SERVICE MANUAL

ADF (Auto Document Feeder)

EPSON

4008512

NOTICE

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PRECAUTIONS

Precautionary notations throughout the text are categorized relative to 1)Personal injury and 2) damage to equipment.

DANGER Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by DANGER Headings.

WARNING Signals a precaution which, if ignored, could result in damage to equipment.

The precautionary measures itemized below should always be observed when performing repair/maintenance procedures.

DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURES.
2. NOWORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIER WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

WARNING

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGES IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY AC RATING DIFFERENT FROM AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; INTRODUCTION OF SECOND-SOURCE ICs OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes basic functions, theory of electrical and mechanical operations, maintenance and repair procedures of ADF. The instructions and procedures included herein are intended for the experienced repair technicians, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. PRODUCT DESCRIPTIONS

Provides a general overview and specifications of the product.

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of electrical and mechanical operations of the product.

CHAPTER 3. TROUBLESHOOTING

Provides the step-by-step procedures for troubleshooting.

CHAPTER 4. DISASSEMBLY AND ASSEMBLY

Describes the step-by-step procedures for disassembling and assembling the product.

CHAPTER 5. ADJUSTMENTS

Provides Epson-approved methods for adjustment.

CHAPTER 6. MAINTENANCE

Provides preventive maintenance procedures and the lists of Epson-approved lubricants and adhesives required for servicing the product.

APPENDIX

Provides the following additional information for reference:

- *Connector pin assignments*
- *Electric circuit boards components layout*
- *Exploded diagram*
- *Electrical circuit boards schematics*

REVISION STATUS

Rev.	Date	Page(s)	Contents
A	1997/10/20	All	First release

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CHAPTER

1

PRODUCT DESCRIPTIONS

1.1 FEATURES

This auto document feeder (ADF) is the exclusive ADF for GT-12000, and its main features are as follows:

- ❑ Supports large document up to A3 size
- ❑ Page transportation system
  Document is transported page by page for each scanning operation
- ❑ Supports duplex feeding function
  - Document is automatically reversed for scanning.

1.2 PRODUCT DESCRIPTION

BASIC SPECIFICATION

Type:	Page transportation & duplex scanning type
Document transportation:	- Document center aligning - Fed faced-up from the bottom - Face-up ejection
Document replacement time:	1.2 seconds (A4/LT landscape)
Loading plural sizes:	Unavailable (Size of the document in a stack must be the same.)
Noise:	50dB or less

Accuracy in top position:	Single feed:	0 – +2 mm
	Duplex feed:	0 – +2 mm
Center alignment:	Single feed:	+1.5 mm
	Duplex feed:	+3 mm
Document skew:	Single feed:	+1.5 mm
	Duplex feed:	+3 mm

* Center alignment = (C+D)/2
* Skew amount = (A-B)x200/L

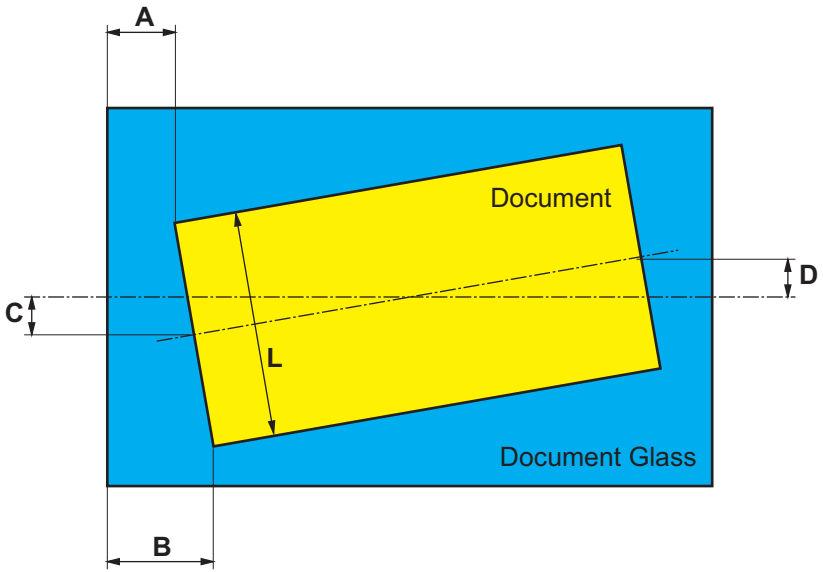


Figure 1-1. Paper Feed Accuracy

DOCUMENT SUPPORTED

Document size:	[Portrait] A3, LD, B4, LG, A4, LT, B5, A5, 140X148 mm / 5.5 x 5.8 inch [Landscape] A4, LT, B5, A5
Feeding capacity:	50 sheets (80 g/m^2) - A4 landscape/portrait - LT landscape/portrait or smaller 30 sheets (80 g/m^2) - B4, LG or larger
Ejecting capacity:	100 sheets
Applicable document	[Paper Type] - High quality paper - Average quality paper - Ink-jet paper (fine/super fine equivalent) - Bond paper [Paper thickness] 50 - 127 g/m^2 Document whose thickness is more than 110g/m^2 is applicable in the normal condition* only. (Normal condition : 15 - 25° C, 40 - 70%).
Inapplicable document:	- Tracing paper, Coating paper, Pasted paper, Label paper, OHP film, Carbon paper, Catalogue paper, Special paper including rice paper - Stapled paper, Clipped paper - Paper with many holes (ex, loose-leaf paper) - Paper with rip, curl and bent

ELECTRICAL SPECIFICATION

Power supply:	Supplied through the scanner - DC24V ± 10% - DC5V ± 10%
Consumption current:	DC24V = 2.0A DC5V = 0.3A
Insulation resistance:	10 mΩ or more at DC500V (Between AC line and chassis)
Dielectric strength:	AC1000V per minute (Between AC line and chassis)
Resistance to static electric noise:	Case = Operated properly at 10KV or less Metal = Operated properly at 7KV or less

ENVIRONMENTAL CONDITION

Temperature:	- Operation = 5 - 35°C - Storage = -25 - 60°C
Humidity:	- Operation = 10 - 80% * - Storage = 10 - 85% * * *Without condensation*
Resistance to vibration:	- Operation = 0.2G / 5 - 55Hz in X,Y,Z directions - Storage = 2G / 5 - 55Hz in X,Y,Z directions
Dropping test:	Height = 62 cm / 24.2 inch* ** When packed.*

RELIABILITY

Paper feeding life:	100,000 sheets
Paper ejecting life:	100,000 sheets
Hinge:	100,00 close motions or more

SAFETY, EMC

Safety regulations:	- UL1950 - CSA950 - FCC
CE Marking:	- Directive 89/336EEC, 92/31 EEC - Directive 73/23 EEC

OPERATING CONDITION

Environment:	Ordinal office or home conditions. (Place with extreme dust should be avoided.)

APPEARANCE

Weight:	16Kg or less
Dimensions (W x D x H):	601 x 529 x 122 mm / 23.6 x 20.8 x 4.8 inch (with the extension tray stored.)

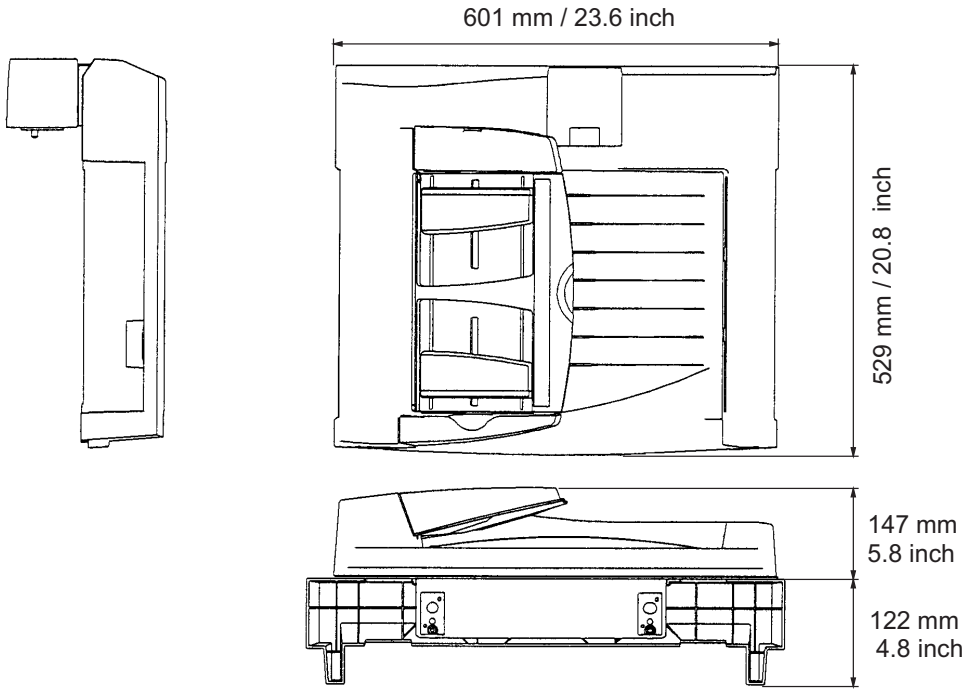


Figure 1-2. External Dimensions of the ADF

CHAPTER

2

OPERATING PRINCIPLES

2.1 OVERVIEW

This chapter gives information on operating principles of the ADF which can be used with the EPSON scanner GT-12000. The contents of this chapter are as follows:

