# DR-5060F

# SERVICE MANUAL

## REVISION 0

Canon

JULY 2001 MY8-1396-000

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***Imprimé au Japon***

Use of this manual should be strictly surpervised to avoid disclosure of confidential information

# PREFACE

This Service Manual describes necessary basic information for after-sales service and maintenance for maintaining the product quality and functions of the DR-5060F.

## Contents

**Chapter 1: General Description**
Features, specifications, names of parts, description of operation

**Chapter 2: Functions & Operation**
Description of operation of electrical and mechanical systems

**Chapter 3: Disassembly & Reassembly**
Description of disassembly and reassembly

**Chapter 4: Installation**
Location and installation procedure

**Chapter 5: Maintenance & Servicing**
Parts to be replaced periodically, consumable parts

**Chapter 6: Troubleshooting**
Service modes and troubleshooting

**Appendix: General circuit diagrams, etc.**

Information in this manual is subject to change. Notification of such changes will be given in Service Information Bulletins.

Thoroughly read the information contained in this Service Manual and the Service Information Bulletins to gain a correct and deeper understanding of the machine. This is one way of fostering response for ensuring the prolonged quality and function, and for investigating the cause of trouble during troubleshooting.

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## CHAPTER 3 GENERAL DESCRIPTION



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# CHAPTER 4 GENERAL DESCRIPTION



# CHAPTER 5 GENERAL DESCRIPTION



# CHAPTER 6 GENERAL DESCRIPTION



# APPENDIX



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# CHAPTER 1

# GENERAL DESCRIPTION



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# I. FEATURES

## 1. Analog Backup

Backup exposing can be made with microfilm.

## 2. Multi-Featured Scanner

This machine inherits the features from the DR-5080C, except for the color mode, 400dpi mode, and the function sheets feature.

## 3. High-Resolution Filmer

Using an optional camera unit allows simplex and duplex exposures. The resolution is equal to or better than that of the usual rotary filmer (when compared with our products).

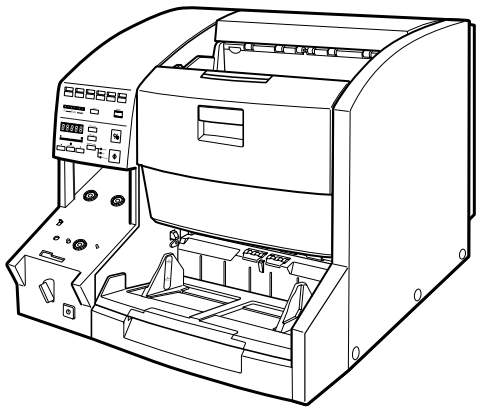

**Fig. 1-101**

*Windows* is a registered trademark of Microsoft Corporation in the U.S. and other countries.
Other company names and product names mentioned in this manual are registered trademarks or trademarks of the respective companies.

# II. SPECIFICATIONS

## 1. Common Specifications –1 (Items Related to Appearance / Installation)

| Item | Specifications |
|---|---|
| 1. Configuration | Desktop |
| 2. Power supply | 1) 100 V AC, 50/60 Hz<br>2) 120 V AC, 60 Hz<br>3) 220-240 V AC, 50/60 Hz |
| 3. Weight | 1) Main body: 47.2 kg<br>2) Camera: 1.1 kg |
| 4. Performance-assured temperature range | 15 to 27.5 °C |
| 5. Performance-assured humidity range | 25 to 75 %RH |
| 6. Maximum power consumption / input current | 220W (100 V model)<br>2A (120 V model)<br>1A (220-240 V models) |
| 7. Noise (Acoustic power level) | 1) During standby: 4.0B or less<br>2) During operation (except beepers):<br>7.9B or less, in the case of scanning at 200 X 100 dpi<br>7.2B or less, otherwise |
| 8. Dimensions | 1) With the tray fully opened: 535 (W) X 839 (D) X 486 (H) mm<br>2) With the tray fully closed: 535 (W) X 671 (D) X 447 (H) mm |
| 9. Output interface | 1) SCSI-2 (Fast SCSI is also available)<br>2) For the endorser |
| 10. Bundled software | 1) Scanning Utility 5060 (driver and application)<br>2) ISIS driver<br>3) TWAIN driver |
| 11. Product lifespan | Whichever of the following is reached first:<br>1) Five years<br>2) Number of fed sheets: 6 million (A4) |
| 12. Options | 1) Camera Unit 57X for DR-5060F<br>2) Camera Unit 24X for DR-5060F<br>3) Patch Code Detector for DR-5060F<br>4) BARCODE DECODER 5000<br>5) IMPRINTER 5000<br>6) ENDORSER ED600<br>* Items 1 to 3 are new options, and other items are options on the DR-5020/5080C. Concurrent use of items 3 and 4 is not possible. |

**Table 1-201**


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## 2. Common Specifications –2 (Items Related to Document Feed)

| Item | Specifications | |
|---|---|---|
| 1. Document size | 1) Width: 55 to 297 mm<br>2) Length: 70 to 432 mm<br>3) Thickness: 0.06 to 0.15 mm for Automatic feed<br>0.05 to 0.20 mm for manual feed | |
| 2. Limitations on document types | 1) Pressure-sensitive paper: Only face-up pickup is allowed<br>2) Carbon paper: Not allowed<br>3) Perforations for binding: Only round holes are allowed (with some limitations)<br>4) Curl: 5 mm or less<br>5) Folds and wrinkles: Smooth them down for pickup (Double feed detection by thickness is not allowed). | |
| 3. Pickup / Delivery capacities | 1) A4/LTR or smaller: 45 mm in height (500 sheets or less)<br>2) Sizes over A4/LTR: 20 mm in height (200 sheets or less) | |
| 4. Operation mode | 1) Backup mode: Scanning and filming document images<br>2) Scanner only mode: Only scanning document images<br>3) Filmer only mode: Only filming document images<br>4) Count only mode: Only counting documents | |
| 5. Functions | 1) Automatic paper thickness adjustment: Provided<br>2) Manual paper thickness adjustment: 13 steps<br>3) Pickup roller load changing: 3 steps<br>4) Skew feed correction: Provided<br>5) Scan-ahead mode : Provided<br>6) Pickup mode: Semi Auto / Auto / Manual / Remote<br>7) Double feed detection: Paper thickness / Paper length<br>8) Skew feed detection: Provided<br>9) Self-test: Provided<br>10) Mechanical counter: Cumulative number of fed sheets (7 digits)<br>11) Function keys: 6 | |
| 6. Feed speed (classified by scanning resolution) | 1) 200 x 100 dpi : 588 mm/sec<br>3) 200 x 200 dpi : 294 mm/sec<br>5) 300 x 300 dpi : 196 mm/sec | 2) 300 x 150 dpi : 392 mm/sec<br>4) 240 x 240 dpi : 245 mm/sec |

**Table 1-202 (cont.)**

| Item | Specifications | | | | | | |
|---|---|---|---|---|---|---|---|
| 7. Number of scanned sheets/minute | 1) Backup mode | | | Document size | | | |
| | | | | A4 | A3 | LTR | Check |
| | Binary | Simplex | 200 x 100 dpi | 84.0 | 57.5 | 87.0 | 200.0 |
| | | | 200 x 200 dpi | 49.5 | 33.0 | 51.0 | 117.0 |
| | | | 300 x 300 dpi | 34.0 | 23.0 | 35.0 | 80.0 |
| | | Duplex | 200 x 100 dpi | 84.0 | 57.5 | 87.0 | 200.0 |
| | | | 200 x 200 dpi | 49.5 | 33.0 | 51.0 | 117.0 |
| | | | 300 x 300 dpi | 31.5 | 17.5 | 33.0 | 80.0 |
| | Gray scale | Simplex | 200 x 100 dpi | 39.5 | 28.5 | 40.5 | - - |
| | | | 200 x 200 dpi | 20.5 | 14.5 | 21.0 | - - |
| | | | 300 x 300 dpi | 12.0 | 8.0 | 12.1 | - - |
| | | Duplex | 200 x 100 dpi | 31.0 | 20.5 | 32.0 | - - |
| | | | 200 x 200 dpi | 16.0 | 11.0 | 16.5 | - - |
| | | | 300 x 300 dpi | 9.0 | 5.5 | 9.0 | - - |
| | 2) Scanner only mode | | | Document size | | | |
| | | | | A4 | A3 | LTR | Check |
| | Binary | Simplex | 200 x 100 dpi | 84.0 | 57.5 | 87.0 | 200.0 |
| | | | 200 x 200 dpi | 49.5 | 33.0 | 51.0 | 117.0 |
| | | | 300 x 300 dpi | 34.0 | 23.0 | 35.0 | 80.0 |
| | | Duplex | 200 x 100 dpi | 84.0 | 57.5 | 87.0 | 200.0 |
| | | | 200 x 200 dpi | 49.5 | 33.0 | 51.0 | 117.0 |
| | | | 300 x 300 dpi | 31.5 | 17.5 | 33.0 | 80.0 |
| | Gray scale | Simplex | 200 x 100 dpi | 57.0 | 36.0 | 59.0 | - - |
| | | | 200 x 200 dpi | 30.5 | 19.0 | 31.0 | - - |
| | | | 300 x 300 dpi | 16.5 | 10.5 | 18.0 | - - |
| | | Duplex | 200 x 100 dpi | 40.5 | 24.5 | 41.5 | - - |
| | | | 200 x 200 dpi | 21.5 | 13.0 | 22.5 | - - |
| | | | 300 x 300 dpi | 11.0 | 6.5 | 12.0 | - - |
| | * Detailed conditions are omitted. The above figures may differ depending on the functional settings, computer and other conditions. | | | | | | |
| | 3) Filmer only mode<br>The number of sheets equates to that of 200 x 200dpi Binary, shown in the above table. | | | | | | |

**Table 1-202**


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## 3. Scanner Specifications

| Item | Specifications |
|---|---|
| 1. Photosensitive element | Contact Image Sensor (COMS CIS), 300 dpi |
| 2. Light source | RG 2 colors in 1 line LED array |
| 3. Scanning resolution | 1) 200 x 100 dpi (200 dpi high-speed)<br>2) 300 x 150 dpi (300 dpi high-speed)<br>3) 200 x 200 dpi<br>4) 240 x 240 dpi<br>5) 300 x 300 dpi |
| 4. Maximum scanning size | 295.3 (W) x 432 (L) mm<br>* Width varies with main-scanning resolution.<br>200 dpi: 292.6 mm 240 dpi: 294.6 mm 300 dpi: 295.3 mm |
| 5. Fixed scanning size | 1) L system: LDR/LTR/LGL<br>2) A system: A3/A4/A5/A6<br>3) B system: B4/B5/B6 |
| 6. Scanned sides | Front side / Back side / Double sided |
| 7. Output modes | 1) Binary: Simple binary / Error diffusion<br>2) Grayscale: 2/4/8 bits (4/16/256 levels) |
| 8. Output resolution | 1) 200 x 200 dpi<br>2) 240 x 240 dpi<br>3) 300 x 300 dpi |
| 9. Image processing | 1) Brightness adjustment: 256 levels (13 levels on the operation panel)<br>2) Automatic brightness adjustment (AE): Simple binary mode only<br>3) Black compensation: Black clamp and Dark compensation<br>4) Contrast adjustment: 13 levels<br>5) Shading compensation: Provided<br>6) Gamma compensation: Provided<br>7) Resolution conversion: Provided for main-scanning<br>8) Edge emphasis: 5 levels<br>9) Binarizing: Simple binary / Error diffusion<br>10) Neg./Pos. reversion (RIF): Provided<br>11) Filter: Thin line complement / Dot erasing / Notch compensation |
| 10. Functions | 1) Automatic detection of sheet width: Image data / Document guide position<br>2) Margin: -10 to +10 mm (The + direction is not allowed for A3)<br>3) Add-on: Provided<br>4) Dropout: Red |

**Table 1-203**

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## 4. Filmer Specifications

| Item | Specifications |
|---|---|
| 1. Film type | 16 mm silver-halide roll film |
| 2. Recommended film | 1) Canon: CKIII (5 mil-100ft)<br>2) Kodak: HQ1461 (5 mil-100ft)<br>HQ2461 (4 mil-125ft)<br>HQ3461 (2.5 mil-215ft)<br>* Depending on the film thickness, some adjustments are required (by a service technician). |
| 3. Exposure form | 1) Camera unit 24X: Simplex<br>2) Camera unit 57X: Duplex |
| 4. Exposure magnification | 1) Camera unit 24X: 1/24 (1/25 actual magnification)<br>2) Camera unit 57X: 1/57 (1/56.94 actual magnification) |
| 5. Exposure light source | Yellow-green fluorescent lamp |
| 6. Light intensity adjustment | Slit width / Density filter |
| 7. Functions | 1) Blip exposure: 2 levels (File / Page)<br>2) Leader feeding: 500 to 3000 mm (in 100 mm steps)<br>3) Space feeding: 5 to 1500 mm (in 5 mm steps)<br>4) Trailer feeding: 500 to 3000 mm (in 100 mm steps), or to film end<br>5) Film-end detection: 1500 to 3000 mm (in 100 mm steps)<br>6) Film-near-end detection:<br>1100 to 1900 mm before the film-end detection<br>7) Film remaining display: 7-digit LED on the operation panel assembly and simple indicator on the camera unit<br>8) Camera unit identification: Camera unit ID from 1 to 15 (4-bit)<br>9) Address memory: Memorizing the final state of use for every ID<br>Page address / File address / Odometer<br>**Note:** Specify the value of 5) larger than or same as that of 4). As for 5) and 6), values are given in the case of 5 mil film thickness. |

**Table 1-204**


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# III. PRECAUTIONS

This section describes items that require particular care, for example, regarding safety. These precautions must be observed. Explain to the user items that relate to user safety, and instruct the user to take appropriate action.

## 1. Electromagnetic Wave Interference Countermeasures

This machine complies with the electromagnetic wave interference standards (VCCI-A, FCC-A, etc.). However, the user might have to carry out separate countermeasures if the machine causes electromagnetic wave interference.

Do not change nor modify this machine. If this has been carried out, its use may be forcibly discontinued on site. If this machine's specifications have been changed, or the machine has been disassembled and reassembled, follow the instructions described in this manual or the Service Information Bulletins.

A “CAUTION LABEL” is affixed on the rear of the machine.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interfernce received, inculuding interference that may cause undesired operation.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

**CAUTION LABEL (120 V machines)**

## 2. Power OFF in Emergency

When such anomalies as abnormal noise, smoke, heat on odor occur, turn the power off immediately and unplug the power cord.

As it may cause injury, be careful not to get clothing (ties, long hair, etc.) caught in the machine. If this happens, turn the power off immediately.

## 3. Moving parts

Injury could occur to fingers from the moving parts during operation. Do not put hands or fingers into the moving parts (such as the document board, feed assembly and roller assembly) under operating conditions.

In addition, improper opening/closing of the upper unit or feed unit may cause fingers to get caught. Take care.

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## 4. Fluorescent Lamps

The lit fluorescent lamp may cause pain to the eyes. When lighting the uncovered fluorescent lamp, be careful not to look at the lamp directly.

During lighting and immediately after shutoff, do not touch the lamp, since it gets very hot.

Also avoid contact with the energized assemblies on the fluorescent lamp and the lamp PCB assembly, since the fluorescent lamp uses high voltage.

A “Caution / High Voltage label” is affixed near the lamp PCB assembly.


**Caution / High Voltage label**

## 5. Instruction Manual

Read the instruction manual thoroughly before using this machine.


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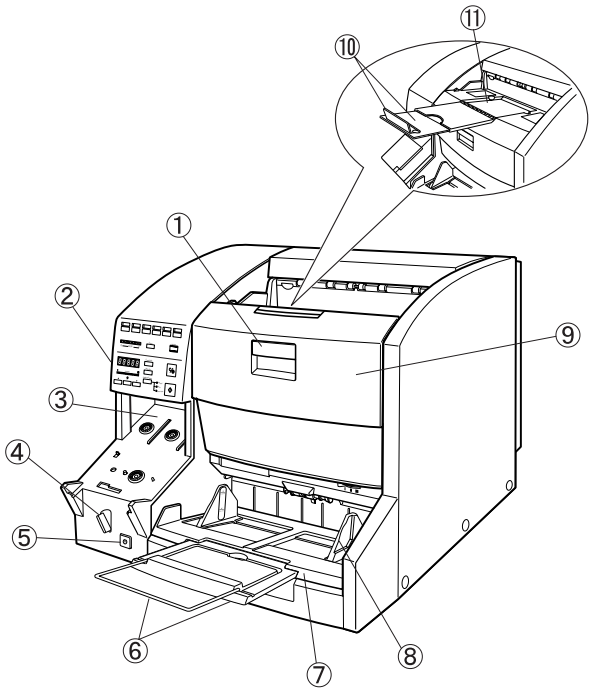
# IV. NAMES OF PARTS

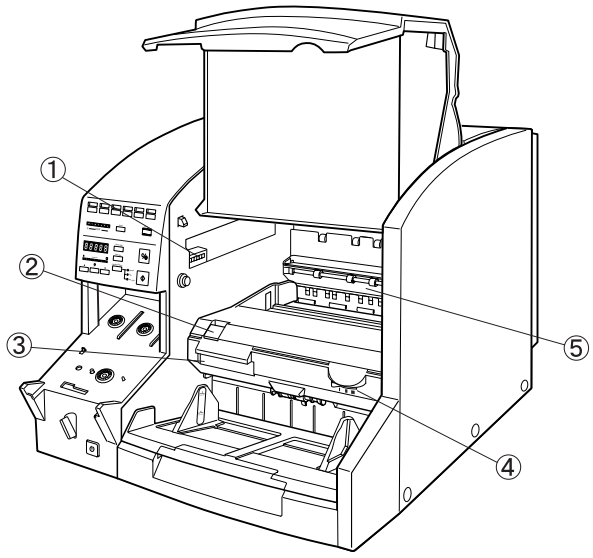
## 1. Front View




① Upper unit open/close button
② Operation panel
③ Camera unit slot
④ Camera unit lock lever
⑤ Power switch
⑥ Document tray extension / extension wire
⑦ Document tray
⑧ Document guide
⑨ Upper unit
⑩ Document eject tray extension / stopper
⑪ Document eject tray

**Fig. 1-401**

## 2. Opened Upper Unit




① Counter
② Feed unit open/close button
③ Feed unit
④ Paper feed adjustment lever
⑤ Intermediate unit

**Fig. 1-402**

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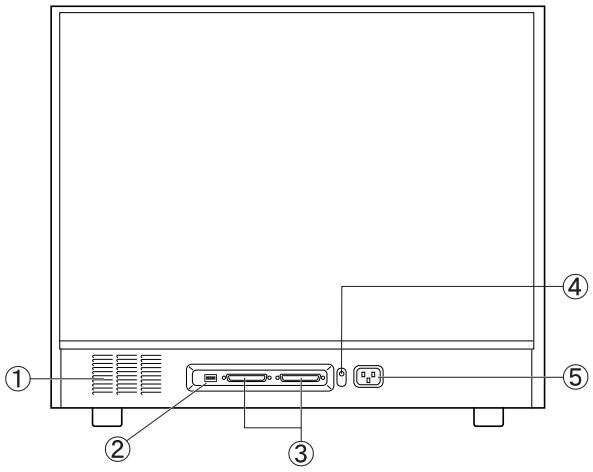
## 3. Rear View

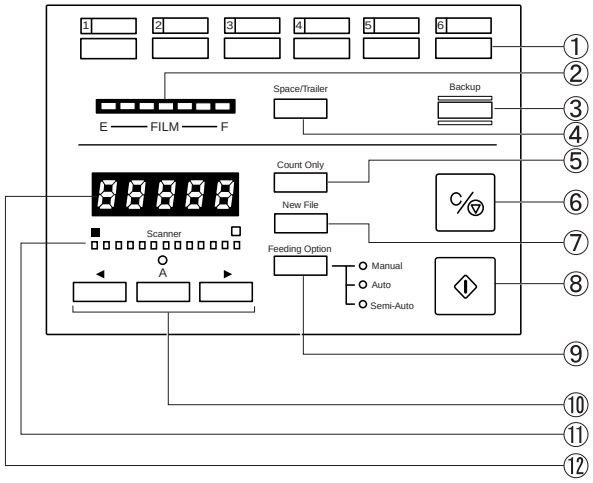



① Air vent
② DIP switch
③ SCSI connectors
④ Ground terminal
⑤ Power cord connector

**Note:** Ensure that the exhaust fan remains unobstructed. Blocking the fan causes heat to build up inside, which may result in damage to the machine.

**Fig. 1-403**

## 4. Operation Panel




① Function keys
② Remaining film indicator
③ Backup key
④ Space/Trailer key
⑤ Count Only key
⑥ Clear/Stop key
⑦ New File key
⑧ Start key
⑨ Feeding Option key
⑩ Brightness key
⑪ Indicator lamps
⑫ Counter display

**Fig. 1-404**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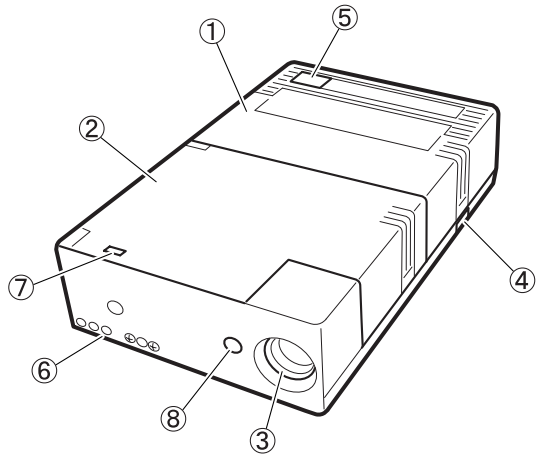
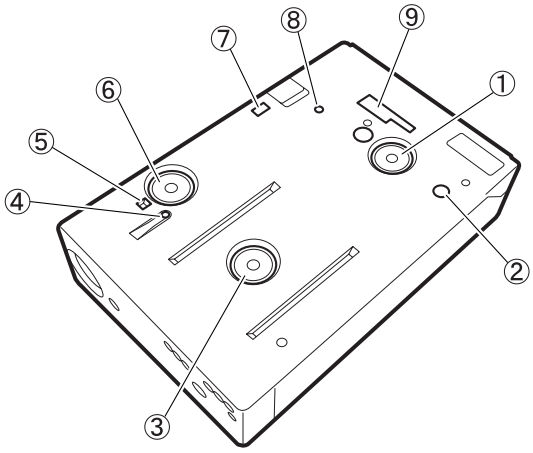
## 5. Camera Unit




① Take-up cover
② Supply cover
③ Lens
④ Cover release notch
⑤ Magnification display
⑥ ID setup
⑦ Remaining display window
⑧ Release hole for the remaining sensor lever

**Fig. 1-405**




① Connecting face gear for take-up
② Release hole for take-up shaft latch
③ Connecting face gear for supply
④ Camera shutter driving hole
⑤ Hole for light from mark LED
⑥ Connecting face gear for capstan roller
⑦ Camera lock driving hole
⑧ Camera lock sensor hole
⑨ Camera unit locking hole

**Fig. 1-406**

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# V. EXPLANATION OF OPERATION

## 1. Basic Operation

The basic operational procedure for recording is as follows.

For details, refer to the instruction manual.

1) Turn the power of the machine on.
2) Turn the personal computer on.
3) Start up the application software.
4) Set the feeding and recording conditions.
5) Place documents in the tray.
6) Start feeding.
7) After the recording is completed, quit the application software.
8) Turn the personal computer off.
9) Turn the power of the machine off.

**Note 1:** For the system requirements for the personal computer and others, refer to the instruction manual.

**Note 2:** For the driver software and the application software, refer to the instruction manuals of each software.

**Note 3:** For use of trays, refer to the instruction manual.

## 2. Operation Screen

The operation screen of the “Scanning Utility 5060” packed with this machine is shown below.

As to the operation screens of other driver software and application software, refer to the instruction manuals of each software.

1) “Start up” screen

   This appears by starting up the application software.

   Start with this screen to carry out the various operations.

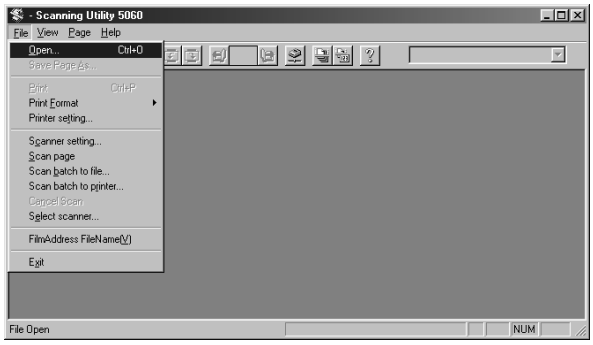


**Fig. 1-501**

2) “Scanner Settings” screen

   This appears by selecting “File” - “Scanner setting” on the “Start up” screen, or clicking ( ) in the tool bar.

   Set the basic conditions on this screen.

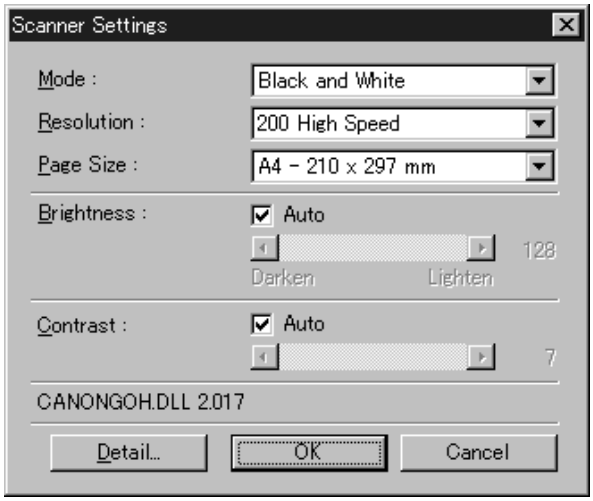


**Fig. 1-502**


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3) “Detail” screen
This appears by clicking “Detail” on the “Scanner settings” screen.
Set the details on this screen.

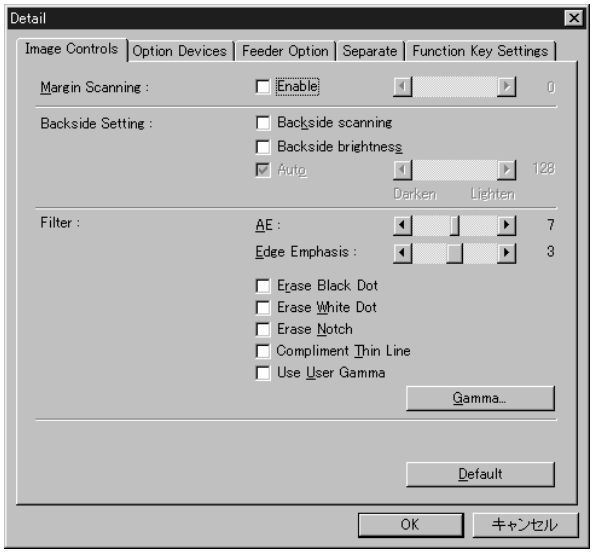


**Fig. 1-503**

4) “Save As” screen
This appears by selecting “File” - “Scan batch to file” on the “Start up” screen, or clicking ( ) in the tool bar.
Specify the files to be saved on this screen.


**Fig. 1-504**

5) “Start Scanning” screen
This appears by clicking “Save” on the “Save As” screen.
Controls the simplex/duplex switching, the file break setting, and the scanning (feeding) start/stop.

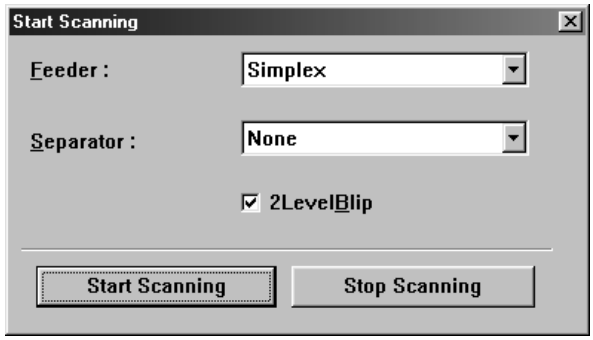


**Fig. 1-505**

# VI. REGULAR INSPECTION BY USERS

Fully explain to the user that the following locations must be cleaned about once a week, and that the power must be turned OFF and the power plug must be disconnected before the user starts cleaning.

For details, refer to the instruction manual.

## 1. Main body

1) Outside covers
   Wipe with a cloth moistened with water or neutral detergent, and then wipe dry.
2) Reading glass (for the scanner and the filmer)
   Wipe with a cloth moistened with water, and then wipe dry.
3) Rollers
   Wipe with a cloth moistened with water, and then wipe dry.

**Note:** Take off the middle unit before cleaning its roller. Users cannot clean the feed drive roller entirely because it cannot be turned by hand.

## 2. Camera unit

1) Outside cover
   Wipe with a cloth moistened with water or neutral detergent, and then wipe dry.
2) Lens
   Wipe with a soft clean cloth.

**Note:** Do not scratch the lens.

3) Capstan roller
   Wipe with a cloth moistened with water or neutral detergent, and then wipe dry.

## 3. Imprinter

Wipe away ink adhering to the guide plate hole at the back of the imprinter.

Moreover, because the power cord is plugged into the outlet for a long period of time, the accumulation of dust could cause leakage, fire or electric shock. To prevent this, instruct the user to clean it regularly.


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# CHAPTER 2

# FUNCTIONS & OPERATION



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# I. OUTLINE

## 1. System Configuration

The system configuration is shown in Fig. 2-101.

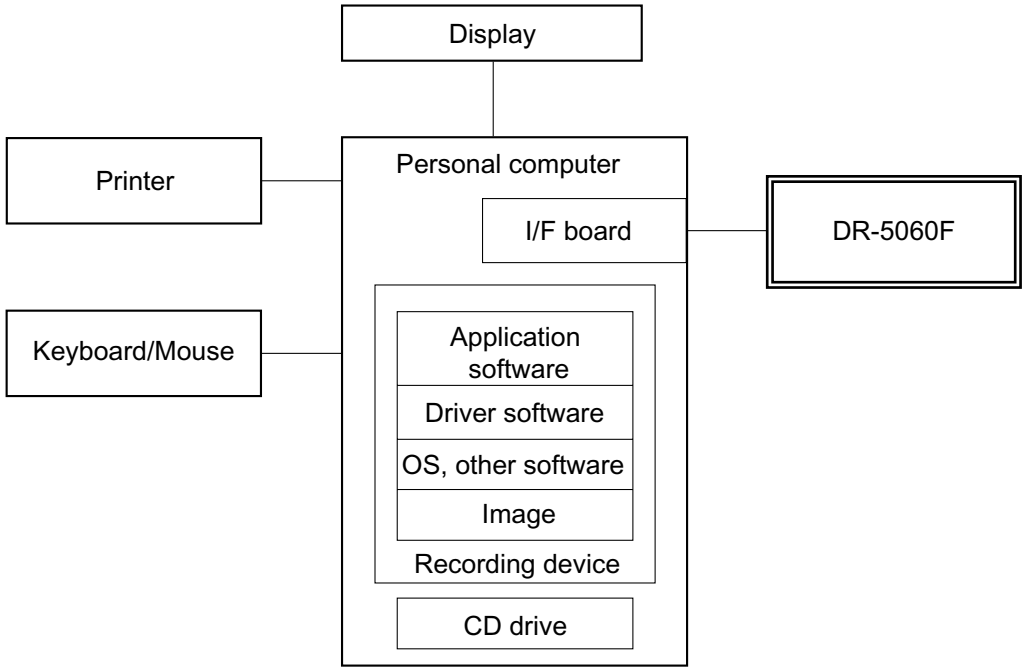


**Fig. 2-101**

| Item | Function/Specification |
|---|---|
| DR-5060F | Inputs image |
| Personal computer | Controls the system, which is an IBM PC/AT compatible machine<br>CPU : Pentium®, 133MHz or faster<br>OS : Windows®95/98/Me, NT4.0 Workstation, or Windows2000 Pro<br>RAM : At least 64MB |
| Display | Displays images, and searching and setting screen, etc. An SVGA compatible display. |
| Printer | Prints images |
| Keyboard/Mouse | Controles image input, searching etc. |
| Recording device | Records images, searching ID and software |
| I/F board | Interfaces with SCSI<br>SCSI board for PC/AT compatible machine and driven by wnaspi32.dll<br>Recommended: Adaptec AHA-2930 series or AHA-2940 series |
| Application software | Software for recording and searching images |
| Driver software | Software for operating DR-5060F |
| CD drive | For installation of setup disk, 4X speed or faster |

**Note:** For details of the software supplied with DR-5060F, refer to the instruction manual of each software.

**Table 2-101**

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## 2. Machine Configuration

The machine configuration is shown in Fig. 2-102.

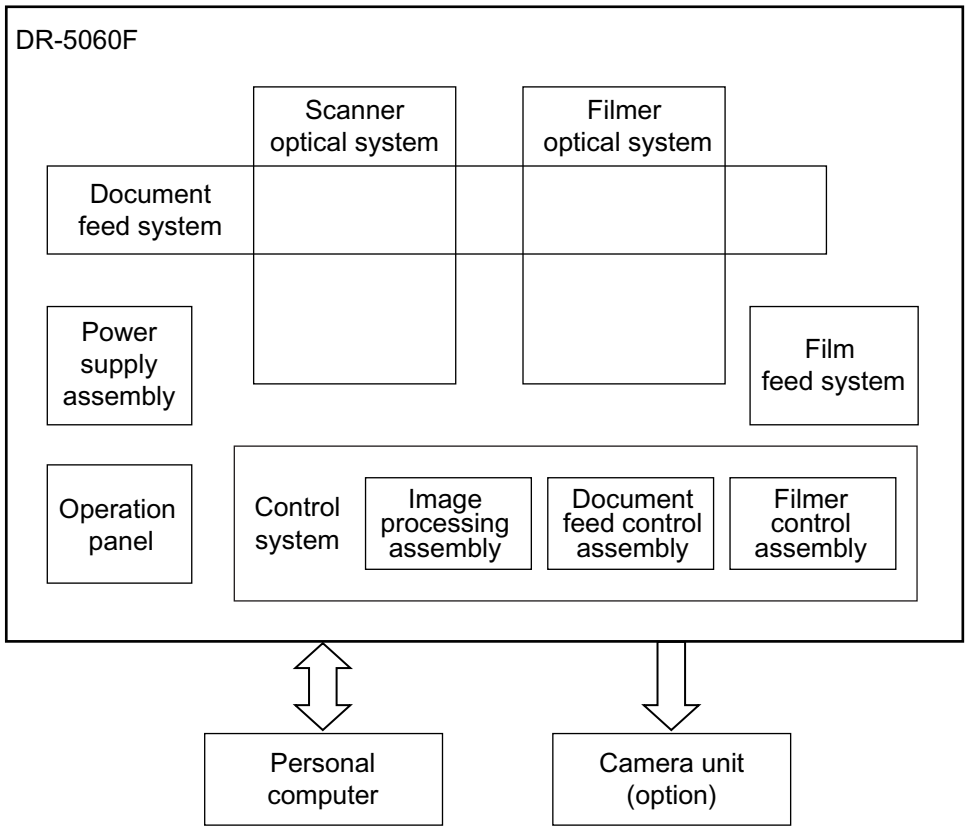


**Fig. 2-102**

a. Document feed system
Performs all processes from pickup to delivery.

b. Scanner optical system
Scans image data using the image sensor.

c. Filmer optical system
Projects image data onto the film in the camera unit.

d. Film feed system
Feeds the film within the camera unit.

e. Control system
This system includes the image processing assembly, document feed control assembly, and filmer control assembly.

f. Operation panel
Makes or displays the settings for the machine

g. Power supply assembly
Converts the AC power to DC power and supplies it to each assembly.


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## 3. Document Feed Drive

This machine has 6 motors for the document feed system. Refer to Fig. 2-103.

- Main motor (M1)
- Pickup motor (M2)
- Feeding motor (M3)
- Gap adjusting motor (M4)
- Separation motor (M5)
- Document board motor (M6)

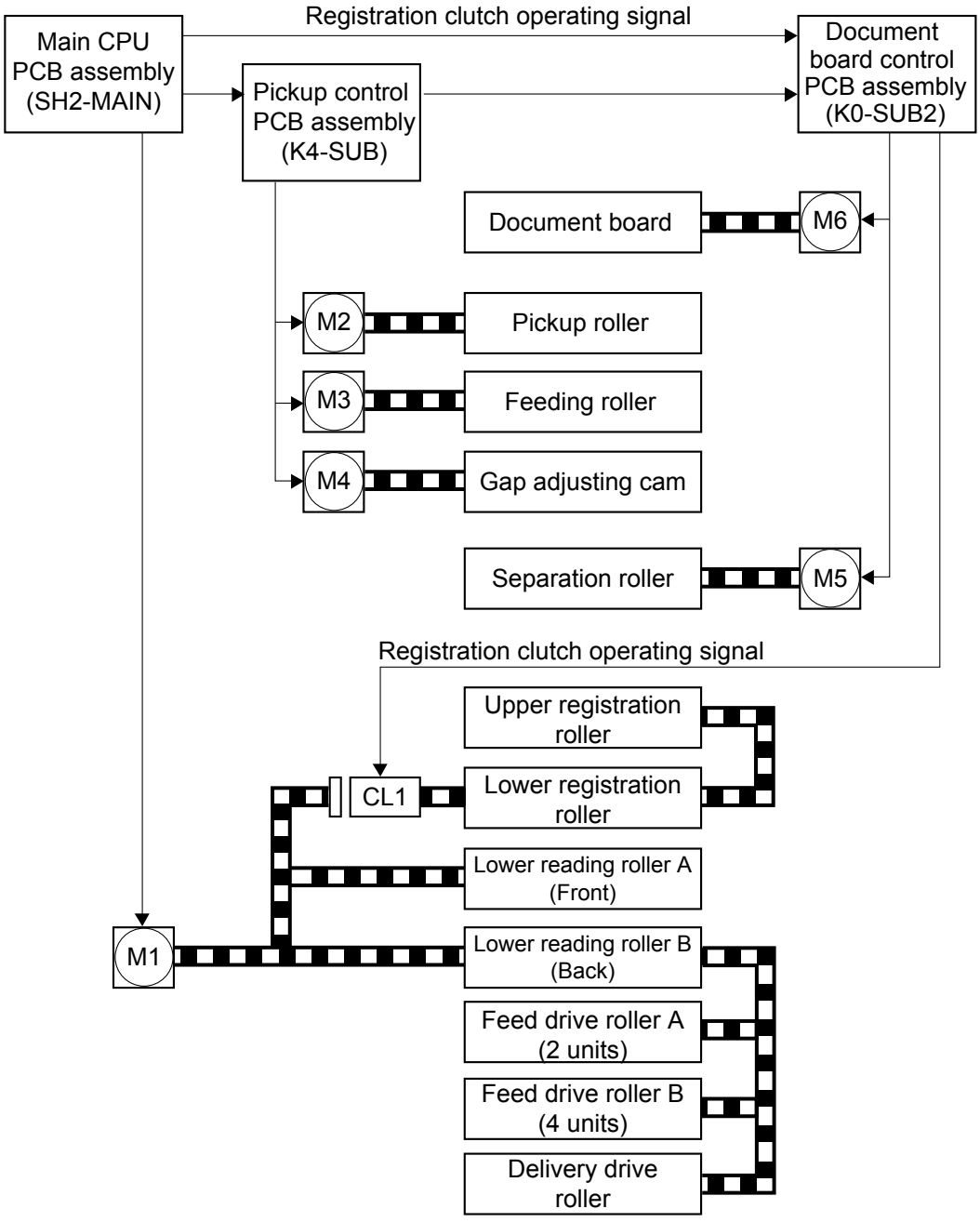


**Fig. 2-103**

## 4. Filmer Drive

This machine has 5 motors for the filmer optical system and film drive system. Refer to Fig. 2-104.

- Capstan motor (M51)
- Camera lock motor (M52)
- Front side slit motor (M53)
- Back side slit motor (M54)
- Take-up motor (M55)

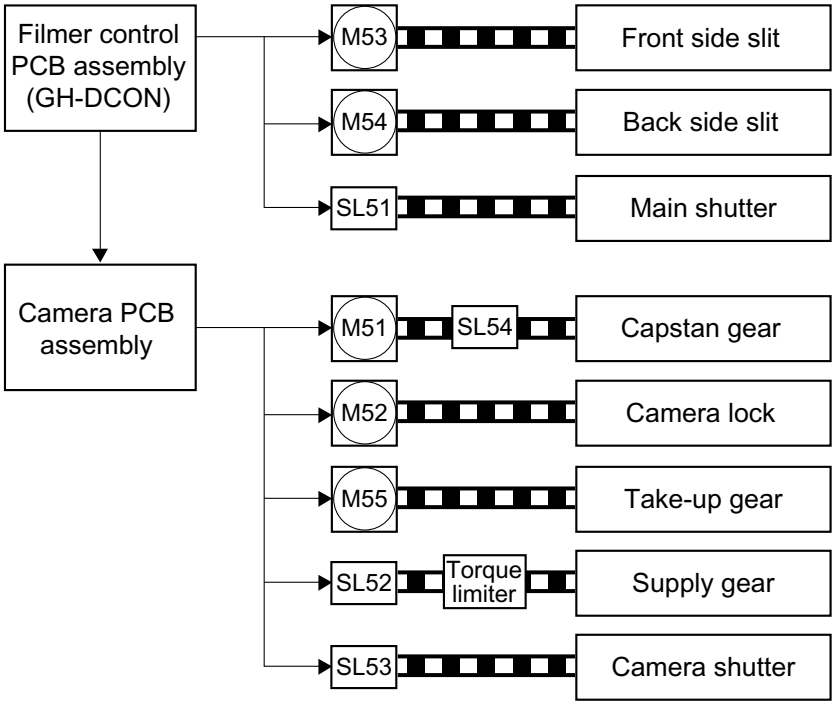


**Fig. 2-104**


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## 5. Outline of Electrical Circuits

a. Scanner

There are 3 CPU PCB assemblies related to the scanner: the main CPU PCB assembly (SH2-MAIN), pickup control PCB assembly (K4-SUB), and document board control PCB assembly (K0-SUB2). Refer to Fig. 2-105.

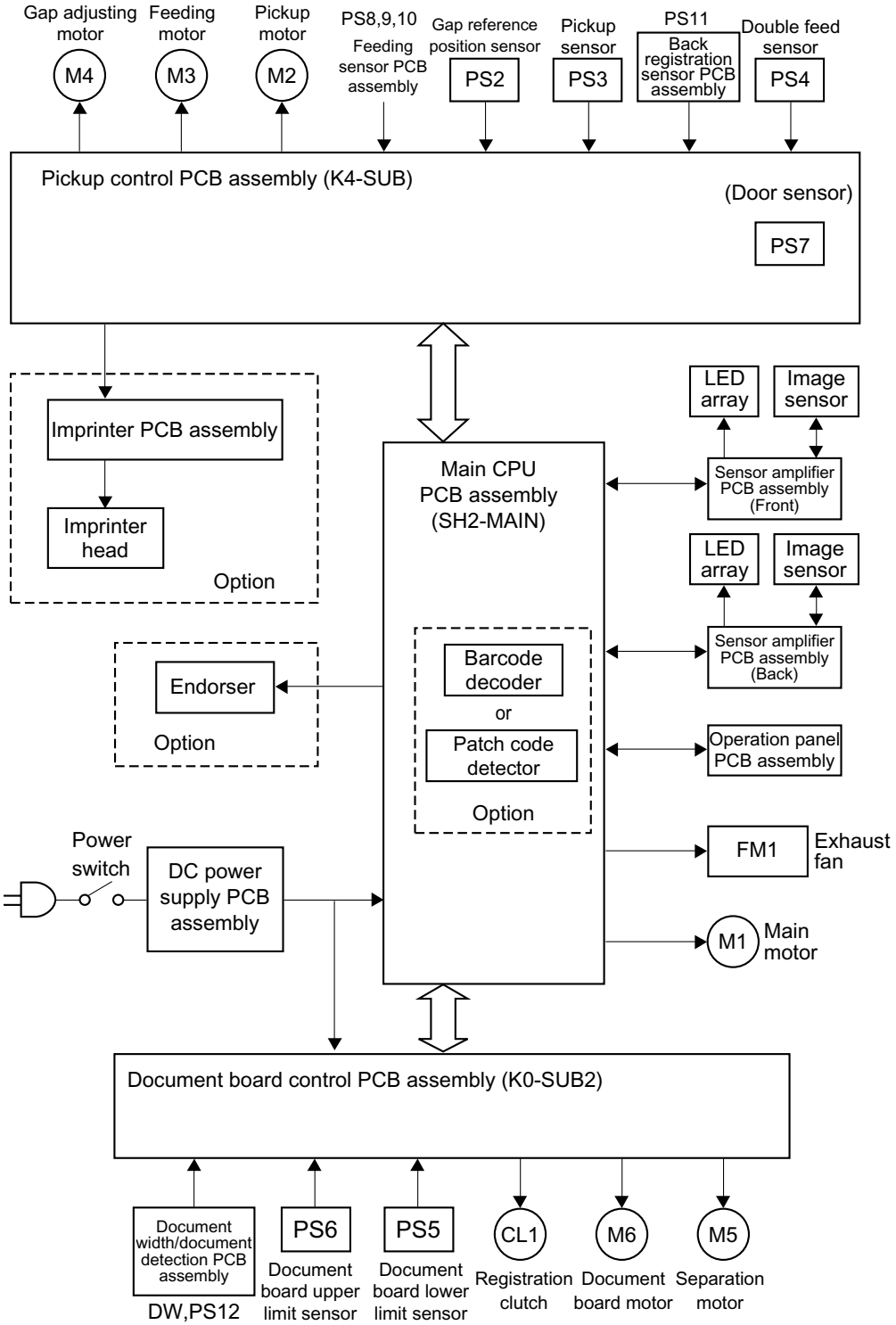


**Fig. 2-105**

b. Filmer

The CPU PCB assembly related to the filmer is the filmer control PCB assembly (GH-DCON).

Refer to Fig. 2-106.

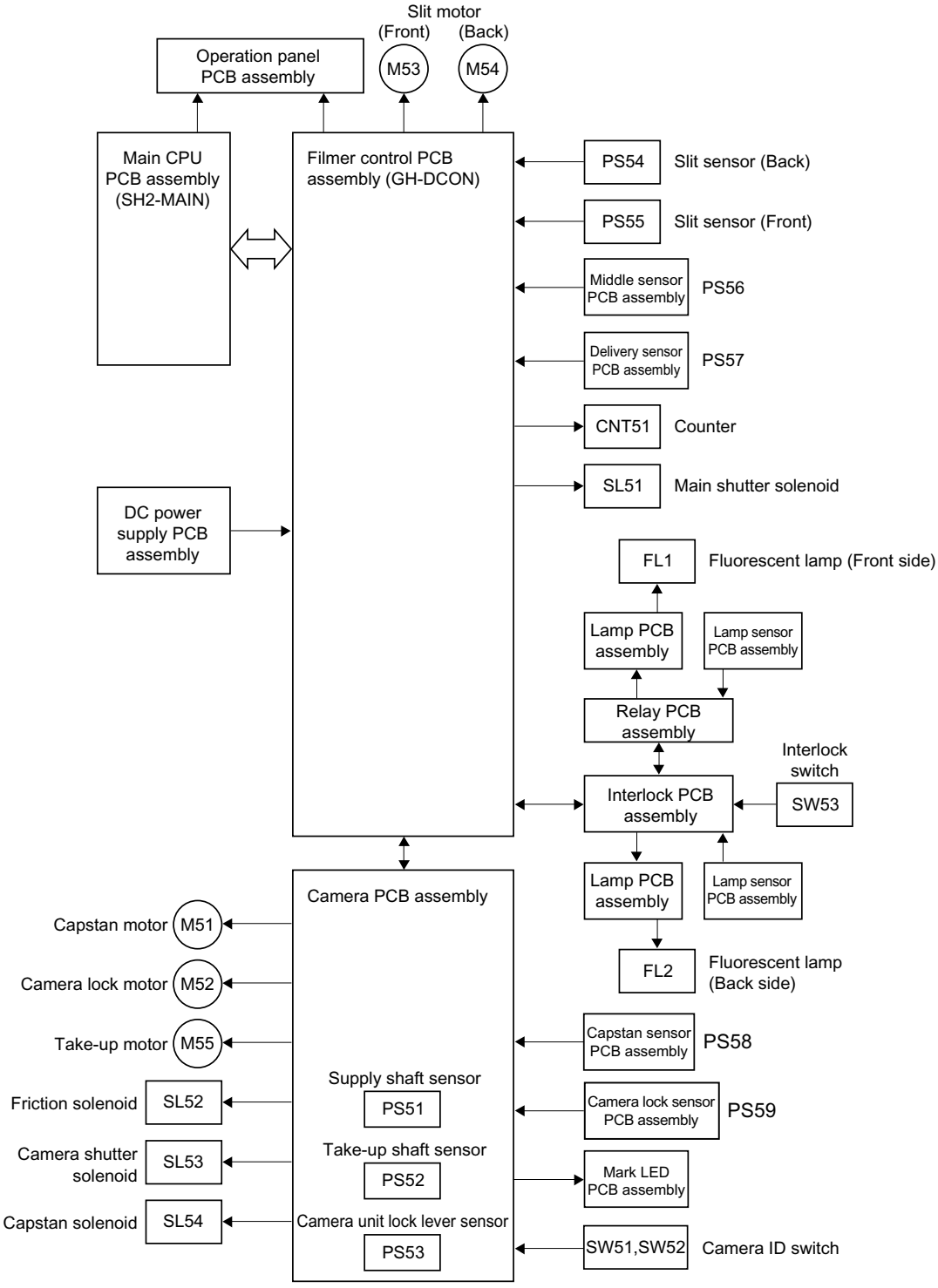


**Fig. 2-106**


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## 6. Input to and Output from Main PCB Assemblies

a. Main CPU PCB assembly (SH2-MAIN)

Fig. 2-107 shows the input to and output from the main CPU PCB assembly.

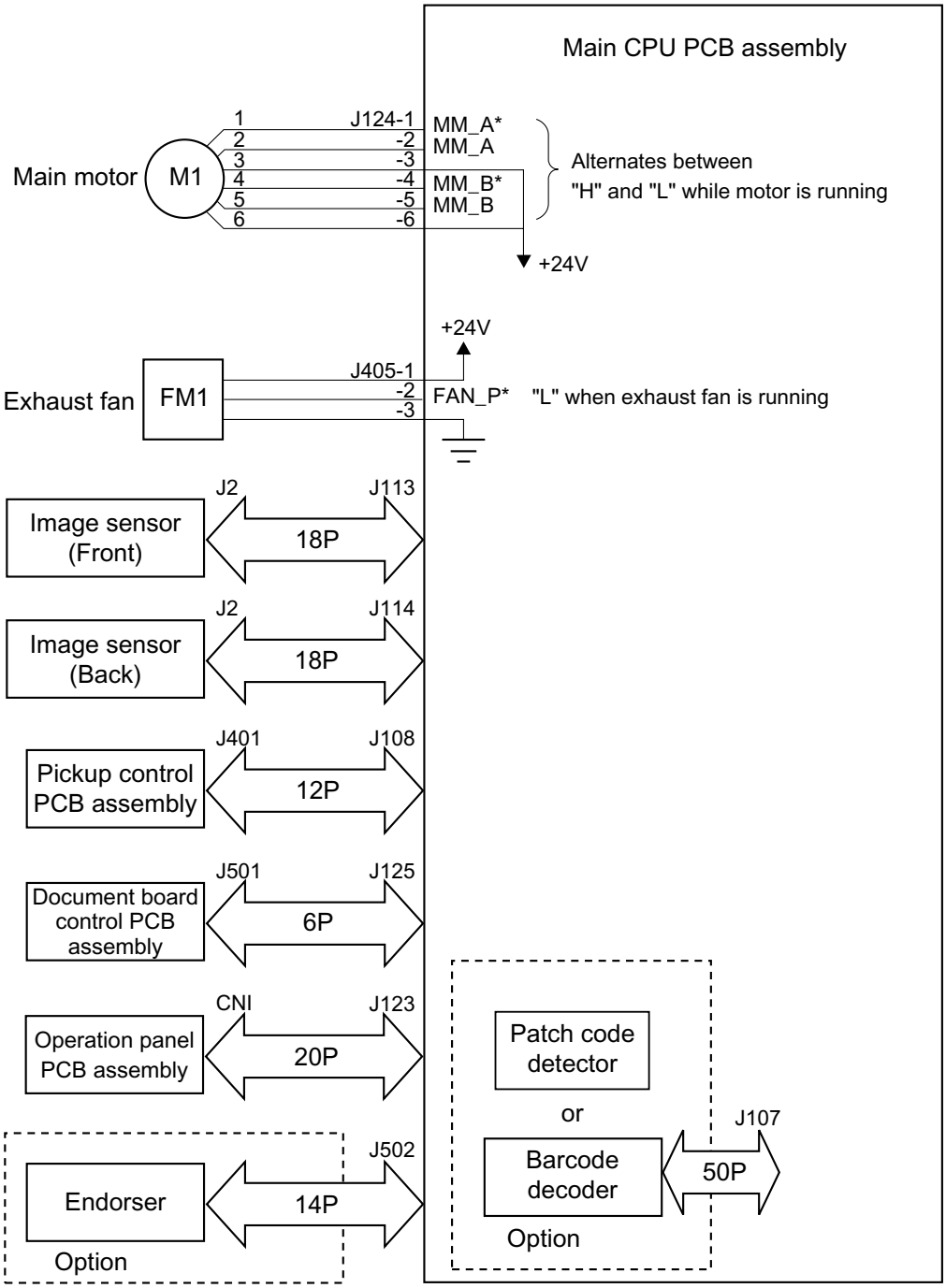


**Fig. 2-107**

b. Pickup control PCB assembly (K4-SUB)

Fig. 2-108 and Fig. 2-109 show the input to and output from the pickup control PCB assembly.

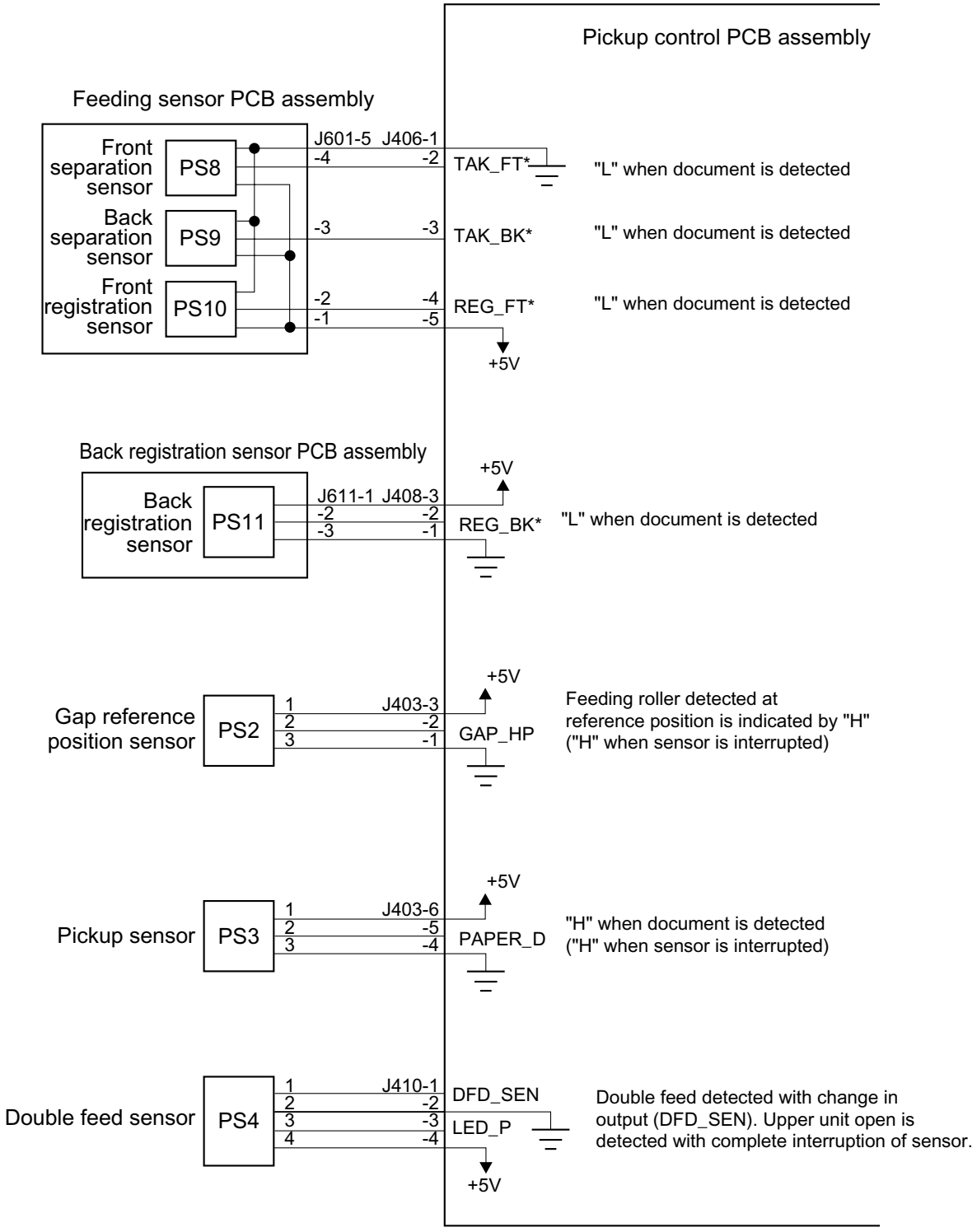


**Fig. 2-108**


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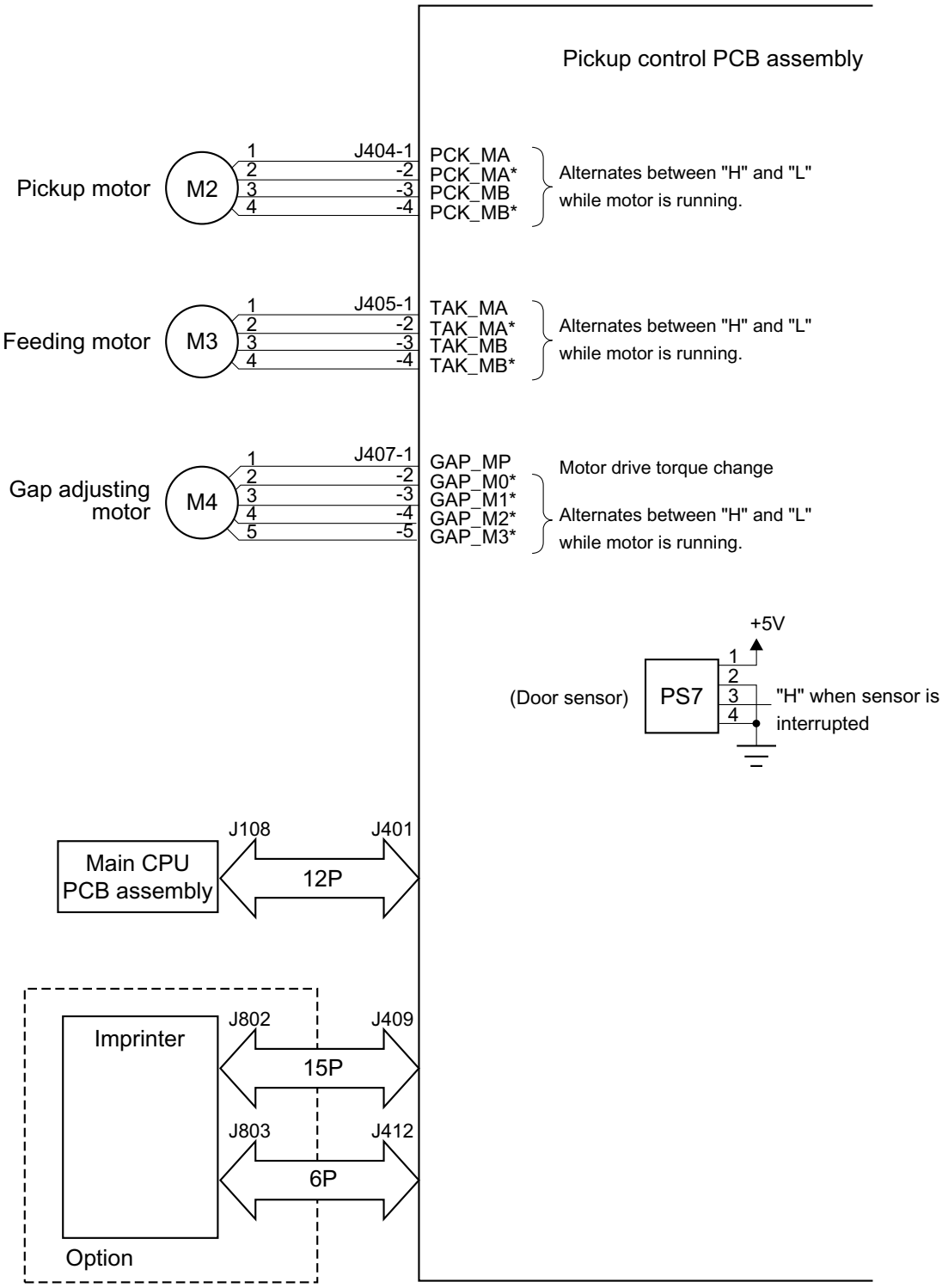


**Fig. 2-109**

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c. Document board control PCB assembly (K0-SUB2)

Fig. 2-110 shows the input to and output from the document board control PCB assembly.

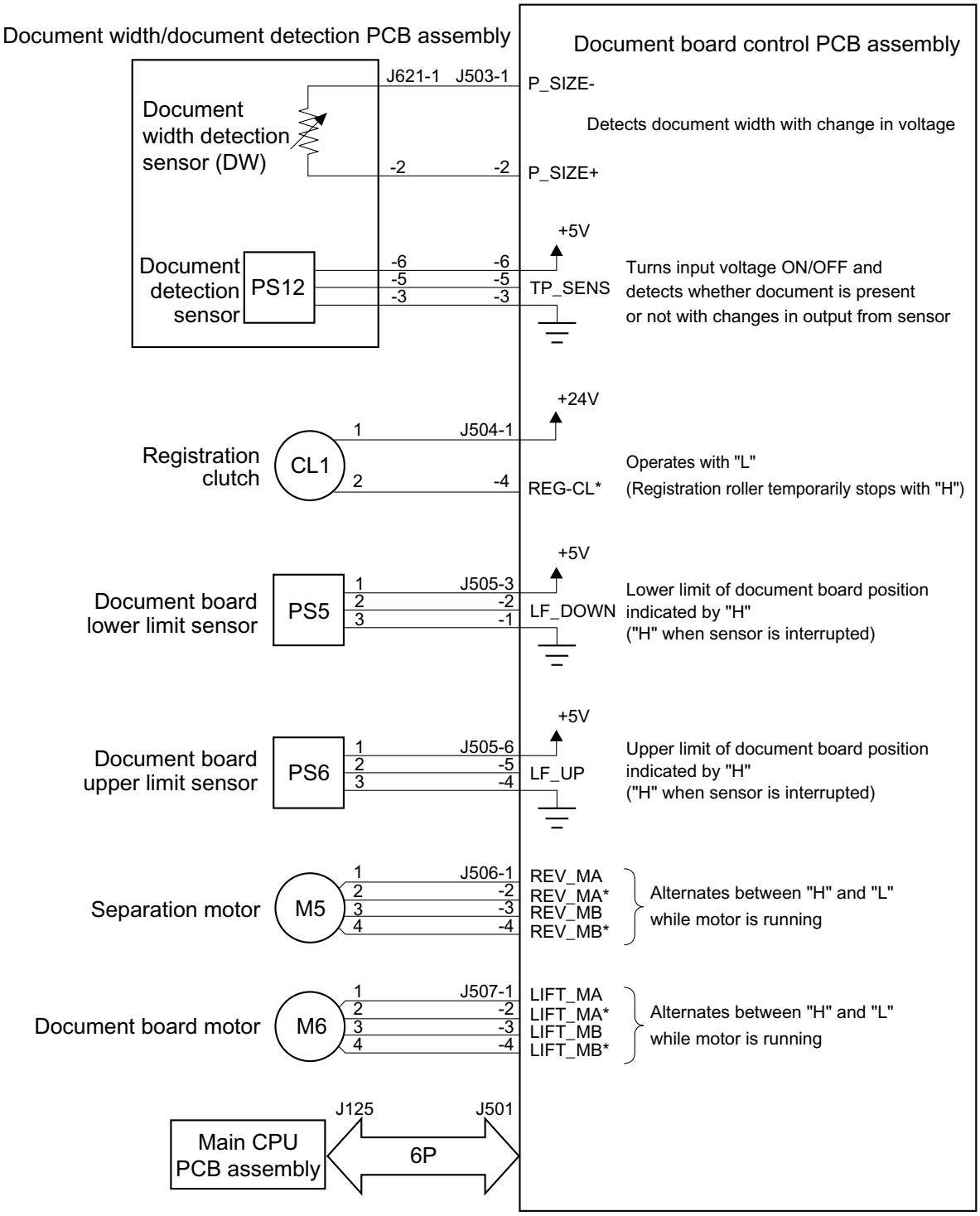


**Fig. 2-110**


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d. Filmer control PCB assembly (GH-DCON)

Fig. 2-111 shows the input to and output from the filmer control PCB assembly.

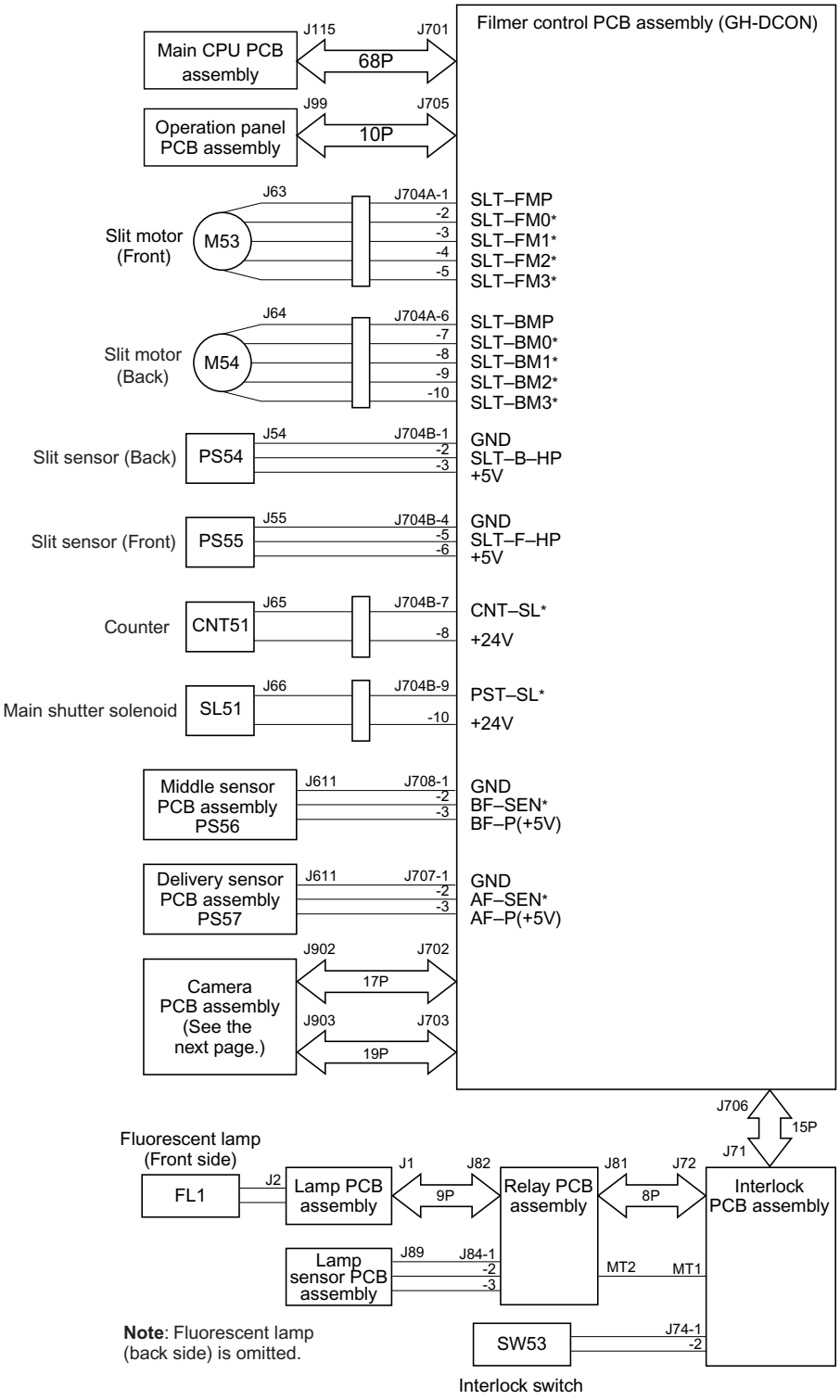


**Fig. 2-111**

e. Camera PCB assembly

Fig. 2-112 shows the input to and output from the camera PCB assembly.

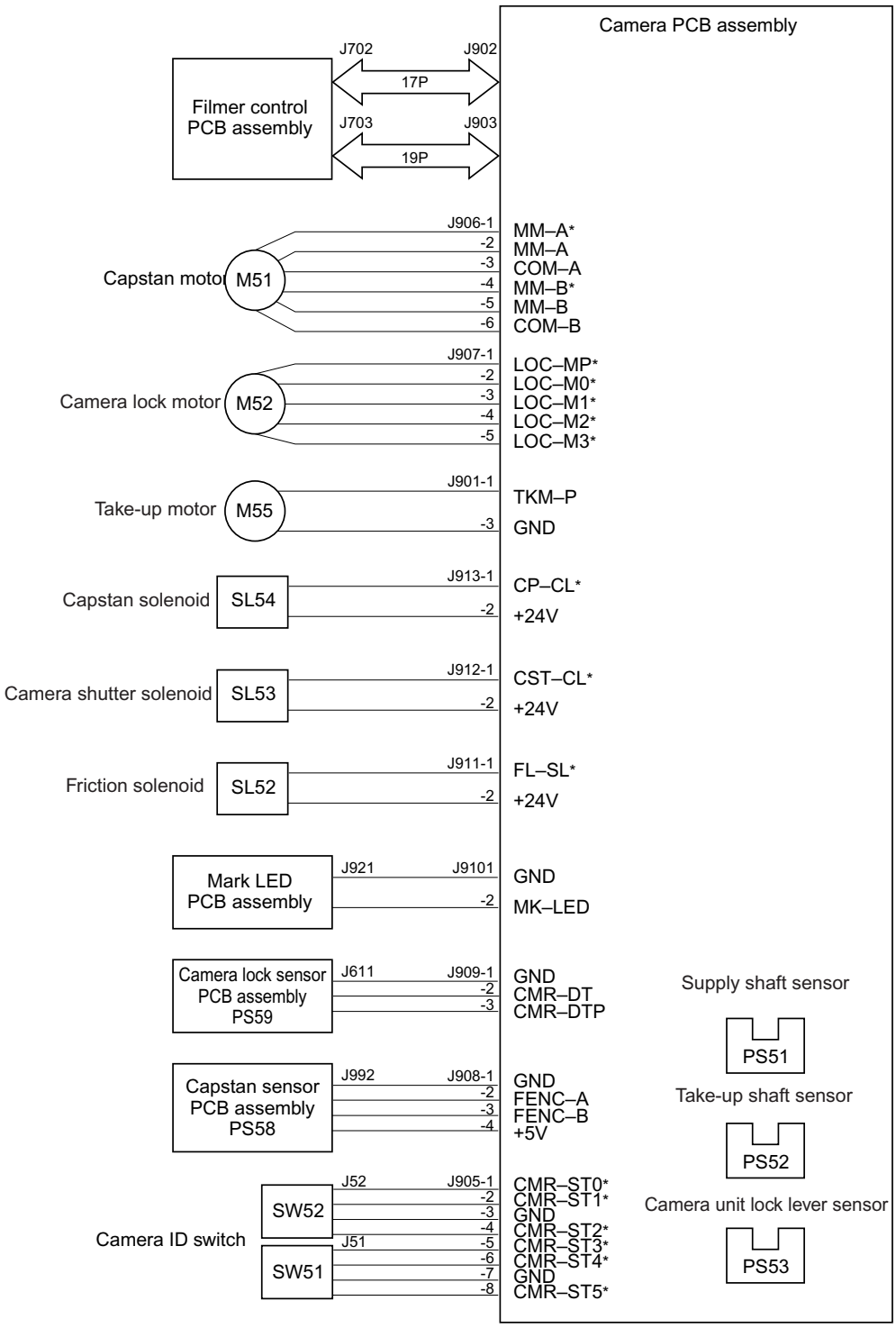


**Fig. 2-112**


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## 7. Power ON Sequence

Fig. 2-113 shows the operational sequence of the main CPU PCB assembly (SH2-MAIN) when power is turned ON.

