the register of the system control GA (IC34).

↓

The system control GA converts the data loaded into the register to a DI signal (ADC setting signal) in serial format and sends it to the D/A converter (IC17) at the timing of the CLK signal (transfer clock signal) and the LD signal (load data signal).

↓

The D/A converter converts the input data to a TCVR signal (transfer bias reference voltage signal) in analog form and sends it to the HVPS.

↓

The I/O port GA-2 (IC6) turns the TCON signal (transfer charger control signal) to "Low" level.

↓

The HVPS generates current based on the voltage value of the TCVR and delivers it to the transfer charger.

Separation (Separation charger)

The CPU (IC66) loads reference voltage data for separation bias into the register of the system control GA (IC34).

↓

The system control GA converts the data loaded into the register to a DI signal (ADC setting signal) in serial format and sends it to the D/A converter (IC17) at the timing of the CLK signal (transfer clock signal) and LD signal (load data signal).

↓

The D/A converter converts the input data to a SPDVR signal (separation bias reference voltage signal) in analog form and sends it to the HVPS.

↓

The I/O port GA-2 (IC6) turns the SPON signal (separation charger control signal) to “Low” level.

↓

The HVPS generates current based on the voltage value of the SPDVR signal and delivers it to the separation charger.

Guide bias (Paper guide plate / Pinch roller)

The I/O port GA-2 (IC6) turns the SPON signal (separation charger control signal) to “Low” level.

↓

The I/O port GA-2 turns the PGON signal (paper guide plate/pinch roller control signal) to “Low” level.

↓

The HVPS generates constant-voltage and delivers it to the paper guide plate/pinch roller.

High voltage to the paper guide plate/pinch roller is delivered or cut off synchronizing with the timing of the SPON signal (separation charger control signal). When the SPON signal is at “Low” level, the voltage is delivered.

11.6 Disassembly and Replacement

[A] Charger unit

1. If an ADU (MD-0101) is attached to the copier, open it.
2. Open side cover. (See Fig.10-3-2)
3. Release 3 hooks and detach the charger unit.

Note: To attach the charger unit, mount 2 springs to each guide firmly.

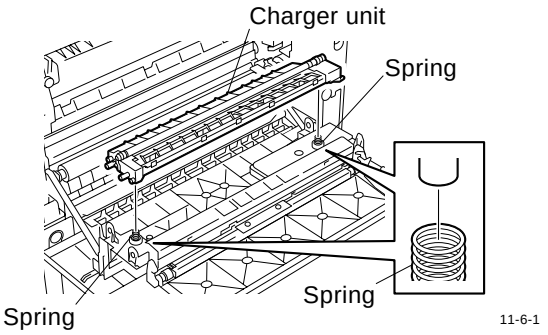


Fig. 11-6-1

[B] Guide roller collar/guide roller gear/ guide roller bush/drum collar

1. If an ADU (MD-0101) is attached to the copier, open it.
2. Open side cover. (See Fig.10-3-2)
3. Detach the charger unit. (Fig. 11-6-1)
4. Release 2 hooks and detach the guide roller assembly.
5. Remove 2 guide roller bushes, one guide roller gear, 2 guide roller collars, and 2 drum collars.

Note: After the guide roller assembly is attached, the guide roller should rotate smoothly.

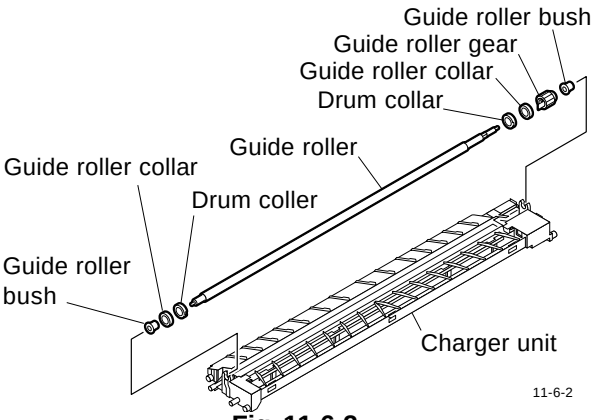


Fig. 11-6-2

[C] Separation charger wire/transfer charger wire

1. If an ADU (MD-0101) is attached to the copier, open it.
2. Open side cover. (See Fig.10-3-2)
3. Detach the charger unit. (Fig. 11-6-1)
4. Peel off the front and rear protection sheets.

Note: When placing the front and rear protection sheets on the charger unit, they do not extend from the charger unit.

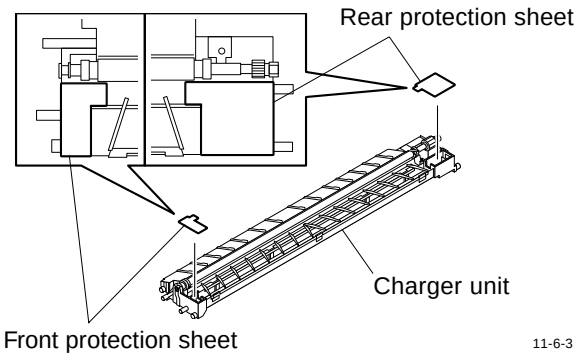


Fig. 11-6-3

5. Release 9 hooks and detach the separation charger guide.

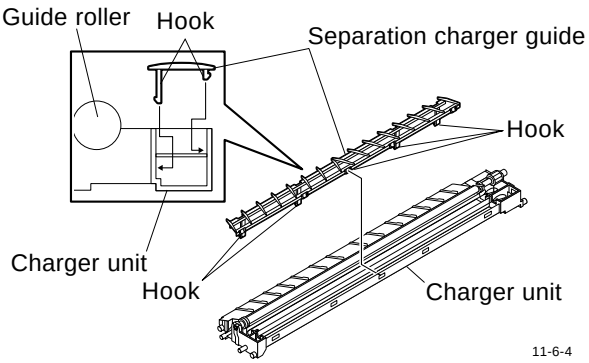


Fig. 11-6-4

6. Detach 2 dampers.

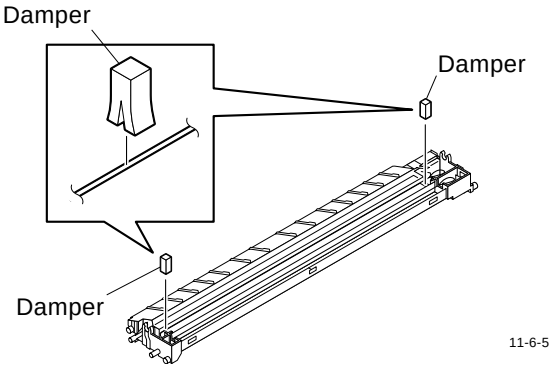


Fig. 11-6-5

7. Release the spring and detach the separation and transfer charger wires.

Note: Be careful handling the wires.

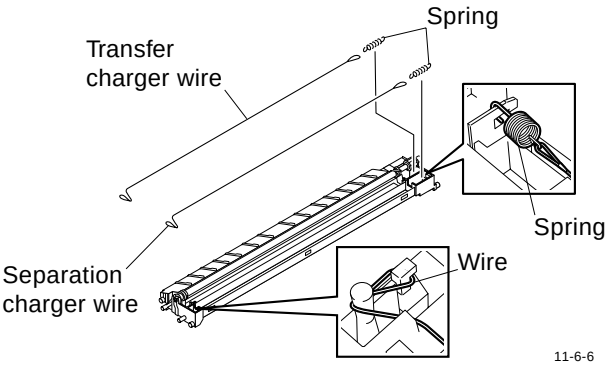


Fig. 11-6-6

12. DEVELOPER SECTION 12-1

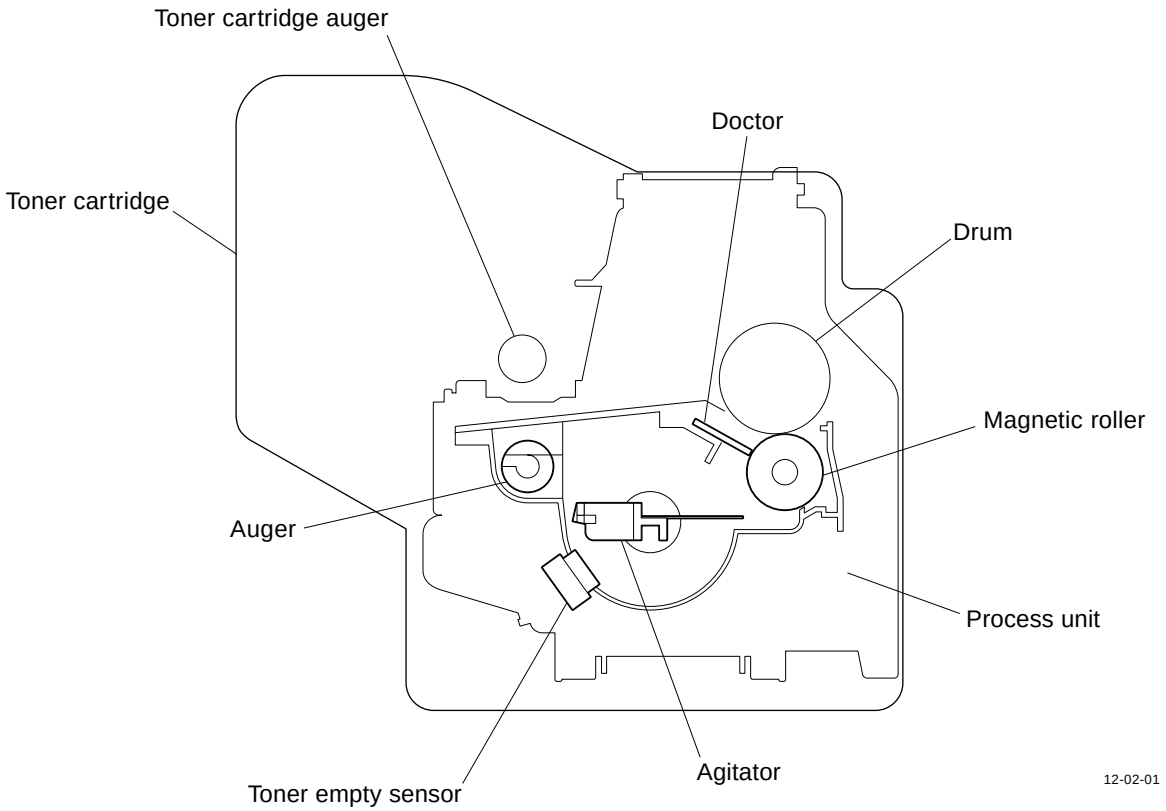
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12.5.3 Toner supply motor 12-7
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12. DEVELOPER SECTION

12.1 General Description

The developer unit converts an electrostatic latent image on the drum surface to an image visible to the naked eye.

12.2 Construction

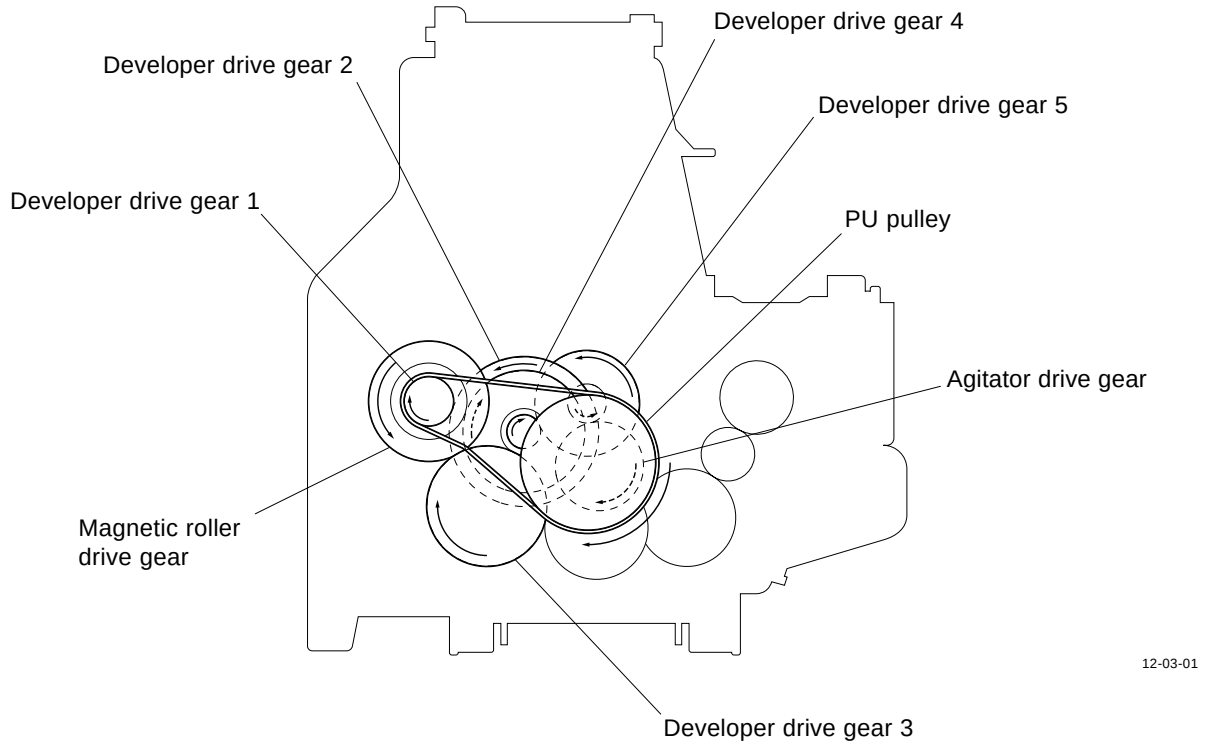


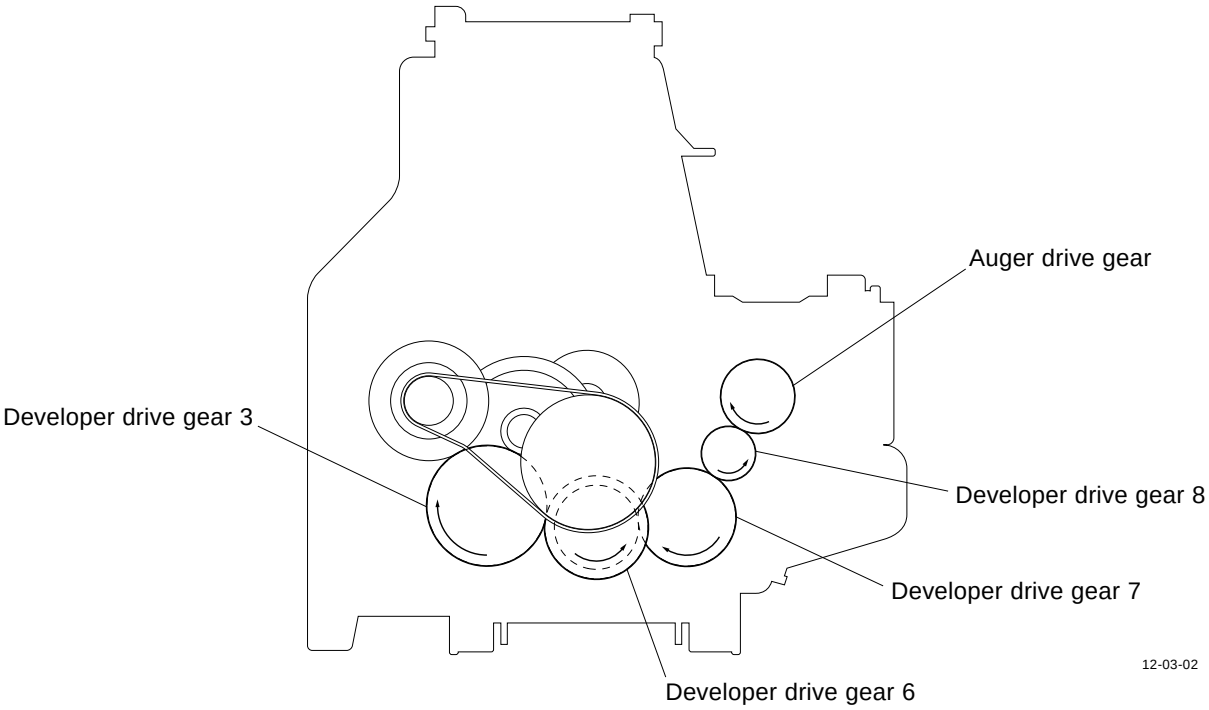
The developer section consists of the following parts:

- Magnetic roller
- Doctor
- Agitator
- Auger
- Toner empty sensor
- Toner cartridge auger

12.3 Drive Description

(1) Magnetic roller, agitator, and auger

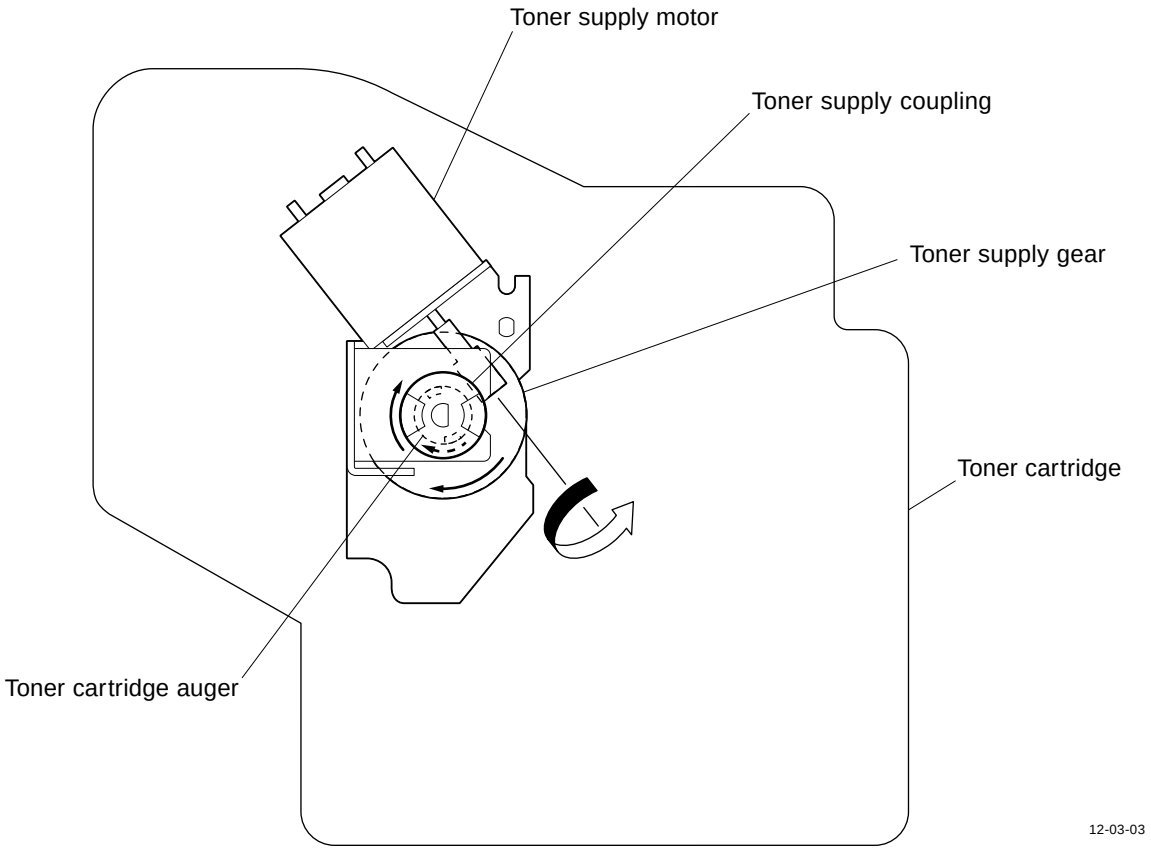




The magnetic roller, agitator, and auger turn as the driving force of the main motor is transmitted to them through each gear.



(3) Toner cartridge auger



The toner cartridge auger turns as the driving force of the toner supply motor is transmitted to them through each gear.

Toner supply motor

↓

Toner supply gear

↓

Toner supply coupling → Toner cartridge auger

12.4 Function of Each Part

(1) Magnetic roller

Magnetic roller is made of aluminum, with magnets positioned inside it. By using the magnetic force, the developer material is attracted (because the carrier is made of iron powder), forming magnetic lines of force shaped like a brush. Further, magnets are secured, and only the sleeves around magnetic roller rotate. Through this rotation, the magnetic brush of the magnetic roller sweeps the surface of the photosensitive drum, enabling development.

(2) Doctor

The doctor makes the thickness of the toner layer on the magnetic roller surface as specified to allow toner to pass between the magnetic roller and the drum.

(3) Agitator

The agitator supplies toner in the developer unit to the magnetic roller.

(4) Auger

The auger delivers the toner supplied from the toner kit to the developer unit.

(5) Toner empty sensor

The toner empty sensor detects the presence or absence of toner in the developer unit.

(6) Toner cartridge auger

The toner cartridge auger supplies toner in the toner cartridge to the developer unit. If the absence of toner in the developer unit is detected by the toner sensor, the toner cartridge motor operates for a fixed time. This allows the toner cartridge auger to turn and toner to be added to the developer unit from the toner cartridge.

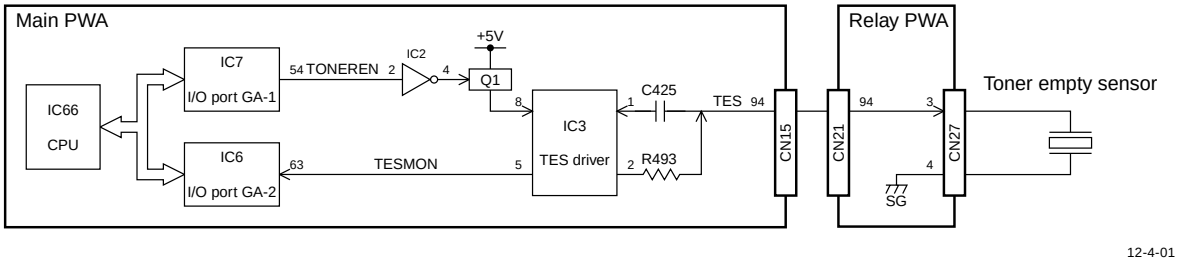
12.5 Toner Control Circuit

12.5.1 Outline

The amount of toner remaining in the process unit is detected by the piezoelectric type toner empty sensor. When the amount is small, the toner supply motor is driven to rotate the auger in the toner cartridge, causing the toner to be supplied to the process unit.

12.5.2 Toner empty detection circuit

The circuit for detecting the amount of toner remaining in the process unit consists of the following:

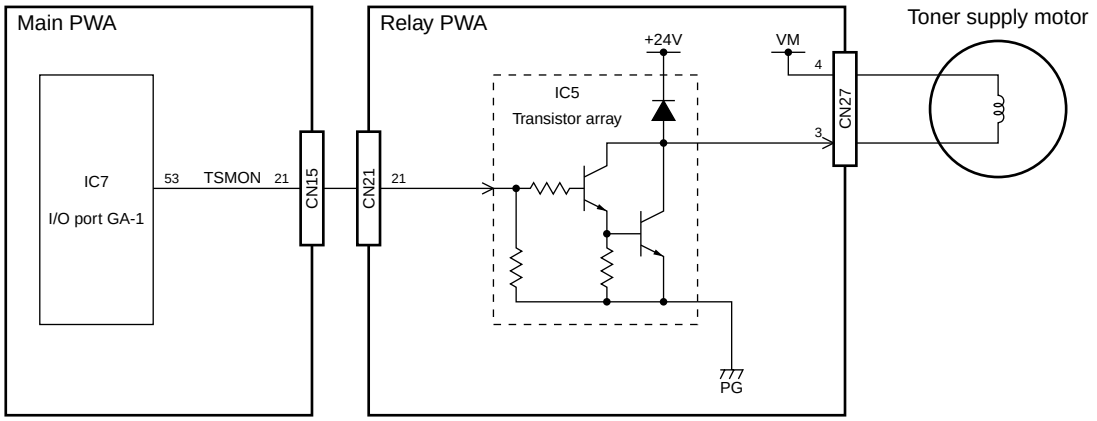


1) The I/O port GA-1 (IC7) turns the TONEREN signal (toner detection start signal) to “High” level to turn on Q1. This allows a +5V power supply to be delivered to the TES driver (IC3).
   ↓
2) The TES driver sends the TES signal (drive/detection signal) to the toner empty sensor.
   ↓
3) The toner empty sensor performs oscillation by the TES signal. At this time, if there is much toner in the process unit, the oscillation of the sensor is obstructed due to the pressure of the toner, thus causing the waveform of the TES signal to change. On the other hand, if there is not much toner in it, the pressure of the toner decreases to cause the sensor to perform oscillation so that the waveform of the TES signal almost remains unchanged.
   ↓
4) The TES driver detects a change in phase of the TES signal, and judges that there is no toner when a change in phase is small. At this time, the TES driver sends the TESMON signal (toner empty signal) at “Low” level to the I/O port GA-2 (IC6).
   ↓
5) The CPU (IC66) judges the amount of remaining toner by the number of times the level of the TESMON signal becomes low.

12.5.3 Toner supply motor

The toner supply motor is provided to supply toner for the process unit.

The toner supply motor is driven by transistor (IC5), and its circuit is structured as follows.



The motor winding is connected to the +24V at its (+) side and to the collector of IC5 at its (-) side.