Section 2.1.1: ADF mechanism
- ❑ Single feeding
- ❑ Reverse feeding

Section 2.1.2: Electrical Circuit
- ❑ Sensor circuits
- ❑ Reset circuits
- ❑ Driver circuits
- ❑ Rush current limitation circuit
- ❑ EEPROM write circuit

2.1.1 ADF Mechanism

See Figure 2-1 which shows major mechanism parts of the ADF and their locations. In both Single/Reverse feeding modes, document is picked up at the paper feed tray and is then transported in the ADF and ejected to the output tray. This process is described step by step thorough out the section.
Descriptions for single and reverse feedings are given separately. As you follows the steps, make sure that you refer to Figure 2-1 for exact locations of the parts and their functions.

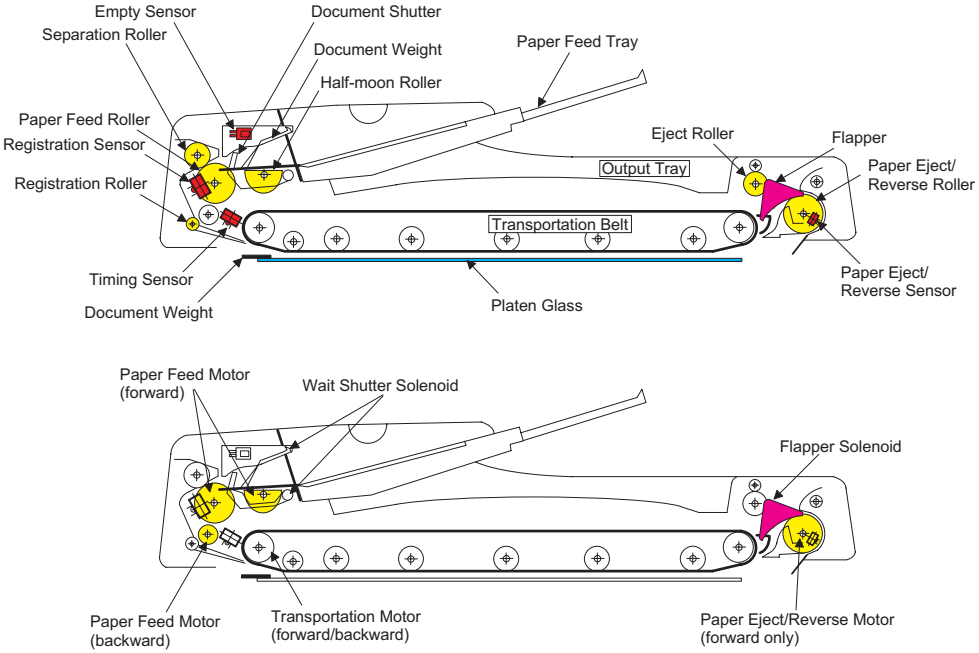


Figure 2-1. Major Mechanism Parts and Their Locations

SINGLE FEEDING

In single feeding mode, the ADF loads document from the paper feed tray and transports it to the scanning position, then ejects it immediately after scanning. Therefore, document must be always transported in single direction to let the ADF repeat feeding/ejecting operation cycle.

Setting document

1. Document is set in the paper feed tray.

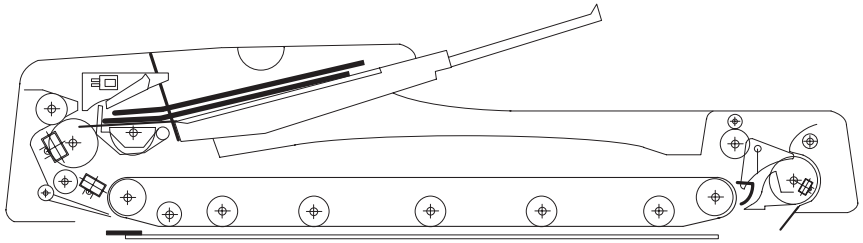


Figure 2-2. Document Set Condition (Step 1)

Pre-feeding

"Pre-feeding" means the sequence in which the ADF transports document from the paper feed tray to the scanning position according to the single feed command sent from the scanner.

2. When the wait shutter solenoid turns on, the document is picked up and transported from the paper feed tray by the forward rotation of the paper feed motor. The motor then stops rotating when the registration sensor comes on. This sequence, from picking up the document to the registration sensor's coming on, is called registration operation. The transportation motor and the paper eject/reverse motor also rotate forward to perform dummy ejection to prevent a remaining document from jamming when the ADF is feeding another document. This is performed for every feeding motion no matter a document is remaining in the ADF or not.

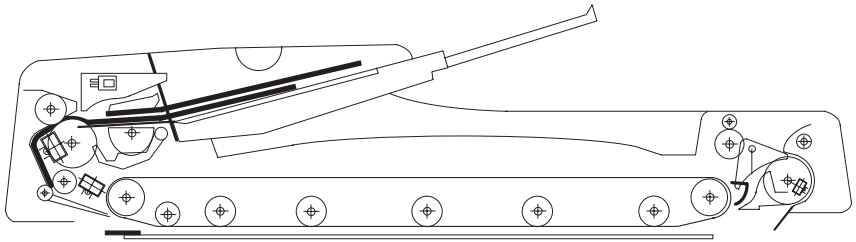


Figure 2-3. Pre-feeding (Step 2)

3. After the registration operation is carried out, the paper feed motor starts rotating forward to transport the document. The document is transported to the position where the timing sensor comes on, which means the end of the pre-feeding operation. Ongoing dummy ejection is carried out.

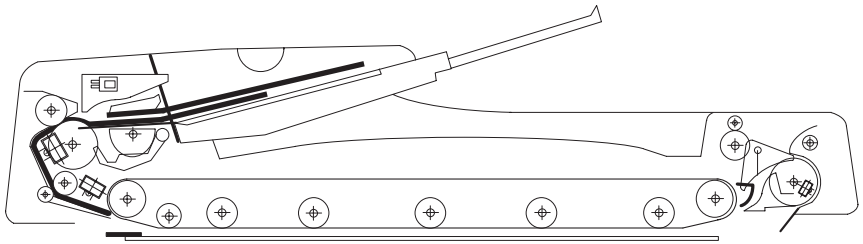


Figure 2-4. Pre-feeding (Step 3)

4. The transportation motor and paper feeding motor rotate forward and backward, respectively, to transport the document onto the platen glass. Then the document size is measured when the registration sensor goes off and the paper feed motor stops rotating when the timing sensor goes off.

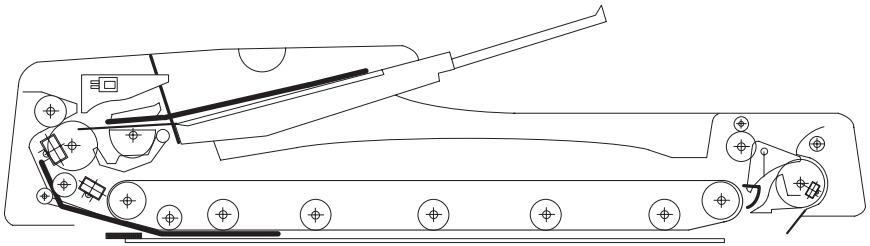


Figure 2-5. Single Feeding (Step 4)

5. The document is transported until the rear edge passed the document stopper, then the transportation motor stops rotating.

6. The transportation motor rotates backward to move the document back until it bumps against the paper stopper, and the motor stops. With the document aligned with the stopper, paper skew is corrected and the document is ready to be scanned. The ADF sends the paper feeding complete signal to the scanner.

7. While scanning is proceeding, the paper feed motor starts rotating forward to pick up and transport the document. The motor stops when the registration sensor comes on.