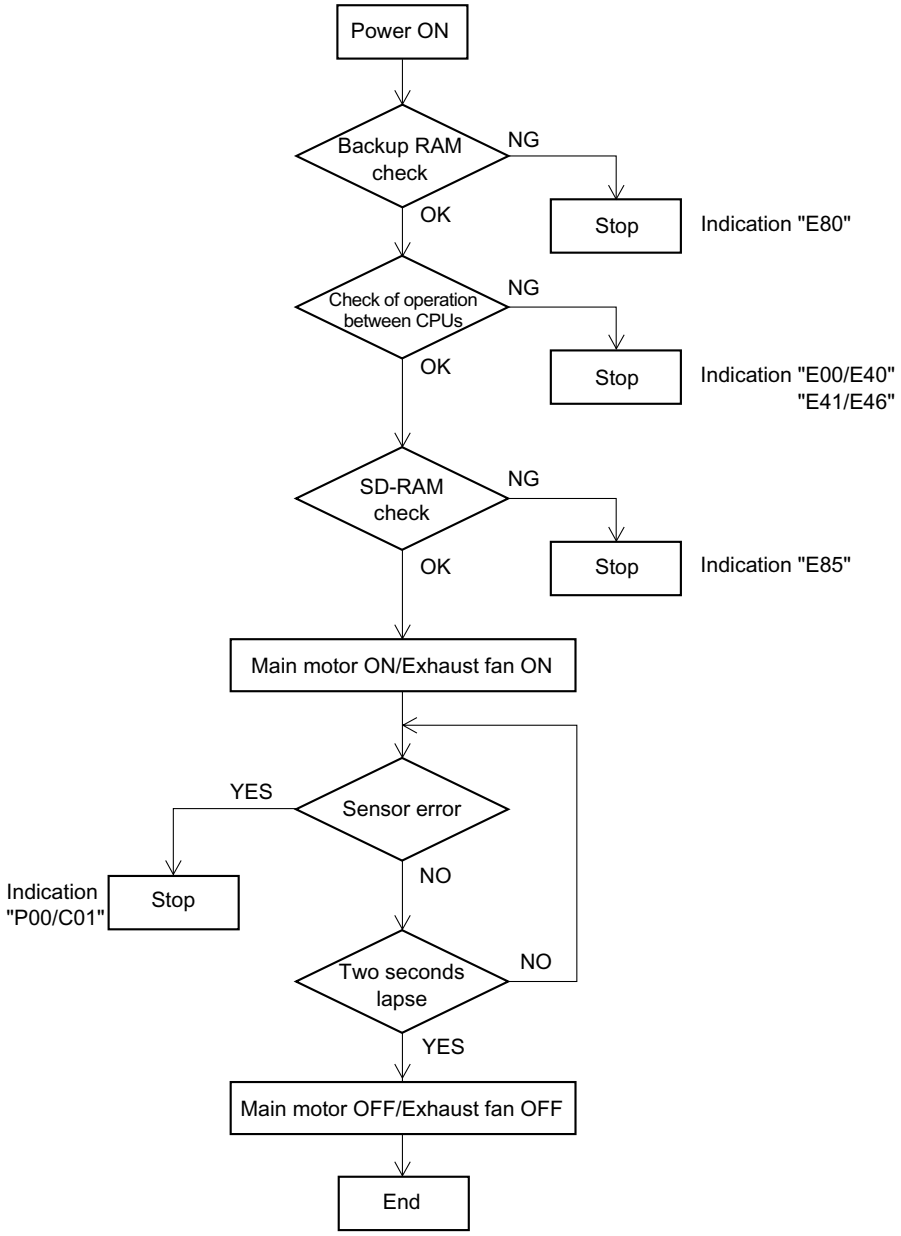


**Fig. 2-113**

# II. OPTICAL SYSTEM

## A. Scanner Optical System

### 1. Outline

Fig. 2-201s shows a block diagram of the scanner optical system.

This machine has almost the same scanner optical system as the DR-5080C model. Since it has no color modes, two LEDs, red (R) and green (G), are used for the LED arrays.

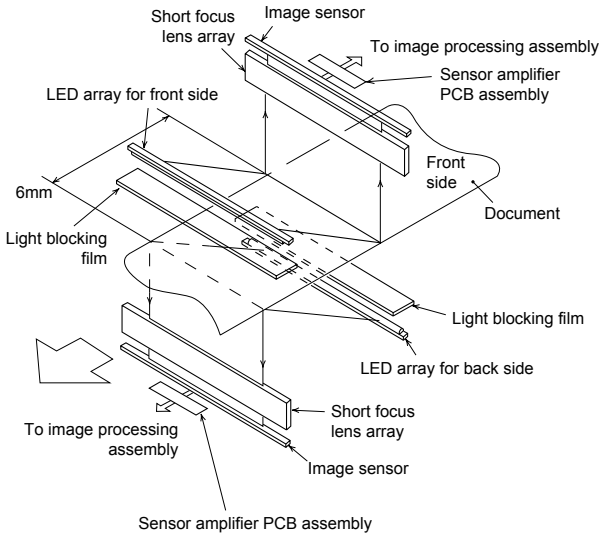


**Fig. 2-201**

### 2. Reading Unit

a. Image sensor

A photosensitive CMOS CIS (Contact Image Sensor) is used.

The 3,510 photosensitive elements are arranged in a line with an 84.7μm pitch, on 15 chips into which circuits to provide the scanning function are integrated, are contained on one PCB assembly. The 15 chips are divided into 4 blocks. (Refer to Fig. 2-202.)

This PCB assembly as a whole is called the image sensor in this manual.

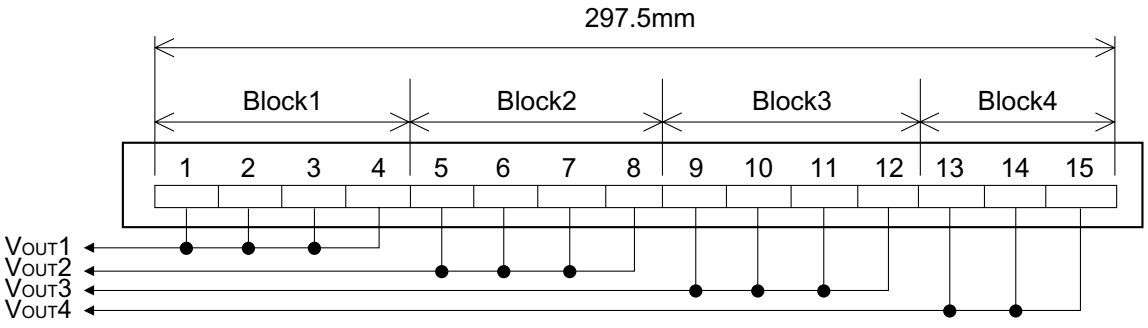


**Fig. 2-202**


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b. LED array

Two LEDs, red(R) and green(G), are used for the LED arrays.

Although the green light is usually lit, if the dropout color is set, only the red light is lit.


**Fig. 2-203**

c. Short focus lens array

Short focus lenses with low chromatic aberration are used. To let more light in, the short focus lenses are arranged in two lines.

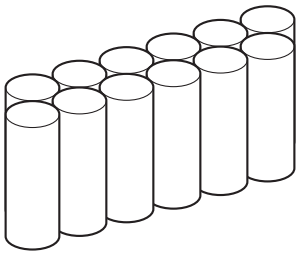

**Fig. 2-204**

d. Sensor amplifier PCB assembly

To reduce susceptibility to noise, a sensor amplifier PCB assembly is provided at the output section of the image sensor to lower the impedance.

This assembly amplifies the difference between the standard voltage and the voltage proportionate to the image density, and outputs it to the image processing assembly on the main CPU PCB assembly.

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# B. Filmer Optical System

## 1. Outline

Fig. 2-205 shows a block diagram of the filmer optical system.

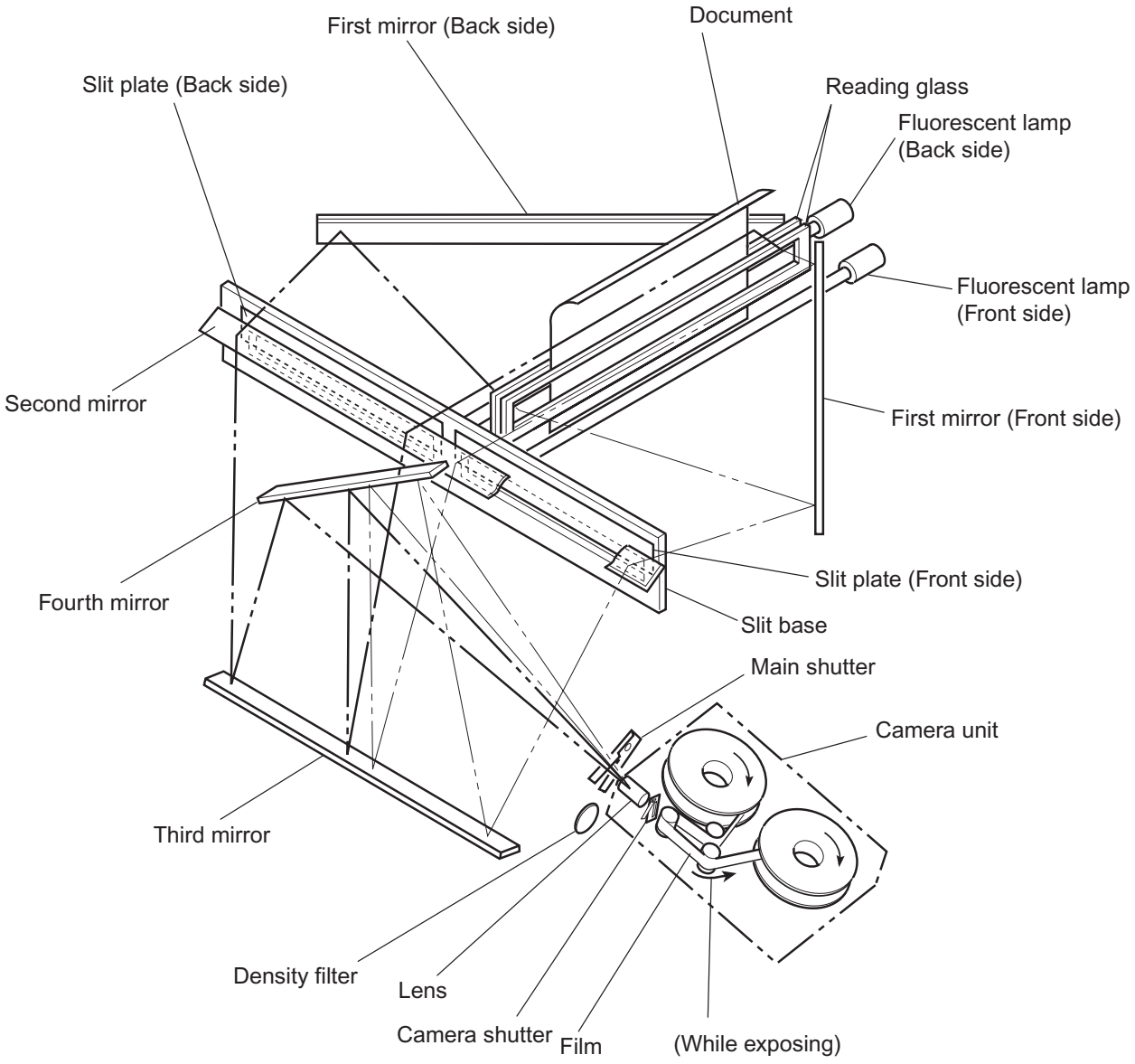


**Fig. 2-205**

The document is illuminated with the fluorescent lamp. The light reflected from the document is directed into the camera unit lens by the first mirror, second mirror, third mirror and fourth mirror. Then, the image is exposed on the film.


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## 2. Image Exposure

The slit, main shutter, and other functions and operations of the optical system are described here.

a. Slit

The slit base and two slit plates are provided immediately in front of the second mirror. These allow the density of the exposed image to be changed.

When moving the slit plate up and down, the slit width of the slit base changes. The slit plate moves with the slit motor (M53, M54).

When raising the slit plate, the width of the slit becomes greater, the amount of light increases, and the density becomes darker.

When lowering the slit plate, the width of the slit becomes smaller, the amount of light decreases, and the density becomes lighter.

The slit motor drive is controlled within the filmer control PCB assembly so that the slit plate stops at the predetermined position, according to the feeding conditions and the density setting.

b. Main shutter

The main shutter is provided at the outlet of the main body. Opening and closing this shutter for every image allows the exposure.

The shutter is opened and closed by the main shutter solenoid (SL51) connected to the filmer control PCB assembly.

c. Camera shutter

The camera shutter is provided on the back of the lens within the camera unit. This shutter opens and closes every batch. The shutter is opened and closed by the camera shutter solenoid (SL53) in the main body.

d. Density filter

A filter is sometimes used depending on the type of film processor. If the density cannot be adjusted enough by the slit, a filter matching the properties of the film processor will be used. When the AP167 model made by our company is used, no filter is needed. Service technicians take charge of attaching the filter. For the description about how to attach the filter, see the sections in “Chapter 4 Installation”.

e. Camera unit

The camera unit is optional. The lens scaling is available in two types: 1/24 and 1/57.

When the 1/24 times camera unit (24X) is used, only the front side of the document is exposed with the SIMPLEX mode. When the 1/57 times camera unit (57X) is used, both sides of the document are exposed with the DUPLEX mode. Even if “single-sided back scanning” is selected in the 1/24 times camera unit, the front side is exposed to the film. The lens may require focus adjustment depending on the thickness of the film. However, when the Canon CK-III is used, no changes are needed in the factory default settings. Service technicians take charge of the adjustment. For the description of how to adjust the lens focus, see the sections in “Chapter 4 Installation”.

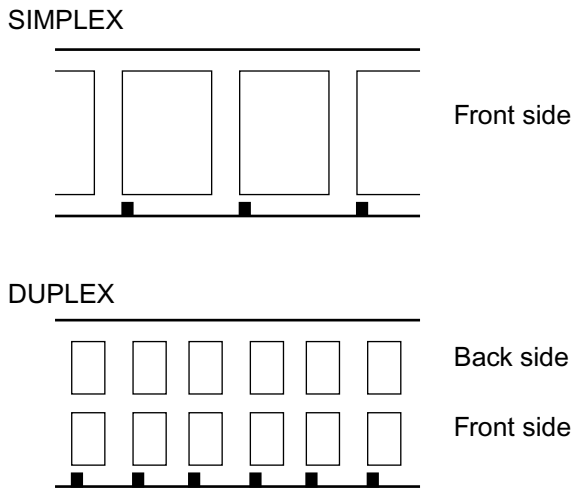


**Fig. 2-206**

## 3. Density Adjustment

The density of images exposed on the film can be adjusted with a density filter or the slit. This section describes the density adjustment using the slit.

The density is normally adjusted (-3 to +3) by the user using the function keys. As shown in Fig. 2-207, ideally the density of the white portions of a document would change proportionate to the setting value. However, actual values are affected by various conditions.

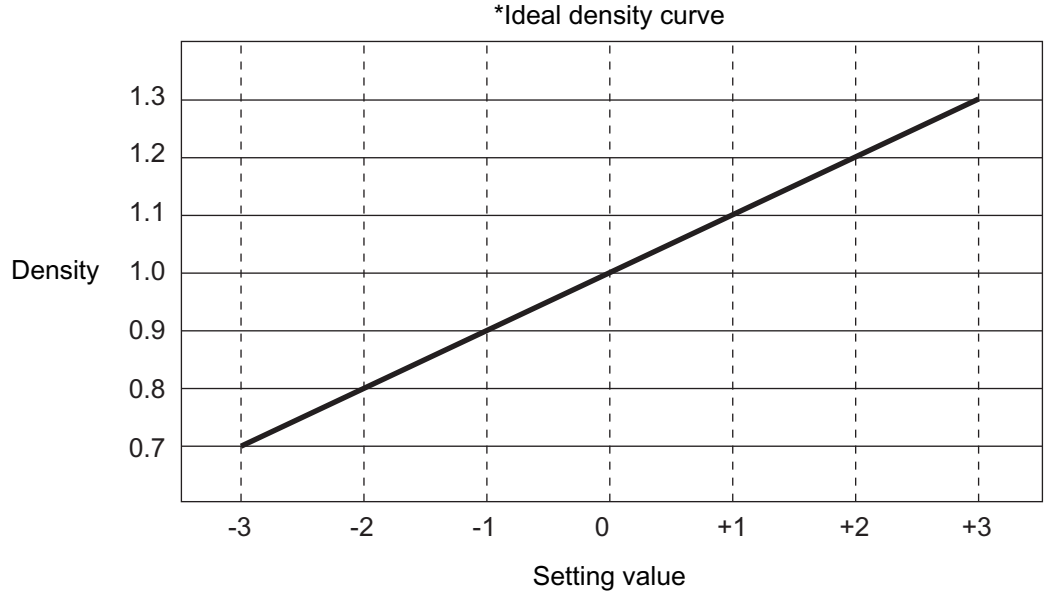


**Fig. 2-207**

There are various factors that affect density: document feed speed, the light intensity of the fluorescent lamp, optical system on the front/rear sides, camera unit, density filter, processing conditions, etc. This machine allows the user to obtain the desired density by changing the slit width. It also automatically modifies the slit width in accordance with the document feed speed.


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Fig. 2-208 shows the change in slit width that varies with the document feed speed. Since the time the film is being radiated is basically constant at any feed speed, if the feed speed is faster, or the scanner resolution is set to the lower level, the slit width becomes larger. If the feed speed is slower, or the scanner resolution is set to the higher level, the slit width becomes smaller.

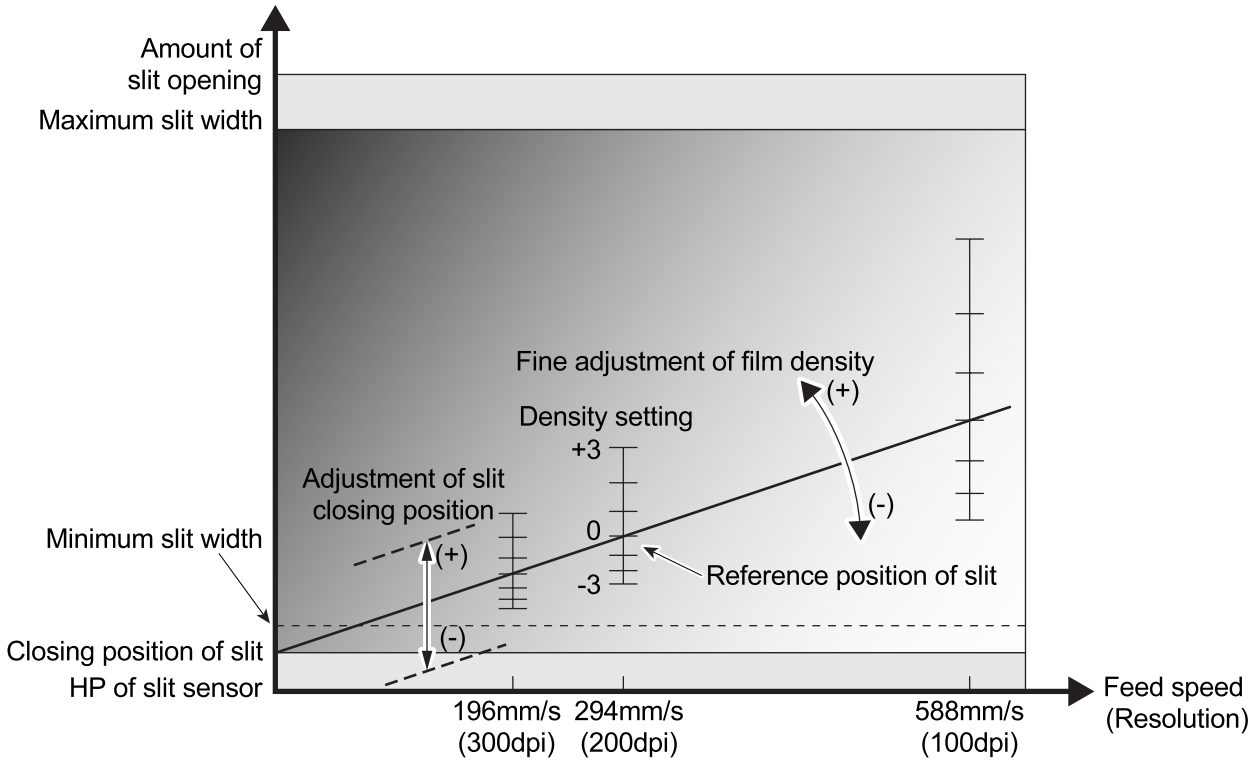


**Fig. 2-208**

The Fine adjustment of film density, Closing position of slit, and Reference position of slit, shown in Fig. 2-208, are adjusted using the service mode. For details, refer to “Chapter 6 III-R. Adjusting the film density”. Since the slit width has maximum and minimum limits, there are some areas whose density may not change even if the setting changes.

- Fine adjustment of film density
  ---Address “10”
- Adjusting the slit closing position
  ---Address “13, 14”
- Setting the slit reference position
  ---Address “1E9, 1EA”

The machine also adjusts the slit width automatically by detecting the light intensity of the fluorescent lamp with the Lamp sensor PCB assembly, and comparing the light intensity between when the slit reference position was set and when the exposure was made.

## 4. Mark Exposure

Fig. 2-210 shows the optical system that exposes marks. The only mark that can be exposed by this machine is this blip.

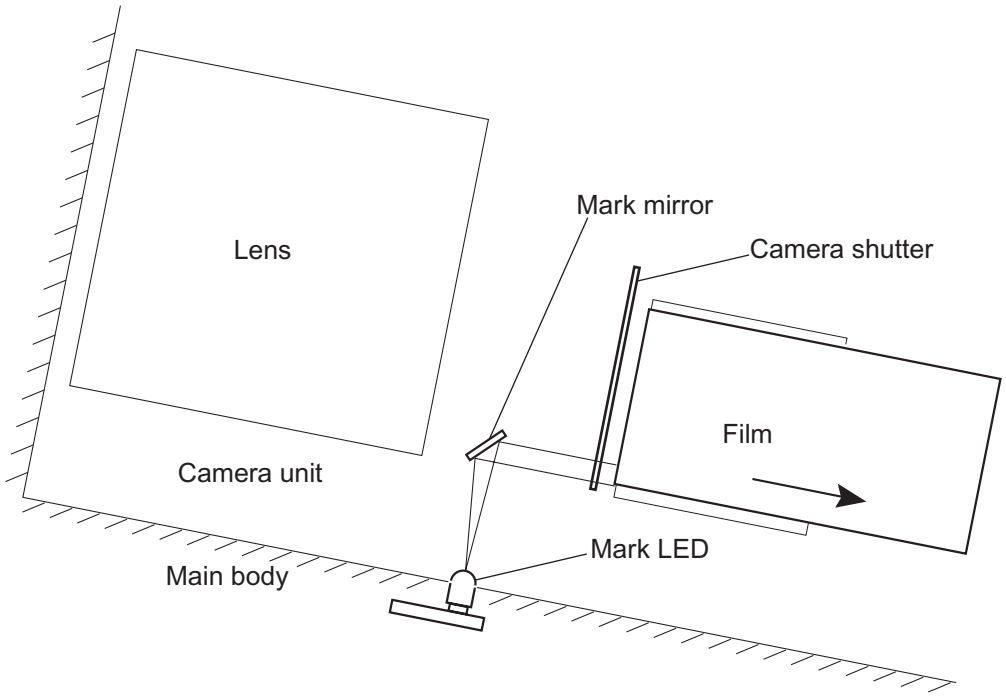


**Fig. 2-209**

As the mark LED is lit in sync with the image exposure, the light is reflected with the mark mirror and the blip is exposed on the film.

The blips include two types: file and page. By changing the number of light-emitting pulses from the LEDs, the width of the exposed blip is changed.

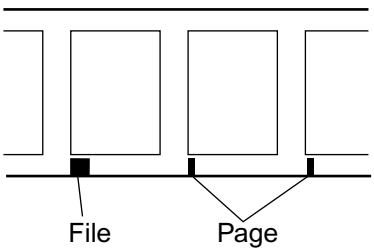


**Fig. 2-210**

The density can be adjusted by adjusting the light intensity of the mark LED. For details, refer to “Chapter 6 III-Q. Adjusting the light intensity of the mark LED”.


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# III. DOCUMENT FEED SYSTEM

## A. Outline

Fig. 2-301 shows a cross section of the document feed system and Fig. 2-302 shows the timing chart.

The various drive rollers are rotated by having drive transmitted from motors via gears and timing belts.

Also various sensors for control are positioned in the system.

The document feed system is equipped with the following mechanisms.

- Document board driving mechanism
  During pickup, this mechanism raises the document board, and when pickup is finished, lowers it.

- Pickup roller load changing mechanism
  To change the pickup roller load, makes the pickup operation better for thin and soft documents, including pressure sensitive paper.

- Manual pickup switch-over mechanism
  This mechanism is designed to switch over from automatic pickup to manual pickup. When manual pickup is selected, the drive of the separation roller stops to cancel the separation function.

- Automatic paper thickness adjustment and skew feed correction mechanism
  Adjusts paper thickness and corrects skewed feeding by moving the feeding roller up or down automatically. For details, refer to the next section, B.

The roller parts of the lower registration roller and the lower reading roller, and part of the roller part of the feed drive roller, are made of metal. This serves to reduce changes in the outside dimensions of the roller parts and variations in feed speed.

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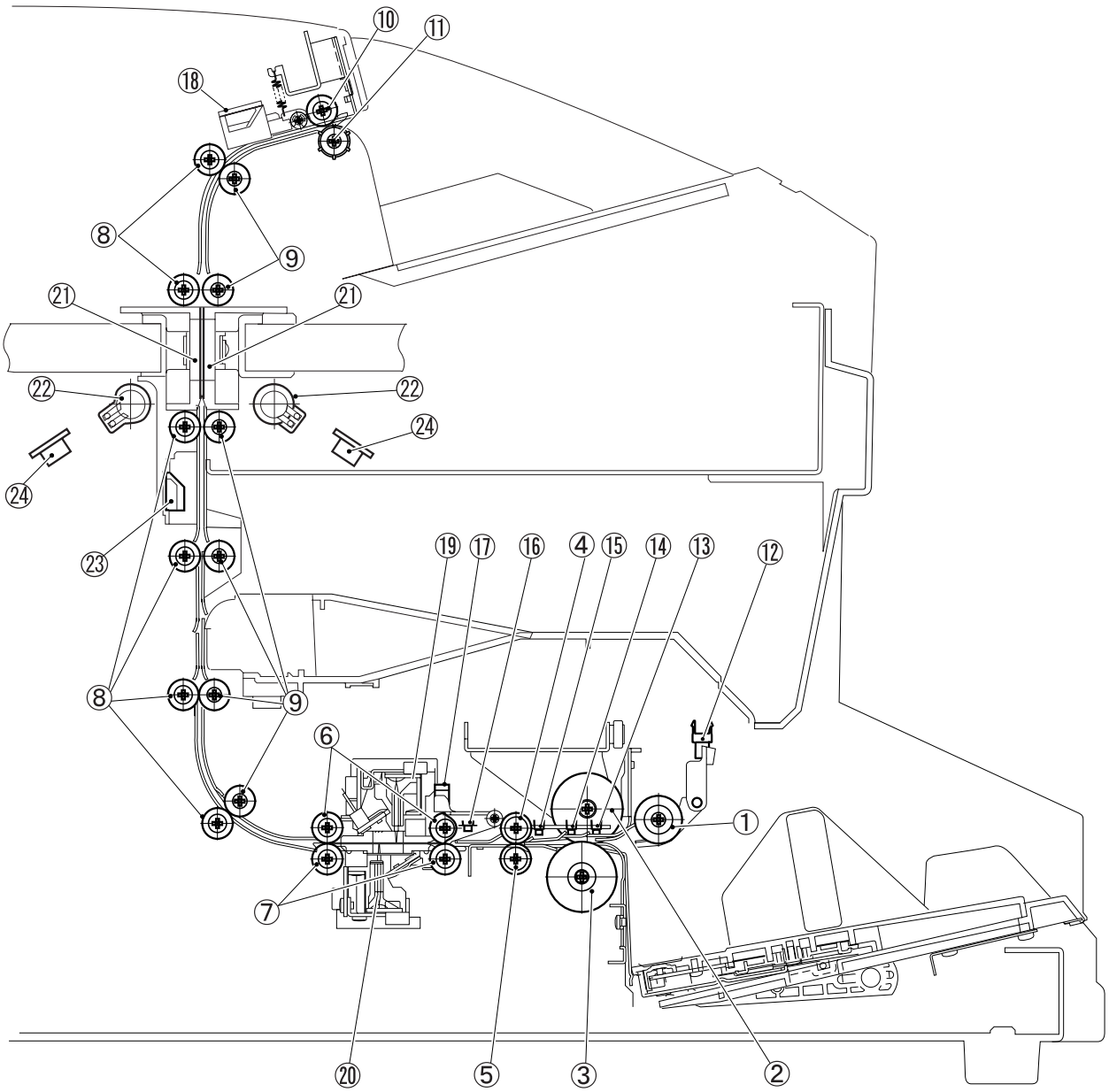


① Pickup roller (drive)
② Feeding roller (drive)
③ Separation roller (drive)
④ Upper registration roller (drive)
⑤ Lower registration roller (drive)
⑥ Upper reading roller
⑦ Lower reading rollers A/B (drive)
⑧ Feed drive rollers A/B
⑨ Feed follower rollers 1/2
⑩ Delivery drive roller
⑪ Delivery follower roller
⑫ Pickup sensor
⑬ Front separation sensor
⑭ Back separation sensor
⑮ Front registration sensor
⑯ Back registration sensor
⑰ Double feed sensor
⑱ Delivery sensor
⑲ Upper reading unit
⑳ Lower reading unit
㉑ Filmer reading glass
㉒ Fluorescent lamp for filmer
㉓ Middle sensor
㉔ Lamp sensor

**Fig. 2-301**


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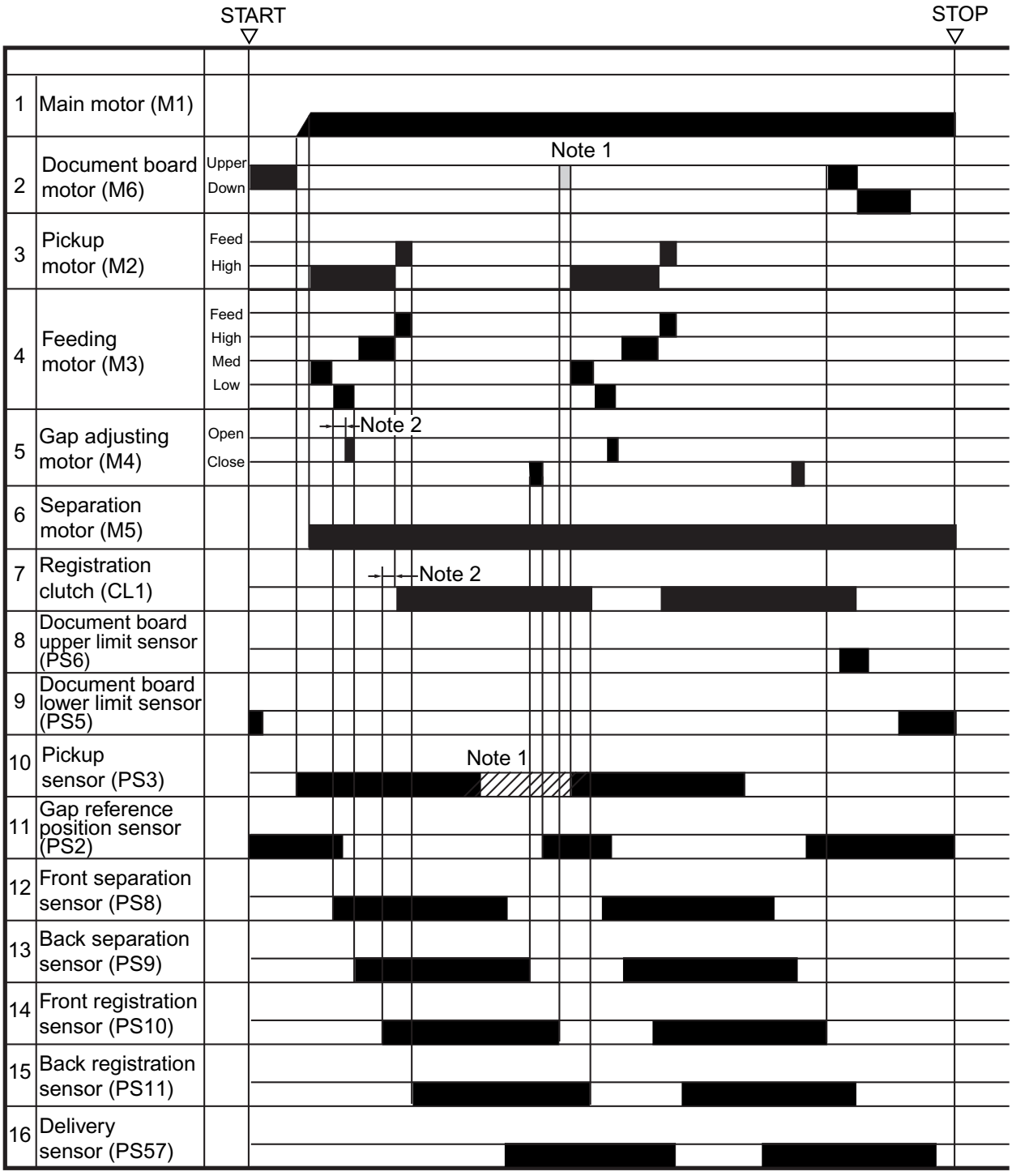
Feed conditions : 1. Automatic pickup 2. Automatic paper thickness adjustment
3. Two sheets 4. Non temporary stop




**Note 1:** For thick documents, the pickup sensor with the oblique line area is OFF and the document board motor with the gray area is ON, then the document board goes up until the pickup sensor turns ON. For thin documents, the document board does not go up.

**Note 2:** This is a waiting time for the screw feed correction.

**Fig. 2-302**

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# B. Automatic Paper Thickness Adjustment and Skew Feed Correction

## 1. Document Feed Flow

The following describes the document feed flow. Refer to Fig. 2-303.

1) The document is picked up by the pickup roller and arrives at the feeding roller and separation roller position.
2) As the feeding roller is underneath and there is no gap between the feeding roller and the separation roller, the document strikes the face of the roller.
3) As the pickup roller continues to rotate, if the document is skewed it is corrected.
4) The leading edge of the document is detected by the front separation sensor, and after the time set for skew correction is over, the feeding roller moves up.
5) The document is fed out when a gap for a single document has opened.
6) When the leading edge of the document is detected by the back separation sensor, the feeding roller stops moving up.
7) The document fed out strikes the face of the upper and lower registration rollers and is again corrected for skewed feed.
8) The leading edge of the document is detected by the front registration sensor, and after the time set for skew correction is over, the registration clutch comes ON.
9) The upper and lower registration rollers start rotating, and the document is fed out.

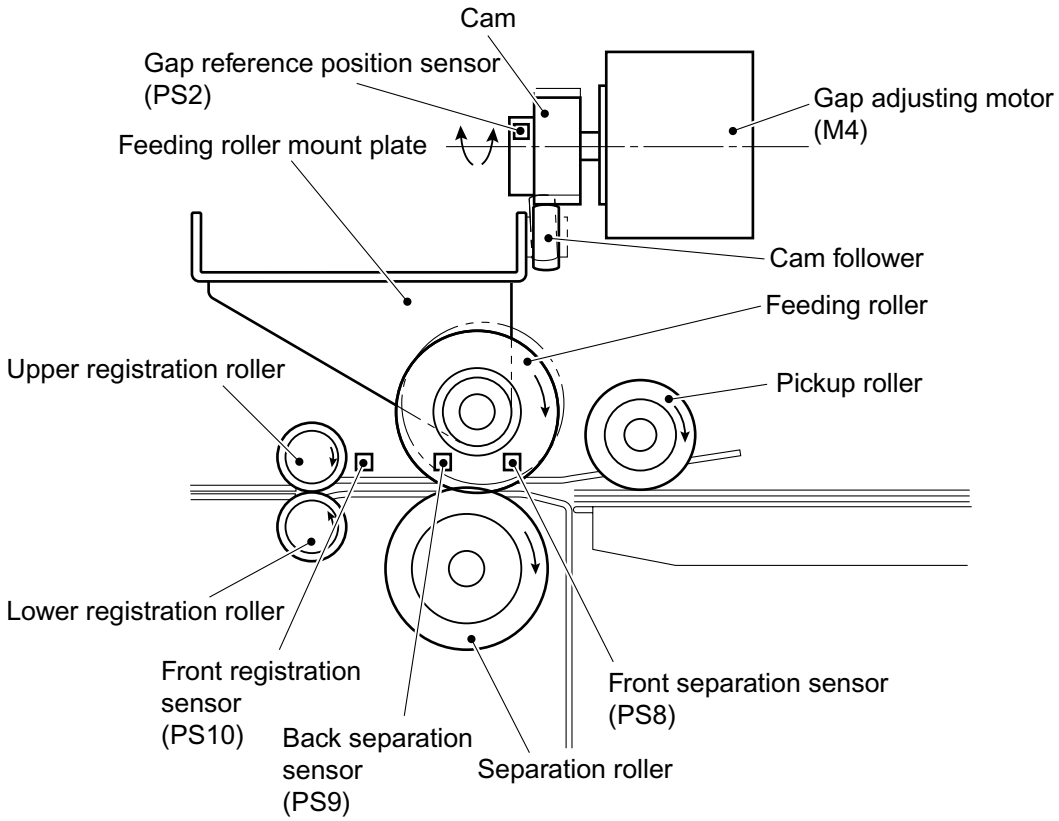


**Fig. 2-303**


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## 2. Feeding Roller Raising and Lowering Drive Flow

A cam has been force-fitted to the output shaft of the gap adjusting motor. This cam is in contact with a cam follower which is attached to the feeding roller mount plate. Refer to Fig. 2-303.

The following describes the raising and lowering drive flow of the feeding roller.

a. Raising

1) The leading edge of the document is detected by the front separation sensor, and after the time set for skewed feed correction is over, the gap adjusting motor starts rotating.
2) When the gap adjusting motor rotates, the cam follower rises. The feeding roller mount plate is under tension by a tension spring.
3) When the cam follower rises, the feeding roller mount plate tilts.
4) When the feeding roller mount plate tilts, the feeding roller rises.
5) When the leading edge of the document is detected by the back separation sensor, the gap adjusting motor stops.

b. Lowering

1) When the trailing edge of the document is detected by the back separation sensor, the gap adjusting motor starts to rotate in reverse.
2) The cam pushes the cam follower and makes the feeding roller descend.
3) When the gap reference position sensor comes ON, the gap adjusting motor stops.

## 3. Manual Paper Thickness Adjustment

Sometimes the automatic paper thickness adjustment does not work, depending on the document used, which may result in double feeds. When this happens, the manual paper thickness adjustment can be selected.

After the paper thickness is manually adjusted, the document is fed using the paper thickness fixed mode. In this case, since the document is fed as the gap between the feeding roller and the separation roller is fixed, the skew correction is not performed on this part.

## 4. Skew Correction on the Registration Roller

As for the skew correction performed on the registration roller, the setting can be modified in the Service mode. For a description of how to make the setting, refer to “Chapter 6 III. Service Modes”.

Since the setting has three possibilities, make the setting most suitable for the documents being fed. “Enabled normally” should usually be selected.

- Disabled only in the paper thickness fixed mode
- Enabled normally (default)
- Disabled normally

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# C. Feed Error Detection

## 1. Document Jam

This machine is equipped with sensors to detect document jams.

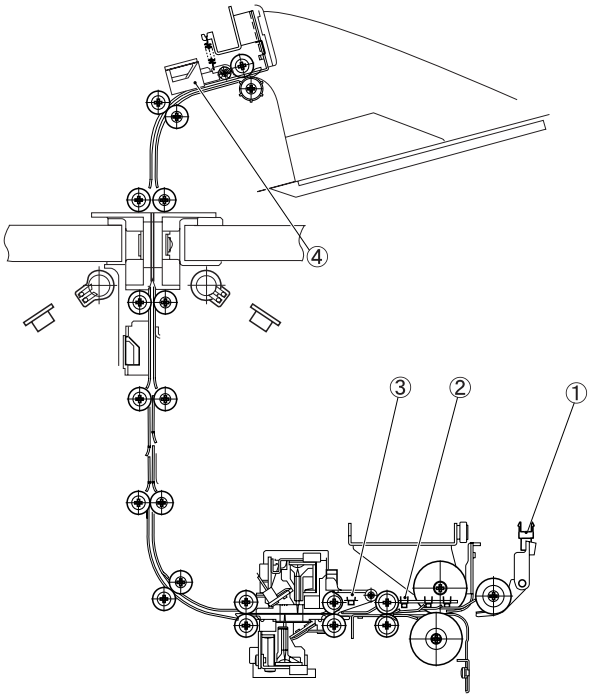


**Fig. 2-304**

| No. | Sensor No. | Sensor Name |
|---|---|---|
| ① | PS3 | Pickup sensor |
| ② | PS10 | Front registration sensor |
| ③ | PS11 | Back registration sensor |
| ④ | PS57 | Delivery sensor |

**Table 2-301**

An error code corresponding to the detected conditions is displayed on the operation panel.

The conditions of the respective error codes are as follows.

**Note 1:** In case two or more error codes occur, the error code of the condition detected first is displayed.

**Note 2:** Each specified time depends on the feeding speed.

1) Error code: P01
   It took more than 30 seconds for a document to reach the front registration sensor after detection by the pickup sensor. (Delay jam at the front registration)
2) Error code: P02
   It took more than the specified time for a document to pass through the front registration sensor after detection by the back registration sensor. (Stagnation jam at the front registration)
3) Error code: P04
   It took more than the specified time for a document to reach the back registration sensor after detection by the front registration sensor. (Delay jam at the back registration)
4) Error code: P10
   It took more than the specified time for a document to reach the delivery sensor after detection by the back registration sensor. (Delay jam at the delivery)
5) Error code: P20
   It took more than the specified time for a document to pass through the delivery sensor after detection by the delivery sensor. (Stagnation jam at the delivery)


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## 2. Skewed Feed Detection

Skewed feed detection is carried out by the image sensor of the upper reading unit. An error occurs when there are more than 2 degrees of skew as a result of calculating the data of the right and left edge positions on the leading edge of the document and those at the 30mm fed point. The error code is “P18”.

## 3. Double Feed Detection

Double feed detection is carried out by the double feed sensor (PS4). The output from the double feed sensor changes in an analog-like manner according to the rotating amount (angle) of the sensor lever at the passing of a document. By this change, not only the existence of the document but also the thickness of the document is detected. Moreover, this change is used to open and close the upper unit.

When double feed detection is set, a double feed error is detected when the second or later detected document exceeds the range of 1.0 and 1.5 times in thickness, or ±50 mm in length based on the first detected document.

1) Error code: d01
   Detected by thickness.
2) Error code: d02
   Detected by length.
3) Error code: d03
   Detected by both thickness and length.

**Note:** The service mode allows a setting that considers documents thinner than the reference as an error. For details, refer to “Chapter 6 III. Service Modes”.

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# IV. FILM FEED SYSTEM

## A. Outline

Fig. 2-401 shows the components of the film feed system. Fig. 2-402 shows a sketch of the film loading.

The camera unit film is fed by three face gears.

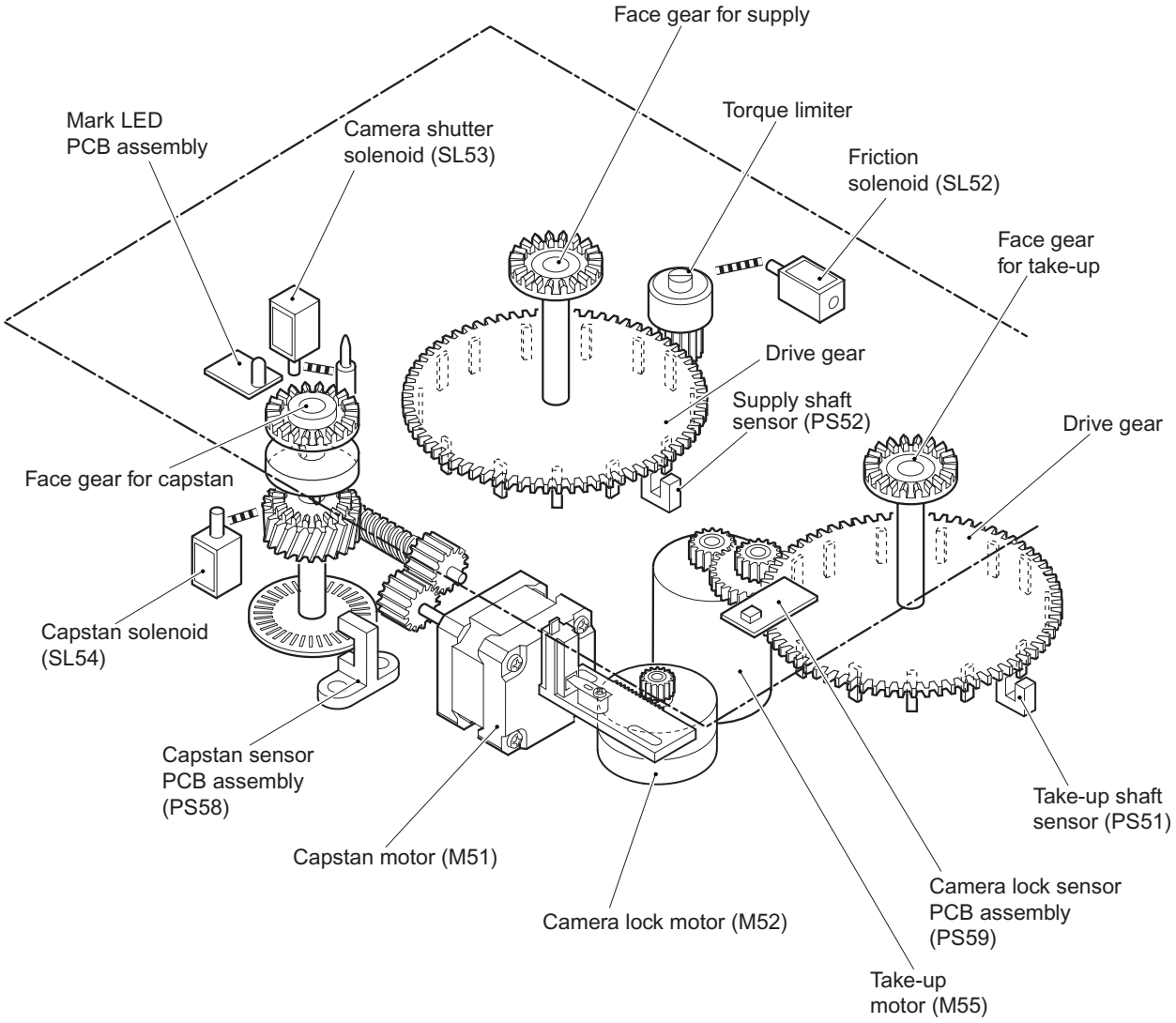


**Fig. 2-401**


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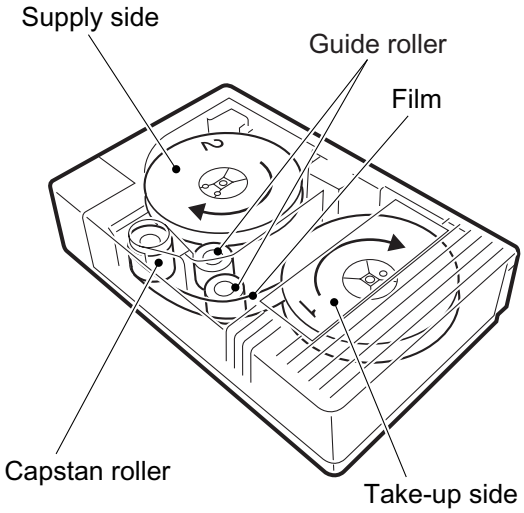


**Fig. 2-402**

## B. Exposure

Following is a description of the operations during exposure, including the filmer optical system. Fig. 2-403 shows the timing during exposure.

1) When a signal to start the document feed is input, the fluorescent lamp lights and the slit motor turns ON. The slit plate is positioned temporarily and then the slit motor turns OFF. The temporary position means the position calculated from the light intensity of lamp immediately after power-ON.
2) Meanwhile, the take-up motor stays ON to give tension to the film, but its take-up shaft does not rotate. The state until here is called the standby state.
3) When the leading edge of the document reaches the middle sensor and the middle sensor turns ON, the exposure operations is started. This time is considered the starting point.
4) First, the camera shutter solenoid turns ON and the camera shutter opens. At the same time, the slit motor turns ON and stays on until the light of the fluorescent lamp is sampled and the slit plate is positioned according to the settings.
5) After the period from the starting point to the time specified by the document feed speed, the capstan motor turns ON and the supply shaft and take-up shaft start rotating. Shortly before the capstan motor turns ON, the main shutter solenoid also turns ON and the main shutter opens.
6) When the trailing edge of the document moves past the middle sensor and the middle sensor turns OFF, the operations to end exposure are started. This time is considered as another starting point.
7) After the period from the starting point to the time specified by the document feed speed, the capstan motor turns OFF and the supply shaft and take-up shaft stop rotating. Shortly before the capstan motor turns OFF, the main shutter solenoid also turns OFF and the main shutter closes.

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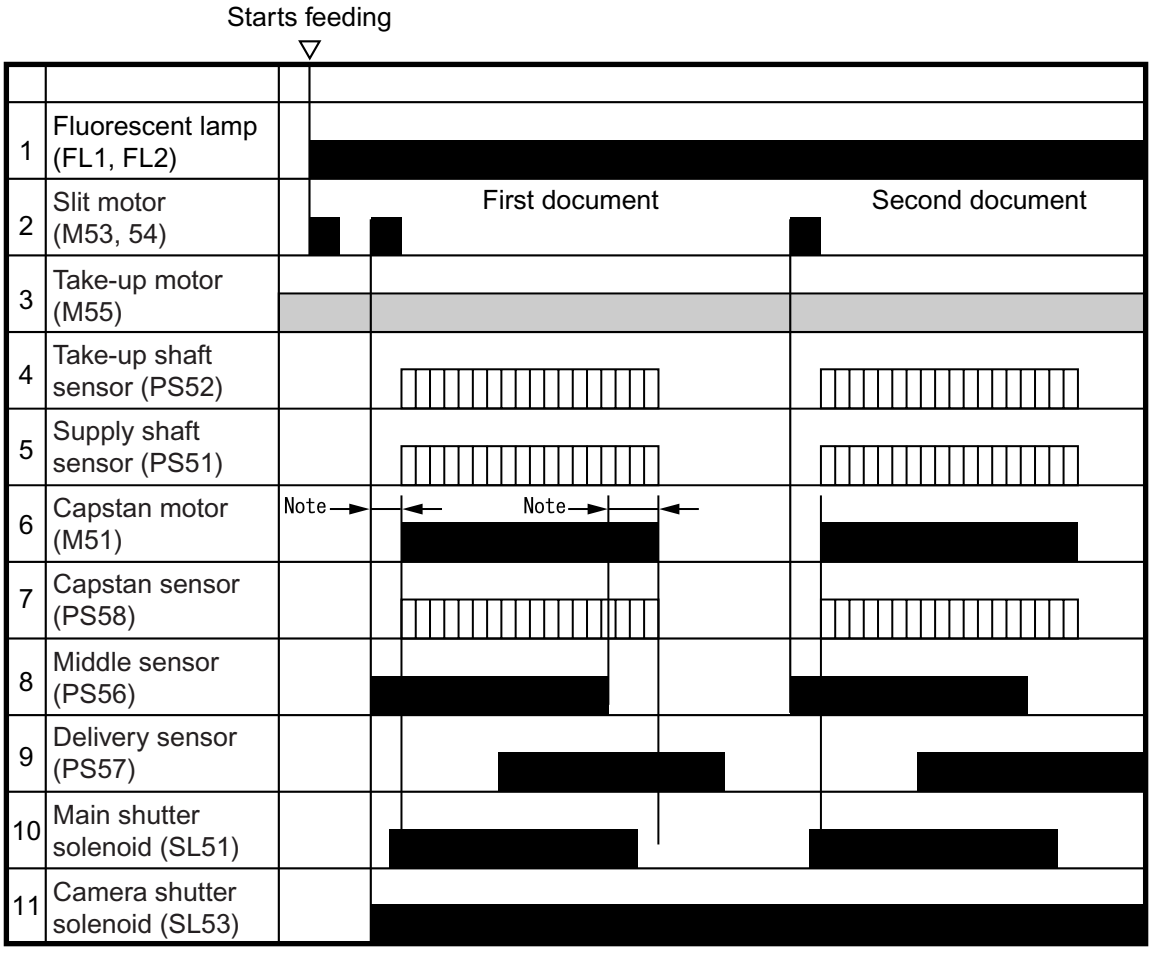
8) If another document exists, when the document reaches the middle sensor and the middle sensor turns ON, exposure is performed similarly. This time is considered as another starting point.

9) When a signal to end the document feed is input, after a specific time, the fluorescent lamp shuts off, the camera shutter solenoid turns OFF, and the camera shutter closes. The slit motor turns ON and stays on until the slit plate returns to its home position, and the slit closes.




**Note:** Time specified by the document feed speed.

**Fig. 2-403**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# C. Camera Setting

## 1. New Camera Setting

When a camera unit is used for the first time (referred to as a new camera), the camera ID is detected first, then the slack is taken out of the film, the camera lock and the leader feeding are performed, and the standby state begins.

Fig. 2-404 shows the timing chart.

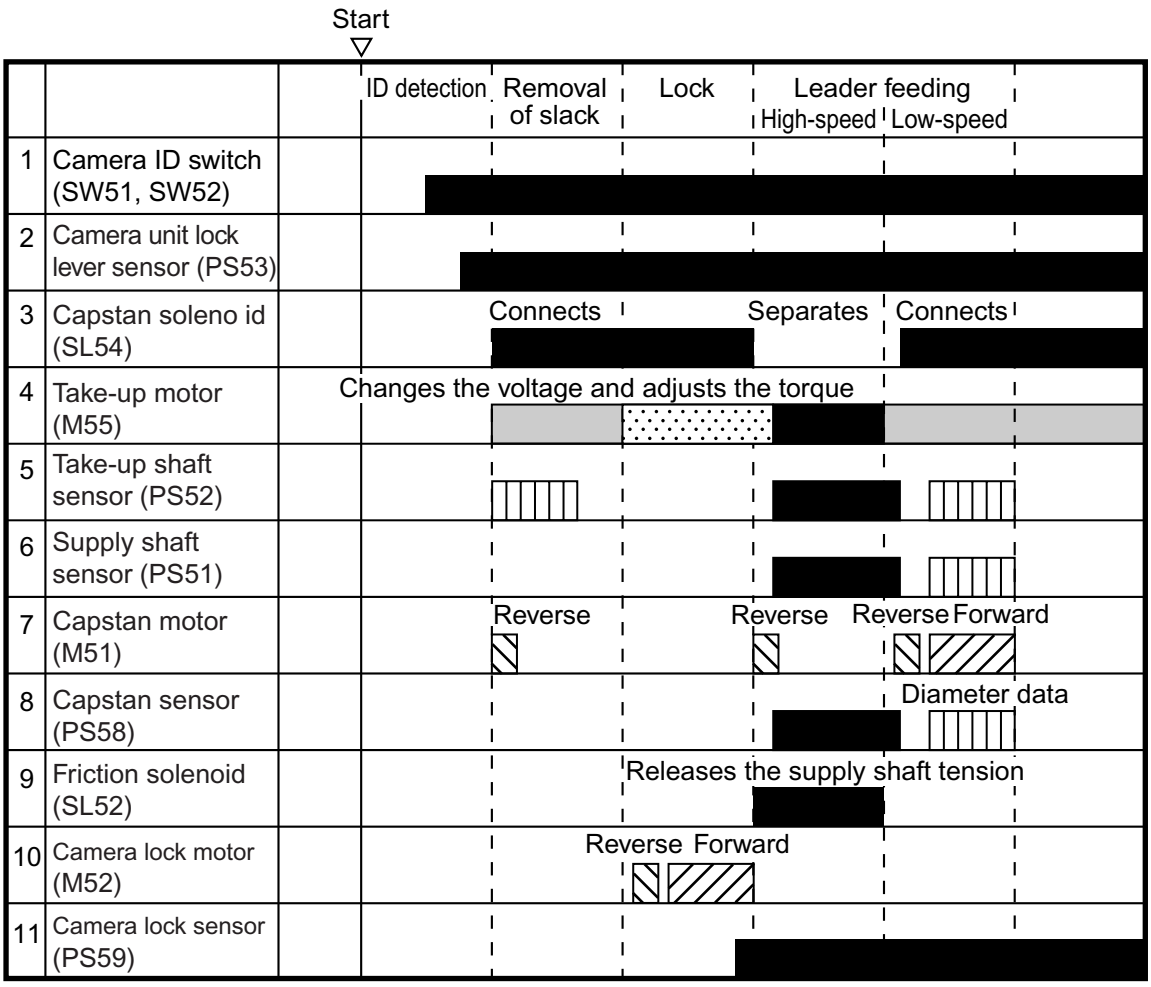


**Fig. 2-404**

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## 2. Locked Camera Setting

When a locked camera unit is set, the camera ID is detected first, then the slack is taken out of the film, the diameter data of the film is confirmed, and the standby state begins.

Fig. 2-405 shows the timing chart.

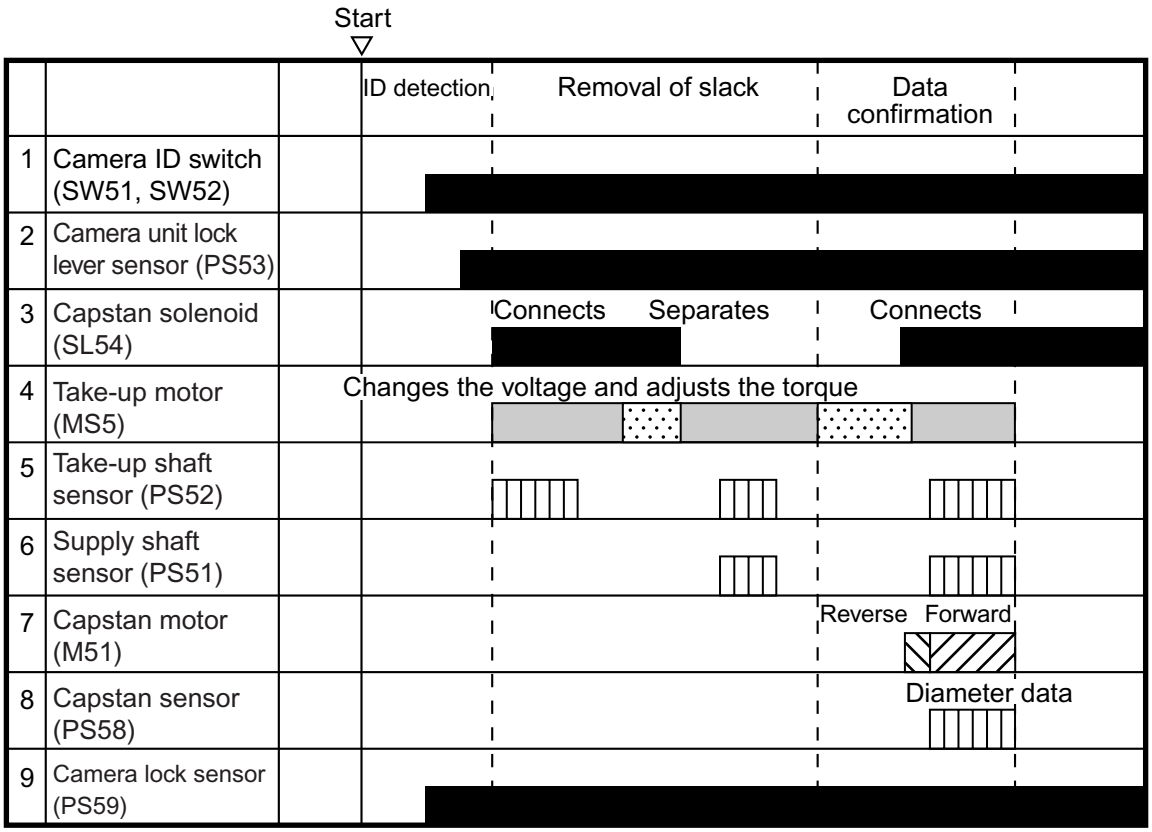


**Fig. 2-405**


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## 3. Film Feeding

Fig. 2-406 shows the timing chart related to the space feeding and trailer feeding.

This function is operated by the “Space/Trailer feeding key” on the operation panel.

The amounts to be fed can be modified using the user mode. For details, refer to the Instruction Manual for Users Guide and “Chapter 6 III. Service Modes”.

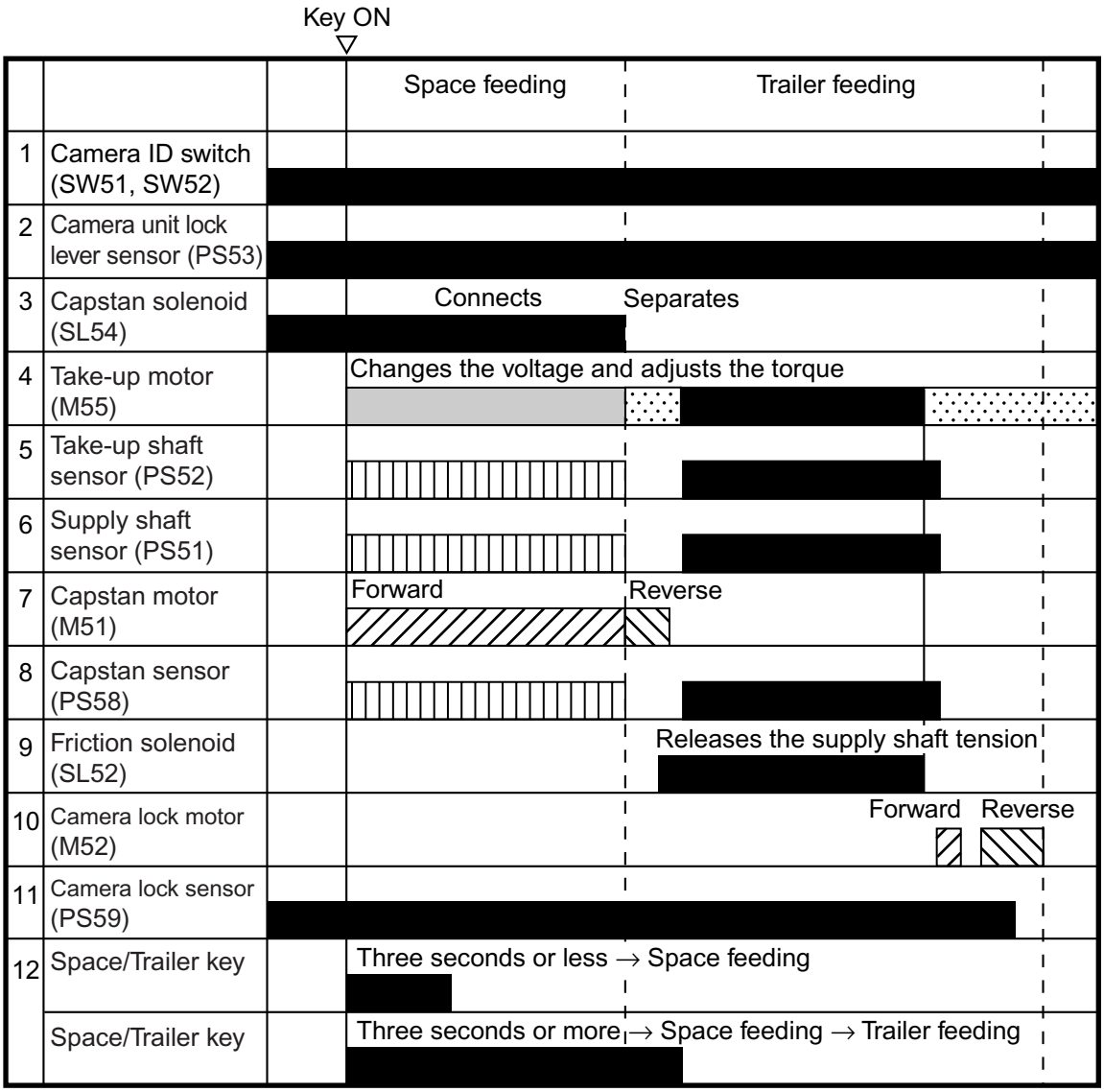


**Fig. 2-406**

# D. Film Remaining Sensor

## 1. Detection by the Sensor

The film remaining indicated by the film-remaining-display LED on the operation panel is calculated from the number of pulses for capstan sensor, supply shaft sensor, and take-up shaft sensor. However, since the number of pulses for the supply shaft sensor and take-up shaft sensor varies with the film diameter, the calculated value indicates the amount of change in diameter, not the actual film length.

Therefore, the film-end detection is affected by the thickness of the film in use. When the film-end detection is set to 1500mm, the end is correctly detected at 1500mm when 5-mil film is used. However, if the film thickness is 2.5mil, the end is detected at 3000mm. Since the amount of feeding (including space feeding) is controlled by the number of pulses from the capstan sensor, feeding amounts are not affected by film thickness.

## 2. Detection by the Camera Unit

For the camera unit, the color of the remaining display window roughly indicates remaining film. If the color is fully red, it indicates that not much remaining, or film is not loaded. Totally green color indicates lots of remaining film. Fig. 2-407 shows the film-remaining detection assembly.

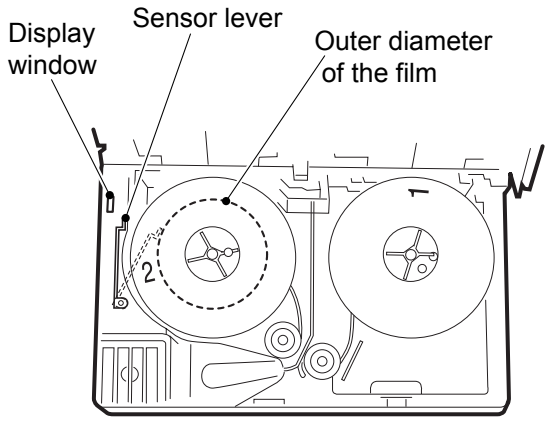


**Fig. 2-407**

The sensor lever touches the outer diameter of the film on the supply side to roughly detect the amount remaining. The sensor lever returns to the original position and the reel can come off when the cover on the supply side is open. When the camera unit is set in the machine, the lever also returns to the original position so as not to scratch the fed film.


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# V. SCAN IMAGE PROCESSING

## A. Outline

Fig. 2-501 shows a block diagram of the scanned image processing.

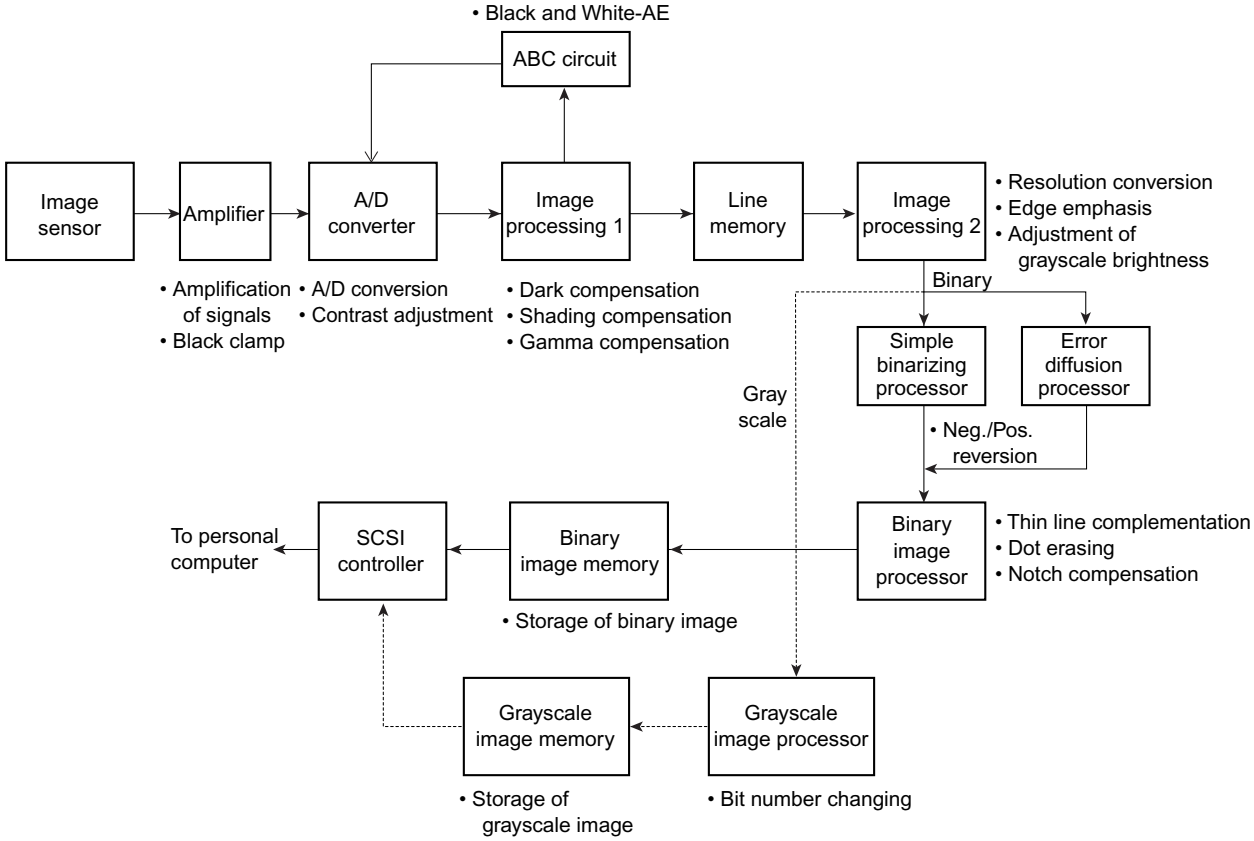


**Fig. 2-501**

Electric signals (analog) proportional to the density of each picture element, read by the image sensor, are sent one after another to the amplifier. After the signals are amplified and black clamped by the amplifier, they are sent to the A/D converter. At the A/D converter, the signals are contrast adjusted and at the same time converted to digital signals proportional to the density.