- When TSMON signal (Toner supply motor drive signal) of the I/O port GA-1 (IC7) becomes “H” level -
  - IC5 is turned on → The +24V power supply supplies current to IC5 via the motor winding → the motor rotates
- When TSMON signal becomes “L” level -
  - IC5 is turned off → The current which was flowing in the motor winding flows via the route of diode. → It decreases at the rate of the time constant determined by the inductance and resistance of the winding. → the motor stops.

12.6 Disassembly and Replacement

[A] DEV. motor assembly

1. If a STP (KK-1600) is attached to the copier, disconnect the power cable.
2. Detach the manual pocket.
3. Detach the toner cartridge and the process unit.
4. Detach rear cover. (See Fig. 2-6-1)
5. Remove MAIN PWA. (See Fig. 2-6-25)
6. Detach the connectors from RELAY PWA (CN32/ CN39/CN54) and release the clamp.

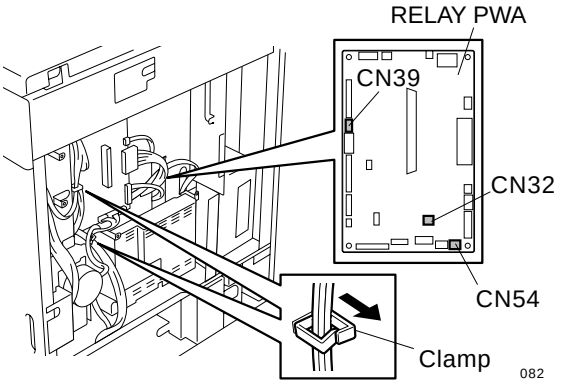


Fig. 12-6-1

7. If an ADU (MD-0101) is attached to the copier, open it.
8. Open side cover.
9. Open front cover.

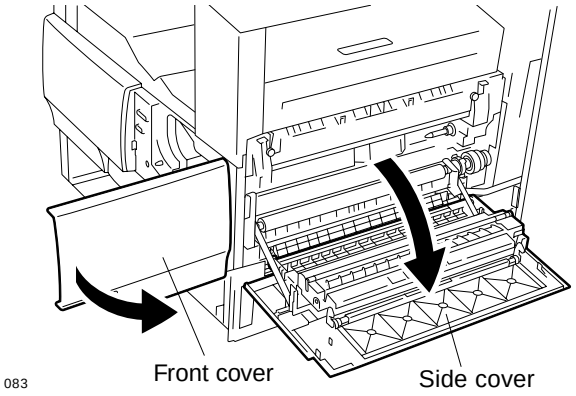


Fig. 12-6-2

10. Remove 3 screws and remove DEV. motor assembly.

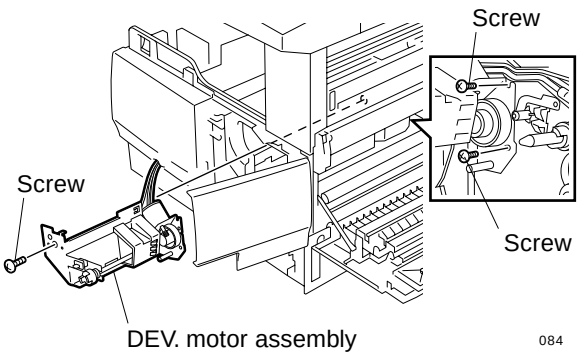


Fig. 12-6-3

13. CLEANER SECTION 13-1

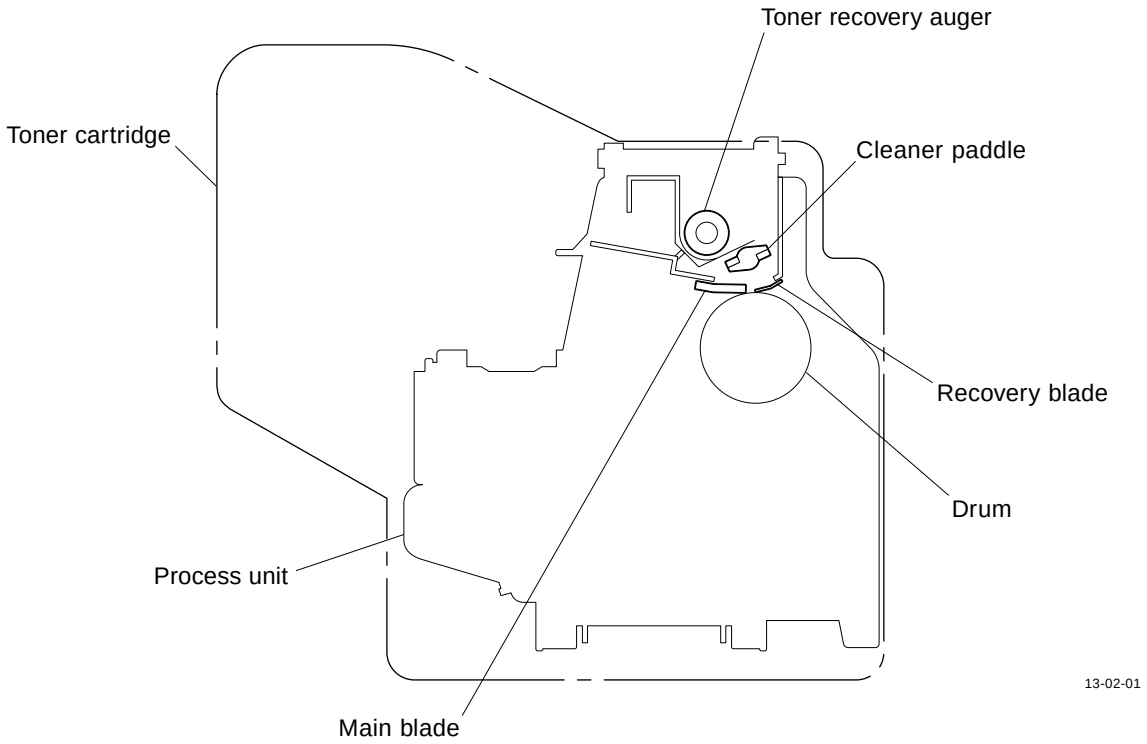
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13. CLEANER SECTION

13.1 General Description

The cleaner unit removes the residual toner from the drum surface and carries it to the toner bag of the toner cartridge.

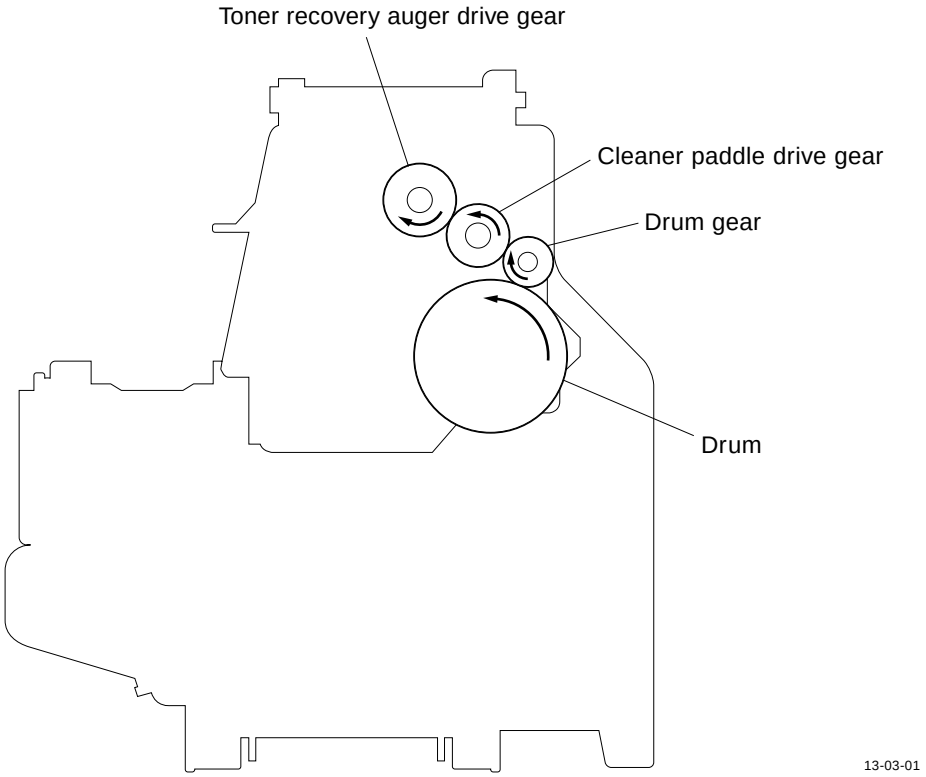
13.2 Construction



The cleaner section consists of the following parts:

- Main blade
- Recovery blade
- Cleaner paddle
- Toner recovery auger

13.3 Drive Description



The cleaner paddle and toner recovery auger turn as the rotation of the drum is transmitted to them through each gear.

Drum

↓

Drum gear

↓

Cleaner paddle drive gear → Cleaner paddle

↓

Toner recovery auger gear → Toner recovery auger

13.4 Function of Each Part

(1) Main blade

Scrapes off residual toner on the drum surface. The blade is pushed against the drum at a constant pressure by weight.

(2) Recovery blade

Catches the toner after it is scraped off by the main blade.

(3) Cleaner paddle

The cleaner paddle conveys the residual toner collected on the recovery blade to the toner recovery auger.

(4) Toner recovery auger

Carries scrapped residual toner to the toner bag.

(5) Toner bag

Stores the scraped residual toner carried by the toner recovery auger.

MEMO

14. FUSER UNIT/EXIT UNIT 14-1

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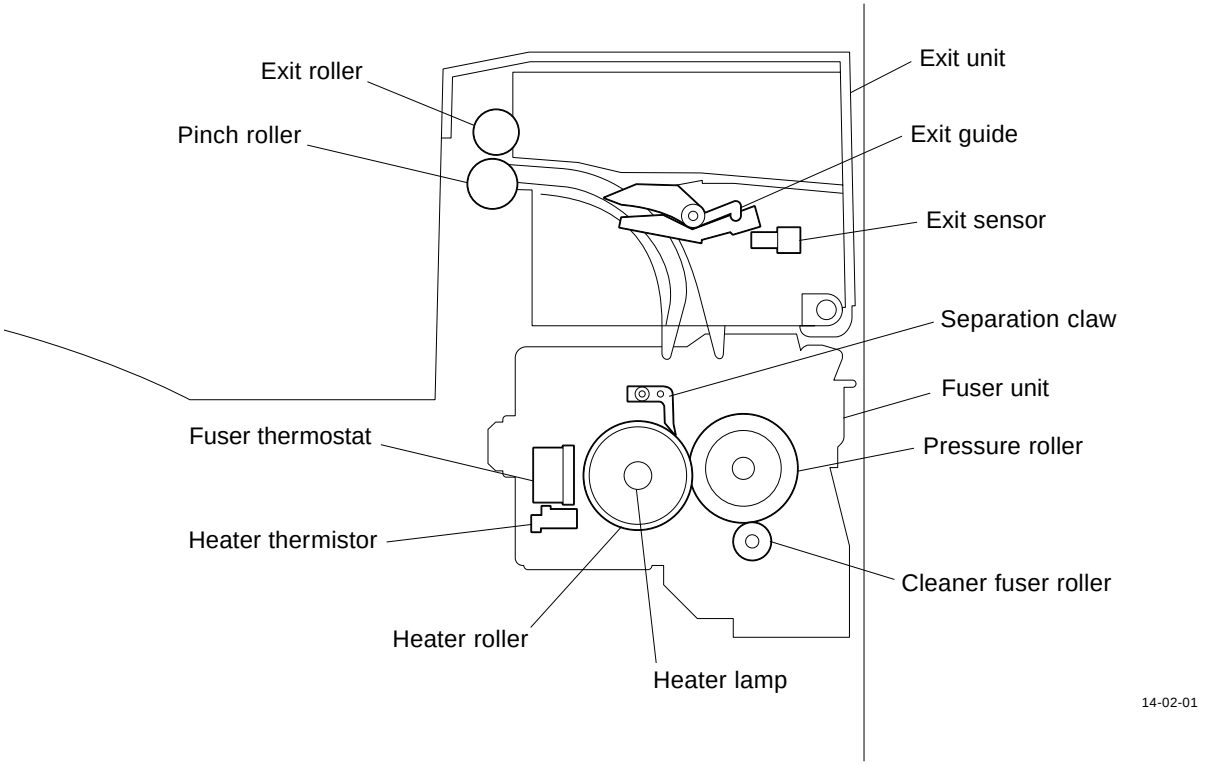
14. FUSER UNIT/EXIT UNIT

14.1 General Description

The fuser unit applies heat and pressure to a toner image formed on the paper to fix it to the paper.

The paper exit unit transports the paper, for which the fusing process has ended, to the paper tray cover.

14.2 Construction



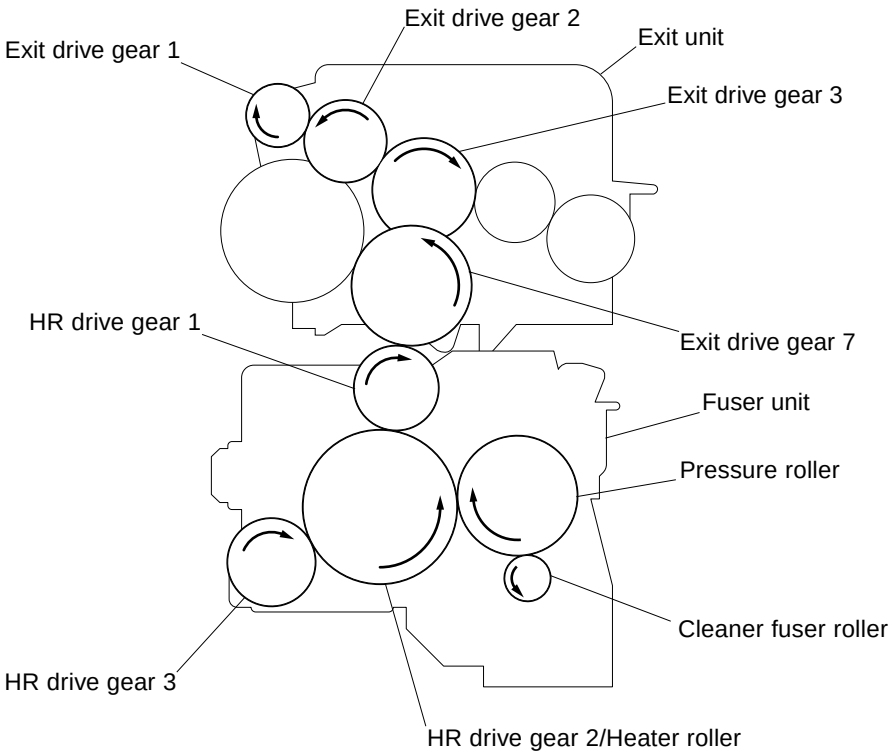
The fuser unit consists of the following parts:

- Heater lamp
- Heater roller
- Pressure roller
- Separation claw
- Cleaner fuser roller
- Heater thermistor
- Fuser thermostat

The exit unit consists of the following parts:

- Exit roller
- Pinch roller
- Exit guide
- Exit sensor

14.3 Drive Description



The heater roller, pressure roller, cleaner fuser roller, and exit roller shaft turn as the driving force of the main motor is transmitted to them through each gear.

HR drive gear 3
↓
HR drive gear 2/Heater roller → Pressure roller → Cleaner fuser roller
↓
HR drive gear 1
↓
Exit drive gear 7
↓
Exit drive gear 3
↓
Exit drive gear 2
↓
Exit drive gear 1 → Exit roller shaft

14.4 Description of Operations

14.4.1 Fuser unit

The power of the main motor is transmitted to the gear of the fuser through the main drive gear assembly to turn the heater roller. Since the pressure roller is pressed against the heater roller by the spring, it turns by the power of the heater roller. Consequently, the paper is transported by the heater roller and pressure roller.

When the paper is transported by the fuser unit, electric power is supplied to the heater lamp inside the heater roller so that the toner image on the paper is melted and fixed by the heat of the heater roller surface and the pressure of the pressure roller, respectively.

The temperature of the heater roller is controlled by turning on or off the heater lamp according to the value detected by the thermistor. If the heat roller temperature exceeds the specified temperature due to an abnormal condition, the supply of the electric power to the heater lamp is stopped by the thermostat.

The paper, on which fixing has taken place, is stripped from the heat roller by the separation claw and transported to the exit unit.

14.4.2 Exit unit

Power from the main motor is transmitted to the gears of the exit unit through the gears of the fuser unit to turn the exit roller. The pinch roller is pressed against the exit roller by the spring so that it is turned by the power of the exit roller. Consequently, the paper is transported by the exit roller and pinch roller.

14.5 Functions of Each Part

14.5.1 Fuser unit

(1) Heater lamp

The halogen lamps are provided inside the heater roller to heat the heater roller. The heater lamp stays fixed even when the heat roller is rotating.

(2) Heater roller

The heater roller is made of aluminum having comparatively good heat conducting properties. It is heated by the heater lamps. Fusing is carried out by passing the transfer paper through the section where the heater roller and pressure roller each other so that the toner image on the paper faces the heater roller. In other words, the toner is melted by the heat of the heater roller, and the heat transfer efficiency is improved by the pressure of the pressure roller so that the toner soaks in between the fibers of the paper.

(3) Pressure roller

The pressure roller is made of rubber to facilitate pressurization of the heater roller. The pressure roller is pressed against the heater roller by springs.

(4) Separation claws

The separation claws separate the paper affixed to the heater roller.

(5) Cleaner fuser roller

The cleaner fuser roller is attached so as to contact the pressure roller to remove the toner and paper scraps that have stuck to the heater roller during the fusing the process.

(6) Heater thermistor 1 (center section)

The thermistor detects the temperature of the heat rollers so that it is maintained within a fixed temperature width, (actually, around 200°C), i.e. higher than the lower limit (defective fusing temperature) and the upper limit (toner burning temperature). In other words, the thermistor controls the temperature so that the heater lamps turn ON when the heater roller is low than the temperature setting, and turn OFF when they are above the temperature setting.

(7) Heater thermistor 2 (end section)

The temperature distribution of the heater roller sometimes differs greatly at the center section and end section in the lengthwise direction depending on the printing conditions. The thermistor 2 detects the temperature at the end section. This thermistor controls the temperature so that the heat lamp turns OFF when either of the values detected by the thermistor 1 or thermistor 2 exceeds the temperature setting.

(8) Fuser thermostat

The thermostat cuts the power to the heater lamps if the heater roller become abnormally hot as a result of thermistor malfunction, for example. The thermostat on this copier is for preventing abnormal operation. When the thermostat detects an abnormality, the thermostat must be replaced together with the other damaged parts in the fuser.

14.5.2 Paper exit unit

(1) Exit roller

The exit roller turns as the power of the main motor or ADU motor (Upper) is transmitted to it through the gear of the fuser, thereby transporting the paper.

(2) Pinch roller

The pinch roller helps the exit roller transport the paper. The pinch roller is pressed against the exit roller by the spring so that it is turned by the power of the exit roller.

(3) Exit sensor

The exit sensor detects the transport of paper at the paper exit unit. A paper jam is detected according to the on/off timing of the exit sensor.

(4) Exit guide

The exit guide is used as a guide for transporting the paper to the option ADU.

14.6 Heater Control Circuit

14.6.1 Temperature detection section

This section detects the surface temperature of the heat roller in the fuser unit by means of two thermistors (heater thermistor 1 and 2) and turns ON and OFF the heater lamp to keep the fusing temperature fixed.

- The thermistor has the property of reducing its resistive value at high temperature. Therefore, the heater control circuit detects that the higher the thermistor resistive value the lower the heat roller temperature, and that the lower the resistive value the higher the temperature. The CPU controls turning ON and OFF the heat roller so that the detected temperature is within the set range of fusing temperatures. Finding the detected temperature abnormal, the CPU performs error processing to stop the supply of power to the heat roller.

- If the heat roller temperature abnormally rises due to short-circuiting of the triac or temperature control disabled by breaking of the thermistor, etc., the thermostat cuts off the power supply line to the heater lamp to prevent the fuser unit from being damaged.

The following abnormal conditions are detected:

(1) Thermistor abnormal or heater lamp broken at warm-up time

SERVICE CALL (C41) is displayed if the heat roller temperature is below 40°C (the output voltage of heater thermistor 1 is 0.1599V) continuously for 500 milliseconds, 25 seconds immediately after the start of warming-up immediately following the power ON or the start of warming-up at the time of restoration from the Super Power Save mode.

(2) Thermistor abnormal after error diagnosis during warming-up

SERVICE CALL (C43) is displayed if the heat roller temperature is below 40°C (the output voltage of heater thermistor 1 is 0.1599V) continuously for 500 milliseconds after the error diagnosis performed during warming-up ends.

(3) Heater lamp abnormal after abnormal diagnosis performed during warming-up or after the Ready state

SERVICE CALL (C44) is displayed if the heat roller temperature does not reach the ready set temperature even 205 seconds after the start of warming-up, or if the temperature at the center of the heat roller is above 230°C (the output voltage of heater thermistor 1 is 3.09V) continuously for 500 milliseconds or below 40°C (the output voltage of heater thermistor 1 is 0.1599V) continuously for 500 milliseconds, after the Ready state.

(4) Thermistor abnormal at the heat roller ends

SERVICE CALL (C45) is displayed if the heat roller end temperature is above 270°C (the output voltage of heater thermistor 2 is 2.72V) continuously for 500 milliseconds or below 40°C (the output voltage of heater thermistor 2 is 0.0702V) continuously for 500 milliseconds, after the Ready state.

(5) Thermistor/Heater status counter control

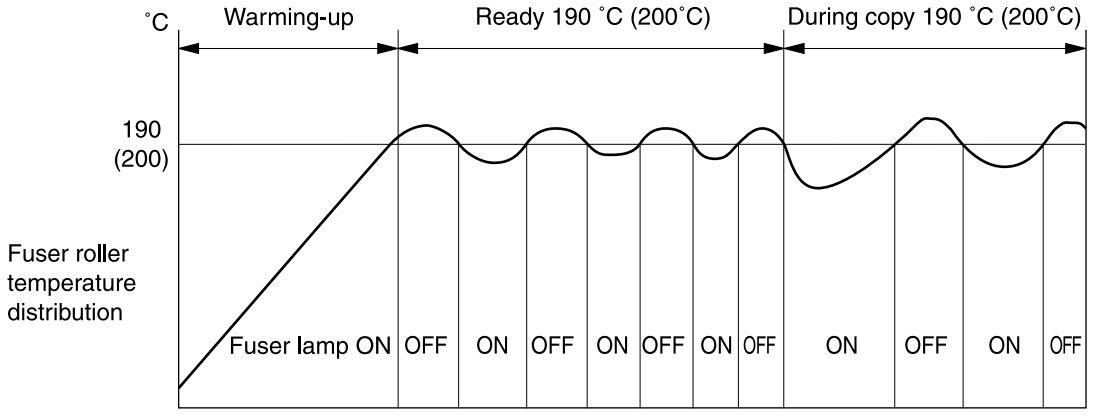
- To enhance the fuser unit safety, CPU works to provide the following protection:
  After tow consecutive C41 errors, if a third C41 error has occurred, turning the power OFF and then ON does not work to turn ON the heater lamp, instead immediately displaying a C41 error.
  However, with the thermistor/heater status counter “1” or below, if the copier becomes ready normally, the counter is cleared to “0”.
- After service calls C41 to C45 occurred and the thermistor and heater lamp have been repaired or replaced, if turning the power ON does not turn the heater lamp ON and an error occurs again, use code 400 in the 08 mode to check the thermistor/heater status counter, and clear it to “0” if necessary.
  Heat roller surface temperature (DP1600 series): 190°C (Thermistor resistance: 5.90KΩ)
  Heat roller surface temperature (DP2000/2500 series): 200°C (Thermistor resistance: 5.01KΩ)

Reference

1. The thermistor/ heater status counter never has values other than 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 written on it.
   - When the power is turned ON, if the heater lamp does not turn ON and service call C41 is displayed immediately, check the thermistor/heater status counter. If it is "2" or over, be sure to check the thermistor and heater lamp. Then, after repairing or replacing, it is necessary to reset the counter to "0"(code 400 in 08 mode) and then turn the power ON.
   - If the thermistor/heater status counter should show "10" or over (e.g., 11), there is a possibility that SRAM or the data in it may have been ruined. Check the bias, high-voltage transformers and charge wires to see if any of them is defective, and repair if necessary. Then, you have to check all the data inside SRAM.
2. Relationship between the thermistor output voltage and heat roller temperature:
   Approx. 2.33V when the temperature is 190°C, approx. 2.53V when the temperature is 200°C and approx. 0.1599V when the temperature is 40°C.
3. Relationship between the heat roller surface temperature and the heater thermistor 1 resistance.

   Values in ( ) are for DP2000/2500 series.

Temperature	Thermistor resistance	Fuser lamp state
190 (200) °C or below	5.9KΩ (5.01KΩ) or over	ON
190 (200) °C	5.9KΩ (5.01KΩ)	The previous state kept intact
190 (200) °C or over	5.9KΩ (5.01KΩ) or below	OFF



Values in ( ) are for DP2000/2500 series.