8. After the registration operation is carried out, the paper feed motor rotates forward to transport the document to the position where the timing sensor comes on, and the pre-feeding operation is done. Then the ADF sends the operation complete signal to the scanner.

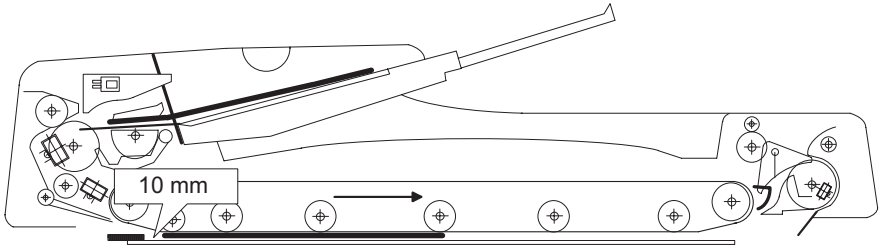


Figure 2-6. Single Feeding (Step 5)

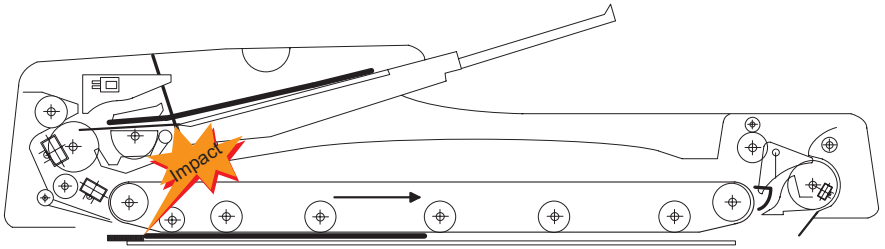


Figure 2-7. Single Feeding (Step 6)

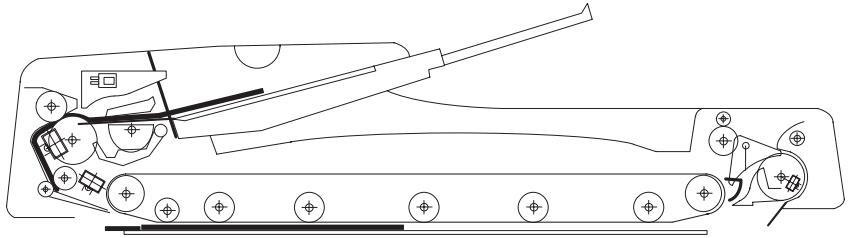


Figure 2-8. Single Feeding (Step 7)

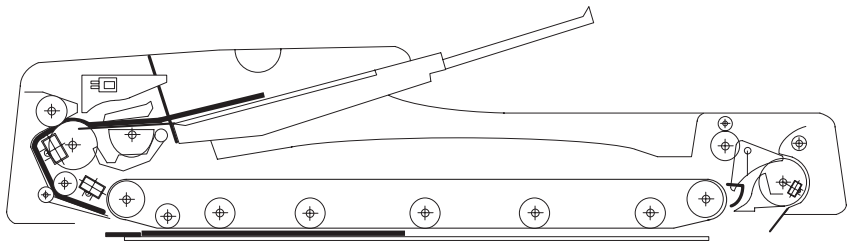


Figure 2-9. Single Feeding (Step 8)

9. After scanned, the scanned document is ejected according to the single feed command from the scanner and the pre-fed document is transported to the scanning position.

10. After the document is fed by the forward rotation of the transportation motor and the paper eject/reverse motor, the paper feed motor rotates backward to transport the document onto the platen glass and stops when the timing sensor goes off.

11. After the paper feed motor stops rotating, the transportation motor transports the document and stops rotating when the rear edge of the document passed the document stopper. In case the empty sensor goes off while the document is transported, the shutter solenoid goes off. The ADF continues to eject the scanned document.

12. Transportation motor rotates backward to feed back the fed document to align it with the document stopper causing impact, then the transportation motor stops. With the document set on the scanning position, the ADF sends the paper feeding complete signal to let the scanner start scanning. The ADF continues to eject the scanned document.

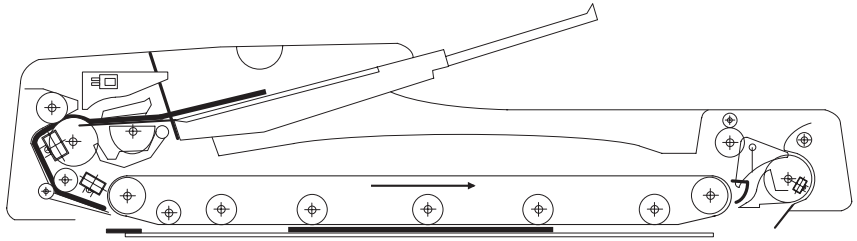


Figure 2-10. Single Feeding (Step 9)

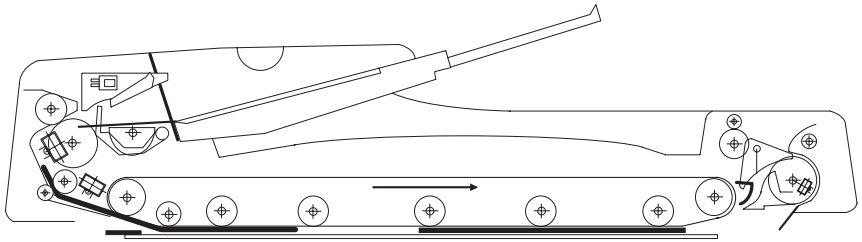


Figure 2-11. Single Feeding (Step 10)

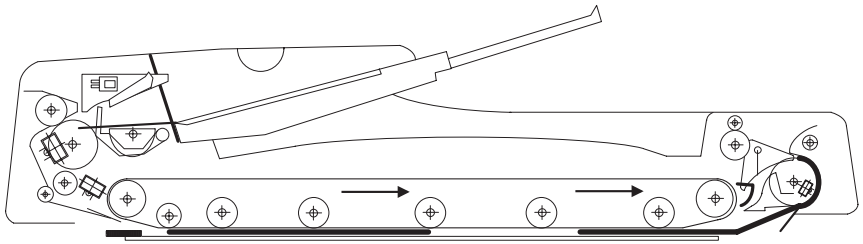


Figure 2-12. Single Feeding (Step 11)

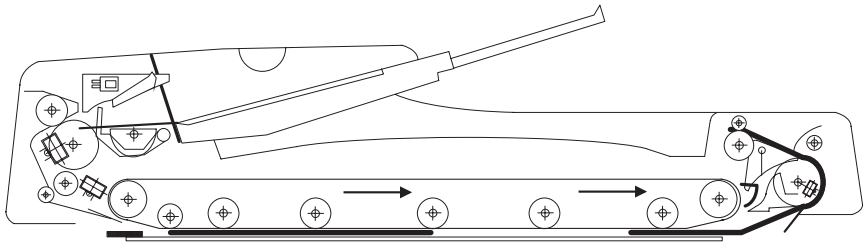


Figure 2-13. Single Feeding (Step 12)

13. While scanning, the document is ejected to the output tray. Rotational speed of the paper eject/reverse motor is reduced when the paper eject/reverse sensor is near off condition to output the document to the output tray slowly.

14. The paper eject/reverse motor stops after outputting the document to the tray slowly. The ADF sends the operation complete signal to the scanner and waits for the next command to be sent.

15. When the ADF receives the ejection command, it starts ejecting the scanned document. The transportation motor and the paper eject/reverse motor rotate forward for this operation.

16. The paper eject/reverse motor reduces its rotational speed when the paper eject/reverse sensor is near off condition to output the document to the output tray slowly. The paper eject/reverse motor then stops when the paper eject/reverse sensor goes off.

17. The ADF sends the operation complete signal to the scanner when the document is slowly ejected and the paper eject/reverse motor stops rotating.