Next, they are sent to image processor 1 where the following image processing is carried out:

- Dark compensation
- Shading compensation
- Gamma compensation

At this time, if Black and White-AE is selected, the signals are sent to the ABC circuit and judged for density.

The digital signals, after being processed by image processor 1, are sent via the line memory to image processor 2 where the following is carried out.

- Resolution conversion
- Edge emphasis
- Adjustment of grayscale brightness

In the case of binary mode, the data processed by image processor 2 are binarized by the simple binary processor or the error diffusion processor. At this time, if neg./pos. reversion is selected, the reversing process is carried out and then the signals are sent to the binary image processor, The following processes are carried out at the binary image processor:

- Thin line complementation
- Dot erasing
- Notch compensation

Image data thus processed, after being stored in the binary image memory, are sent via the SCSI controller to the personal computer.

In the case of grayscale mode, the data processed by image processor 2 are sent to the grayscale image processor. At the grayscale image processor, the bit number of the grayscale data is changed, and after being stored in the grayscale image memory the data is sent via the SCSI controller to the personal computer.

# B. Image Processing

The following describes the image processing. (Refer to Fig. 2-501 for a block diagram of the entire image processing.)

## 1. Black Clamp

Amplifying and black clamping of signals are carried out at the amplifier.

The light from the LEDs can not reach some parts of the photosensitive elements of the image sensor. The signals of those parts are called black level signals.

The difference between the voltage proportionate to the image density and the standard voltage is output from the image sensor.

As the true signal is the difference between the voltage proportionate to the image density and the black level signal, if the black level signal differs from the standard voltage, the true signal will not be amplified. (Refer to Fig. 2-502.)

Making the black level signal the same as the standard voltage is called black clamping. This process makes it possible to amplify the true signal.

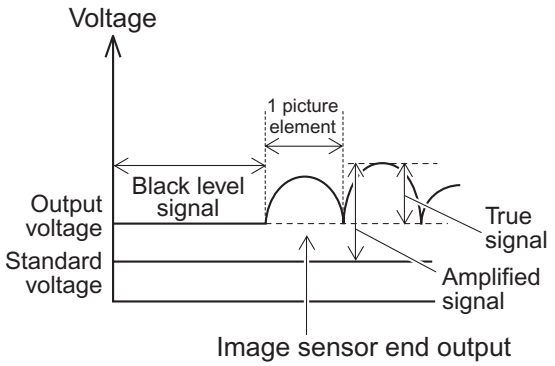


**Fig. 2-502**


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## 2. A/D Conversion

The signals sent from the image sensor are analog signals. These signals are converted into digital signals in order to process them into an image.

Fig. 2-503 shows the output of digital signals after A/D conversion when they are 4-bit signals.

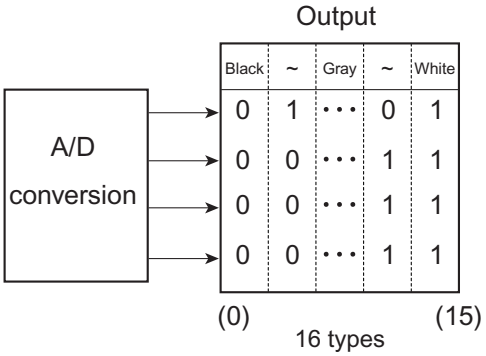


**Fig. 2-503**

If it were only necessary to judge whether the image density of the document was black or white, the output need only be one bit. However, it is necessary to reproduce tones gray levels.

If the output is 4 bits, it is possible to output 16 values. Consequently, as the image changes progressively through white, gray, and black, the analog signal is converted to one of the above 16 digital levels, corresponding to the analog value.

This machine outputs 8 bits, so 256 tonal values can be obtained.

As the number of output bits increases, the resulting digital signal represents the changes in image density of the document more faithfully with good tonality.

## 3. Contrast Adjustment

In addition to the analog signals from the image sensor, a white comparison voltage (VH) and a black comparison voltage (VL) are input to the A/D converter. The analog signals are converted to digital signals proportional to the density of the document in accordance with the difference between those two voltages. (Refer to Fig. 2-504 and Fig. 2-505.)

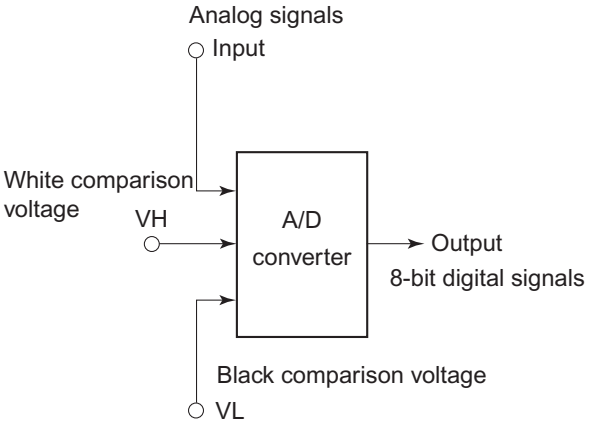


**Fig. 2-504**

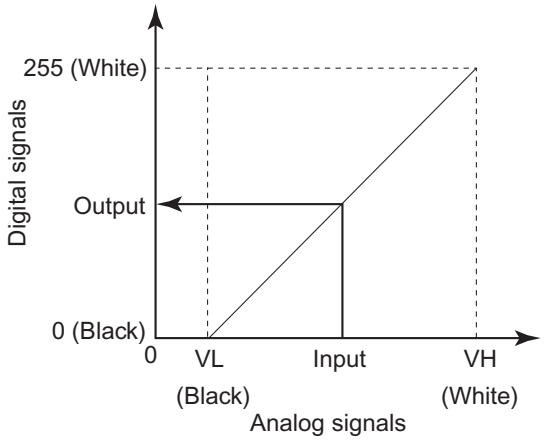


**Fig. 2-505**

This machine adjusts contrast by changing the white comparison voltage. Fig. 2-506 shows the differences in output caused by the changes in comparison voltage.

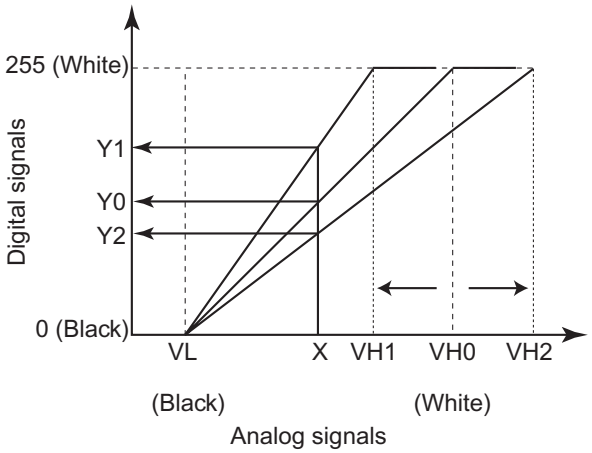


**Fig. 2-506**

The analog signal input is X, the white comparison voltage when contrast is not adjusted is VH0, and the output is Y0.

When the white comparison voltage is changed from VH0 to VH1, the slope of the straight line of the A/C conversion becomes greater, and an output Y1 brighter than Y0 is obtained from input X. The input signals are made brighter and contrast becomes higher.

When the white comparison voltage is changed from VH0 to VH2, the slope of the straight line of the A/C conversion becomes smaller, and an output Y2 darker than Y0 is obtained from input X. The input signals are made darker and contrast becomes lower.

## 4. Dark Compensation

When no light falls on the elements, the output of the photosensitive elements differ. Therefore, the output when reading a black document is not definite, because it becomes the added output with different values depending on each element. Compensating this output is called dark compensation.

Compensation is performed by storing in memory as compensation values the output from the image sensor when the LEDs are turned off, and then subtracting the compensation values from the output when an image is scanned. (Refer to Fig. 2-507 and Fig. 2-508.)

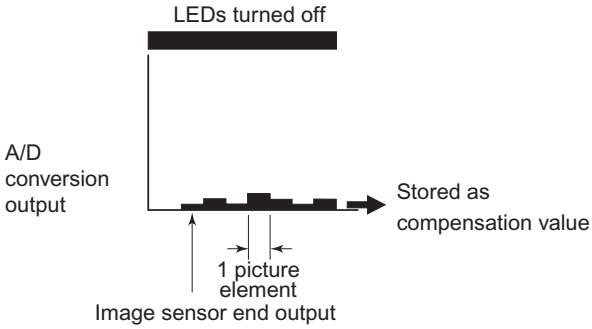


**Fig. 2-507**

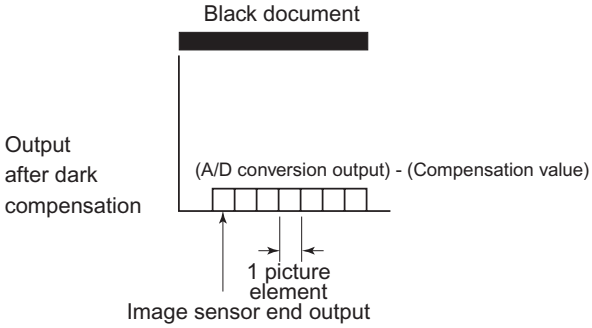


**Fig. 2-508**

Black clamping together with dark compensation is sometimes called black compensation.


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## 5. Shading Compensation (White Compensation)

The outputs from the image sensor for each picture element will not be uniform values, even when scanning a document whose density is uniform in the scanning direction. The reasons are as follows:

1) The light intensity of each LED is different.
2) The light intensity on the image sensor differs depending on each individual short focus lens.
3) The sensitivity of each photosensitive element in the image sensor is different.

Compensating for the unevenness in the output from the image sensor (as mentioned above) is called shading compensation.

In other words, when the reflected light from a document with uniform density is detected by the image sensors, because the output from each sensor is different, compensation is carried out by multiplying each image sensor output (corresponding to each picture element) with a fixed compensation factor so that all the outputs are equal. (Refer to Fig. 2-509 and Fig. 2-510.)

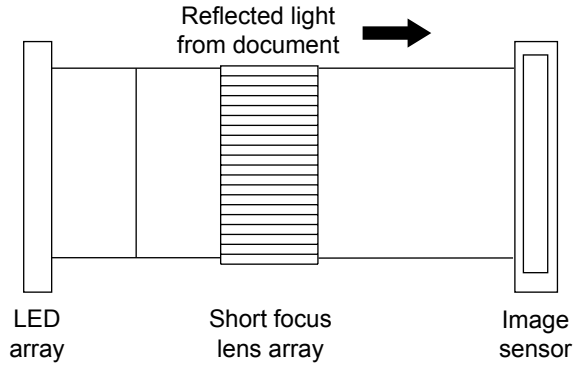


**Fig. 2-509**

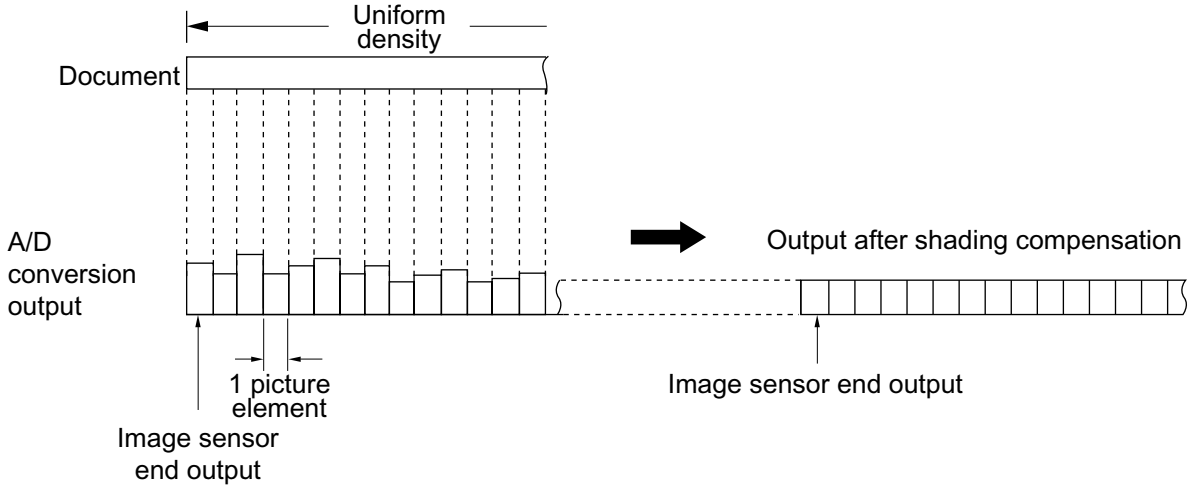


**Fig. 2-510**

Fig. 2-511 shows the output of a picture element (A) of the image sensor when the document density changes from black to white, and the output of the standard value of the image sensor, if the A/D conversion output is assumed to be 4 bits.

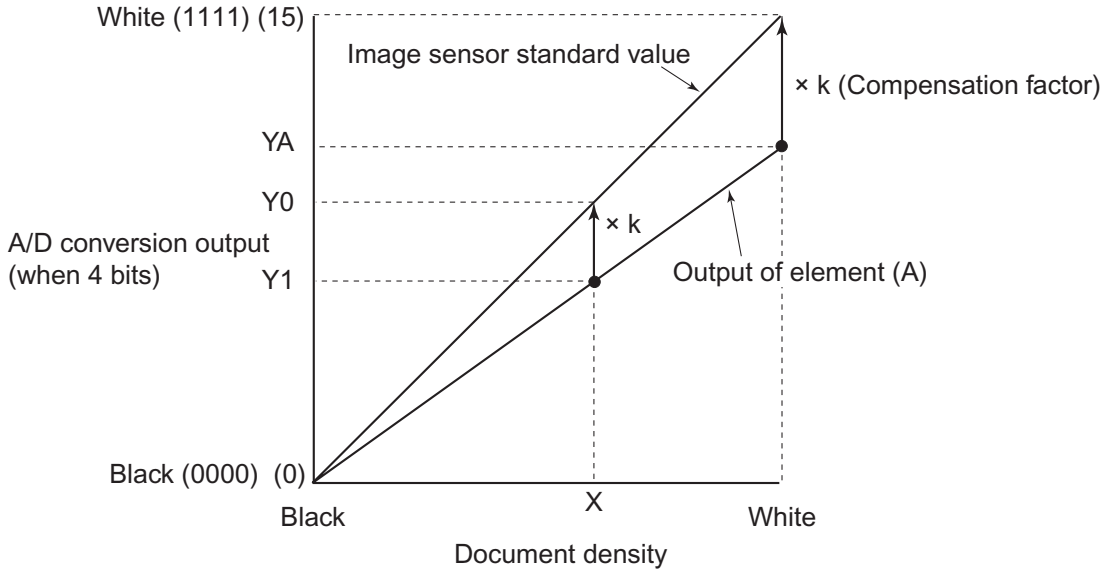


**Fig. 2-511**

At first, a standard white sheet is scanned, and the respective output data from the image sensors is stored in memory.

Then, by comparing with the standard values for the image sensors, the compensation factors are calculated so as to make the output data level from each image sensor uniform, and are stored in the index table RAM.

Output YA of element (A) is stored in memory when a standard white sheet is scanned. Compensation factor k required to obtain the same output from element (A) as the image sensor's standard value is calculated and stored in the index table RAM.

When scanning a document whose image density is X, the output Y0 after shading compensation is obtained by multiplying the pre-compensation output Y1 by the compensation factor k.


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## 6. Gamma Compensation (Tone Compensation)

Because there is a difference between the density of a document detected by an image sensor and the density observed by the human eye, it is necessary to compensate the output in order to obtain the appropriate density, depending on the type of document.

A curve for compensation is called a gamma compensation curve, and compensating the output values using the curve is called gamma compensation (tone compensation).

This machine, however, adjusts density only in the error diffusion mode, by modifying the gamma curve to change the output. In the simple binary mode and grayscale mode, a linear gamma curve is used and no density adjustment is carried out using gamma compensation. (Refer to Fig. 2-512 and Fig. 2-513.)

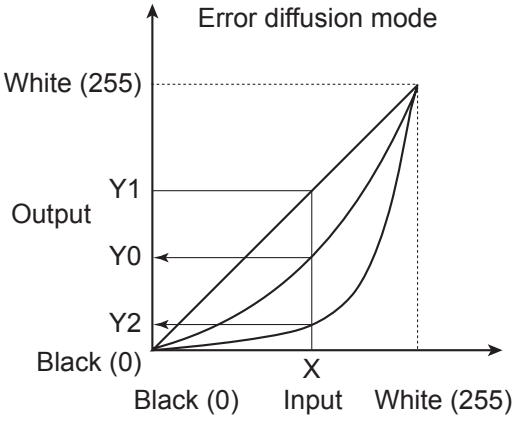


**Fig. 2-512**

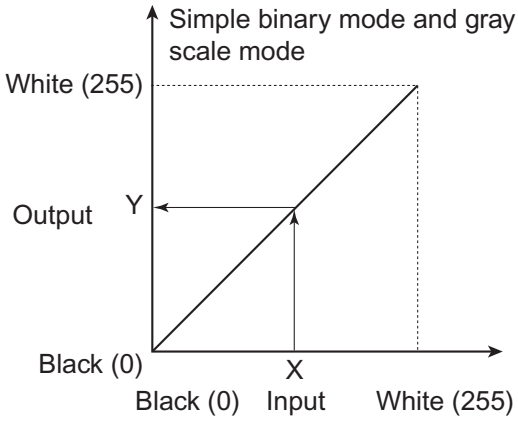


**Fig. 2-513**

## 7. Intensity Adjustment (Density Adjustment)

The intensity of scanned images is adjusted by varying the input value according to the specified value. The processing methods vary with the scan mode. Table 2-501 shows the relation.

The density adjustment for film images is different from that for scanned images.

| Mode name | Processing method |
|---|---|
| Simple binary (Black and White) | Modifies the binarized slice level. |
| Error diffusion (Black and White-ED) | Modifies the gamma curve for gamma compensation. |
| Grayscale | Adds or subtracts the numerical value specified by the intensity setting value. |

**Table 2-501**

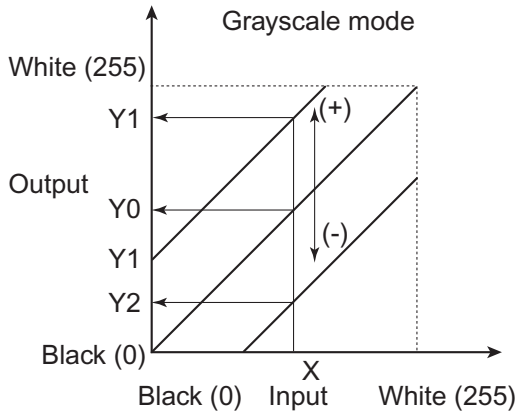


**Fig. 2-514**


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## 8. Black and White-AE

Black and White-AE is a process for automatically adjusting the intensity of scanned images according to the density of the document background, in the case of binary mode.

This machine judges the density of each line and then adjusts density by adjusting the level of A/D conversion from the next line it scans. The circuit that carries out this process is called the ABC circuit.

Density is judged by the number of the brightest picture elements in one line.

The number of the brightest picture elements in one line is counted and when it becomes more than the value prescribed depending on the size of the document, the white comparison voltage is gradually changed in each line until it becomes the voltage of the brightest picture elements.

Fig. 2-514 shows the difference in output caused by Black and White-AE when a document with characters on a colored background is scanned.

If the analog signal of the brightest picture elements in the colored background is X, then the output after normal A/D conversion becomes Y0, and the background color is replaced with black picture elements when binarized.

When Black and White-AE is selected, the white comparison voltage VH is lowered to VH1 by judging the density, the output of X after A/D conversion becomes Y1, and the background is replaced with white picture elements when binarized.

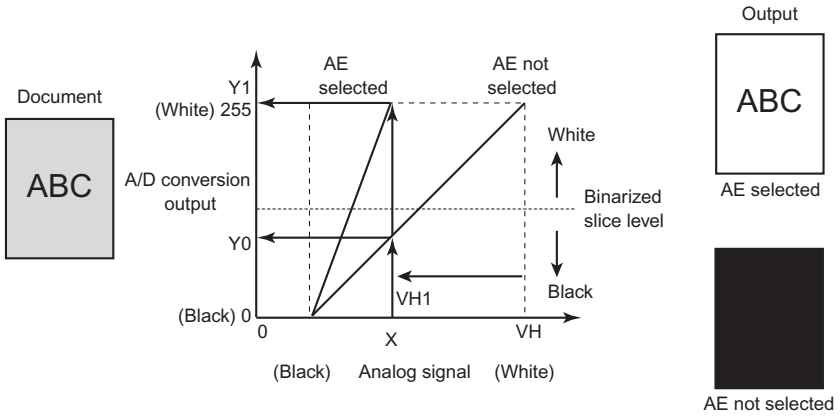


**Fig. 2-515**

## 9. Line Memory

Line memory is used for comparing the image density of the former line and the next line when processing the image using edge emphasis.

By using two line memories, we can compare the data of three lines. (Refer to Fig. 2-516.)

The following shows the flow of image data of each line. The data for the three lines are called Line 1, Line 2, and Line 3 in the order in which they are read from the image sensor.

1) Line 1 is read into image processor 2. At the same time, it is written into line memory (A).
2) Line 2 is read into image processor 2. Line 1 is read from line memory (A) and at the same time, Line 2 is written into line memory (A). Line 1 is written into line memory (B).
3) Line 3 is read into image processor 2. Line 2 is read from line memory (A) and at the same time, Line 3 is written into line memory (A). Line 1 is read from line memory (B) and at the same time, Line 2 is written into line memory (B).

The data of subsequent lines are successively read and written in the same manner.

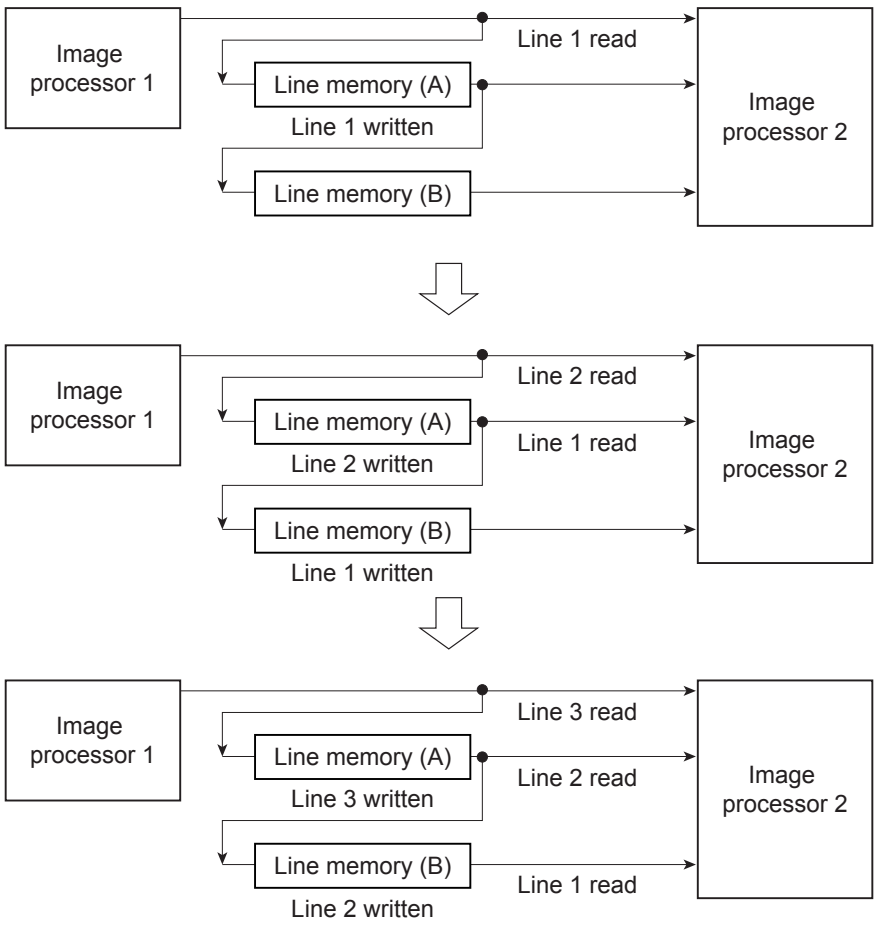


**Fig. 2-516**


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## 10. Resolution Conversion

The scanning resolution of this machine can be selected from the following.

- 300 X 300dpi
- 240 X 240dpi
- 200 X 200dpi
- 300 X 150dpi (300dpi high-speed)
- 200 X 100dpi (200dpi high-speed)

The optical resolution of image sensor (main-scanning direction) is 300dpi.

For the sub-scanning direction, the resolution can be selected from 1/2-times 150dpi or 100dpi in the case of 300dpi or 200dpi in the main-scanning direction. This is called the high-speed scanning mode.

a. Main-scanning direction

Conversion of main-scanning resolution is done by thinning out the standard clock for the image processing according to the resolution. (Refer to the Fig. 2-517.)

When converting the resolution to 200dpi, one out of three on the standard clock is thinned out and used as the operating clock. In the case of 240 dpi, one out of five pulses from the standard clock are used as the operating clock.

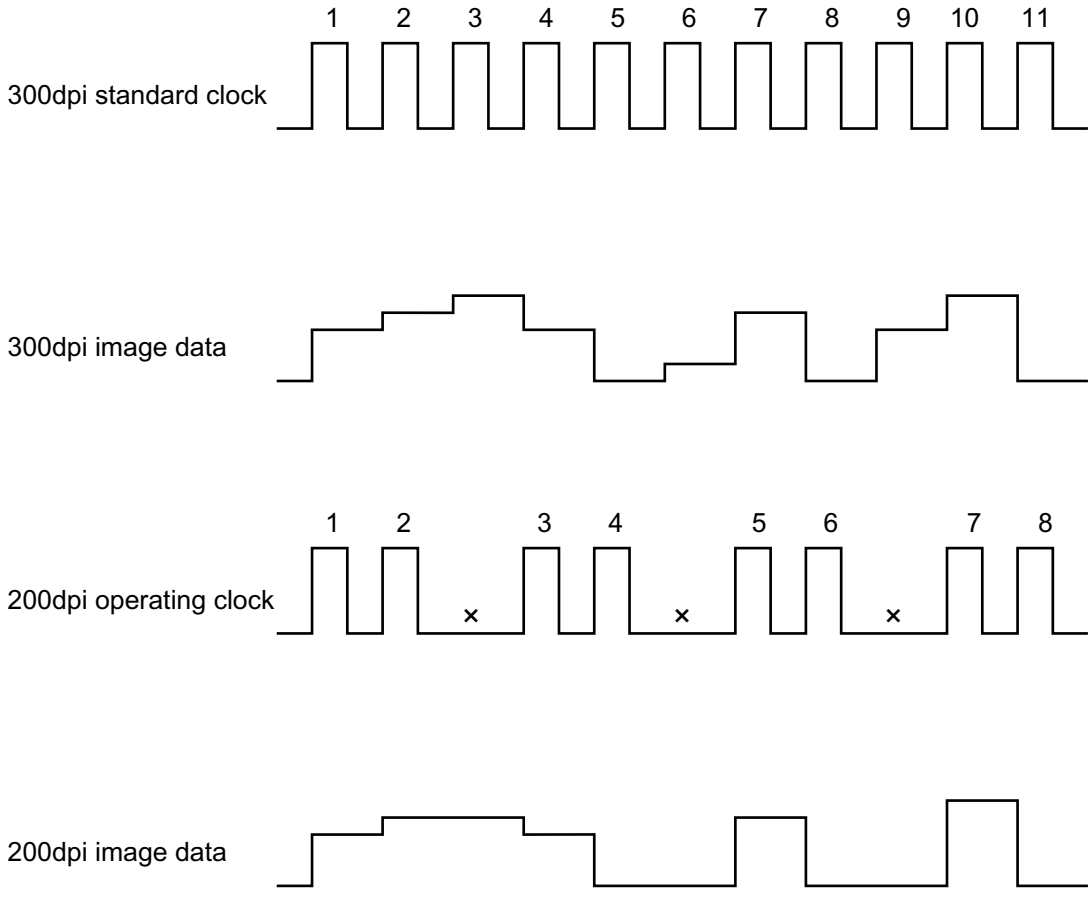


**Fig. 2-517**

b. Sub-scanning direction

As for the sub-scanning direction, the feed speed of the document is changed when scanning.

In the case of 200dpi, the feed speed changes to 1.5 times that of 300dpi, and if 150dpi, it changes to 2 times that of 300dpi, and if 100dpi, it changes to 3 times that of 300dpi. Since the timing for loading data from the image sensor is not changed, the feed speed is modified to convert the resolution in the sub-scanning direction. (Refer to Fig. 2-518.)

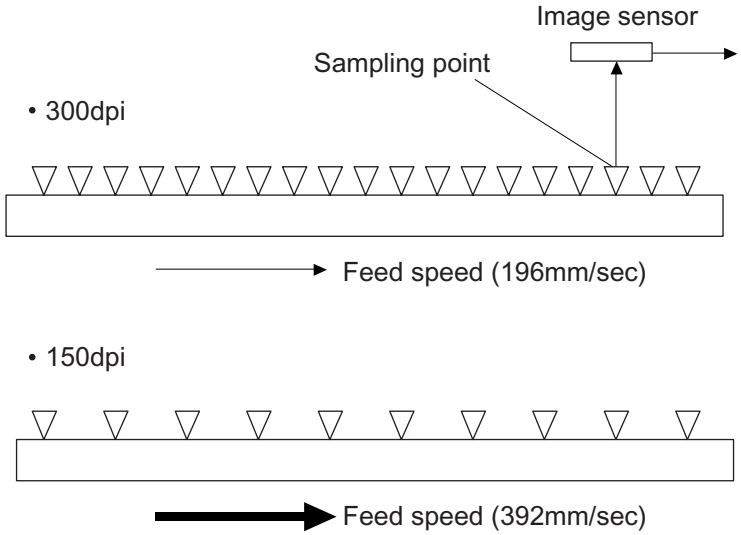


**Fig. 2-518**

As for the high-speed scanning mode (300 x 150dpi/200 x 100dpi), the data in the sub-scanning direction is doubled inside the computer and output at 300 x 300dpi/200 x 200dpi.

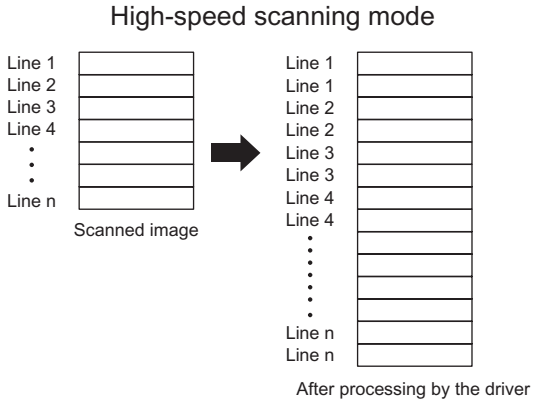


**Fig. 2-519**


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## 11. Edge Emphasis

Edge emphasis is a kind of processing which emphasizes light and shade in order to make the image appear sharp. (Fig. 2-520)

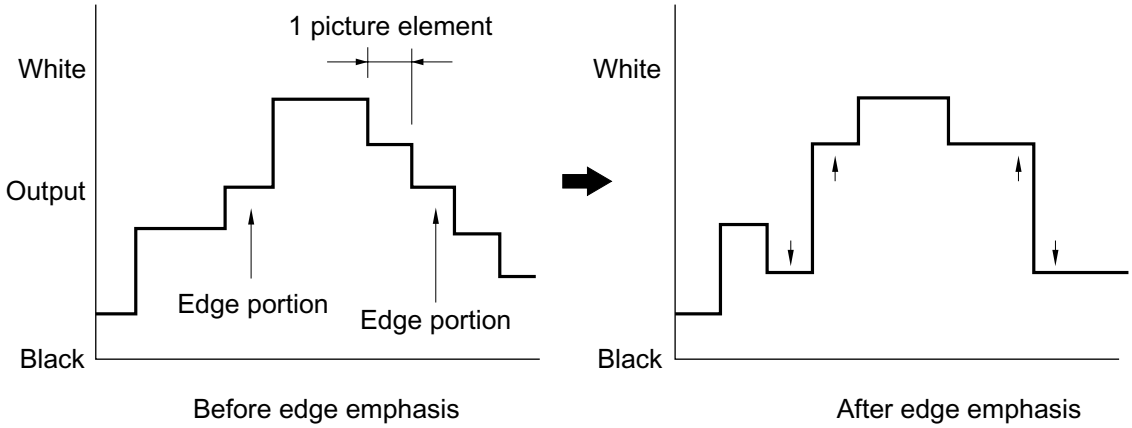


**Fig. 2-520**

Density processing is performed by comparing the data in the conversion table provided for performing edge emphasis, with the target picture element. (Refer to Fig. 2-521.)

The stages in edge emphasis can be changed by changing the conversion table and reproduction ratio (B) of the conversion table.

If the density of the target picture element is increased fourfold and the density of the other four points multiplied by -1, the overall density will remain unchanged.

Arithmetic processing in the main-scanning direction is done at the same time with data read. Arithmetic processing in the sub-scanning direction is done by using the line memory to convert the data in the previous line.

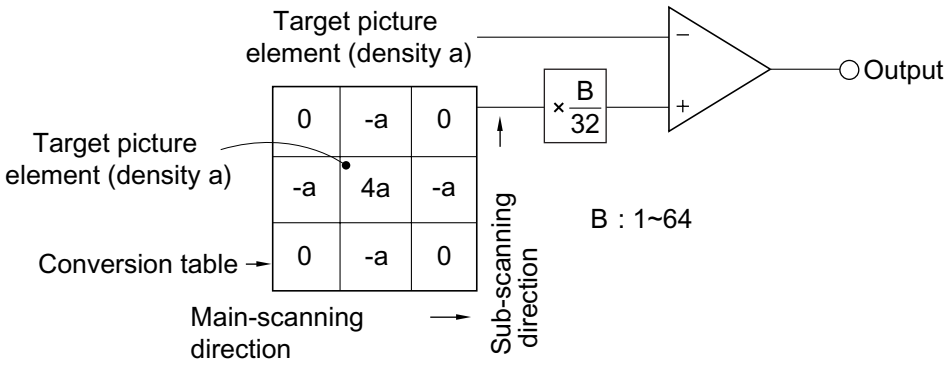


**Fig. 2-521**

## 12. Simple Binarizing

Binary Image data can only express picture elements as either “black” or “white”.

In order to specify one picture element as either black or white, signals corresponding to the image density of the document must be cut off at a certain level, with anything above that level judged as “white” and anything below as “black”. This is called binarizing. The level at which picture elements are to be divided into white or black is called the “slice level” (or threshold value).

To binarize by changing the slice level is called the simple binarizing. This is good for text documents.

For example, when the image sensor output is converted to 4-bit digital signals by A/D conversion, one of the values from “0” to “15” is set as the slice level, and compared with the digital signals. (Refer to Fig. 2-522.)

The output after the A/D conversion becomes 8 bits in this machine.

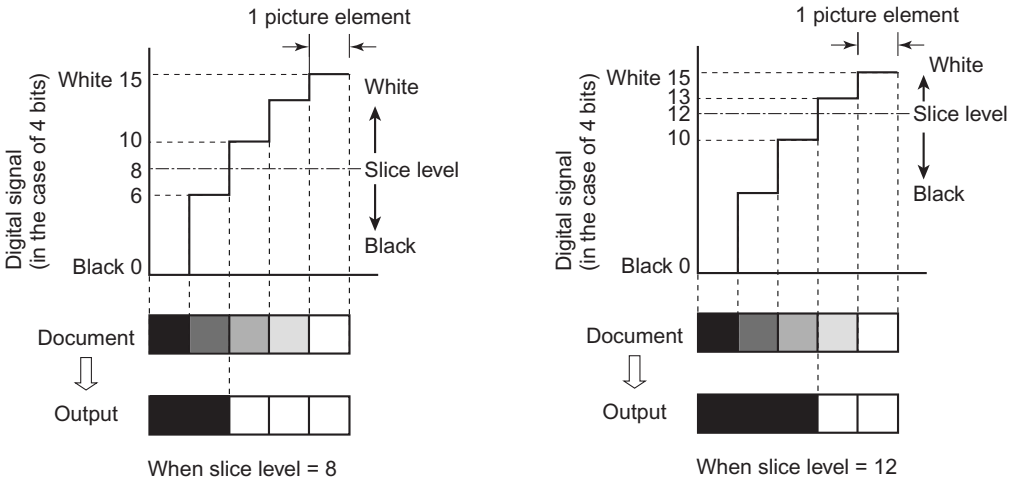


**Fig. 2-522**


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## 13. Error Diffusion

Error diffusion processing is used to binarize documents containing gray levels, such as pictures and photos.

The value of 1 picture element of input image data is compared with the slice level. When it is smaller than the slice level, it is output as “0” and when it is bigger then the slice level, it is output as “15” (in the case of 4 bits).

The difference between the values of the input and output picture elements is then added to the next picture element to be processed.

Let's take “8” for the slice level as an example. First, when processing the first low of Line 1, since the data “12” is larger than the slice level “8”, the output data becomes “15”, and the resultant error becomes -3(=12-15). (Refer to Fig. 2-523.)

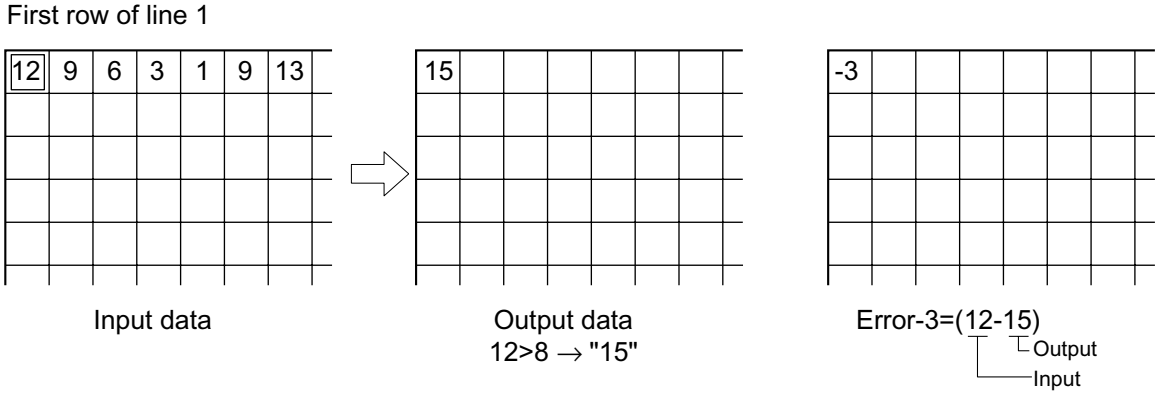


**Fig. 2-523**

Next, when processing the second row of Line 1, since the error is diffused to the right, the data of the picture element of the second row of Line 1 becomes “6”(=9-3).

As this value is smaller than the slice level, the output data is “0” and the error becomes “+6”[=(9-3)-0]. (Refer to Fig. 2-524.)

The third row of Line 1 and later are processed similarly.

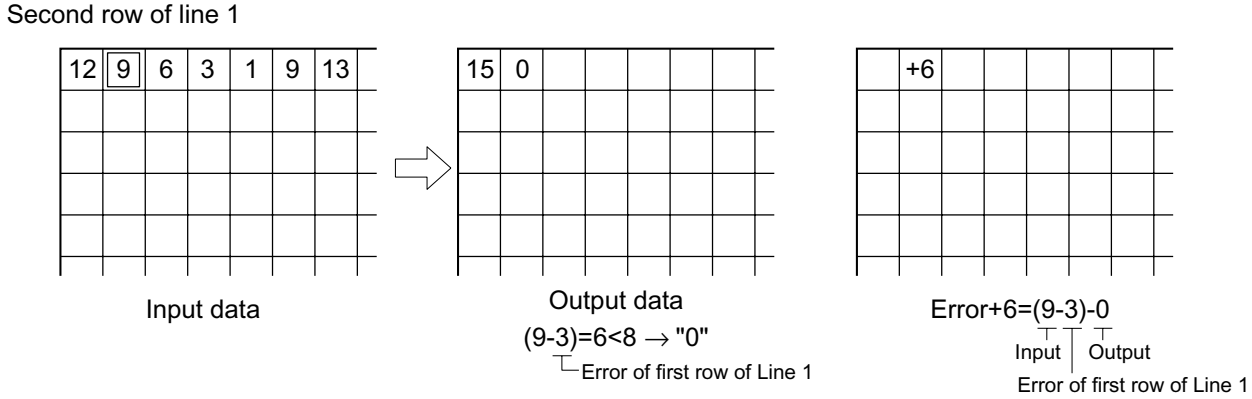


**Fig. 2-524**

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Line 2 is processed using the first row of Line 2 as a reference. If the rest is processed similarly, the data becomes as shown in Fig. 2-525.

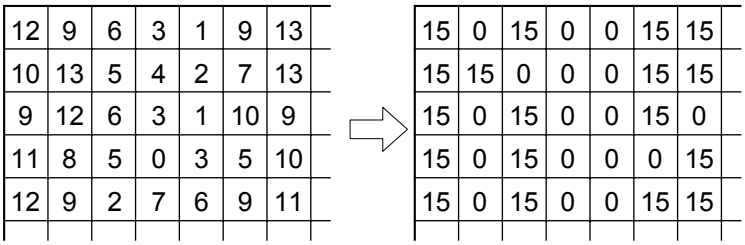


**Fig. 2-525**

Fig. 2-526 shows a comparison of binarizing with error diffusion processing, and binarizing without error diffusion processing (simple binarizing).

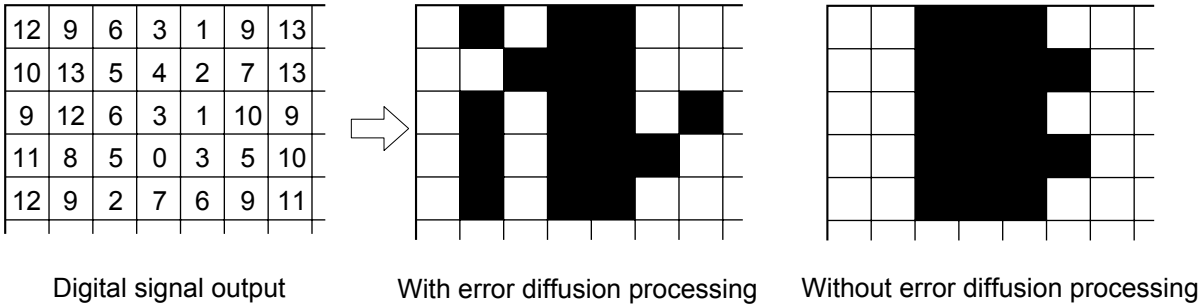


**Fig. 2-526**

Since the error diffusion has a fixed slice level, the intensity is adjusted by modifying the gamma curve.


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## 14. Neg./Pos. Reversion (RIF)

The density level of image data is reversed against the document, as shown in Fig. 2-527, by reversing the binary data. It is called Negative/Positive reversion of RIF (Reverse Image Function).

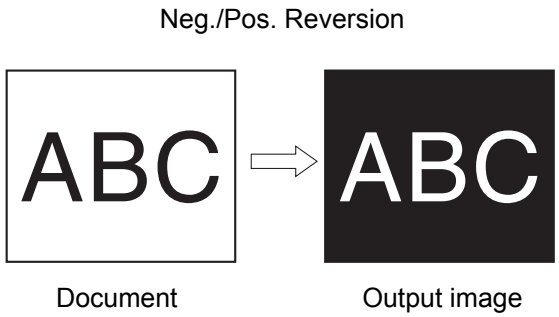


**Fig. 2-527**

## 15. Thin Line Complementation

Thin Line Complementation is the process of compensating for any omission in binary output when a thin line is scanned. (Refer to Fig. 2-528.)

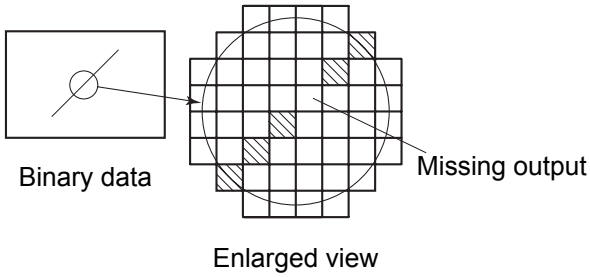


**Fig. 2-528**

Thin line complementation is done using a conversion table such as that shown in Fig. 2-529.

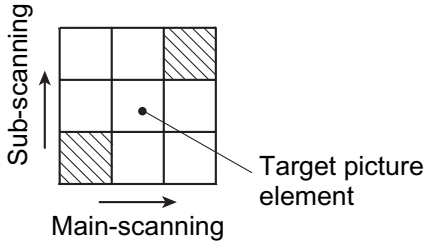


**Fig. 2-529**

A target picture element is judged to be included in a line under the following conditions, and its output is reversed. (Refer to Fig. 2-530.)

1) The 2 dots above and below the target picture element differ in color from the target picture element and the other 6 dots are the same color as the target picture element. (a)
2) The 2 dots to the right and left of the target picture element differ in color from the target picture element and the other 6 dots are the same color as the target picture element. (b)
3) The 2 dots to the upper left and lower right of the target picture element differ in color from the target picture element and the other 6 dots are the same color as the target picture element. (c)

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4) The 2 dots to the lower left and upper right of the target picture element differ in color from the target picture element and the other 6 dots are the same color as the target picture element. (d)

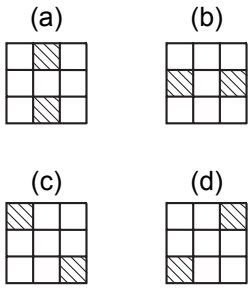


**Fig. 2-530**

**Note:** In this machine, the image processing, thin line complementation, dot erasing, and notch compensation are performed in that order.

## 16. Dot Erasing

Dot erasing is the process of erasing any unnecessary small black dots in the binary data.

This is called black dot erasing.

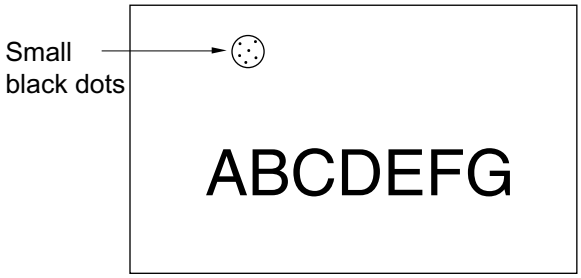


**Fig. 2-531**

This is a function for preventing the occurrence of a lot of small dots like sand soil as a result of the edge emphasis mentioned previously, when scanning a document with a colored background, or, a “dirty” document.

Owing to this process, isolated dots on the image can be erased to make the image clearer, and at the same time, the image compression ratio at encoding becomes higher and recording on the recording media can be more efficient.

For dot erasing, the conversion table shown in Fig. 2-532 is used.

When all the colors of the 8 dots around the target picture element differ from that of the target picture element, the target picture element is judged an “isolated dot” and erased.

Since the target picture element is 1 picture element, small dots with 2 picture elements or more are not erased by this process.

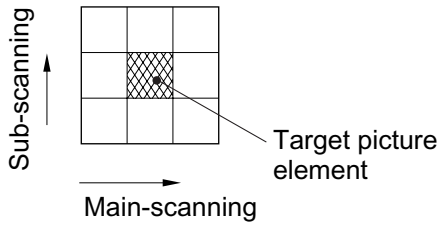


**Fig. 2-532**

The white dots in a document with a black background can be erased using the same method. This is called white dot erasing.


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## 17. Notch Compensation

Notch compensation is the process of compensating for any unevenness in binary output when horizontal and vertical straight lines are scanned. (Refer to Fig. 2-533.)

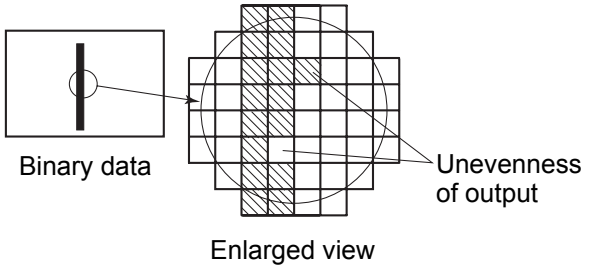


**Fig. 2-533**

Notch compensation is done using a conversion table like that shown in Fig. 2-534.

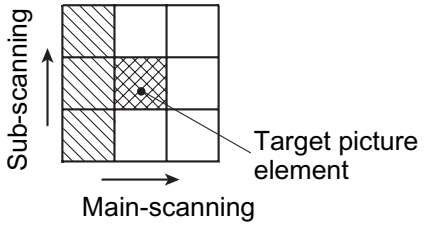


**Fig. 2-534**

A target picture element is judged to be a notch under the following conditions and its output is reversed. (Refer to the Fig. 2-535.)

1) The 3 dots to the right of the target picture element (right, upper right, and lower right) are the same color as the target picture element and the other 5 dots are a different color. (a)
2) The 3 dots to the left of the target picture element (left, upper left, and lower left) are the same color as the target picture element and the other 5 dots are a different color. (b)
3) The 3 dots above the target picture element (top, top right, and top left) are the same color as the target picture element and the other 5 dots are a different color. (c)
4) The 3 dots below the target picture element (bottom, bottom right, and bottom left) are the same color as the target picture element and the other 5 dots are a different color. (d)

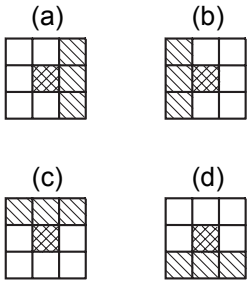


**Fig. 2-535**

## 18. Bit Number Changing

Since this machine processes 8-bit data, grayscale data with 256 levels per picture element can be produced, and the number of levels for an image can be changed by modifying the number of bits for the image data.

For 4-bit data, the high-order 4 bits taken from the 8 bit data produce 16 levels.

For 2-bit data, the high-order 2 bits taken from the 8 bit data produce 4 levels. (Refer to Fig. 2-536.)

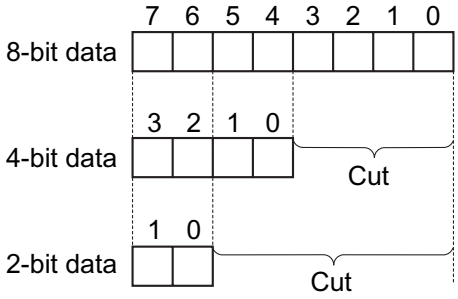


**Fig. 2-536**

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## 19. Dropout Color

Dropout color is a function that does not scan specific colors on documents.

This machine can dropout red.

When red is specified as the dropout color, scanning is done with only the red LEDs illuminated. When the red in the document is the same color as the LED light, the reflected light has the same quantity of light as the white part and is detected as white. (Refer to Fig. 2-537.)

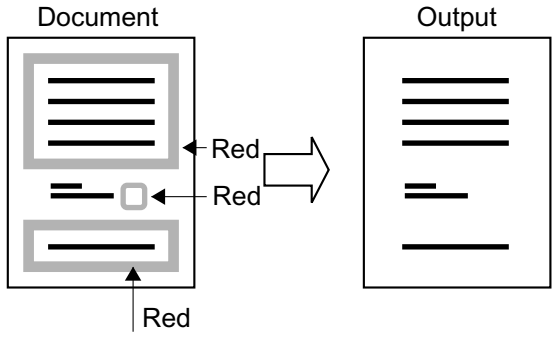


**Fig. 2-537**

This machine also has the ability to do partial dropout. The area not to be dropped is called the non-dropout area.

When red is specified as the dropout color, normally the red stamp is not output, but by specifying a non-dropout area, the red stamp in that area can be made to be output. (Refer to the Fig. 2-538.)

The starting and ending positions of the non-dropout area are specified by their distance from the leading edge of the paper.

A non-dropout area is read by illuminating only the green LED.

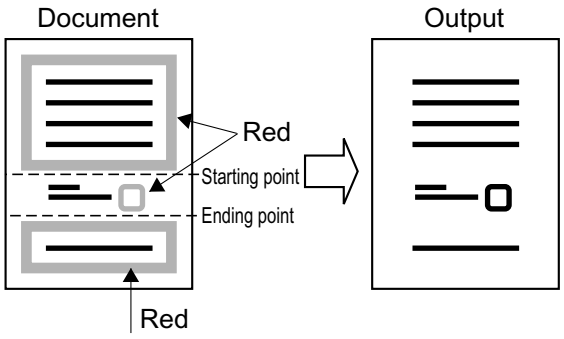


**Fig. 2-538**

## 20. Image Compression

Image compression processing is not done within this machine, because it does not have priority for improvement of scanning speed. Therefore, image compression processing is done within the personal computer.

When specifying a file format for recorded image data, the type of image compression is chosen. Each scanning mode has restrictions on the file format. For details, refer to the Instruction Manual.

- TIFF format → MMR
- JPEG format → JPEG
- JBIG format → JBIG
- BMP format → Non compression

| Mode | BMP | JBIG | JPEG | TIFF |
|---|---|---|---|---|
| Simple binary (Black and White) | OK | OK | | OK |
| Error diffusion (Black and White-ED) | OK | OK | | OK |
| Grayscale | OK | OK | OK | |

**Table 2-502**


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# VI. DESCRIPTION OF ELECTRICAL CIRCUITS

## A. Main CPU PCB Assembly

### 1. Outline

The main CPU PCB assembly (SH2-MAIN) mainly performs image processing.

Fig. 2-601 shows a block diagram of the flow of image data. The block diagram shows the main elements.

The analog signals output from the image sensor in four blocks are made into a composite by an amplifier and an analog switch. They are then converted to 8-bit digital signals by an A/D converter and sent to the image processing controller (CIS-Chip).

The image data input into the image processing controller are subjected to re-arranging of the picture elements and a combining of the front and back. After that, the dark compensation, shading compensation, and gamma compensation are applied to that data, which is sent to the binary image processing controller (IFB-Chip) via the line memory.

If Black and White-AE is selected, the image data is output to the ABC circuit and judged for density by the CPU.

At the binary image processing controller, edge emphasis is carried out using the line memory. If at that time a resolution of less than 300 dpi is selected, the resolution is converted by thinning out the read-in clock.

After edge emphasis has been carried out, binarizing is performed by simple binarizing or by error diffusion. Error diffusion processing is carried out by an error diffusion processing controller (GENESIS).

If neg./pos. reversion is selected, the processing is performed when binarizing is carried out.

Thin line complementation, dot erasing and notch compensation, are carried out on the binarized image data. After that the data is stored in binary image memory and transmitted to external equipment via the SCSI protocol controller (SPC-Chip).

When processing the grayscale image data, the data is edge-emphasized and sent to the grayscale image processing controller (IFC-Chip).

At the grayscale image processing controller, the image data is stored in the grayscale image memory and transmitted to the external equipment via the SCSI protocol controller (SPC-Chip).

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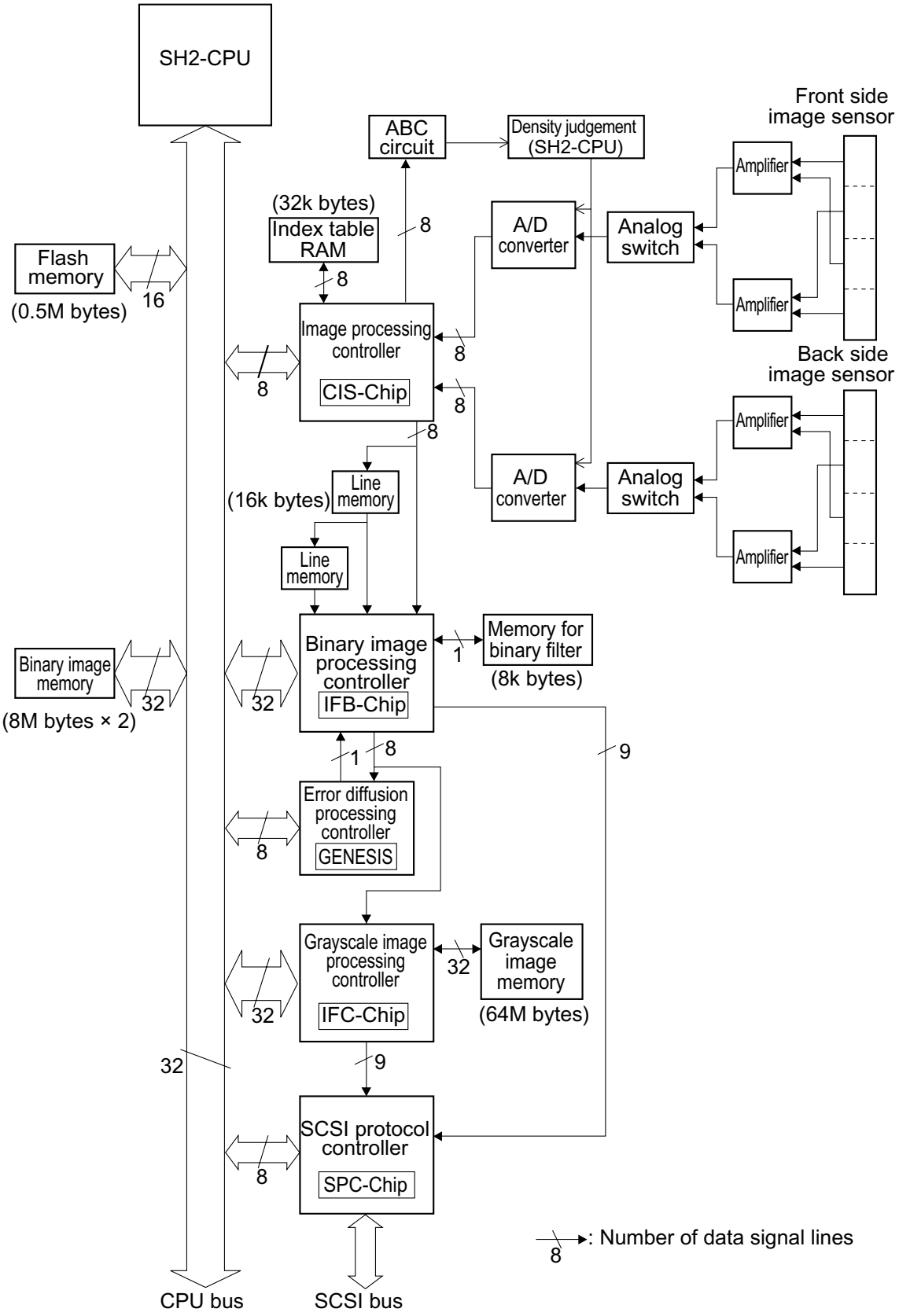


**Fig. 2-601**


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## 2. CPU Circuit

Table 2-601 shows the main function of the IC and Fig. 2-602 shows a block diagram of the main CPU PCB assembly.

This machine is controlled by a 32-bit CPU (IC-135).

| | |
|---|---|
| IC101 (IFC-Chip) | Gate array for grayscale image processing |
| IC111, IC114 | Line memory (16k bytes X 2) |
| IC117 | Index table RAM (32k bytes) |
| IC121 (CIS-Chip) | Gate array for driving image sensor and for grayscale image processing |
| IC133 | Flash memory for writing various kinds of data (0.5M bytes) |
| IC135 (CPU) | Microprocessor which controls this machine |
| IC145 (SPC-Chip) | Gate array for controlling SCSI interface |
| IC155, IC513 (GENESIS) | Gate array for error diffusion processing |
| IC156 | Memory for thin line complement, dot erasing and notch compensation (8k bytes) |
| IC164 (IFB-Chip) | Gate array for binarizing and image processing |
| IC531, IC532 | Memory for binary image data (8M bytes X 2) |
| SD-RAM | Memory for grayscale image data (64M bytes) |

**Table 2-601**

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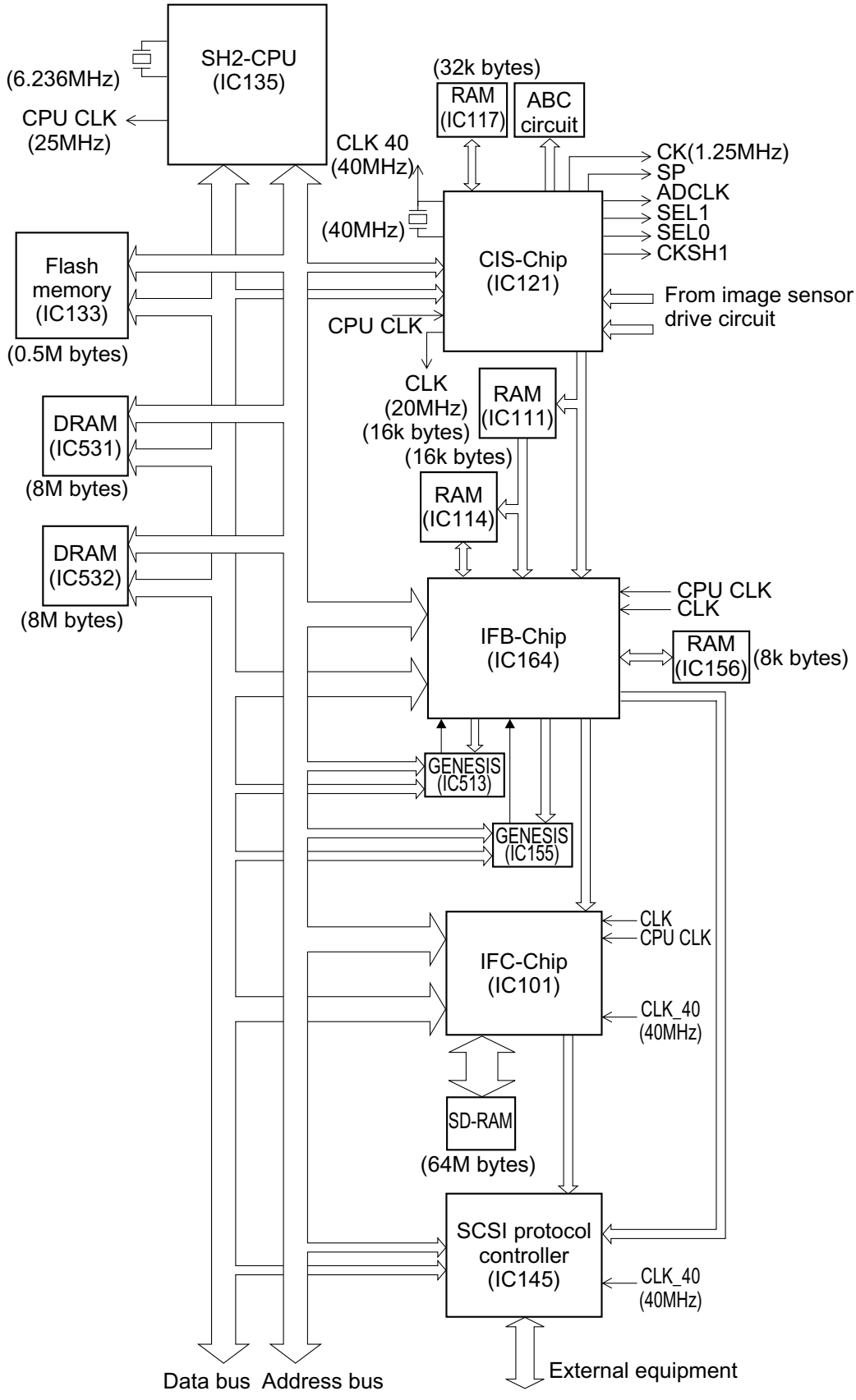


**Fig. 2-602**


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## 3. Image Sensor Drive Circuit

Fig. 2-603 shows the block diagram of the image sensor drive circuit.

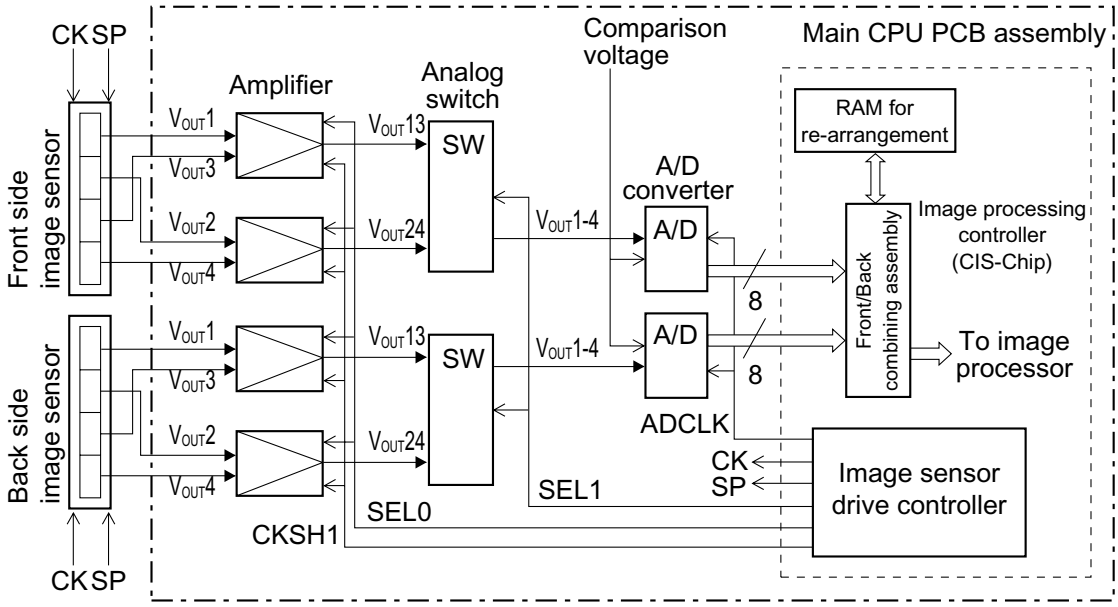
The four blocks of analog signals from the image sensor are output to the main CPU PCB assembly as Vout1, Vout2, Vout3, and Vout4.

Image sensor drive clock (CK) and line interval signals (SP) are input in the image sensor.

When line interval signal comes ON, the potential held synchronizes with the drive clock and is transmitted successively.

The analog signals output from the image sensor are amplified by amplifiers and are converted by A/D converters into 8-bit digital signals.

After that they are sent to the image processing controller (CIS-Chip) where image data re-arrangement and combining of front and back are carried out.




SP : Line interval signal
CK : Image sensor drive clock
CKSH1 : Amplifier read timing signal
SEL0 : Amplifier read switching signal
SEL1 : Analog switch switching signal
ADCLK : A/D conversion sampling signal

**Fig. 2-603**

## 4. Image Processing Controller Circuit (CIS-Chip)

a. Outline

This circuit performs image processing of the image data output from the image sensor drive circuit, and outputs the result to the binary image processing controller (IFB-Chip).

This circuit has the following functions:

- Image processing
- Generating the standard clock for image processing
- Generating the drive timing signals for two (front and back) image sensors

b. Operation

Fig. 2-604 shows a block diagram of the image processing controller (CIS-Chip).

The image data from the image sensor drive circuit of the front side and back side of the document are sent at the same time to the image processing controller.

The front and back combining assembly in the image processing controller re-arranges the image data in one line and combines the front and back sides. The RAM in the image processing controller is used in these processes.

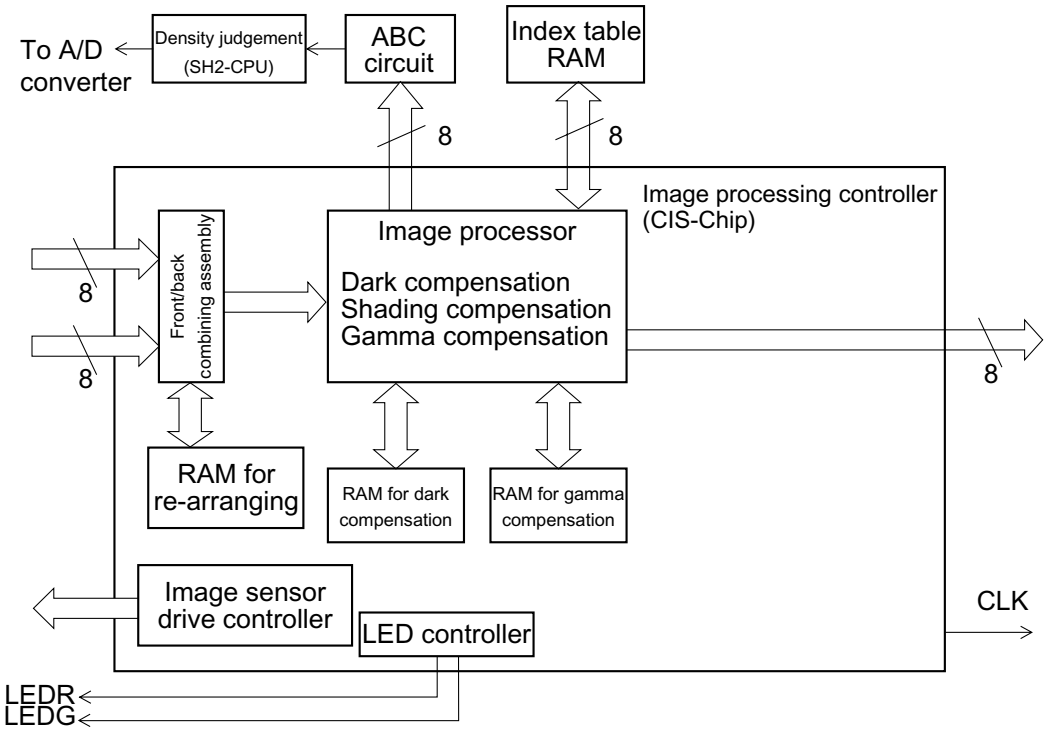
Fig. 2-605 shows the input and output of the front / back combining assembly. The output from Vout1 of the image sensor is represented here as a1, a2, a3… for every picture element. Similarly, the output from Vout2 are b1, b2, b3…, Vout3 are c1, c2, c3…, and Vout4 are d1, d2, d3….

The combined image data is sent to the image processor where dark compensation, shading compensation and gamma compensation are carried out.

The compensation factor for shading compensation is stored in the index table RAM. The compensation values for dark compensation and gamma compensation are stored in the RAM in the image processing controller.

If binary AE is selected, the image data is sent to the ABC circuit and density judgment is made by the SH2-CPU.

After that, the data is output to the binary image processing controller (IFB-Chip).