16_001

Fig. 14-6-1

4. Temperature control at heat roller ends
   During multi copying, the temperature on the ends of the heat roller (non-paper passage areas) generally tends to become higher than that on the paper passage areas. This temperature is detected by the heater thermistor 2; i.e. when it detects a temperature of 245°C or over, the heater lamp is set to automatically turn itself OFF, regardless of the temperature on the paper passage areas.

14.6.2 Temperature detection by the thermistor

* The detection circuits for heater thermistors 1 and 2 are equal to each other. Here, heater thermistor 1 is described.

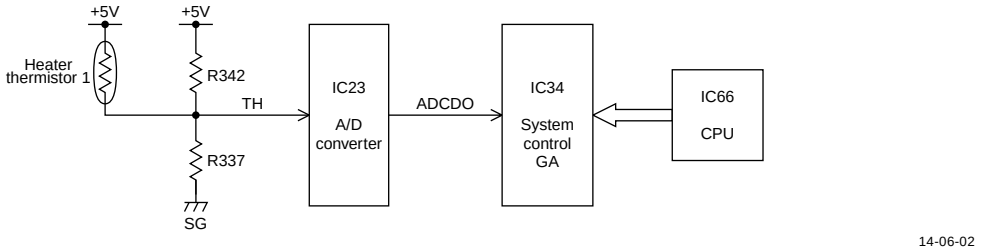


Fig. 14-6-2

- The input voltage is obtained by dividing the +5V among R342, Heater thermistor 1 and R337.
- The surface temperature of the heat roller varies.

↓

- The resistance of the heater thermistor 1 changes.

↓

- The input voltage changes.

- The input voltage is converted to digital data by the A/D converter and output to the register of the system control GA. The CPU reads this value and detects a change in the data to judge if the heat roller temperature is normal or abnormal.

14.7 Disassembly and Replacement

[A] Fuser assembly

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Detach 2 connectors, remove 2 screws, and remove fuser assembly.

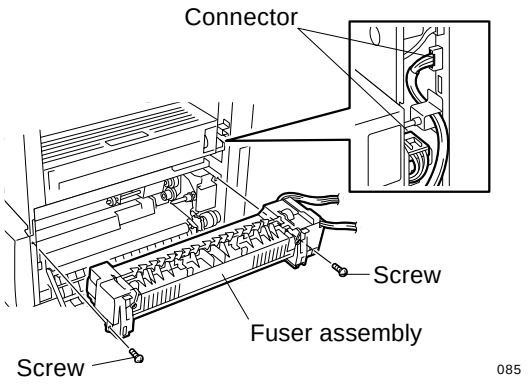


Fig. 14-7-1

[B] Heater thermofuse

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Detach 2 screws, release 6 hooks, and remove heater thermofuse.

Note: Never touch or bend the tip of the heater thermofuse.

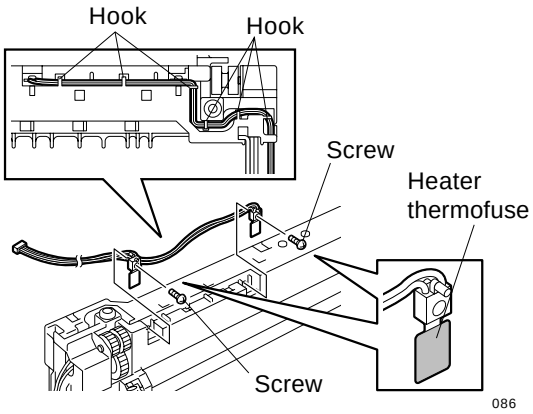


Fig. 14-7-2

[C] Heat roller separator/fuser front cover

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove 2 screws and open fuser front cover.

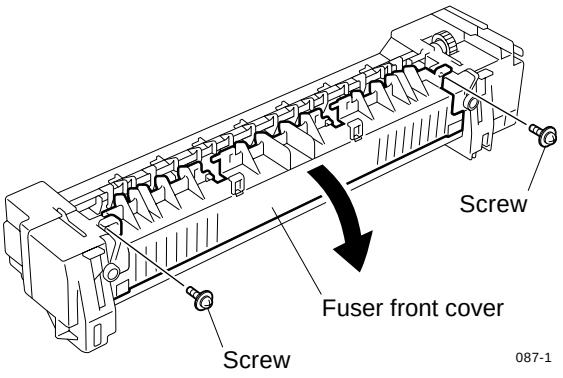


Fig. 14-7-3

5. Remove the fuser front cover.

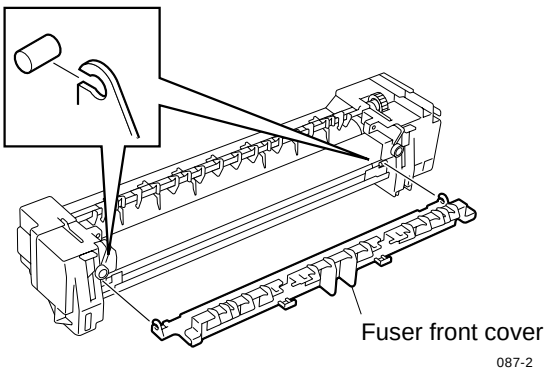


Fig. 14-7-4

6. Remove the spring from the fuser unit and detach the heat roller separator.
7. Remove the spring from the heat roller separator.

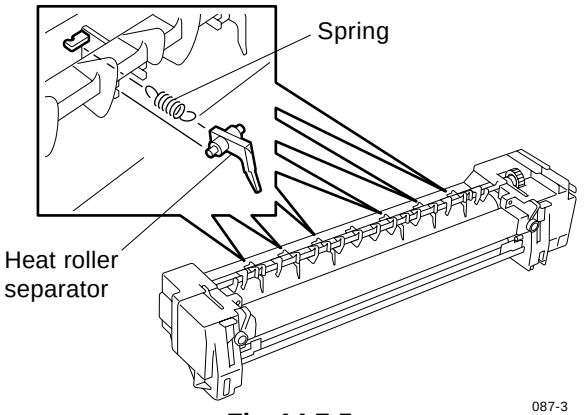


Fig. 14-7-5

[D] Housing

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove the fuser front cover. (See Figs. 14-7-3 and 14-7-4)
5. Remove 2 screws and detach the housing.

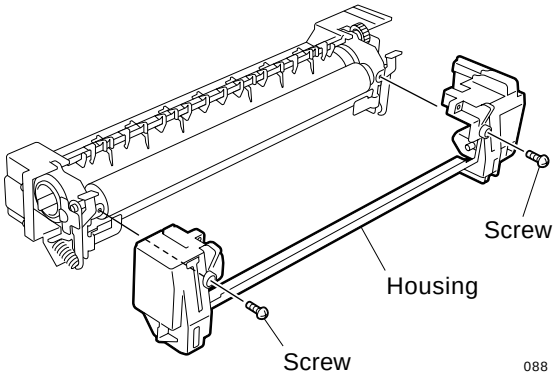


Fig. 14-7-6

[E] Fuser thermofuse

(DP1600 series)

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-16)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove heater thermofuse. (See Fig. 14-7-2)
5. Remove 2 screws and detach the housing assembly.

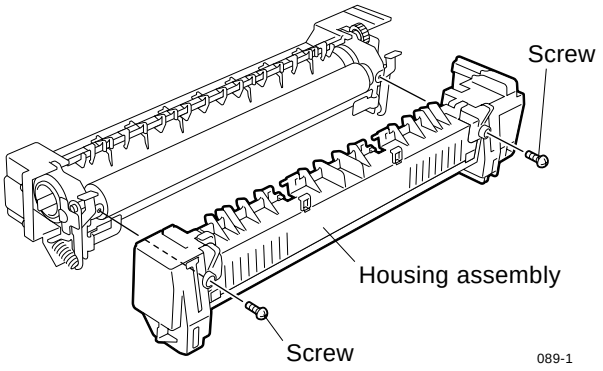


Fig. 14-7-7

6. Remove the heat roller separator. (See Fig. 14-7-5)
7. Remove one screw and detach the spring plate.

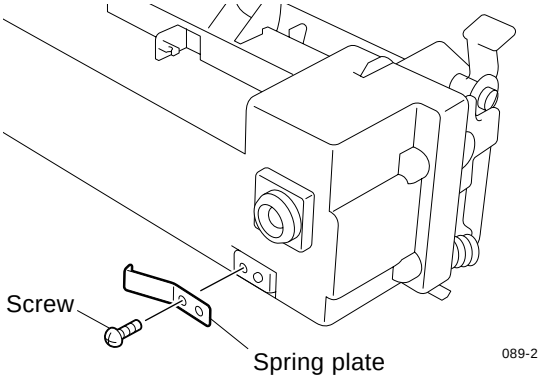


Fig. 14-7-8

8. Remove 3 screws (A type: for NAD/TWD/SAD models) or 4 screws (B type: for ASD/AUD/CND/MJD models) to release the heater cover assembly.

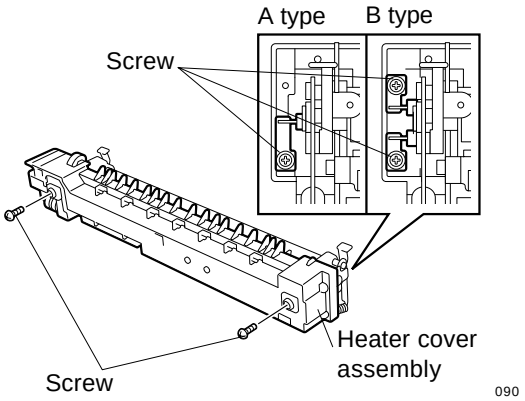


Fig. 14-7-9

9. Remove 2 screws and detach the fuser thermofuse.

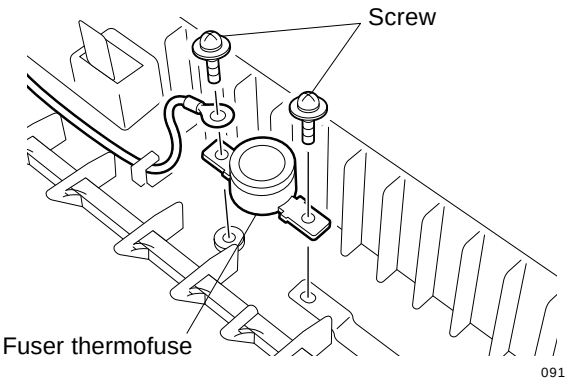


Fig. 14-7-10

(DP2000/2500 series)

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-16)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove heater thermofuse. (See Fig. 14-7-2)
5. Remove 2 screw and detach the housing assembly. (See Fig.14-7-7)
6. Remove the heat roller separator. (See Fig. 14-7-5)
7. Release 2 hooks to detach the partition plate.

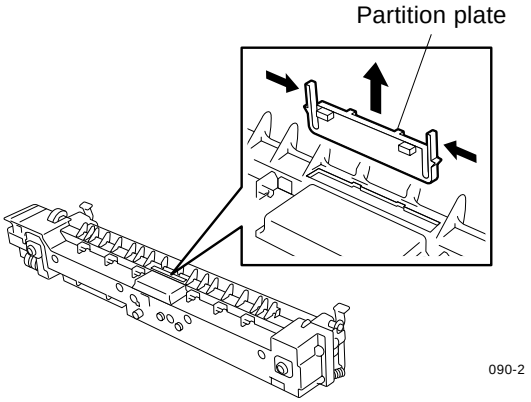


Fig. 14-7-11

8. Remove 4 screws (A type: for NAD/TWD/SAD models) (B type: for ASD/AUD/CND/MJD models) to release the heater cover.

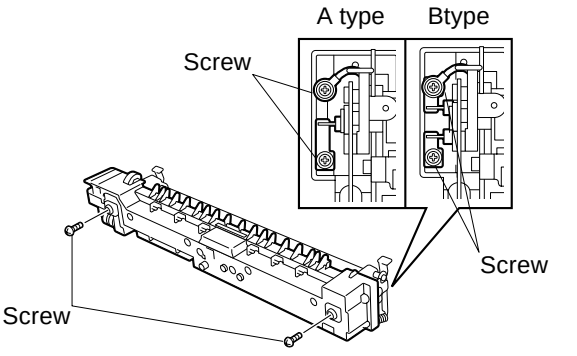


Fig. 14-7-12

9. Remove 2 screws and detach the fuser thermofuse.

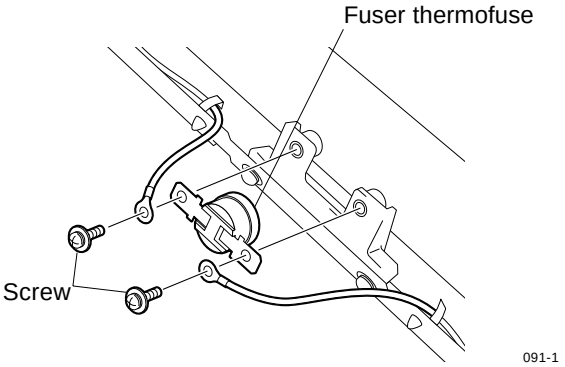


Fig. 14-7-13

Note: When assembling, make sure that the thermofuse is attached as shown in the figure on the right.

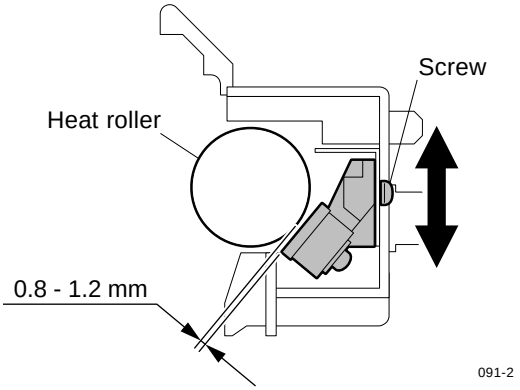


Fig. 14-7-14

[F] HR drive gear 1

(DP1600 series)

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove heater thermofuse. (See Fig. 14-7-2)
5. Remove the housing assembly. (See Fig. 14-7-7)
6. Remove the heat roller separator. (See Fig. 14-7-5)
7. Release the heater cover assembly. (See Figs. 14-7-8 and 14-7-9)
8. Remove the HR drive gear 1.

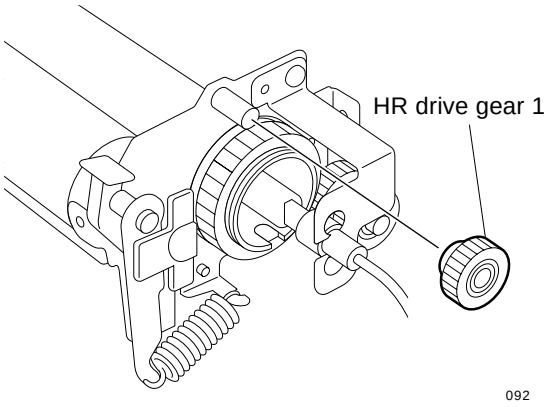


Fig. 14-7-15

[G] HR drive gear1/ HR drive gear3

(DP2000/2500 series)

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove heater thermofuse. (See Fig. 14-7-2)
5. Remove the housing assembly. (See Fig. 14-7-7)
6. Remove the heat roller separator. (See Fig. 14-7-5)
7. Release the heater cover assembly. (See Fig.14-7-11 and 14-7-12)
8. Remove 2 screw and detach the heater arm holder.
9. Remove the HR drive gear 1 and HR drive gear 3.

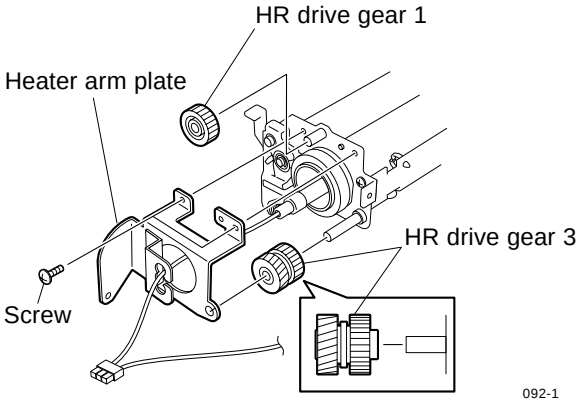


Fig. 14-7-16

[H] Heater lamp U900/heater lamp E400/500

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove the housing assembly. (See Fig. 14-7-7)
5. Remove the heat roller separator. (See Fig. 14-7-5)
6. Release the heater cover assembly. (See Figs. 14-7-8 and 14-7-9)
7. Remove one screw, release 4 hooks, and then detach the heater cover assembly. (DP1600 series)

DP1600 series

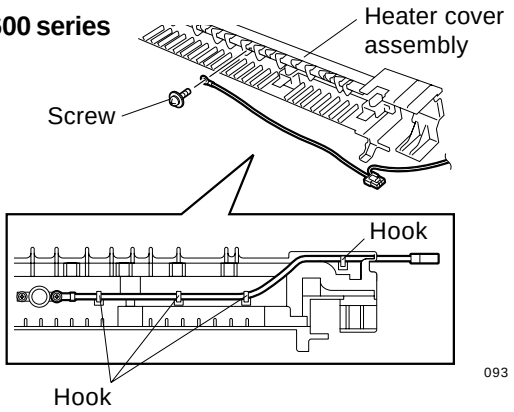


Fig. 14-7-17

8. Remove one screw and release the clamp. (DP2000/2500 series)

DP2000/2500 series

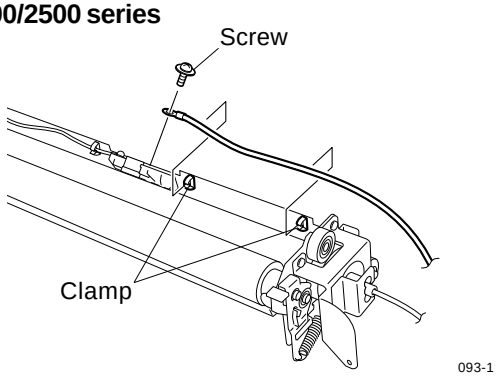


Fig. 14-7-18

9. Remove one screw and detach the heater bracket. (DP1600 series)
10. Remove the heater lamp.

[CAUTION]

Never touch the heater lamp with your bare hands.

Note: For the ASD/AUD/CND/MJD models, the 400W heater lamp should be attached to the upper side.

DP1600 series

NAD/TWD/SAD models

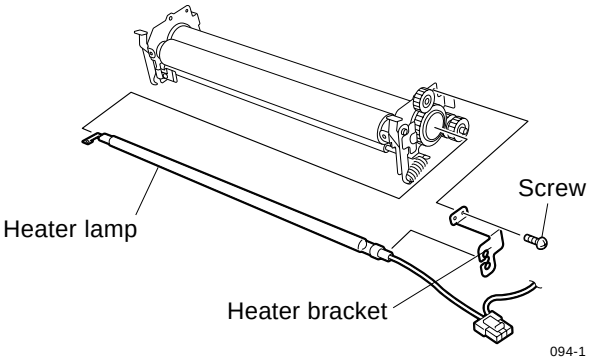


Fig. 14-7-19

DP1600 series

ASD/AUD/CND/MJD models

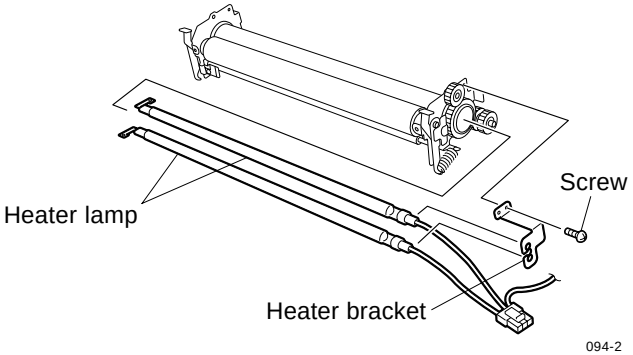


Fig. 14-7-20

11. Remove 2 screws and detach the heater arm holder. (DP2000/2500 series)
12. Remove the heater lamp.

[CAUTION]

Never touch the heater lamp with your bare hands.

Note: For the ASD/AUD/CND/MJD models, the 400W heater lamp should be attached to the upper side.

DP2000/2500 series

NAD/TWD/SAD models

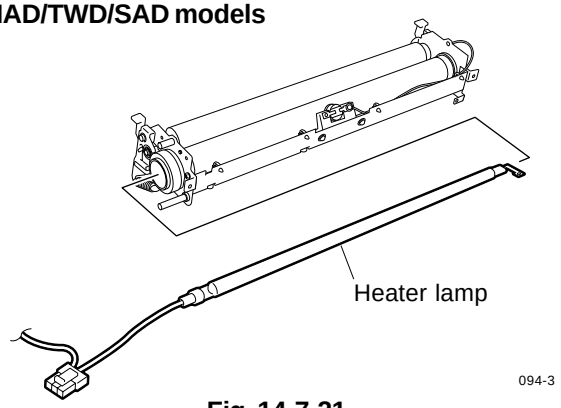


Fig. 14-7-21

DP2000/2500 series

ASD/AUD/CND/MJD models

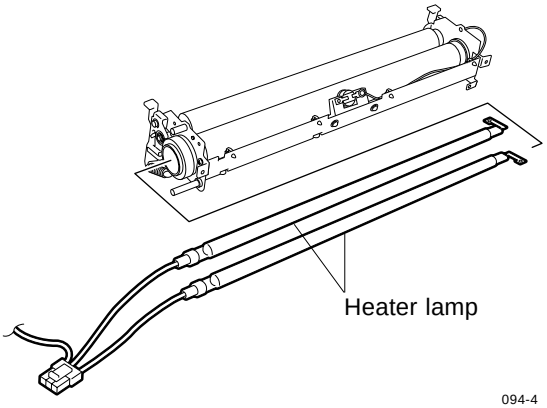


Fig. 14-7-22

[I] HR drive gear 3/heat roller/heat roller bushing/ press roller/press roller bushing/cleaning roller/ cleaning roller bushing

When disassembling the fuser assembly, pay special attention not to damage the heat roller, press roller and cleaning roller.

(DP1600 series)

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove heater thermofuse. (See Fig. 14-7-2)
5. Remove the housing assembly. (See Fig. 14-7-7)
6. Remove the heat roller separator. (See Fig. 14-7-5)
7. Release the heater cover assembly. (See Figs. 14-7-8 and 14-7-9)
8. Remove the HR drive gear 1. (See Fig. 14-7-15)
9. Remove the heater lamp. (See Figs. 14-7-17, 14-7-19 and 14-7-20)
10. Remove the HR drive gear 3.
11. Remove the C ring to detach the HR drive gear 2 and the heat roller bushing.
12. Remove the HR frame R assembly, detach press roller and the cleaning roller.

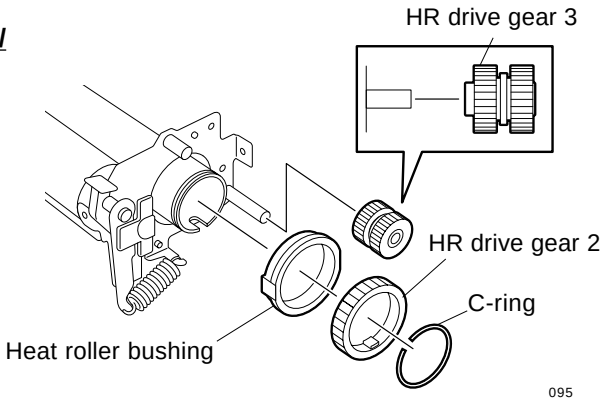


Fig. 14-7-23

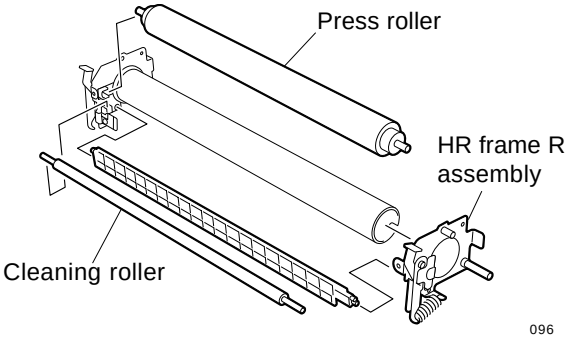


Fig. 14-7-24

13. Remove the C-ring to detach the heat roller bushing.
14. Remove heat roller.

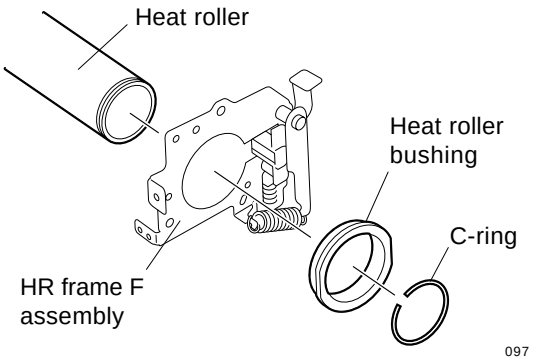


Fig. 14-7-25

15. Remove 2 press roller bushings.
16. Release the spring to remove the cleaning roller bushing.

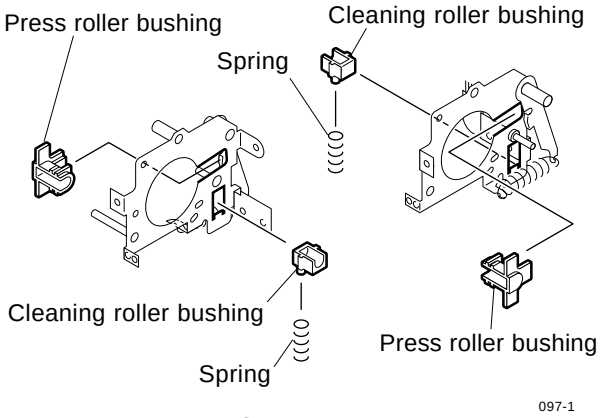


Fig. 14-7-26

[J] Heat roller/ Heat roller bushing/ press roller/ press roller bushing/ cleaning roller/cleaning roller bushing

When disassembling the fuser assembly, pay special attention not to damage the heat roller, press roller and cleaning roller.