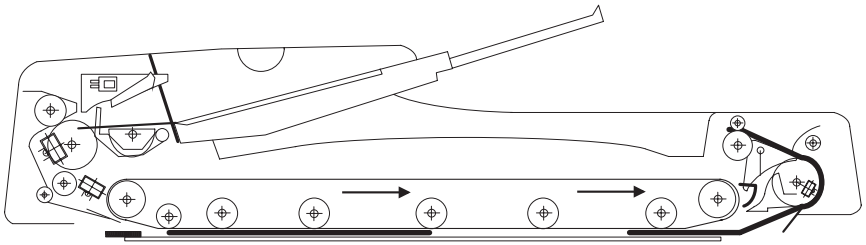


Figure 2-14. Single Feeding (Step 13)

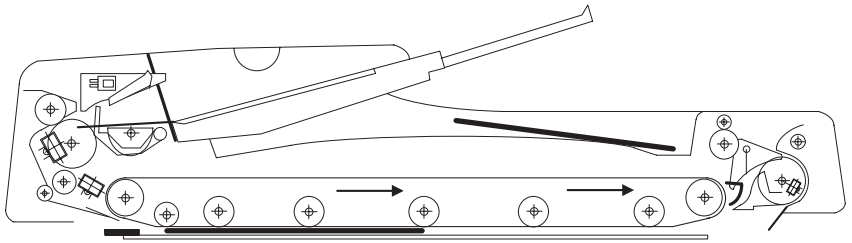


Figure 2-15. Single Feeding (Step 14)

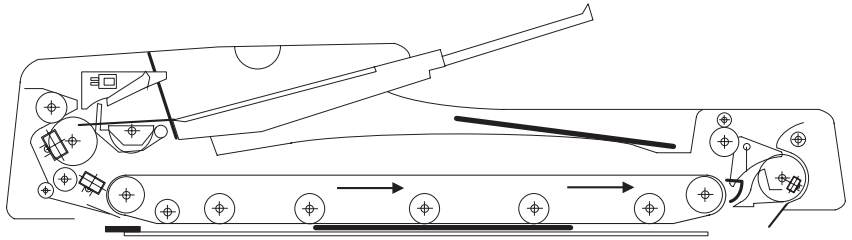


Figure 2-16. Single Feeding (Step 15)

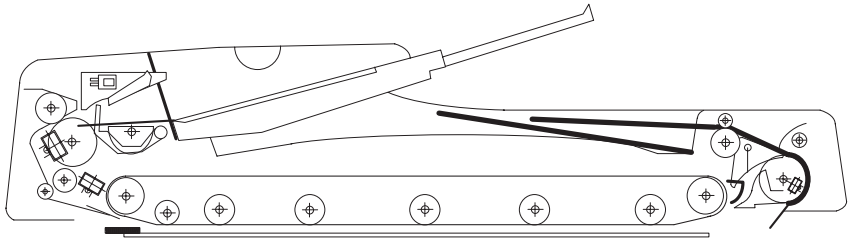


Figure 2-17. Single Feeding (Step 16)

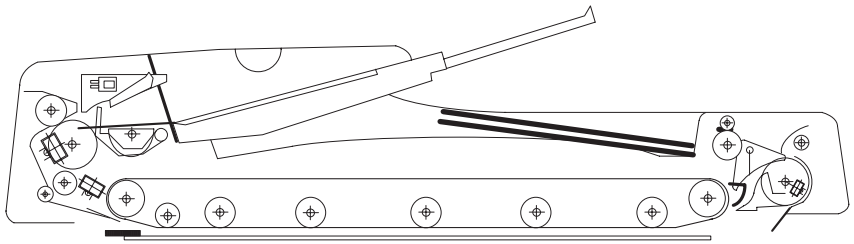


Figure 2-18. Single Feeding (Step 17)

REVERSE FEEDING

In the reverse feeding mode, document is fed in the following order:

The document is fed. → The document is reversed. →
Image is scanned → The document is reversed again. →
Image on the reversed side is scanned.

Setting a document

1. Document is set in the paper feeding tray.

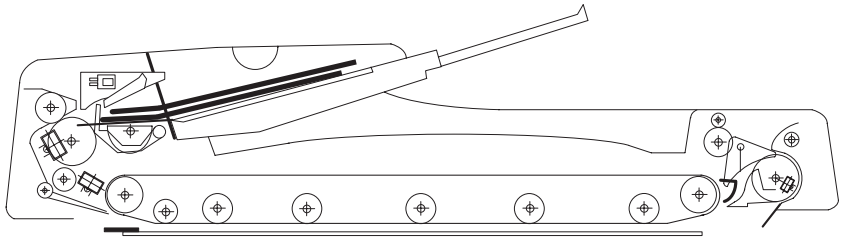


Figure 2-19. Setting a Document (Step 1)

Pre-feeding

"Pre-feeding" consists of operations which pick up the document from the paper feed tray and transport it to the scanning position according to the reverse feed command sent from the scanner.

2. Step 2) After the wait shutter solenoid turns on, the document is picked up and transported from the paper feed tray by the forward rotation of the paper feed motor. The motor then stops rotating when the registration sensor comes on. This sequence, from picking up the document to the registration sensor's coming on, is called registration operation. The transportation motor and the paper eject/reverse motor also rotate forward to perform dummy ejection to prevent a remaining document from jamming when the ADF is feeding another document. This is performed for every feeding motion no matter a document is remaining in the ADF or not.

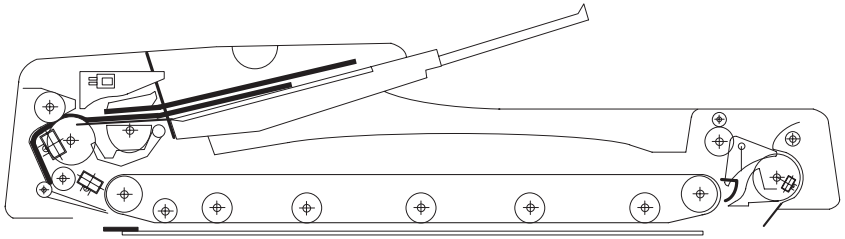


Figure 2-20. Pre-feeding (Step 2)

3. After the registration operation is carried out, the paper feed motor starts rotating forward to transport the document. The document is transported to the position where the timing sensor comes on, which means the end of the pre-feeding operation. Ongoing dummy ejection carries on.

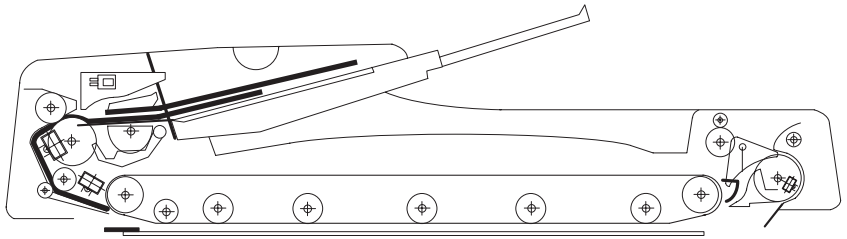


Figure 2-21. Pre-feeding (Step 3)

4. The transportation motor and paper feed motor rotate forward and backward, respectively, to transport the document onto the platen glass. The paper feed motor stops rotating when the registration sensor goes off. The flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side.

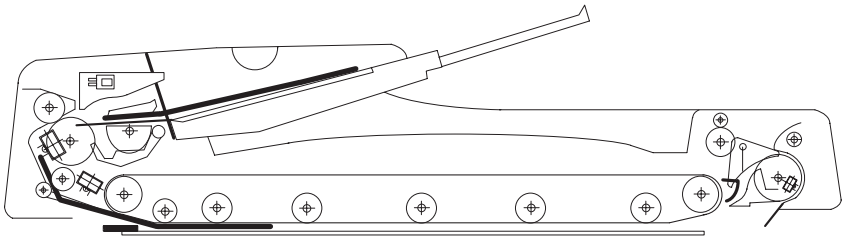


Figure 2-22. Reverse Feeding (Step 4)

5. When the paper eject/reverse sensor comes on, the transportation motor stops and then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

6. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position on the platen glass. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off. When the document bumps against the paper stopper, transportation motor stops and the flapper solenoid goes off to stop transporting the document. With the document set for scanning, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

7. The paper feed motor starts rotating forward to pick up and transport another document from the paper feed tray. The motor stops when the registration sensor comes on.

8. After the registration operation is carried out, the paper feed motor rotates forward to transport the pre-fed document to the position where the timing sensor comes on. The pre-feeding operation is complete when the ADF sends the operation complete signal to the scanner.