LEDR : Control signal for red (R) LED
LEDG : Control signal for green (G) LED
CLK : Standard clock for image processing

**Fig. 2-604**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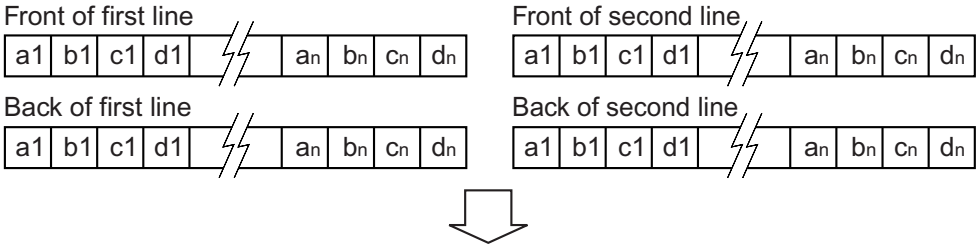
- Input into front/back combining assembly




- Output from front/back combining assembly

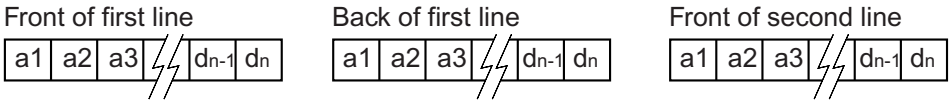



**Fig. 2-605**

## 5. Binary Image Processing Controller Circuit (IFB-Chip)

a. Outline

This circuit performs image processing of the image data output from the image processing controller (CIS-Chip), and after storing in the binary image memory, outputs the data to the SCSI protocol controller (SPC-Chip).

If the grayscale mode is selected, the data is sent to the grayscale image processing controller (IFC-Chip).

This circuit has the following functions:

- Image processing
- Serial/parallel conversion for transmitting image data at high speed

b. Circuit description

Fig. 2-606 shows the block diagram of the binary image processing controller (IFB-Chip).

Note that the numbers in the diagram correspond to the numbers (① to ⑧) in this description.

1) The 8-bit image data output from the image processing controller is input into the binary image processing controller via line memory. ①
   Operation of edge emphasis in the sub-scanning direction is performed using the line memory.
   If a resolution less than 300 dpi is selected, resolution conversion is performed by thinning out the read timing signals at this time.
   The read timing signals for resolution conversion are generated in the binary image processing controller based on the standard clock (CLK) for image processing.
2) After edge emphasis is carried out, binarizing of the image data is performed. If simple binarizing is selected, the data is sent to the simple binarizing processor and binarized.②
   If error diffusion is selected, the data is sent to the error diffusion processing controller ③, where error diffusion processing is performed, and then returned to the binary image processing controller.
   At this point, if a grayscale image is to be processed, the data is sent to the grayscale image processing controller. ④
3) The binarized image data undergoes thin line complementation, dot erasing, and notch compensation at the binary image processor. ⑤
   The memory for the binary filter is used in these processes.
4) After image processing has been performed, the data is converted to 32 bit parallel signals for high speed transmission ⑥, and stored in the binary image memory by DMA transmission via the CPU bus. ⑦
5) The image data stored in the binary image memory is again DMA transmitted via the CPU bus and returned to the binary image processing controller. The data is then sent via the exclusive 9-bit bus to the SCSI protocol controller. ⑧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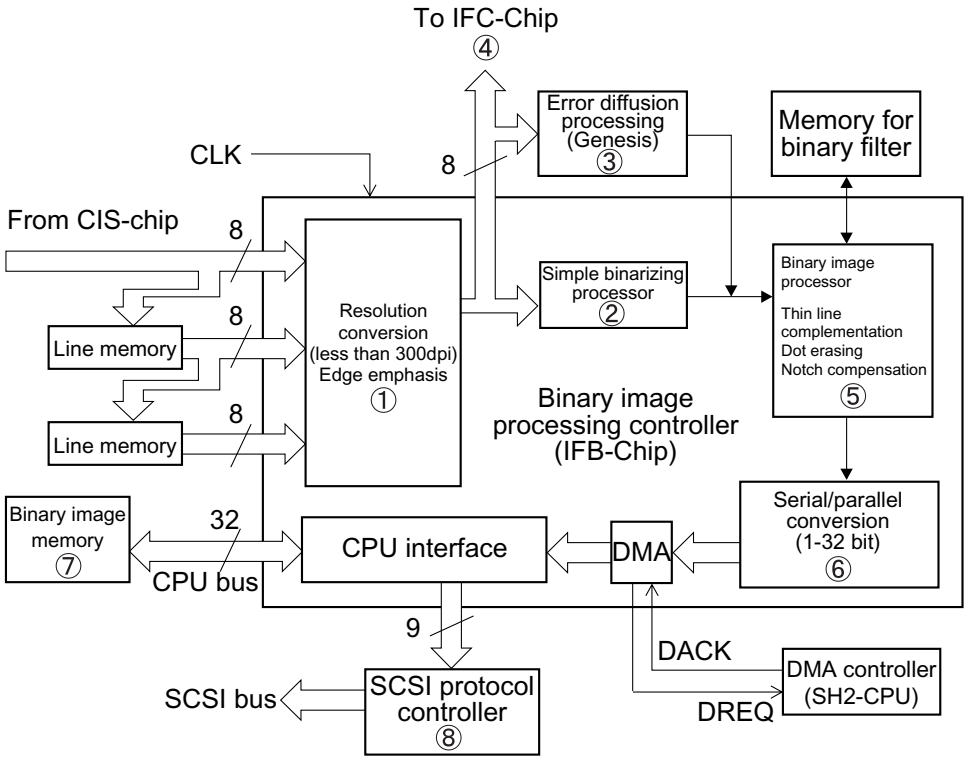



DACK : DMA transmission request signal
DREQ : DMA request acknowledgement signal
CLK : Standard clock for image processing

**Fig. 2-606**

## 6. Grayscale Image Processing Controller Circuit (IFC-Chip)

a. Outline

This circuit stores the 8-bit grayscale image data output from the binary image processing controller (IFB-Chip) in grayscale image memory, and outputs the data to the SCSI protocol controller (SPC-Chip).

This circuit has the following functions:

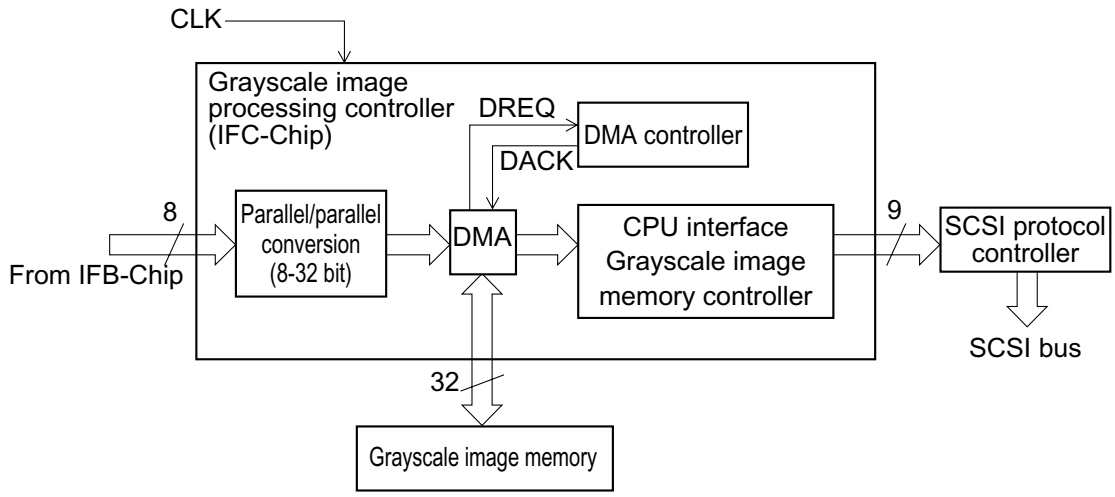
- Bit number changing of image data
- Parallel/parallel conversion for high speed transmission of image data
- Control of grayscale image memory

b. Description of circuit

Fig. 2-607 shows a block diagram of the grayscale image processing controller (IFC-Chip).

The 8-bit grayscale image data output from the binary image processing controller (IFB-Chip) is converted to 32-bit parallel signals for high speed transmission, and stored in grayscale image memory by DMA transmission. At this time, if there is bit number change, the data is stored in memory after bit number changing has been performed.

The image data stored in the grayscale image memory is again DMA transmitted and returned to the grayscale image processing controller. After that the data is sent via the exclusive 9-bit bus to the SCSI protocol controller.




DACK : DMA transmission request signal
DREQ : DMA request acknowledgement signal
CLK : Standard clock for image processing

**Fig. 2-607**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## B. Pickup Control PCB Assembly

Fig. 2-608 shows a block diagram of the pickup control PCB assembly (K4-SUB).

K4-CPU in the pickup control PCB assembly has the following functions:

- Control of document pickup on command from main CPU PCB assembly
- Control of pickup motor, feeding motor, and gap adjusting motor
- Instructions to document board control PCB assembly
- Processing of signal from various sensors
- Printing of imprinter (option)

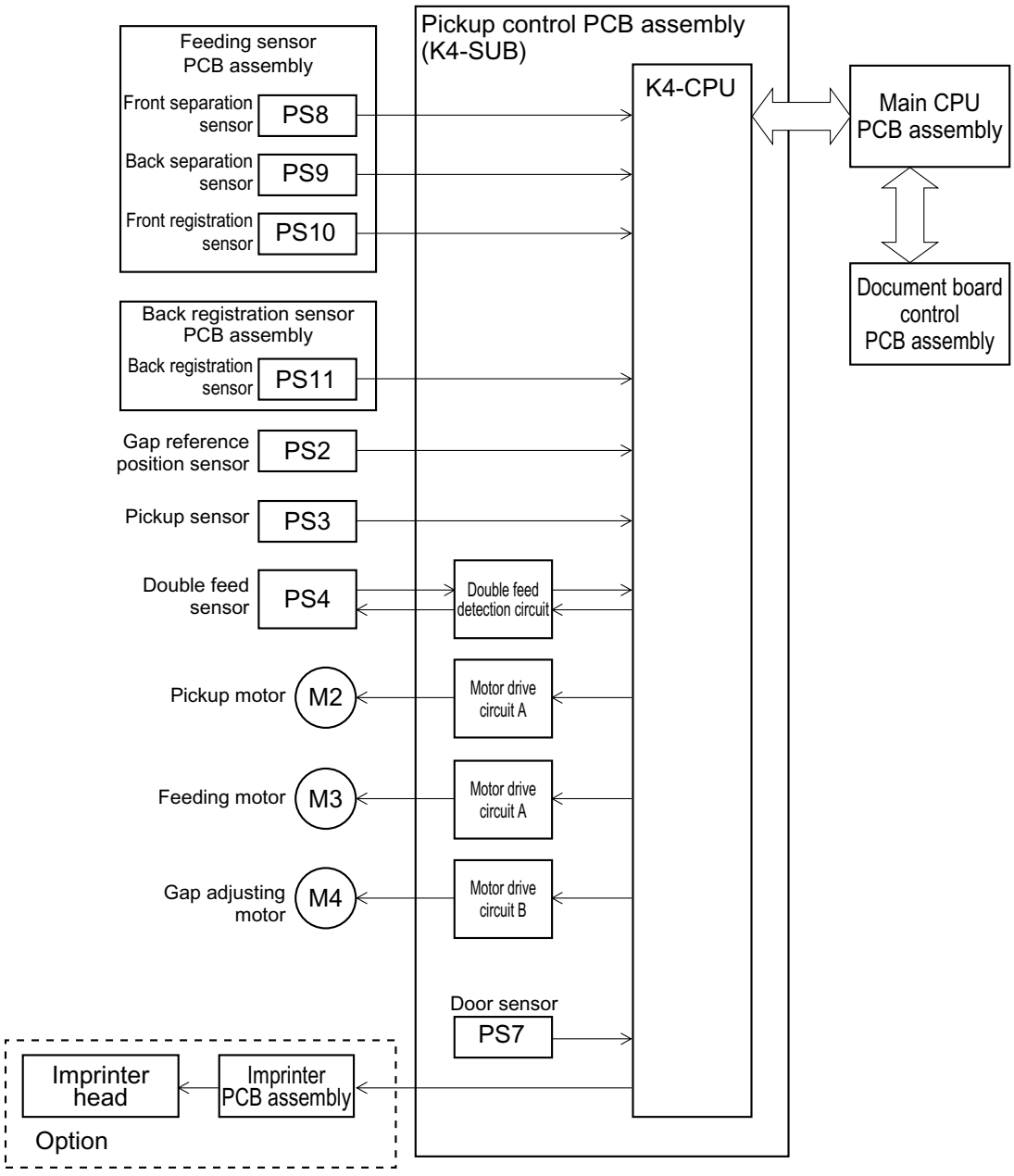


**Fig. 2-608**

# C. Document Board Control PCB Assembly

Fig. 2-609 shows a block diagram of the document board control PCB assembly (K0-SUB2).

K0-CPU in the document board control PCB assembly has the following functions:

- Control of separation motor and document board motor on command from the pickup control PCB assembly
- Control of registration clutch on command from main CPU PCB assembly
- Processing of signals from various sensors

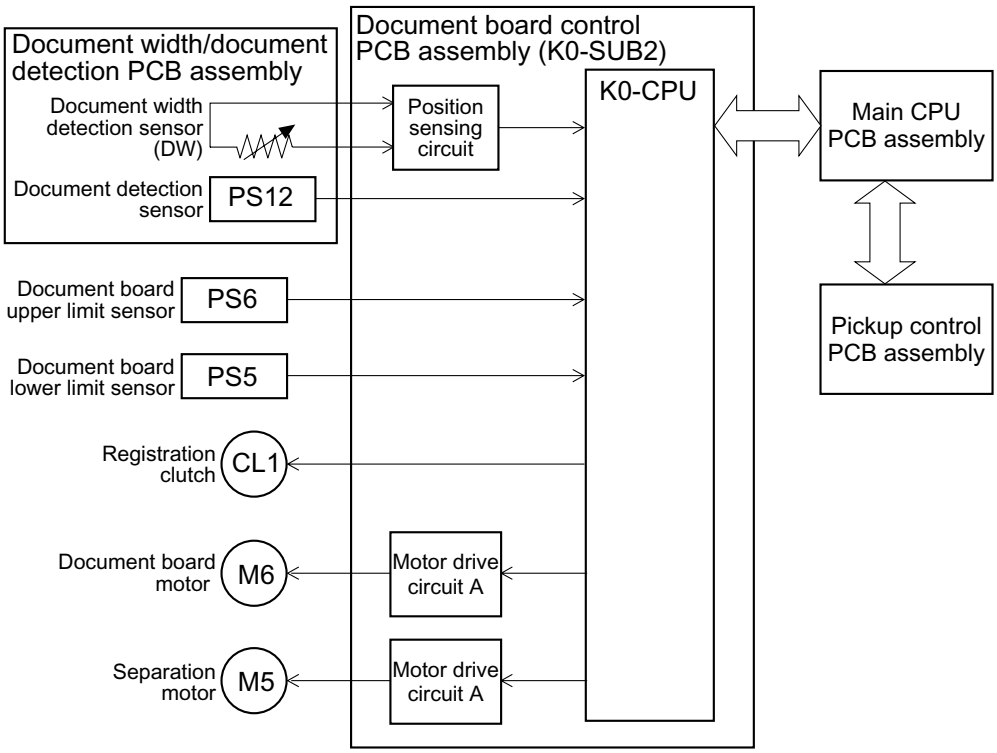


**Fig. 2-609**


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## D. Filmer Control PCB Assembly

Fig. 2-610 shows a block diagram of the filmer control PCB assembly (GH-DCON).

The filmer control PCB assembly carries out data communication with the main CPU PCB assembly, while controlling the exposure of images on film.

The M16-CPU in the filmer control PCB assembly has the following functions:

- Control of motor and solenoid
- Control of fluorescent lamp
- Control of mark LED
- Processing of signals from the sensor

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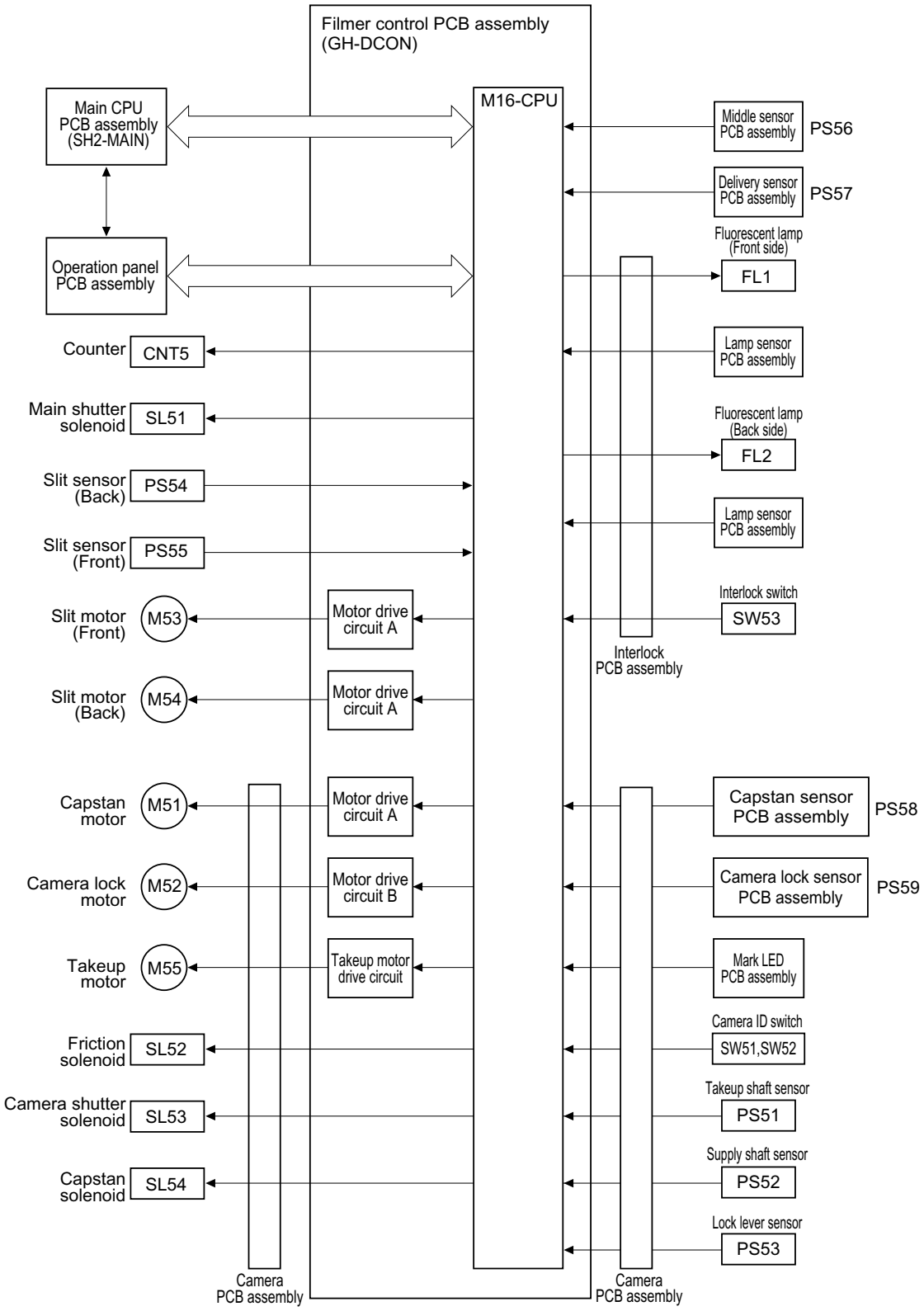


**Fig. 2-610**


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# VII. INTERFACE

## 1. Outline

When sending data from this machine to a personal computer, the data is transmitted by an interface. This machine uses a SCSI-2 (Small Computer System Interface-2) interface.

Because it also handles Fast SCSI, data transmission of a maximum of 10MB/sec. is possible.

Fig. 2-701 shows the input and output of SCSI data, and Table 2-701 shows the connectors and names of the signals.

The connector numbers of the main CPU PCB assembly are J105 and J106.

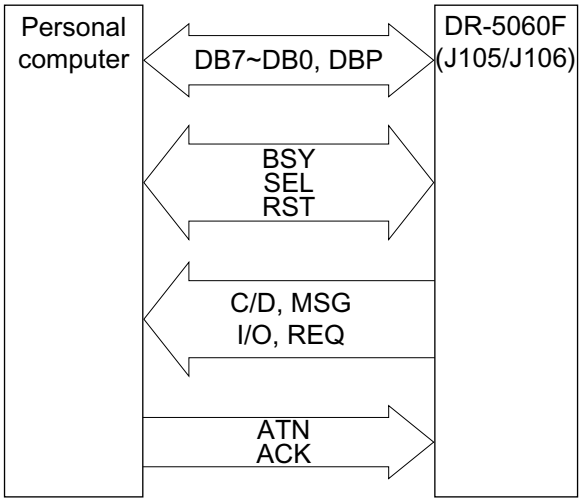


**Fig. 2-701**

| Pin No. | Name of Signal | Remarks |
|---|---|---|
| 1-12 | GND | (Ground) |
| 13 | OPEN | (Non connection) |
| 14-25 | GND | (Ground) |
| 26 | DB0* | (Data Bit 0) |
| 27 | DB1* | (Data Bit 1) |
| 28 | DB2* | (Data Bit 2) |
| 29 | DB3* | (Data Bit 3) |
| 30 | DB4* | (Data Bit 4) |
| 31 | DB5* | (Data Bit 5) |
| 32 | DB6* | (Data Bit 6) |
| 33 | DB7* | (Data Bit 7) |
| 34 | DBP* | (Odd Parity Data Bit) |
| 35-37 | GND | (Ground) |
| 38 | TERMPWR | (Termination Power) |
| 39-40 | GND | (Ground) |
| 41 | ATN* | (Attention) |
| 42 | GND | (Ground) |
| 43 | BSY* | (Busy) |
| 44 | ACK* | (Acknowledge) |
| 45 | RST* | (Reset) |
| 46 | MSG* | (Message) |
| 47 | SEL* | (Select) |
| 48 | C/D* | (Control/Data) |
| 49 | REQ* | (Request) |
| 50 | I/O* | (Input/Output) |

The asterisk "*" at the end of the name of a signal denotes a low active signal.

**Table 2-701**

The SCSI bus is made up of data signals (1 byte + parity bit =9 signals) and control signals (9 signals) for a total of 18.

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## 2. Control Method

The following is a brief explanation of the method of controlling DR-5060F using the SCSI bus.

Data is transmitted by setting the required state (phase) with control signals. Table 2-702 explains of the various phases.

The equipment connected to the SCSI bus is called the SCSI device. The side that issues the command for data transmission is called the “initiator” and the side receiving the command and providing the data is called the “target”. (Refer to Fig. 2-702.)

| No. | Name | Explanation | |
|---|---|---|---|
| 1 | BUS FREE phase | State in which SCSI bus is not used in any SCSI device | Phase which decides the state of use of the SCSI bus |
| 2 | ARBITRATION phase | Decides the SCSI device to use the SCSI bus | |
| 3 | SELECTION phase | Decides target when the initiator uses the SCSI bus | |
| 4 | RESELECTION phase | Target requests initiator for reconnection | |
| 5 | COMMAND phase | Command from initiator to target | Data transmission phase |
| 6 | DATA phase | Data input/output is carried out in accordance with command | |
| 7 | STATUS phase | Denotes the result of whatever was carried out in accordance with command | |
| 8 | MESSAGE phase | Control data is being input/output between initiator and target | |

**Table 2-702**

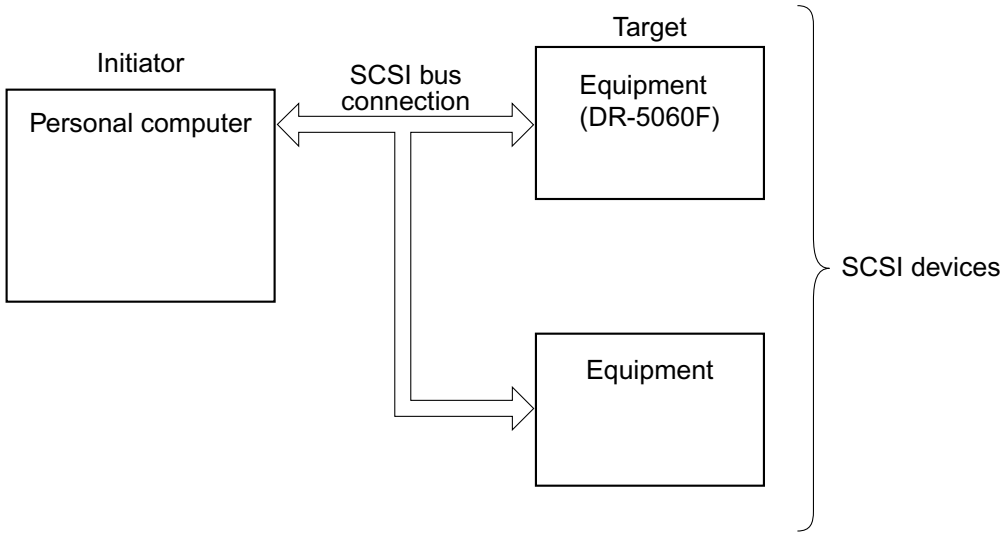


**Fig. 2-702**


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Table 2-703 shows the basic communication sequence.

| No. | Personal computer side | Direction of communication | DR-5060F side |
|---|---|---|---|
| 1 | Command to start recording | →→ | |
| 2 | | | Feed starts |
| 3 | Command inquiring about whether or not there is data and the state of feeding | →→ | |
| 4 | | ←← | Availability of data and status of feeding |
| 5 | 1) If during feeding and there is not data, return to No.3.<br>2) If feeding is stopped and there is no data, go to No.9.<br>3) If there is data, go to No.6. | | |
| 6 | Data read command | →→ | |
| 7 | | ←← | Data output |
| 8 | 1) Return to No.6 until there is no more data for 1 page of document.<br>2) Return to No.3 when there is no more data for 1 page of document. | | |
| 9 | End | | |

**Table 2-703**

# VIII.POWER SUPPLY

## 1. Outline

The DC power supply PCB assembly of this machine is capable of handling power input of 100 to 240VAC.

Fig. 2-801 shows a block diagram of the DC power supply PCB assembly.

AC power is supplied to the DC power supply PCB assembly by turning on the power switch.

The 100 to 240VAC power is converted by a rectifying bridge to unsmoothed 100 to 240 VUN and sent to the booster assembly. At the booster assembly, the power is temporarily raised to 380 VUN and then converted to DC voltage. After that, it is converted to 24 V by a DC/DC converter and output to the various PCB assemblies.

A fuse is used in the DC power supply PCB assembly to protect against overcurrent.

Only +24 VDC is output from the DC power supply PCB assembly and the necessary voltage is then generated by the DC/DC converter in each PCB assembly.

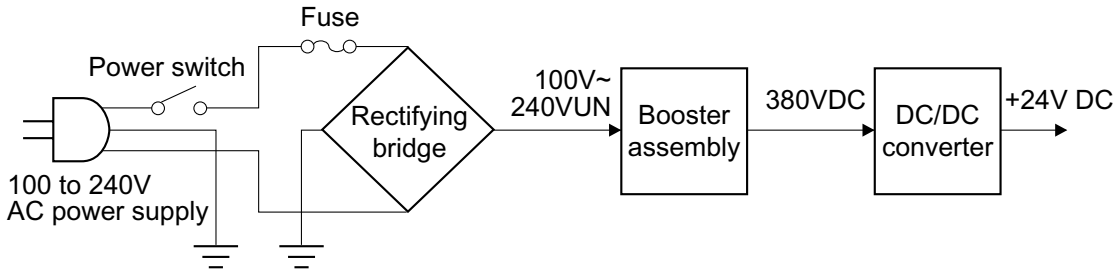


**Fig. 2-801**


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## 2. Protective Function of Power Supply Circuit

The DC power supply PCB assembly is a switching regulator type.

If the load goes into a short circuit state due to some abnormality, and there is an overcurrent situation, the protective function is activated and output is stopped. Also, if the DC/DC converter generating ±5 VDC and + 3.3 VDC in the main CPU PCB assembly breaks down causing +24 VDC to be applied, the protective function is activated and output is stopped.

When output stops, it can be automatically restored by turning the power switch off, eliminating the cause of the short circuit, discharging the capacitor (for about 10 minutes) and then turning on the power switch.

A fuse is used for protection in each PCB assembly. If an overcurrent flows into the DC/DC converter, the fuse blows and stops the power supply to the PCB assembly.

A fuse is also used for protection of the main motor. If an overcurrent flows into the part of the main motor where +24 VDC is supplied, the fuse blows and stops the power supply to the main motor.

## 3. Battery

The following lithium battery is equipped in the main CPU PCB assembly as memory backup.

Maker: SANYO Electric Co., Ltd.
Model: CR14250SE
Voltage: +3VDC
Capacity: 850mAh

When replacing the battery, a battery identical to the above should be used.

Also, when disposing of a used battery or a PCB assembly equipped with a battery, the instructions of the maker and the regulations of the region should be followed.

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# IX. LIST OF CONNECTORS, SW & LEDS FOR EACH CIRCUIT BOARD

The following lists the connectors, setting SWs (switches) and LEDs mounted on the major PCB assemblies.

Connectors, SWs and LEDs not listed in the tables are for factory adjustment only. Special tools and measuring instruments are required to perform adjustments and checks using these connectors, SWs and LEDs. Often a high degree of accuracy is demanded. For this reason, do not touch these connectors, SWs and LEDs in the field.

In addition, do not touch any device that has a note prohibiting use.

**Note:** This machine does not have any VRs (variable resistors) that may be adjusted in the field.

## 1. Main CPU PCB Assembly (SH2-MAIN)

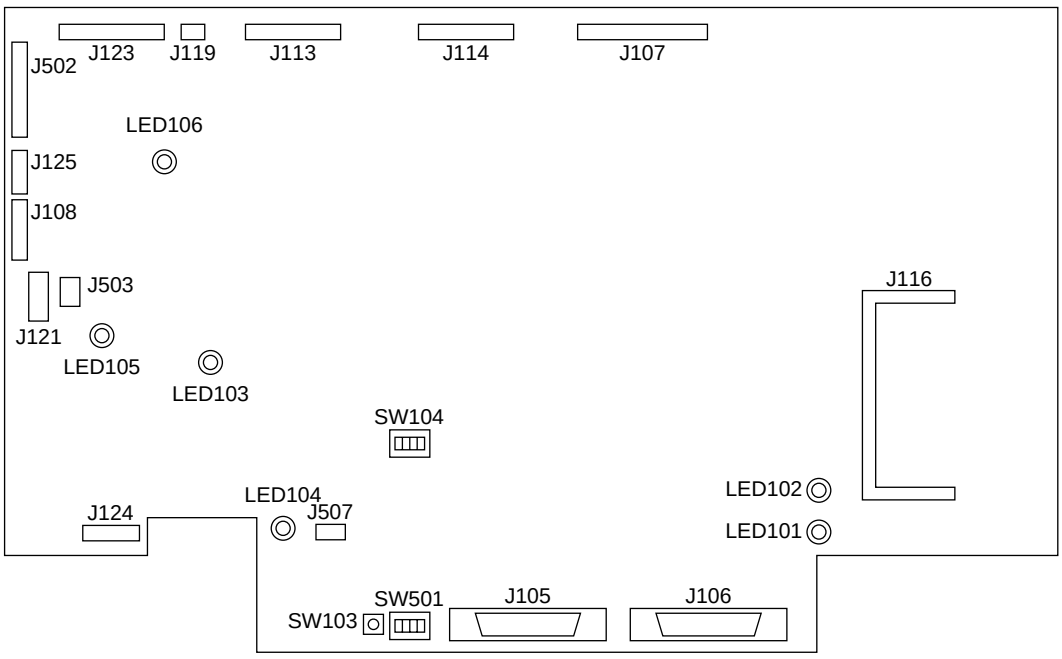


**Fig. 2-901**


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<table>
<tr><th>LED No.</th><th>Display</th></tr>
<tr><td>LED101<br>LED102</td><td>• Displays the CPU state
<table>
<tr><th>LED101</th><th>LED102</th><th>Meaning</th></tr>
<tr><td>OFF</td><td>flashing</td><td>Normal operation</td></tr>
<tr><td>flashing</td><td>OFF</td><td>Abnormal condition</td></tr>
<tr><td>flashing</td><td>flashing</td><td>Writing the software</td></tr>
</table></td></tr>
<tr><td>LED103</td><td>• +5V normal → lit</td></tr>
<tr><td>LED104</td><td>• +3.3V normal → lit</td></tr>
<tr><td>LED105</td><td>• +24V normal → lit</td></tr>
<tr><td>LED106</td><td>• -5V normal → lit</td></tr>
</table>

**Table 2-901**

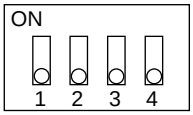
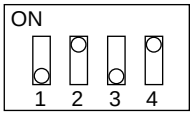
| Switch No. | Setting |
|---|---|
| SW103 | • Switch for the service mode<br>While pressing this switch, press the stop key on the operation panel, to enter the service mode.<br>**Note:** Do not turn the power switch on while pressing this switch. If this does occur, turn the power off immediately. |
| SW104 | • Switch for the designing section.<br>Turn all switches off. Do not change these settings in the field.<br>  |
| SW501 | • Switches for the SCSI interface<br>1: Terminator ON/OFF<br>2 to 4: SCSI ID setting<br>For details, refer to the instruction manual.<br>Initial setting<br>Terminator OFF, SCSI ID: 2<br>  |

**Table 2-902**

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## 2. Pickup Control PCB Assembly (K4-SUB)

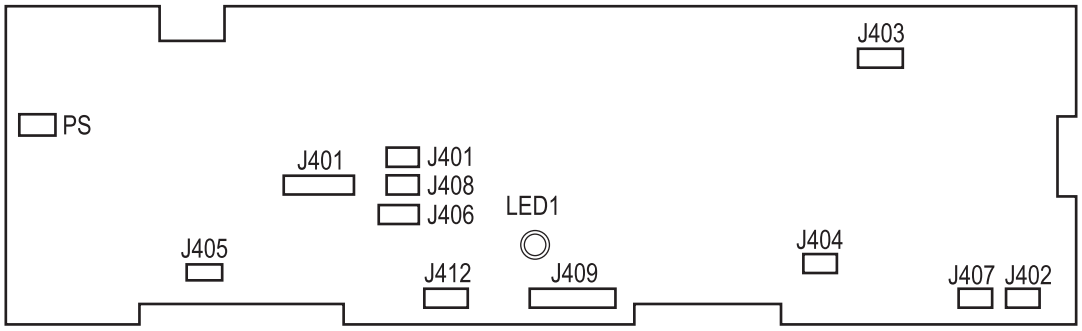


**Fig. 2-902**

| LED No. | Display |
|---|---|
| LED1 | CPU operates normally → flashing |

**Table 2-903**

## 3. Document Board Control PCB Assembly (K0-SUB2)

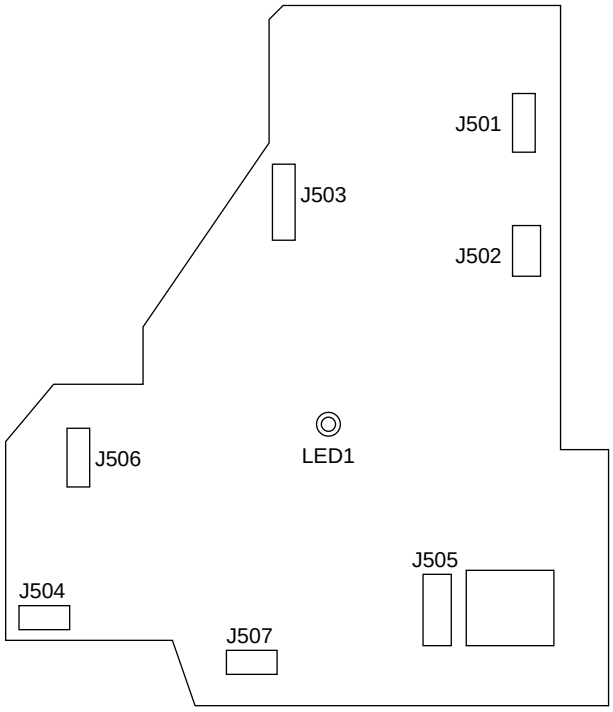


**Fig. 2-903**

| LED No. | Display |
|---|---|
| LED1 | CPU operates normally → flashing |

**Table 2-904**


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## 4. Filmer Control PCB Assembly (GH-DCON)

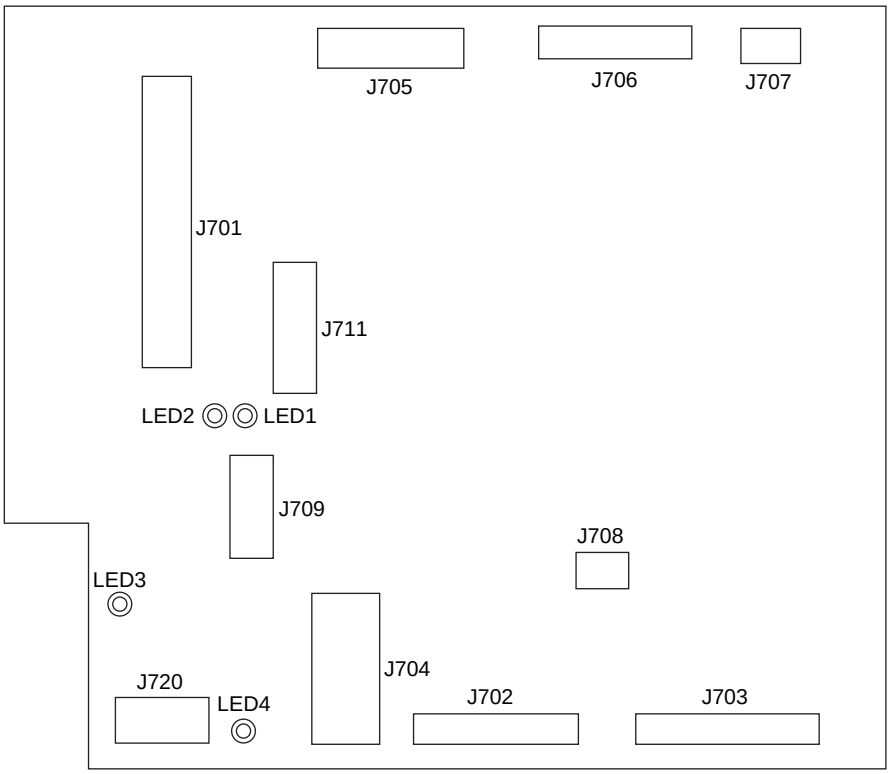
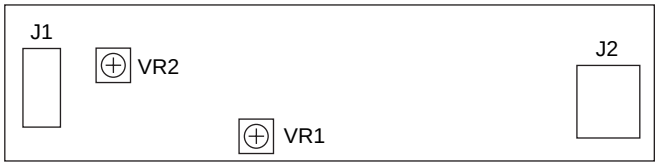



**Fig. 2-904**

| LED No. | Display |
|---|---|
| LED1 | CPU operates normally → flashing |
| LED2 | Not in use (lit) |
| LED3 | +24V normal → lit |
| LED4 | +5V normal → lit |

**Table 2-905**

## 5. Lamp PCB Assembly




**Note:** Does not use VRs.

**Fig. 2-905**

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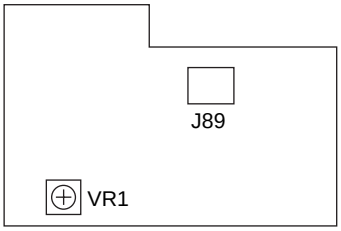
## 6. Lamp sensor PCB assembly




**Note:** Does not use VR.

**Fig. 2-906**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# CHAPTER 3

# DISASSEMBLY & REASSEMBLY

This chapter describes the disassembly and reassembly procedure.
When disassembling and reassembling the machine, observe the following:

1. Before starting the disassembly and reassembly operations be sure to disconnect the power to the machine for safety.
2. Reassembly can be performed by revercing the disassembly procedure unless otherwise mentioned.
3. In reassembly, do not confuse the type of screws (length and diameter) and their location.
4. To ensure positive continuity of electricity, a toothed washer is used on the ground retaining screw. Be sure to use this washer when reassembling the machine.
5. As a rule, do not operate the machine with any parts a removed.
6. Do not smudge or damage the glass parts such as the mirror or fluorescent lamp.



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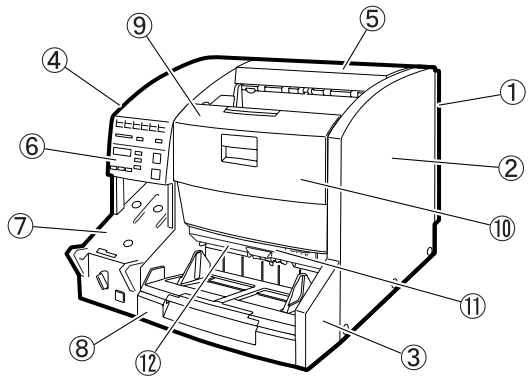
# I. EXTERNAL COVER



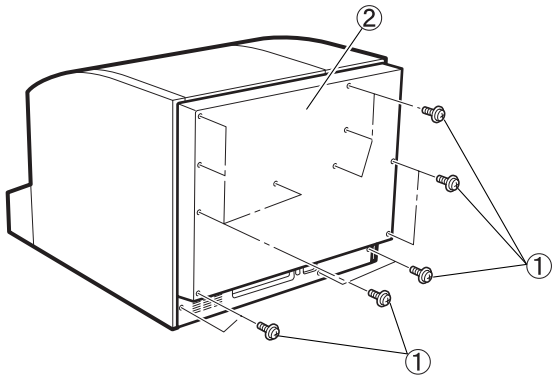

| | Screw | Hook |
|---|---|---|
| ① Rear cover | (13) | [0] |
| ② Right cover | (6) | [0] |
| ③ Front-right cover | (2) | [0] |
| ④ Left cover | (7) | [0] |
| ⑤ Top cover assembly | (4) | [0] |
| ⑥ Operation panel assembly | (3) | [0] |
| ⑦ Camera drive cover | (3) | [0] |
| ⑧ Front cover | (4) | [2] |
| ⑨ Upper delivery cover assembly | (4) | [0] |
| ⑩ Front optical cover | (6) | [0] |
| ⑪ Upper pickup cover assembly | (6) | [0] |
| ⑫ Front pickup cover | (2) | [0] |

**Note:** Figures inside parentheses ( ) show the number of fixing screws.
Figures inside brackets [ ] show the number of mounting hooks.

**Fig. 3-101**

## 1. Rear Cover

1) Remove 13 screws ① (washer-type, BH-W) and take off the rear cover ②.

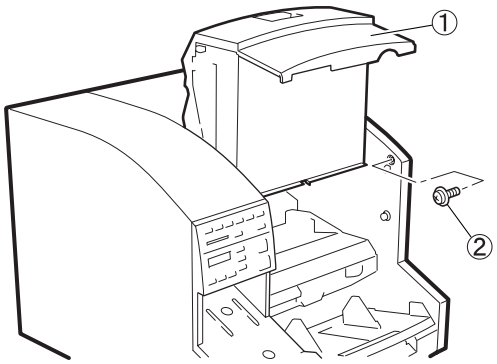



① Screw ② Rear cover

**Fig. 3-102**

## 2. Right Cover

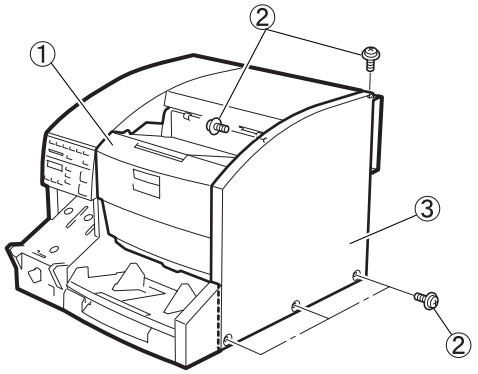
1) Take off the rear cover.
2) Open the upper unit ① and remove one screw ② (washer-type, BH-W).




① Upper unit ② Screw

**Fig. 3-103**

3) Close the upper unit ①, remove five screws ② (washer-type, BH-W), and take off the right cover ③.

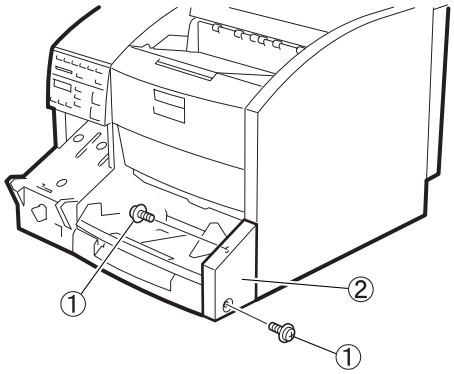



① Upper unit ② Screw
③ Right cover

**Fig. 3-104**

## 3. Front-right Cover

1) Remove two screws ① (one of which is a self-tapping screw, BH-W+BH-SELF-B) and take off the front-right cover ②.




① Screw ② Front-right cover

**Fig. 3-105**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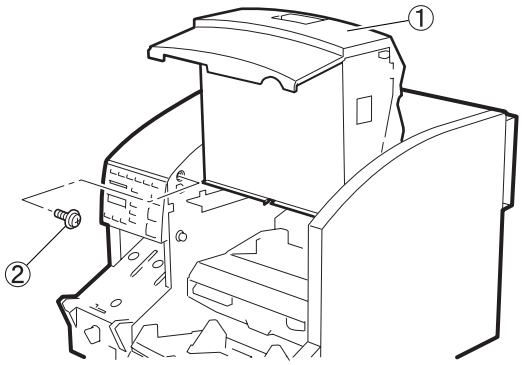
## 4. Left Cover

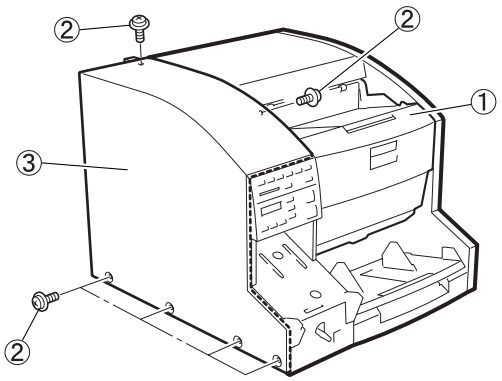
1) Take off the rear cover.
2) Open the upper unit ① and remove one screw ② (washer-type, BH-W).




① Upper unit ② Screw

**Fig. 3-106**

3) Close the upper unit ①, remove six screws ② (washer-type, BH-W), and take off the left cover ③.



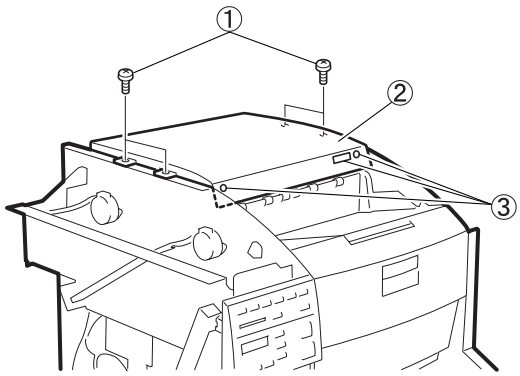

① Upper unit ② Screw
③ Left cover

**Fig. 3-107**

## 5. Top Cover

1) Take off the rear cover.
2) Take off the right cover and the left cover.
3) Remove four screws ① (BH-B) and take off the top cover assembly ②.

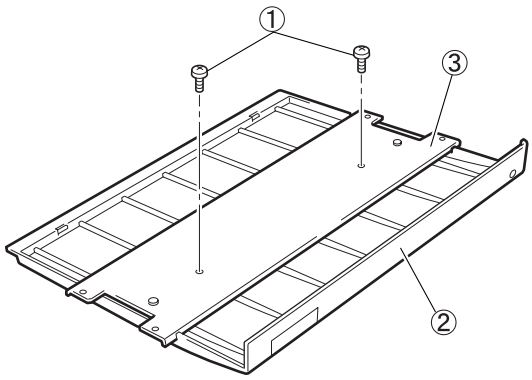
**Note:** Be aware that the blind plates A/B ③ may come off.




① Screw ② Top cover assembly
③ Blind plates A/B

**Fig. 3-108**

4) Remove two screws ① (self-tapping, BH-B) and separate the top cover ② from the reinforcing plate ③.




① Screw ② Top cover
③ Reinforcing plate

**Fig. 3-109**

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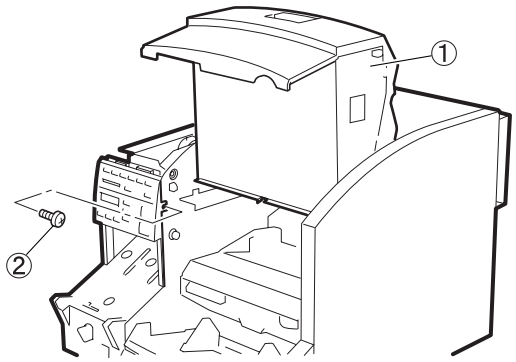
## 6. Operation Panel Assembly

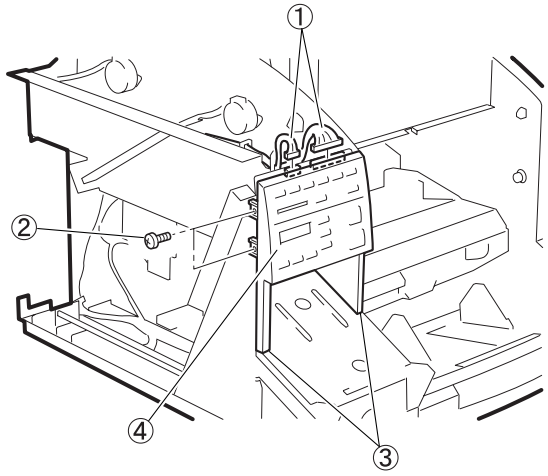
1) Take off the rear cover.
2) Take off the left cover.
3) Open the upper unit ① and remove one screw ② (BH-W).




① Upper unit ② Screw

**Fig. 3-110**

4) Unhook two connectors ①, remove two screws ② (BH-W), and disengage the fitted part ③ to take off the operation panel assembly ④.



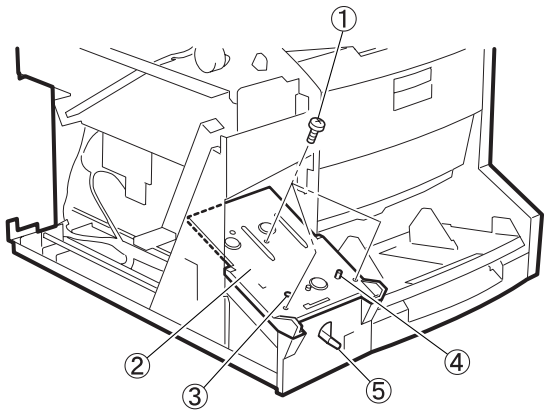

① Connector ② Screw
③ Fitted part ④ Operation panel assembly

**Fig. 3-111**

## 7. Camera Drive Cover

1) Take off the rear cover.
2) Take off the left cover.
3) Take off the operation panel assembly.
4) Remove three screws ① (BH-W) and take off the camera drive cover ②.
   Remove the sensing plate ③ and the pin ④ mounted on the back of the camera drive cover.

**Note:** Turn the lock lever ⑤ to the OFF position. Do not lose the sensing plate or the pin.




① Screw ② Camera drive cover
③ Sensing plate ④ Pin
⑤ Lock lever

**Fig. 3-112**

**Note:** Care is needed when reassembling because the drive transfer between the camera drive unit and the camera unit may be faulty if the cover is secured in the wrong position. For details, see “Chapter 6 IX-B-5. Camera unit lock lever / Parts related to the camera drive unit”.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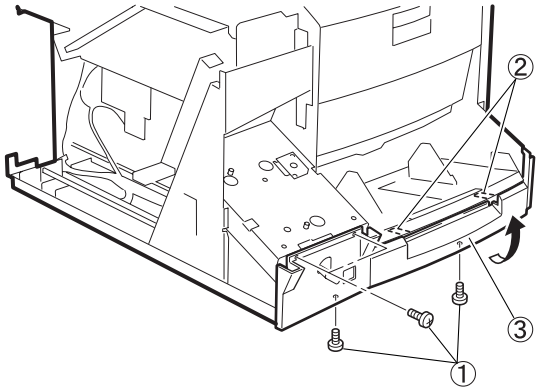
## 8. Front Cover

1) Take off the rear cover.
2) Take off the left cover.
3) Take off the operation panel assembly.
4) Take off the camera drive cover.
5) Take off the front-right cover.
6) Remove four screws ① (BH-W), and while releasing two hooks ②, turn the front cover ③ from below to remove it.

**Note:** Two screws are located at the bottom of the machine.



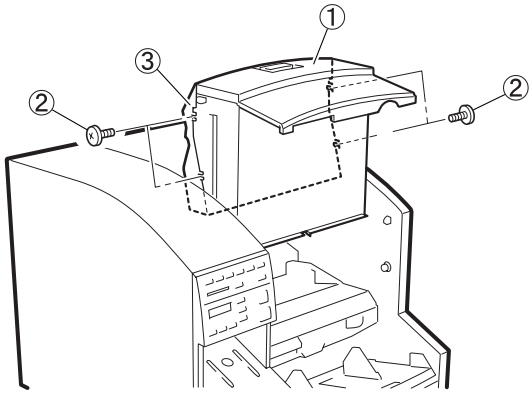

① Screw ② Hook
③ Front cover

**Fig. 3-113**

## 9. Upper Delivery Cover

1) Open the upper unit ①, remove four screws ② (flat-head, M4), and close the upper unit to take off the upper delivery cover assembly ③.

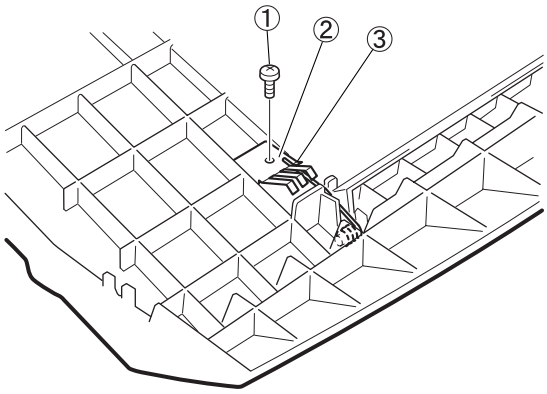
**Note:** Turn the screws carefully because their heads are shallow.




① Upper unit ② Screw
③ Upper delivery cover assembly

**Fig. 3-114**

2) Remove one screw ① (self-tapping, BH-SELF-B) on the back of the assembly, take off the earth plate ②, and release the end of the spring ③.




① Screw ② Earth plate
③ Spring

**Fig. 3-115**

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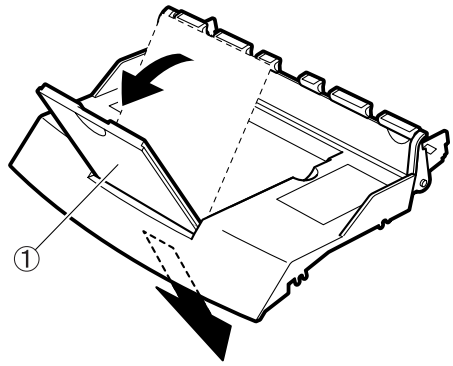
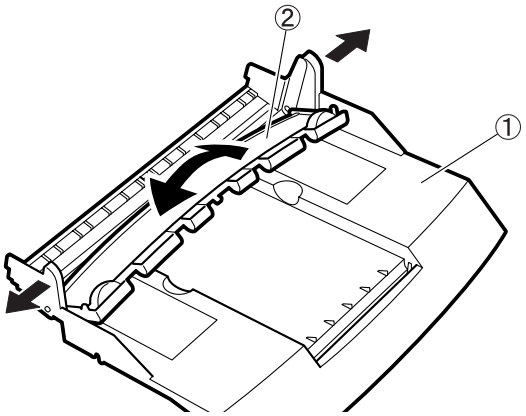
3) Turn the delivery tray assembly ① to take off it.




① Delivery tray assembly

**Fig. 3-116**

4) Open both sides of the upper delivery cover ① slightly, release the hooks of the IP cover ②, warp the cover to release the bosses on both sides, and take off the cover from the upper delivery cover.

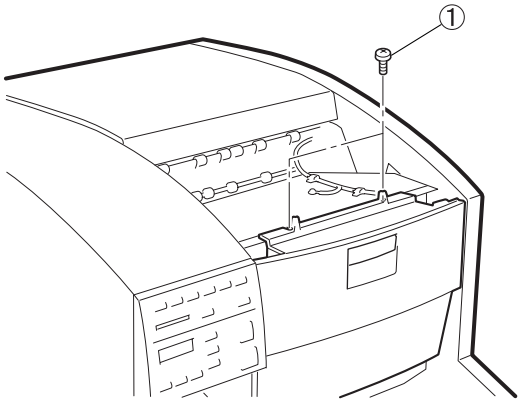



① Upper delivery cover ② IP cover

**Fig. 3-117**

## 10. Front Optical Cover

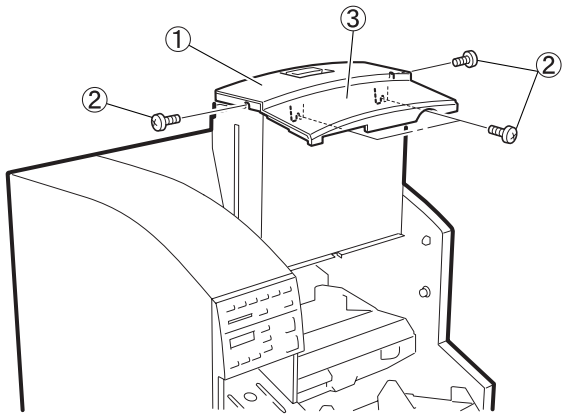
1) Take off the upper delivery cover assembly.
2) Remove two screws ① (BH-W).




① Screw

**Fig. 3-118**

3) Open the upper unit ①, remove four screws ② (BH-W), and take off the front optical cover ③.




① Upper unit ② Screw
③ Front optical cover

**Fig. 3-119**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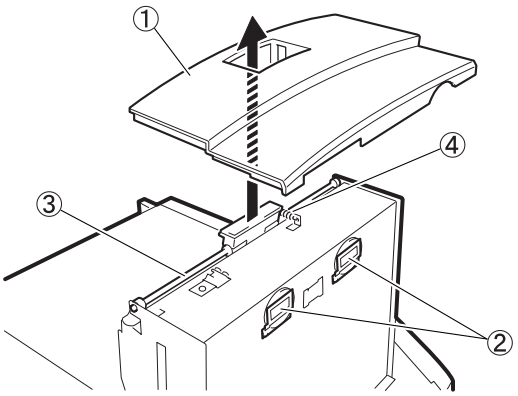
**Note:** When the front optical cover ① is removed, the service density filter ② (two units), the open/close shaft assembly ③, and a spring ④ may fall off.
When reassembling, position the open/close shaft assembly properly before attaching the front optical cover.

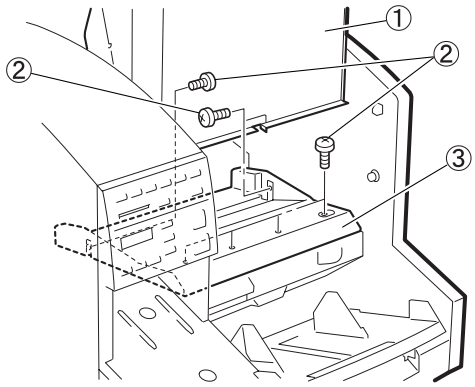



① Front optical cover ② Service density filter
③ Open/close shaft assembly
④ Spring

**Fig. 3-120**

## 11. Upper Pickup Cover

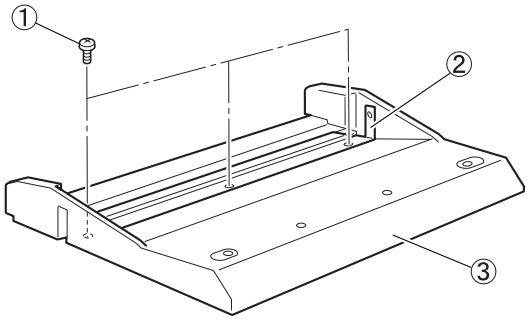
1) Open the upper unit ①, remove six screws ② (BH-W), and take off the upper pickup cover assembly ③.




① Upper unit ② Screw
③ Upper pickup cover assembly

**Fig. 3-121**

2) Remove three screws ① (self-tapping, BH-W), and separate the upper pickup cover ③ from the mounting plate ②.




① Screw ② Mounting plate
③ Upper pickup cover

**Fig. 3-122**

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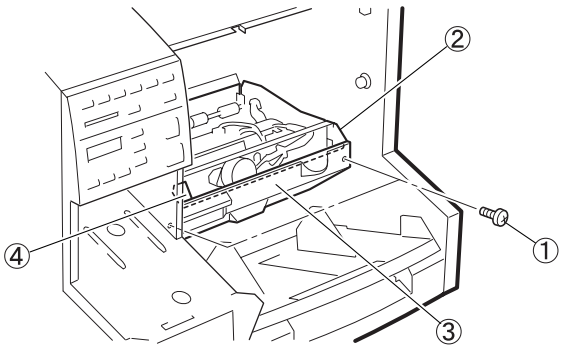
## 12. Front Pickup Cover

1) Take off the upper pickup cover assembly.
2) Remove two screws ① (BH-W), open the feed unit ② slightly so as not to hit the screws protruding from the side plate, and take off the front pickup cover assembly ③. Take off the open/close shaft assembly ④ as well.

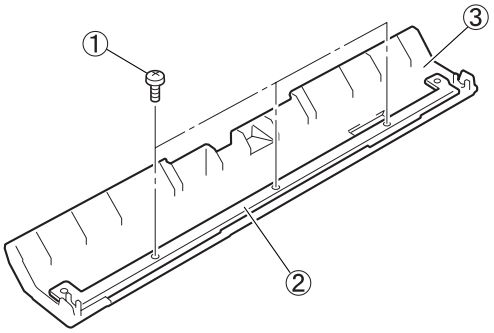



① Screw ② Feed unit
③ Front pickup cover assembly
④ Open/close shaft assembly

**Fig. 3-123**

**Note:** When the front pickup cover assembly is removed, the open/close shaft assembly may come off. When reassembling, position the open/close shaft assembly properly before attaching the front pickup cover assembly.

3) Remove three screws ① (self-tapping, BH-B) and separate the front pickup cover ② from the mounting plate ③.




① Screw ② Front pickup cover
③ Mounting plate

**Fig. 3-124**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# II. MAIN UNIT

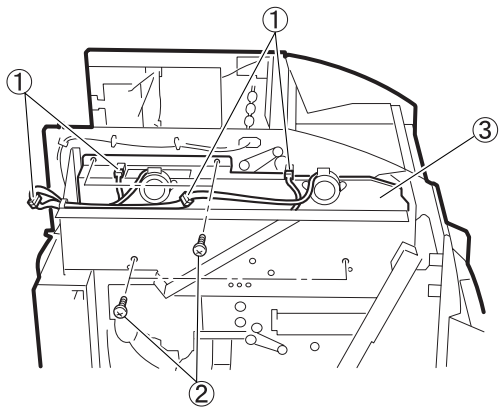
## 1. Upper Unit

1) Take off the rear cover.
2) Take off the right cover and the left cover.
3) Take off the upper delivery cover assembly.
4) Take off the front optical cover and the open/close shaft assembly.

**Note:** Be careful not to drop the service density filter.
When opening or closing the upper unit with the open/close shaft assembly removed, release the left and right locks manually.

5) Unhook four connectors ①, remove four screws ② (BH-B), and take off the slit unit ③.

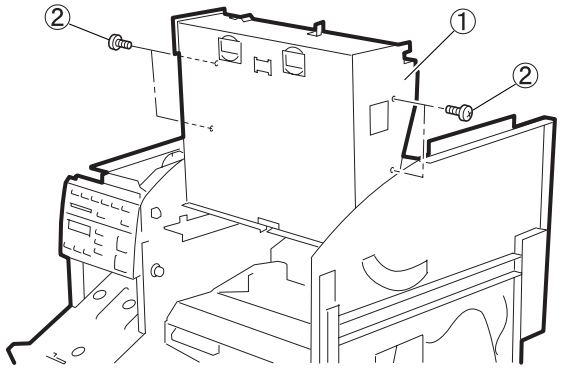
**Note:** Do not smudge or damage the mirror.




① Connector ② Screw
③ Slit unit

**Fig. 3-201**

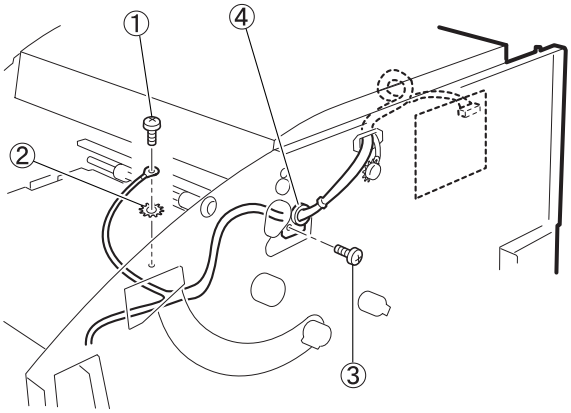
6) Open the upper unit ① and remove four screws ② (BH-B).




① Upper unit ② Screw

**Fig. 3-202**

7) Close the upper unit, remove one screw ① (BH-W) and the toothed washer ②. Remove one screw ③ (TP-B) and pull out the cable assembly guide ④.




① Screw ② Toothed washer
③ Screw ④ Cable assembly guide

**Fig. 3-203**

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**Note:** The cable assembly guide for the upper unit has a longer edge. Be careful not to make a mistake when reassembling.

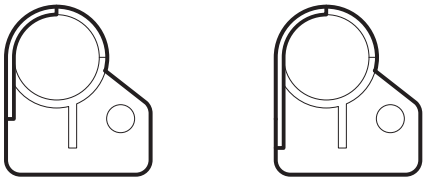
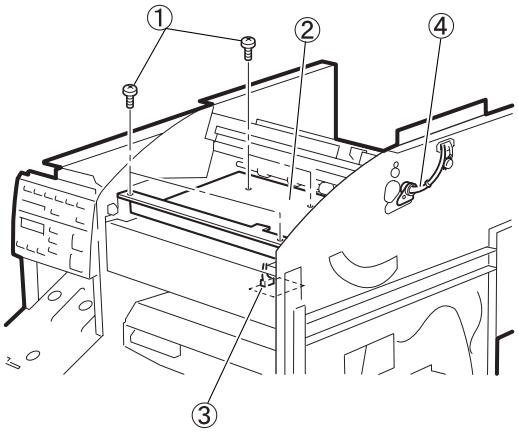



**Fig. 3-204**

8) Remove four screws ① (BH-B), lift the middle plate ② slightly to unhook one connector ③ inside, and take off the middle plate. Pull out the cable assembly ④ as well.

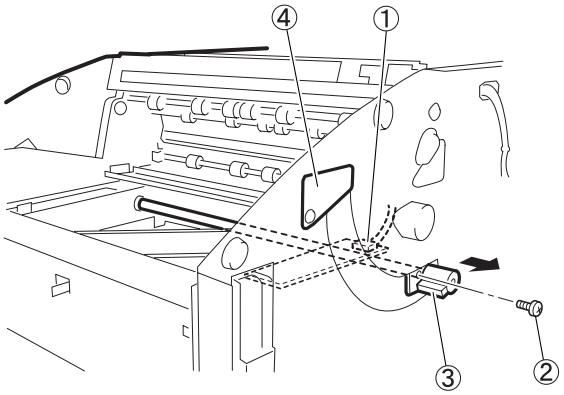



① Screw ② Middle plate
③ Connector ④ Cable assembly

**Fig. 3-205**

9) Unhook one connector ① (locking-type) for the fluorescent lamp, remove one screw ② (BH-B, L6), and dismount the fluorescent lamp ③.

**Note:** Do not smudge or damage the fluorescent lamp. Position the shading plate ④ to cover the hole. Do the same for the left shading plate.




① Connector ② Screw
③ Fluorescent lamp ④ Shading plate

**Fig. 3-206**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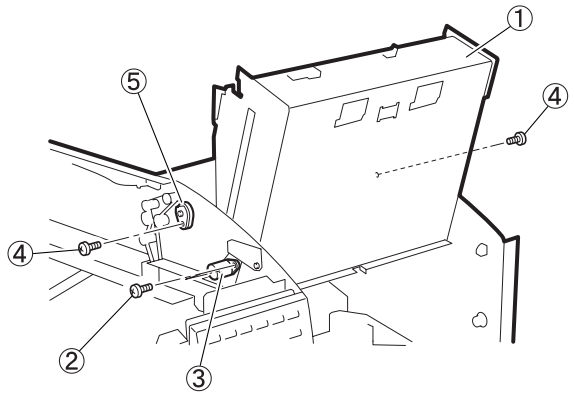
10) Open the upper unit ①, remove two screws ② (BHB, L6), and take off the fluorescent lamp support ③.
While slightly closing the upper unit and holding it, remove two screws ④ (TP-B, one on each side) to take off the pivot assembly ⑤, and then remove the upper unit.




① Upper unit ② Screw
③ Fluorescent lamp support ④ Screw
⑤ Pivot assembly

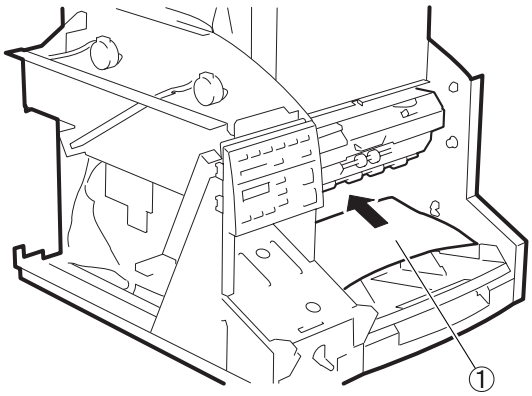
**Fig. 3-207**

**Note:** When reassembling, check the positions of the damper on the right plate and the gear of the upper unit, and also check the positions of the left and right pivot assemblies.

## 2. Feed Unit

1) Take off the rear cover.
2) Take off the right and left covers.
3) Take off the upper pickup cover.
4) To protect the reading glass, insert a soft sheet ① into the reading assembly.

**Note:** Use the same sheet when reassembling.

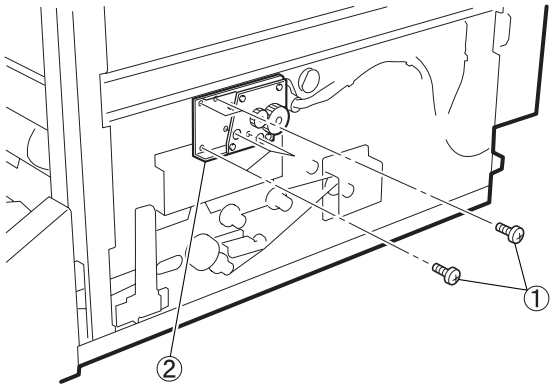



① Sheet

**Fig. 3-208**

5) Remove five screws ① (with round-tip, BH-B) and take off the damper unit ②.

**Note:** Since the damper function does not work when the damper unit is removed, be careful not to get hands or fingers caught in the feed unit.