(DP2000/2500series)

1. If an ADU (MD-0101) or SFB (MY-1016) is attached to the copier, detach it.
2. Detach right cover R. (See Fig. 2-6-15)
3. Remove fuser assembly. (See Fig. 14-7-1)
4. Remove heater thermofuse. (See Fig. 14-7-2)
5. Remove the housing assembly. (See Fig. 14-7-7)
6. Remove the heat roller separator. (See Fig. 14-7-5)
7. Release the heater cover assembly. (See Fig.14-7-11 and 14-7-12)
8. Remove the HR drive gear 1 and HR drive gear 3. (See Fig.14-7-16)
9. Remove the heater lamp. (See Fig.14-7-21 and 14-7-22)
10. Remove the spring.
11. Remove 2 screws, detach the arm holder, and then remove the guide plate.
12. Remove the C-ring to detach the HR drive gear 2 and the heat roller bushing.

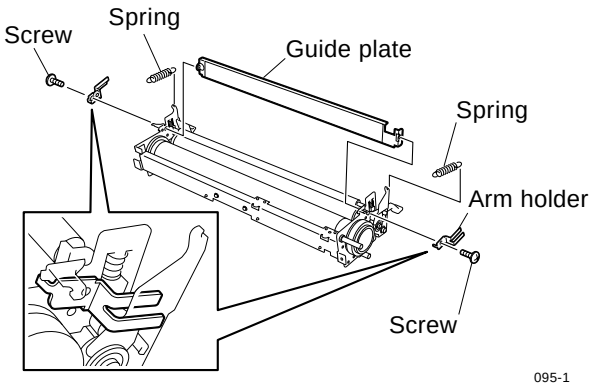


Fig. 14-7-27

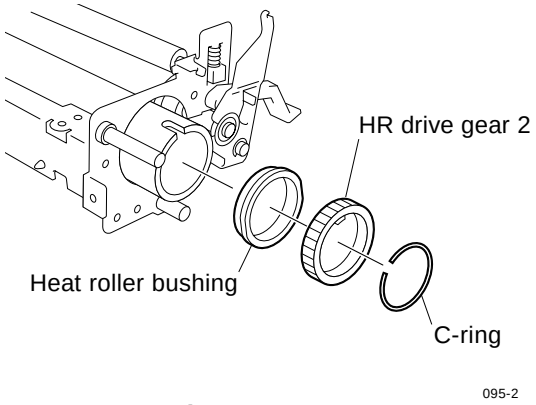


Fig. 14-7-28

13. Remove the C-ring to detach the heat roller bushing.

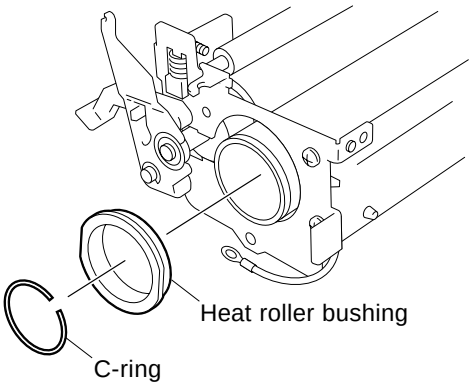


Fig. 14-7-29

14. Remove heat roller.

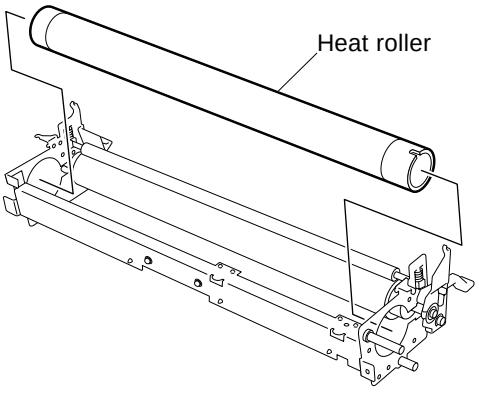


Fig. 14-7-30

15. Remove the press roller by removing the two E-rings and the two bearings.

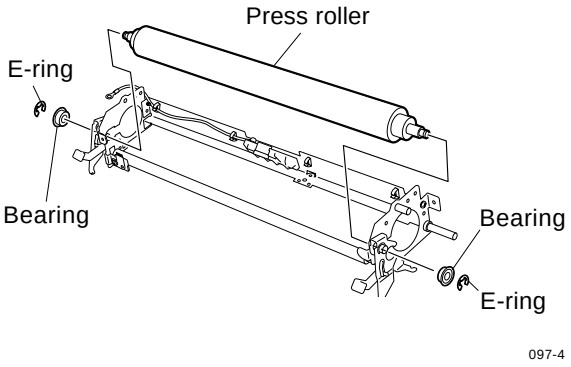


Fig. 14-7-31

16. Release the cleaning roller bushing and remove the cleaning roller.

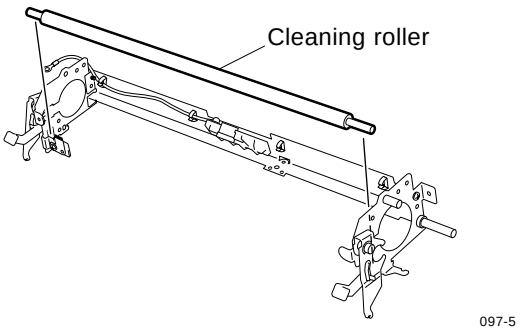


Fig. 14-7-32

17. Release the spring and detach the cleaning roller bushing.

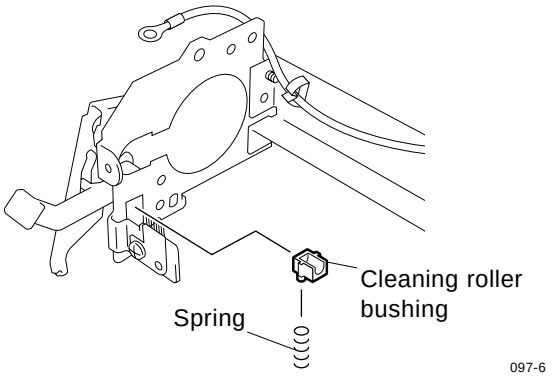


Fig. 14-7-33

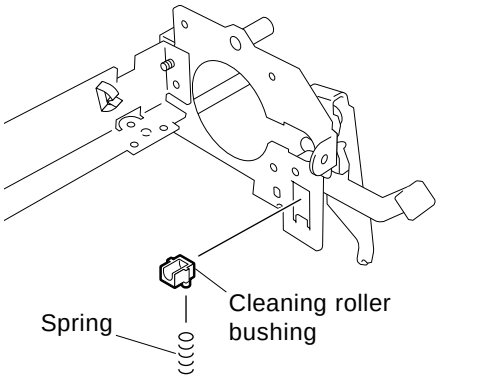


Fig. 14-7-34

[K] Exit unit

1. If a Finisher (MJ-1011) is attached to the copier, detach the finisher plate and junction block.
2. If a JSP (MJ-5001) or OCT (MJ-5002) is attached to the copier, detach it.
3. If an Original Cover (KA-1600PC), ADF (MR-2012), or the RADF (MR-3011) is attached to the copier, open it.
4. Detach scanner cover.
   (See Fig. 2-6-3 and 2-6-4)
5. Detach control panel front cover.
   (See Fig. 2-6-7)
6. Detach control panel bottom cover.
   (See Fig. 2-6-8)
7. Detach ozone cover. (See Fig. 2-6-10)
8. Detach paper tray cover. (See Fig. 2-6-11)
9. Detach right cover R. (See Fig. 2-6-15)
10. Detach front frame cover F/R.
    (See Fig. 2-6-19 and 2-6-20)
11. Detach exit cover. (See Fig. 2-6-21)
12. Remove one screw holding the top cover L.
    (See Fig. 2-6-22)
13. Remove 2 screw holding the left cover R.
    (See Fig. 2-6-22)
14. Detach inner cover. (See Fig. 2-6-22)
15. Detach the relay connector.
16. Remove 4 screws, release the clamp, and remove exit unit.

Note: If exit roller is found dirty, wipe off.

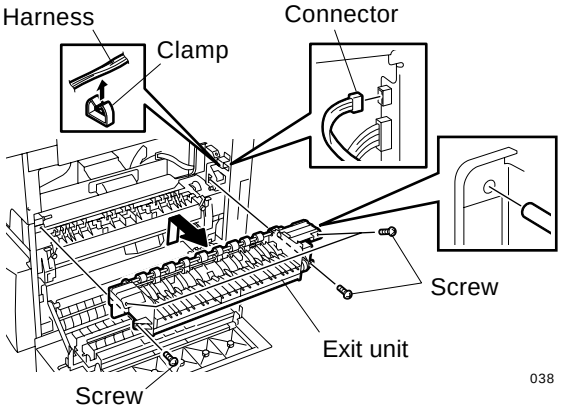


Fig. 14-7-35

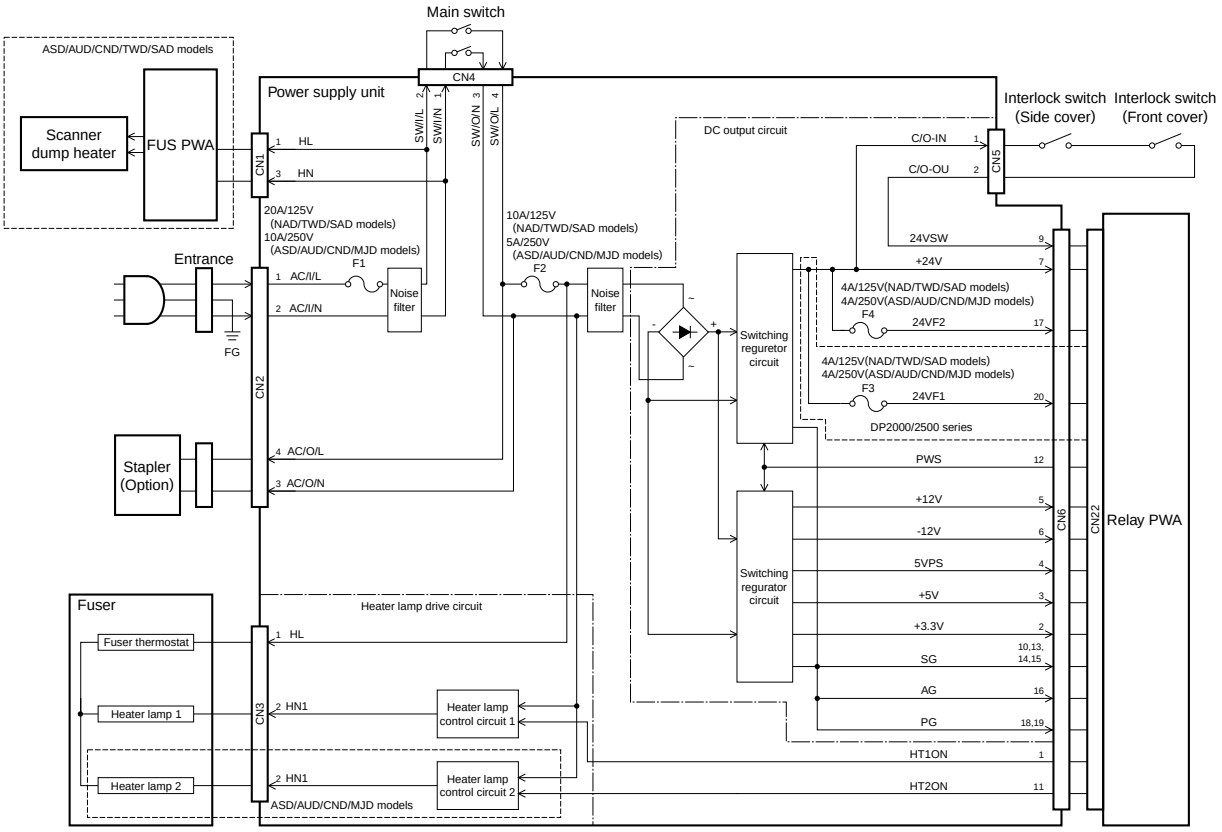
15. POWER SUPPLY UNIT 15-1

15.1 Outline 15-1
15.2 DC Output Circuit 15-2
15.3 Heater Lamp Drive Circuit 15-4
15.4 Dump Heater Power Supply Circuit (ASD/AUD/CND/TWD/SAD models) 15-4
15.5 Stapler Power Supply Circuit 15-4

15. POWER SUPPLY UNIT

15.1 Outline

The power supply unit provides AC and DC power for each part of this machine. The unit is made up of the following circuits.



15-01-01

Fig. 15-1-1

15.2 DC Output Circuit

This circuit converts the AC voltage input from the inlet to each DC voltage (+24V, +12V, -12V, +5V, +3.3V) and delivers it to each part of the machine. Turning on the main switch causes the supply of all DC voltages to begin.

Each DC voltage is supplied or cut off when the Power Save mode is activated or the following covers are opened or closed as shown in the table below.

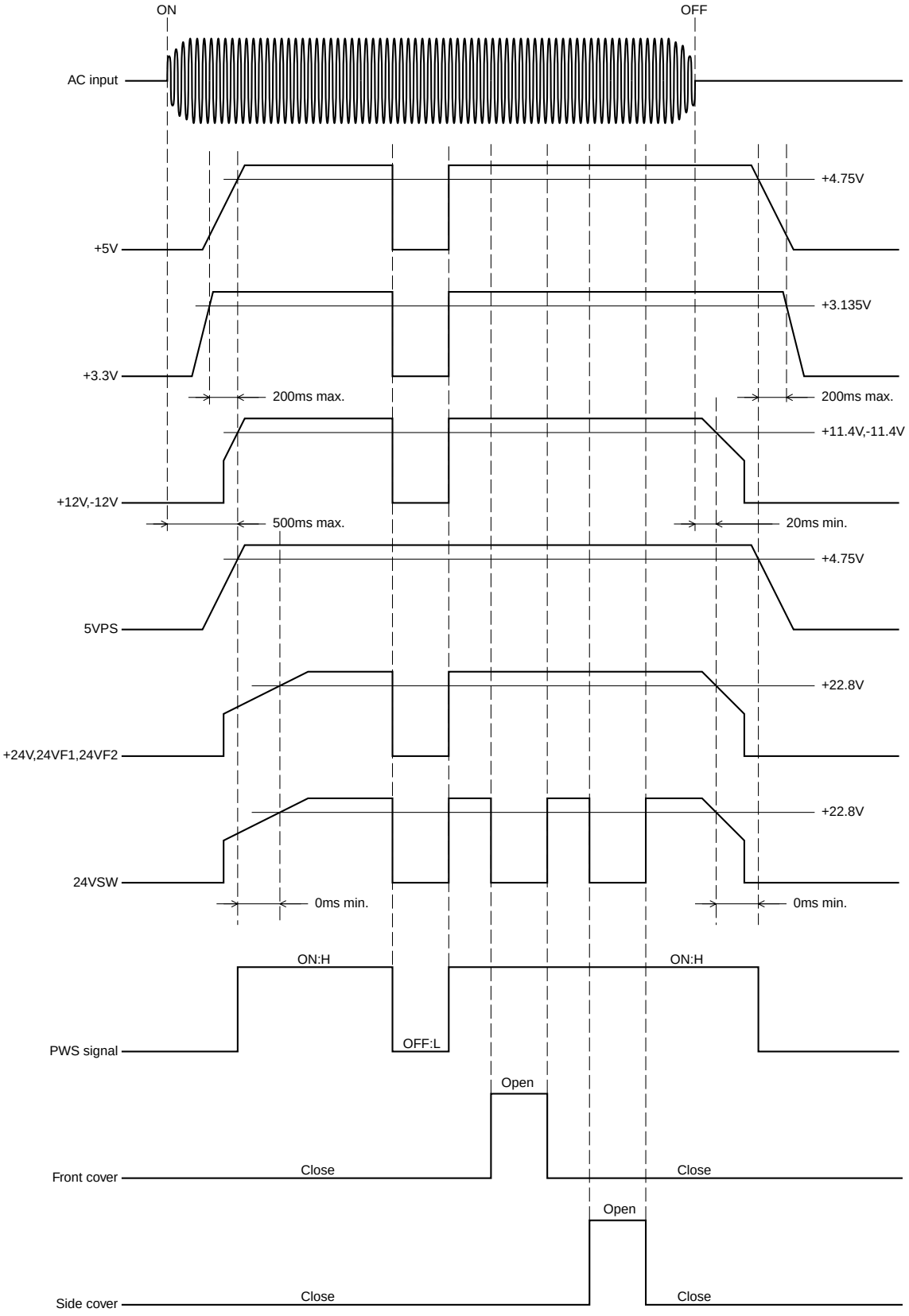
DC Voltage	Voltage Value (V)	In Power Save mode (PWS signal = Low)	Front Cover = Open	Side Cover = Open
24VSW	+24	-	-	-
24VF1	+24	-	○	○
24VF2 (DP2000/2500 series)	+24	-	○	○
+24V	+24	-	○	○
+12V	+12	-	○	○
-12V	-12	-	○	○
5VPS	+5	○	○	○
+5V	+5	-	○	○
3.3V	+3.3	-	○	○

○ : Output - : Cut off

Output Protection

An overcurrent and an overvoltage protective circuit are configured for each DC voltage output. If the output is shorted for some reason or an abnormal condition occurs in a circuit, these circuits prevent overcurrent and overvoltage from flowing through the entire circuitry of this machine.

Power supply sequence



15-02-01

Fig. 15-2-1

15.3 Heater Lamp Drive Circuit

This circuit supplies AC power to the heater lamp in the fuser. The heater lamp may be damaged if it is suddenly supplied with high voltage. To prevent it, the circuit supplies AC power only when the AC voltage is around 0V. AC power is supplied only when the HT1ON and HT2ON signals (ASD/AUD/CND/MJD models) are LOW.

15.4 Dump Heater Power Supply Circuit (ASD/AUD/CND/TWD/SAD models)

This circuit outputs the AC power input from the inlet directly to the FUS PWA, thereby supplying power to the scanner dump heater. AC power is always supplied to the dump heater, regardless of the ON or OFF state of the main switch.

15.5 Stapler Power Supply Circuit

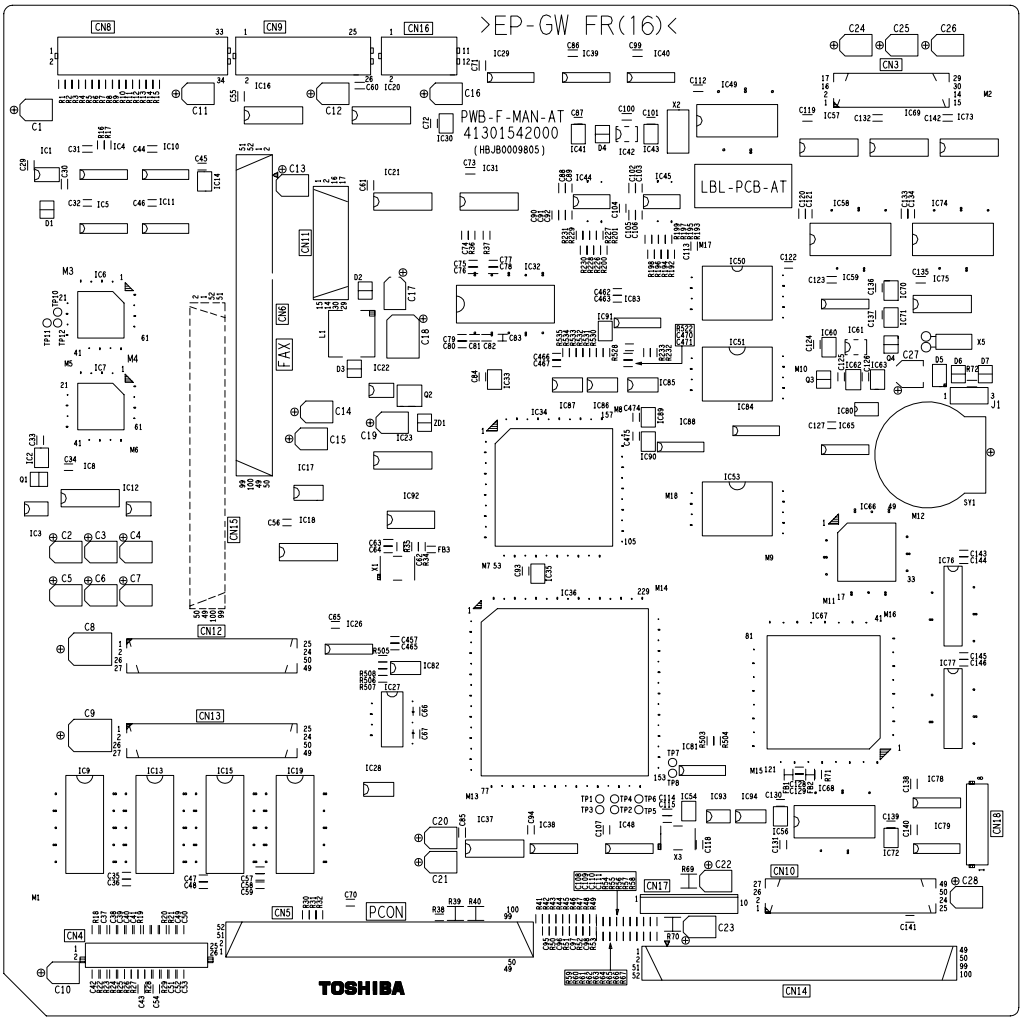
This circuit supplies AC power to an optionally connected stapler (option). AC power is supplied when the main switch is ON.