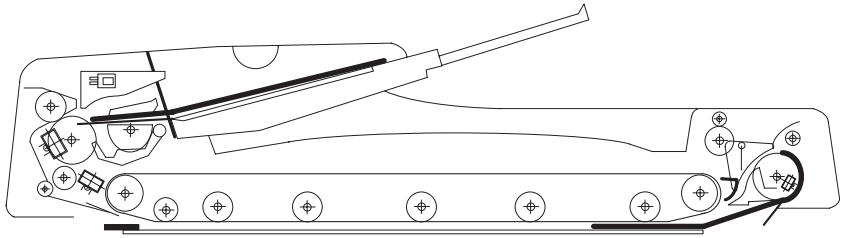


Figure 2-23. Reverse Feeding (Step 5)

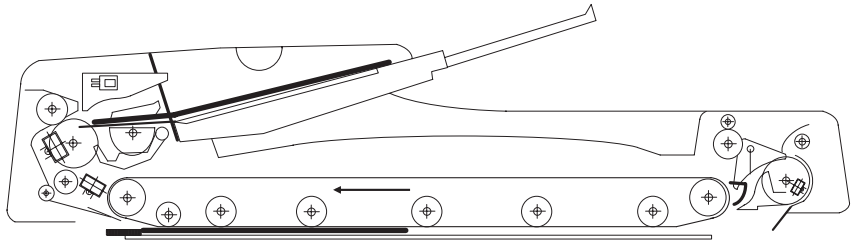


Figure 2-24. Reverse Feeding (Step 6)

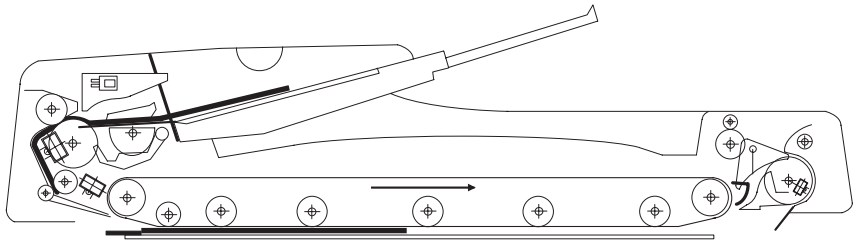


Figure 2-25. Reverse Feeding (Step 7)

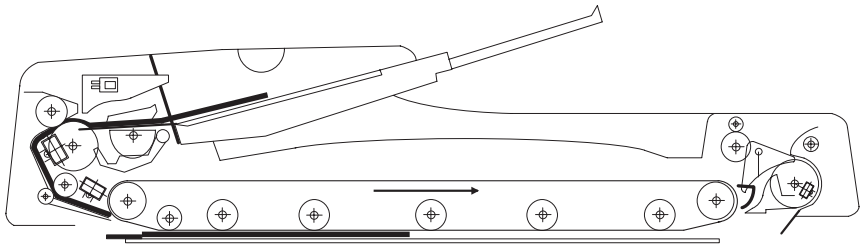


Figure 2-26. Reverse Feeding (Step 8)

9. According to the reverse feeding command, the transportation motor and the paper eject/reverse motor rotate forward to transport the scanned document to the paper eject/reverse mechanism and the flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side.

10. When the paper eject/reverse sensor comes on, the transportation motor stops and then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

11. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position on the platen glass. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off. When the document bumps against the paper stopper, transportation motor stops and the flapper solenoid goes off to stop transporting the document. With the document set for scan, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

12. After scanning, the ADF starts ejecting the scanned document and transporting the pre-fed document according to the reverse feeding command. The transportation motor and the paper eject/reverse motor rotate forward to transport the document to eject it.

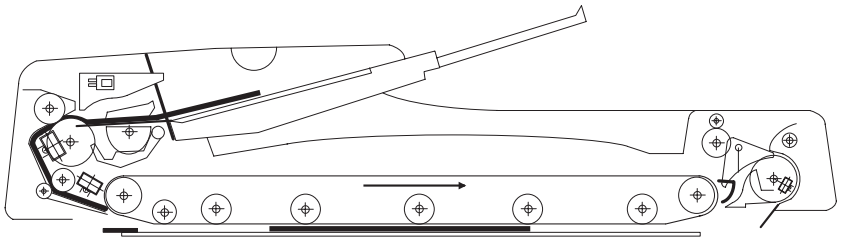


Figure 2-27. Reverse Feeding (Step 9)

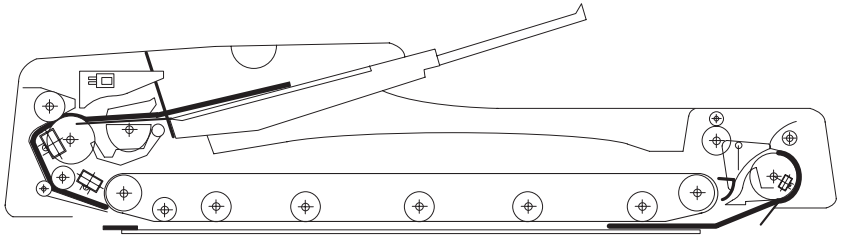


Figure 2-28. Reverse Feeding (Step 10)

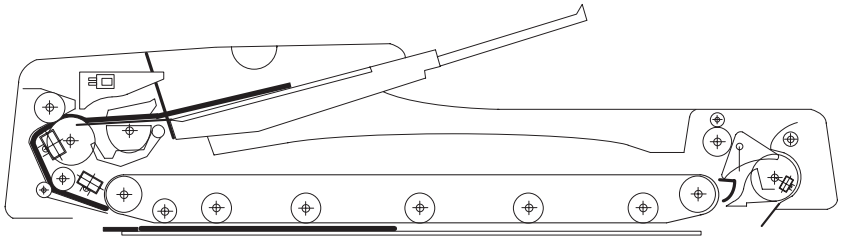


Figure 2-29. Reverse Feeding (Step 11)

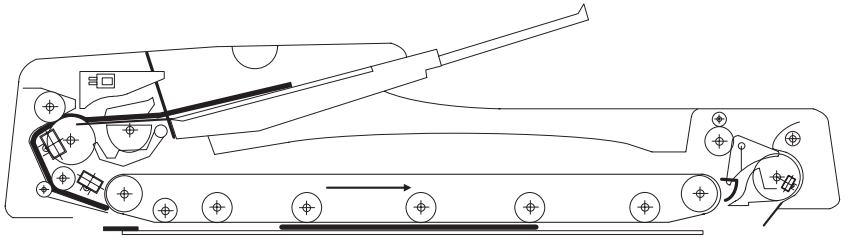


Figure 2-30. Reverse Feeding (Step 12)

13. The transportation motor rotates forward and then the paper feed motor rotates backward to transport the pre-fed document to the platen glass. The document size is measured when the registration sensor goes off, and the paper feed motor stops when the timing sensor goes off. The flapper solenoid also comes on to switch the paper path to the paper eject/reverse mechanism side.

14. After the paper feed motor stops, the transportation motor starts transporting the document and stops when the leading edge of the document is near the paper eject/reverse mechanism to wait for the scanned document to be ejected completely. In case the empty sensor goes off while transporting, the shutter solenoid goes off.

15. After the scanned document is ejected, the flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side. The transportation motor and the paper eject/reverse motor rotate forward to transport the fed document to the paper eject/reverse mechanism.

16. When the paper eject/reverse sensor comes on, the transportation motor stops. Then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

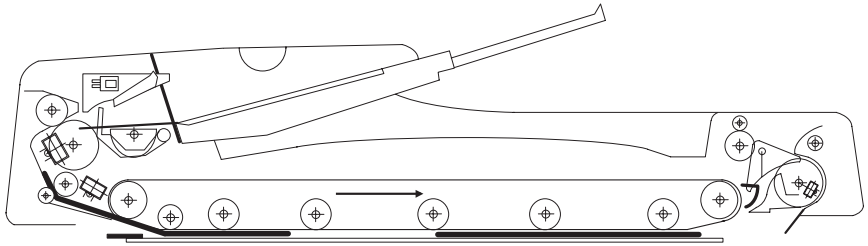


Figure 2-31. Reverse Feeding (Step 13)

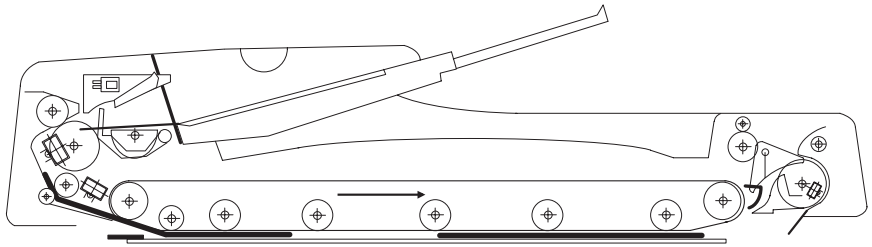


Figure 2-32. Reverse Feeding (Step 14)