① Screw ② Damper unit

**Fig. 3-209**

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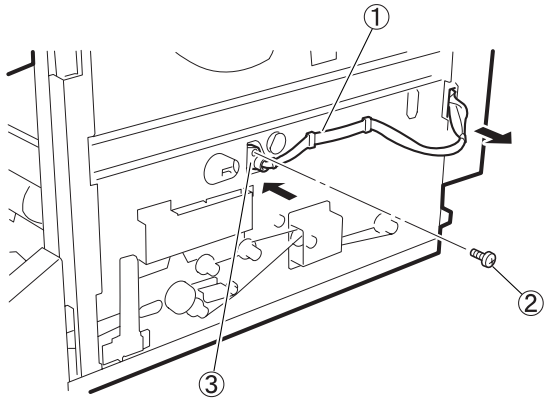
6) Unhook three connectors (that for the DC power supply is a locking-type connector) from the main CPU PCB assembly and pull out the cable assembly ①.
Remove one screw ② (TP-B) and pull out the cable assembly guide ③.

**Note:** When removing the feed unit, store the cable assembly in the feed unit so as not to damage the cable assembly.




① Cable assembly ② Screw
③ Cable assembly guide

**Fig. 3-210**

**Note:** The cable assembly guide for the feed unit has a shorter edge. Be careful not to make a mistake when reassembling.

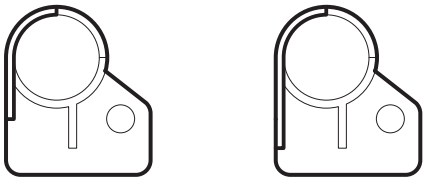
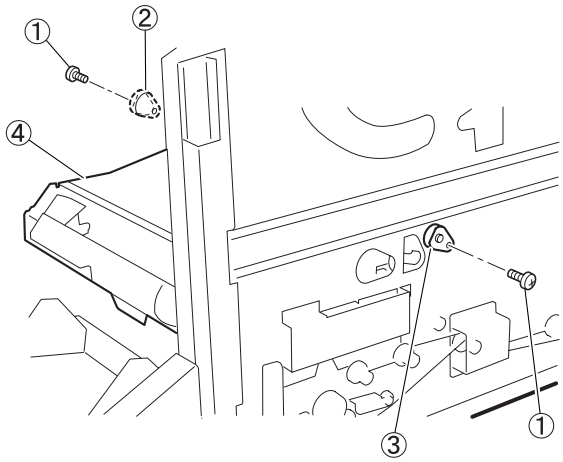



**Fig. 3-211**

7) Remove two screws ① (one on either side, TP-B), take off the left pivot assembly ② and the right pivot assembly ③, and open the feed unit ④ slightly to take off the feed unit

**Note:** The left pivot assembly and the right pivot assembly are not the same shape. The left pivot assembly has a larger cutting plane of the metal plate.




① Screw ② Left pivot assembly
③ Right pivot assembly ④ Feed unit

**Fig. 3-212**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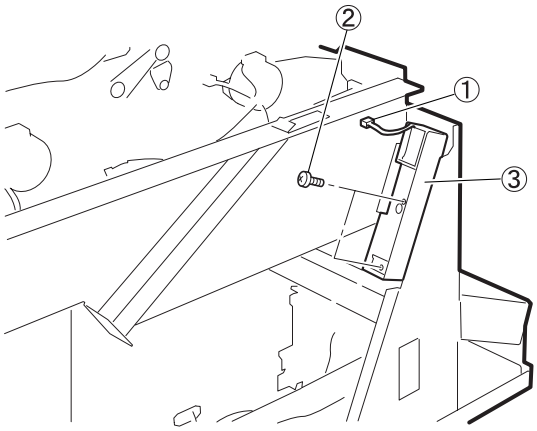
## 3. Camera Drive Unit

1) Take off the rear cover.
2) Take off the front-right cover.
3) Take off the left cover.
4) Take off the operation panel assembly.
5) Take off the camera drive cover.
6) Take off the front cover.
7) Unhook one connector ①, remove two screws ② (BH-B), and take off the shutter unit ③.

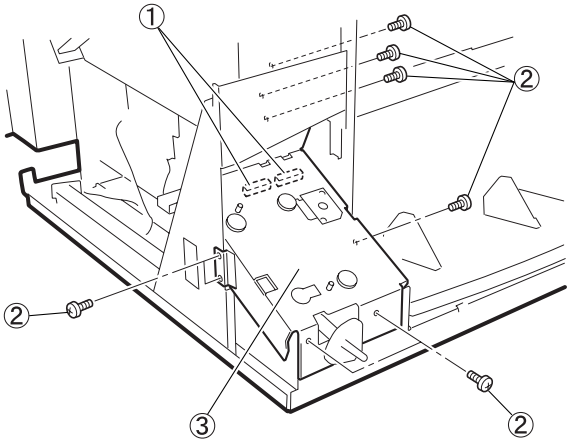



① Connector ② Screw
③ Shutter unit

**Fig. 3-213**

8) Open the feed unit, unhook two connectors ①, remove eight screws ② (BH-B) on the rear side, and take off the camera drive unit ③.

**Note:** Since the camera drive unit is heavy and has a narrow clearance, remove it carefully so as not to hit or damage parts such as the PCB assembly on the back.




① Connector ② Screw
③ Camera drive unit

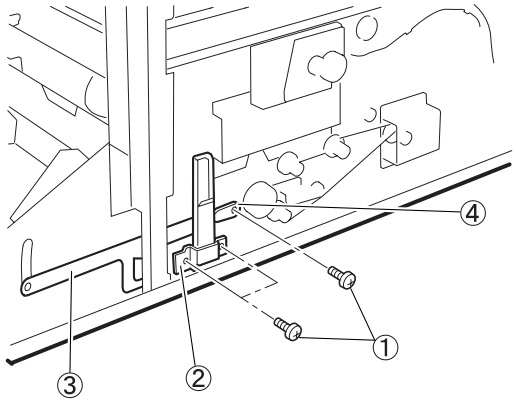
**Fig. 3-214**

**Note:** As is the case with disassembly, be careful not to strike or damage the parts when reassembling. Check the positioning before tightening the screws. The shutter unit has two positioning places, and the camera drive unit has one positioning place on the front side and two positioning places on the right side.

## 4. Document Board Assembly

1) Remove the camera drive unit. For details, see the previous section “3. Camera drive unit”.
2) Take off the right cover and the front-right cover.
3) Remove three screws ① (BH-B), take off the locking assembly ②, and remove the right document board arm ③ and the link plate ④.

**Note:** When reassembling the locking assembly, check the two positioning places.

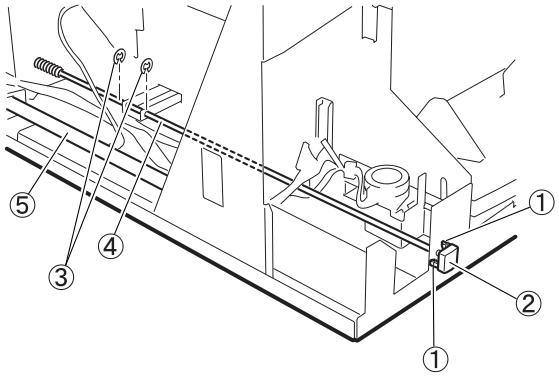



① Screw ② Locking assembly
③ Right document board arm
④ Link plate

**Fig. 3-215**

4) Release two hooks ① and take off the power switch key ②.
Unfasten two E-ring ③, and slide the power switch shaft assembly ④ to take off it.

**Note:** Be careful not to damage or smudge the mirror ⑤.

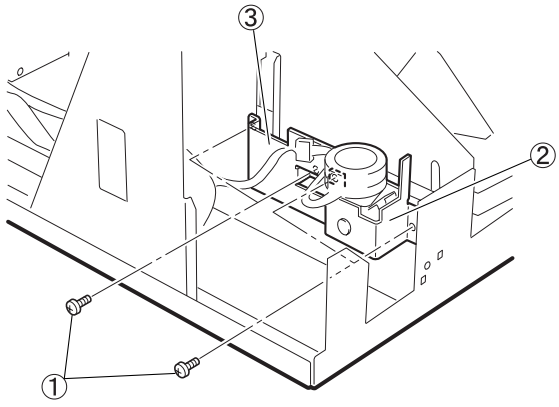



① Hook ② Power switch key
③ E-ring ④ Power switch shaft assembly
⑤ Mirror

**Fig. 3-216**

5) Remove four screws ① (BH-B) and take off the document board drive assembly ② and the document board sensor assembly ③.

**Note:** When removing the document board drive assembly, be aware that the inside bushing will come off.




① Screw
② Document board drive assembly
③ Document board sensor assembly

**Fig. 3-217**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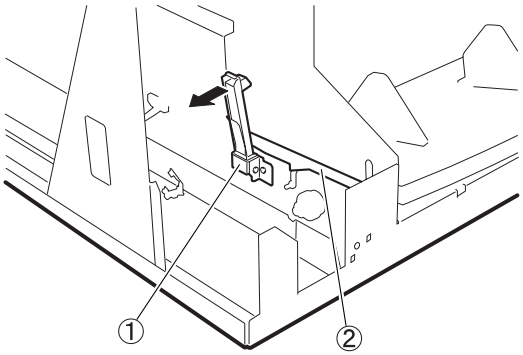
6) Pull the upper part of the locking assembly ① frontward and take off the left document board arm ②.

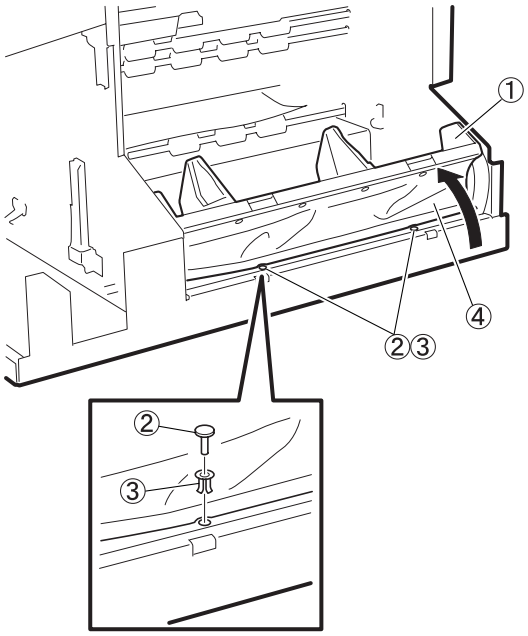
**Note:** Be careful not to deform the left document board arm.




① Locking assembly
② Left document board arm

**Fig. 3-218**

7) While lifting the front side of the document board assembly ①, insert a tool with a thin, flat tip between the pin ② and stopper ③, pull out the two pins, remove the stopper, and then separate the barrier sheet ④ from the machine body.




① Document board assembly ② Pin
③ Stopper ④ Barrier sheet

**Fig. 3-219**

**Note:** When the pin or the stopper becomes deformed, replace it with the new one.

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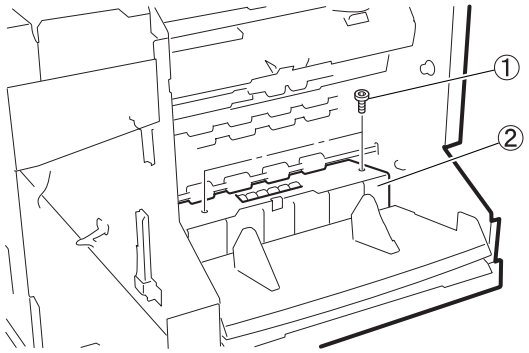
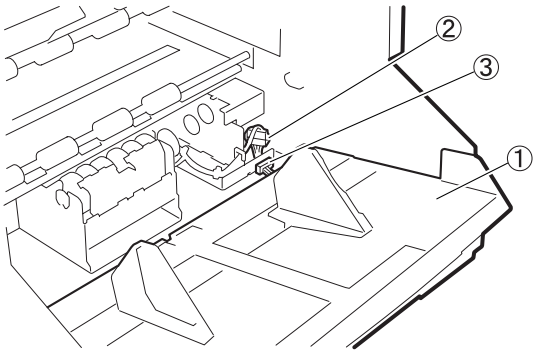
8) Remove two screws ① (hex socket, flat-headed) and take off the lower paper inlet guide ②.




① Screw ② Lower paper inlet guide

**Fig. 3-220**

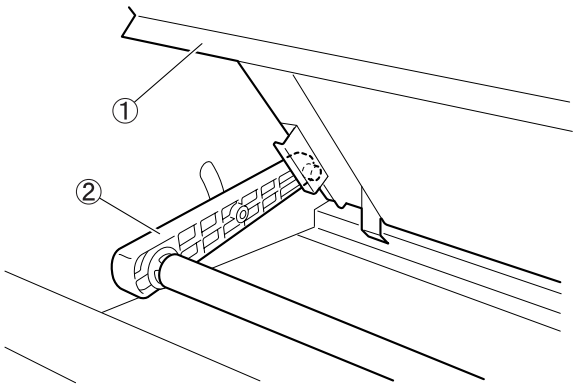
9) Pull the document board assembly ① slightly frontward, unhook one connector ② and the cable clamp ① (locking-type), and take off the document board assembly.




① Document board assembly
② Connector ③ Cable clamp

**Fig. 3-221**

**Note:** When reassembling, fit the left and right guides of the document board assembly ① into the protrusion on the document board raising/lowering arm ②.




① Document board assembly
② Document board raising/lowering arm

**Fig. 3-222**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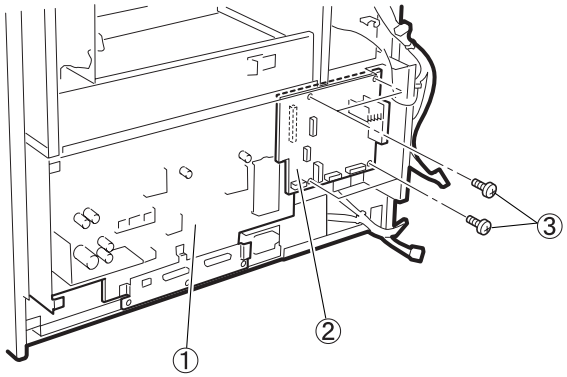
## 5. Back Plate Assembly

1) Take off the rear cover.
2) Unhook every connector from the main CPU PCB ① assembly and on the filmer control PCB assembly ②, remove four screws ③ (BH-W), and dismount the filmer control PCB assembly.

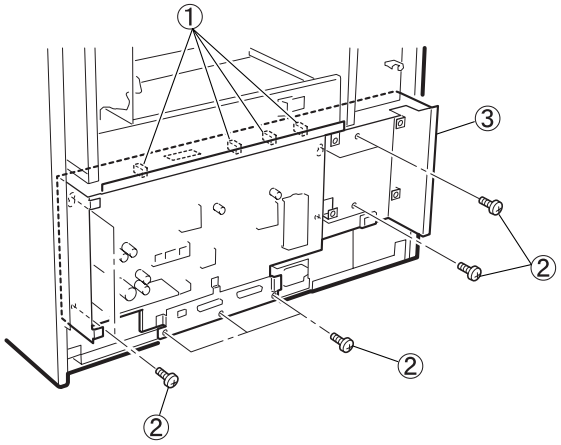
**Note:** The main CPU PCB assembly and the filmer control PCB assembly are connected by one connector located on the back of the filmer control PCB assembly. When reassembling, check the positions for press-fitting.




① Main CPU PCB
② Filmer control PCB assembly
③ Screw

**Fig. 3-223**

3) Unfasten four cable clamps ① (locking-type), remove nine screws ② (BH-W), and take off the back plate assembly ③.




① Cable clamps ② Screw
③ Back plate assembly

**Fig. 3-224**

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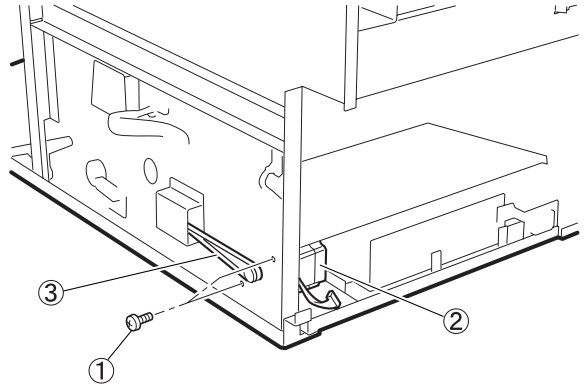
# III. DRIVE ASSEMBLIES (MOTORS AND BELTS)

## A. Document Feeding

### 1. Main Motor

1) Take off the camera drive unit. For details, see section “II-5. Back plate assembly.”
2) Take off the right cover.
3) Remove two screws ① (TP-B) and dismount the main motor ②.

**Note:** For information on the belt ③, refer to “8. Drive sharing plate (right-side belt)”.

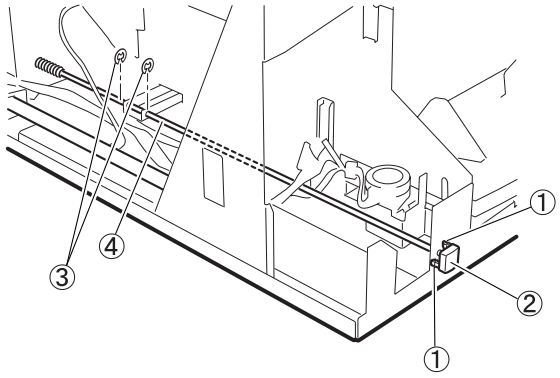



① Screw ② Main motor
③ Belt

**Fig. 3-301**

### 2. Document Board Motor

1) Take off the camera drive unit. For details, see section “II-3. Camera drive unit.”
2) Release two hooks ① and remove the power switch key ②.
   Unfasten two E-ring ③ and slide off the power switch shaft assembly ④.

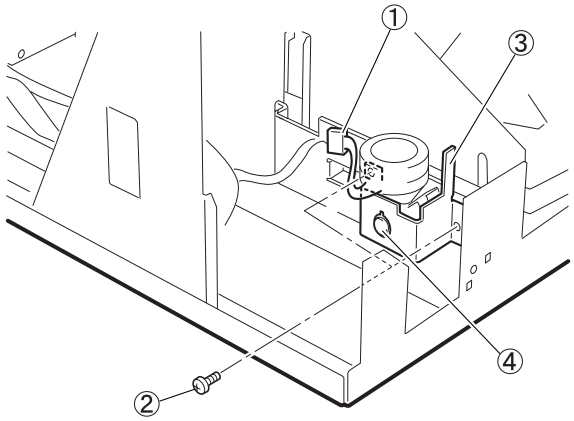



① Hook ② Power switch key
③ E-ring ④ Power switch shaft assembly

**Fig. 3-302**

3) Unhook one connector ①, remove two screws ② (BH-B), and take off the document board drive assembly ③.

**Note:** When removing the document board drive assembly, be aware that the inside bushing ④ may come off. When reassembling, check the positioning before fixing the bushing.




① Connector ② Screw
③ Document board drive assembly
④ Bushing

**Fig. 3-303**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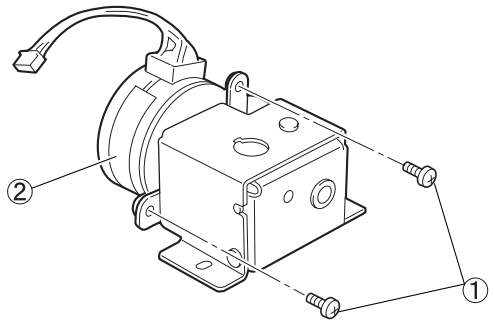
4) Remove two screws ① (BH-W, L4) and dismount the document board motor ②.

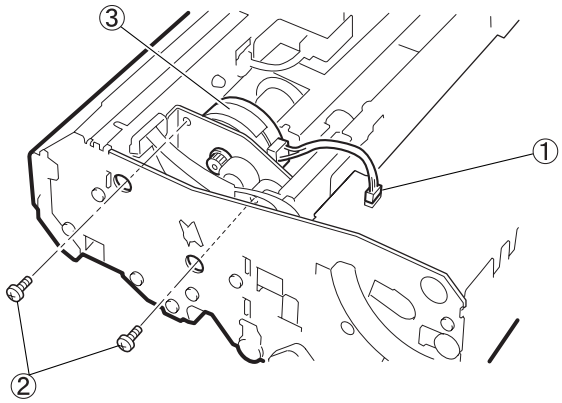



① Screw ② Document board motor

**Fig. 3-304**

## 3. Pickup Motor

1) Take off the feed unit. For details, see section “II-2. Feed unit.”
2) Unhook one connector ① and remove two screws ② (BH-W) to dismount the pickup motor ③.

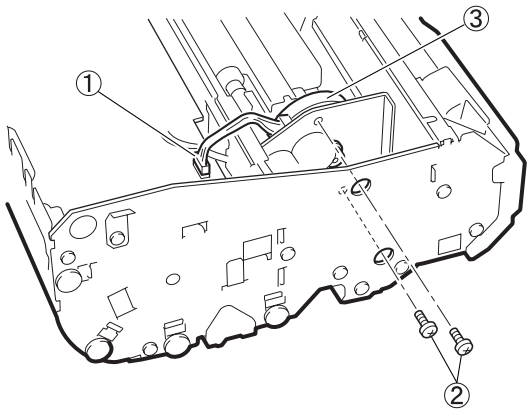



① Connector ② Screw
③ Pickup motor

**Fig. 3-305**

## 4. Feeding Motor

1) Take off the feed unit. For details, see section “II-2. Feed unit.”
2) Unhook one connector ① and remove two screws ② (BH-W) to dismount the feeding motor ③.




① Connector ② Screw
③ Feeding motor

**Fig. 3-306**

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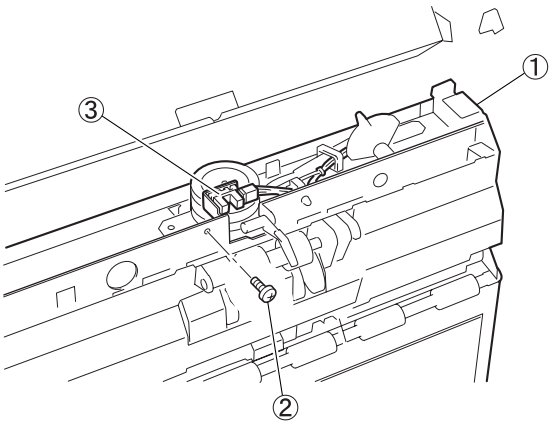
## 5. Gap Adjusting Motor

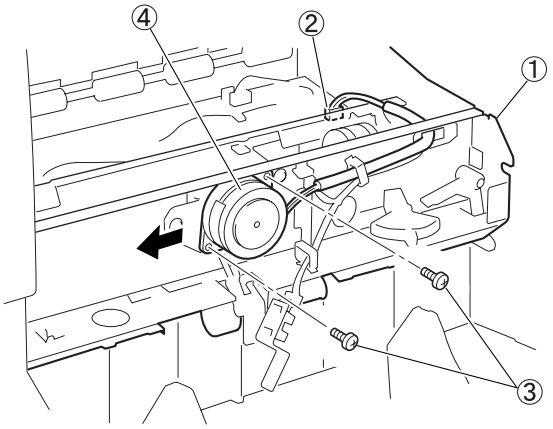
1) Take off the upper pickup cover.
2) Take off the front pickup cover and the open/close shaft assembly.
3) Release the locks on the right and left sides manually to open the feed unit ①, and remove one screw ② (BH-W) to take off the pickup sensor assembly ③.




① Feed unit ② Screw
③ Pickup sensor assembly

**Fig. 3-307**

4) Close the feed unit ①, unhook one connector ②, and remove two screws ③ (BH-W). Then, turn the shutter on the back side to let it escape from the sensor, and slide the gap adjusting motor ④ to the left to dismount it.

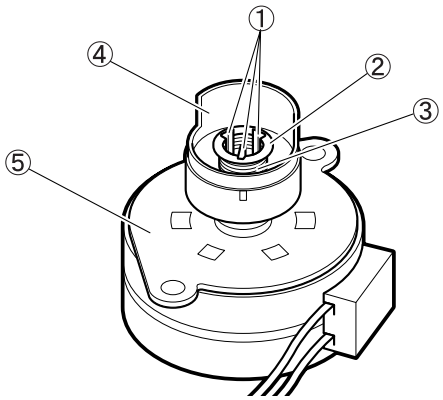



① Feed unit ② Connector
③ Screw ④ Gap adjusting motor

**Fig. 3-308**

5) While releasing three hooks ①, remove the washer ②, spring ③, and shutter ④ to dismount the gap adjusting motor ⑤.

**Note:** Be careful not to damage the hooks.




① Hook ② Washer
③ Spring ④ Shutter
⑤ Gap adjusting motor

**Fig. 3-309**

**Note:** After reassembling, position the cam and shutter properly, and check and adjust the gap reference position. For details, see "Chapter 6 III-I. Gap Adjustment Mode."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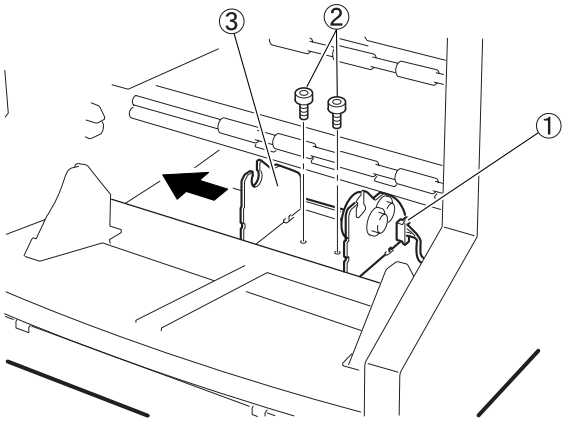
## 6. Separation Motor

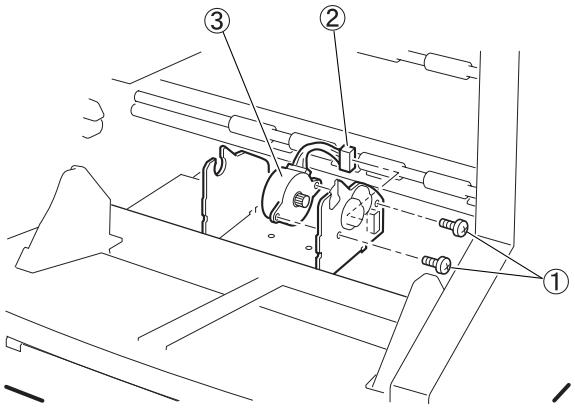
1) Take off the separation roller. For details, see section “IV-3. Separation roller.”
2) Unhook one connector ①, remove two hex socket bolts ②, and shift the separation roller base assembly ③ to the left.




① Connector ② Hex socket bolts
③ Separation roller base assembly

**Fig. 3-310**

3) Remove two screws ① (TP-B), unhook one connector ②, and dismount the separation motor ③.

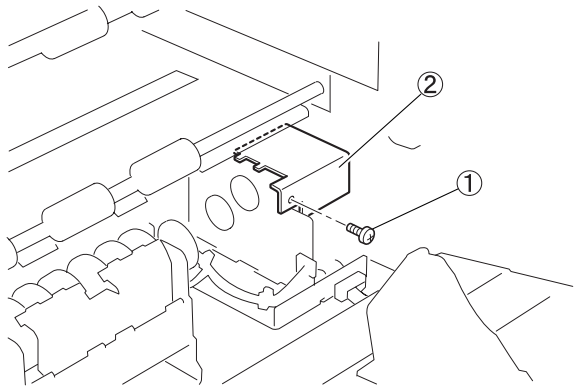



① Screw ② Connector
③ Separation motor

**Fig. 3-311**

## 7. Registration Clutch

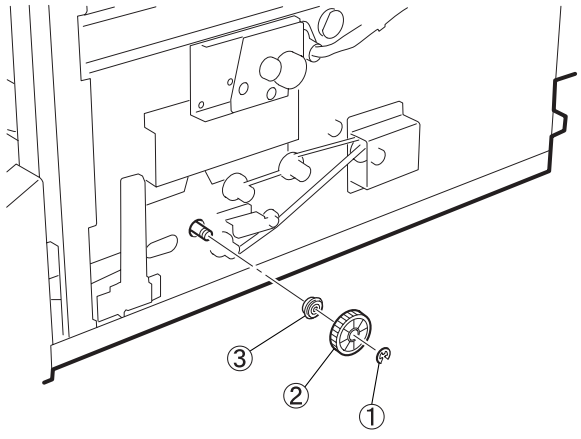
1) Take off the rear cover.
2) Take off the right cover and the left cover.
3) Take off the upper registration roller and the lower registration roller. For details, see section “IV-5. Lower registration roller.”
4) Remove one screw ① (BH-B) and the cover ②.




① Screw ② Cover

**Fig. 3-312**

5) Unfasten one E-ring ①, and remove the gear ② and the ball bearing ③.




① E-ring ② Gear
③ Ball bearing

**Fig. 3-313**

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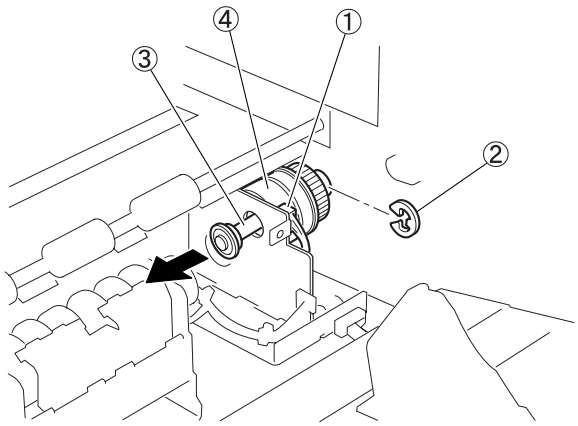
6) Disconnect one connector ①, unfasten one E-ring ②, pull out the clutch shaft assembly ③, and take off the registration clutch ④.

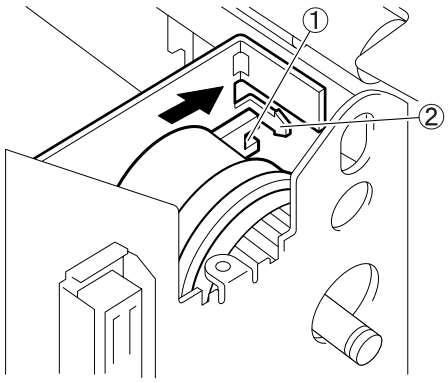
**Note:** Be aware that the washer on the clutch shaft assembly may come off.




① Connector ② E-ring
③ Clutch shaft assembly ④ Registration clutch

**Fig. 3-314**

**Note:** When reassembling, fit the positioning groove ① of the registration clutch to the protrusion of the mount plate ②, and check the D-cut positions on the clutch shaft. When press-fitting the E-ring that was removed in step 6) above, use the E-ring press-fitting tool.

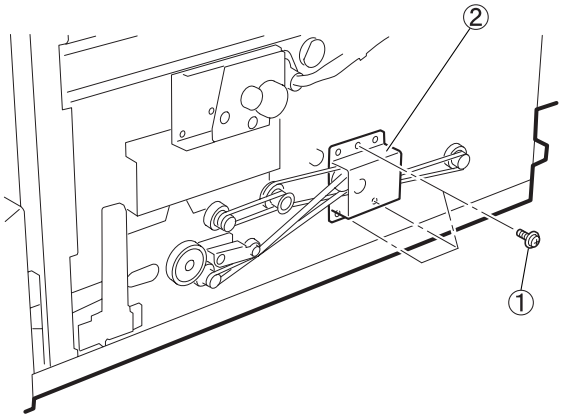



① Positioning groove ② Mount plate

**Fig. 3-315**

## 8. Drive sharing plate (right-side belt)

1) Take off the rear cover.
2) Take off the right cover.
3) Remove three screws ① (TP-B) and take off the drive sharing plate assembly ②.




① Screw ② Drive sharing plate assembly

**Fig. 3-316**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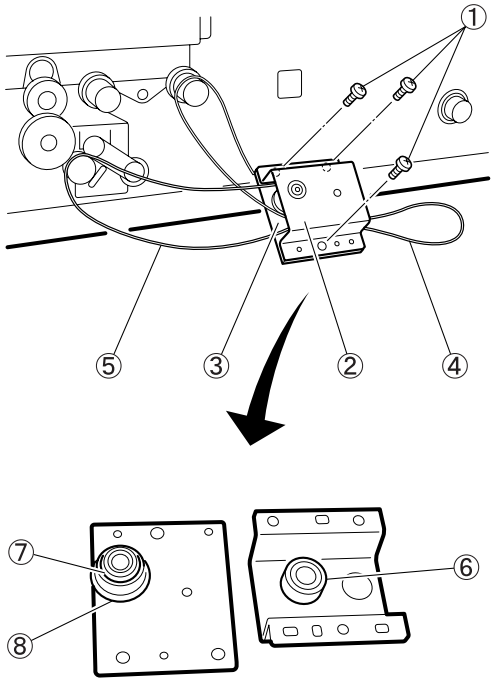
4) Remove three screws ① (BH-B, L6) and separate sharing plate A ② from sharing plate B ③. Take off belt A ④ and belt B ⑤ as well.

**Note:** Sharing plate A is installed with the ball bearing ⑥. Another ball bearing ⑦ and the gear assembly ⑧ are installed between sharing plates A and B.




① Screw
② Sharing plate A
③ Sharing plate B
④ Belt A
⑤ Belt B
⑥ Ball bearing
⑦ Ball bearing
⑧ Gear assembly

**Fig. 3-317**

**Note:** When reassembling, place the belts in the proper positions. Adjust and fix the positions of the drive sharing plates after reassembling to feed the belts properly. Maintain belt tension so that they do not slip or skip teeth, and maintain clearance between the upper and lower sides of each belt so they do not touch.

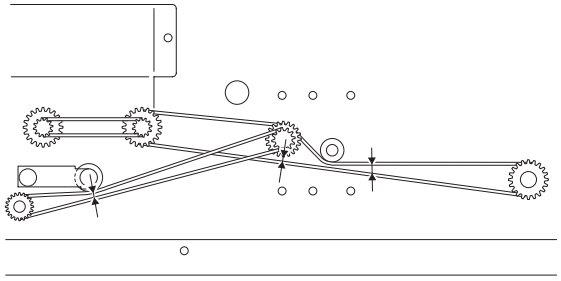
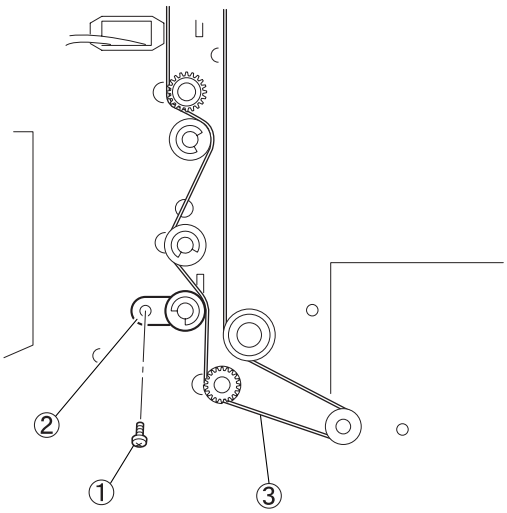


**Fig. 3-318**

## 9. Left-side belt

1) Take off the rear cover.
2) Take off the left cover.
3) Remove one screw ① (TP-B), dismount the tensioner ② and take off the belt ③.

**Note:** Be careful not to damage or smudge the mirror.




① Screw ② Tensioner ③ Belt

**Fig. 3-319**

**Note:** When reassembling, hang the belts properly and provide moderate tension using the tensioner. Maintain proper tension so that the belts do not slip or skip teeth, but do not set too much tension.

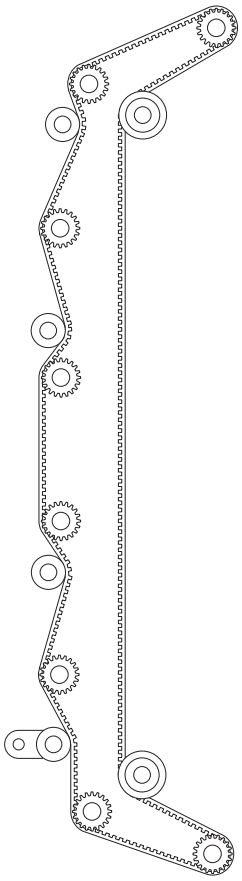


**Fig. 3-320**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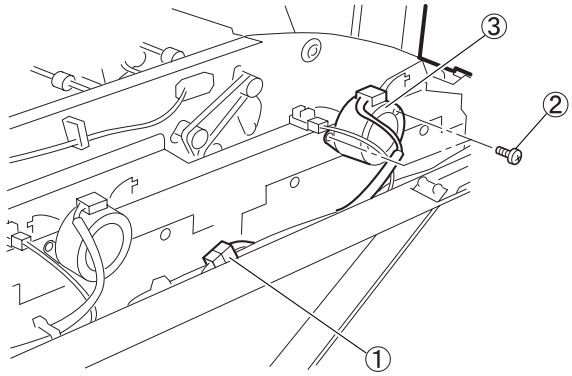
# B. Filmer

## 1. Front Side Slit Motor

1) Take off the rear cover.
2) Take off the left cover.
3) Unhook one connector ①, remove two screws ② (BH-B), and dismount the motor ③.

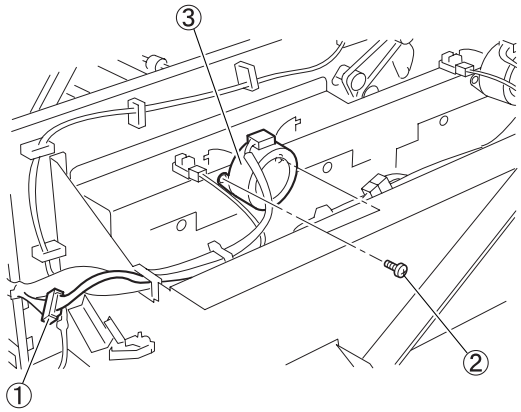



① Connector ② Screw ③ Motor

**Fig. 3-321**

## 2. Back Side Slit Motor

1) Take off the rear cover.
2) Take off the left cover.
3) Unhook one connector ①, remove two screws ② (BH-B), and dismount the motor ③.



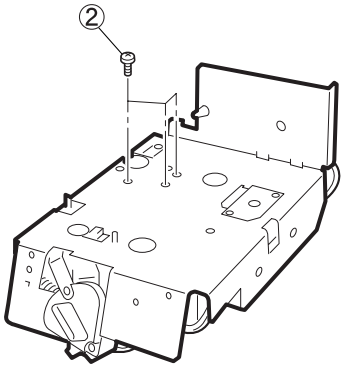

① Connector ② Screw ③ Motor

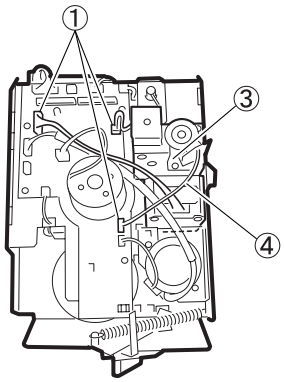
**Fig. 3-322**

## 3. Capstan Motor

1) Take off the camera drive unit. For details, see section "II-3. Camera drive unit."
2) Unhook three connectors ①, remove three screws ② (BH-B, L6), and slide the capstan drive assembly ③ off.

**Note:** When reassembling, tie down the other cables using cable A ④ so as not to allow slack in the cables, to avoid their getting caught on the sensors. Do the same when assembling and reassembling the motors related to the other camera-driven units.



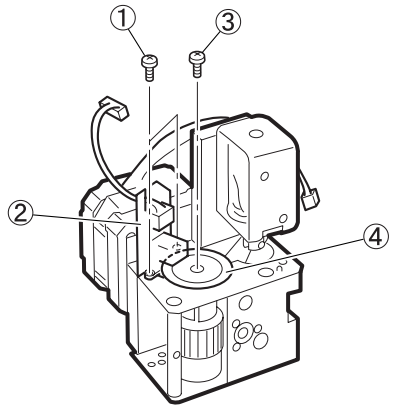




① Connector ② Screw
③ Capstan drive assembly ④ Cable A

**Fig. 3-323**

3) Remove two screws ① (BH-B, M2) and dismount the encoder PCB assembly ②. Remove one screw ③ (BH-B) and take off the encoder board ④.

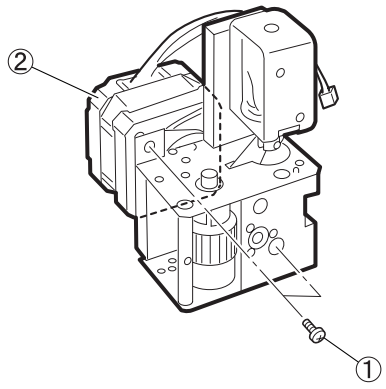
**Note:** Be aware that the encoder PCB assembly has its positioning place on the back.




① Screw ② Encoder PCB assembly
③ Screw ④ Encoder board

**Fig. 3-324**

4) Remove two screws ① (BH-B, L6, L10) and dismount the motor assembly ②. Then remove two screws (BH-B) and take off the motor from the mount.

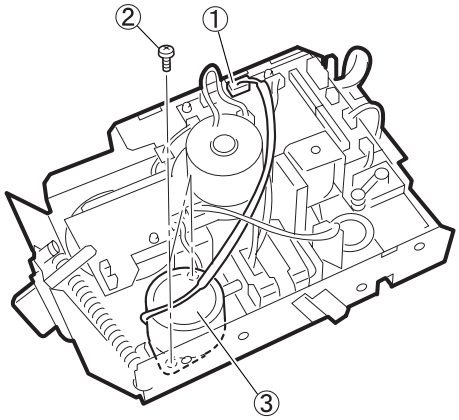



① Screw ② Motor assembly

**Fig. 3-325**

## 4. Camera Lock Motor

1) Take off the camera drive unit. For details, see section "II-3. Camera drive unit."
2) Unhook one connector ①, remove two screws ② (BH-B), and dismount the motor ③.




① Connector ② Screw ③ Motor

**Fig. 3-326**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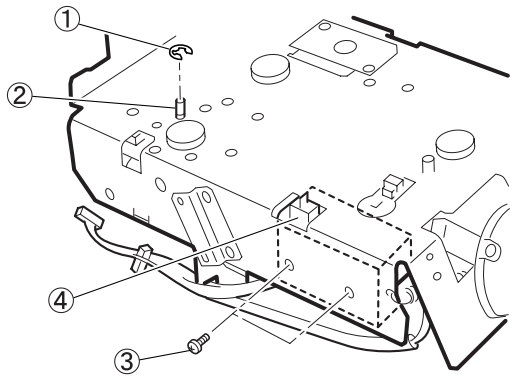
## 5. Take-up Motor Assembly

1) Take off the camera drive unit. For details, see section “II-3. Camera drive unit.”
2) Dismount the camera PCB assembly. For details, see section “VI-7. Camera PCB assembly.”
3) Unfasten one E-ring ① (small) and take off the shaft assembly ②.
   Remove two screws ③ (BH-B) and dismount the lock motor assembly ④.

**Note:** When removing the shaft assembly, the solenoid spring and the plunger will come off.

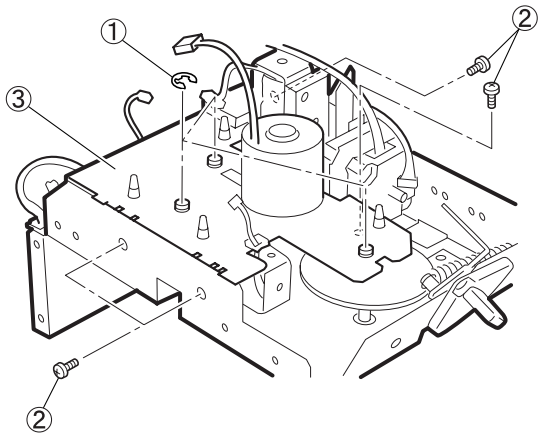



① E-ring ② Shaft assembly
③ Screw ④ Lock motor assembly

**Fig. 3-327**

4) Unfasten three E-rings ①, four screws ② (BH-B), and take off the motor mounting plate assembly ③.

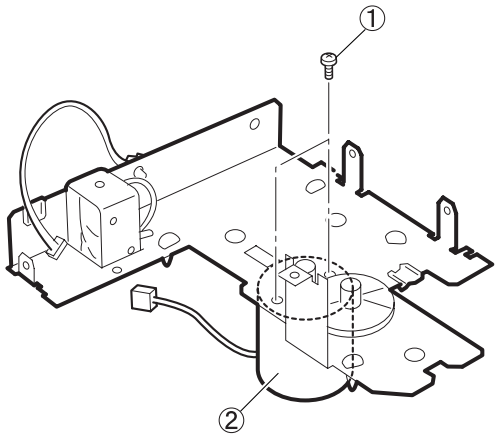
**Note:** The inner parts related to the gear will also come off.




① E-ring ② Screw
③ Motor mounting plate assembly

**Fig. 3-328**

5) Remove two screws ① (BH-B) and dismount the motor assembly ②.

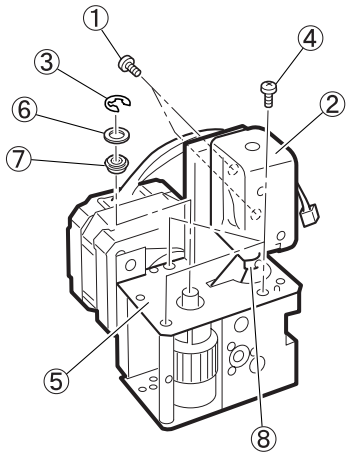



① Screw ② Motor assembly

**Fig. 3-329**

## 6. Capstan Solenoid

1) For details, see section 3.
2) Remove two screws ① (BH-B, L10) and take off the solenoid body ②.
   Unfasten one E-ring ③ and three screws ④ (BH-B), and take off the mounting plate ⑤, washer ⑥, and ball bearing ⑦ to take off the plunger ⑧.

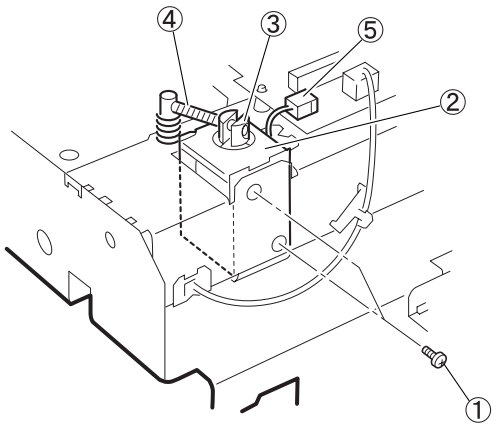



① Screw
② Solenoid body
③ E-ring
④ Screw
⑤ Mounting plate
⑥ Washer
⑦ Ball bearing
⑧ Plunger

**Fig. 3-330**

## 7. Camera Shutter Solenoid

1) Take off the camera drive unit. For details, see section “II-3. Camera drive unit.”
2) Remove two screws ① (BH-B), slide the solenoid body ② to unfasten the pin ④ from the plunger ③, unhook one connector ⑤, and take off the solenoid.




① Screw
② Solenoid body
③ Plunger
④ Pin
⑤ Connector

**Fig. 3-331**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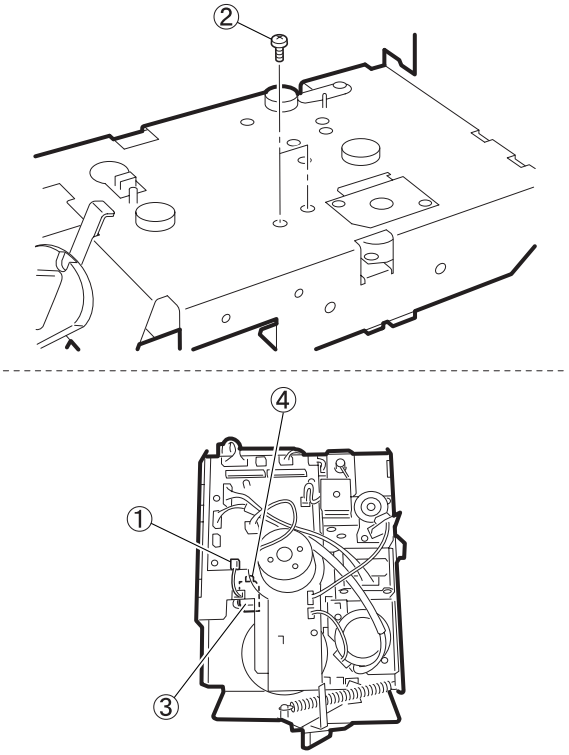
## 8. Friction Solenoid

1) Take off the camera drive unit. For details, see section “II-3. Camera drive unit.”
2) Unhook one connector ①, remove two screws ② (BH-W), and take off the solenoid ③ by sliding it.
   Then remove the plunger ④ by sliding it.

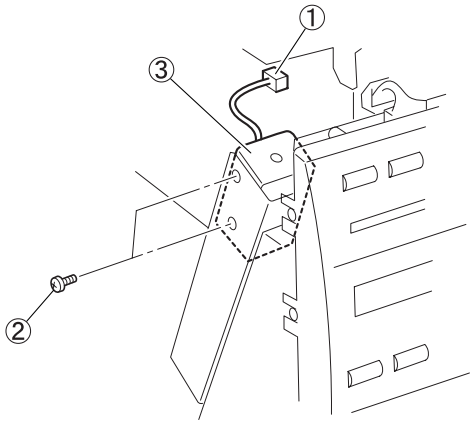



① Connector ② Screw
③ Solenoid ④ Plunger

**Fig. 3-332**

## 9. Main Shutter Solenoid

1) Take off the rear cover.
2) Take off the left cover.
3) Unhook one connector ①, remove two screws ② (BH-B), and take off the solenoid ③.




① Connector ② Screw
③ Solenoid

**Fig. 3-333**

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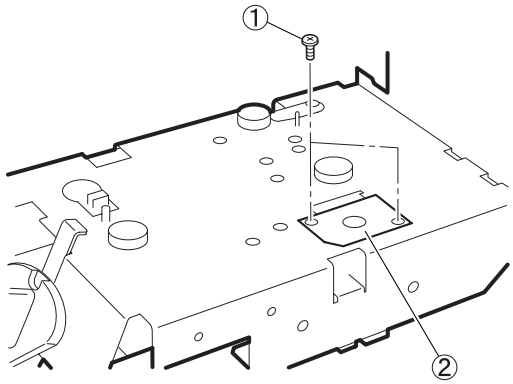
## 10. Torque Limiter Assembly

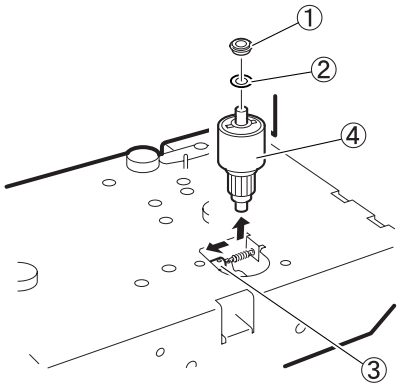
1) Take off the camera drive unit. For details, see section “II-3. Camera drive unit.”
2) Remove two screws ① (flat-head, W) and take off the locking plate ②.




① Screw ② Locking plate

**Fig. 3-334**

3) Remove the ball bearing ① and washer ②. While moving the plunger ③ of solenoid by hand, pull off the torque limiter assembly upward.




① Ball bearing ② Washer
③ Plunger ④ Torque limiter assembly

**Fig. 3-335**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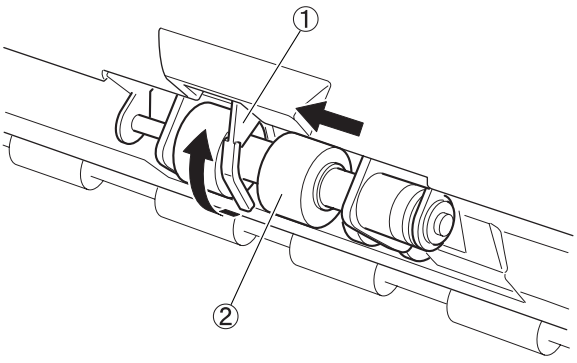
# IV. FEED (ROLLERS)

## 1. Pickup Roller

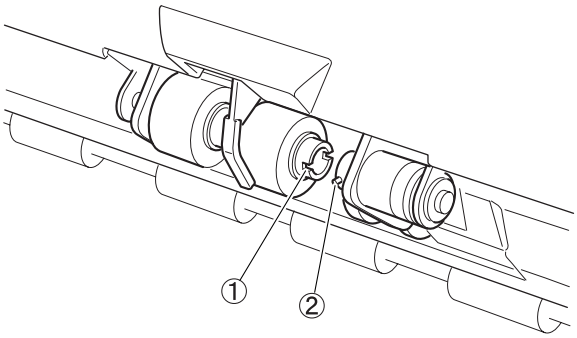
1) Lift up the sensor lever ①, press the pickup roller ② to the left, and move it to take off it.




① Sensor lever ② Pickup roller

**Fig. 3-401**

**Note:** When reassembling, fit the groove ① of the pickup roller to the pin ②.

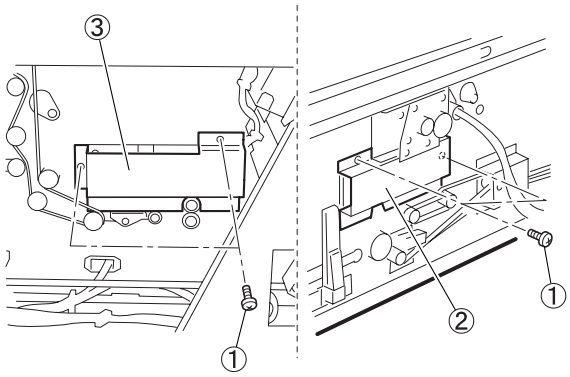



① Groove ② Pin

**Fig. 3-402**

## 2. Feeding Roller

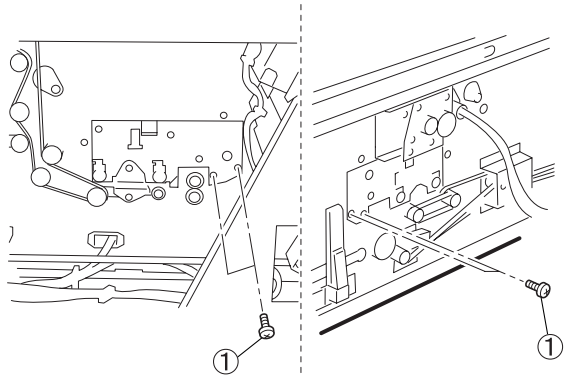
1) Take off the rear cover.
2) Take off the right and left covers.
3) Remove four screws ① (with round-tip, BH-B) and take off the right blind plate ② and left blind plate ③.




① Screw ② Right blind plate
③ Left blind plate

**Fig. 3-403**

4) Close the feed unit, and remove four screws ① (BH-W).




① Screw

**Fig. 3-404**

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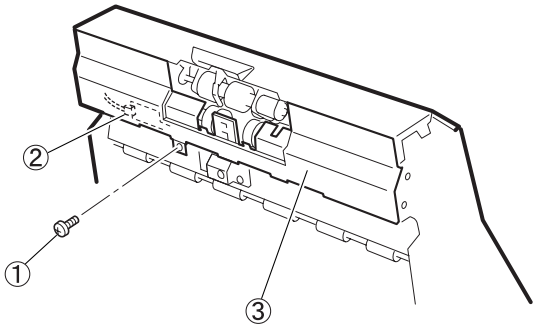
5) Open the feed unit, unhook one screw ① (BH-W) and one connector ② and take off the upper pickup guide ③.

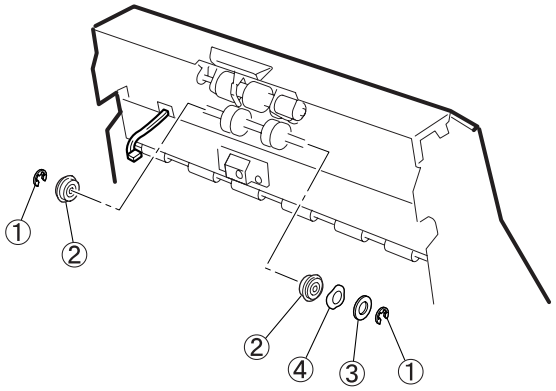



① Screw ② Connector
③ Upper pickup guide

**Fig. 3-405**

6) Unfasten two E-rings ① and remove the ball bearing ②, washer ③, and wave washer ④.

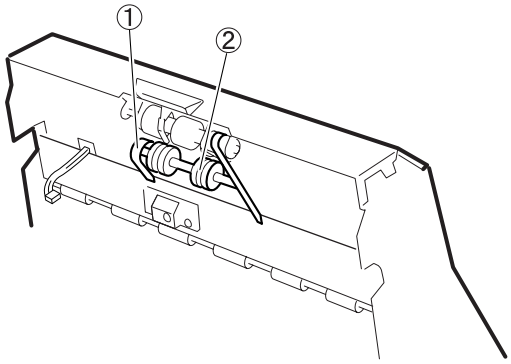
**Note:** If it appears difficult to remove the E-rings, take off the feed unit first.




① E-ring ② Ball bearing
③ Washer ④ Wave washer

**Fig. 3-406**

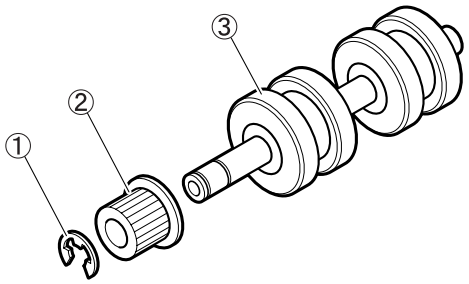
7) Take off the belt ① and take off the feeding roller assembly ②.




① Belt ② Feeding roller assembly

**Fig. 3-407**

8) Unfasten one E-ring ① and take off the pulley ② from the feeding roller ③.




① E-ring ② Pulley
③ Feeding roller

**Fig. 3-408**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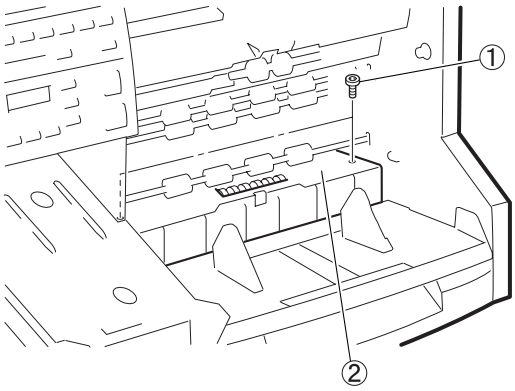
## 3. Separation Roller

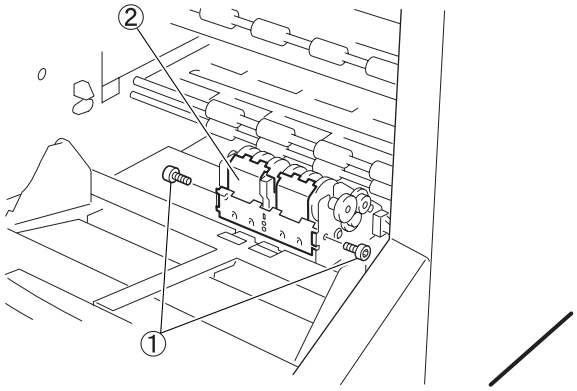
1) Remove two screws ① (hex socket, flat-head) and take off the lower entry guide plate ②.




① Screw ② Lower entry guide plate.

**Fig. 3-409**

2) Remove two hex socket bolts ① and take off the guide assembly ②.

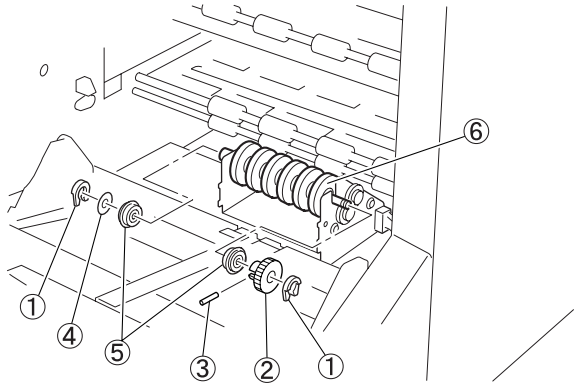



① Hex socket bolts ② Guide assembly

**Fig. 3-410**

3) Unfasten two plastic rings ①, remove the gear ②, pin ③, washer ④, and ball bearing ⑤, and dismount the separation roller ⑥.

**Note:** Be careful not to drop or lose the pin.

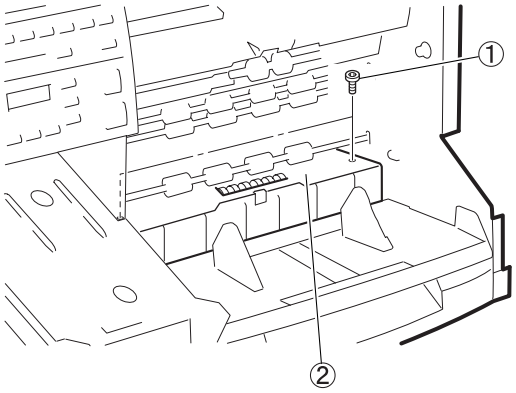



① Plastic ring ② Gear
③ Pin ④ Washer
⑤ Ball bearing ⑥ Separation roller

**Fig. 3-411**

## 4. Upper Registration Roller

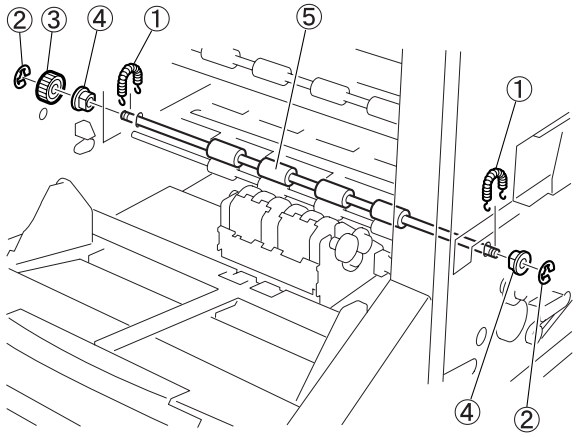
1) Take off the rear cover.
2) Take off the right and left covers.
3) Remove two screws ① (hex socket, flat-head) and and take off the lower entry guide plate ②.




① Screw
② Lower entry guide plate

**Fig. 3-412**

4) Remove two springs ① and two E-rings ②, take off the gear ③ and metal bushing ④, and take off the upper registration roller ⑤.

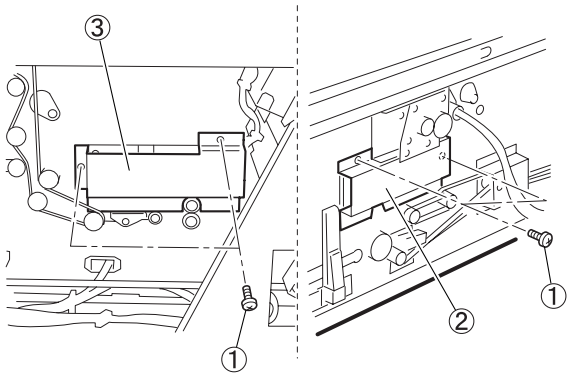



① Spring ② E-ring
③ Gear ④ Metal bushing
⑤ Upper registration roller

**Fig. 3-413**

## 5. Lower Registration Roller

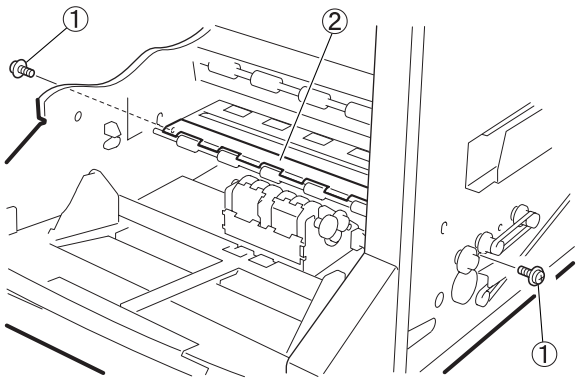
1) Take off the rear cover.
2) Take off the right and left covers.
3) Take off the lower entry guide plate.
4) Take off the upper registration roller.
5) Remove four screws ① (round-tip, two on each side), and take off the right and left blind plates ② ③.




① Screw ② Right blind plate
③ Left blind plate

**Fig. 3-414**

6) Remove two screws ① (TP-B) and take off the registration guide assembly ②.




① Screw ② Registration guide assembly

**Fig. 3-415**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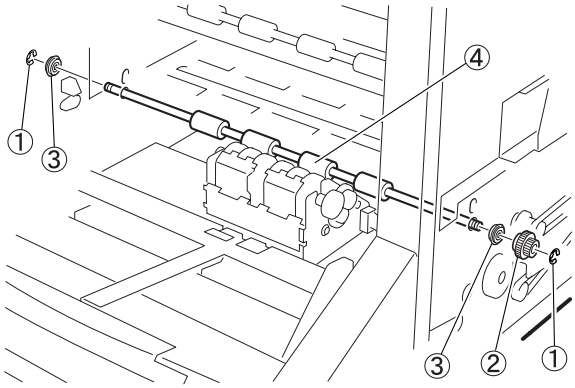
7) Unfasten two E-rings ①, remove the gear ② and ball bearing ③, and take off the lower registration roller ④.

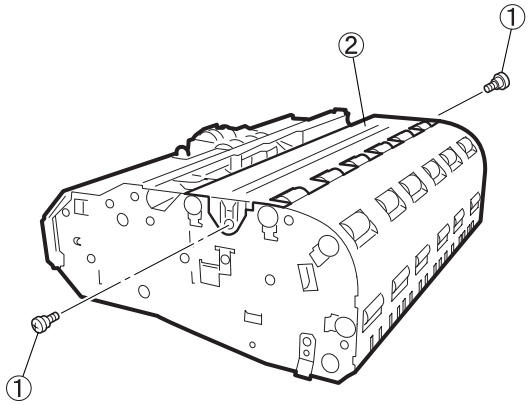



① E-ring ② Gear
③ Ball bearing ④ Lower registration roller

**Fig. 3-416**

## 6. Upper Reading Roller (Feed Follower Roller 1)

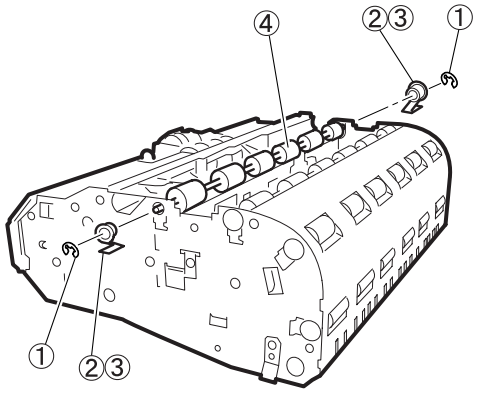
1) Take off the feed unit. For details, see section “II-2. Feed unit”.
2) Remove two screws ① (step screw) and take off the upper reading unit ②.




① Screw ② Upper reading unit

**Fig. 3-417**

3) Unfasten two E-rings ① for each roller. Remove the plate spring ② from the groove, take off metal bushing ③ and the plate spring together, and dismount the rollers ④.




① E-ring ② Plate spring
③ Metal bushing ④ Roller

**Fig. 3-418**

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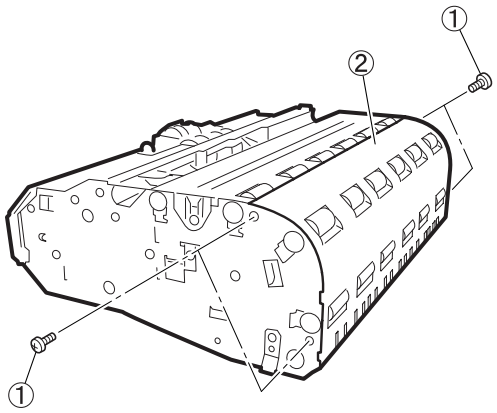
## 7. Feed Follower Roller 1

1) Take off the feed unit. For details, see section “II-2. Feed unit”.
2) Remove four screws ① (BH-W) and take off the guide plate ②.

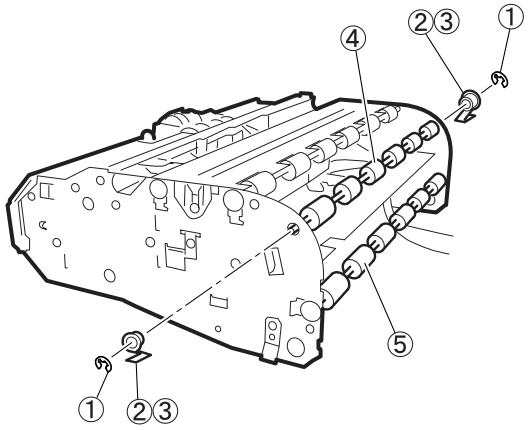


① Screw ② Guide plate

**Fig. 3-419**

3) Unfasten two E-rings ① for each roller. Remove the plate spring ② from the groove, take off metal bushing ③ and the plate spring together, and dismount the rollers ④.

**Note:** The roller ⑤ can be disassembled with the guide plate attached.

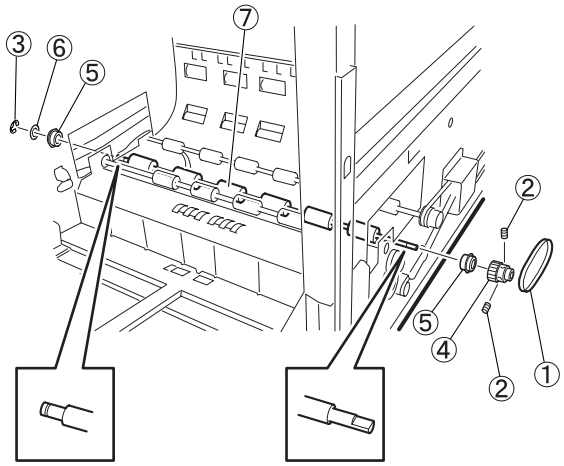


① E-ring ② Plate spring
③ Metal bushing ④ Roller
⑤ Roller

**Fig. 3-420**

## 8. Lower reading roller A (front side)

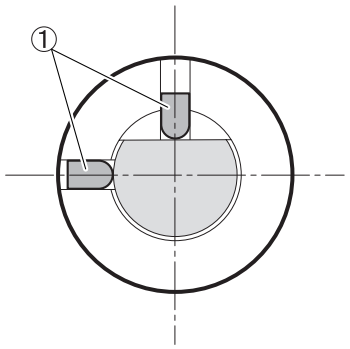
1) Take off the feed unit. For details, see section “II-2. Feed unit”.
2) Take off the lower reading unit. For details, see section “V-2. Lower reading unit”.
3) Remove the belt ①, two set screws ②, and the E-ring ③, dismount the pulley ④, ball bearing ⑤ and washer ⑥, and then take off the lower reading roller A ⑦.