16. BOARD ASSEMBLY 16-1

16.1 PWA-F-MAN 16-1
16.2 PWA-F-RLY 16-2
16.3 PWA-F-PIF 16-3
16.4 PWA-F-PNL 16-4
16.5 PWA-F-VR 16-4
16.6 PWA-F-SLG 16-5
16.7 PWA-F-FUS (ASD/AUD/CND/TWD/SAD models) 16-6

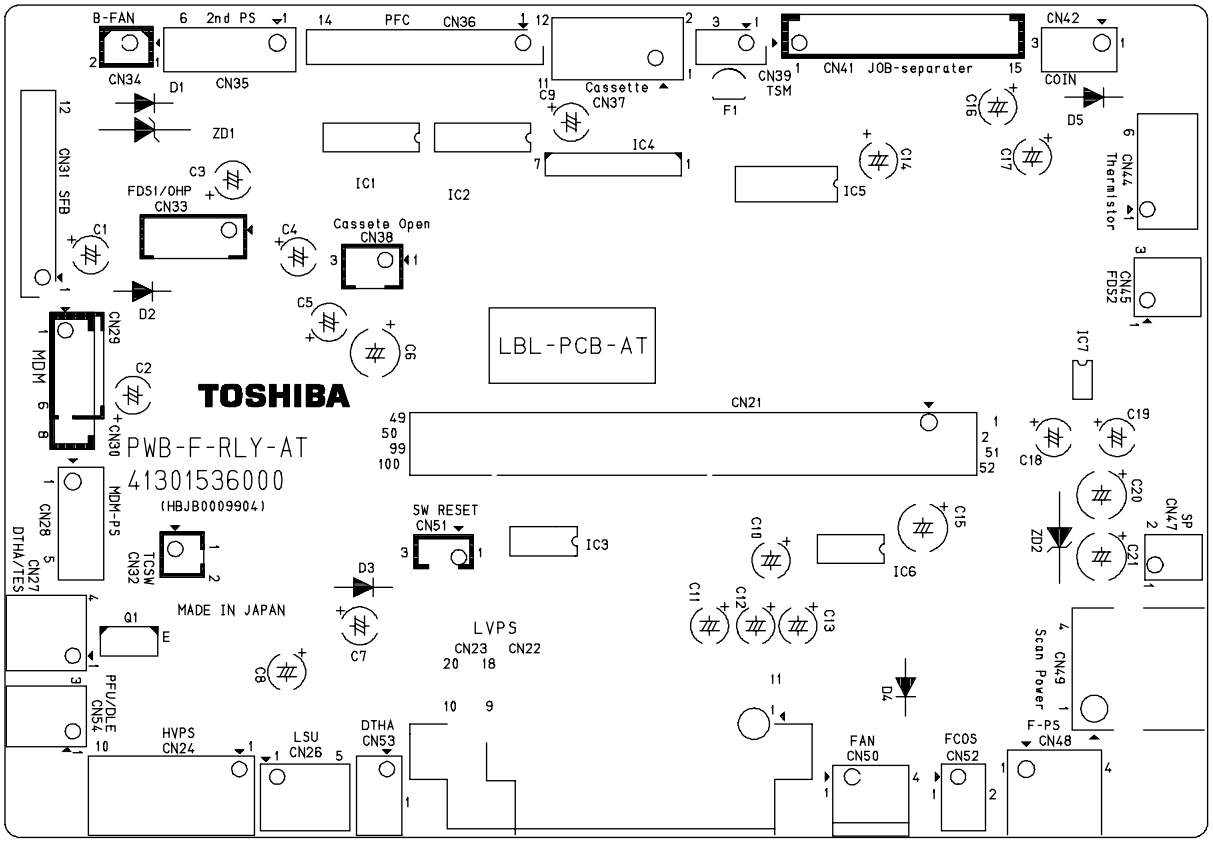
16. BOARD ASSEMBLY

16.1 PWA-F-MAN



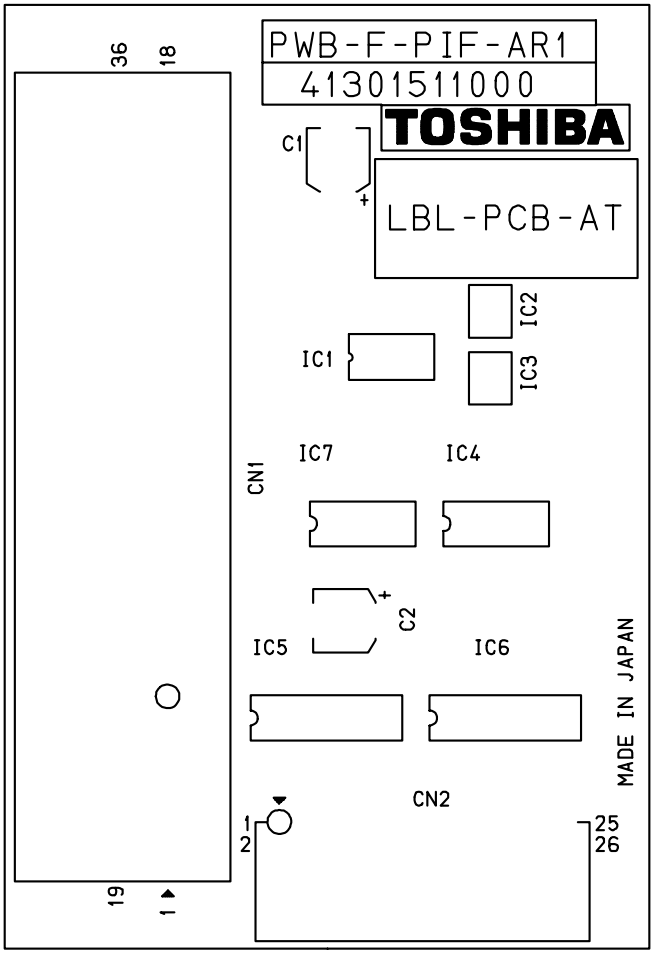
16-01-01

16.2 PWA-F-RLY



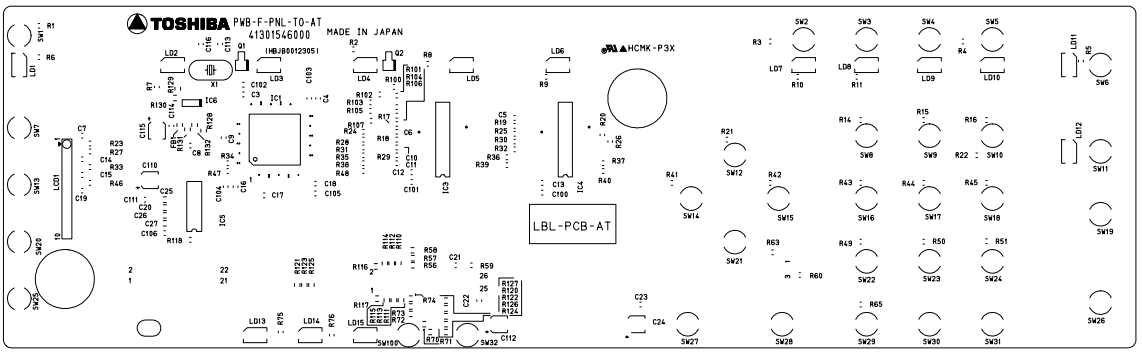
16-02-01

16.3 PWA-F-PIF



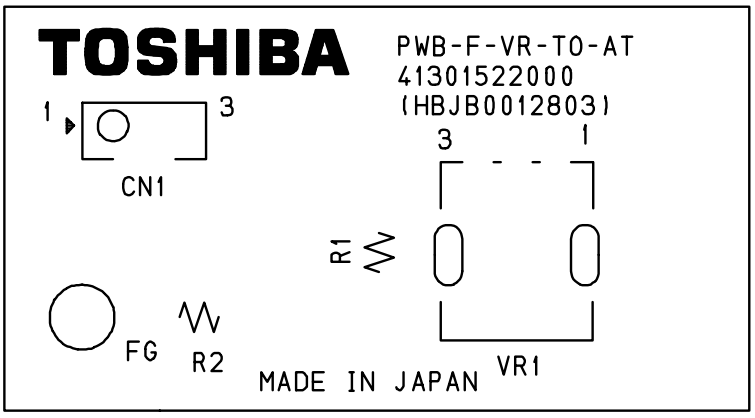
16-03-01

16.4 PWA-F-PNL



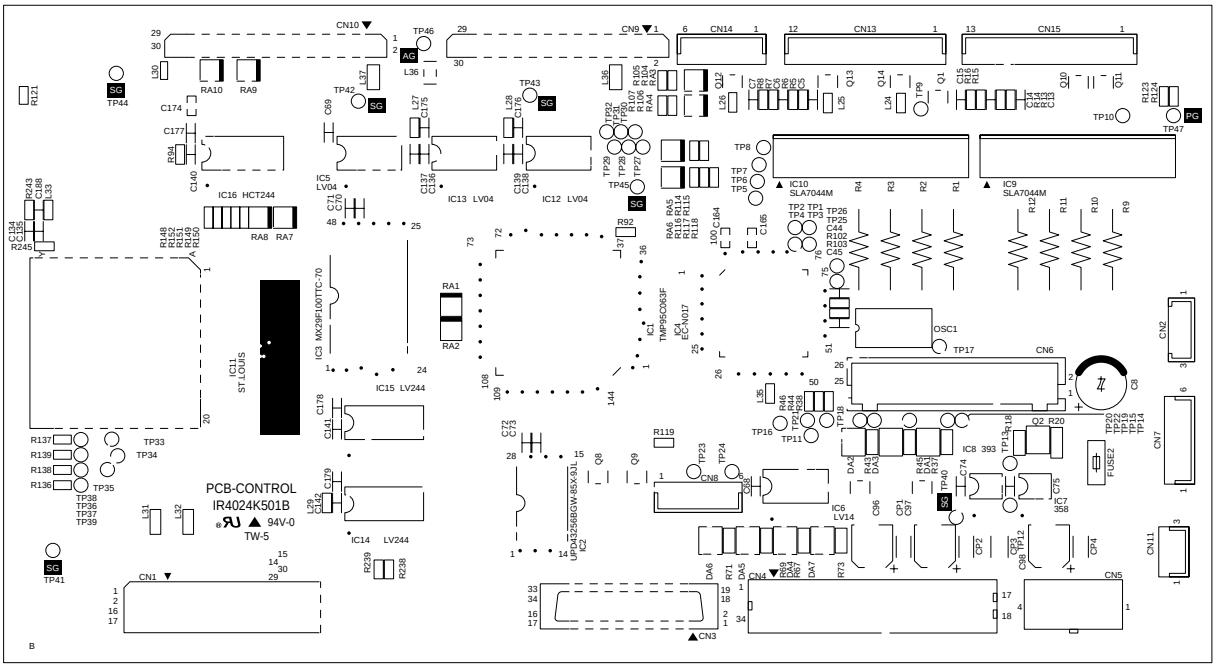
16-04-01

16.5 PWA-F-VR



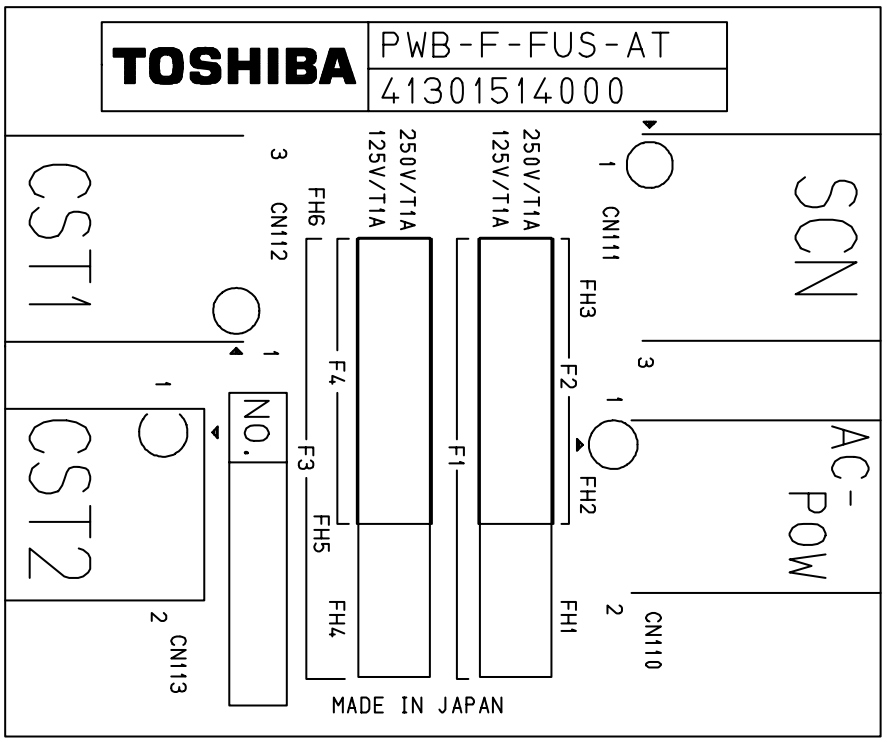
16-05-01

16.6 PWA-F-SLG



16-06-01

16.7 PWA-F-FUS (ASD/AUD/CND/TWD/SAD models)



16-07-01

17. WIRE HARNESS
CONNECTION DIAGRAMS 17-1

17. WIRE HARNESS CONNECTION DIAGRAMS

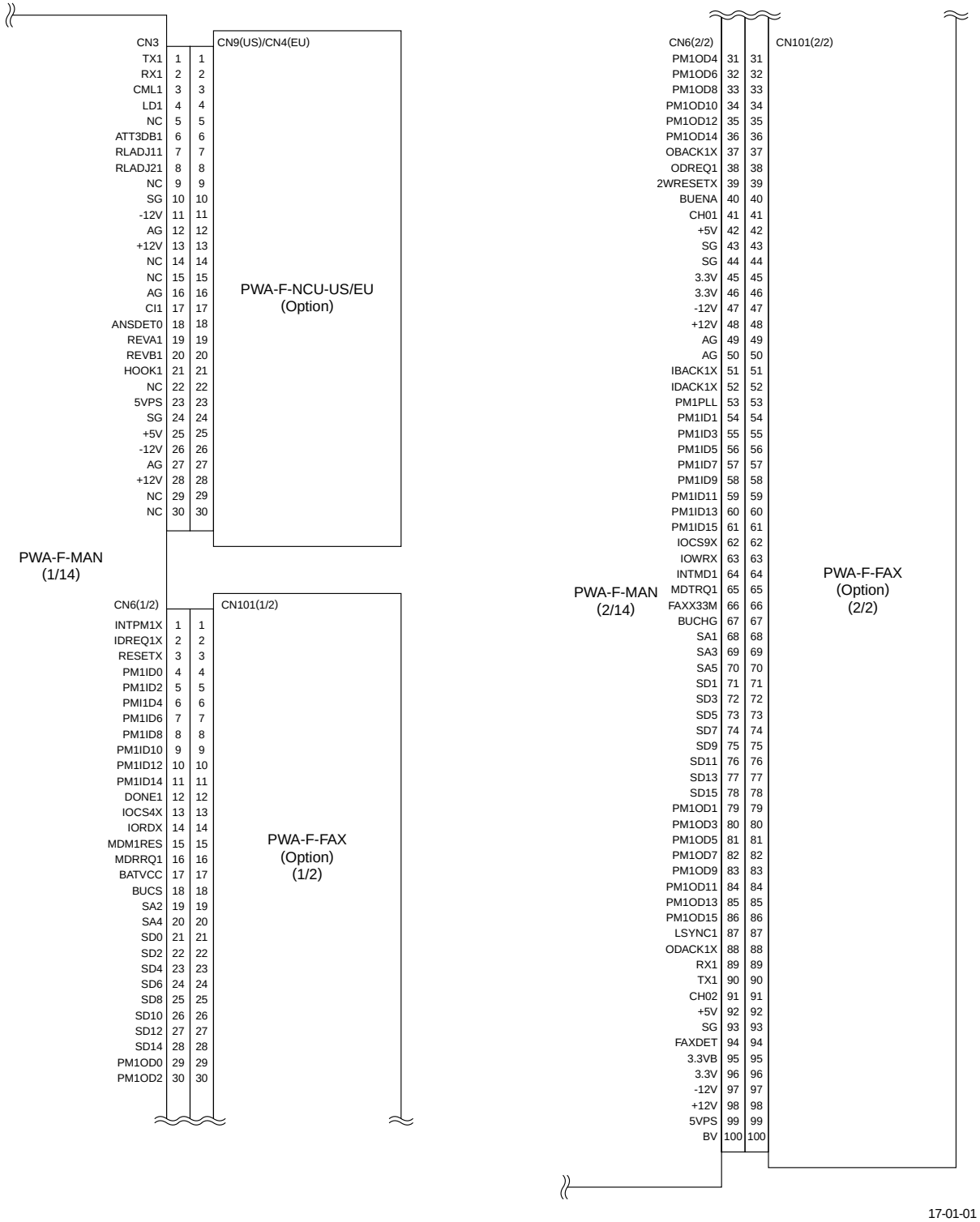


Fig. 17-1-1

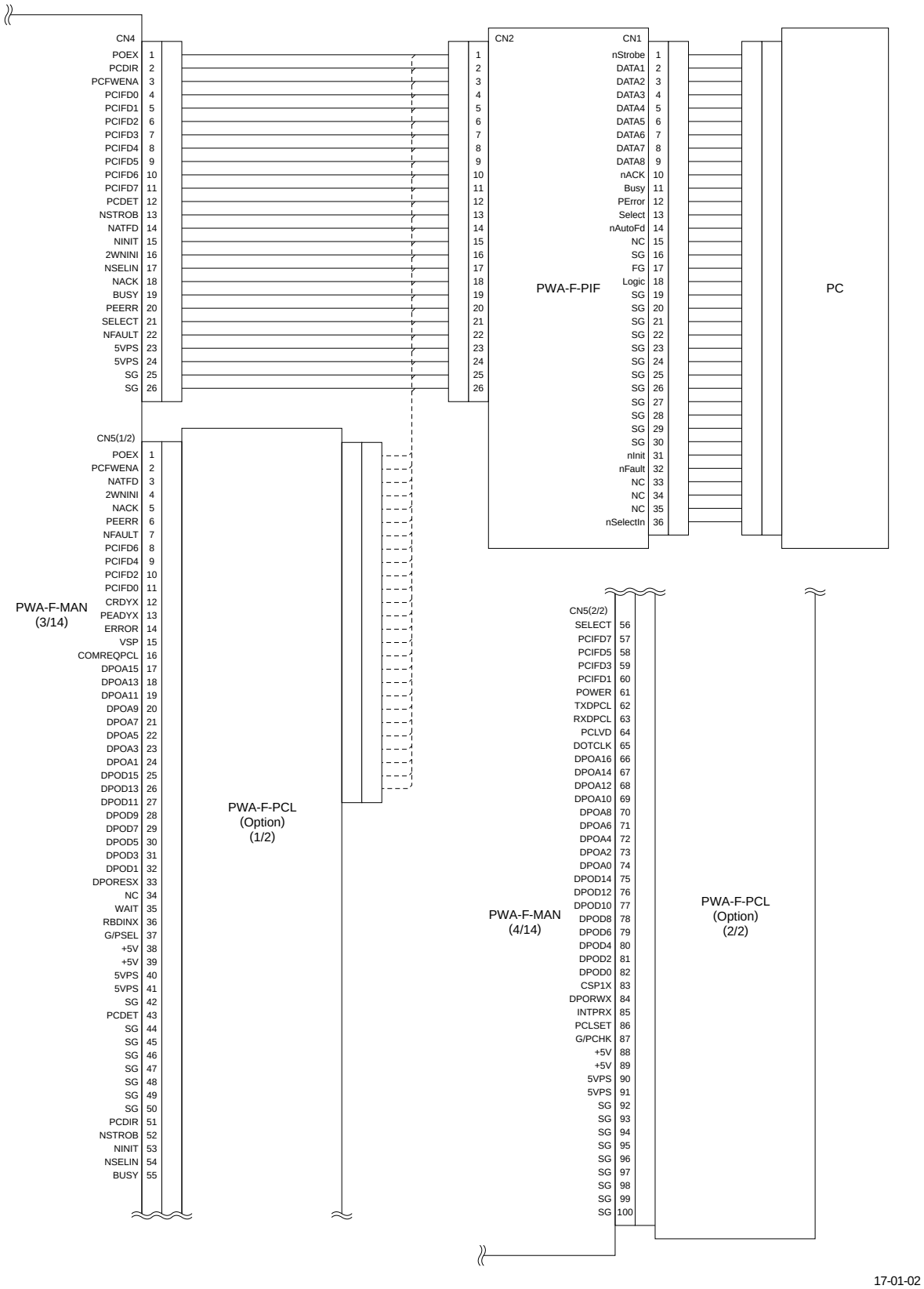
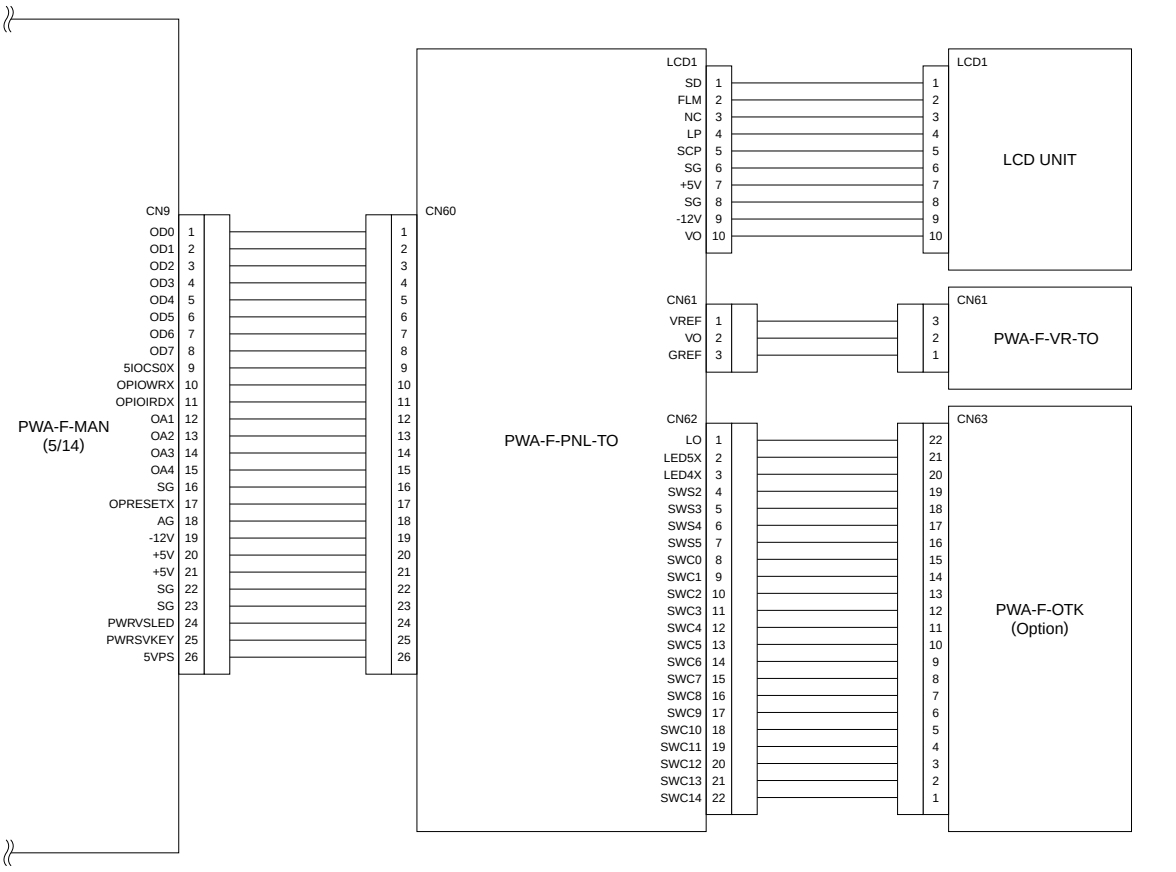

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PCIFD2 6
PCIFD3 7
PCIFD4 8
PCIFD5 9
PCIFD6 10
PCIFD7 11
PCDET 12
NSTROB 13
NATFD 14
NINIT 15
2WNINI 16
NSELIN 17
NACK 18
BUSY 19
PEERR 20
SELECT 21
NFAULT 22
5VPS 23
5VPS 24
SG 25
SG 26
CN2
CN1
nStrobe 1
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DATA2 3
DATA3 4
DATA4 5
DATA5 6
DATA6 7
DATA7 8
DATA8 9
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Busy 11
PError 12
Select 13
nAutoFd 14
NC 15
SG 16
FG 17
Logic 18
SG 19
SG 20
SG 21
SG 22
SG 23
SG 24
SG 25
SG 26
SG 27
SG 28
SG 29
SG 30
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nFault 32
NC 33
NC 34
NC 35
nSelectIn 36
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NACK 5
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PCIFD4 9
PCIFD2 10
PCIFD0 11
CRDYX 12
PEADYX 13
ERROR 14
VSP 15
COMREQPCL 16
DPOA15 17
DPOA13 18
DPOA11 19
DPOA9 20
DPOA7 21
DPOA5 22
DPOA3 23
DPOA1 24
DPOD15 25
DPOD13 26
DPOD11 27
DPOD9 28
DPOD7 29
DPOD5 30
DPOD3 31
DPOD1 32
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G/PSEL 37
+5V 38
+5V 39
5VPS 40
5VPS 41
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SG 46
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SG 48
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NSELIN 54
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PWA-F-PCL
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(1/2)
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PCIFD1 60
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RXDPCL 63
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DPOA14 67
DPOA12 68
DPOA10 69
DPOA8 70
DPOA6 71
DPOA4 72
DPOA2 73
DPOA0 74
DPOD14 75
DPOD12 76
DPOD10 77
DPOD8 78
DPOD6 79
DPOD4 80
DPOD2 81
DPOD0 82
CSP1X 83
DPORWX 84
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PCLSET 86
G/PCHK 87
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5VPS 90
5VPS 91
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SG 97
SG 98
SG 99
SG 100
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(4/14)
PWA-F-PCL
(Option)
(2/2)
17-01-02