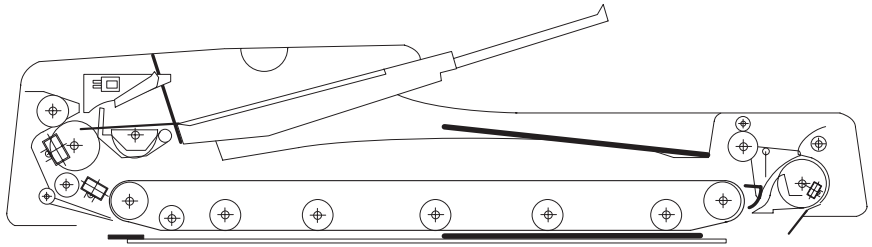


Figure 2-33. Reverse Feeding (Step 15)

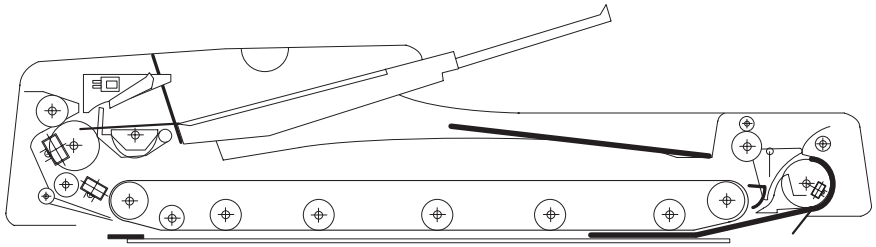


Figure 2-34. Reverse Feeding (Step 16)

17. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off and the transportation motor stops when the document bumps against the paper stopper. Document transportation stops when the flapper solenoid goes off. With the document set for scan, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

18. After scanning, the ADF starts transporting the scanned document back to the scanning position via the paper eject/reverse mechanism. The transportation motor and the paper eject/reverse motor rotate forward to transport the scanned document to the paper eject/reverse mechanism and the flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side.

19. When the paper eject/reverse sensor comes on, the transportation motor stops and then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

20. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off and the transportation motor stops when the document bumps against the paper stopper. With the document set for scan, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

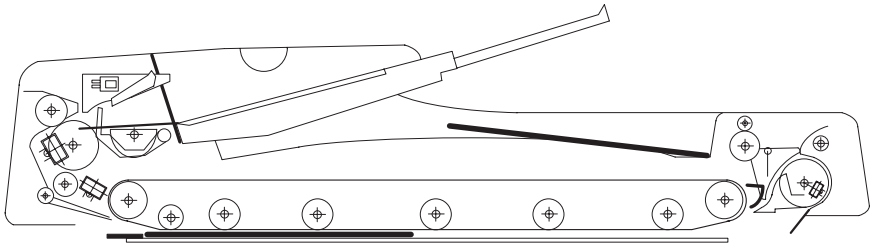


Figure 2-35. Reverse Feeding (Step 17)

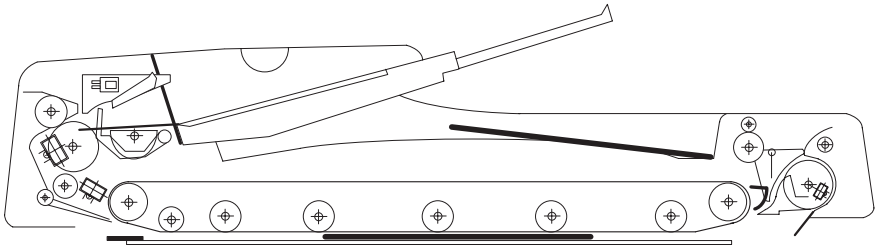


Figure 2-36. Reverse Feeding (Step 18)

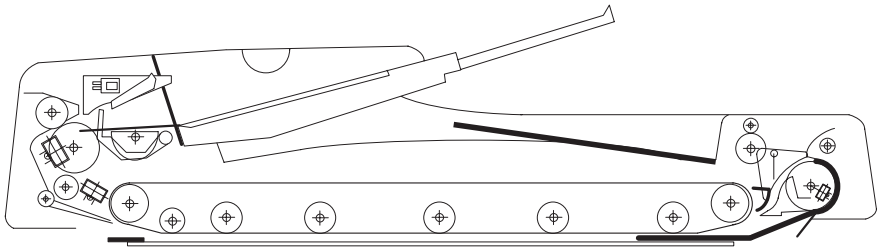


Figure 2-37. Reverse Feeding (Step 19)

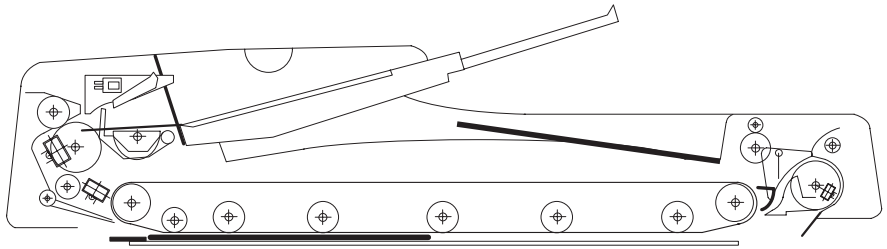


Figure 2-38. Reverse Feeding (Step 20)

21. According to the ejection command from the scanner, the scanner starts ejecting the scanned document. The transportation motor and the paper eject/reverse motor rotate forward to eject the scanned document.

22. When the paper eject/reverse sensor is near off condition, rotational speed of the paper eject/reverse motor is reduced to eject the document slowly to the output tray. The transportation motor stops when the paper eject/reverse sensor goes off.

23. The paper eject/reverse motor stops after the document is ejected to the output tray and the ADF sends the operation complete signal to the scanner.

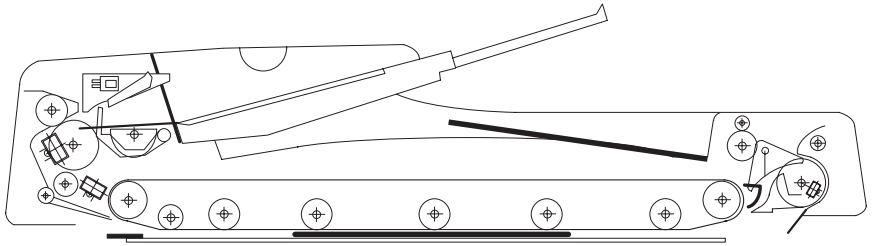


Figure 2-39. Reverse Feeding (Step 21)

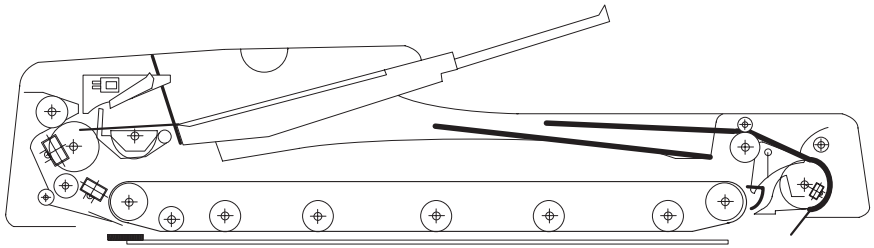


Figure 2-40. Reverse Feeding (Step 22)

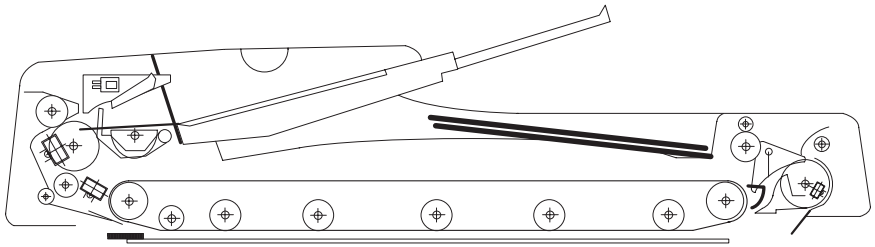


Figure 2-41. Reverse Feeding (Step 23)

2.1.2 Electrical Circuit

This ADF (R-4C1070).is equipped with only one control board. This section describes the functions of the board.

2.1.2.1 Transmission Circuit

The transmission circuit manages parallel and serial signal transmission between the ADF and the scanner. The protocol used between them is original.

- Serial transmission
  IC11 is the transceiver used for the serial transmission. It receives output signal from the CPU and separates them according to the signal types; reversed or non-reversed, then it outputs the signals to the scanner from DO1. 2 signals (RI1 and RI2) sent from the scanner are combined into 1 signal and output from the RO1.

- Parallel transmission
  Signals sent from the CPU is output at the open collector via IC1 and IC3. Signals from the scanner are transferred to the CPU via the pull-up resistor.