① Belt ② Screw
③ E-ring ④ Pulley
⑤ Ball bearing ⑥ Washer
⑦ Lower reading roller A

**Fig. 3-421**

**Note:** When reassembling, fit the set screw ① to the flat portion of the roller axis.



① Set screw

**Fig. 3-422**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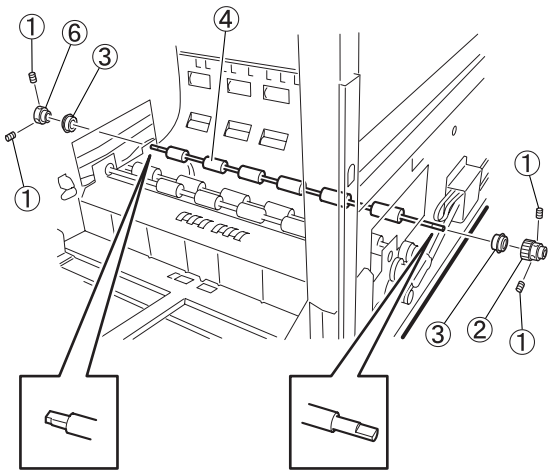
## 9. Lower reading roller B (back side)

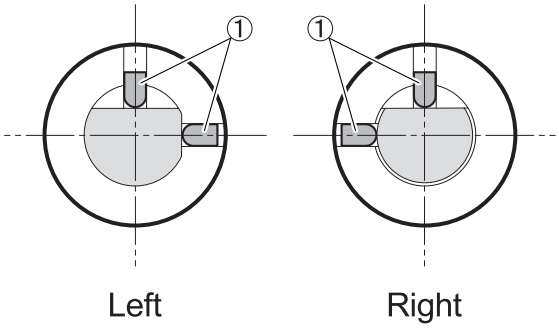
1) Take off the feed unit. For details, see section “II-2. Feed unit”.
2) Take off the lower reading unit. For details, see section “V-2. Lower reading unit”.
3) Remove three belts connected to the lower reading roller (B).
4) Remove two set screws ① each on the right and left, dismount the pulley ② and ball bearing ③, and then take off the lower reading roller B ④.




① Set screw ② Pulley
③ Ball bearing ④ Lower reading roller B

**Fig. 3-423**

**Note:** When reassembling, fit the set screw ① to the flat portion of the roller axis.

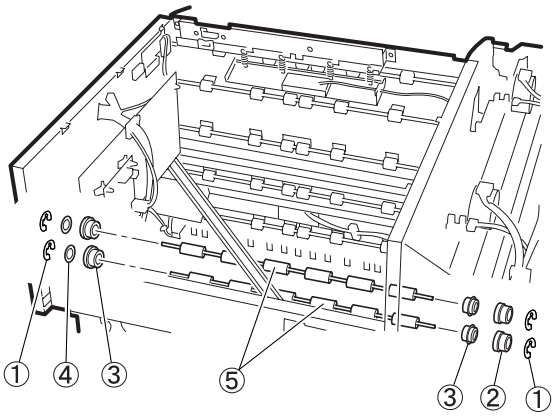



① Set screw

**Fig. 3-424**

## 10. Feed drive roller A

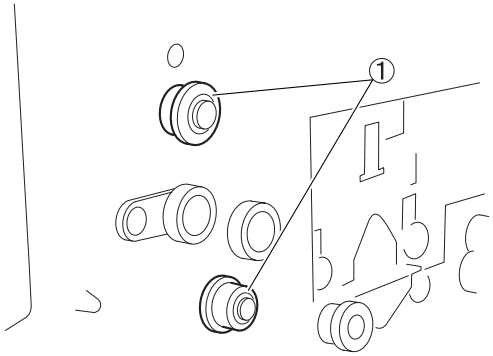
1) Take off the rear cover.
2) Take off the right and left covers.
3) Take off the top cover.
4) Take off the belt.
5) For each roller, unfasten two E-rings ① remove the pulley ②, ball bearings ③, and the washer ④, and then dismount the roller ⑤.




① E-ring ② Pulley
③ Ball bearing ④ Washer
⑤ Roller

**Fig. 3-425**

**Note:** When reassembling, position the flange of pulley ① carefully. The flange of the lower pulley faces inward and the flange of the upper pulley faces outward.




① Pulley

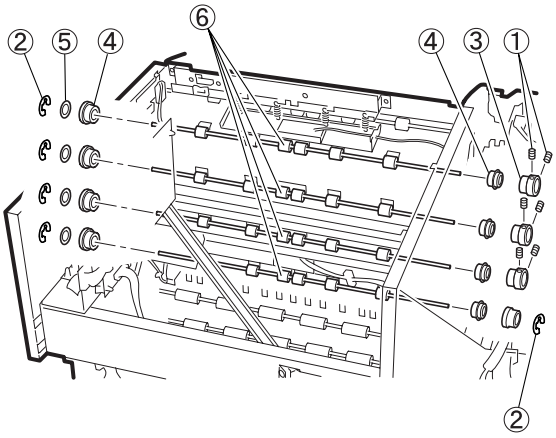
**Fig. 3-426**

**Note:** Be careful not to damage or smudge the mirror.

## 11. Feed drive roller B

1) Take off the rear cover.
2) Take off the right and left covers.
3) Take off the top cover.
4) Take off the belt.
5) When removing the two inside rollers, take off the slit unit as well. For details, see step 5) of "II-1. Upper Unit".
6) For each roller, unfasten two set screws ① and one E-ring ②, remove the pulley ③, ball bearings ④, and washer ⑤, and then dismount the roller ⑥.

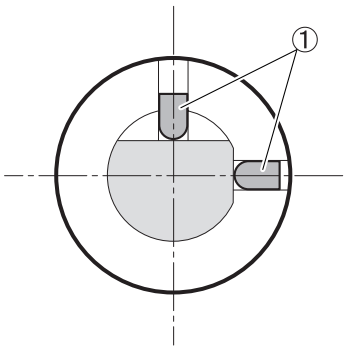
**Note:** When removing the lowermost belt, unfasten the E-ring instead of the set screw and remove the resin pulley.




① Set screw ② E-ring
③ Pulley ④ Ball bearing
⑤ Washer ⑥ Roller

**Fig. 3-427**

**Note:** When reassembling, fit the set screw ① to the flat portion of the roller axis.

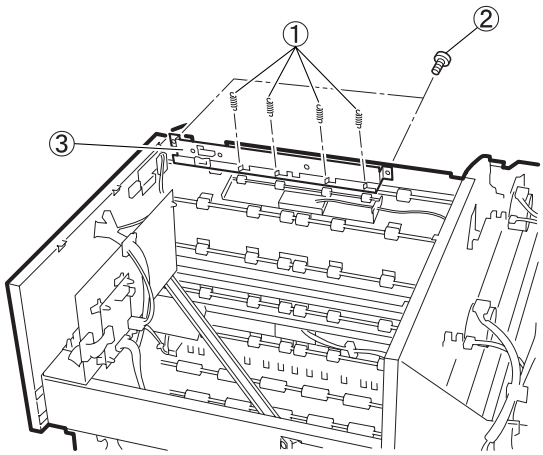



① Set screw

**Fig. 3-428.**

## 12. Delivery drive roller

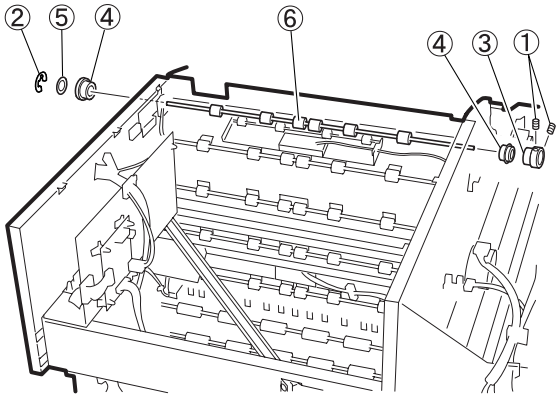
1) Take off the rear cover.
2) Take off the right and left covers.
3) Take off the top cover.
4) Take off the belt.
5) Remove four springs ① and two screws ② (TP-B) to take off the spring mounting plate ③.




① Spring ② Screw
③ Spring mounting plate

**Fig. 3-429**

6) Unfasten two set screws ① and one E-ring ②, remove the pulley ③, ball bearings ④, and washer ⑤, and then dismount the roller ⑥.




① Set screw ② E-ring
③ Pulley ④ Ball bearing
⑤ Washer ⑥ Roller

**Fig. 3-430**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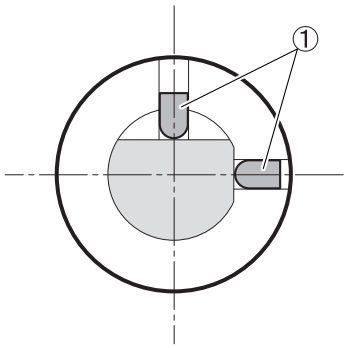
**Note:** When reassembling, fit the set screw ① to the flat portion of the roller axis.

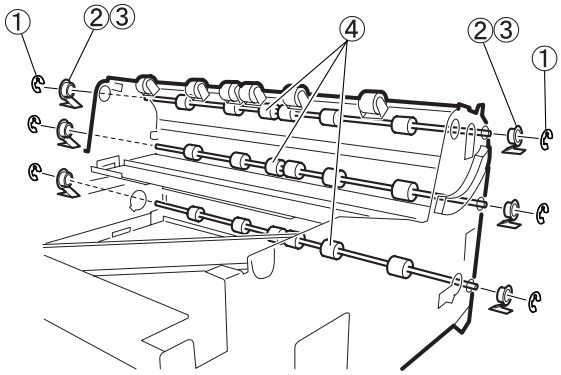



① Set screw

**Fig. 3-431**

## 13. Feed follower roller 2

1) Take off the upper unit. For details, see section “II-1. Upper Unit”.
2) Unfasten two E-rings ① for each roller. Remove the plate spring ② from the groove, take off the metal bushing ③ and the plate spring together, and dismount the roller ④.

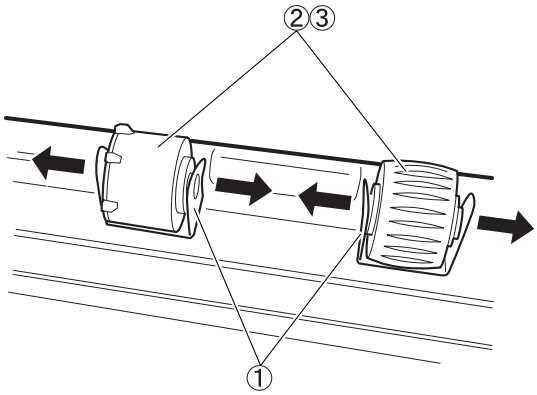



① E-ring ② Plate spring
③ Metal bushing ④ Roller

**Fig. 3-432**

## 14. Delivery follower roller 1, 2

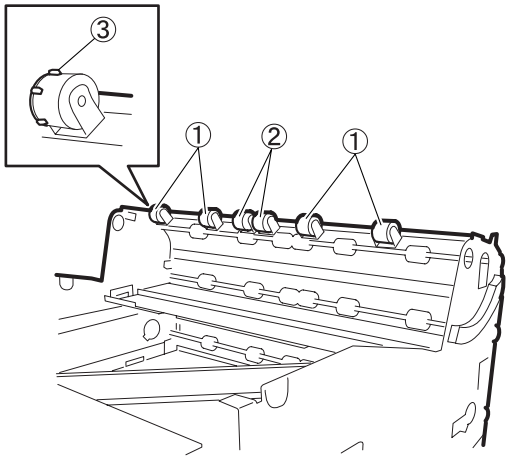
1) Take off the upper unit. For details, see section “II-1. Upper Unit”.
2) Open the roller mounting plate ① slightly from side to side and take off the roller ② and its shaft ③ together.




① Roller mounting plate ② Roller
③ Shaft

**Fig. 3-433**

**Note:** The outer four rollers are the feed follower rollers 1 ① and the middle two rollers are the feed follower rollers 2 ②. Reassemble feed follower roller 1 with its protrusion ③ turned outward.




① Feed follower roller 1 ② Feed follower roller 2
③ Protrusion

**Fig. 3-434**

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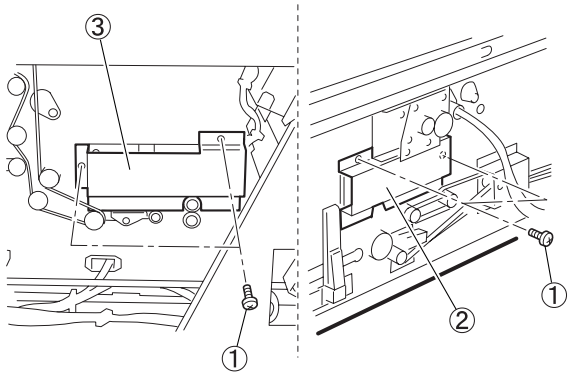
# V. OPTICAL ASSEMBLIES

## 1. Upper Reading Unit (with LED)

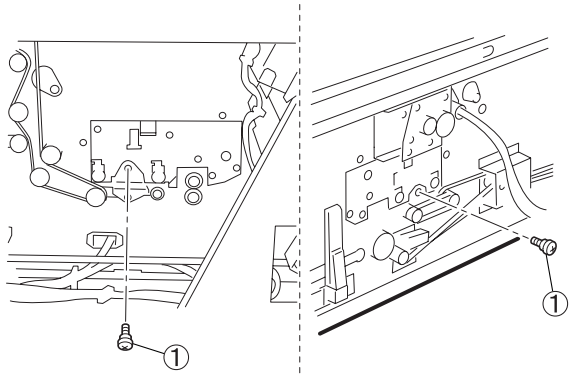
1) Take off the rear cover.
2) Take off the right and left covers.
3) Remove four screws ① (round-tip, BH-B) and take off the right blind plate ② and left blind plate ③.




① Screw ② Right blind plate
③ Left blind plate

**Fig. 3-501**

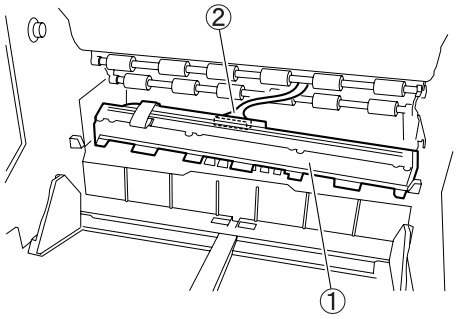
4) Close the feed unit and remove two screws ① (step screw).




① Screw

**Fig. 3-502**

5) Open the feed unit, pull out the upper reading unit ①, unhook one connector ②, and then take off the upper reading unit.




① Upper reading unit ② Connector

**Fig. 3-503**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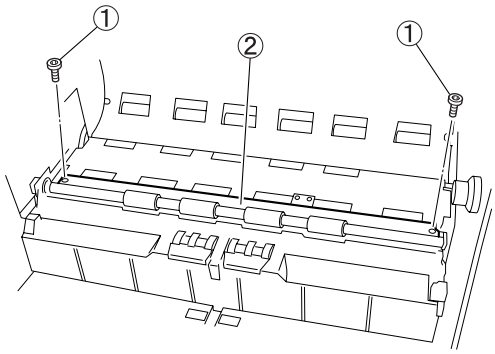
## 2. Lower Reading Unit (with LED)

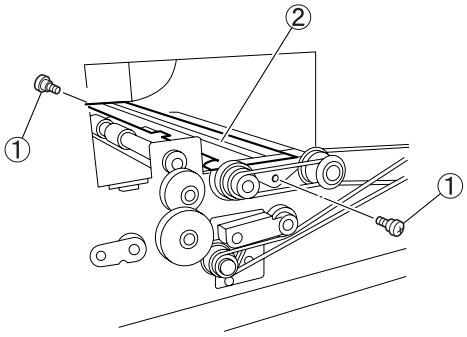
1) Take off the feed unit. For details, see section “II-2. Feed unit”.
2) Take off the right blind plate and left blind plate.
3) Remove two screws ① (hex socket, flat-head) and take off the upper registration guide ②.




① Screw ② Upper registration guide

**Fig. 3-504**

4) Remove two screws ① (step screw), pull out the lower reading unit ②, unhook one connector, and then take off the lower reading unit.

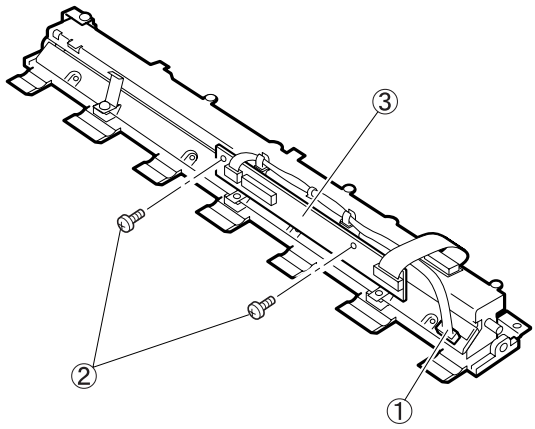



① Screw ② Lower reading unit

**Fig. 3-505**

## 3. Upper LED Unit

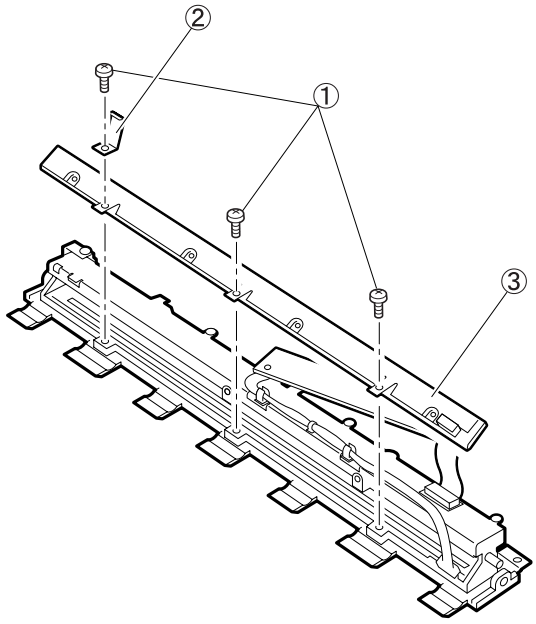
1) Take off the upper reading unit.
2) Unhook one connector ①, remove two screws ②, and dismount the PCB assembly ③.




① Connector ② Screw
③ PCB assembly

**Fig. 3-506**

3) Remove three screws ① and take off the plate spring ② and LED unit ③.




① Screw ② Plate spring ③ LED unit

**Fig. 3-507**

**Note:** When reassembling, fix the tip of the plate spring so that it can touch the metal portion.

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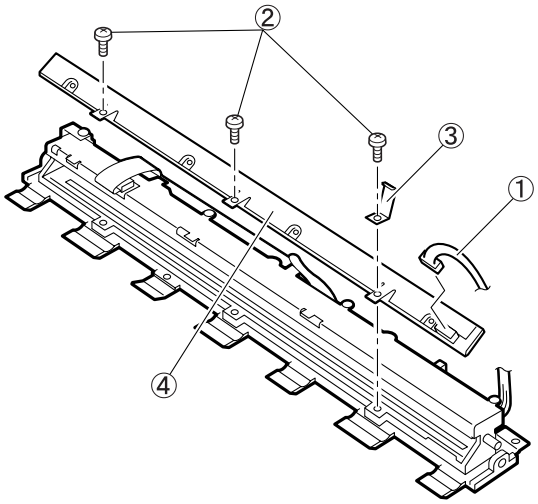
## 4. Lower LED unit

1) Take off the lower reading unit.
2) Unhook one connector ①, remove three screws ②, and take off the plate spring ③ and LED unit ④.




① Connector ② Screw
③ Plate spring ④ LED unit

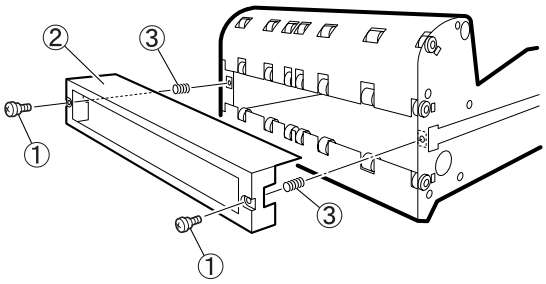
**Fig. 3-508**

**Note:** When reassembling, fix the tip of the plate spring so that it can touch the metal portion.

## 5. Front-Side Filmer Reading Glass

1) Take off the upper unit. For details, see section “II-1. Upper Unit”.
2) Remove two screws ① (step screw) and take off the reading glass ② and spring ③.

**Note:** The spring is sandwiched between the reading glass and the part to be attached. Be careful not to drop or lose the spring.




① Screw ② Reading glass
③ Spring

**Fig. 3-509**

**Note:** When reassembling, do not install the reading glass upside down. Also do not forget to install the spring.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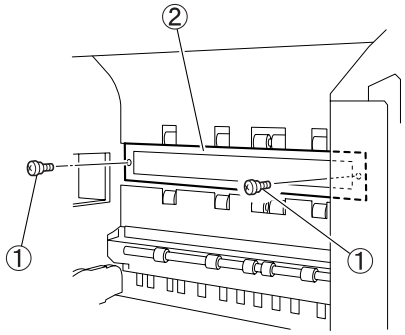
## 6. Back-Side Filmer Reading Glass

1) Take off the upper unit. For details, see section “II-1. Upper Unit”.
2) Remove two screws ① (step screw, B) and take off the reading glass ②.




① Screw ② Reading glass

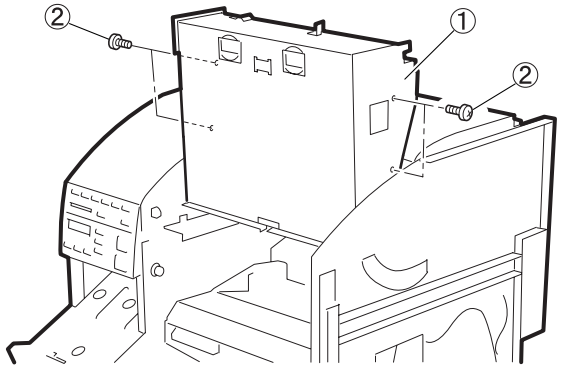
**Fig. 3-510**

## 7. Front-Side Fluorescent Lamp

1) Take off the rear cover.
2) Take off the right cover.
3) Take off the upper delivery cover assembly.
4) Take off the front optical cover and the open/close shaft assembly.

**Note:** Be careful not to drop the service density filter. It should be removed.
When opening or closing the upper unit with the open/close shaft assembly removed, release the left and right locks manually.

5) Open the upper unit ① and remove four screws ② (BH-B).




① Upper unit ② Screw

**Fig. 3-511**

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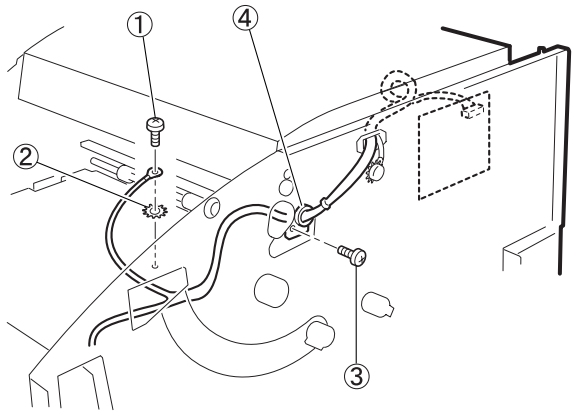
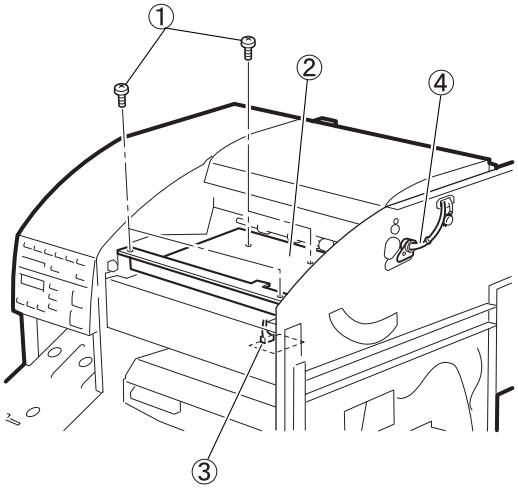
6) Close the upper unit, remove one screw ① (BH-W) and the toothed washer ②. Remove one screw ③ (TP-B) and pull out the cable assembly guide ④.




① Screw ② Toothed washer
③ Screw ④ Cable assembly guide

**Fig. 3-512**

7) Remove four screws ① (BH-B), lift the middle plate ② slightly to unhook one connector ③ inside, and take off the middle plate. Pull out the cable assembly ④ as well.

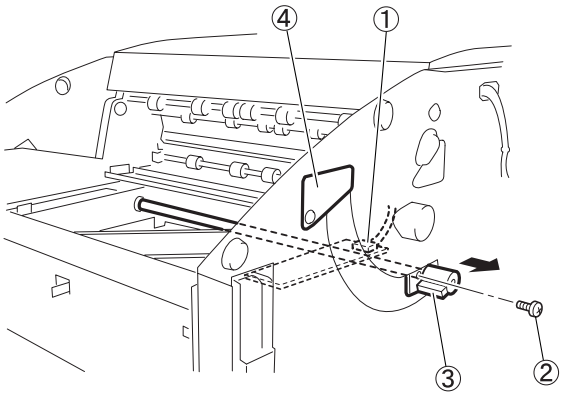



① Screw ② Middle plate
③ Connector ④ Cable assembly

**Fig. 3-513**

8) Unhook one connector ① (locking-type) for the fluorescent lamp, remove one screw ② (BH-B, L6), and dismount the fluorescent lamp ③.

**Note:** Do not smudge or damage the fluorescent lamp. Position the shading plate ④ to cover the hole. Do the same for the left shading plate.




① Connector ② Screw
③ Fluorescent lamp ④ Shading plate

**Fig. 3-514**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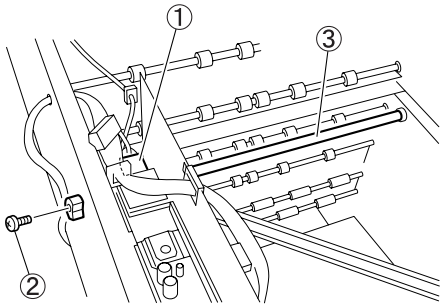
## 8. Back-Side Fluorescent Lamp

1) Take off the rear cover.
2) Take off the right cover and left cover.
3) Take off the top cover.
4) Unhook one connector ① (locking-type), remove one screw ② (BH-B, L6), and take off the fluorescent lamp ③.

**Note:** Since a metal sheet is sticking out near the connector, be careful not to cut yourself when unhooking the connector.

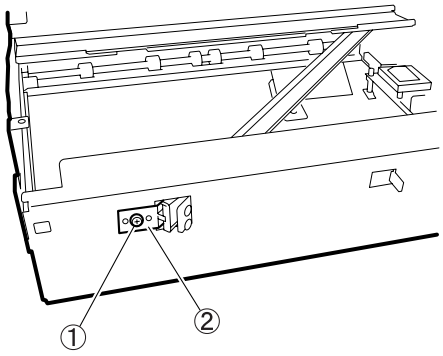



① Connector ② Screw
③ Fluorescent lamp

**Fig. 3-515**

## 9. Front-Side First Mirror

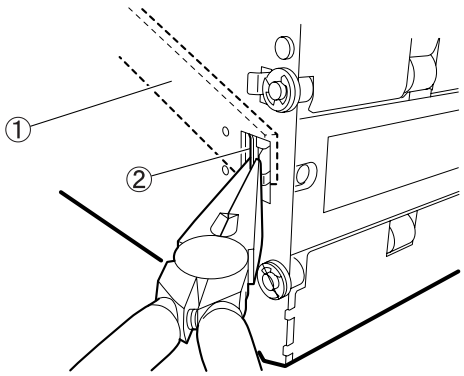
1) Take off the upper unit. For details, see section “II-1. Upper Unit”.
2) Remove one screw ① (BH-B) and take off the plate spring A ②.




① Screw ② Plate spring A

**Fig. 3-516**

3) While holding the mirror ①, compress plate spring B ②, and take off plate spring B and the mirror.



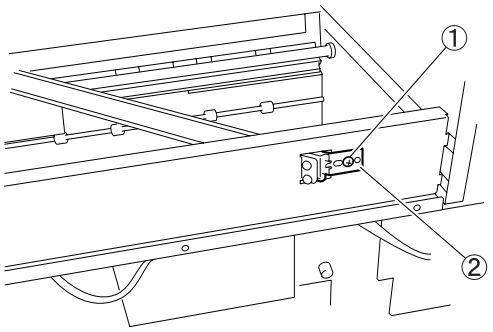

① Mirror ② Plate spring B

**Fig. 3-517**

**Note:** About the mirrors:
1) Do not disassemble or assemble the mirrors except as required.
2) Do not touch the reflector.
3) Handle the mirrors properly so as not to damage them.
4) Handle the mirrors carefully so as not to smudge them.
5) Since the positions of mirrors have been adjusted at the factory, do not touch the screws that are fixed with adhesive.
6) Fix the springs to the specified positions.
7) After reassembling, check the mirrors for looseness. If they are loose, check and fix the plate springs.

## 10. Back-Side First Mirror

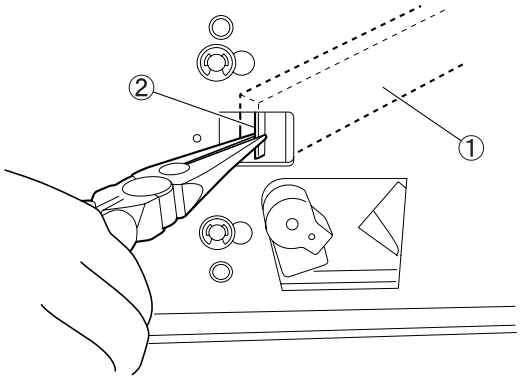
1) Take off the rear cover.
2) Take off the right cover and left cover.
3) Take off the top cover.
4) Remove one screw ① (BH-B) and take off plate spring A ②.




① Screw ② Plate spring A

**Fig. 3-518**

5) While holding the mirror ①, compress plate spring B ②, and take off plate spring B and the mirror.




① Mirror ② Plate spring B

**Fig. 3-519**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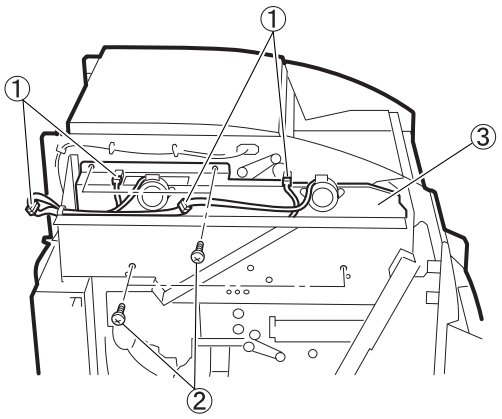
## 11. Second Mirror

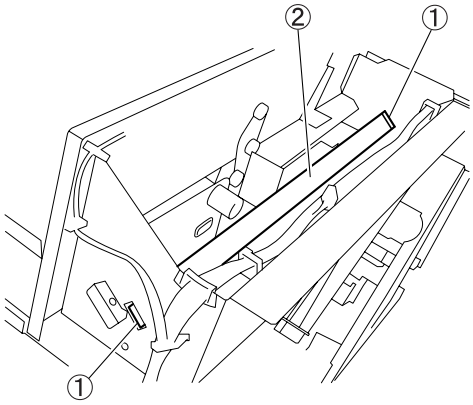
1) Take off the rear cover.
2) Take off the left cover.
3) Take off the operation panel assembly.
4) Unhook four connectors ①, remove four screws ② (BH-B), and take off the slit unit ③.




① Connector ② Screw
③ Slit unit

**Fig. 3-520**

5) Compress one of the two plate springs ① and remove it. Next, while holding the mirror ②, compress the other plate spring to remove it and dismount the mirror.

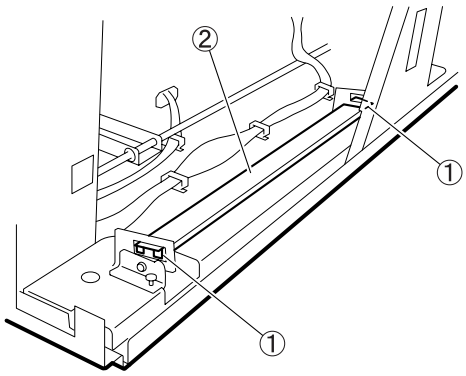



① Plate spring ② Mirror

**Fig. 3-521**

## 12. Third Mirror

1) Take off the rear cover.
2) Take off the left cover.
3) Compress one of the two plate springs ① and remove it. Next, while holding the mirror ②, compress the other plate spring to remove it and take off the mirror.

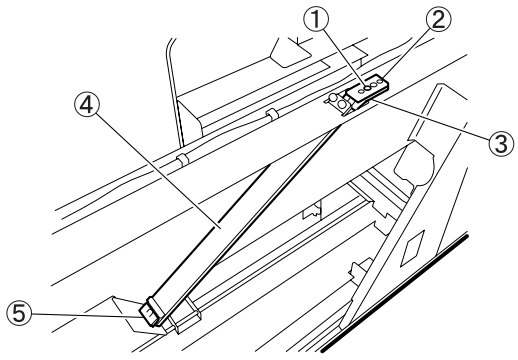



① Spring ② Mirror

**Fig. 3-522**

## 13. Fourth Mirror

1) Take off the rear cover.
2) Take off the left cover.
3) Remove one screw ① (BH-B), take off the locking plate ② and plate spring A ③. Next, while holding the mirror ④, compress plate spring B ⑤ and take off plate spring B and the mirror.




① Screw ② Locking plate
③ Plate spring A ④ Mirror
⑤ Plate spring B

**Fig. 3-523**

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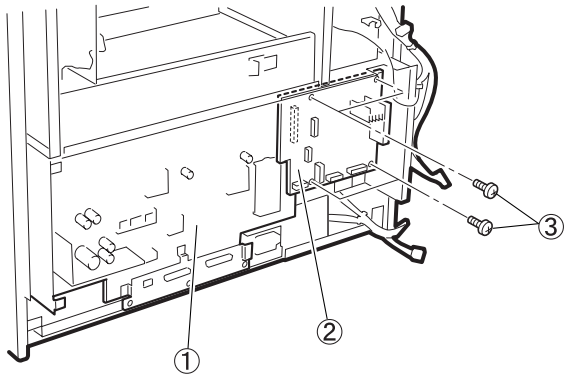
# VI. ELECTRICAL ASSEMBLIES (PCB ASSEMBLIES)

## 1. Main CPU PCB Assembly (SH2-MAIN)

1) Take off the rear cover.
2) Unhook every connector from the main CPU PCB assembly ① and on the filmer control PCB assembly ② , remove four screws ③ (BH-W), and dismount the filmer control PCB assembly.

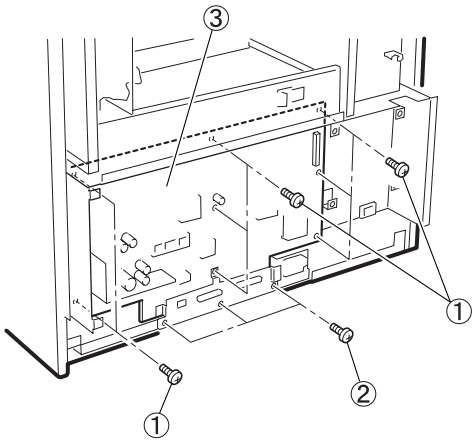
**Note:** The main CPU PCB assembly and the filmer control PCB assembly are connected by one connector located on the back of the filmer control PCB assembly. When reassembling, check the positions for press-fitting.




① Main CPU PCB assembly
② Filmer control PCB assembly ③ Screw

**Fig. 3-601**

3) Remove eight screws ① (BH-W, M4) and three screws ② (BH-W, M3) and dismount the PCB assembly ③.




① Screw ② Screw
③ PCB assembly

**Fig. 3-602**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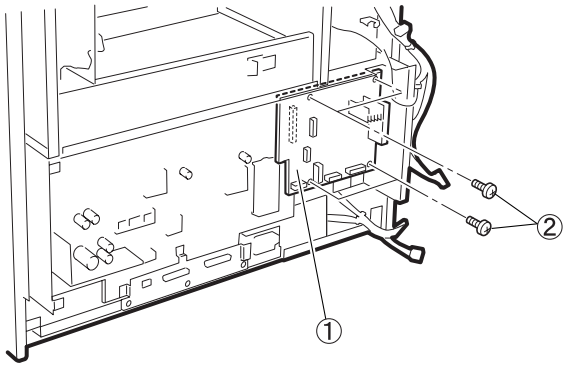
## 2. Filmer Control PCB Assembly (GH-DCON)

1) Take off the rear cover.
2) Unhook every connector from the filmer control PCB assembly ①, remove four screws ② (BH-W), and dismount the filmer control PCB assembly.

**Note:** The main CPU PCB assembly and the filmer control PCB assembly are connected by one connector located on the back of the filmer control PCB assembly. When reassembling, check the positions for press-fitting.

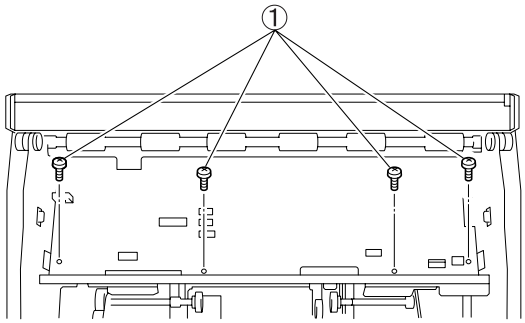



① Filmer control PCB assembly
② Screw

**Fig. 3-603**

## 3. Pickup Control PCB Assembly (K4-SUB)

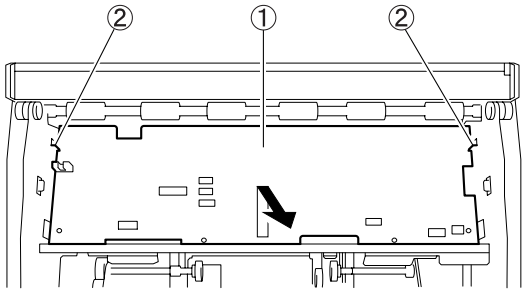
1) Take off the upper pickup cover assembly.
2) Unhook all the connectors and remove four screws ① (BH-W).




① Screw

**Fig. 3-604**

3) Lift the front side of the PCB assembly ①, and release the right and left guides ② to take off the PCB assembly.




① PCB assembly ② Guide

**Fig. 3-605**

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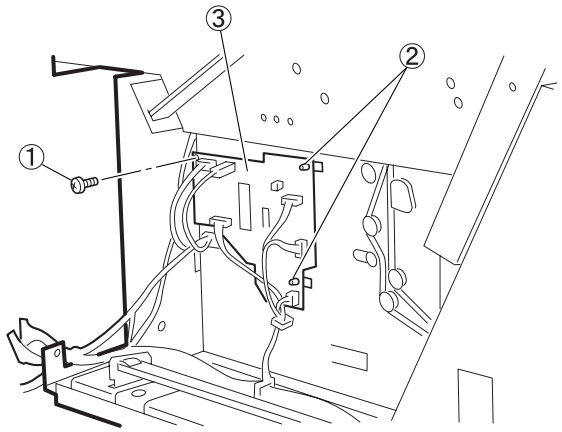
## 4. Document Board Control PCB Assembly (K0-SUB2)

1) Take off the rear cover.
2) Take off the left cover.
3) Unhook all the connectors, remove one screw ① (BH-B) and two locking supports ②, and then take off the PCB assembly ③.

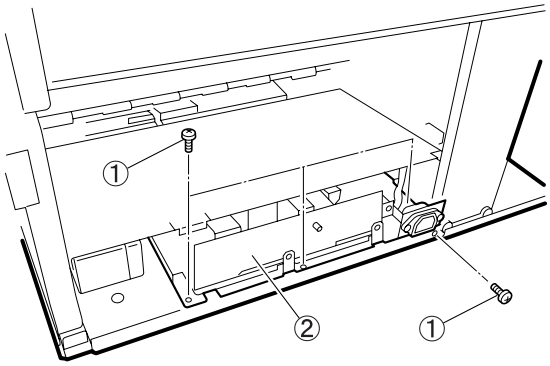



① Screw ② Locking supports
③ PCB assembly

**Fig. 3-606**

## 5. DC Power Supply PCB Assembly

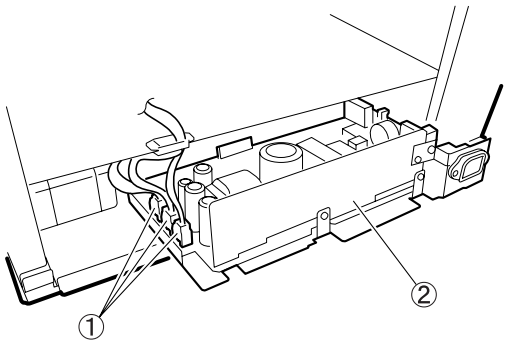
1) Take off the back plate assembly. For details, see section "II-5. Back Plate Assembly".
2) Remove four screws ① (round-tip, BH-W) and pull the PCB assembly ② out.




① Screw ② PCB assembly

**Fig. 3-607**

3) Unhook three connectors ① and take off the PCB assembly ②.




① Connector ② PCB assembly

**Fig. 3-608**

**Note:** When reassembling, fit the protrusion on the PCB assembly into the positioning hole at the back of the machine and install the assembly. The power switch should be turned off (with the longer tip sticking).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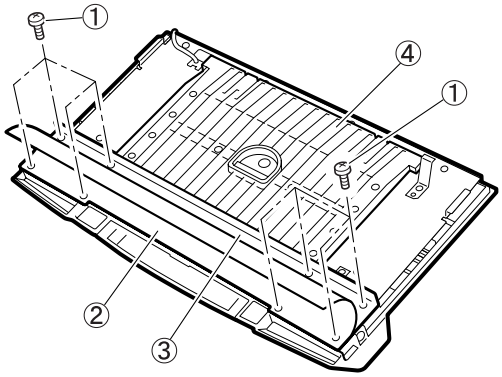
## 6. Document Width/Document Sensor PCB Assembly

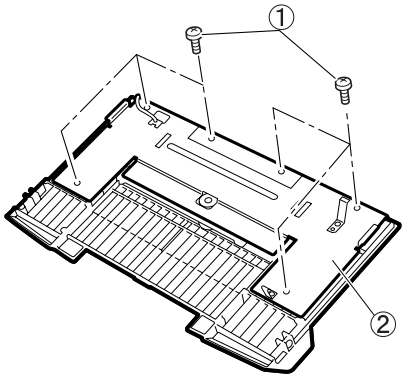
1) Take off the document board assembly. For details, see section "II-4. Document board assembly."
2) Remove eight screws ① (self-tapping, BH-B) and take off the barrier sheet ②, the extension tray mount ③, and the extension tray assembly ④.




① Screw ② Barrier sheet
③ Extension tray mount
④ Extension tray assembly

**Fig. 3-609**

3) Remove six screws ① (self-tapping, BH-B), and take off the reinforcing plate assembly ②.

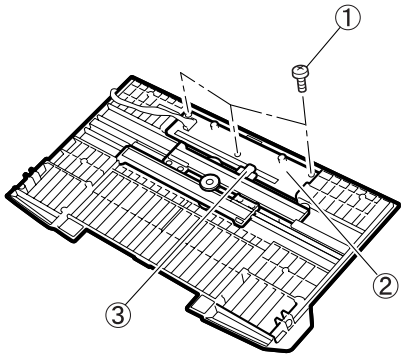



① Screw ② Plate assembly

**Fig. 3-610**

4) Remove three screws ① (M2.6, self-tapping, BH-B) and dismount the PCB assembly ②.

**Note:** Be careful not to distort the contact ③. The document sensing plate is located underneath the PCB assembly.

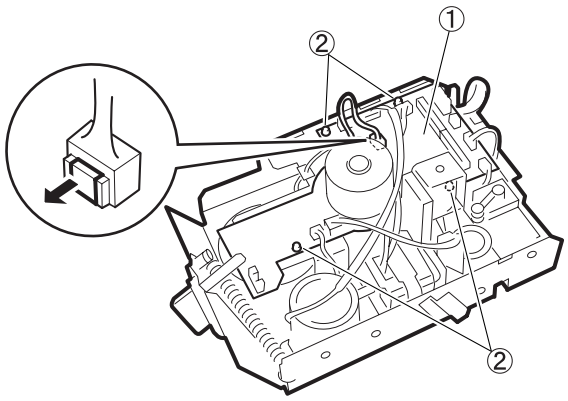



① Screw ② PCB assembly
③ Contact

**Fig. 3-611**

## 7. Camera PCB Assembly

1) Take off the camera drive assembly. For details, see section “II-3. Camera drive unit.”
2) Disconnect every connector from the PCB assembly ①. (J901 is locking-type.) Unlock four supports ② and dismount the PCB assembly.



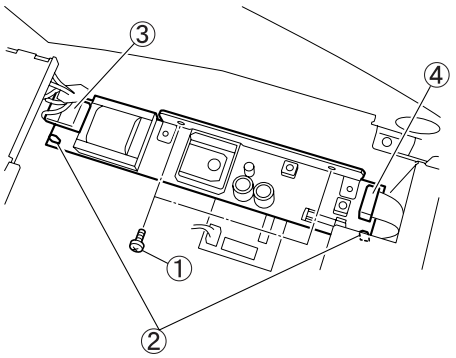

① PCB assembly ② Support

**Fig. 3-612**

## 8. Front-Side Fluorescent Lamp PCB Assembly

1) Take off the middle plate on the upper unit. For details, see sections 1 to 7 in “V-7. Front-Side Fluorescent Lamp”.
2) Remove two screws ① (BH-B), unlock the two supports ②, unhook two connectors ③ (locking-type), and then dismount the PCB assembly ④.

**Note:** Do not damage or smudge the mirror.




① Screw ② Support
③ Connector ④ PCB assembly

**Fig. 3-613**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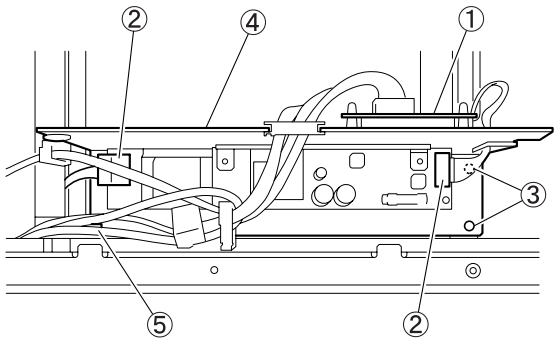
## 9. Back-Side Fluorescent Lamp PCB Assembly

1) Take off the rear cover.
2) Take off the right and left covers.
3) Take off the top cover.
4) Unhook the connector from the interlock PCB assembly ①. Unhook two connectors ② (locking-type), remove two screws ③ (BH-B), and then slide and release the mounting plate ④ for the PCB assembly from the positioning place ⑤ to take off the plate.

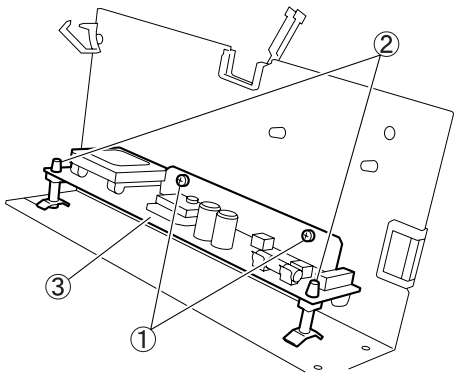
**Note:** Since a metal sheet is sticking out near the connector ②, be careful not to cut yourself when unhooking the connector.




① PCB assembly ② Connector
③ Screw ④ Mounting plate
⑤ Positioning place

**Fig. 3-614**

5) Remove two screws ① (BH-B), unlock two supports ②, and dismount the PCB assembly ③.

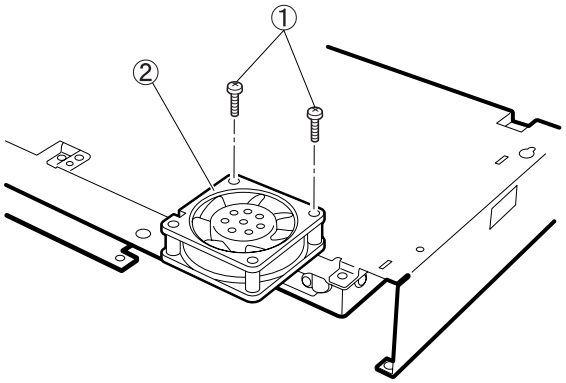



① Screw ② Support
③ PCB assembly

**Fig. 3-615**

## 10. Exhaust Fan

1) Take off the back plate assembly.
2) Remove two screws ① (BH-B, L25) and take off the exhaust fan ②.




① Screw ② Exhaust fan

**Fig. 3-616**

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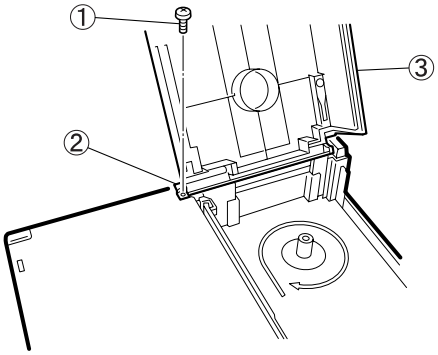
# VII. CAMERA UNIT

## 1. Cover on the Take-up Side

1) Remove one screw ① (self-tapping, BH-B, L8), take off the stopper ② and the cover assembly ③ on the take-up side.

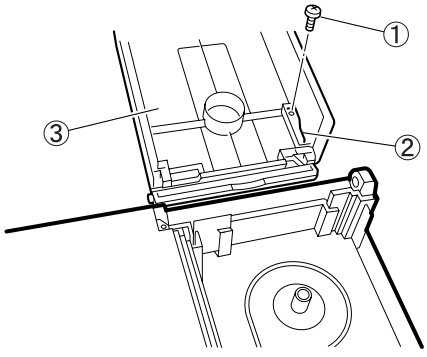



① Screw ② Stopper
③ Cover assembly

**Fig. 3-701**

2) Remove one screw ① (self-tapping, BH-B, L6), separate two plate springs ② from the cover ③ on the take-up side.

**Note:** The two plate springs are overlaying each other.

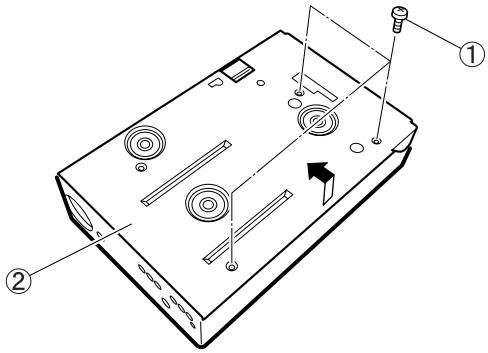



① Screw ② Plate spring
③ Cover

**Fig. 3-702**

## 2. Lower Cover

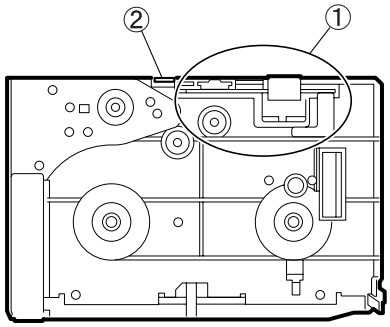
1) Remove three screws ① (self-tapping, BH-B, M2) and take off the lower cover ② while lifting the front side of the lower cover slightly.




① Screw ② Lower cover

**Fig. 3-703**

**Note:** Do not disassemble the lock mechanical parts ① that are revealed when removing the cover. If the magnet ② comes off, return it to its original position before reassembling.




① Look mechanical parts
② Magnet

**Fig. 3-704**

**Note:** Disassembling the camera unit:
In the field, do not disassemble any parts other than those described above, such as supply cover parts, camera shutter parts, and remaining sensing plate parts.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# CHAPTER 4

# INSTALLATION

This product undergoes exhaustive adjustment and testing before it is shipped from the factory.

Installation after unpacking at the field is important for demonstrating the machine's performance to be the same as when it passed factory inspections.

The service technician must fully understand the machine's performance before installing and inspecting the machine at a suitable environment according to the described procedure.



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# I. SELECTION OF LOCATION

It is recommended that the customer engineer personally inspect the customer's premises before installing any machine. The location should meet the following requirements:

- The power supply should be connected to an outlet capable of supplying the voltage shown on the rating plate plus or minus 10%. A grounded plug must be used.

| Grounding Items |
|---|
| 1) Power outlet grounding terminal |
| 2) Earth lead that has been grounded for office equipment |

- Do not place the machine on unstable locations such as on a weak base or at un-level location. The machine weighs about 48 kg.
- The machine operates at temperatures from 10 to 32.5°C and at a humidity from 20 to 80%RH. Since its performance is assured within a range of 15 to 27.5°C and 25 to 75 %RH, it is desirable to install it at a place with this range. In particular, do not install the machine near water faucets, humidifiers, hot water heaters, and refrigerators.
- The machine should not be exposed to open flame, dust, ammonia or other corrosive gases, direct sunlight, intensive vibration or near machinery that generates electromagnetic waves.
  - Prevent cigarette smoke from coming into direct contact with the machine.
  - In applications where installation of the machine in direct sunlight is unavoidable, a heavy curtain should be installed on the windows to protect the machine.
- Maintain sufficient space around the machine during operation and maintenance, and to allow ventilation.
  - The exhaust fan and power cord are located at the rear of the machine. Do not push the machine against the wall.
  - Allow sufficient space on both sides of the machine so that you can insert your hands to lift it up when the machine is to be moved.

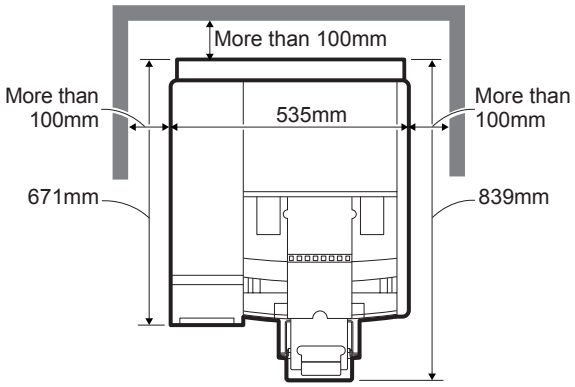


**Fig. 4-101**

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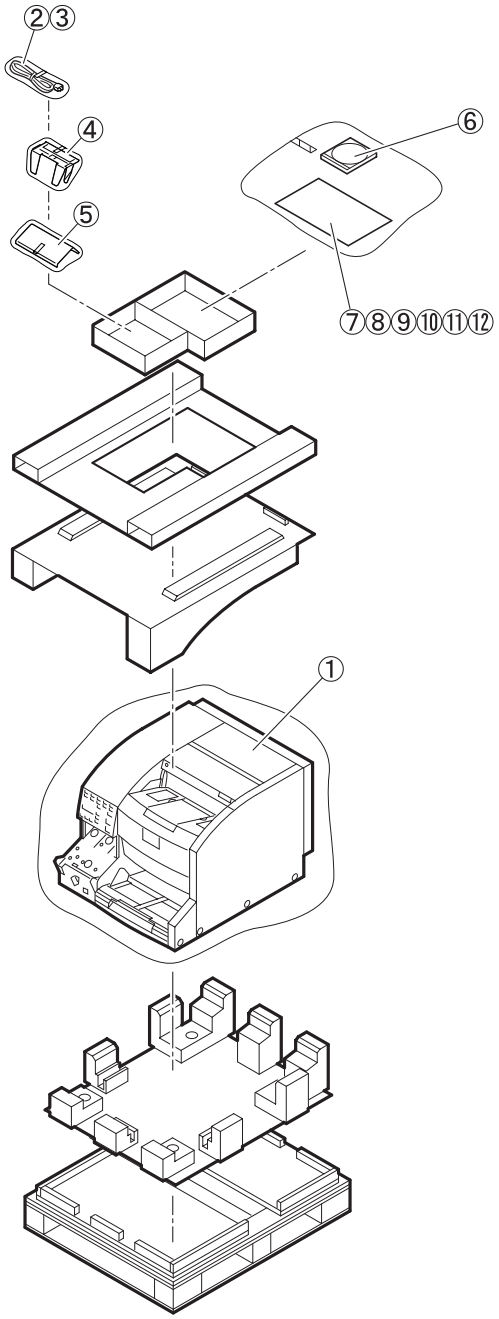
# II. UNPACKING & INSTALLATION

If the machine (in its shipping container) has been stored in a cold location, it should not be unpacked in a warm room until it has had time to warm up. Otherwise, moisture may condense on the metal and glass parts, resulting in trouble. At least one hour should be allowed for the machine to warm up to room temperature before the shipping container is opened.

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Unpack the outer container, and take out the machine and other items.<br>Check if anything is missing.<br>The package weighs about 67 kg, and its external dimensions are about 690(W) X 830(D) X 800(H) mm.<br>① Main body<br>② Power cord<br>③ Grounding wire (100V model only)<br>④ Removable tray<br>⑤ Delivery support plate<br>⑥ Setup CD-ROM<br>⑦ Function key label<br>⑧ Instruction manual (Drive software)<br>⑨ Instruction manual (Hardware)<br>⑩ Instruction manual (Application software)<br>⑪ Software license agreement<br>⑫ Warranty card (100V and 120V modes only) |  |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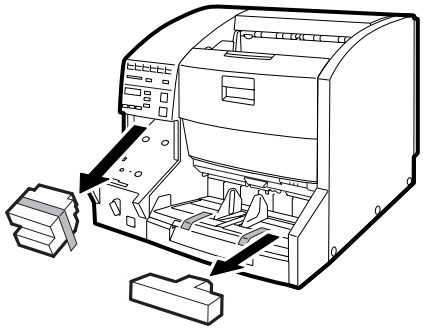
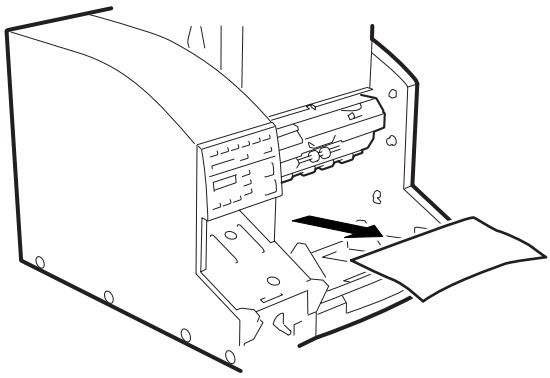
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 2 | Move the main body to where it is to be installed.<br>**Note:** Two or more people should hold the bottom at both sides of the machine and carry it with care. It might be good to use a rollaway truck, etc. The machine weighs about 48 kg. | |
| 3 | Peel off all tape securing the various parts. Also remove the protective pad from the document guide assembly and the camera drive unit. |  |
| 4 | Open the upper unit and feed unit, and remove the protective sheet from the reading glasses. |  |
| 5 | Connect the power cord.<br>In the case of the 100V model, also connect the grounding wire. | |
| 6 | Connect a personal computer to the main body using a SCSI cable.<br>Change the SCSI ID and terminator settings if necessary. | |
| 7 | After turning on the power of the machine, turn on the power of the personal computer. | |
| 8 | Install the driver software and application software in the personal computer. For details, refer to the instruction manual. | |
| 9 | Mount the camera unit and check if it operates normally.<br>For details on how to operate it, refer to the instruction manual. | |
| 10 | Affix the function key labels if necessary. | The labels includes the index label for the camera unit and the positioning label for the document guide. |
| 11 | As for the film address log, when modifying the format of the scanning date, refer to “III. Setting the date format”. | The factory default format is “MM/DD/YYYY”. |

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| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 12 | When using any processor other than the Canon AP167, refer to the “IV. Density Filter Mounting Procedure”. | |
| 13 | When changing the camera unit ID or using microfilms other than the Canon CKIII, refer to the “VI. Setting the Camera Unit”. | |


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# III. SETTING THE DATE FORMAT

When adding this setting to the setting file of each driver, a new format is specified.

When making other changes, the contents of the format are modified. If the format is deleted, the setting returns to the default “MM/DD/YYYY”. The following describes how to set YYYY/MM/DD, as an example.

If the logged date is July 25, 2001, the default setting will produce “07/25/2001”, which becomes “2001/7/25” after changing the setting.

## 1. Scanning Utility 5060

Open \ceiscan\CANONGOH in the Windows directory of the PC (Windows or Winnt) and add DATEFORMAT to the driver section. Refer to Fig. 4-301.

For details on the format conversion marks, refer to Table 4-301.

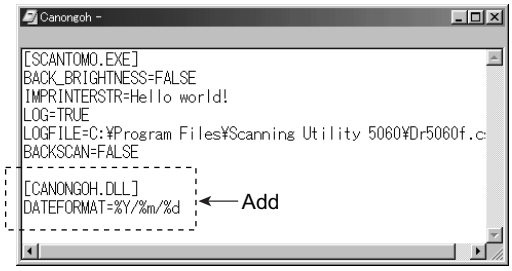


**Fig 4-301**

| Mark | Description |
|---|---|
| %a | Abbreviated weekly name |
| %A | Full weekday name |
| %b | Abbreviated month name |
| %B | Full month name |
| %c | Date and time representation appropriate for locale |
| %d | Day of month as a decimal number (01~31) |
| %j | Day of year as a decimal number (001~366) |
| %m | Month as a decimal number (01~12) |
| %U | Week of year as a decimal number, w/ Sunday as the first day of the week (00~53) |
| %w | Weekday as a decimal number (0~6; Sunday is 0) |
| %W | Week of year as a decimal number, w/ Monday as the first day of the week (00~53) |
| %x | Date representation for current locale |
| %y | Year without century, as a decimal number (00~99) |
| %Y | Year with century, as a decimal number |
| %% | %character |

**Tab. 4-301**

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## 2. ISIS/TWAIN

Open \setscan in the Windows directory of the PC (Windows or Winnt) and add LogDateFormat to the scanner section [DR-5060]. Refer to Fig. 4-302.

For details on the format conversion marks, refer to Table 4-301, which is the case for Scanning Utility 5060.

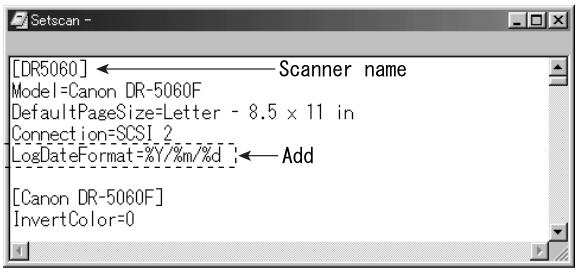


**Fig. 4-302**


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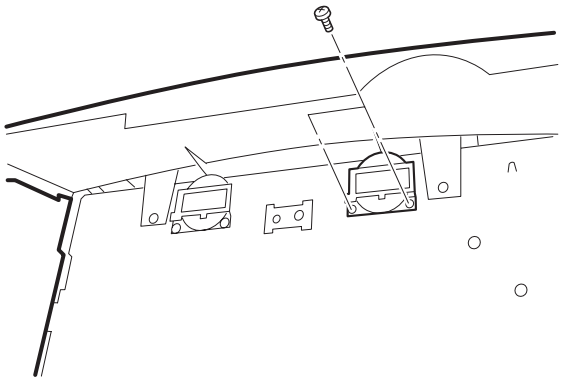
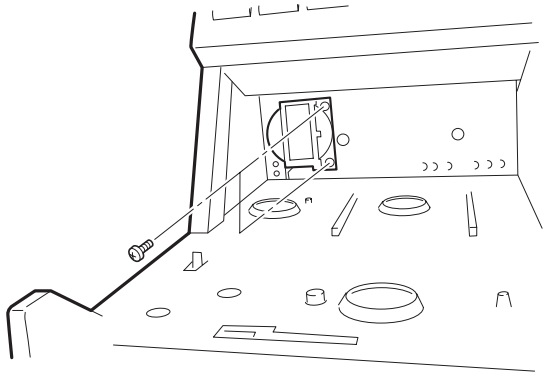
# IV. MOUNTING PROCEDURE FOR THE DENSITY FILTER

The film density of this machine is set for the Canon AP167 processor. When using processor made by an other company, the density filter needs to be mounted on the main shutter assembly of this machine to match the density to the processor.

This machine is provided with the density filter at transparency of 25% and 50%. Use the filter that matches the processor.

**Reference:** In the case of PROSTAR processor made by Kodak, it is recommendable to try the density filter at transparency of 25% with a darker color.

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Open the upper unit, unfasten two screws, and dismount the density filter together with its mounting plate.<br>**Note:** Do not smudge or drop the density filter. If the filter get smudged, clean it with care. |  |
| 2 | Attach the density filter with its mounting plate to the main shutter assembly using two screws.<br>Use the screws removed in step No.1.<br>**Note:** Make sure the density filter is not misaligned or floating. |  |
| 3 | Perform the “Adjusting the light intensity of the mark LED”.<br>For details, refer to the section of “Chapter 6 III. Service Modes”. | |
| 4 | Perform exposing and processing and check the film density. | |
| 5 | Change the density filter and re-adjust the “Adjusting the light intensity of the mark LED” if necessary. | |

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| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 6 | Perform the “Fine adjustment of film density” if necessary.<br>For details, refer to the section of “Chapter 6 III. Service Modes”. | |


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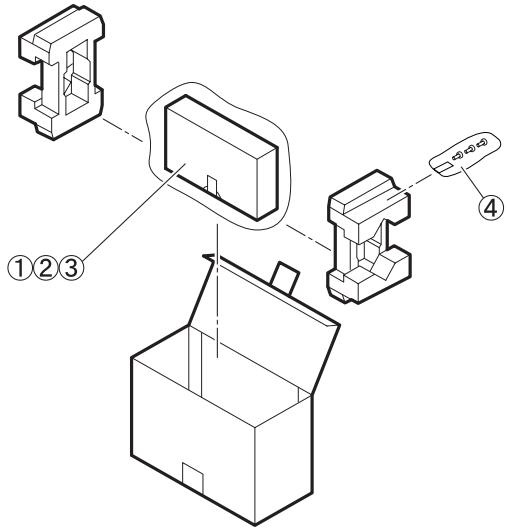
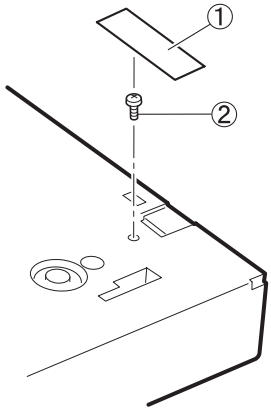
# V. MOUNTING PROCEDURE FOR THE CAMERA UNIT

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1. | Open the container and take out the machine and other items packed inside. Check if anything is missing.<br>① Main body<br>② Case<br>③ Reel<br>④ Three screws (self-tapping, black)<br>Note: The reel is contained in the main body. |  |
| 2. | Peel off the fixing tape from the back of the main body. Remove one screw contained inside.<br>**Note:** This screw is attached so as not to lock the cover of the camera unit during transportation, and is not needed when using the camera unit. |  <br>① Fixing tape ② Screw |
| 3. | If needed, set the camera ID and the film thickness. For details, refer to “VI. Setting the camera unit”. | |
| 4. | Load the camera unit with film by inserting it into the opening of the DR-5060F as far as possible.<br>Make sure the camera unit is not loose, and secure the unit with the fixing lever. For details, refer to the instruction manual for the DR-5060F. | |

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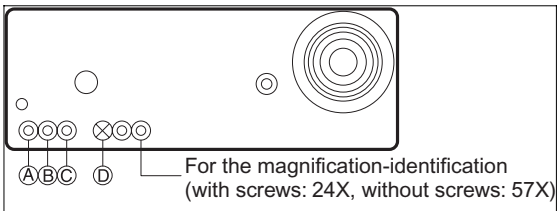
# VI. SETTING THE CAMERA UNIT

Although the camera unit (57X, 24X) is shipped off-the-shelf, some settings have to be changed depending on the usage conditions.

1. When changing the camera ID. The factory-shipped setting for the camera ID is “1”.
2. When changing the setting of film thickness. This setting is made when using the microfilm with any film thickness other than 5 mil. If Canon “CK-III” is used, no changes are needed for the setting.