Fig. 17-1-2



17-01-03

Fig. 17-1-3

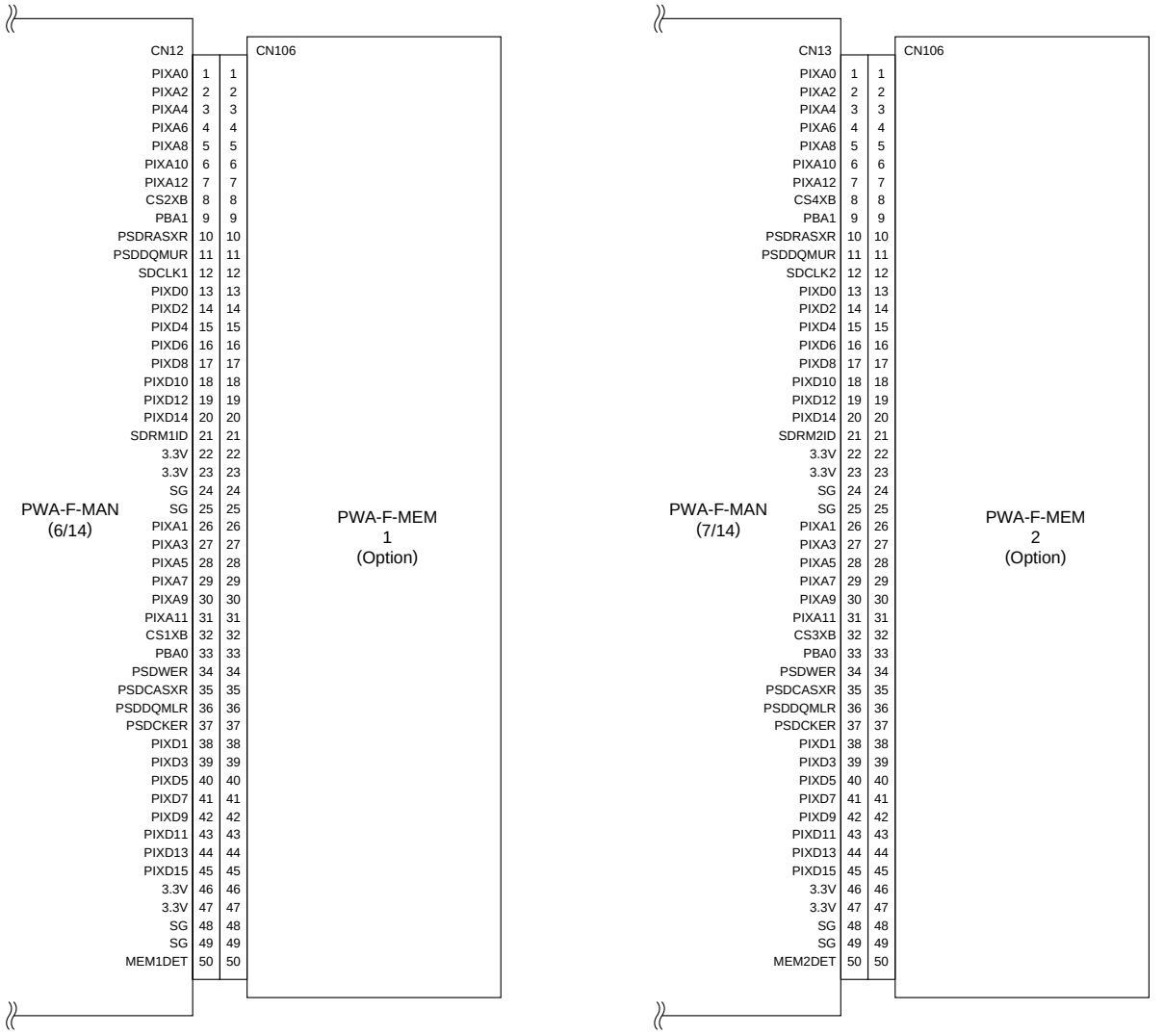

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CN106
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PIXA4 3 3
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PIXA8 5 5
PIXA10 6 6
PIXA12 7 7
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PBA1 9 9
PSDRASXR 10 10
PSDDQMUR 11 11
SDCLK1 12 12
PIXD0 13 13
PIXD2 14 14
PIXD4 15 15
PIXD6 16 16
PIXD8 17 17
PIXD10 18 18
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PIXD14 20 20
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3.3V 23 23
SG 24 24
SG 25 25
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PIXA3 27 27
PIXA5 28 28
PIXA7 29 29
PIXA9 30 30
PIXA11 31 31
CS1XB 32 32
PBA0 33 33
PSDWER 34 34
PSDCASXR 35 35
PSDDQMLR 36 36
PSDCKER 37 37
PIXD1 38 38
PIXD3 39 39
PIXD5 40 40
PIXD7 41 41
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PIXD11 43 43
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(6/14)
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(Option)
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PIXD14 20 20
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3.3V 23 23
SG 24 24
SG 25 25
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PIXA3 27 27
PIXA5 28 28
PIXA7 29 29
PIXA9 30 30
PIXA11 31 31
CS3XB 32 32
PBA0 33 33
PSDWER 34 34
PSDCASXR 35 35
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(Option)
17-01-04

Fig. 17-1-4

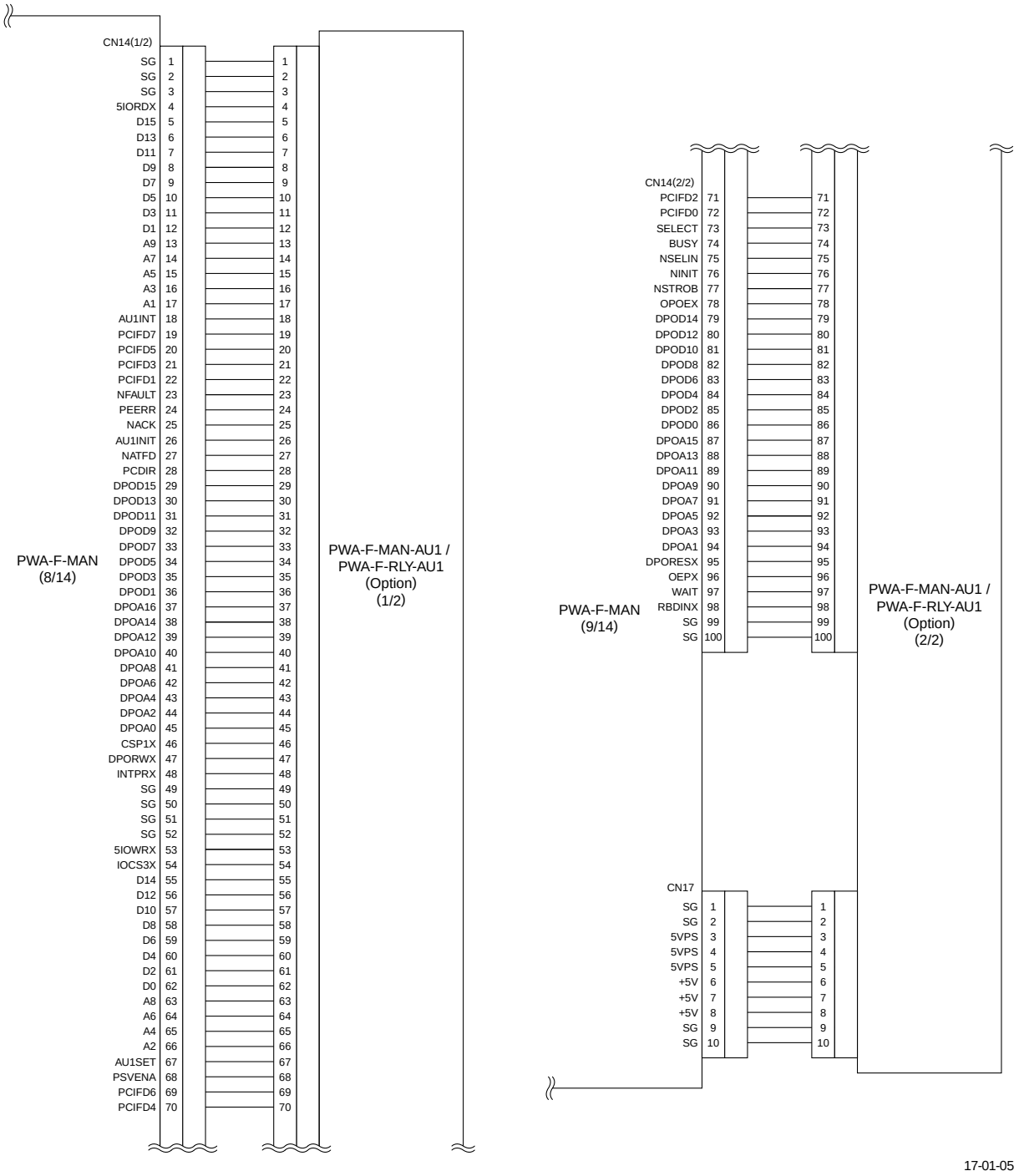

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D7 9
D5 10
D3 11
D1 12
A9 13
A7 14
A5 15
A3 16
A1 17
AU1INT 18
PCIFD7 19
PCIFD5 20
PCIFD3 21
PCIFD1 22
NFAULT 23
PEERR 24
NACK 25
AU1INIT 26
NATFD 27
PCDIR 28
DPOD15 29
DPOD13 30
DPOD11 31
DPOD9 32
DPOD7 33
DPOD5 34
DPOD3 35
DPOD1 36
DPOA16 37
DPOA14 38
DPOA12 39
DPOA10 40
DPOA8 41
DPOA6 42
DPOA4 43
DPOA2 44
DPOA0 45
CSP1X 46
DPORWX 47
INTPRX 48
SG 49
SG 50
SG 51
SG 52
5IOWRX 53
IOCS3X 54
D14 55
D12 56
D10 57
D8 58
D6 59
D4 60
D2 61
D0 62
A8 63
A6 64
A4 65
A2 66
AU1SET 67
PSVENA 68
PCIFD6 69
PCIFD4 70
PWA-F-MAN
(8/14)
PWA-F-MAN-AU1 /
PWA-F-RLY-AU1
(Option)
(1/2)
CN14(2/2)
PCIFD2 71
PCIFD0 72
SELECT 73
BUSY 74
NSELIN 75
NINIT 76
NSTROB 77
OPOEX 78
DPOD14 79
DPOD12 80
DPOD10 81
DPOD8 82
DPOD6 83
DPOD4 84
DPOD2 85
DPOD0 86
DPOA15 87
DPOA13 88
DPOA11 89
DPOA9 90
DPOA7 91
DPOA5 92
DPOA3 93
DPOA1 94
DPORESX 95
OEPX 96
WAIT 97
RBDINX 98
SG 99
SG 100
PWA-F-MAN
(9/14)
PWA-F-MAN-AU1 /
PWA-F-RLY-AU1
(Option)
(2/2)
CN17
SG 1
SG 2
5VPS 3
5VPS 4
5VPS 5
+5V 6
+5V 7
+5V 8
SG 9
SG 10
17-01-05

Fig. 17-1-5

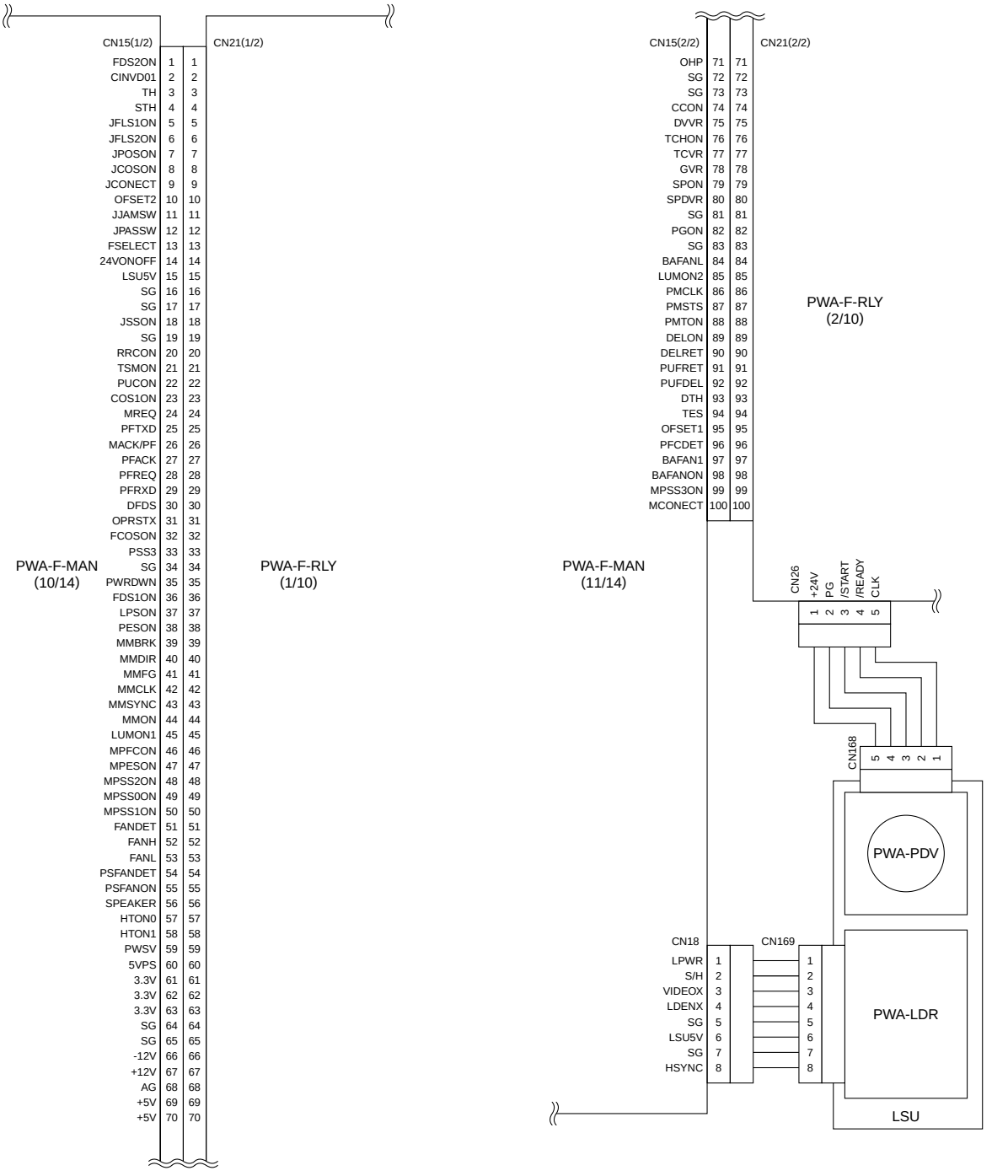
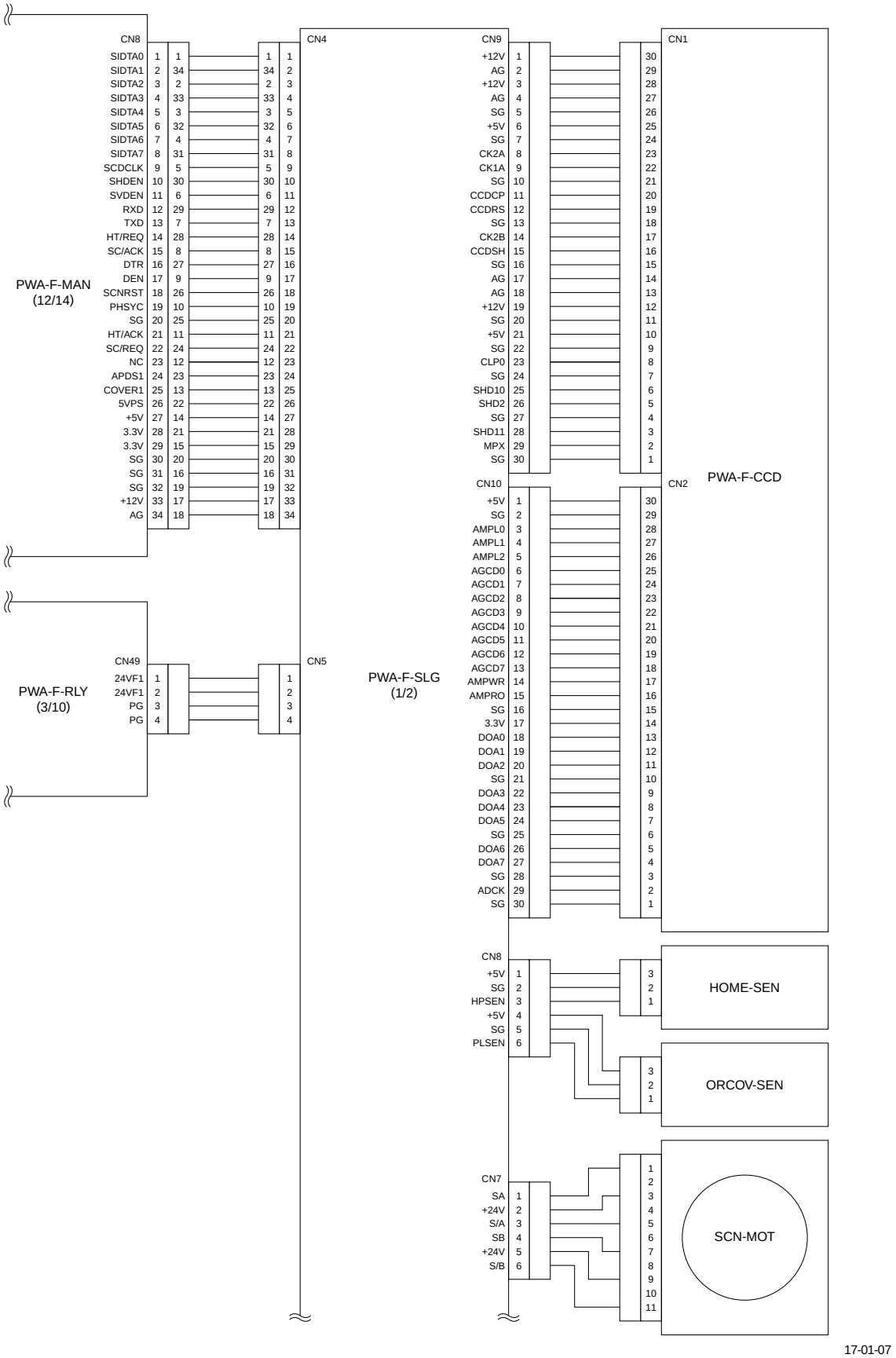
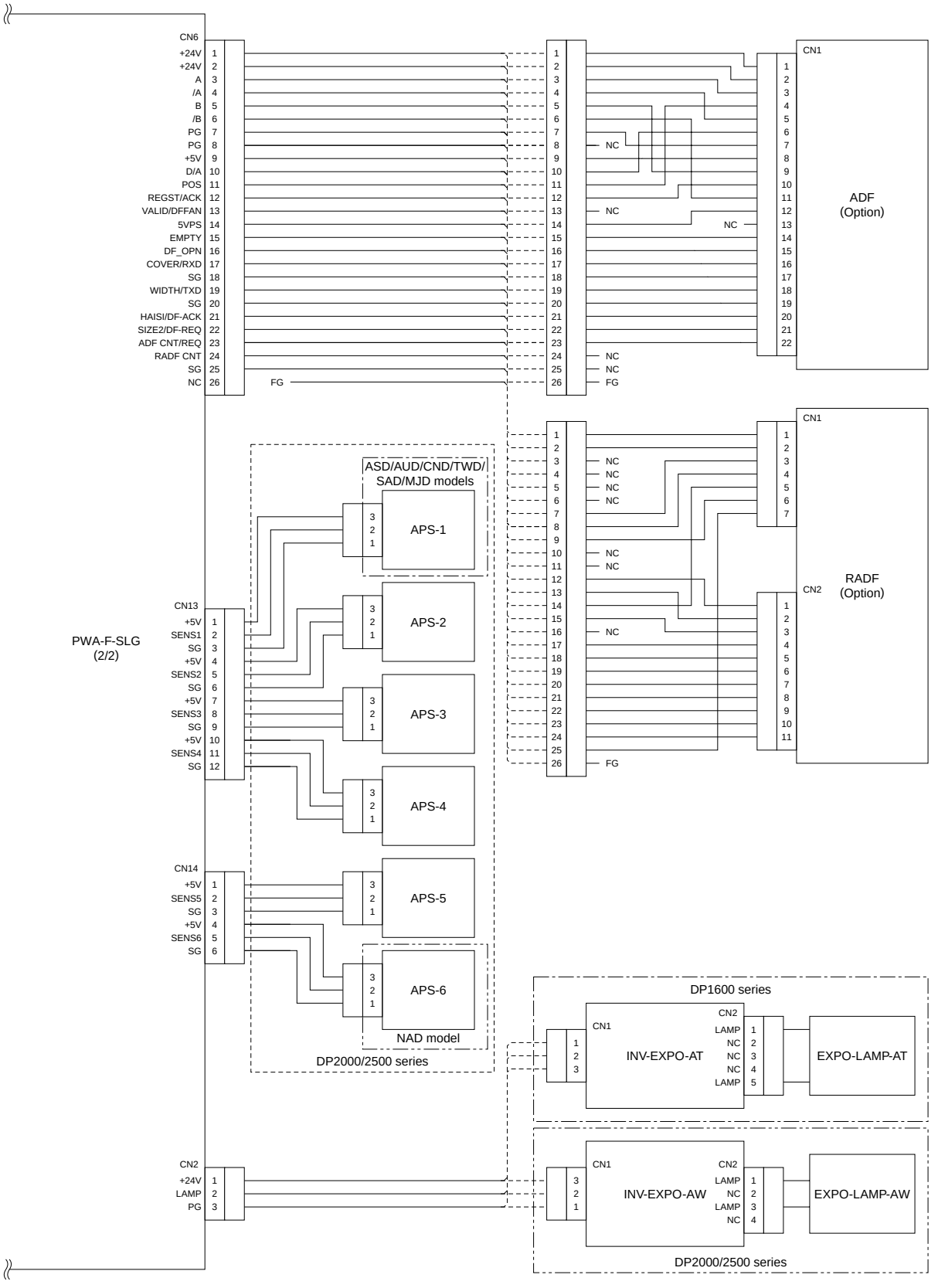

CN15(1/2)
CN21(1/2)
FDS2ON 1 1
CINVD01 2 2
TH 3 3
STH 4 4
JFLS1ON 5 5
JFLS2ON 6 6
JPOSON 7 7
JCOSON 8 8
JCONECT 9 9
OFSET2 10 10
JJAMSW 11 11
JPASSW 12 12
FSELECT 13 13
24VONOFF 14 14
LSU5V 15 15
SG 16 16
SG 17 17
JSSON 18 18
SG 19 19
RRCON 20 20
TSMON 21 21
PUCON 22 22
COS1ON 23 23
MREQ 24 24
PFTXD 25 25
MACK/PF 26 26
PFACK 27 27
PFREQ 28 28
PFRXD 29 29
DFDS 30 30
OPRSTX 31 31
FCOSON 32 32
PSS3 33 33
PWA-F-MAN (10/14)
SG 34 34
PWRDWN 35 35
FDS1ON 36 36
LPSON 37 37
PESON 38 38
MMBRK 39 39
MMDIR 40 40
MMFG 41 41
MMCLK 42 42
MMSYNC 43 43
MMON 44 44
LUMON1 45 45
MPFCON 46 46
MPESON 47 47
MPSS2ON 48 48
MPSS0ON 49 49
MPSS1ON 50 50
FANDET 51 51
FANH 52 52
FANL 53 53
PSFANDET 54 54
PSFANON 55 55
SPEAKER 56 56
HTON0 57 57
HTON1 58 58
PWSV 59 59
5VPS 60 60
3.3V 61 61
3.3V 62 62
3.3V 63 63
SG 64 64
SG 65 65
-12V 66 66
+12V 67 67
AG 68 68
+5V 69 69
+5V 70 70
PWA-F-RLY (1/10)
CN15(2/2)
CN21(2/2)
OHP 71 71
SG 72 72
SG 73 73
CCON 74 74
DVVR 75 75
TCHON 76 76
TCVR 77 77
GVR 78 78
SPON 79 79
SPDVR 80 80
SG 81 81
PGON 82 82
SG 83 83
BAFANL 84 84
LUMON2 85 85
PMCLK 86 86
PMSTS 87 87
PMTON 88 88
DELON 89 89
DELRET 90 90
PUFRET 91 91
PUFDEL 92 92
DTH 93 93
TES 94 94
OFSET1 95 95
PFCDET 96 96
BAFAN1 97 97
BAFANON 98 98
MPSS3ON 99 99
MCONECT 100 100
PWA-F-RLY (2/10)
PWA-F-MAN (11/14)
CN26
+24V
PG
/START
/READY
CLK
1 2 3 4 5
CN168
5 4 3 2 1
PWA-PDV
CN18
LPWR 1
S/H 2
VIDEOX 3
LDENX 4
SG 5
LSU5V 6
SG 7
HSYNC 8
CN169
1 2 3 4 5 6 7 8
PWA-LDR
LSU
17-01-06