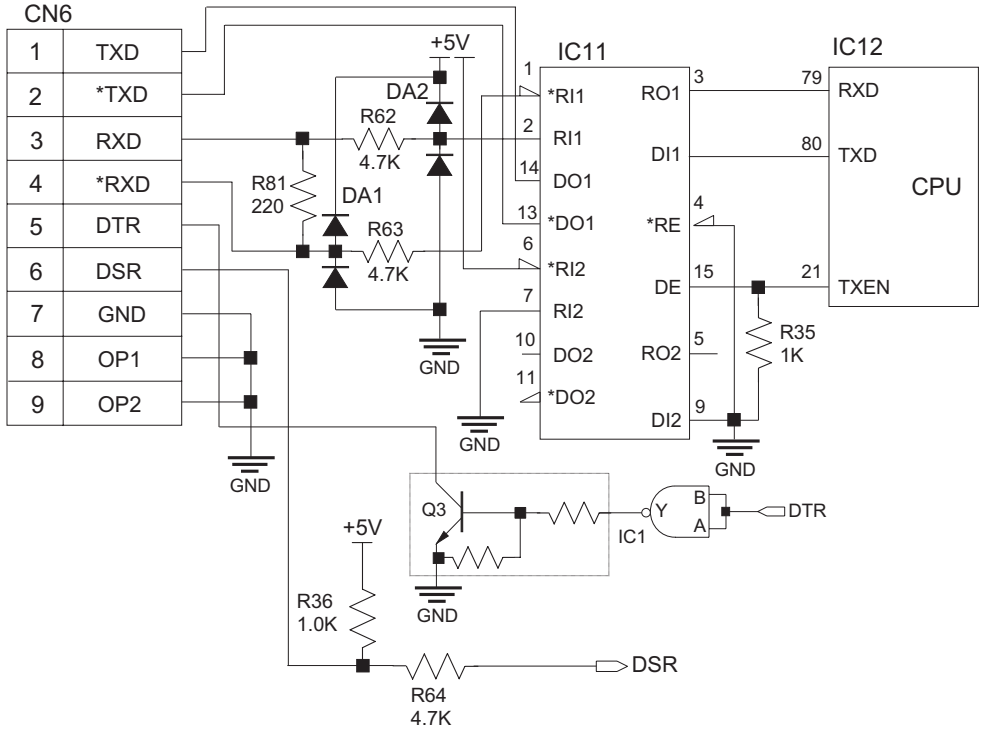


Figure 2-42. Transmission Circuit Block Diagram

2.1.2.2 Paper Size Detection Circuit

The edge guides in the paper feed tray of this ADF are used to detect the paper size. As they move, slide resistance changes in accordance with the distance between them. The resistance is then converted into analog data and transferred to the CPU, where the paper size is determined. This circuit consists of the RC noise filter.

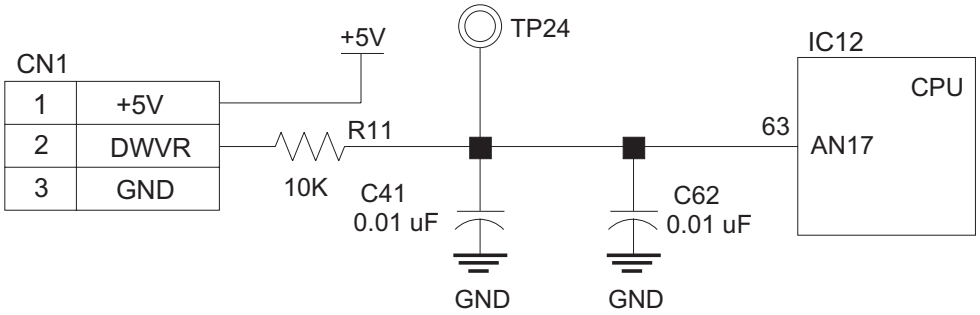


Figure 2-43. Document Width Detection Circuit Block Diagram

2.1.2.3 Document Sensor (Empty Sensor) Circuit

A photo-interrupter sensor located at the bottom of the paper feed tray is used to detect document. The ADF determines whether or not it continues pre-feeding based on the signal sent from this sensor. The signal is transferred to the CPU via the resistors only.

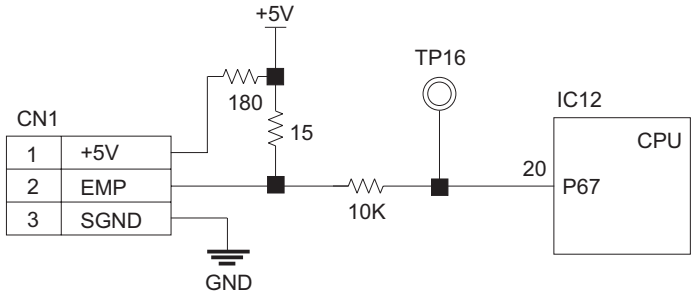


Figure 2-44. Document Sensor Circuit Block Diagram

2.1.2.4 Paper Feeding Motor Encoder Sensor Circuit

The paper feeding motor is used to manage the following operations:

- ❑ Registration operation
- ❑ Drives the transportation motor after the timing sensor goes off.
- ❑ Controlling backward rotation of the motor

Since this motor is used for various operations, the motor rotation must be precisely controlled. Failure in controlling the motor does not guarantee prompt feeding, or may result in jamming caused by the document inserted over the document remaining in the ADF. The motor rotation is controlled according to the signal form the photo-interrupter which detects the slid plate directly attached to the motor shaft. The signal is output to the CPU via the resistors only.

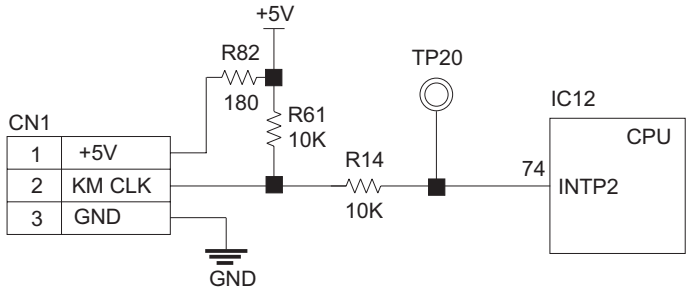


Figure 2-45.
Paper Feeding Motor Encoder Sensor Circuit Block Diagram

2.1.2.5 Registration Sensor Circuit

The registration sensor with an LED and the photo transistor built in has an mirror attached across the paper path. Since the registration sensor is a reflex type sensor, it detects paper empty condition by emitting infrared light from the LED toward the mirror and receiving the light reflected on the mirror.

The voltage input to the sensor is divided by R55 and R56, and 1/3 of the original level is input to the AD converter of the CPU. (Actually, it is regulated to 5 V by D2.) Analog data for the input voltage is output one after another in a rectangle waveform from IC4 via PWM circuit in the gate array. This PWM signal is integrated via R3 and C6 of the C,R circuit and converted into the analog voltage. Then it is amplified by the non-reverse amplifier to establish the reference value for the comparator. Therefore, the reference value is set to 1/3 of the High level of each sensor output timing. In case the voltage level input to the AD converter of the CPU drops below 1.6 V, the CPU outputs High from Pin 48 to increase LED emission.

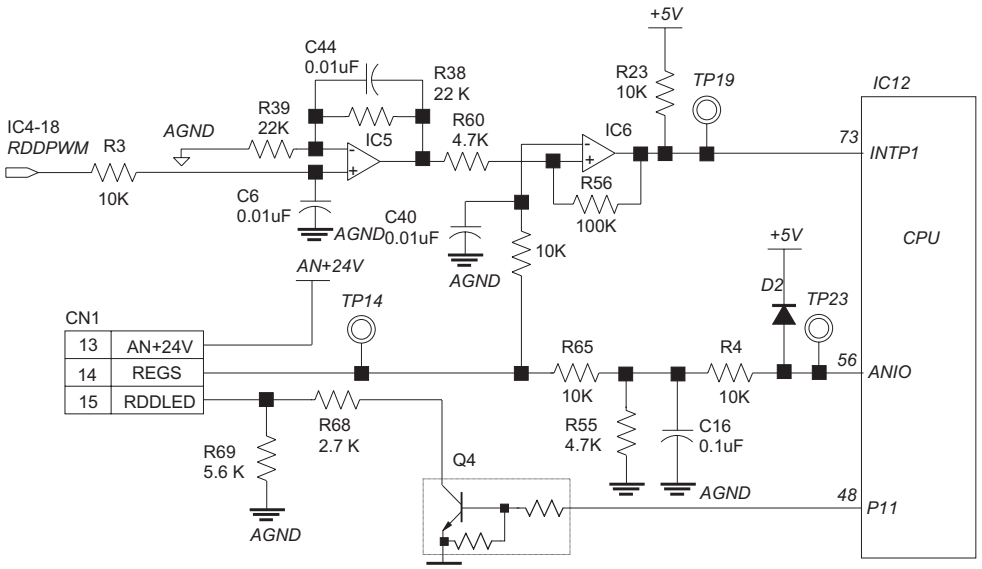


Figure 2-46. Registration Sensor Circuit Block Diagram

2.1.2.6 Sensor Circuits

The timing sensor and the paper eject/reverse sensor are reflex type sensors, and each of them has an LED and photo-transistor built in it. Each sensor emits infrared light from the LED toward the mirror attached across from the sensor and detects paper empty condition when it receives the infrared light reflected on the mirror.