## 1. Changing the Camera ID

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Fasten the screw(s) in accordance with the setting table shown to the right.<br>The screws are included with the camera unit.<br>**Note:** Up to 15 settings are allowed for the camera unit. |  |
| 2 | Using the “Displays the camera unit ID”, check to make sure the setting is properly made.<br>For details, refer to the section of “Chapter 6 III. Service Modes”. | Camera ID setting table ⊗ : Show with screws |

| ID | Ⓐ | Ⓑ | Ⓒ | Ⓓ | ID | Ⓐ | Ⓑ | Ⓒ | Ⓓ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ○ | ○ | ○ | ⊗ | 9 | ⊗ | ○ | ○ | ⊗ |
| 2 | ○ | ○ | ⊗ | ○ | 10 | ⊗ | ○ | ⊗ | ○ |
| 3 | ○ | ○ | ⊗ | ⊗ | 11 | ⊗ | ○ | ⊗ | ⊗ |
| 4 | ○ | ⊗ | ○ | ○ | 12 | ⊗ | ⊗ | ○ | ○ |
| 5 | ○ | ⊗ | ○ | ⊗ | 13 | ⊗ | ⊗ | ○ | ⊗ |
| 6 | ○ | ⊗ | ⊗ | ○ | 14 | ⊗ | ⊗ | ⊗ | ○ |
| 7 | ○ | ⊗ | ⊗ | ⊗ | 15 | ⊗ | ⊗ | ⊗ | ⊗ |
| 8 | ⊗ | ○ | ○ | ○ | | | | | |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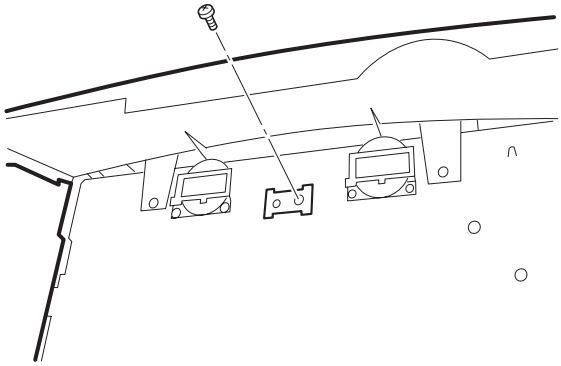
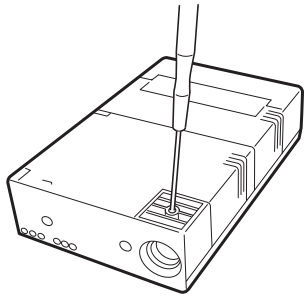
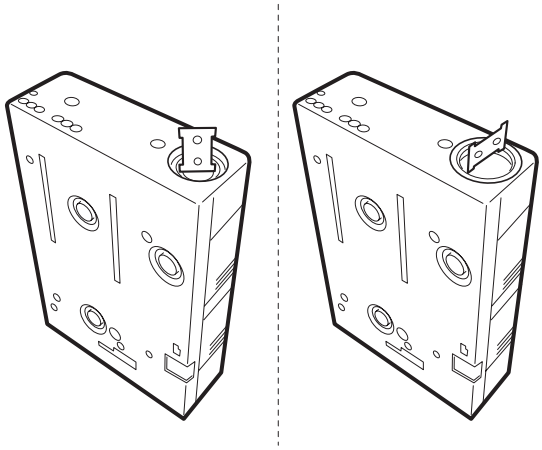
## 2. Changing the Setting of Film Thickness

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Open the upper unit, remove one screw, and take off the setting tool. |  |
| 2 | Unfasten the set screw. |  |
| | Using the setting tool, rotate the lens and adjust the position of the groove to the film thickness. “4” in the case of 4 mil, and “2.5” for 2.5 mil.<br>**Note:** Use the setting tool in different orientations depending on the lens magnification. | [57X] [24X]<br>  |
| 4 | Fasten the set screw. | |
| 5 | Perform exposing and processing, and check to make sure that the image is properly focused. | |

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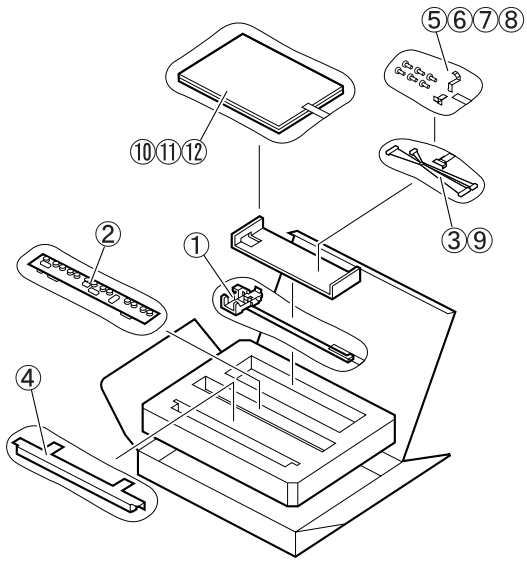
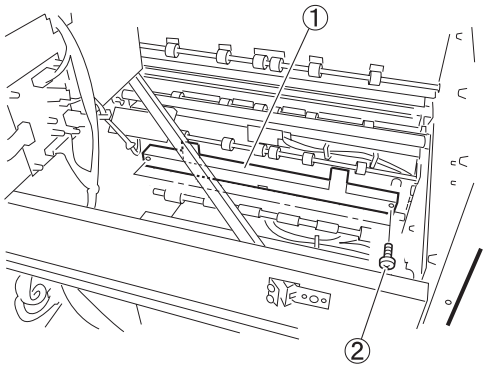
# VII. MOUNTING PROCEDURE FOR THE IMPRINTER 5000

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Open the container and take out the machine and other items packed inside.<br>Check if anything is missing.<br>① IP mount unit<br>② IP PCB assembly<br>③ IP cable assembly<br>④ IP drain unit<br>⑤ IP plate spring 1<br>⑥ IP plate spring 2<br>⑦ Two screws (BH, white)<br>⑧ Four screws (self-tapping, black)<br>⑨ FPC stopper 2<br>⑩ IP operation label<br>⑪ Instruction manual<br>⑫ Warranty card (100V model only)<br>**Note:** IP head is sold separately. |  |
| 2 | Take off the rear cover, right cover, left cover, and top cover assembly of the machine.<br>For details, refer to the section of “Chapter 3 I. Outside Covers”. | |
| 3 | Install the IP drain unit using two screws (white). |  <br>① IP drain unit ② Screw (white) |
| 4 | Detach the upper pickup cover assembly.<br>Separate the upper pickup cover from its mounting plate.<br>For details, refer to the section of “Chapter 3 I. Outside Covers”. | |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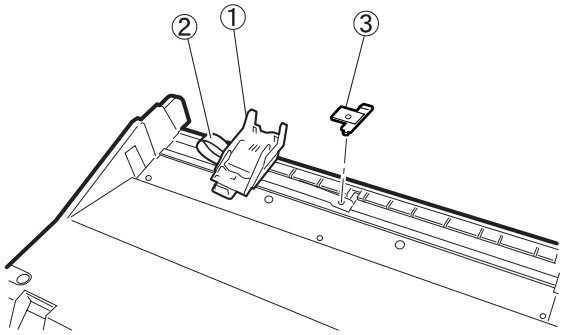
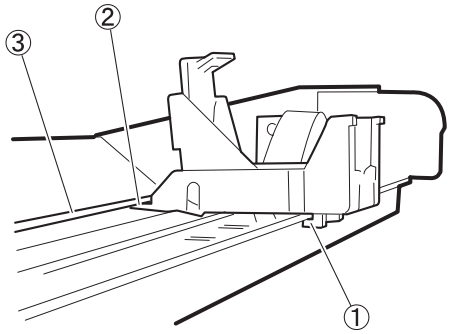
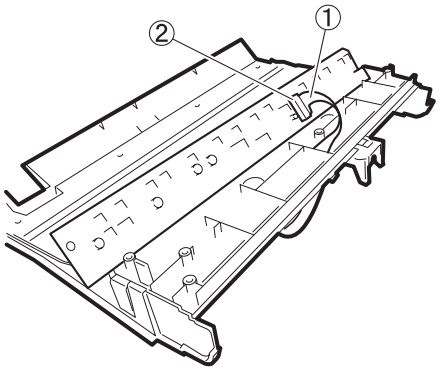
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 5 | Install the IP mount unit.<br>1) Peel off the separate paper from the adhesive double coated tape stuck on the back of the FPC, and then affix the FPC straight on the upper pickup cover.<br>2) Insert the FPC stopper 2 and fix it. |  <br><br>① IP mount unit ② FPC<br>③ FPC stopper 2 |
| 6 | Attach the mounting plate to match the position of the IP mount unit.<br>Hang the hook at the front of the unit on the edge of the cover, and fit the protrusion at the back into the gap between the cover and the mounting plate. |  <br><br>① Hook ② Protrusion<br>③ Mounting plate |
| 7 | Connect the FPC in the IP mount unit to the connector of the IP PCB assembly. |  <br><br>① FPC ② Connector |

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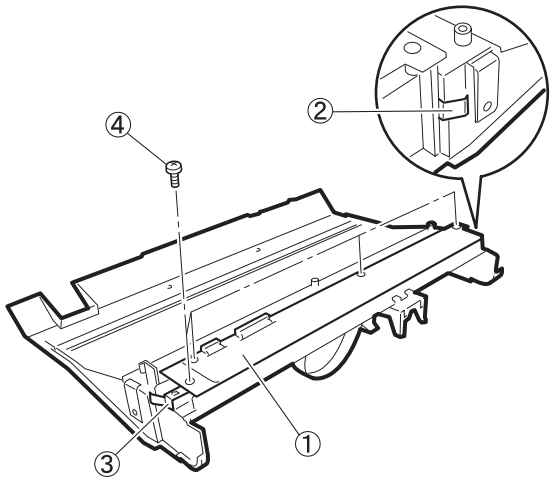
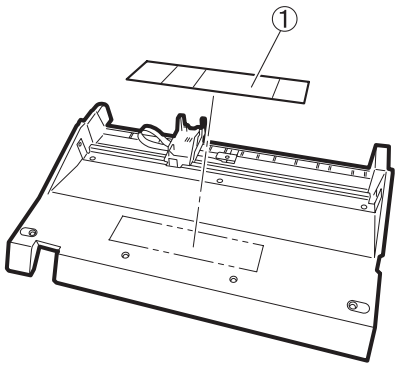
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 8 | Mount the IP PCB assembly, IP plate spring 1 and IP plate string 2 using four screws (black).<br>Each spring should be inserted between the IP PCB assembly and the upper pickup cover, and fastened together with the screws. |  <br>① IP PCB assembly ② IP plate spring 1<br>③ IP plate spring 2 ④ Screw (black) |
| 9 | Peel off the separate paper from the IP operation label and affix the label to the pickup cover.<br>Match the directions of the label and the main body so that the label instruction of how to mount the IP head can be viewed from the front side of the main body. |  <br>① IP operation label |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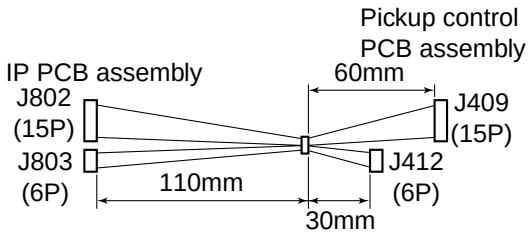
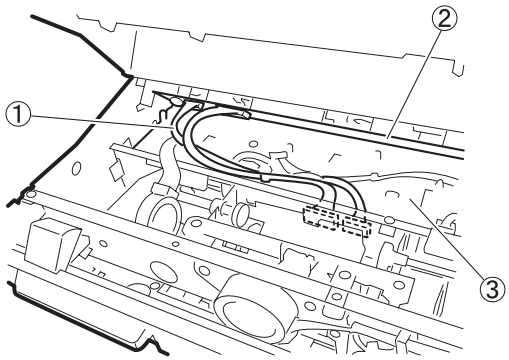
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 10 | Insert the IP cable assembly into the connectors (2 connectors) of the IP PCB assembly, and then insert the other end of the cable into the connectors (2 connectors) of the pickup control PCB assembly. | • Connecting the IP cable assembly<br>  <br><br>  <br><br>① IP cable assembly ② IP PCB assembly<br>③ Pickup control PCB assembly |
| 11 | Attach the upper pickup cover assembly.<br>Do not get the cable assembly caught.<br>**Note:** Do not distort the IP plate springs. Do not allow the cover to float. | |
| 12 | Attach the IP head.<br>For details on how to attach it, refer to the instruction manual for the imprinter or the IP operation label<br>Clean the external cover or the inside when they are stained with the ink during operation. | |
| 13 | Check if the imprinter operates properly.<br>For details on how to operate it, refer to the instruction manuals for the DR-5060F and the imprinter. | |

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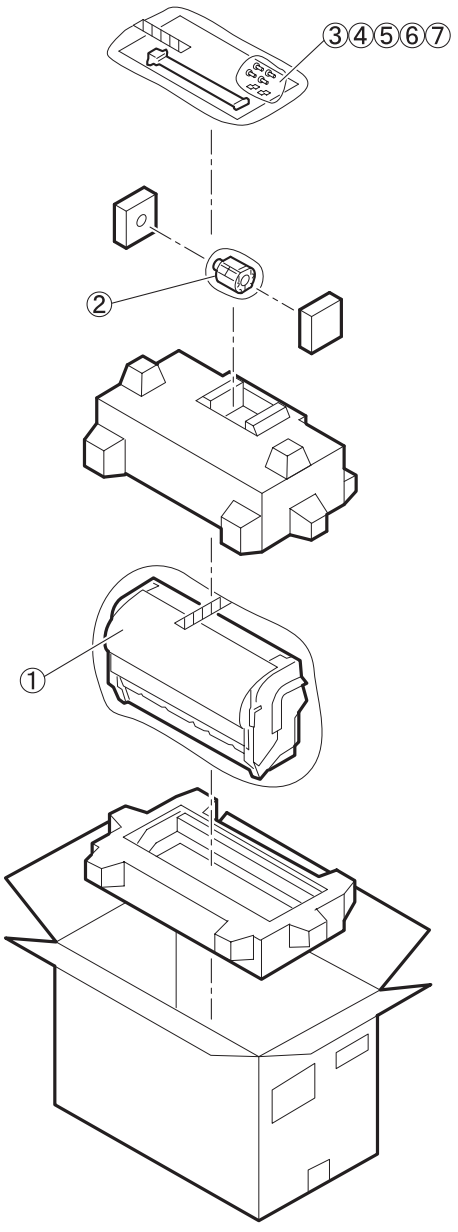
# VIII.MOUNTING PROCEDURE FOR THE ENDORSER ED600

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Open the container and take out the machine and other items packed inside.<br>Check if anything is missing.<br>① Main body<br>② Diedrum (with its fixing screw(s))<br>③ Endorser cable assembly<br>④ Two plate springs<br>⑤ Two screws (step screw)<br>⑥ One screw (BH, white)<br>⑦ Instruction manual<br>**Note:** Ink roller and stamping plate are sold separately. |  |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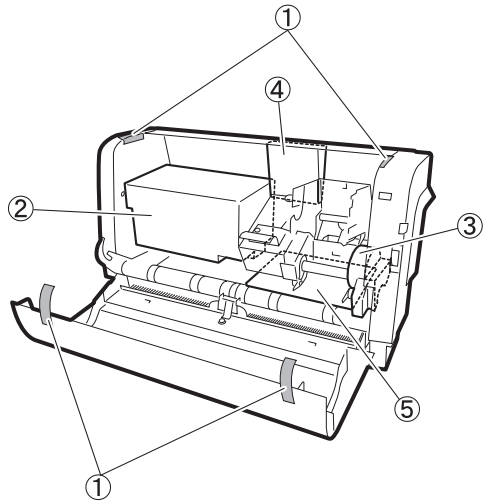
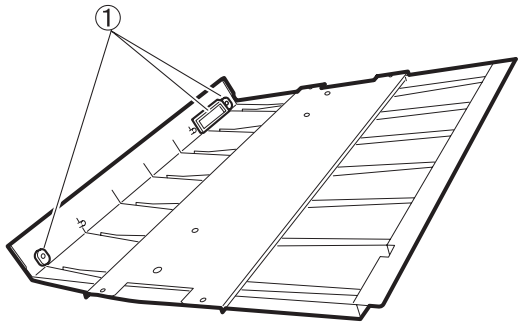
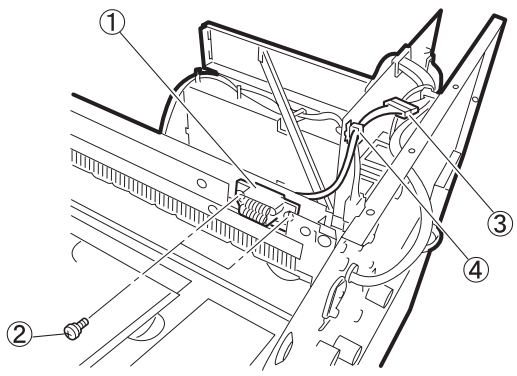
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 2 | Peel off all the fixing tape.<br>Open the cover and remove the protective pad and protective sheet. |  <br>① Fixing tape ②③④ Protective pad<br>⑤ Protective sheet |
| 3 | Take off the rear cover, right cover, left cover, and top cover assembly of the DR-5060F.<br>For details, refer to the section of “Chapter 3 I. Outside Covers”. | |
| 4 | Detach the blind plates of the top cover assembly. |  <br>① Blind plate |
| 5 | Mount the endorser cable assembly using two screws (step screw). Connect the cable assembly to the connector and secure it with the cable stopper.<br>**Note:** Be careful that the endorser cable does not touch the roller. |  <br>① Endorser cable assembly ② Step screw<br>③ Connector ④ Cable stopper |

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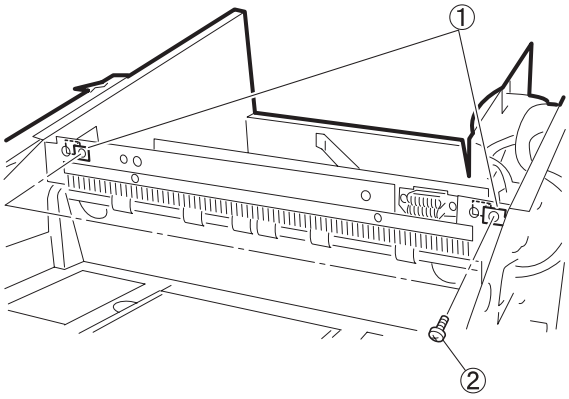
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 6 | Attach the plate springs to both sides with the screws.<br>**Note:** Use the screw from the DR-5060F for the right spring. |  <br>① Plate spring ② Screw |
| 7 | Attach the rear cover, right cover, left cover, and top cover assembly of the DR-5060F. | |
| 8 | Check if the endorser operates normally.<br>For details on how to operate it, refer to the instruction manuals for the DR-5060F and the endorser. | |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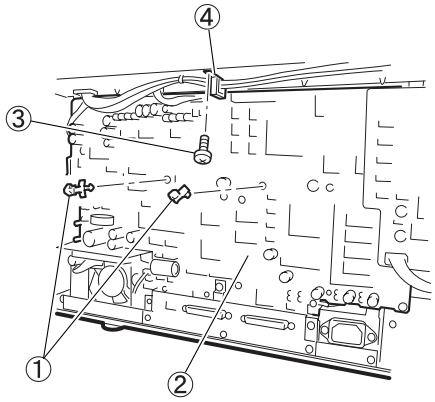
# IX. BAR CODE DECODER AND PATCH CODE DETECTOR MOUNTING PROCEDURE

The mounting the procedure for the bar code decoder is the same as that of patch code detector. As for the PCB assemblies, the smaller one is different in shape.

Only one of the two devices can be mounted.

| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 1 | Open the container and take out the machine and other items packed inside.<br>Check if anything is missing.<br>* Bar code decoder<br>① main body<br>② Two locking supports<br>③ Instruction manual<br>④ Warranty card (for Japan)<br>* Patch code detector<br>⑤ Main body<br>⑥ Two locking supports<br>⑦ Patch code sheet | |
| 2 | Take off the rear cover of the DR-5060F.<br>For details, refer to the section of “Chapter 3 I. Outside Covers”. | |
| 3 | Attach the two locking supporters contained to the main CPU PCB assembly of the DR-5060F.<br>Unfasten the screw and remove the cable stopper. |  <br>① Locking supporter<br>② Main CPU PCB assembly<br>③ Screw ④ Cable stopper |

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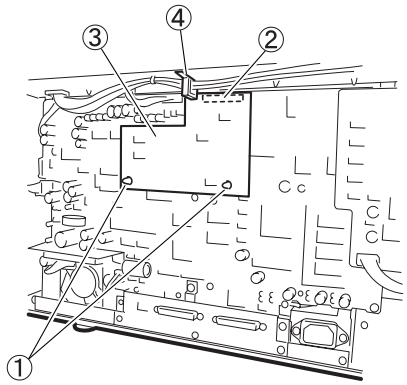
| No. | Procedure | Inspection and Remarks |
|---|---|---|
| 4 | Mount the bar code decoder or patch code detector.<br>Press-fit it securely to the two locking supporters and the connector of the main CPU PCB assembly.<br>Fasten the cable stopper using the screw. |  <br><br>① Locking supporter ③ Connector<br>② Decoder or detector ④ Cable stopper |
| 5 | Check if it operates properly.<br>For details on how to operate it, refer to the instruction manual for the DR-5060F. | |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# CHAPTER 5

# MAINTENANCE & SERVICING



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# I. BASIC PERIODIC SERVICING PROCEDURE

Before you visit the user site for periodic servicing, check the Service Ledger, and take any parts that you expect need to be replaced.

| No. | Procedure | Inspection | Remarks |
|---|---|---|---|
| 1 | Pay your respects to the supervisor. | Check current status. | |
| 2 | Perform recording, searching, and exposing. | • Condition of document feed<br>• Results of recording, searching, and exposing<br>• Abnormal noise | Confirm the counter display. |
| 3 | Replace parts.<br>(only when necessary) | | |
| 4 | Clean the document feed assembly and optical assembly. | | Clean the inside of the machine if necessary. |
| 5 | Perform the adjustment and the compensation once again (when necessary) | | For details, refer to “Chapter 6.III. Service Mode” |
| 6 | Re-check the results, and perform recording, searching, and exposing again. | | |
| 7 | Clean around the machine. | | |
| 8 | Make any required entries in the Service Sheet, and report to the supervisor. | | |

**Table 5-101**

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# II. PARTS TO BE REPLACED PERIODICALLY

Parts must be replaced periodically to maintain the machine's functions to a constant standard. The following table shows parts that must be replaced periodically (parts that greatly influence machine operation when they are no longer functional but are not visibly deformed or damaged).

Preferably these parts should be replaced during the periodic service carried out on the date closest to that in the guides for periodic replacement below.

| No. | Part Name | Part No. | Q'ty | Guide for replacement | Remarks |
|---|---|---|---|---|---|
| 1 | Separation roller | MA2-6150 | 1 | 250 thousand sheets | |
| 2 | Pickup roller | MA2-5520 | 1 | 500 thousand sheets | |
| 3 | Feeding roller | MA2-5539 | 1 | | |
| 4 | Main shutter unit | MG1-3238 | 1 | 1 million sheets | Number of exposed sheets |
| 5 | Double feed sensor lever 2 | MA2-5545 | 1 | 1.5 million sheets | |
| 6 | Double feed sensor reference plate | MA2-5510 | 1 | | |
| 7 | LED unit | MG1-3300 | 2 | Lit: 500 hours | About 1.5 million sheets |
| 8 | Separation motor | RH7-1278 | 1 | 3 million sheets | |
| 9 | Feed follower roller 1 | MA2-5561 | 2 | | Upper reading unit |
| 10 | Feed follower roller 2 | MA2-5562 | 4 | | |
| 11 | Bearing | FS1-1422 | 12 | | For No.9 and 10 |
| 12 | Fluorescent lamp | MH7-3044 | 2 | Lit: 1,000 hours | Number of exposed sheets:<br>About 3 million sheets<br>Replace them all at the same time. |
| 13 | Lamp PCB assembly | MH3-7015 | 2 | | |

**Table 5-201**

**Note:** The above figures are for reference only. They may vary according to conditions of use.


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# III. CONSUMABLE PARTS AND CONSUMABLES

This machine has no consumable parts.

The following table shows the optional consumables. The replacement of these items will be performed by the user.

| No. | Parts Name | Purpose | Remarks |
|---|---|---|---|
| 1 | IP head | Imprinter 5000 | Replace when the ink runs out.<br>Guide for replacement: 500 thousand characters |
| 2 | Ink rollers | Endorser ED600 | Replace when the ink runs out.<br>Guide for replacement: 300 thousand sheets |

**Table 5-301**

**Note:** Used consumable parts and consumables must be collected and disposed of according to local laws.

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# IV. PERIODIC MAINTENANCE LIST

**Note:** Use only the specified solvents and oils.

[△ : Cleaning ● : Replacement ☆ : Oiling □ : Adjustment ◎ : Inspection]

| Unit Name | Location | Maintenance Cycle | | | Remarks |
|---|---|---|---|---|---|
| | | Every 250,000 sheets | Every 500,000 sheets | Others | |
| Document feed system | Separation roller | ● | | | |
| | Pickup roller | △ | ● | | |
| | Feeding roller | △ | ● | | |
| | Registration roller (upper, lower) | △ | | | |
| | Lower reading roller | △ | | | |
| | Upper reading roller (Feed follower roller 1) | △ | | ● | 3 million sheets |
| | Feed follower roller 2 | △ | | ● | 3 million sheets |
| | Bearing | | | ● | 3 million sheets |
| | Double feed sensor lever 2 | | | ● | 1.5 million sheets |
| | Double feed sensor reference plate | | | ● | 1.5 million sheets |
| | Separation motor | | | ● | 3 million sheets |
| Scanner optical system | Reading glass | △ | | | |
| | LED unit | | | ● | LED lit 150 hours (0.5 million sheets as a guide) |
| | Reading unit | | | □ | LED lit 500 hours (1.5 million sheets as a guide) Shading compensation |
| Filmer optical system | Reading glass | △ | | | Clean both sides, inside and outside. |
| | Main shutter unit | | | ● | Number of exposed sheets: 1 million sheets |
| | Fluorescent lamp | | | ● | Lit 1000 hours (3 million sheets as a guide), simultaneous replacement |
| | Lamp PCB assembly | | | ● | |

**Table 5-401**

**Note 1:** If the contamination is heavy, instruct the user to perform "Daily User Inspection" again.

**Note 2:** Clean the camera unit during the periodic maintenance.

**Note 3:** When using the imprinter, clean any ink residue from inside the machine with a swab.

**Note 4:** Since leakage currents may occur if dust settles on the connector portion of the power cable, clean it as required.

**Note 5:** Since the surface of the mirror is covered with a special coating, be extremely careful when cleaning the surface. because a film will remain on the surface.


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# CHAPTER 6

# TROUBLESHOOTING



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# I. ERROR INDICATION AND REMEDY

## 1. Error Codes

When various types of errors occur, this machine indicates the error code on the display of the operation panel. Error codes are shown in alphanumeric characters. Table 6-101 shows a list of the error codes. The list includes errors that the user must take care of and those that are for checking. Errors such as document jams that the user can correct, are taken care of by the user. However, when an error taken care of by the user is not corrected, the service technician takes care of it. For details, refer to this chapter.

For error indications on the display connected to the personal computer, refer to the instruction manual or the instruction manual of the software being used.

## 2. Error Message

Aside from the indication of error-codes, error messages are indicated on the display connected to the PC.

As for the messages or their remedies, refer to the Instruction Manual or manuals for software in use.

The following gives some examples of messages.

- JAM occurred. Remove the paper.
- Cover is opened. Close the cover.
- Parameter is not valid. Change the parameters.

| Category | Code | Description | Remedy |
|---|---|---|---|
| Document jam | P00 | Document remains inside when the power turns ON or after recovering from a document jam. | Recover from document jam. |
| | P01 | Document did not reach the front registration sensor. | |
| | P02 | Document did not come out of front registration sensor. | |
| | P04 | Document did not reach the back registration sensor. | |
| | P06 | Document reaches back registration sensor early. Document has perforations for binding. | |
| | P10 | Document did not reach the delivery sensor. | |
| | P20 | Document does not come out of delivery sensor. | |
| | P30 | Document jam has occurred at the Endorser. | |
| Skew | J18 | Skew detected. | Recover from document jam. |

**Table 6-101 (cont.)**

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| Category | Code | Description | Remedy |
|---|---|---|---|
| Double feed | d01 | Double feed detected by paper thickness. | Clear indication and recovery document jam |
| | d02 | Double feed detected by paper length. | |
| | d03 | Both d01 and d02 detected. | |
| Door open | C01 | Upper unit or feed unit is open. | Close the unit completely. If the problem is not solved, refer to "IX-B-6. Interlock switch assembly". |
| | C02 | IP door sensor detected. | This does not happen normally. This will happen if power turns ON with the upper pickup cover removed. |
| | C03 | Both d01 and d02 are detected. | |
| | C04 | Endorser is uncovered. | Close them completely. |
| | C05 | Upper unit, feed unit, or endorser is uncovered. | |
| Confirmation | L01 | Setting can not be handled due to the SD RAM size. | Correct the setting and retry it. |
| | U01 | There is a count mismatch (counter < number of scanned sheets). | Check the number of documents. |
| | U02 | There is a count mismatch (counter > number of scanned sheets). | Check if documents have all been recorded. |
| | H01 | IP head is not set. | Set the IP head. |
| | H02 | Endorser is not set. | Set the Endorser. |
| | H03 | IP head and Endorser are not set. | Set them both. |
| | F01 | Camera unit is not set. | Set the camera unit. |
| | F02 | Film is not set. | Set the film. |
| | F08 | Exposure error due to operating mistake | Retry the operation. |
| | F-End | Film end | Set new film. |
| | F-Err | Film feed error | Confirm the state of the film setting and the film drive unit.<br>If the problem is not solved, refer to "IX-B-5. Camera unit lock lever".<br>**Note:** To check the film, open the camera unit cover in a darkroom. |
| Service | E20 | Main motor trouble | Check connections and load, replace parts as needed. |
| | E21 | Document board motor trouble | |
| | E22 | Separation motor trouble | |
| | E23 | Gap adjusting motor trouble | |
| | E24 | Feeding motor trouble | |
| | E25 | Pickup motor trouble | |
| | E27 | Endorser feeding motor trouble | |
| | E28 | Endorser imprint motor trouble | |
| | E29 | Registration clutch trouble | |
| | E30 | Exhaust fan trouble | |

**Table 6-101 (cont.)**


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| Category | Code | Description | Remedy |
|---|---|---|---|
| Service | E00 | Communication error between CPU's | Check connections, replace PCB assemblies as needed. |
| | E40 | Communication error between CPU's (SH2–K4) | |
| | E41 | Communication error between CPU's (K4–K0) | |
| | E46 | Communication error between CPU's (SH2–GH) | |
| | E50 | Fluorescent lamp trouble (including end of lifespan) | Check connections, replace fluorescent lamp as needed. |
| | E60 | Capstan motor trouble | Check connections and load, replace parts as needed. |
| | E61 | Front slit motor trouble | |
| | E62 | Back slit motor trouble | |
| | E63 | Camera lock motor trouble | |
| | E64 | Takeup motor trouble | |
| | E70 | Capstan solenoid trouble | |
| | E71 | Camera shutter solenoid trouble | |
| | E72 | Friction solenoid trouble | |
| | E73 | Main shutter solenoid trouble | |
| | E74 | Counter trouble | Check connections, replace parts as needed. |
| | E80 | Backup RAM error | Check connections, replace SH2 PCB assembly as needed. Perform service mode "00-CF". |
| | E85 | SD-RAM connecting error | Check connections, replace SD-RAM/SH2 PCB assembly as needed. |
| | E86 | Filmer EEPROM error | Check connections, replace GH-DCONPCB assembly as needed. |
| | LP | End of lifespan for fluorescent lamp | Replace fluorescent lamp if needed. |

**Table 6-101**

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# II. DOCUMENT JAM

## 1. Recovery Procedures

1) Remove the documents from the document board and delivery tray.
   Take off the removable tray and auxiliary delivery plate, and close the auxiliary delivery tray.

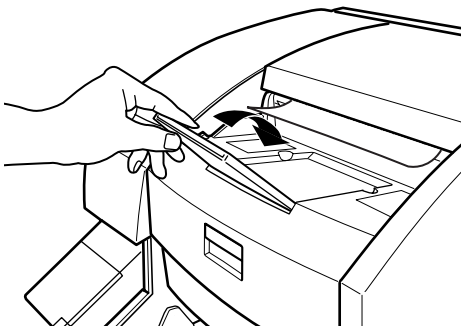

**Fig. 6-201**

2) Press the open/close button, and open the upper unit slightly.

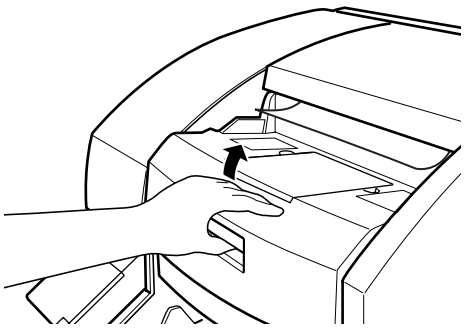

**Fig. 6-202**

3) Remove the documents remaining in the delivery assembly.

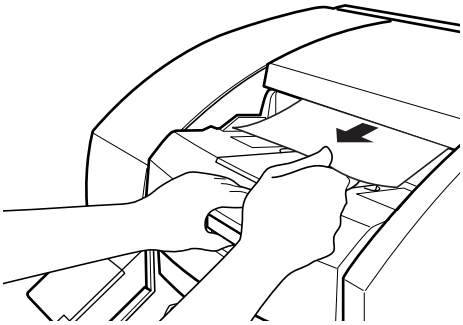

**Fig. 6-203**

4) Open the upper unit slowly to the full.
5) Remove the documents remaining in the intermediate unit.
   For a description of how to take off the middle unit, refer to the later section.

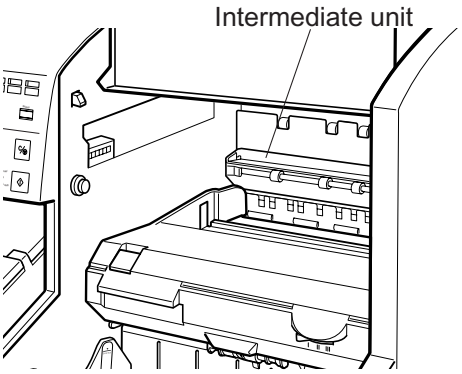


**Fig. 6-204**


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6) Press the open/close button, and open the feed unit slowly to the full.

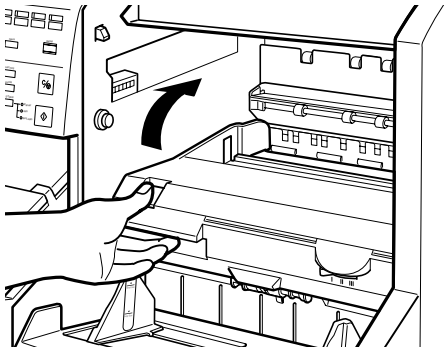

**Fig. 6-205**

7) Remove the document remaining in the feed unit.

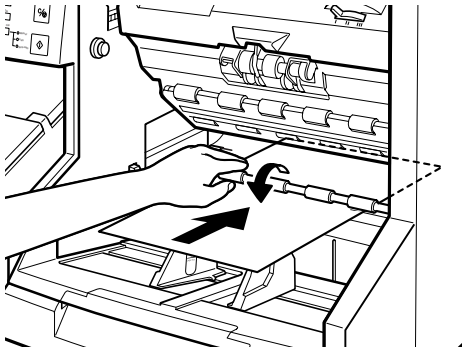

**Fig. 6-206**

8) Press the handle toward the back once, then release the hand. Do not push down the handle forcedly.

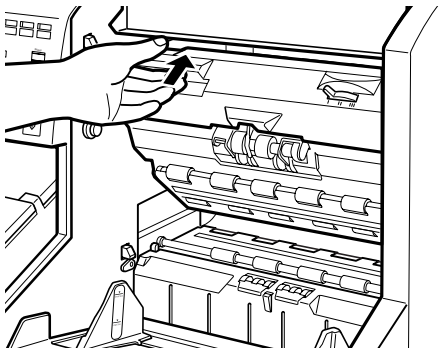

**Fig. 6-207**

9) Push down both sides with both hands to close the unit securely.

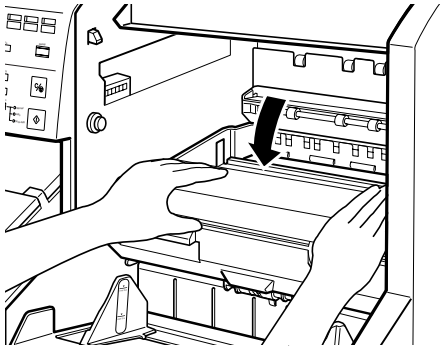

**Fig. 6-208**

10) Close the upper unit slowly, and then press both sides with both hands to close it securely.

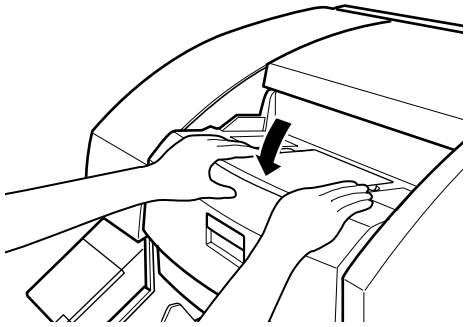

**Fig. 6-209**

**Note:** When removing documents, be careful not to tear off them.
When opening/closing the upper unit or feed unit, be careful not to get fingers caught.
Check to make sure that the last page of the delivered document was properly recorded.

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## 2. Intermediate Unit

a. Removing

1) Slide the intermediate unit upwards.

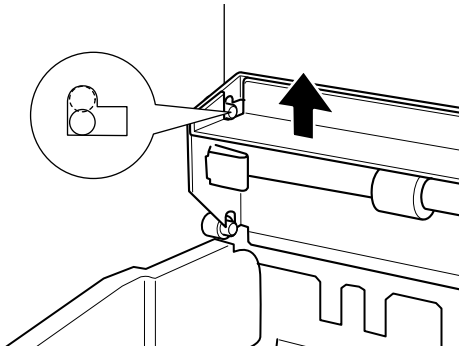

**Fig. 6-210**

2) Tilt the intermediate unit toward the front, and remove the upper pins.

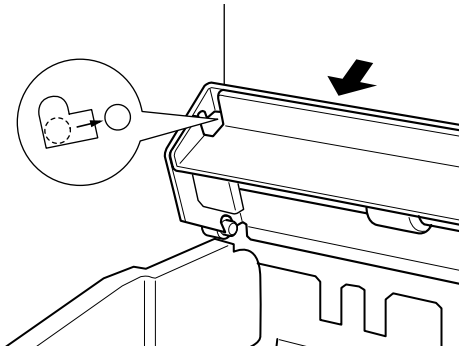

**Fig. 6-211**

3) Lift the intermediate unit as it is to remove.

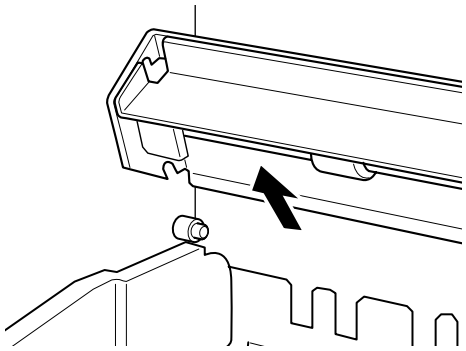

**Fig. 6-212**

b. Attaching

1) Hold the intermediate unit slightly skewed and hang each lower pin on the notch at each side.

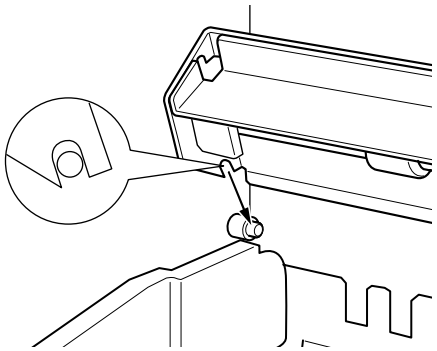

**Fig. 6-213**

2) Push the intermediate unit toward the back with it floating over the pins.

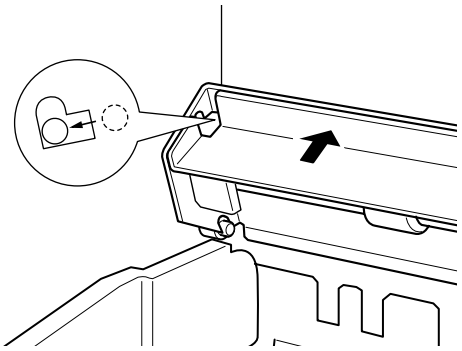

**Fig. 6-214**

3) Lower the intermediate unit downward.

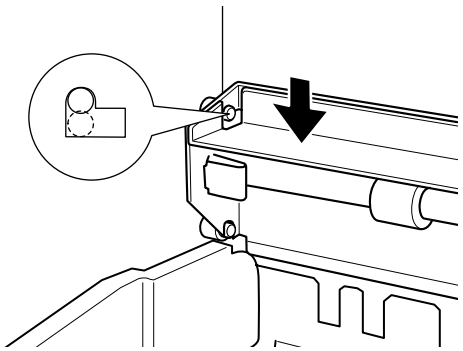

**Fig. 6-215**


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# III. SERVICE MODES

## A. List of Service Modes

Table 6-301 shows the service mode groups and Table 6-302 shows a list of the Service modes.

In addition to modes used by the service technician in the field, the list includes modes used by the factory and development group. Do not use modes other than as instructed.

| Address | Service mode groups |
|---|---|
| 00~1F | Service/Factory, setting |
| 20~6F | Service/Factory, displaying |
| 70~bF | For development (Some services are allowed) |
| C0~EF | For development |
| F0~15F | Unassigned items |
| 160~17F | For development (Some services are allowed) |
| 180~18F | For development |
| 190~19F | Unassigned items |
| 1A0~1E7 | Service/Factory, Filmer, setting/displaying |
| 1E8~1FF | Service/Factory, adjusting/confirming |

**Table 6-301**

| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 00 | 50 | Clears C01 detection counter | Use to clear the detection counters on the scanner unit.<br>There is no need to use these in the field. | |
| | 51 | Clears C02 detection counter | | |
| | 52 | Clears C04 detection counter | | |
| | 53 | Clears P01 detection counter | | |
| | 54 | Clears P02 detection counter | | |
| | 55 | Clears P04 detection counter | | |
| | 57 | Clears P10 detection counter | | |
| | 58 | Clears P20 detection counter | | |
| | 5C | Clears P06 detection counter | | |
| | 5d | Clears J18 detection counter | | |
| | 5E | Clears P30 detection counter | | |
| | 5F | Clears d01 detection counter | | |
| | 60 | Clears d02 detection counter | | |
| | 61 | Clears E85 detection counter | | |
| | 62 | Clears E40 detection counter | | |
| | 63 | Clears E41 detection counter | | |
| | 64 | Clears E30 detection counter | | |
| | 65 | Clears E20 detection counter | | |
| | 66 | Clears E21 detection counter | | |
| | 67 | Clears E22 detection counter | | |
| | 68 | Clears E23 detection counter | | |
| | 69 | Clears E24 detection counter | | |

**Table 6-302 (cont.)**

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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 00 | 6A | Clears E25 detection counter | Use to clear the detection counters on the scanner unit. | |
| | 6b | Clears E27 detection counter | | |
| | 6d | Clears E29 detection counter | | |
| | 6E | Clears the power ON detection counter | | |
| | A0 | Clears E60 detection counter | Use to clear the detection counters on the filmer unit.<br>There is no need to use these in the field. | |
| | A1 | Clears E61 detection counter | | |
| | A2 | Clears E62 detection counter | | |
| | A3 | Clears E63 detection counter | | |
| | A4 | Clears E64 detection counter | | |
| | A5 | Clears E70 detection counter | | |
| | A6 | Clears E71 detection counter | | |
| | A7 | Clears E72 detection counter | | |
| | A8 | Clears E73 detection counter | | |
| | A9 | Clears E74 detection counter | | |
| | AA | Clears E86 detection counter | | |
| | Ab | Clears E50 detection counter | | |
| | AC | Clears F01 detection counter | | |
| | Ad | Clears F02 detection counter | | |
| | AE | Clears F-End detection counter | | |
| | AF | Clears E08 detection counter | | |
| | C0 | Clears the counter of cumulative number of fed sheets | Do not use this in the field. | |
| | C1 | Clears the LED illuminated time counter | Use this after replacing the LED or the regularly replaced parts in the scanner unit.<br>* For details, see section C. | |
| | C2 | Clears counter 1 of scanner unit replacement parts | | |
| | C3 | Clears counter 2 of scanner unit replacement parts | | |
| | C4 | Clears counter 3 of scanner unit replacement parts | | |
| | C5 | Clears counter 4 of scanner unit replacement parts | | |
| | C6 | Clears counter 5 of scanner unit replacement parts | | |
| | CA | Clears all counters | Do not use this in the field. | |
| | CF | Clears the backup RAM | Use this to initialize the backup RAM of SH2-MAIN PCB assembly.<br>* For details, see section E. | |
| | d0 | Clears the counter of cumulative number of exposed sheets | Do not use this in the field. | |

**Table 6-302 (cont.)**


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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 00 | d1 | Clears counter 1 of filmer unit replacement parts | Use this after replacing the regularly replaced parts in the filmer unit.<br>* For details, see section C. | |
| | d2 | Clears counter 2 of filmer unit replacement parts | | |
| | d3 | Clears counter 3 of filmer unit replacement parts | | |
| | d4 | Clears F-Err detection counter | Use to clear the detection counter on the filmer unit.<br>There is no need to use these in the field. | |
| | d5 | Clears E46 detection counter | | |
| 01 | | Sets main-scanning front registration | Use when changing values registration-adjusted with address “1FA”. (Units: 0.1mm)<br>No need to use in the field.<br>At time of installation, the settings have the value obtained by performing the “1FA” at the factory. | 000 |
| 02 | | Sets main-scanning back registration | | 000 |
| 03 | | Sets sub-scanning leading edge registration | | 010 |
| 04 | | Sets sub-scanning trailing edge registration | | 010 |
| 05 | | Sets LED selection when in binary mode<br>002: Green (G) | Use when type of LED unit is changed.<br>No change is needed for this machine. | 002 |
| 06 | | Sets feeding speed when on count only | Use when changing the feeding speed of count only. (Units: dpi)<br>Do not use this in the field. Should be “200” when user is using the machine.<br>Refer to address “1F6”. | 200 |
| 07 | | Sets document guide correction value | Use when changing the value of the document width detection sensor. Use when increasing/decreasing recording width when setting automatic paper size detection with only the document guides. (Units: 0.1mm)<br>Normally, there is no need to use this in the field. | -080 |
| 08 | | Fine-adjustment binary AE | Use when changing the AE slice level very slightly.<br>Normally handled by changing user setting; does not need to be used in the field. | 000 |
| 09 | | Sets document board position for manual feed | Use for changing upper stopping position of document board when feeding paper manually. Do this after changing document board parts, etc. At time of installation, setting is at factory shipment value.<br>* For details, see section F. | 001 |

**Table 6-302 (cont.)**

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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 0A | | Sets paper thickness opening when on manual feed | Use for changing gap when feeding paper manually. Change only when extremely thick or thin document is used with manual feed and feed is otherwise not possible.<br>Normally there is no need to use this in the field. | 020 |
| 0b | | Sets light intensity of double feed sensor LED | Use when changing setting to match characteristic of double feed sensor. Use after changing double feed sensor. At time of installation, setting is at factory shipment value.<br>* For details, see section G. | 032 |
| 0C | | Sets printing of "¥" and "\" marks<br>000 : \ (back slash)<br>001 : ¥ (yen) | When using an English keyboard, use this to select the characters " ¥ " and "\" when setting the add-on / imprinter. | 000 |
| 0d | | Sets the maximum document length | Use this only for special users.<br>Do not use this normally. | 432 |
| 10 | | Fine adjustment of film density | Allows the film density adjustment to change on the front and back simultaneously. The adjustable effective range is about from -20 to +20.<br>* For details, see section R. | 000 |
| 11 | | Adjusting the position of mark | When increasing the numerical value, the filmed position shifts backward. The position moves about 0.05mm on the film for a change of "10".<br>* For details, see section P. | 100 |
| 12 | | Adjusts the light intensity of mark LED | When increasing the numerical value, the mark becomes dark.<br>Use this when changing the processor or using a density filter.<br>* For details, see section Q. | 020 |
| 13 | | Adjusts the closing position of front slit | This is not used in the field.<br>The difference in density between the front and back is adjusted with address "14". | 13 |
| 14 | | Adjusts the closing position of back slit | Makes adjustment for the back side and adjusts the difference in density between the front and back.<br>Give priority to using "1EA".<br>* For details, see section R. | 13 |

**Table 6-302 (cont.)**


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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 20 | | Displays the counter of cumulative number of fed sheets | Displays various numerical values. Use when checking status of use and time for periodic replacement.<br>Values at shipment from factory are the same as the initial values.<br>* For details, see section C. | 0000 |
| 21 | | Displays the LED illuminated time counter | | |
| 22 | | Displays counter 1 of scanner unit replacement parts | | |
| 23 | | Displays counter 2 of scanner unit replacement parts | | |
| 24 | | Displays counter 3 of scanner unit replacement parts | | |
| 25 | | Displays counter 4 of scanner unit replacement parts | | |
| 26 | | Displays counter 5 of scanner unit replacement parts | | |
| 27 | | Displays model name<br>5060: DR-5060F | Use to check the model name. | |
| 28 | | Displays SD-RAM capacity<br>064: Equipped with 64MB | Use when checking what capacity of SD-RAM is mounted on machine. | |
| 29 | | Displays version of SH2-MAIN | Use when checking the version of each PCB software. | |
| 2A | | Displays version of K4-SUB | | |
| 2b | | Displays version of K0-SUB2 | | |
| 2C | | Displays version of GH-DCON | | |
| 2d | | Displays the camera unit ID | Use to check the ID number. | |
| 2E | | Displays the version of patch code PCB assembly | Use to check the version of PCB software. | |
| 30 | | Displays detection of front separation /back separation /front registration /back registration sensors | Use when checking the status of detection of each sensor. The detection of each sensor can be checked by using jointly with manual or count only mode.<br>* For details, see section H. | |
| 31 | | Displays detection of document board lower limit /document board upper limit / pickup sensors | | |
| 32 | | Displays detection of delivery / middle sensors | | |
| 33 | | Displays detection of gap adjusting sensor | | |
| 34 | | Displays data of document width detection sensor | | |
| 35 | | Displays analog value of double feed sensor | | |

**Table 6-302 (cont.)**

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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 36 | | Displays analog value of front registration sensor | The analog value output by each sensor can be checked.<br>Normally not used in the field. | |
| 37 | | Displays analog value of back registration sensor | | |
| 38 | | Displays analog value of front separation sensor | | |
| 39 | | Displays analog value of back separation sensor | | |
| 3A | | Displays analog value of document width detection sensor | | |
| 3b | | Displays analog value of pickup motor | The analog value output by each motor can be checked.<br>Normally not used in the field.<br>**Note:** "3d" is the analog indication of the output showing the position of the imprinter head. | |
| 3C | | Displays analog value of front feeding motor | | |
| 3d | | Displays analog value of imprinter | | |
| 3E | | Displays analog value of separation motor | | |
| 3F | | Displays analog value of document board motor | | |
| 40 | | Displays analog value of main motor | | |
| 44 | | Displays analog value of double feed detection (high sensitivity) | Value of double feed detected is displayed.<br>Normally not used in the field. | |
| 45 | | Displays analog value of double feed detection (low sensitivity) | | |
| 46 | | Displays length of double feed detection | | |
| 47 | | Displays detection of pre-paint sensors of endorser | Use to check the detection status of endorser sensors. | |
| 48 | | Displays detection of endorser document sensor | | |
| 49 | | Displays detection of endorser diedrum sensor | | |
| 4A | | Displays analog value of endorser adjusting dial | The analog value output by the endorser adjusting dial can be checked. Normally not used in the field. | |
| 50 | | Displays C01 detection counter | Use to display the detection counters on the scanner unit. | 0000 |
| 51 | | Displays C02 detection counter | | |
| 52 | | Displays C04 detection counter | | |
| 53 | | Displays P01 detection counter | | |
| 54 | | Displays P02 detection counter | | |
| 55 | | Displays P04 detection counter | | |

**Table 6-302 (cont.)**


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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 57 | | Displays P10 detection counter | Use to display the detection counters on the scanner unit. | 0000 |
| 58 | | Displays P20 detection counter | | |
| 5C | | Displays P06 detection counter | | |
| 5d | | Displays J18 detection counter | | |
| 5E | | Displays P30 detection counter | | |
| 5F | | Displays d01 detection counter | | |
| 60 | | Displays d02 detection counter | | |
| 61 | | Displays E85 detection counter | | |
| 62 | | Displays E40 detection counter | | |
| 63 | | Displays E41 detection counter | | |
| 64 | | Displays E30 detection counter | | |
| 65 | | Displays E20 detection counter | | |
| 66 | | Displays E21 detection counter | | |
| 67 | | Displays E22 detection counter | | |
| 68 | | Displays E23 detection counter | | |
| 69 | | Displays E24 detection counter | | |
| 6A | | Displays E25 detection counter | | |
| 6b | | Displays E27 detection counter | | |
| 6C | | Displays E28 detection counter | | |
| 6d | | Displays E29 detection counter | | |
| 6E | | Displays the power ON detection counter | | |
| 70 \| bA | | Development setting items (not publicly disclosed) | Do not use in the field.<br>Do not change settings. | |
| bb | | Sets the skew correction on the registration roller<br>000: Disabled only in the case of paper thickness mode or manual feeding<br>001: Enabled at all times<br>002: Disabled at all times | Use this when facilitating pickup of fragile and thin documents, or in other conditions depending on the user's usage pattern. Normally, there is no need to use this in the field. | 001 |
| bC | | Sets the mode that does not consider document thinner than the reference as an error in the double feed detection by thickness<br>000: Disabled 001: Enabled | Use this in any condition depending on the user's usage pattern.<br>Normally, there is no need to use this in the field. | 001 |

**Table 6-302 (cont.)**

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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| bd | | Ignores the paper thickness adjustment set by the PC and sets the mode that gives priority to the operation panel setting<br>000: Disabled 001: Enabled | Use this according to the user's application.<br>Normally, there is no need to use this in the field. | 000 |
| bE | | Set to disable the key entry on the operation panel.<br>0000: Disabled | Use this only for special users.<br>Do not use this normally. | 0000 |
| C0<br>\|<br>EF | | Development setting items (not publicly disclosed) | Do not use in the field. | |
| F0<br>\|<br>15F | | Unassigned address | Do not use this. | |
| 160<br>\|<br>17F | | Development setting items for filmer | Do not use in the field.<br>Do not change settings.<br>The following addresses are exceptions. | |
| 16E | | Sets the leading edge for exposure | Use only when reseting the factory default values after clearing the RAM or replacing the SH2-MAIN PCB assembly. | 045 |
| 16F | | Sets the trailing edge for exposure | | 047 |
| 173 | | Sets the size of the page mark | | 060 |
| 174 | | Sets the size of the file mark | | 230 |
| 180<br>\|<br>18F | | Development setting items for filmer (not publicly disclosed) | Do not use in the field. | |
| 190<br>\|<br>19F | | Unassigned address | Do not use this. | |
| 1A0 | | Displays E60 detection counter | Use to display the detection counters on the filmer unit. | 0000 |
| 1A1 | | Displays E61 detection counter | | |
| 1A2 | | Displays E62 detection counter | | |
| 1A3 | | Displays E63 detection counter | | |
| 1A4 | | Displays E64 detection counter | | |
| 1A5 | | Displays E70 detection counter | | |
| 1A6 | | Displays E71 detection counter | | |
| 1A7 | | Displays E72 detection counter | | |
| 1A8 | | Displays E73 detection counter | | |
| 1A9 | | Displays E74 detection counter | | |
| 1AA | | Displays E86 detection counter | | |
| 1Ab | | Displays E50 detection counter | | |
| 1AC | | Displays F01 detection counter | | |

**Table 6-302 (cont.)**


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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 1Ad | | Displays F02 detection counter | Use to display the detection counters on the filmer unit. | 0000 |
| 1AE | | Displays F-End detection counter | | |
| 1AF | | Displays F08 detection counter | | |
| 1C8 | | Initializes the data on the filmer adjustment | The data on the light intensity and illumination time of the fluorescent lamp and the position of slits is initialized.<br>* For details, refer to section S. | |
| 1Cd | | Clears the illumination time of the front-side fluorescent lamp | Use this after replacing the fluorescent lamp.<br>* For details, refer to section D. | |
| 1CE | | Clears the illumination time of the back-side fluorescent lamp | | |
| 1d0 | | Displays the counter of cumulative number of exposed sheets | Each numerical value is displayed. Use this to check the usage status and the time of regular replacements.<br>* For details, refer to section C. | 0000 |
| 1d1 | | Displays the counter 1 of filmer unit replacement parts | | |
| 1d2 | | Displays the counter 2 of filmer unit replacement parts | | |
| 1d3 | | Displays the counter 3 of filmer unit replacement parts | | |
| 1d4 | | Displays the F-Err detection counter | Use to display the detection counters on the filmer unit. | 0000 |
| 1d5 | | Displays E46 detection counter | | |
| 1E0 | | Displays the illuminated time of front-side fluorescent lamp | Total illumination time is displayed.<br>* For details, refer to section D. | |
| 1E1 | | Displays the illuminated time of back-side fluorescent lamp | | |
| 1E2 | | Displays the setting light intensity of the front-side fluorescent lamp | The light intensity when setting the reference position of slits is displayed. | |
| 1E3 | | Displays the setting light intensity of the back-side fluorescent lamp | | |
| 1E4 | | Displays the current light intensity of the front-side fluorescent lamp | The current light intensity is displayed. | |
| 1E5 | | Displays the current light intensity of the back-side fluorescent lamp | | |
| 1E9 | | Sets the reference position of front slit | Used to adjust the density difference between the front and back. This setting is required after replacing the PCB assemblies (GH-DCON, LAMP-DP).<br>* For details, refer to section R. | 035 |
| 1EA | | Sets the reference position of the back slit | | 035 |

**Table 6-302 (cont.)**

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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 1Eb | | Sets the illumination time of the front-side fluorescent lamp | Set the lifespan of lamp. This setting is required after replacing the PCB assemblies (GH-DCON).<br>* For details, refer to section D. | |
| 1EC | | Set the illumination time of the back-side fluorescent lamp | | |
| 1F0 | | Gap adjustment mode | Used when adjusting the attached position of the gap adjusting motor.<br>* For details, refer to section I. | |
| 1F2 | | Double feed sensor adjustment mode | Used when adjusting the attached position of the double feed sensor.<br>* For details, refer to section J. | |
| 1F5 | | Check mode of endorser | Used to check the endorser operation without a PC.<br>* For details, refer to section N. | |
| 1F6 | | Count only mode | Used when checking the feeding operation without a PC. Feeding speed of count only can be changed separately from normal count only.<br>* For details, refer to section M. | |
| 1F7 | | Shading check mode (for Factory) | Used in the factory to check shading data. Do not use this in the field. | |
| 1F8 | | Gain adjustment / shading compensation mode | Used when adjusting LED light intensity and writing shading data.<br>* For details, refer to section K. | |
| 1F9 | | Color LED light intensity adjustment mode | This mode is not needed for this machine. | |
| 1FA | | Registration adjustment mode | Use when making registration adjustments.<br>* For details, refer to section L. | |
| 1Fb | | Imprinter check mode | Use when checking the operation of the imprinter without a PC.<br>* For details, refer to section O. | |
| 1FC | | Timer feed mode | Use for special operation and when changing that operation mode.<br>This is not used in the field. | |
| 1Fd | | Count only image taken-in mode | | |
| 1FE | | Count only image taken-in / timer feed mode | | |
| 1FF | 01 | All LEDs flashing on operation panel | Use to check the operation of the scanner unit. | |
| | 02 | Main motor drive (400dpi) | | |
| | 03 | Clutch ON /Main motor drive (400dpi) | | |
| | 04 | Main motor drive (200dpi) | | |
| | 05 | Clutch ON /Main motor drive (200dpi) | | |
| | 06 | Main motor drive (100dpi) | | |

**Table 6-302 (cont.)**


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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 1FF | 07 | Clutch ON /Main motor drive (100dpi) | Use to check the operation of the scanner unit. | |
| | 08 | Pickup motor forward drive (low torque) | | |
| | 09 | Pickup motor reverse drive (low torque) | | |
| | 0A | Pickup motor forward drive (medium torque) | | |
| | 0b | Pickup motor reverse drive (medium torque) | | |
| | 0C | Pickup motor forward drive (high torque) | | |
| | 0d | Pickup motor reverse drive (high torque) | | |
| | 0E | Feeding motor forward drive (low torque) | | |
| | 0F | Feeding motor reverse drive (low torque) | | |
| | 10 | Feeding motor forward drive (medium torque) | | |
| | 11 | Feeding motor reverse drive (medium torque) | | |
| | 12 | Feeding motor forward drive (high torque) | | |
| | 13 | Feeding motor reverse drive (high torque) | | |
| | 14 | Feeding motor forward drive (ultra high torque) | | |
| | 15 | Feeding motor reverse drive (ultra high torque) | | |
| | 16 | Gap adjusting motor forward drive | | |
| | 17 | Gap adjusting motor reverse drive | | |
| | 18 | Separation motor forward drive (low torque) | | |
| | 19 | Separation motor reverse drive (low torque) | | |
| | 1A | Separation motor forward drive (medium torque) | | |
| | 1b | Separation motor reverse drive (medium torque) | | |
| | 1C | Separation motor forward drive (high torque) | | |

**Table 6-302 (cont.)**

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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 1FF | 1d | Separation motor reverse drive (high torque) | Use to check the operation of the scanner unit. | |
| | 1E | Document board motor forward drive (low torque) | | |
| | 1F | Document board motor reverse drive (low torque) | | |
| | 20 | Document board motor forward drive (medium torque) | | |
| | 21 | Document board motor reverse drive (medium torque) | | |
| | 22 | Document board motor forward drive (high torque) | | |
| | 23 | Document board motor reverse drive (high torque) | | |
| | 24 | Front LED all illuminated | | |
| | 25 | Back LED all illuminated | | |
| | 26 | LED for checking that bar code decoder is illuminated | Use to check the operation of the bar code decoder. | |
| | 27 | Forward-drives the feeding motor of endorser (low torque) | Use to check the operation of the endorser. | |
| | 28 | Reverse-drives the feed motor of endorser (low torque) | | |
| | 29 | Forward-drives the feed motor of endorser (high torque) | | |
| | 2A | Reverse-drives the feed motor of endorser (high torque) | | |
| | 2b | Forward-drives the imprint motor of endorser (low torque) | | |
| | 2C | Reverse-drives the imprint motor of endorser (low torque) | | |
| | 2d | Forward-drives the imprint motor of endorser (high torque) | | |
| | 2E | Reverse-drives the imprint motor of endorser (high torque) | | |
| | 30 | Opens/closes the front slit | Use to check the operation of the filmer unit. | |
| | 31 | Opens/closes the back slit | | |
| | 32 | Opens/closes the camera lock | | |
| | 33 | Lights the front-side fluorescent lamp | | |
| | 34 | Lights the back-side fluorescent lamp | | |
| | 35 | Rotates the capstan motor at low speed | | |

**Table 6-302 (cont.)**


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| Address | Sub-address | Description | Purpose | Initial Value |
|---|---|---|---|---|
| 1FF | 36 | Rotates the capstan motor at low speed (with a clutch) | Use to check the operation of the filmer unit. | |
| | 37 | Rotates the capstan motor at medium speed | | |
| | 38 | Rotates the capstan motor at medium speed (with a clutch) | | |
| | 39 | Rotates the capstan motor at high speed | | |
| | 3A | Rotates the capstan motor at high speed (with a clutch) | | |
| | 3b | Rotates the takeup motor at low speed | | |
| | 3C | Rotates the takeup motor at medium speed | | |
| | 3d | Rotates the takeup motor at high speed | | |
| | 3E | Rotates the takeup motor at highest speed | | |
| | 3F | Drives the camera shutter solenoid | | |
| | 40 | Drives the main shutter solenoid | | |
| | 41 | Drives the capstan solenoid | | |
| | 42 | Drives the friction solenoid | | |
| | 43 | Lights the mark LED | | |
| | 44 | Slit check mode | The fluorescent lamp lights up and the slit opens slightly.<br>Use this when checking the tilt of the slit plate.<br>* For details, refer to section T. | |
| | 45 | Exposes-filmer-alone mode | Performs exposure for about 30 seconds without feeding documents. Use this to check the operation of film feeding. Inconsistencies in operation can be checked by loading white paper on the filmer reading glass and processing the film during the exposure.<br>Normally, this is not used in the field. | |

**Table 6-302**

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# B. Operating Method

## 1. Entering Service Mode

1) Turn on the power to the main body.
2) Insert a pin of about 1 mm in diameter in the hole in the back and press the switch (SW103) of the main CPU PCB assembly (SH2-MAIN), while pressing the switch (SW103), press the Stop key (C/▽) on the operation panel.

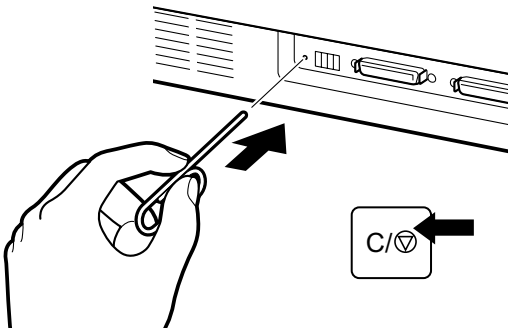
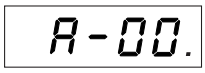



**Fig. 6-301**

3) Enter service mode. Display becomes “A-00” showing that address is “00”.
   Also, while in service mode, the dot in the lower right remains flashing.




## 2. Existing Service Mode

1) Service mode will be exited by pressing the Stop key for about three seconds while the address is displayed. The address display will return to the display shown prior to entering the Service mode.
2) Power off the machine.

## 3. Basic Operation

1) The address can be changed by pressing the Intensity Setting key (◀, ▶) while the address is displayed.
   Pressing the ▶ key increases and pressing the ◀ key decreases the address. However, the changes are an endless chain.
2) Pressing the AE key (A) while the address is displayed will display the data of that address.
3) Pressing the Intensity Setting key while the data is displayed will change the data.
4) Pressing the AE key while the data is displayed will select that data.
5) Pressing the Stop key while the data is displayed will return the display to the address.
6) In case of automatic adjustment mode, pressing the AE key (A) while the address is displayed, will enable automatic adjustment to start. Also, when completed, the display will automatically return to the address.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## 4. Basic Operation When There are Sub-addresses

When there are sub-addresses such as "1FF-01" in the address, operate as follows.

1) Pressing the AE key while the address is displayed will change the display to "0000". The lower two-digit number indicate a sub-address.


2) Next, pressing the Intensity Setting key, will change the sub-address.
3) Pressing the AE key while the sub-address is displayed, will activate the corresponding mode.
4) Pressing the Stop key while the sub-address is displayed will return the display to the address.

## 5. Notes

When service mode is entered, the error code will not be displayed even when a document jam, etc. occurs because the address and settings will be displayed on the display panel. As it is conceivable that an error has occurred when service mode cannot be operated, take steps to eliminate the document jam. If the machine is not restored even then, exit service mode and check the error indication.

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## 6. User Mode

A list of user modes is shown for reference in Table 6-303. Method of operation is as follows:

1) User Mode will be entered if AE key (A) is pressed for about five seconds in the user operation state.
2) Address will change if an Intensity Setting key (◀, ▶) is pressed.
3) Pressing the AE key changes the settings alternatively. When entering the setting value, press the AE key and use the Intensity Setting keys to enter the setting value, then press the AE key again.
4) Pressing the Stop key (C/▽) select the settings and leaves the User Mode.

For details, refer to the Instruction Manual.

| Address Setting | Details |
|---|---|
| U1-0 | Buzzer OFF when operating |
| U1-1 | Buzzer ON when operating (initial value) |
| U2-0 | Document width detection mode using image data |
| U2-1 | Document width detection mode using document guide (initial value) |
| U3-0 | Skew feed detection OFF (initial value) |
| U3-1 | Skew feed detection ON |
| U3-2 | Skew feed detection ON, except manual feed mode |
| U4-0 | SCSI synchronized transmission OFF |
| U4-1 | SCSI synchronized transmission ON (initial value) |
| U5-0 | Bar code reading buzzer OFF |
| U5-1 | Bar code reading buzzer ON (initial value) |
| U6-0 | Output START/STOP codes in Codabar using small letters (initial value) |
| U6-1 | Output START/STOP codes in Codabar using capital letters |
| U7-0 | Number of times bar code is verified: None |
| U7-1 | Number of times bar code is verified: Once (initial value) |
| U7-2 | Number of times bar code is verified: Twice |
| U7-3 | Number of times bar code is verified: Three times |
| U8-0 | Imprinter/endorser OFF when on count only mode (initial value) |
| U8-1 | Imprinter/endorser ON when on count only mode |
| U9-0 | Endorser Check-size mode |
| U9-1 | Endorser A4-size mode |
| U11- - | Sets the amount of space feeding. Range: 5 - 1500mm (initial value: 10mm) |
| U12- - | Sets the amount of leader feeding. Range: 500 - 3000mm (initial value: 1500mm) |
| U13- - | Sets the amount of trailer feeding. Range: End, or 500 - 3000mm (initial value: 1500mm) |
| U14- - | Sets the amount of film-end detection. Range: 1500 - 3000mm (initial value: 1500) |
| U15-0 | Unusable Scanner only mode |
| U15-1 | Usable Scanner only mode (initial value) |

**Note:** The setting value for U14 is the value specified when CKIII (5 mil film thickness) is used. When using film whose thickness is 2.5 mil, the setting value is doubled.
Specify the film-end detection amount the same as or larger than the trailer feeding amount.

**Table 6-303**


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# C. Clearing and Displaying of Counters

## 1. Address-Sub

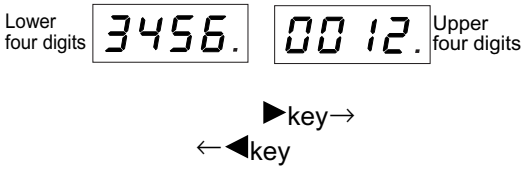
Refer to table 6-304. For information on the fluorescent lamp, refer to section D.

## 2. Purpose

Use to check the status of use and the time for periodic replacement.

## 3. Operating Procedure

1) Refer to the basic operation and enter into each service mode.
2) LED on-time counter 21 shows the LED on-time (in Hours), and the others show the number of sheets fed and the number of exposed sheets.
3) Because the display for the number of sheets is four digits, the total number of sheets is divided into the lower four digits and the upper four digits. Switching between the lower four digits and the upper four digits is done using the density keys.
   Ex.: When number of sheets fed is 123,456,




4) After checking the display, exit service mode.
5) When the LED unit or other replacement parts are replaced, enter the corresponding sub-address in service mode 00 , and clear. Assign the replacement part counters as follows.

| Name of Counter | Clear | Display | Applicable Part |
|---|---|---|---|
| Cumulative number of fed sheets counter | [00-C0]* | [20] | * Do not use Clear in the field. |
| LED illuminated time | [00-C1] | [21] | LED unit |
| Scanner unit replacement parts counter 1 | [00-C2] | [22] | Part with replacement criteria of 250,000 sheets (separation roller) |
| Scanner unit replacement parts counter 2 | [00-C3] | [23] | Part with replacement criteria of 500,000 sheets (pickup roller, etc) |
| Scanner unit replacement parts counter 3 | [00-C4] | [24] | Part with replacement criteria of 1.5 million sheets (double feed sensor/lever 2, etc) |
| Scanner unit replacement parts counter 4 | [00-C5] | [25] | Part with replacement criteria of 3 million sheets (separation roller) |
| Scanner unit replacement parts counter 5 | [00-C6] | [26] | Spare for the scanner |
| Clears all counters | [00-CA]* | - - - | * Do not use Clear in the field. |
| Clears the counter of cumulative number of exposed sheets | [00-d0]* | [1d0] | * Do not use Clear in the field. |
| Filmer unit replacement parts counter 1 | [00-d1] | [1d1] | Part with replacement criteria of 1 million sheets (main shutter) |
| Filmer unit replacement parts counter 2 | [00-d2] | [1d2] | Spare for the filmer |
| Filmer unit replacement parts counter 3 | [00-d3] | [1d3] | Spare for the filmer |

**Note:** LED unit replacement shall basically be replacement of the front and back at the same time.
For information on the fluorescent lamp, refer to section D.

**Table 6-304**

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### 4. Notes

After a set value is cleared, it cannot be returned to its previous setting, so be sure not to make a mistake when clearing.

Also, the count is cleared when the backup RAM is cleared and the SH2-MAIN PCB assembly is replaced. It would be wise to record the count in a separate service record at the time of checking.

## D. Illumination time of fluorescent lamp

This section describes the counters related to the illumination time of the fluorescent lamp.

The data on the illumination time of the fluorescent lamp is stored in the memory of the GH-DCON PCB assembly.

### 1. Address

| Address | Description |
|---|---|
| 1Cd | Clears the illumination time of the front-side lamp |
| 1CE | Clears the illumination time of the back-side lamp |
| 1E0 | Displays the illumination time of the front-side lamp |
| 1E1 | Displays the illumination time of the back-side lamp |
| 1Eb | Sets the illumination time of the front-side lamp |
| 1EC | Sets the illumination time of the back-side lamp |

**Table 6-305**


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## 2. Purpose

a. Clear

Use this to clear the illumination time after replacing a fluorescent lamp.

At the same time, this samples the data on the light intensity of the fluorescent lamp, which is considered to be the initial light intensity regarding the lifespan.

**Note:** Basically, the front-side and back-side fluorescent lamps should be replaced at the same time. The lamp PCB assembly (INVERTER) should also be replaced at this time.

b. Display

Use this to check the usage status and the time for regular replacements.

The numerical values are displayed in units of hours (H).

c. Set

Use this to set the illumination time again after replacing the GH-DCON PCB assembly or lamp sensor PCB assembly.

**Note:** For the procedures to be followed after replacing each PCB assembly, refer to IX. Procedures after replacing parts .

## 3. Operating Procedure

a. Clear

1) To sample the proper data on the light intensity, close the upper unit.
2) Enter into the service mode following the basic operation, and press the AE key.
3) The fluorescent lamp lights up and the operation panel display changes.
   Example: A-1Cd → -Cd-
4) When the process has finished, the fluorescent lamp shuts off and the operation panel returns to its normal display.
   It takes about 20 seconds to finish.
5) Exit from the service mode.

b. Display

Refer to Basic Operation.

c. Set

1) To sample the proper data on the light intensity, close the upper unit.
2) Enter into the service mode following the basic operation, specify the numerical value, and press the AE key.
3) The fluorescent lamp lights up and the operation panel display disappears.
4) When the process has finished, the fluorescent lamp shuts off and the operation panel returns to its normal display.
   It takes about 20 seconds to finish.
5) Exit from the service mode.

**Note:** When clearing or setting counters, if the fluorescent lamp does not light up, it takes about 1 second to finish. This indicates improper execution and requires a retry.