Fig. 17-1-6



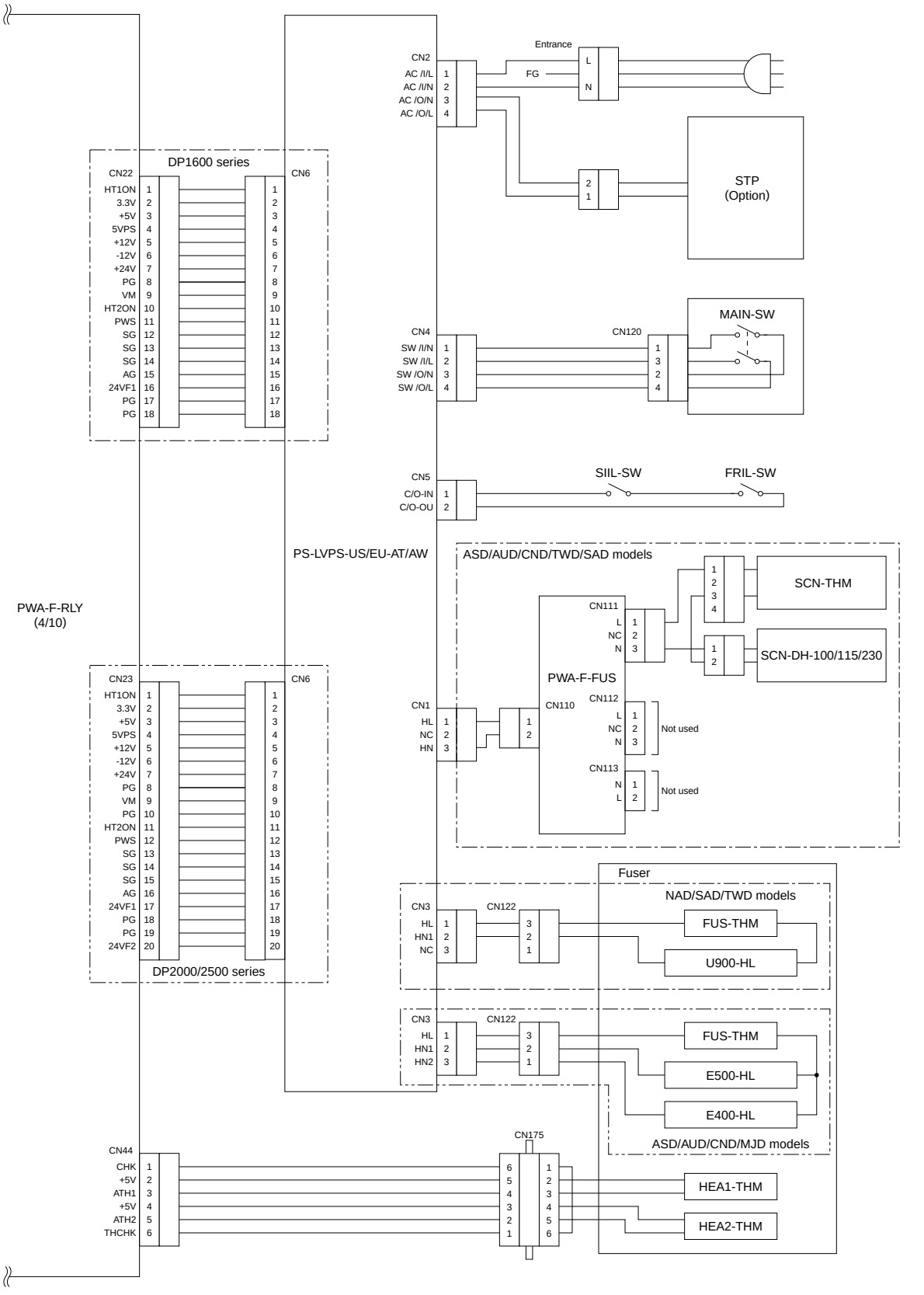
17-01-07

Fig. 17-1-7



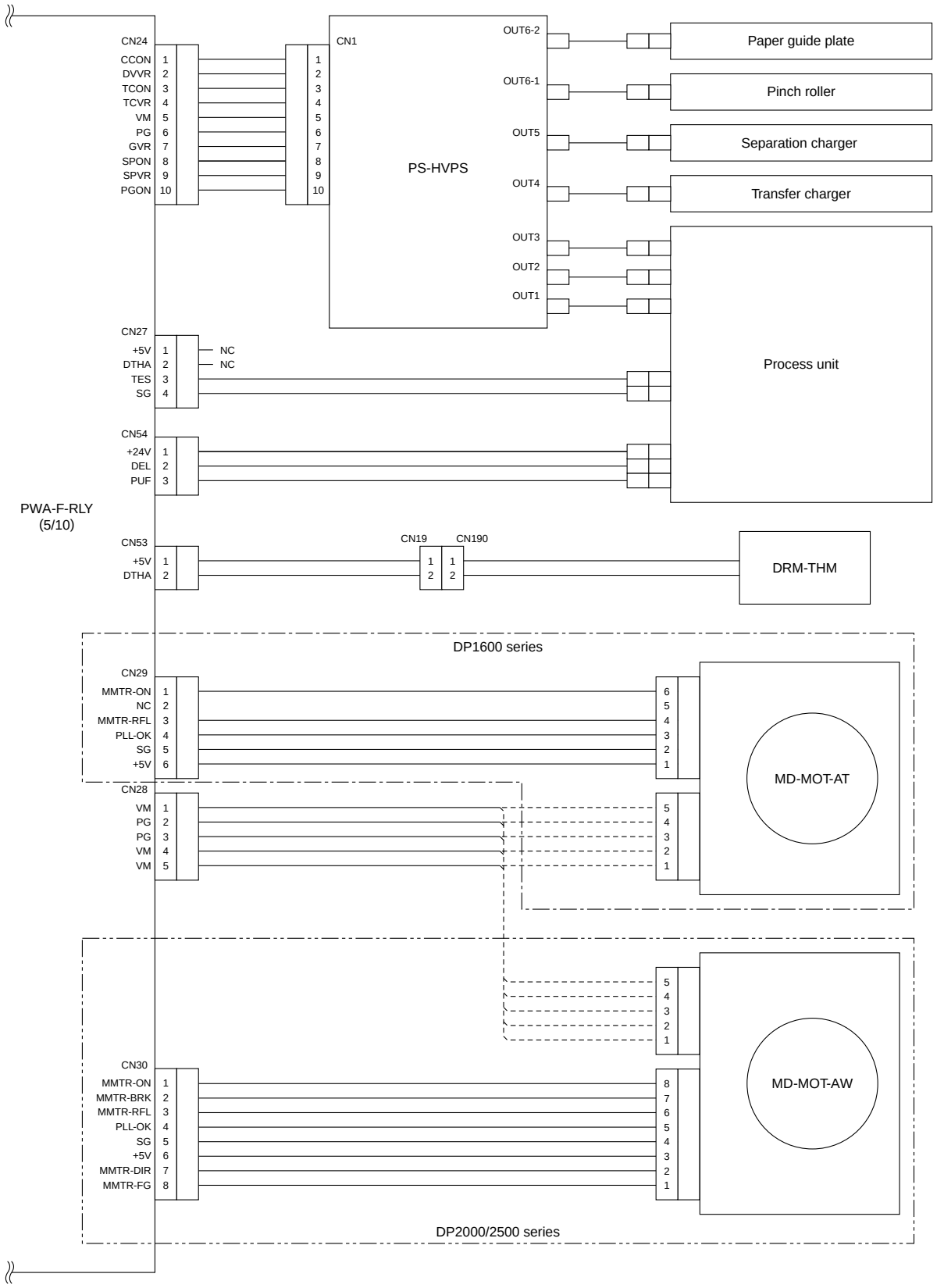
17-01-08

Fig. 17-1-8



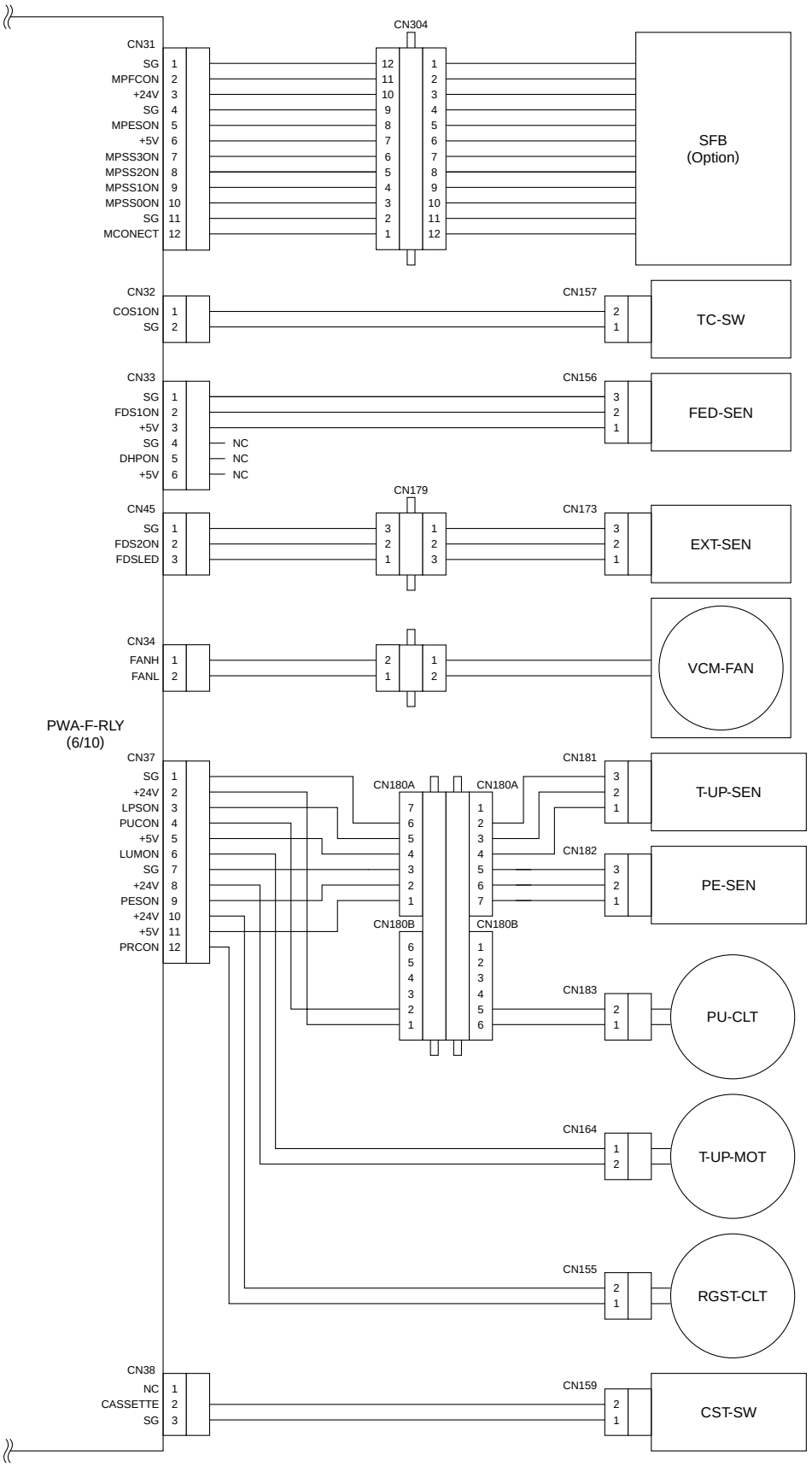
17-01-09

Fig. 17-1-9



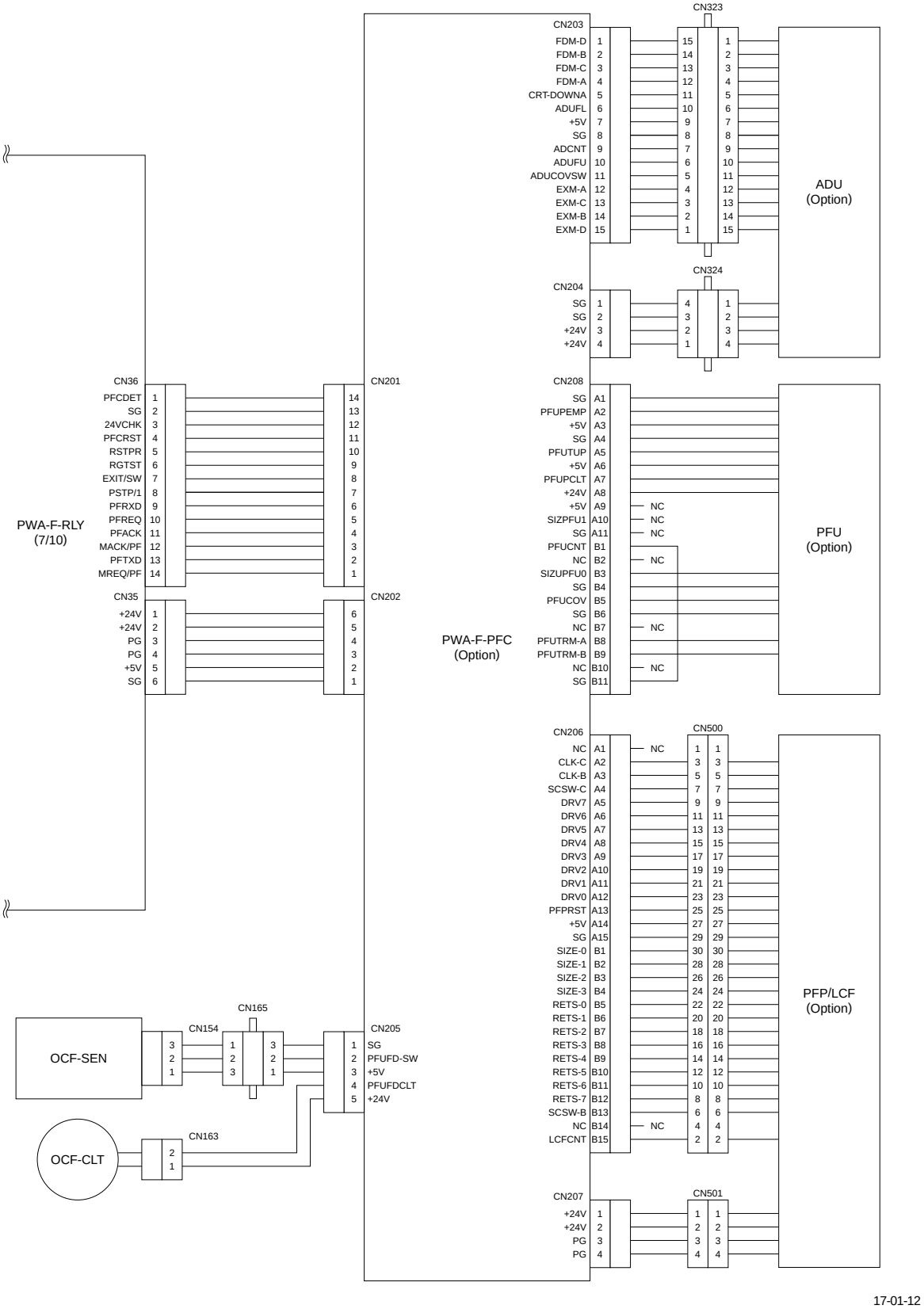
17-01-10

Fig. 17-1-10



17-01-11

Fig. 17-1-11



17-01-12

Fig. 17-1-12

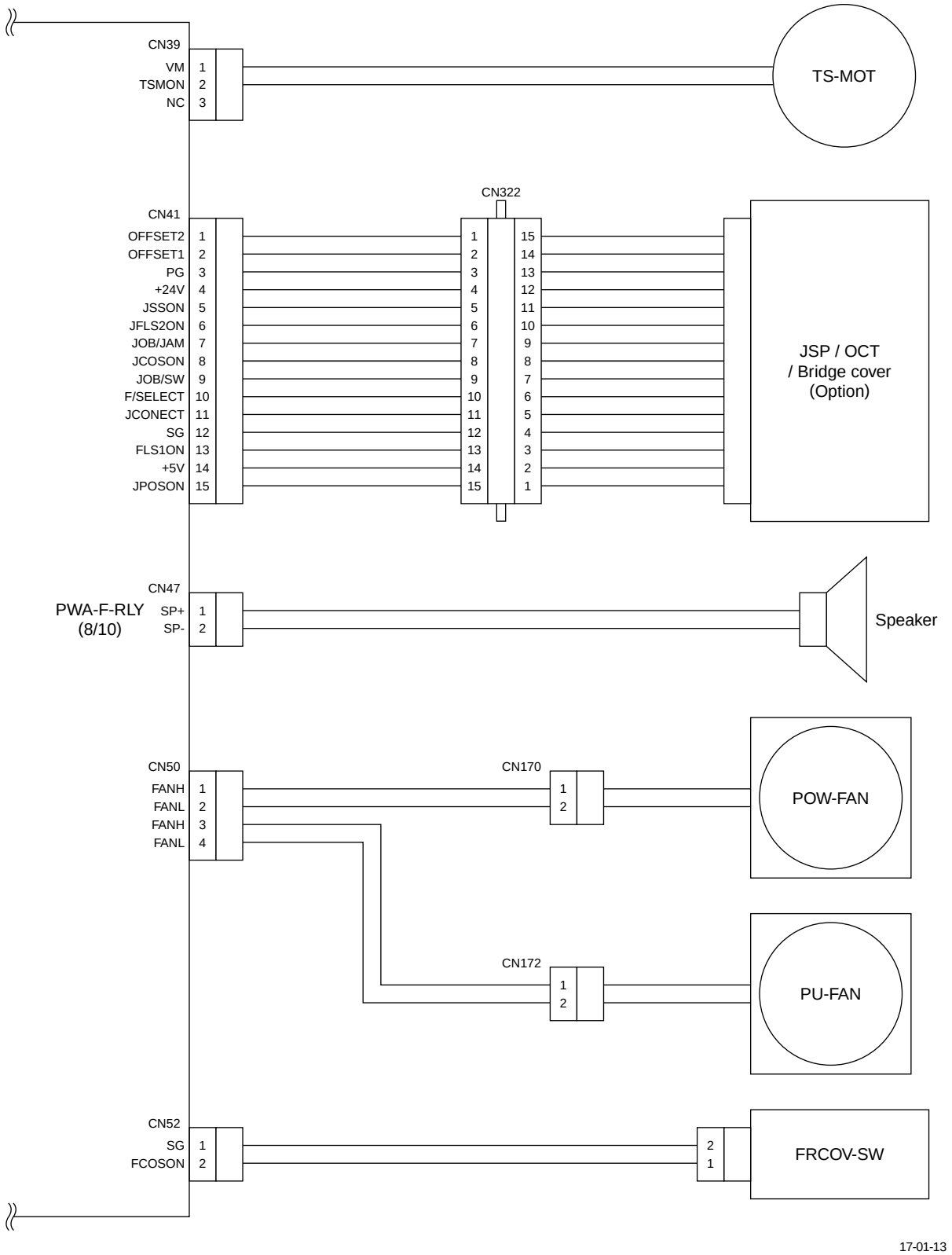

CN39
VM 1
TSMON 2
NC 3
TS-MOT
CN322
CN41
OFFSET2 1
OFFSET1 2
PG 3
+24V 4
JSSON 5
JFLS2ON 6
JOB/JAM 7
JCOSON 8
JOB/SW 9
F/SELECT 10
JCONECT 11
SG 12
FLS1ON 13
+5V 14
JPOSON 15
JSP / OCT
/ Bridge cover
(Option)
CN47
PWA-F-RLY
(8/10)
SP+ 1
SP- 2
Speaker
CN50
FANH 1
FANL 2
FANH 3
FANL 4
CN170
POW-FAN
CN172
PU-FAN
CN52
SG 1
FCOSON 2
FRCOV-SW
17-01-13

Fig. 17-1-13

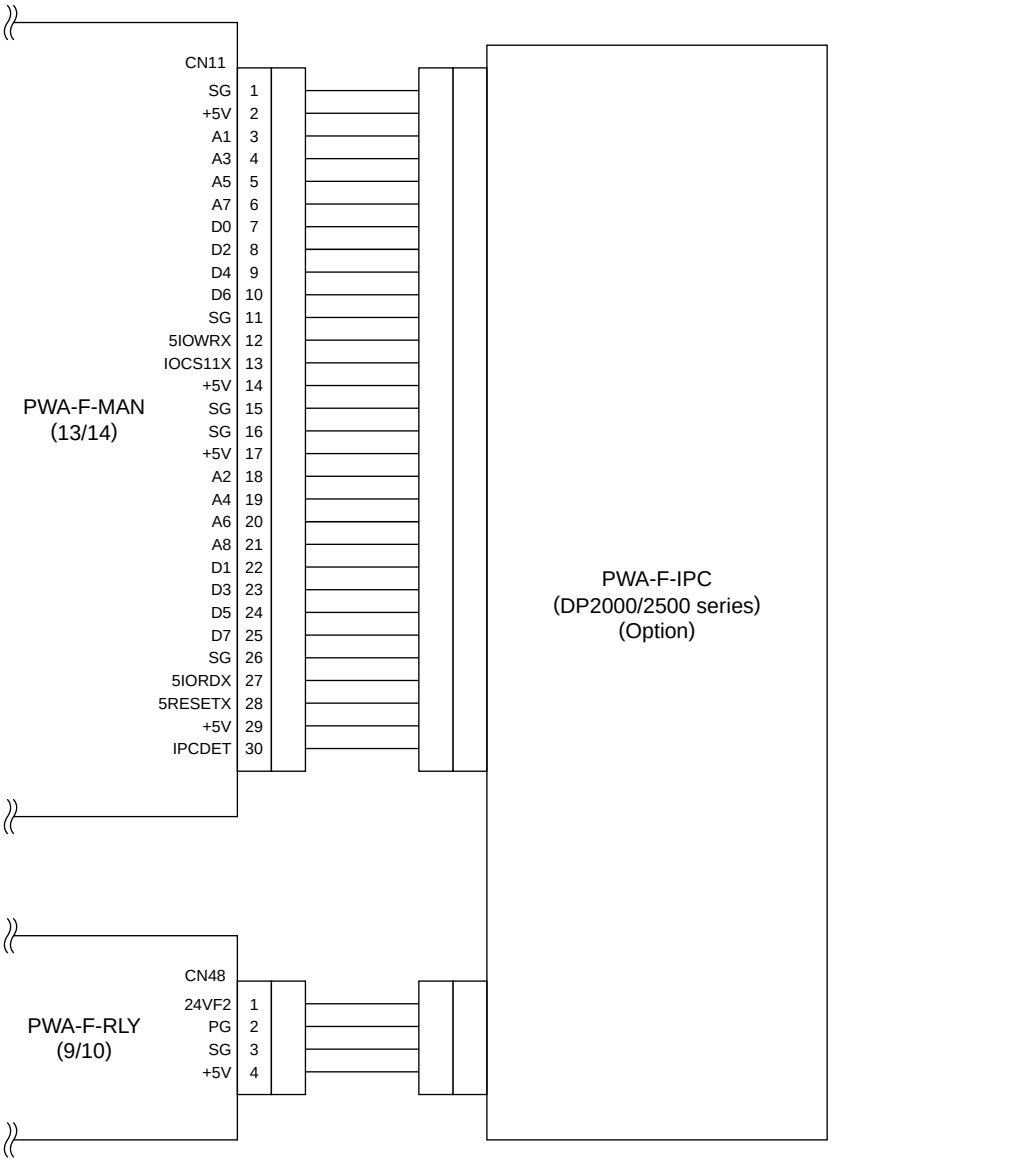

CN11
SG 1
+5V 2
A1 3
A3 4
A5 5
A7 6
D0 7
D2 8
D4 9
D6 10
SG 11
5IOWRX 12
IOCS11X 13
+5V 14
SG 15
SG 16
+5V 17
A2 18
A4 19
A6 20
A8 21
D1 22
D3 23
D5 24
D7 25
SG 26
5IORDX 27
5RESETX 28
+5V 29
IPCDET 30
PWA-F-MAN
(13/14)
PWA-F-IPC
(DP2000/2500 series)
(Option)
CN48
24VF2 1
PG 2
SG 3
+5V 4
PWA-F-RLY
(9/10)
17-01-14

Fig. 17-1-14

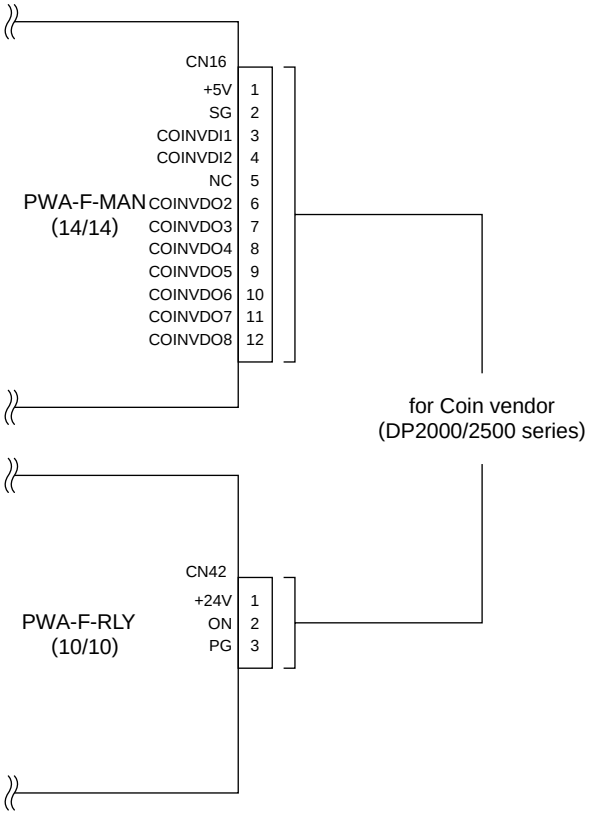

CN16
+5V 1
SG 2
COINVDI1 3
COINVDI2 4
NC 5
PWA-F-MAN COINVDO2 6
(14/14) COINVDO3 7
COINVDO4 8
COINVDO5 9
COINVDO6 10
COINVDO7 11
COINVDO8 12
for Coin vendor
(DP2000/2500 series)
CN42
+24V 1
PWA-F-RLY ON 2
(10/10) PG 3
17-01-15

Fig. 17-1-15

MEMO

18. PAGE MEMORY BOARD 18-1

18.1 Introduction 18-1
18.2 Structure 18-2
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18.2.2 Schematic 18-3
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18. PAGE MEMORY BOARD

18.1 Introduction

The page memory board stores digital image data scanned on the digital copier in page Units so that editing function such as rotation and sorting can be applied before output.

The page memory board supports the following basic functions.

(1) Scanning : Writes digital image data scanned on the digital copier into the page memory.

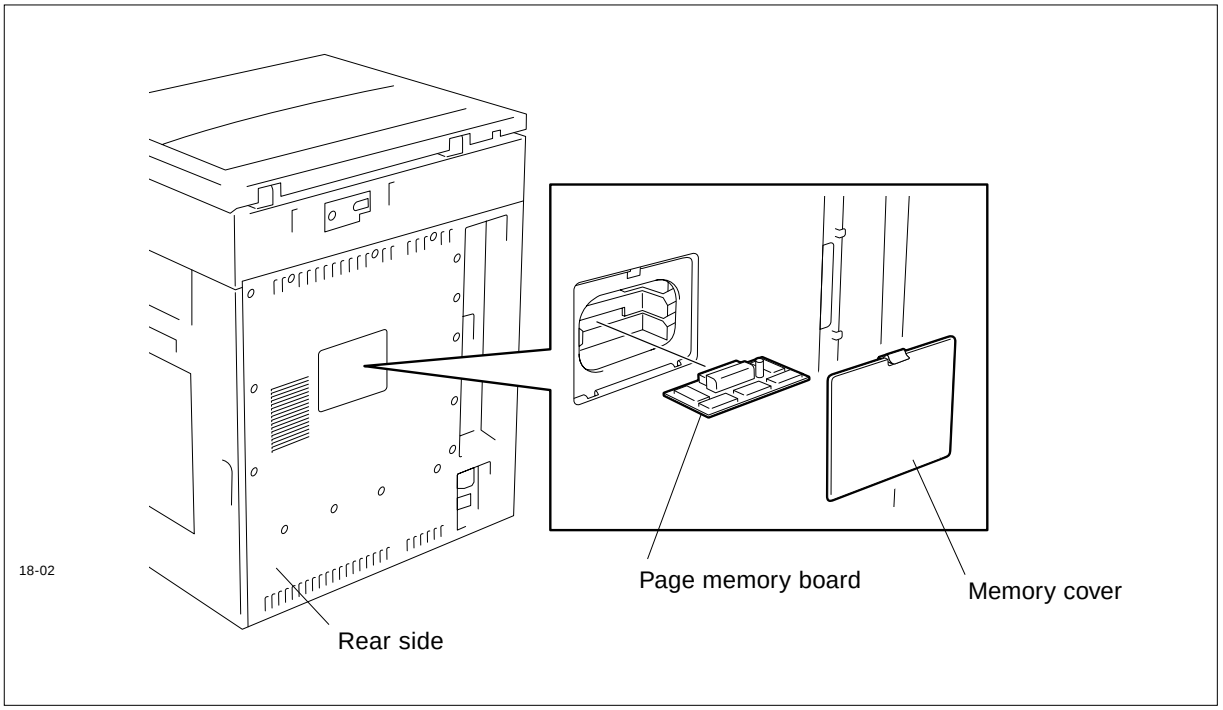
(2) Printing : Outputs image data in the memory to the printer.

(3) Compression/decompression
: Compresses image data when writing image data to memory at the scanner processor, and decompresses the image data when outputting to the printer at the printer output processor.

(4) Editing : Executes the following processes the image data saved in the page memory.
- Makes multi-image copies
- Rotates images.

18.2 Structure

The page memory boards are located on the main board when the memory cover is removed.



18.2.1 Interfaces

(1) I / O interface

CPU on the main PC board handles the control data for controlling the page memory Board.

(2) Scanner interface

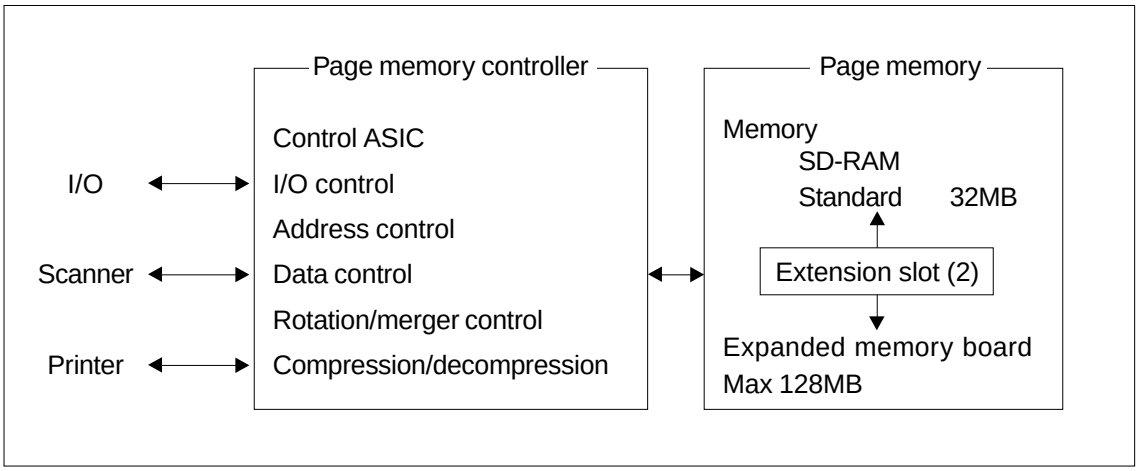
Image data scanned by the digital copier are loaded to page memory from the external interface of the scanner processor.

(3) Printer interface

Image data in page memory are output to the laser controllers in the digital copier's printer by the external interface of the digital copier relay processor.

18.2.2 Schematic

The figure below shows a schematic diagram of the page memory board.



Page Memory Board Schematic

(1) Page memory

32 MB of memory (DRAM) are mounted on the main board as standard.

The Option page memory board specification (DRAM)

Model	HM5264405F-A60 or equivalent product	
Access time	100 nS	
Memory configuration	4194304 x 4 bits x 4 banks	
Address	Row address	A0-A1
	Column address	A0-A9
	Bank select address	A12-A13
Refreshment cy	4096 cycle/64mS	

The page memory board is provided with two slots for mounting the main PC Board.

Adding on this memory board increases the memory to 128 MB.

(2) Page memory control ASIC (EC-N024)

Address control

This ASIC forms the address on the page memory when the following condition are met:

- When digital image data are written to the page memory.
- When digital image data in the page memory are read.

Data control

This ASIC executes the following operations:

- Controls the images bus on the page memory board.
- Receives and waits for image data transfer control between the compression/decompression LSI and the page memory.
- Merges image data in the page memory with image data scanned by the digital copier, and writes image data into the page memory .

Rotation / merge control

This ASIC executes the following operations:

- Receives and wait for digital image data transfer control between the digital copier and the page memory PC board on the scanner and printer interface.
- Swaps data in the page memory during rotation processing.

(3) Compression / decompression LSI (PM-22)

This LSI executes the following operations:

- Compressions image data on the page memory, and forms coded data.
- Decompresses the coding data compressed on the page memory to restore the image data.

18.3 Description of Function

18.3.1 Basic functions

(1) Alternation

This operation is achieved by the page memory board compression/decompression and rotation functions. The orientation of multiple copies is switched for each copy or by each page at a time.

Alternation assumes that a cassette of the same paper size having a different orientation is installed in the digital copier.

(2) Sort copying

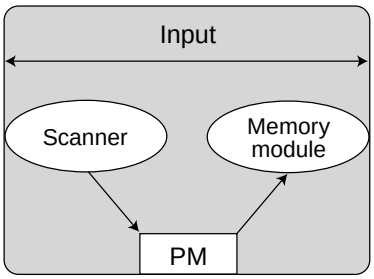
This operation is achieved by the compression/ decompression function on the page memory while being compressed. Image data stored in the memory are then decompressed at each page, and printed. Assuming that printing of N number of copies has been set, decompression and printing at each page are repeated for N number of times.

Example :

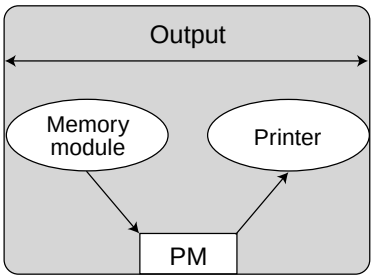
The following describes an example of execution process where alternation and sorting have been specified when marking multi-copies.

Execution process (Basic function)

Input process



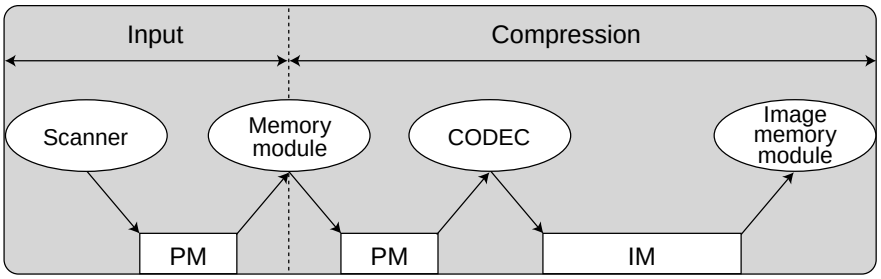
Output process



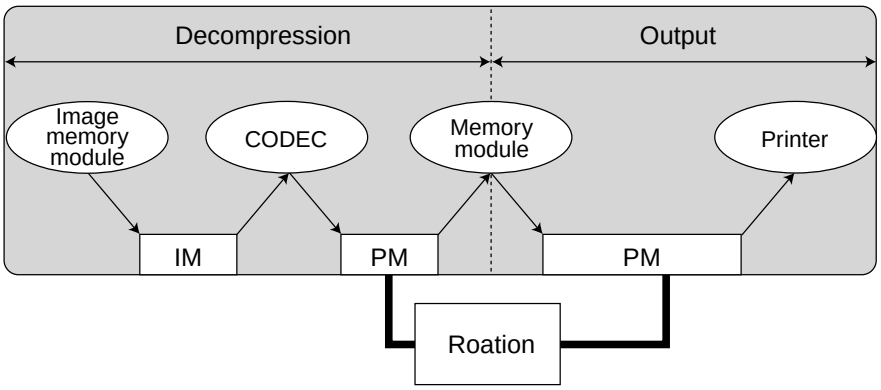
PM: Page Memory

Execution process (Alternation/sort copying)

Input process



Decompression process

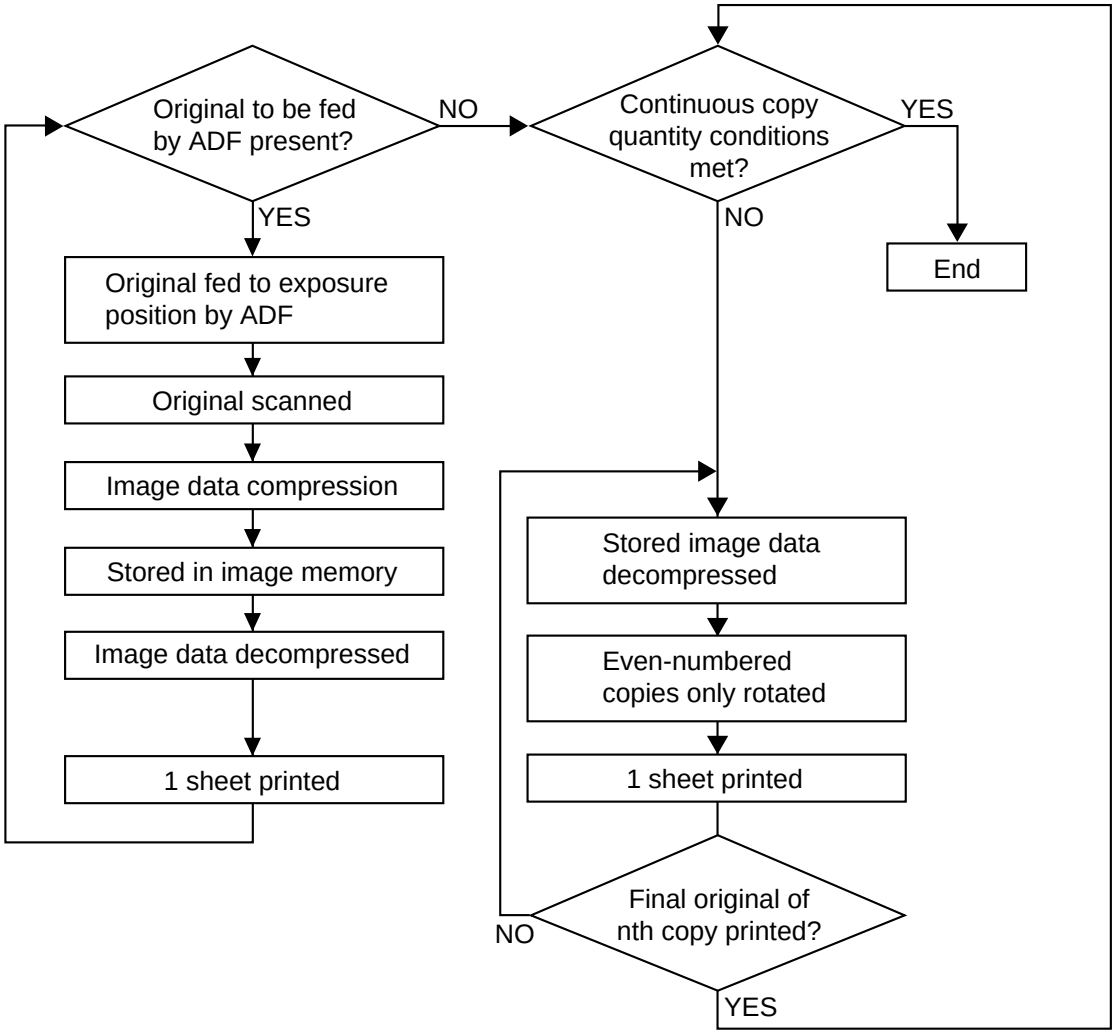


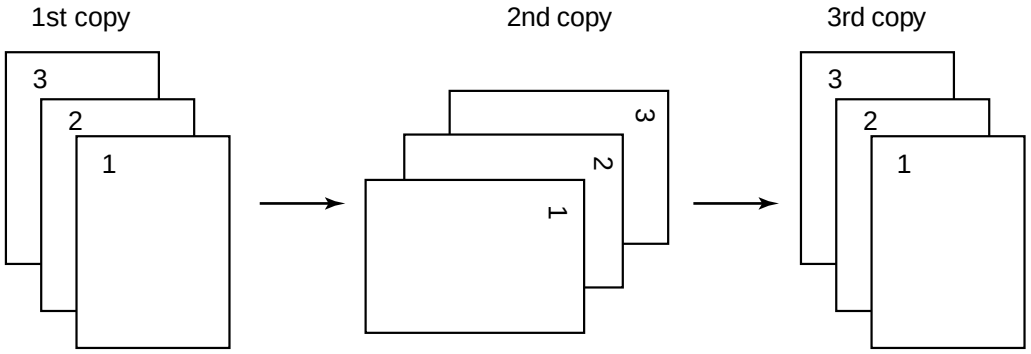
PM: Page Memory

IM: Image Memory

Example :

The following describes an example where alternation and sorting have been specified when making copies using the ADF.





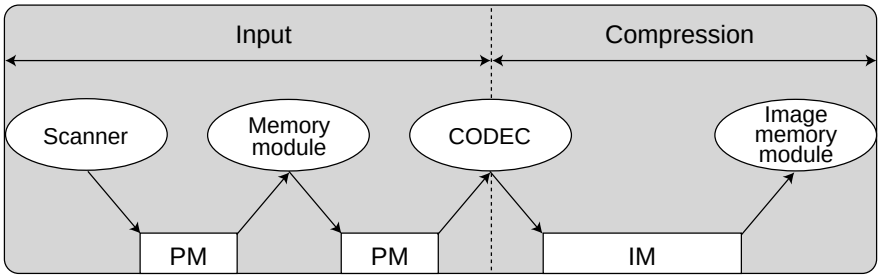
(3) Magazine sorting

Sorts original in such a way a weekly magazine or newspaper can be made.

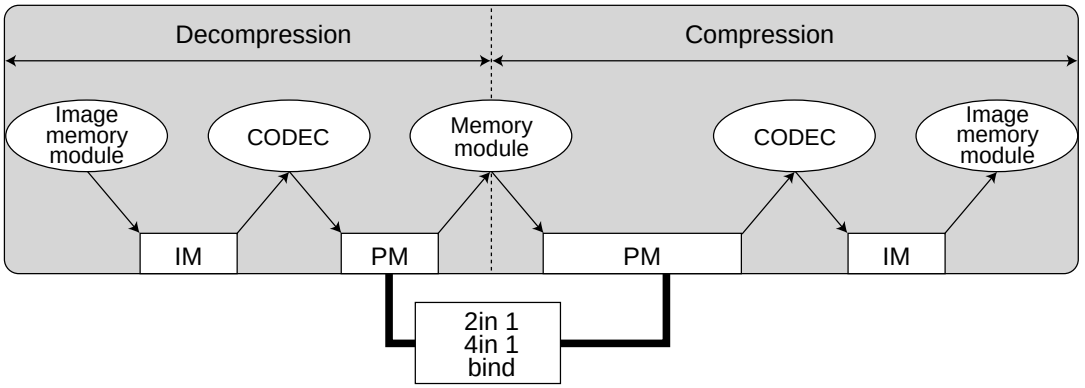
The following describes an example of execution process using the magazine sorting function.

Execution process (Magazine sorting)

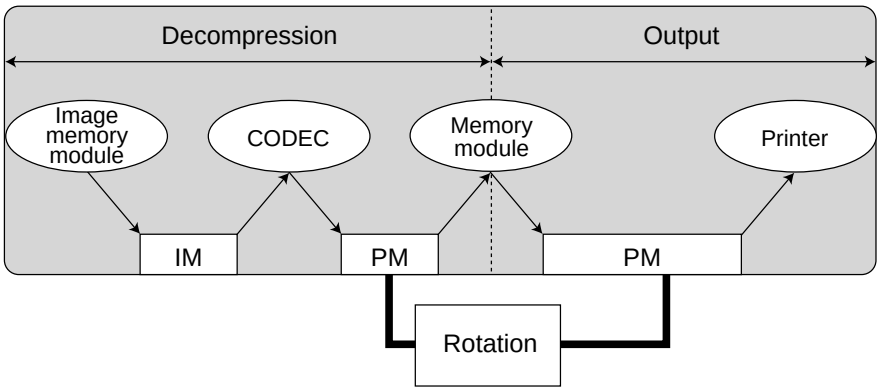
Input process



Compression process



Decompression process

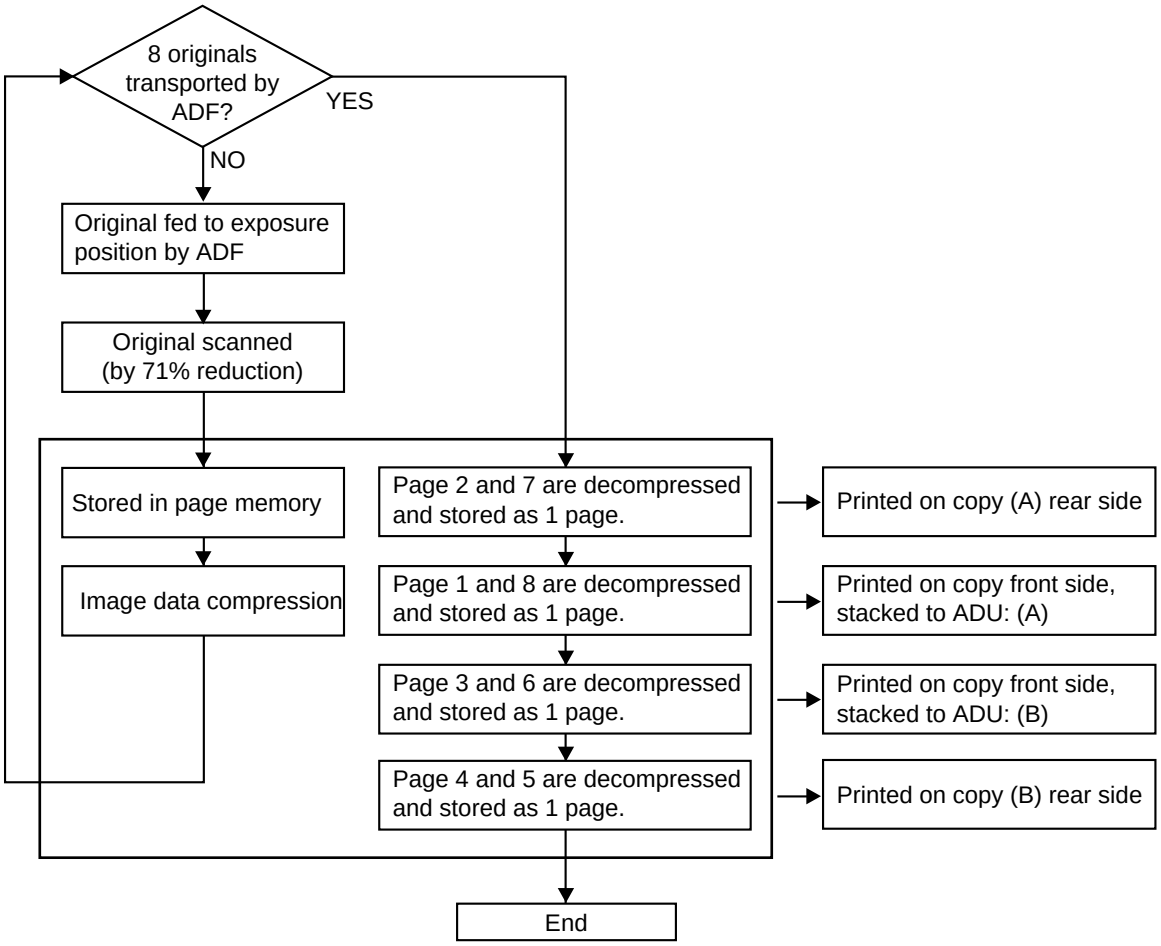


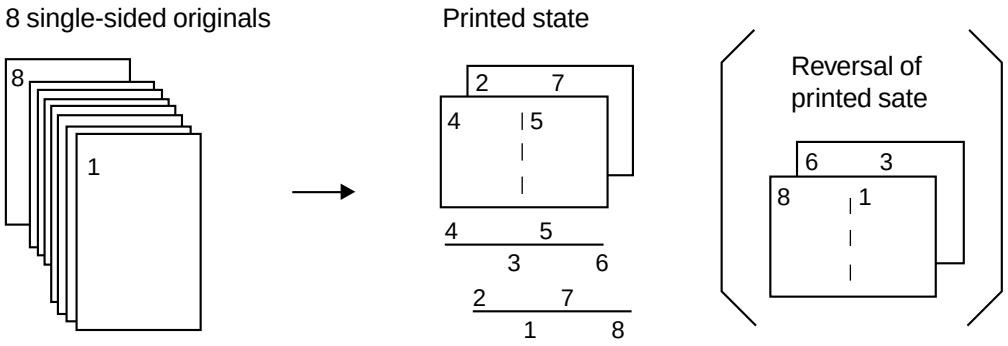
PM: Page Memory

IM: Image Memory

Example :

The following describes an example where eight single-sided A4-size originals are output onto A4-sized paper using the magazine sorting function.





18.3.2 Editing

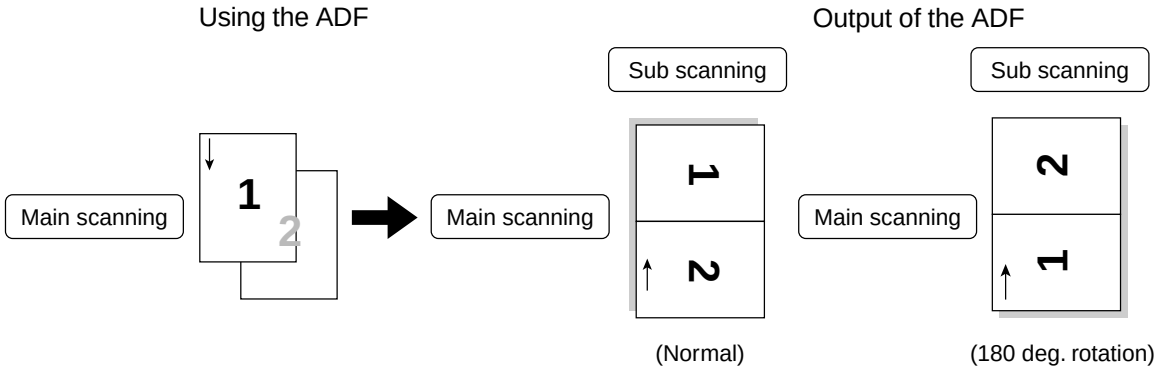
(1) 2 in 1 and 4 in 1

2 in 1 : Two originals are printed out onto single side of a single sheet of paper.

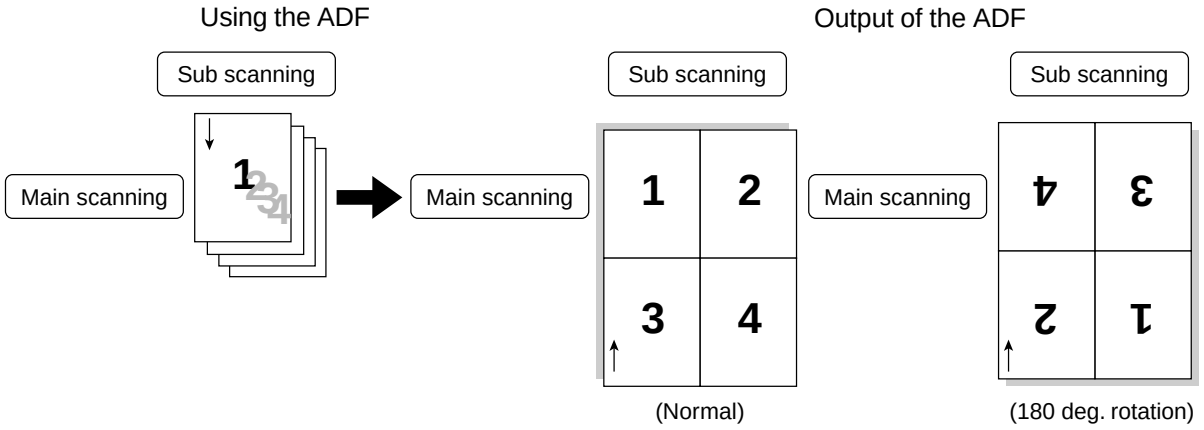
4 in 1 : For originals are printed out onto single side of a single sheet of paper.

The orientation of the printed copy can be selected for each of these modes as Follows.

2in 1 copy



4in 1 copy



TOSHIBA

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