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# E. Clearing Backup RAM

## 1. Address-Sub

"00-CF"

## 2. Purpose

Use to return backup RAM to the initial values.

1) When error code "E80" is displayed. Also, after replacement of SH2-MAIN.
2) When it is necessary to return the setting to the initial values.

## 3. Operating Procedure

Refer to the basic operation.

## 4. Re-setting

As all the data recorded in the backup RAM will return to the initial values, there will be items that will require making settings.

a. Items returned to initial values

1) Service mode

| Address | Description |
|---|---|
| 01 | Sets main-scanning front registration |
| 02 | Sets main-scanning back registration |
| 03 | Sets sub-scanning leading edge registration |
| 04 | Sets sub-scanning trailing edge registration |
| 05 | Sets LED selection when in binary mode |
| 06 | Sets feeding speed when in count mode. |
| 07 | Sets document guide correction value |
| 08 | Fine-adjustment binary AE |
| 09 | Sets document board position when manual feed is used |
| 0A | Sets paper thickness opening when manual feed is used |
| 0b | Sets light intensity of double-feed sensor LED |
| 0C | Sets printing of " ¥ " and " \ " marks |
| 0d | Sets the maximum document length |
| 10 | Fine adjustment of film density |
| 11 | Adjusts the position of the mark LED |
| 12 | Adjusts the light intensity of the mark LED |
| 13 | Adjusts the closing position of the front slit |
| 14 | Adjusts the closing position of the back slit |
| bb | Sets the skew correction on the registration roller |
| bC | Sets the double-feed detection (errors for thin documents) |
| bd | Sets the priority to the operation panel |
| bE | Sets the disabled operation panel |
| 16E | Sets the leading edge for exposure |
| 16F | Sets the trailing edge for exposure |
| 173 | Sets the size of the page mark |
| 174 | Sets the size of the file mark |
| 20~26 | Displays the scanner-related counters |
| 50~6E | Displays the scanner-related detection counters |
| 1A0~1AF | Displays the filmer-related detection counters |
| 1d0~1d3 | Displays the filmer-related counters |
| 1d4, 1d5 | Displays the filmer-related detection counters |

**Table 6-306**

2) Scanner settings
3) User mode settings


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b. Items requiring setting again

1) Service mode

| Address | Description |
|---|---|
| 09 | Sets document board position for manual feed* |
| 0b | Sets light intensity of double-feed sensor LED* |
| 0C | Sets printing of "¥" and "\" marks |
| 0d | Sets the maximum document length |
| 10 | Fine adjustment of film density* |
| 11 | Adjusts the position of the mark LED* |
| 12 | Adjusts the light intensity of the mark LED* |
| 13 | Adjusts the closing position of the front slit* |
| 14 | Adjusts the closing position of the back slit* |
| bb | Sets the skew correction for the registration roller |
| bC | Sets the double-feed detection (errors for thin documents) |
| bd | Sets the priority to the operation panel |
| bE | Sets the disabled operation panel |
| 16E | Sets the leading edge for exposure* |
| 16F | Sets the trailing edge for exposure* |
| 173 | Sets the size of the page mark* |
| 174 | Sets the size of the file mark* |
| 1FA | Registration adjustment mode |

**Table 6-307**

**Note:** Registration settings 01-04 are set again by performing registration adjustment mode "1FA".
As for items with a " * " mark, the factory default values are listed on the "Setting label".
For details, refer to "c. Setting label".

2) Scanner settings

3) User mode settings

c. Setting label

The setting label lists the setting values of items that are changed from the initial values at the factory-shipment.

Since the setting label is attached to the bottom of the upper unit, open the upper unit to see it.

| Address | Factory Default | Address | Factory Default |
|---|---|---|---|
| 05 | 0 1 ② 4 7 | 16E | |
| 09 | | 16F | |
| 0B | | 173 | |
| 10 | | 174 | |
| 11 | | 1E9 | |
| 12 | | 1EA | |
| 13 | | | |
| 14 | | | |
| | | | |
| | | | |
| | | | |

1) When setting again after clearing the backup RAM, specify the numerical values listed on the setting label.
2) When changing setting values in the field, rewrite the numerical values on the setting label.
3) As for the items that are not listed on the setting label, such as address "0C", it is advisable to write the descriptions in the margin of the label when making any change to their initial values.

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# F. Setting Document Board Position for Manual Feed

## 1. Address

"09"

## 2. Purpose

Use to change the upper stopping position of the document board for manual feed.

When the relative positions of the upper stopping position of document board and the pickup sensor (lever) slip out of position, the pickup sensor will sometimes not come ON when using manual feed even though a document is set on the board, or the pickup sensor will come ON at the upper surface of the document board even though no document is set on the board. Carry out this setting when the pickup operation becomes faulty during manual feed.

1) When the document board is removed and reassembled.
2) When the document board and the parts related to document board raising and lowering are replaced or re-assembled.
3) When the Document board upper limit sensor is replaced or reassembled.
4) When the pickup sensor and the sensor lever are replaced or re-assembled.
5) When the backup RAM is cleared, and the SH2-MAIN PCB assembly is replaced.

**Note:** The set value is the applied pulse number of the motor from the time the document board upper limit sensor comes ON until the document board motor stops. Increasing the set value will prolong the time until the motor comes to a stop, so the stopping position of the document board becomes higher.

## 3. Operating Procedure

1) Loosen the screws of the left and right document board stoppers, and fix them so that the document board stoppers are located at the top position.

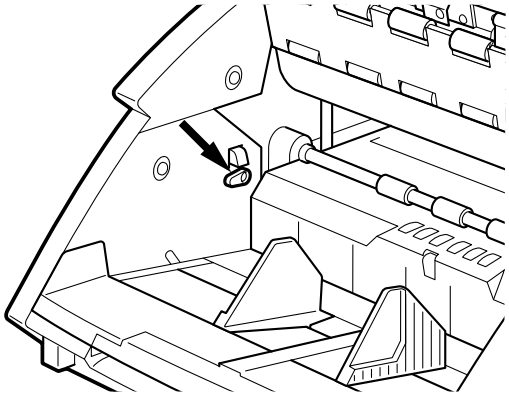

**Fig. 6-302**

2) Enter service mode "09". The present set value will be displayed.
3) Set and fix the setting at "0001".
4) Press the "Count Only" button to go to count only mode.
5) Set the pickup start mode to "Manual". The document board will rise.
6) When the pickup roller turns:
   Because faulty assembly of the sensor and other document board raising/lowering related parts is possible, check the state of the assembly and correct it if necessary.
7) When the pickup roller does not turn:
   Feed thin paper (0.05mm thickness) manually. The thin paper should not have any curl, burrs or pleats on its edges.
8) When the pickup roller turns and the thin paper is fed:
   Continue the operation from step 10.
9) When the pickup roller does not turn and the thin paper is not fed:
   9-1) Raise the set value by 2 and fix it.
   9-2) After changing the pickup start mode and lowering the document board, again set it to "Manual" and raise the document board.
   9-3) Feed the thin paper manually.


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9-4) Repeat steps 9-1, 9-2 and 9-3 until the pickup roller begins to turn so that the thin paper can be fed.

10) Set the pickup start mode to other than “Manual” and lower the document board.
11) Exit service mode.
12) If the setting value is changed, correct the number on the setting label.

### 4. Notes of Caution

When a document jam (such as a pickup error) occurs, the operation keys will not work. In such a case, opening the upper unit, eliminating the document jam, and closing the upper unit will allow operation to proceed.

## G. Setting Light Intensity of Double Feed Sensor LED

### 1. Address

“0b”

### 2. Purpose

Use to change the set value to match the characteristic of the double feed sensor.

1) Use when double feed sensor is replaced.
2) When backup RAM is cleared and the SH2-MAIN PCB assembly is replaced.

### 3. Operating Procedure

1) Read the number indicated on the cable assembly of the double feed sensor. Or read the number of the “setting label”.

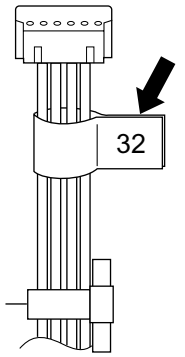


**Fig. 6-303**

2) Enter service mode “0b”. The present set value will be displayed.
3) Change the setting value to the number read at step 1 and fix it.
4) Exit service mode.
5) If the setting value is changed, correct the number on the setting label.

# H. Sensor Detection Display

## 1. Address

Table 6-308 shows the addresses and the corresponding sensor names.

| Address | Sensor Name |
|---|---|
| [30] | Front separation / back separation / front registration / back registration sensors |
| [31] | Document board lower limit / Document board upper limit/pickup sensors |
| [32] | Middle / Delivery sensors |
| [33] | Gap adjusting sensor |
| [34] | Document width detection sensor |
| [35] | Double feed sensor |

**Table 6-308**

## 2. Purpose

Use to check the state of detection of the sensors. The sensors can be checked whether in order or not by using jointly with feeding by count only mode, or blocking the light by hand.

## 3. Operating Procedure

1) Data is displayed when the AE key is pressed in the corresponding address state. For other operating methods, refer to the paragraph on basic operation.
2) In the data-displayed state, check that the data changes by covering the sensor unit with the hand and blocking the light by moving the sensor lever. Also, it is possible to check that the data changes by feeding paper in the count only mode.

**Note:** If the data displayed does not change, it is possible that the sensor is defective or it has been incorrectly installed, or there is a faulty connection, so carry out the necessary repairs.


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## 4. Display

Table 6-309 shows the displays and the corresponding addresses.

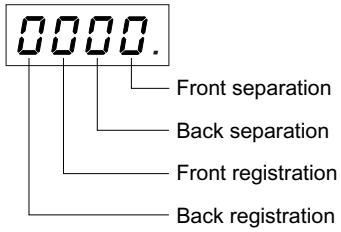
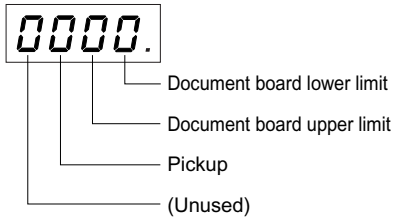
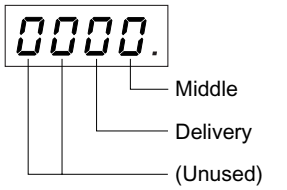
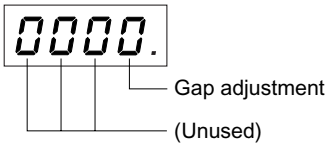
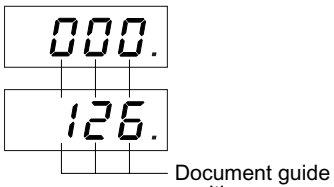
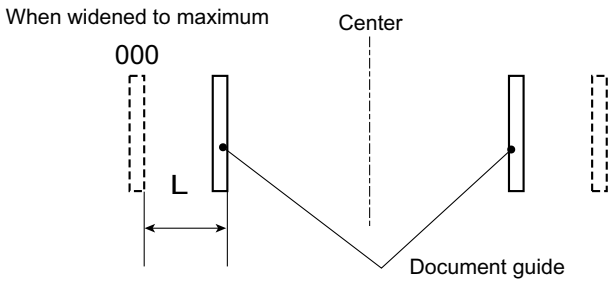
| Address | Display Position | Display Details |
|---|---|---|
| [30] |  | 0: Sensor OFF<br>1: Sensor ON (light blocked) |
| [31] |  | 0: Sensor OFF<br>1: Sensor ON (light blocked)<br>However, unused digits are “0”. |
| [32] |  | 0: Sensor OFF<br>1: Sensor ON (light blocked)<br>However, unused digits are “0”. |
| [33] |  | 0: Sensor OFF<br>1: Sensor ON (light blocked)<br>However, unused digits are “0”. |
| [34] |  | Displays document guide position (L) in mm<br>  |
| [35] |  | Displays analog output value of double feed sensor using two digits.<br>Numerical values are hexadecimal numbers from “00” to “FF”.<br>Adjust with service mode “1F2”. |

**Table 6-309**

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# I. Gap Adjustment Mode

## 1. Address

"1F0"

## 2. Purpose

Use when adjusting installed position of gap adjusting motor. Re-adjustment is necessary when the relative positions of the shutter on which the gap adjusting motor is attached and the gap adjusting sensor slip out of position.

1) When the gap adjusting motor and the gap adjusting sensor are replaced.
2) Even when only disassembling and re-assembling are involved, check the value and, if necessary, re-adjust.

## 3. Operating Procedure

1) Take off the upper pickup cover and front pickup cover. Shield the IP door sensor from light with thick paper or the like.
2) Check that the shutter and cam are correctly located. The proper positioning is shown in Fig.6-304. If they are not, correct by turning the shutter.

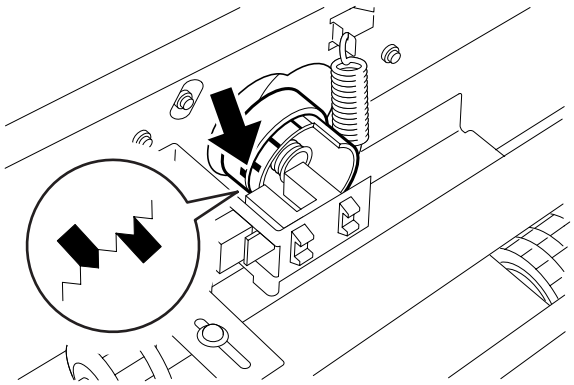
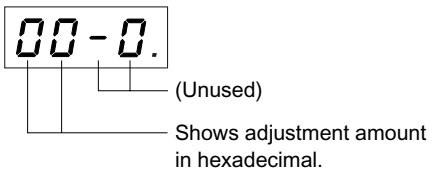
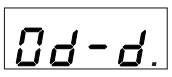


**Fig. 6-304**

3) Have address "F0" displayed and press the AE key. Standard value "00-0." will be displayed.




4) Set the pickup start mode at "Semi Auto".
5) Set test sheet: TKM-0267 (0.19 mm thick and free of curling, burrs, and folds) sideways on the document board and have it fed.
6) Read the indication.
7) When the adjustment amount is from "0C" to "0E", there is no need for adjustment. Exit from the service mode.





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8) If the adjustment amount is not from “00” to “0E”, loosen the two fixing screws on the stopper and change the motor’s position. When the motor moves downward, the gap increases.

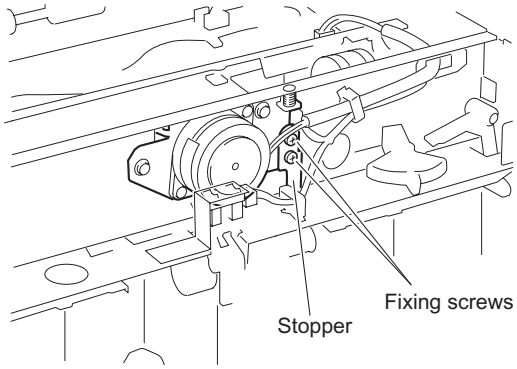


**Fig. 6-305**

9) Fix the stopper, try feeding the test sheet, and read the indicator.
10) Repeat the adjustment until the adjustment amount becomes from “0C” to “0E”.
11) Feed the test sheet once again and check to see that the adjustment amount ranges from “0C” to “0E”. If the amount exceeds the range, adjust it again.
12) Exit from the service mode.
13) Remove the shield from the IP door sensor and attach the upper pickup cover and front pickup cover.

### 4. Notes

The adjustment amount differs depending on the thickness of the paper that is fed. The adjustment range when t = 0.26mm is 18±1.

## J. Double Feed Sensor Adjustment Mode

### 1. Address

“1F2”

### 2. Purpose

Use when adjusting the attached position of the double feed sensor. Re-adjustment is necessary when the relative positions of the double feed sensor and the double feed sensor lever slip out of position.

1) When the double feed sensor and its attachment plate are replaced or disassembled/reassembled.
2) When the double feed sensor lever 2 and the double feed reference plate of the lower reading unit are replaced.

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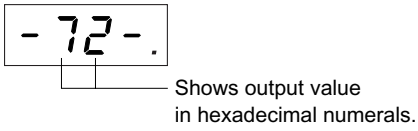
## 3. Operating Procedure

1) Put the feed unit in the closed state.
2) Have address “1F2” displayed and press the AE key. The present double feed sensor output value will be displayed.




3) When the display is from “60” to “8F”, there is no need for adjustment. Exit from the service mode.
4) When the display is not from “60” to “8F”, remove the upper pickup cover and slightly loosen the fixing screw on the plate mounting the double feed sensor.

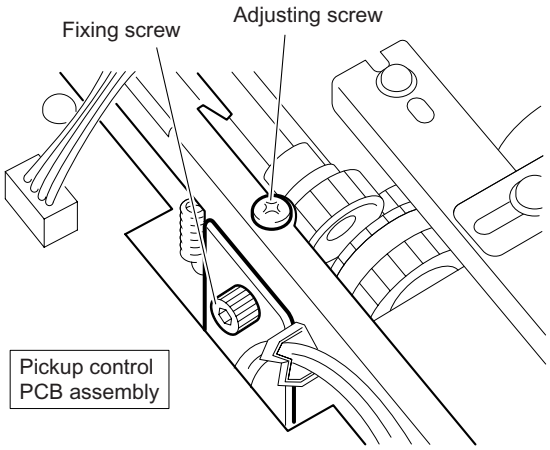



**Fig. 6-306**

5) Turn the adjusting screw to move the plate mounting the sensor up and down so that the display is from “70” to “7F”, and then tighten the fixing screw.
   When turning the adjusting screw to the right, the mounting plate moves upwards and the numerical value decreases. When turning the screw to the left, the mounting plate moves downwards and the numerical value increases.

**Note:** Since the numerical value changes while tightening the fixing screw, adjust it in expectation of the change. To decrease the amount of change of the numerical value, turn the adjusting screw while pushing the mounting plate downward.

6) Open and close the feed unit again. If the indication is from “60” to “8F” when the upper unit is closed, it is OK. If it is outside that range, re-adjust.
7) Exit service mode.
8) Attach the upper pickup cover.

## 4. Notes

The power is on when adjusting. As the fixing screw and adjusting screw are close to the pickup control PCB assembly, take care not to drop any tools on the PCB assembly.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# K. Gain Adjustment / Shading Compensation Mode

## 1. Address

"1F8"

## 2. Purpose

Use when adjusting the light intensity of the LED and when writing the shading data.

1) When the LED unit and reading unit are replaced.
2) When periodic maintenance is carried out for every 150 hours of LED is illumination, and when the LED unit is replaced at every 500 hours of LED is illumination.
3) When the SH2-MAIN PCB assembly is replaced.

## 3. Data Processing Procedure

1) Check and adjust the LED light intensity. Obtain the light intensity adjustment data separately for the color of the LED, the output mode, and resolution.
2) Write in the LED light intensity data.
3) Obtain the black compensation data.
4) Obtain the basic shading data while feeding a standard white sheet (TKM-0299 or TKM-0316).
5) Write in the black compensation data and the basic shading data.
6) Obtain the shading data for each condition while feeding the standard white sheet.
7) Write in the shading data for each condition.

**Note:** The data is written into the flash memory (IC133).

## 4. Operating Procedure

1) Open the feed unit and clean the glass parts and the rollers for the upper/lower reading units.
2) Widen the document guide to the maximum, and manually feed the standard white sheet (TKM-0299 or TKM-0316) between the registration roller. Make sure to feed the sheet until its leading edge passes the reading unit.

**Note:** Make sure the sheet is not dirty, wrinkled, or folded. Feed the sheet straight in and not skewed.

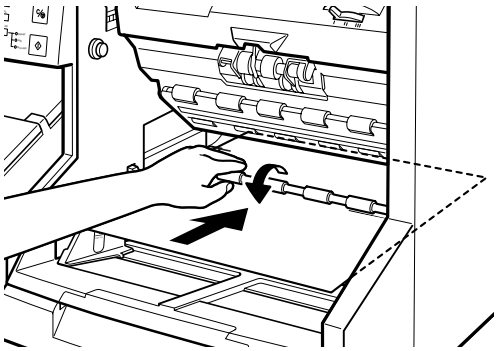
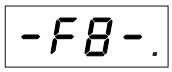


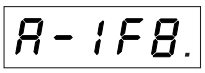
**Fig. 6-307**

3) Close the feed unit.
4) Enter service mode "1F8" and press the AE key.
5) Processing will begin and "-F8-." will start flashing on the display unit.




6) After obtaining the black compensation data, feed will start automatically and the next process will start.

7) When the feeding stops and the process is finished, the display will change to an illuminated “A-1F8”. The time required to finish the process is about 1 minute and 30 seconds.




8) Remove the standard white sheet and exit the service mode.

### 5. Notes

When “EEEE” is displayed at step 5, it denotes that adjustment cannot be made because of lack of light or because of dirtiness.

Repeat the procedure after resetting the power.

A proper adjustment cannot be made just by pressing the clear key and clearing the error indication. Always reset the power of the main unit.

The following gives the causes of the error and the countermeasures to take.

- When the standard white sheet is not set in the machine, set it.
- When the glass is dirty, clean it.
- When the standard white sheet is dirty, replace the sheet or remove the dirt.
- When the LED is not illuminated, check the connctions.
- When the time the LED has been illuminate exceeds 500 hours, replace the LED unit.

## L. Registration Adjustment Mode

### 1. Address

“1FA”

### 2. Purpose

Use when adjusting registration. Re-adjustment becomes necessary when the positions of the back registration sensor and the reading unit changes. This adjustment must also be carried out when SH2-MAIN is replaced.

The adjustment writes the leading edge and trailing edge registration correction data and the slippage correction data of the left and right registration of the top and back surfaces.

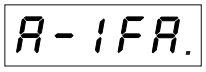
### 3. Operating Procedure

1) Enter the service mode with address “1FA” displayed.
2) Set standard white copy paper (A4/LTR size) on the document board in the vertical direction.

**Note:** Make sure the copy paper is not dirty, wrinkled or folded.

3) Pressing the AE key will automatically feed the copy paper. “-FA-.” will start flashing on the display panel.


4) When processing is finished, the display will return to “A-1FA”.




5) Exit the service mode.

### 4. Notes

When “EEEE” is displayed at step 3, it denotes that proper data could not be obtained. Check if there is any fault in the copy paper, and try again after resetting the power.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# M. Count Only Mode

## 1. Address

"1F6"

## 2. Purpose

Use this mode to check the operation of the machine at various feed speeds without a personal computer.

Although the feed speed on the count only mode can be modified using address "06", use address 1F6 in the field so that the setting is not permanently changed.

## 3. Operating Procedure

1) Enter into service mode "1F6" and press the AE key.
2) Set the resolution corresponding to the feed speed using the Intensity Setting key.
   The selection ranges from 100 to 400 (dpi).
3) Pressing the AE key makes the upper two digits the setting value displays.
   When the setting value is 250, "-25-" is displayed.


4) Set a proper document on the document board.
5) Select the pickup start mode, and press the start key to start the feed.
6) Check the feed state.
7) Exit from the service mode.

# N. Endorser Check Mode

## 1. Address

"1F5"

## 2. Purpose

Use this mode to check the operation of endorser without a personal computer. The endorser is optional.

## 3. Operating Procedure

1) Set the endorser to this machine.
2) Enter into the service mode "1F5" and press the AE key.
3) Select the "100" or "300" with the Intensity Setting key.
   100 : Turns the Check mode, at 100dpi in feed speed.
   300 : Turns the A4 mode, at 300dpi in feed speed.
4) Pressing the AE key makes "-10-" or "-30-" display.


5) Set a proper document on the document board.
6) Select the pickup start mode, and press the start key to start the feed.
7) Check the feed state.
8) Exit from the service mode.

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# O. Imprinter check mode

## 1. Address

"1Fb"

## 2. Purpose

Use when checking the operation of the imprinter without a personal computer. The imprinter is an optional item.

## 3. Operating Procedure

1) Adjust the left and right printing positions as necessary. For details, refer to the instruction manual.
2) Enter service mode "1Fb" and press the AE key.
3) Set a suitable sheet of paper on the document board and feed it.
4) "CANON DR-5060F W/IMPRINTER" will be printed.
5) Check the state of printing.
6) Exit service mode.

# P. Adjusting the position of the mark

## 1. Address

"11"

## 2. Purpose

Use this when the exposed Mark slips out of position after the Mark LED PCB assembly is replaced, or when improving the accuracy of the position.

**Note:** Check the position of the Mark LED PCB assembly before making this adjustment. For details, refer to "IX-B-4. Mark LED PCB assembly".

## 3. Operating Procedure

1) Enter into service mode "11" and press the AE key.
2) Using the Intensity Setting key, specify any value corresponding to the desired position.
   When increasing the numerical value, the exposed position shifts backward. If the value is modified by "10", the position moves about 0.05mm on the film. The setting range is from 0 to 255, and the default is "100".
3) When pressing the AE key, the setting value is stored.
4) Exit from the service mode.
5) Expose and process the film to check the mark position.
   Retry this adjustment as required.


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# Q. Adjusting the Light Intensity of Mark LED

## 1. Address

"12"

## 2. Purpose

Use this when changing the processor or attaching a density filter.

## 3. Operating Procedure

1) Enter into service mode 12 and press the AE key.
2) Using the Intensity Setting key, specify value corresponding to the desired light intensity.
   When increasing the numerical value, the density becomes higher. The setting range is from 3 to 30, and the default is "20".
   As a guide, use "20" for the Canon processor AP167, and "5" for the PROSTAR made by Kodak.
3) Press the AE key, to store the setting.
4) Exit from the service mode.
5) Expose and process the film to check the mark density.
   Retry this adjustment as required.

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# R. Adjusting the film density

## 1. Address / Purpose

Refer to Table 6-310 and Fig. 6-308.

| Address | Details | Purpose | Initial Value |
|---|---|---|---|
| 10 | Fine adjustment of film density | Use this when adjusting the film density on the front and back simultaneously. The adjustable effective range is about -20 to +20. | 000 |
| 13 | Adjusting the closing position of front slit | This is not used in the filed. | 013 |
| 14 | Adjusting the closing position of back slit | Use this when adjusting the difference in film density between the front and back. However, give priority to using address "1EA". Use of this address when adjusting the difference in density is only required when 300dpi is selected as the resolution, or when "-3" is selected for the density setting | 013 |
| 1E9 | Setting the reference position of front slit | Use this when adjusting the difference in film density between the front and back. These settings are required after replacing the PCB assemblies (GH-DCON, LAMP-DT). | 035 |
| 1EA | Setting the reference position of back slit | | 035 |

**Table 6-310**


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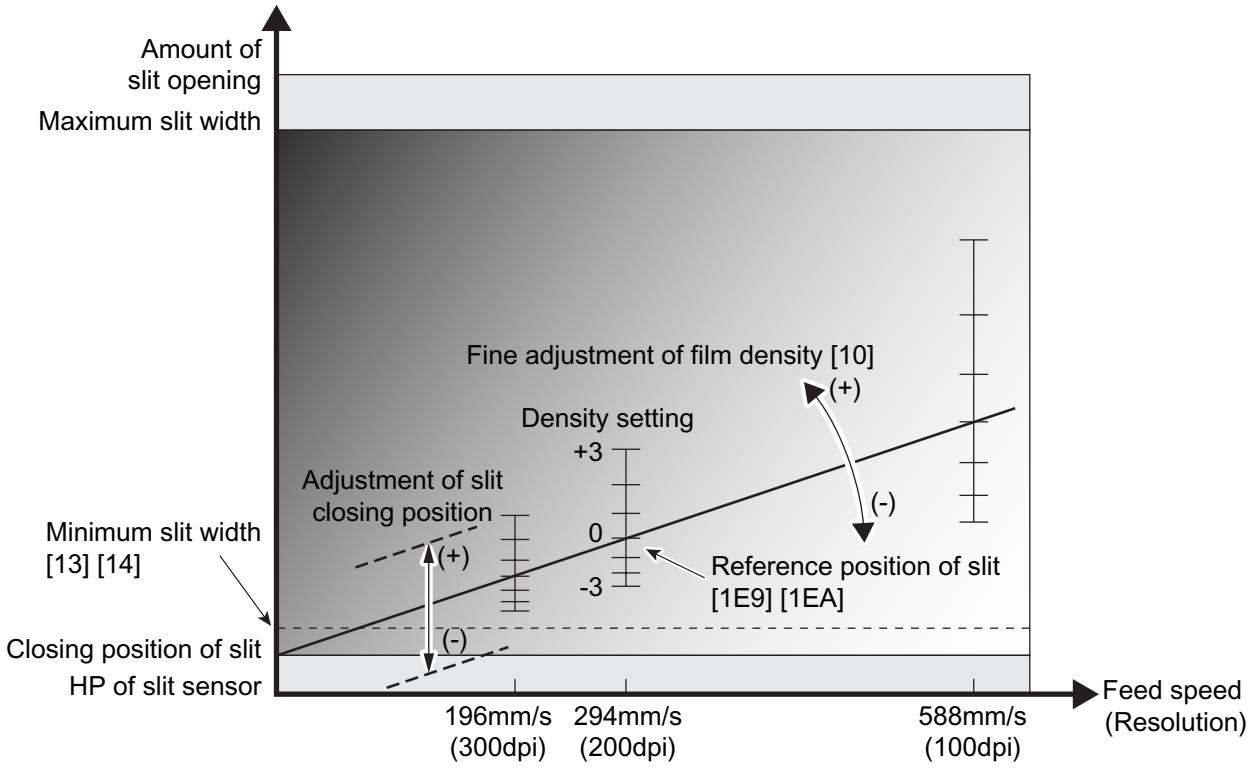
Amount of
slit opening
Maximum slit width
Fine adjustment of film density [10]
(+)
Density setting
+3
Adjustment of slit
closing position
(-)
Minimum slit width
[13] [14]
0
(+)
Reference position of slit
[1E9] [1EA]
-3
Closing position of slit
HP of slit sensor
(-)
196mm/s
(300dpi)
294mm/s
(200dpi)
588mm/s
(100dpi)
Feed speed
(Resolution)

**Fig. 6-308**

## 2. Description

The image density is normally adjusted by using the “Film Density” function key to select a value from -3 to +3. However, the density adjustment resulting from the replacement of parts and the like is performed with the service modes listed here by adjusting the slit position.

a. Fine adjustment of film density “10”
Use this address to make adjustments for the front and back simultaneously.
The amount of change will be the same for the front and back. This adjustment changes the positions at which the slits open on the reference setting “0” of the Film Density as a function key.
The setting range is from -128 to +128. However, if the value is too large, the adjustment becomes ineffective when selecting “-3” or “+3” asthe film density. As a result, the adjustable effective range is about -20 to +20.

b. Adjusting the closing position of slit “13” “14”
Use this when adjusting the difference in density between the front and back. However, give priority to using address 1EA .
Use address “14” only when adjusting the difference in density, in the case of 300dpi resolution and “-3” at the density setting. This adjustment is made on the back side using address “14”, not the front side with address “13”. The density is adjusted by changing the position at which the slit closes. The setting range is from 5 to 20.

c. Setting the reference position of slit “1E9” “1EA”
Although the setting range is from 20 to 120, it is recommended to remain within the range of ±5 of the initial value or the factory default value.
After the Lamp sensor PCB assembly (LAMP-DT) is replaced, re-adjustment is needed. When the filmer control PCB assembly (GH-DCON) is replaced, set this again.

**Note:** For the procedures to be followed after replacing each PCB assembly, refer to “IX. Procedures after replacing parts”.

## 3. Operating Procedure

1) Enter the service mode and press the AE key.
2) Use the Intensity Setting key to specify the desired value. When increasing the numerical value, the density becomes higher.
For each setting range, refer to the previous description.
3) The setting value is stored when the AE key is pressed. As for “Setting the reference position of the slit”, it takes about 30 seconds to finish, since the light intensity is checked for the fluorescent lamp. Leave the upper unit closed.
4) Exit from the service mode.
5) Expose and process the film to check the density.
Retry this adjustment as required.

**Note:** It is recommended to perform exposing under several conditions and decide the best setting value from among them.
There is a subtle error in adjusting the light intensity immediately after the fluorescent lamp lights up. Therefore, perform more than 6 sheets of continuous exposure under each condition and ignore the first three sheets.


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# S. Initializing the adjusted data of the filmer

## 1. Address

"1C8"

## 2. Purpose

When replacing the GH-DCON PCB assembly, use this before setting each value.

The reference position of the slits and the light intensity setting of the fluorescent lamp return to the initial values, and the illumination time and initial light intensity of the fluorescent lamp are cleared.

## 3. Operating Procedure

1) Leave the upper unit closed.
2) Enter into the service mode following the basic operation, and press the AE key.
3) The fluorescent lamp lights up and the operation panel display changes to "-C8-".
4) When the process has finished, the fluorescent lamp shuts off and the operation panel returns to its normal display. It takes about 20 seconds to finish.
5) Exit from the service mode.

# T. Slit check mode

## 1. Address / Sub-address

"1FF-44"

## 2. Purpose

Use this to check whether the slit plates on the front and back are properly installed and are operating normally. This also allows checking whether the closing positions of the slits are adequate.

In the case of a malfunction, density deficiencies will occur in film images.

## 3. Operating Procedure

1) Take off the left cover. Take off the camera unit.
2) Follow the basic operation and enter into service mode "1FF-44".
3) While pressing the AE key, peer into the slit-checking hole and verify the beam passing from the slit which is reflected from the third mirror.
   When pressing the AE key, the fluorescent lamp lights up and the slit plate moves to open the slit slightly.

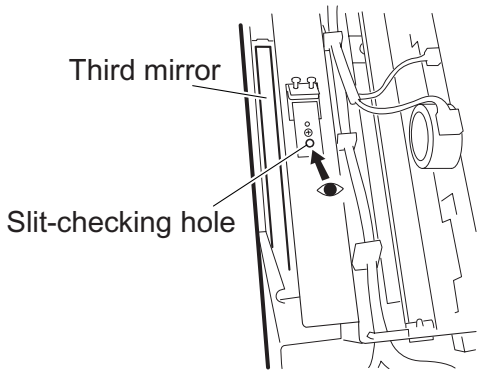


**Fig. 6-309**

4) When confirming these, release the AE key.
5) Exit from service mode.

**Note:** It is normal that two green lines of equal thickness can be seen.
If the two lines are different in thickness, or either of the lines cannot be seen, it becomes necessary to make the setting again to adjust the closing position of the slits: addresses “13” and “14”.
If the front and back lines are not the same thickness, or either of the lines is missing, the slit plate is tilted, which requires adjusting.
For details, refer to IX-B-7. Parts related to the slit unit .

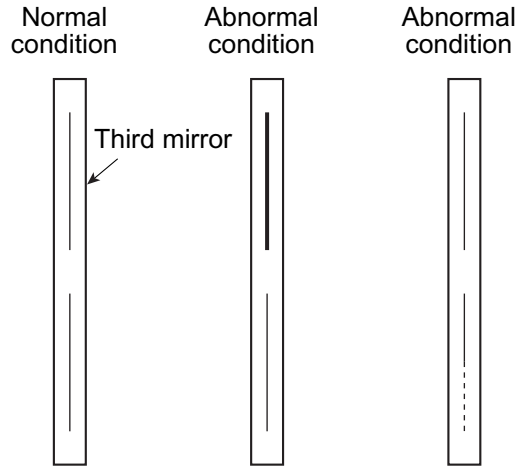


**Fig. 6-310**


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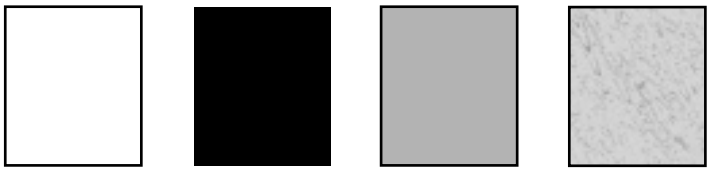
# IV. SCAN IMAGE TROUBLESHOOTING

## 1 Image not displayed (completely white, completely black, all gray, mottled)



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| "Brightness" setting | 1 | Is setting of "Brightness" appropriate? | NO | Change the setting. Also change "Contrast" if necessary. |
| Reading glass | 2 | Is reading glass clean? | NO | Clean. Also clean roller if necessary. |
| Reading unit connection | 3 | Are J113/J114 of SH2-MAIN and J1/J2/J3/J4/J5 of the reading unit correctly connected? | NO | Connect properly. |
| Shading compensation | 4 | Is the problem solved when service mode 1F8 is carried out? | YES | End. |
| LED unit | 5 | Is the problem solved when the LED unit is replaced? | YES | End. |
| Reading unit | 6 | Is the problem solved when the reading unit is replaced? | YES | End. |
| SH2-MAIN | 7 | Is the problem solved when the SH2-MAIN is replaced? | YES | End. |

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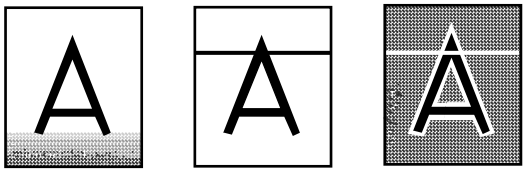
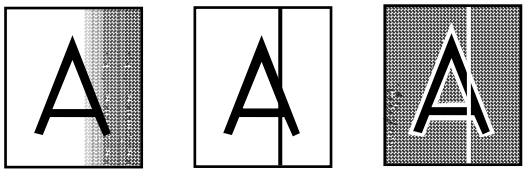
## 2 Uneven density, streaks (main-scanning direction)



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Roller | 1 | Dirty or deformed? | NO | Clean or replace the roller. |
| Gear, belt | 2 | Turning smoothly? | NO | Adjust assembly or replace parts. |
| Main motor | 3 | Is the problem solved when the main motor is replaced? | YES | End. |
| Reading unit | 4 | Is the problem solved when the reading unit is replaced? | YES | End. |
| SH2-MAIN | 5 | Is the problem solved when the SH2-MAIN is replaced? | YES | End. |

## 3 Uneven density, streaks (sub-scanning direction)



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Reading glass | 1 | Is reading glass clean? | NO | Clean.<br>If necessary, clean roller too. |
| Shading compensation | 2 | Is the problem solved when service mode 1F8 is carried out? | YES | End. |
| LED unit | 3 | Is the problem solved when the LED unit is replaced? | YES | End. |
| Reading unit | 4 | Is the problem solved when the reading unit is replaced? | YES | End. |
| SH2-MAIN | 5 | Is the problem solved when the SH2-MAIN is replaced? | YES | End. |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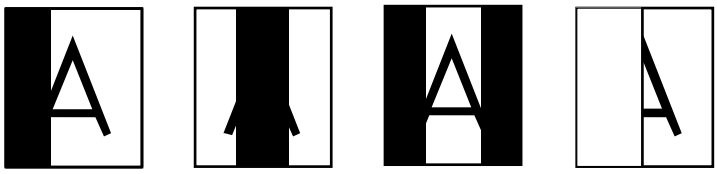
## 4 Part of the image is not displayed.



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Document width/document detection PCB assembly | 1 | Is image only displayed for the minimum width of document guide? | YES | Replace document width/document detection PCB assembly. |
| Shading compensation | 2 | Is the problem solved when service mode 1F8 is carried out? | YES | End. |
| LED unit | 3 | Is the problem solved when the LED unit is replaced? | YES | End. |
| Reading unit | 4 | Is the problem solved when the reading unit is replaced? | YES | End. |
| SH2-MAIN | 5 | Is the problem solved when the SH2-MAIN is replaced? | YES | End. |

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# V. FILM IMAGE TROUBLESHOOTING

## A. Initial checks

### 1. Installed environments

Do not install the machine where the machine body tilts or is susceptible to vibrations.

Do not place the machine at a location that allows condensation on the optical-system parts, such as the mirrors.

For more information, refer to Chapter 4-I. Selection of Location .

### 2. Film

Make sure the film thickness is set as specified.

Do not use expired films

Store in a cool, dark place.

### 3. Processor

Make sure nothing is wrong with the processor and it is operated properly.

Be sure to attach the density filter that matches the processor in use, and adjust the density in accordance with the processor.

### 4. Reading glass, mirrors

Be sure no smudges or scratches exist.

**Note:** When cleaning, be careful not to scratch them.

### 5. Error codes

If any error code including abnormal conditions of the fluorescent lamp or filmer drive is displayed, take care of the problem.


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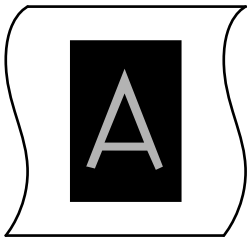
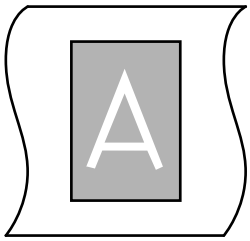
## B. Remedy procedure

| 1 | Density deficiencies (high or low) |
|---|---|




| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Density adjustment with the function keys | 1 | Is the density setting appropriate? | NO | Change the setting. |
| Density adjustment with the service mode | 2 | Is the density setting appropriate? | NO | Change the setting. |
| Reading glass, mirrors | 3 | Are reading glass and mirrors clean? | NO | Clean them. |
| Camera unit lens | 4 | Is the lens clean? | NO | Clean it. |
| Lamp sensor PCB assembly | 5 | Is it properly mounted? | NO | Mount it properly. |
| Slit plate operation | 6 | Does the slit plate operate normally? | NO | Assemble the slit unit properly. |

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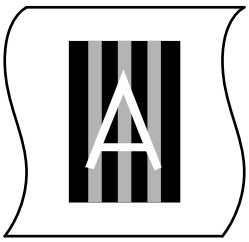
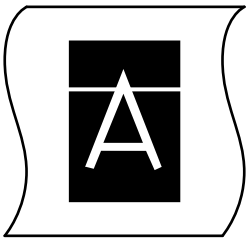
## 2 Density inconsistency (Uneven density)



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Installed location | 1 | Is the location vibration-free and stable? | NO | Change the location. |
| Capstan roller | 2 | Is the capstan roller clean? | NO | Clean it. |
| Locking Lever | 3 | Is the camera unit locked securely? | NO | Adjust the position of the locking lever. |
| Camera drive unit cover | 4 | Is the cover attached properly? | NO | Assemble it properly. |
| Camera drive unit | 5 | Does the drive shaft operate normally? | NO | Assemble it properly. |

## 3 White streaks appearing in images



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Reading glass, mirrors | 1 | Is any foreign matter deposited on the reading glass or mirrors? | YES | Clean them. |
| Optical path unit | 2 | Is there anything interrupting the optical path? | YES | Remove it. |
| Camera unit lens | 3 | Is the lens clean? | NO | Clean it. |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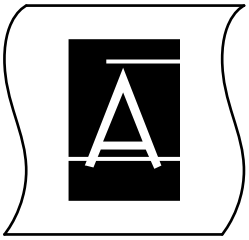
## 4 Scratched films



| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Capstan roller, Guide roller | 1 | Are there any smudges or foreign matter deposited on it? | YES | Clean it. |
| Remaining sensor lever | 2 | Does it operate normally? | NO | Remove anything blocking the lever. |

## 5 Unexposed mark

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Optical path unit | 1 | Is the opening for the light from the LED blocked in the camera unit? | YES | Remove anything blocking it. |
| Mark LED PCB assembly | 2 | Does the LED light up?<br>Service mode: 1FF-43 | NO | Check the connection, and if it has no problem, replace the mark LED PCB assembly. |
| | | | YES | Make revisions to the mounted position of the mark LED PCB assembly. For details, refer to “IX-B-4. Mark LED PCB assembly”. |

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# VI. IDENTIFICATION TROUBLESHOOTING

## 1 PC not identifying the machine

An error message Scanner is not found. Check the cable. appears on the display connected to the PC.

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| SCSI cable connection | 1 | Is the SCSI cable connected properly? | NO | Connect it properly. |
| Power-on sequence | 2 | The power to the scanner is turned on prior to that of the PC. | NO | Turn the power on properly. Or, update the device manager on the PC. |
| SCSI ID / Terminator settings | 3 | Are the SCSI ID / Terminator settings are correct? | NO | Set them properly. The factory default settings for this machine are “ID: 2, Terminator: OFF”. |
| PC / SCSI card settings | 4 | Are the PC / SCSI card settings correct? | NO | Set them properly. For details, refer to the appropriate instruction manual. |


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# VII. ACTIVATION TROUBLESHOOTING

If a malfunction occurs, first check the Error Code shown by the self-diagnostic function of this machine.

The Service Mode allows several sensor checks and operation checks.

For more information about Error Codes and Service Modes, see the respective sections.

## 1 The power cannot be turned on.

**Note:** Immediately after the AC power is turned off, the capacitor of the DC power supply PCB assembly is still charged. Wait for about 10 seconds after power-down prior to the insertion and extraction of connectors.

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Power cord connection | 1 | Is the power cord connected? | NO | Connect it securely. |
| AC power-supply voltage | 2 | Is the correct voltage available at the wall socket? | NO | Explain to the customer that the machine is not at fault. |
| Power switch | 3 | Does the power switch operate properly? | NO | Check the operation of the power switch shaft assembly. |
| Connectors (related to the DC power supply) | 4 | Is LED 105 of SH2-MAIN lighting up? (+24VDC) | NO | Check if J121 of SH2-MAIN is securely connected. |
| | 5 | Is LED1 of K4-SUB blinking? (+24VDC) | NO | Check if J503 of SH2-MAIN and J402 of K4-SUB are securely connected. |
| | 6 | Is LED1 of K0-SUB2 blinking? (+24VDC) | NO | Check if J502 of K0-SUB2 is securely connected. |
| | 7 | Is LED3 of GH-DCON lighting up? (+24VDC) | NO | Check if J720 of GH-DCON is securely connected. |
| | 8 | Are CN1, CN2, and CN3 of the DC power supply PCB assembly connected securely? | NO | Connect them securely. |
| Connectors (related to the operation panel) | 9 | Are J123 of SH2-MAIN, and J98 of the operation panel PCB assembly connected securely? | NO | Connect them securely. If the operation panel LED still does not light, replace the operation panel. |
| DC power supply PCB assembly | 10 | Is the problem solved when the DC power supply PCB assembly is replaced? | YES | End. |
| SH2-MAIN | 11 | Are LED103 (+5VDC), LED104 (+3.3VDC) and LED106 (-5VDC) lighting up? | NO | Replace SH2-MAIN. |
| GH-DCON | 12 | Is LED4 (+5VDC) lighting up? | NO | Replace GH-DCON. |

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## 2 Motor does not operate (including solenoids).

Error code “EXX” is displayed. The faulty motor is specified by the error code.

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Connectors | 1 | Are the connectors of the specified motor or sensor properly connected? | NO | Connect them properly. |
| Transfer system load | 2 | Is the transfer system load normal? Are the gears, pulleys, and belts normal? | NO | Remove the abnormal load. Replace parts. |
| Sensor | 3 | When checking with the sensor detection display in service mode, does it operate normally? | NO | Replace the sensor. |
| Motor | 4 | When checking with the operating checks in service mode, does it operate normally? | NO | Replace the motor. |
| SH2-MAIN | 5 | Is the problem solved when SH2-MAIN is replaced? | YES | End. |
| GH-DCON | 6 | Is the problem solved when GH-DCON is replaced? | YES | End. |
| Camera PCB assembly | 7 | Is the problem solved when the camera PCB assembly is replaced? | YES | End. |

## 3 Fluorescent lamp does not light.

Error code “E50” is displayed.

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Connector connection | 1 | Is the fluorescent lamp or lamp sensor PCB assembly connected to GH-DCON properly? | NO | Connect it properly. |
| Fluorescent lamp | 2 | Is the problem solved when the fluorescent lamp is replaced? | YES | End.<br>Refer to “IX-B-1. Fluorescent lamp”. |
| Lamp sensor PCB assembly | 3 | Is the problem solved when the lamp sensor PCB assembly is replaced? | YES | End. |


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# VIII.FEED TROUBLESHOOTING

## 1 Document feeding problem (jams, double-feeds, wrinkled media)

**Note:** This machine provides a manual paper thickness adjustment and a pickup roller load-changing mechanism. When feeding extremely thick, thin, or fragile documents, feeding can be improved if the customer changes the settings. For details, refer to the Instruction Manual.
Also refer to the special settings of addresses “bb” and “bC” with service modes.

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Document | 1 | Does the document conform to the standards? (thickness, dimensions, folds, curling) | NO | Ask the customer to use documents conforming to the standards. |
| Roller | 2 | Is the roller clean? | NO | Clean it.<br>Also clean the reading glass if needed. |
| Parts of feed path | 3 | Are the parts contacting the documents attached properly? (float, tilt) | NO | Attach them properly. |
| | 4 | Is the contact between documents and the parts smooth? (scratches, burrs) | NO | Replace defective parts if needed. |
| Drive transfer system | 5 | Do any abnormal sounds occur during feeding?<br>Damaged gear or loose belt? | YES | Replace defective parts if needed. Adjust the belt to the correct tightness. |

## 2 Film feeding problems

Error code “F-Err” is displayed.

Since trailer feeding is not allowed, open the cover of the camera unit in a darkroom to prevent the film from being exposed to light.

| Cause/Faulty Location | Step | Check Item | Result | Action |
|---|---|---|---|---|
| Film setting | 1 | Is the film loaded properly? | NO | Load it properly. |
| Capstan roller, Guide roller | 2 | Is there any foreign matter deposited on them? | YES | Clean them. |
| lock lever | 3 | Is the camera unit locked securely? | NO | Adjust the position of the lock lever. |
| Camera drive unit cover | 4 | Is the cover properly attached? | NO | Assemble it properly. |
| Camera drive unit | 5 | Does the drive shaft operate normally? | NO | Assemble it properly. |

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# IX. ADJUSTMENTS AFTER REPLACING PARTS

Some parts used in this machine need adjusting or setting after replacing or disassembling/reassembling them.

After replacing or reassembling the parts, check feeding operations and images. If any problems occur, refer to Troubleshooting in this chapter.

## A. Scanner

Table 6-901 shows the above-mentioned parts and service modes.

| Address / Parts | "00-CF" RAM clear | "09" Document board position | "0b" Light intensity of double feed | "1F0" Gap adjustment | "1F2" Double feed sensor | "1F8" Shading | "1FA" Registration adjustment |
|---|---|---|---|---|---|---|---|
| Main CPU PCB assembly | Replacement | Replacement | Replacement | | | Replacement | Replacement |
| Reading unit, LED unit | | | | | | Replacement | Replacement, disassembly |
| Document board assembly, Parts related to document board drive | | Replacement, disassembly | | | | | |
| Pickup sensor, Pickup sensor lever | | Replacement, disassembly | | | | | |
| Double feed sensor | | | Replacement | | Replacement, disassembly | | |
| Mounting plate of double feed sensor, Double feed sensor lever 2 | | | | | Replacement, disassembly | | |
| Reference plate of double feed sensor | | | | | Replacement, disassembly | | Replacement, disassembly |
| Gap adjusting motor, Gap reference sensor | | | | Replacement, disassembly | | | |
| Back registration sensor PCB assembly | | | | | | | Replacement, disassembly |

**Table 6-901**

**Note1:** If the feed unit is removed, check the adjusted value with address "1F2" after reassembling, and re-adjust it if there are any problems.

**Note2:** Adjustments are also needed when changing the firmware on the main CPU PCB assembly. For details, refer to technical information issued separately.


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# B. Filmer

The following shows adjustments needed after replacing parts. Some adjustments are needed even before replacing parts or after disassembling/reassembling them. After the adjustments, check the film images and adjust the film density as needed. For film density adjustment, refer to “III-R. Adjusting the Film Density”. For detailed information on the addresses shown below, refer to “III. Service Modes”.

## 1. Fluorescent lamp

After replacing the lamp, it is necessary to clear the fluorescent lamp illumination time (“1Cd” “1CE”).

**Note:** Basically, the front and back fluorescent lamps should be replaced at the same time. The lamp PCB assembly (INVERTER) should also be replaced when replacing the fluorescent lamps.

## 2. Filmer control PCB assembly (GH-DCON)

When replacing this, it is necessary to set the “reference position of slit” and “fluorescent lamp illumination time” again.

The following shows the procedure for replacing the parts.

1) Before replacement, check the values for the slit reference position (“1E9” and “1EA”) and the fluorescent lamp illumination time (“1Eb” and “1EC”) and record them.

**Note:** Just check and record the current values. Do not set them again or clear them.

2) Replace the PCB assembly.
3) Execute “1C8” to initialize the filmer data.
4) Set the values again for the slit reference position (“1E9” and “1EA”) and fluorescent lamp illumination time (“1Eb” and “1EC”), which were previously recorded.

**Note:** If the values for fluorescent lamp illumination time (“1Eb” and “1EC”) cannot be verified before the replacement because of a defective PCB assembly, replace the fluorescent lamps too, since the illumination time is unknown.
If the values for the slit reference position (“1E9” and “1EA”) cannot be verified, use the numerical values written on the setting label.

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## 3. Lamp sensor PCB assembly (LAMP-DT)

Since the sensing properties of this PCB assembly change even when using the same fluorescent lamp, it becomes necessary to set the light intensity data again for the fluorescent lamp after replacement.

Therefore, it is necessary to modify the values temporarily for the slit reference position ("1E9" and "1EA") on the replaced side and the fluorescent lamp illumination time ("1Eb" and "1EC") after replacement.

The following shows the procedure for replacing the parts.

1) After replacing the PCB assembly, add +1 to each value for the slit reference position ("1E9" and "1EA") on the replaced side and the fluorescent lamp illumination time ("1Eb" and "1EC") to set them again.
2) Check the film images and adjust the film density as needed.

## 4. Mark LED PCB assembly

After replacing or disassembling/reassembling, it may become necessary to adjust the position of this PCB assembly.

If the mark shape is incorrect or the density is uneven after replacing or disassembling/reassembling, adjust the position of this PCB assembly. The adjustment procedure is as follows:

1) Use "1FF-43" to light the mark LED. Take off the camera unit in advance.
2) It is essential that only the tip of the mark on the underside of the operation panel is irradiated with the brightest portion of light.

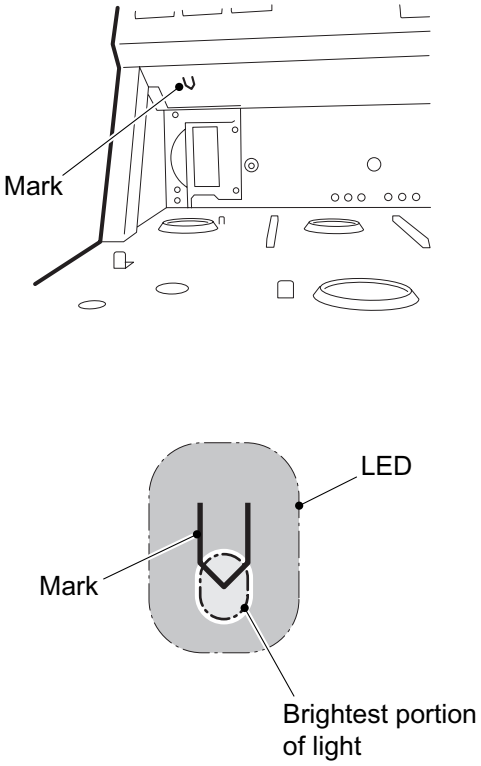


**Fig. 6-901**


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3) If the position is wrong, loosen the fixing screws of the PCB assembly and its adjusting plate and shift the PCB assembly slightly.

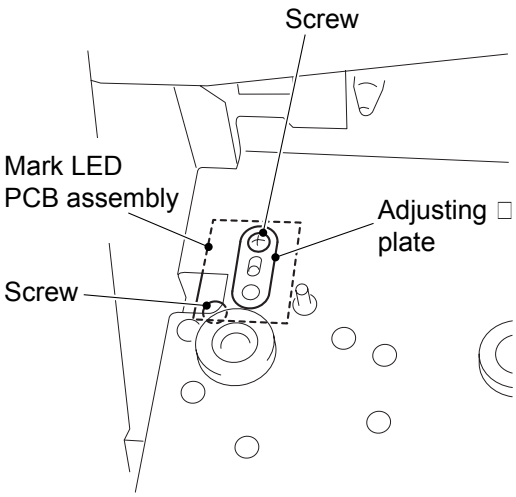


**Fig. 6-902**

## 5. Camera unit lock lever / Parts related to the camera drive unit

After replacing or disassembling/reassembling the camera unit lock lever, or after replacing or disassembling/reassembling the parts related to the camera drive unit, it may become necessary to adjust the position of camera unit lock lever.

If the locking lever is not positioned properly after replacing or disassembling/reassembling, the drive transfer between the camera drive unit and the camera unit may be faulty, causing strange sounds during film-feeding or film-feeding errors (“F-Err”). In any other case the camera unit cannot be secured.

The adjustment procedure is as follows:

1) Remove the front cover and attach the camera drive cover.
2) Loosen the fixing screws of the camera unit lock lever, shift the locking plate, and secure it again.

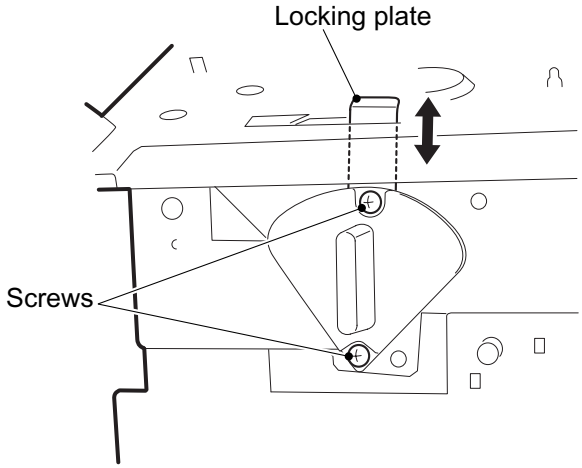


**Fig. 6-903**

**Note:** If the camera drive cover is secured in the wrong position, the drive transfer between the camera drive unit and the camera unit may be faulty. When securing the camera drive cover, use the external shape of the front cover as a guide and make sure that the face gear of the camera drive unit is centered over the hole of the camera drive cover.

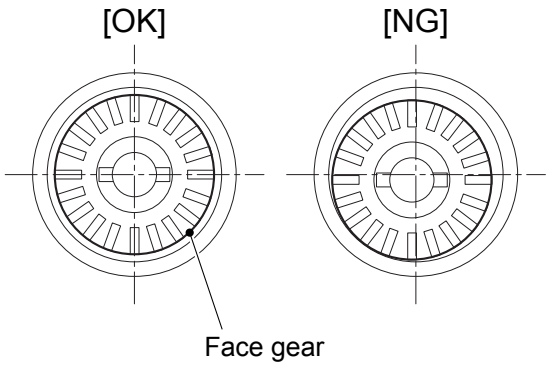


**Fig. 6-904**

## 6. Interlock switch assembly / Parts related to the upper unit

After replacing or disassembling/reassembling the interlock switch assembly, or after replacing or disassembling/reassembling the parts related to the upper unit, it may become necessary to adjust the interlock switch assembly position.

If the interlock switch is not positioned properly after replacing or disassembling/reassembling, an error code “C01” appears even if the upper unit is closed completely.

The adjustment procedure is as follows:

1) Close the feed unit and the upper unit completely.
   Error code “C01” is displayed.
2) Loosen the fixing screws of the switch assembly slightly. Turn the adjusting screw to lower the switch assembly, until the error code “C01” disappears.
   Turn the adjusting screw another half-turn and secure the fixing screws.

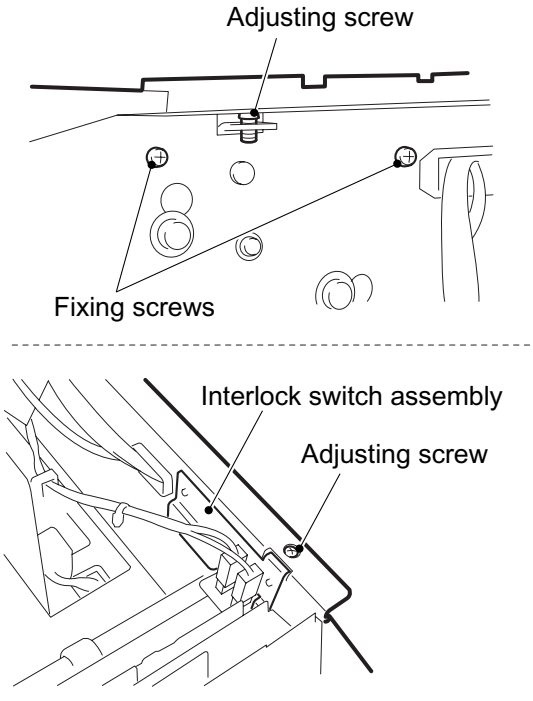


**Fig. 6-905**

**Note:** When error code “C01” is displayed, the double feed sensor of the feed unit may be at fault if the interlock switch assembly on the upper unit side is positioned properly. In this case, refer to “A. Scanner - Note 1”.


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## 7. Parts related to the slit unit

After replacing or disassembling/reassembling the parts related to the slit unit, such as the slit plate or slit drive gear, it may become necessary to adjust the tilt of the slit plate.

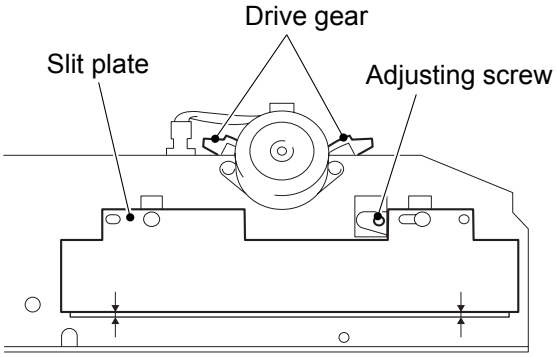
If the slit plate is not positioned properly after replacing or disassembling/reassembling, film density problems will occur.

This adjustment will modify the tilt of the slit plate using service mode “1FF-44” when the thicknesses of the front and back lines are different, or when either line is missing.

The adjustment procedure is as follows:

1) Using service mode “1FF-44”, verify the beam passing through the slit. For details, refer to “III-T. Slit check mode”.
2) Take off the slit unit.
3) Check the drive gear for proper engagement. Correct any problems.
4) Move the drive gear by hand and move the slit plate to the position that facilitates adjustment.
5) Loosen the adjusting screw slightly and move the slit plate so that the slit width is equal.

[Front]




[Back]

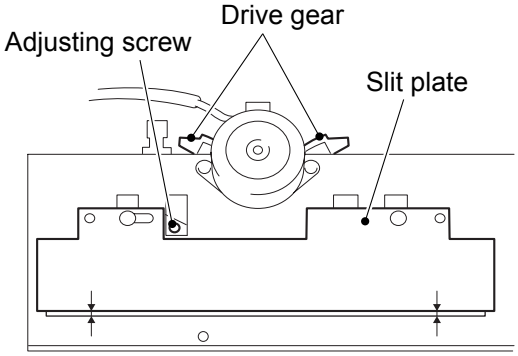



**Fig. 6-906**

6) Holding the slit plate by hand, secure the adjusting screw again.
Since the slit plate will move slightly when securing the adjusting screw, allow for this movement.

# APPENDIX



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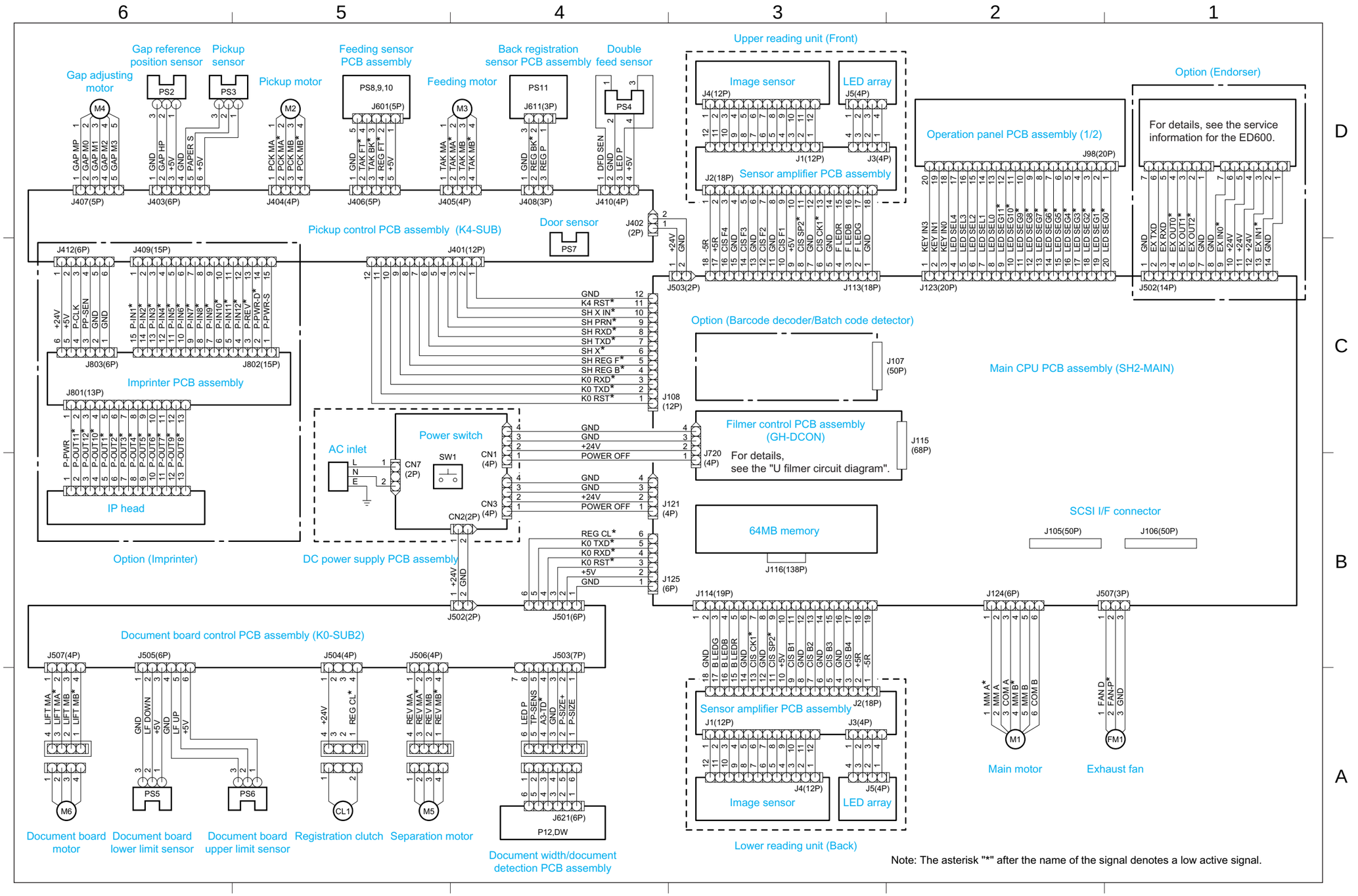
General Circuit Diagram

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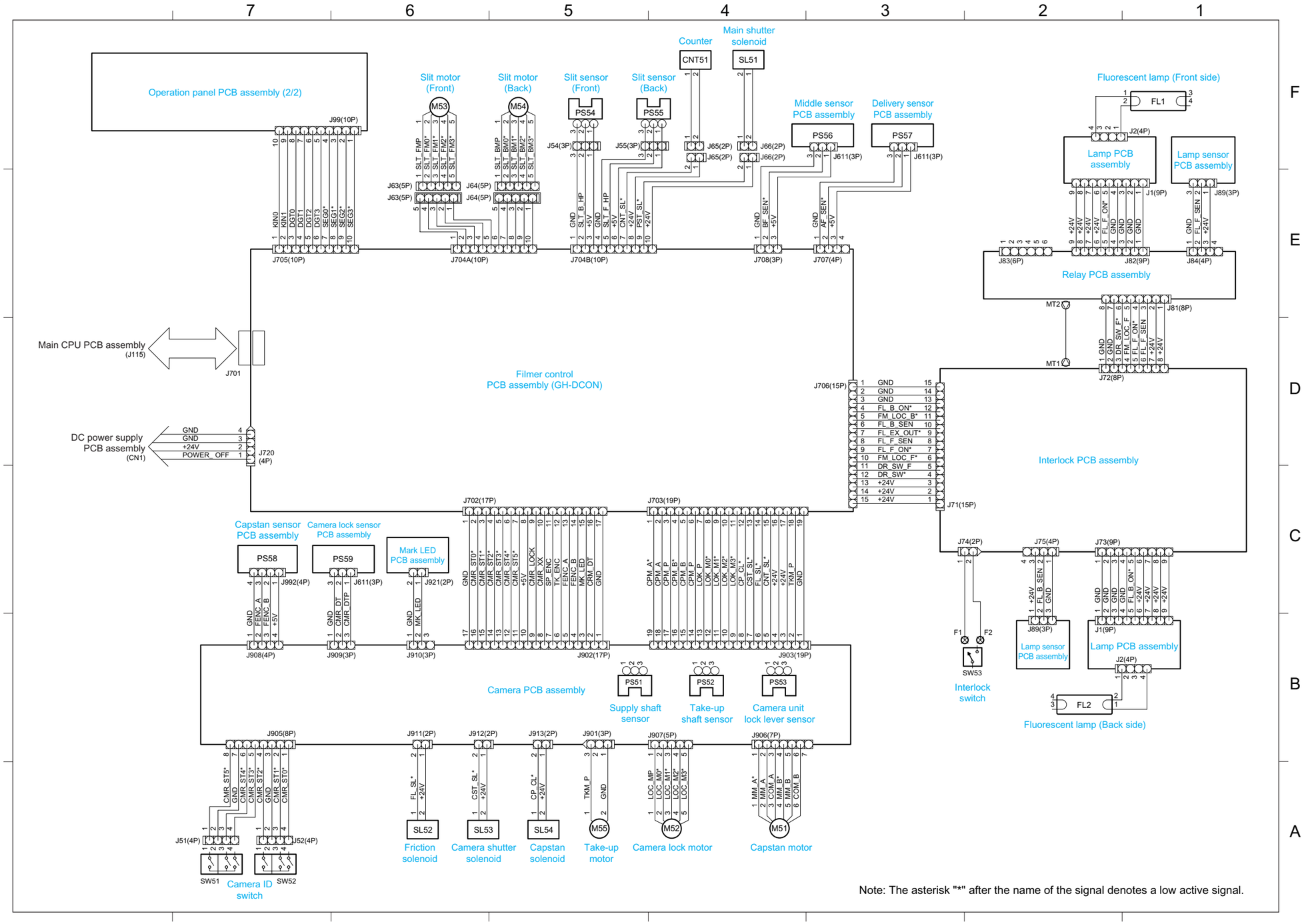
# II. FILMER CIRCUIT DIAGRAM

Filmer Circuit Diagram




Note: The asterisk "*" after the name of the signal denotes a low active signal.

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# III. LIST OF SPECIAL TOOLS

The following lists the special tools that are required for servicing this machine in addition to the standard tool set.

| No. | Tool Name | Tool No. | Shape | Rank | Purpose / Remarks |
|---|---|---|---|---|---|
| 1 | Test sheet | TKM-0271 | A4 size | A | • 10 sheets / set<br>• One side printed<br>• Feed / Image checking |
| 2 | Test sheet | TKM-0267 | 230_100mm | B | • 10 sheets / set<br>• Checking double-sided images<br>• Gap adjustment (t=0.19mm) |
| 3 | Standard white sheet | TKM-0299<br>or<br>TKM-0316 | 305_350mm<br><br>264_305mm | B | • 10 sheets / set<br>• Shading compensation |

**Note:** Rank

A = Each service technician should carry one with him.

B = A group of about five service technicians should share one.

C = Each workshop should keep one.

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