The cathode of the LED is connected to the collector of Q3. Current output to the photo diode is controlled at the terminal AN0 of the CPU. Photoelectric current from the photo transistor is converted into voltage via the resistor in the input circuit of the sensor, and is input to the comparator, where the voltage level is compared with the reference voltage (2V).

If the input voltage is higher than the reference voltage, it means the paper empty condition, and the compactor outputs a Low signal to the CPU. Since sensors are generally produced with uneven sensitivities, the CPU adjusts the input voltage from the sensor to the specified level. When the ADF is turned on under the paper empty condition, the input voltage (analog data) from the sensor is input to the CPU as a digital data. The CPU then manipulates the data to make the proper level of output voltage (analog data). After this process, the current flows to the LED changes and the input voltage from the sensor is adjusted to the proper level as the result.

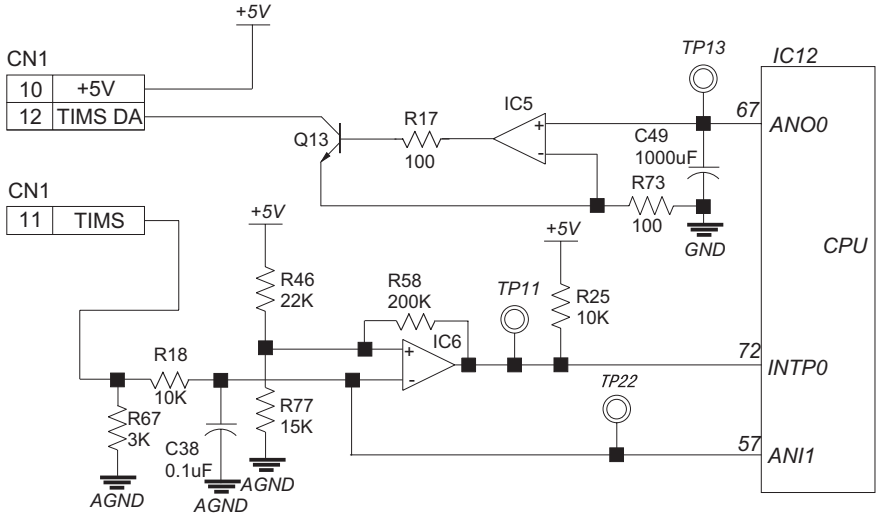


Figure 2-47.
Timing Sensor Circuit / Reverse Sensor Circuit Block Diagrams

2.1.2.7 Switch Circuits

Each of the ADF, feeding cover and ejection cover is equipped with a open/close sensor to detect status such as operation stop and error occurrence. These open/close mechanisms are used when removing jammed documents or setting documents manually. The circuits for the sensors have the same layout and each of the circuits inputs 5 V directly to the CPU via the Zener diode and the transistor with internal resistors integrated to detect conditions.

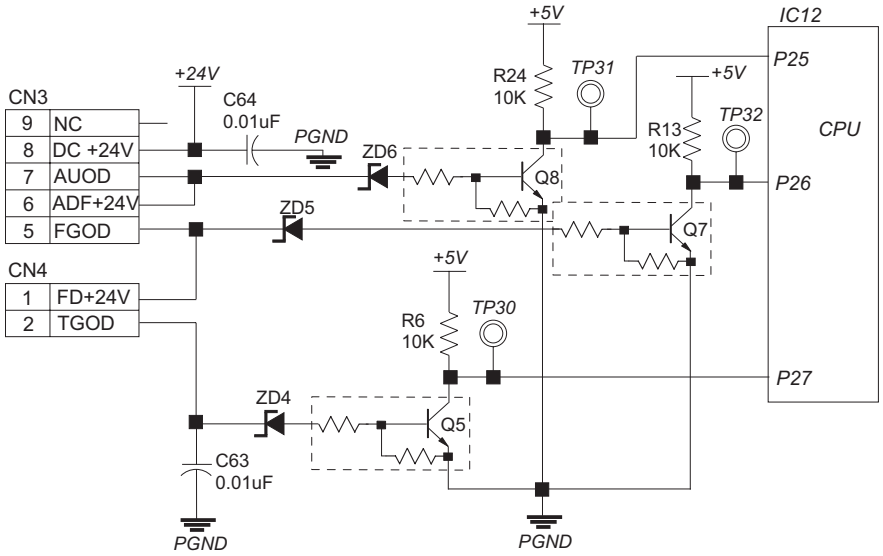


Figure 2-48. Open/Close Sensor Circuit Black Diagram

2.1.2.8 Reset Circuit

This circuit produces reset signals sent to the CPU and the gate array. IC8 has the following 2 functions:

- ❑ Power-on reset at power-on time
- ❑ Resets when 5 V is at an abnormally low level.

After power-on, reset condition is kept until the voltage level for IC8 rises to 4.3 V. This circuit is also equipped with WDT used when the CPU is running away. It is to allow the CPU itself to output the reset signal.

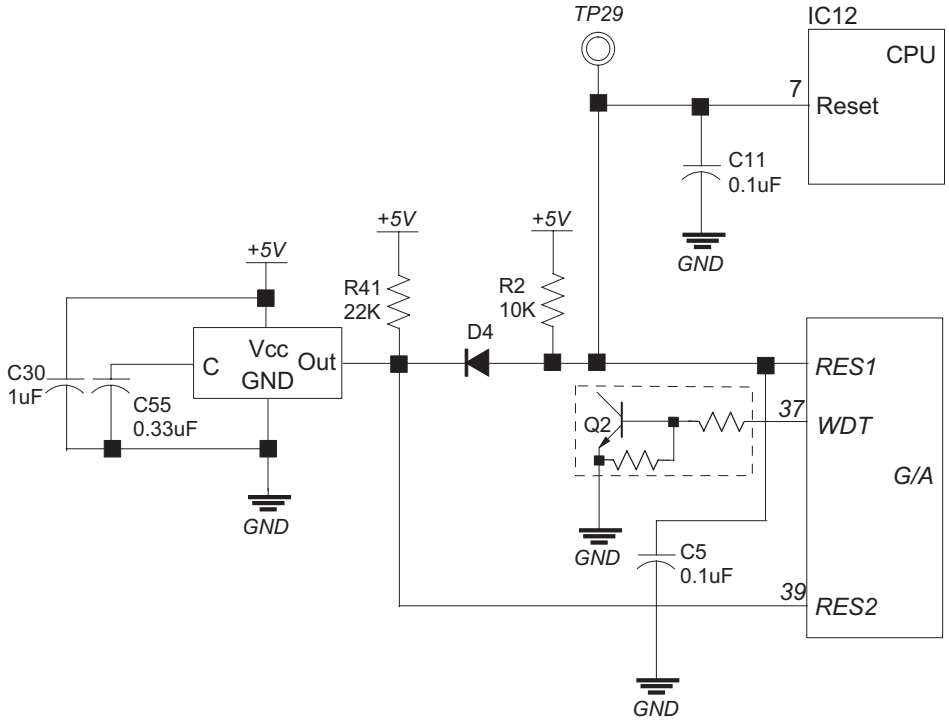


Figure 2-49. Reset Circuit

2.1.2.9 Paper Feed Motor Driver Circuit

This ADF is equipped with 3 motors, and a DC motor is used for the paper feed motor only. The paper feed motor has a slit plate which detects conditions such as amount and directions of motor rotation and stop control status. The paper feed motor driver circuit sends signals to the CPU according to the motor status detected by the slid plate. The signals for rotation direction and stop control fed back to the CPU are transferred to the gate array via data bus, where the signals are combined and decoded into one, and output from Pin 65 - Pin 68 as a control signal. Since this motor is a phase 2 DC motor, the motor control HIC (IC3) is finally output from Pin 2.

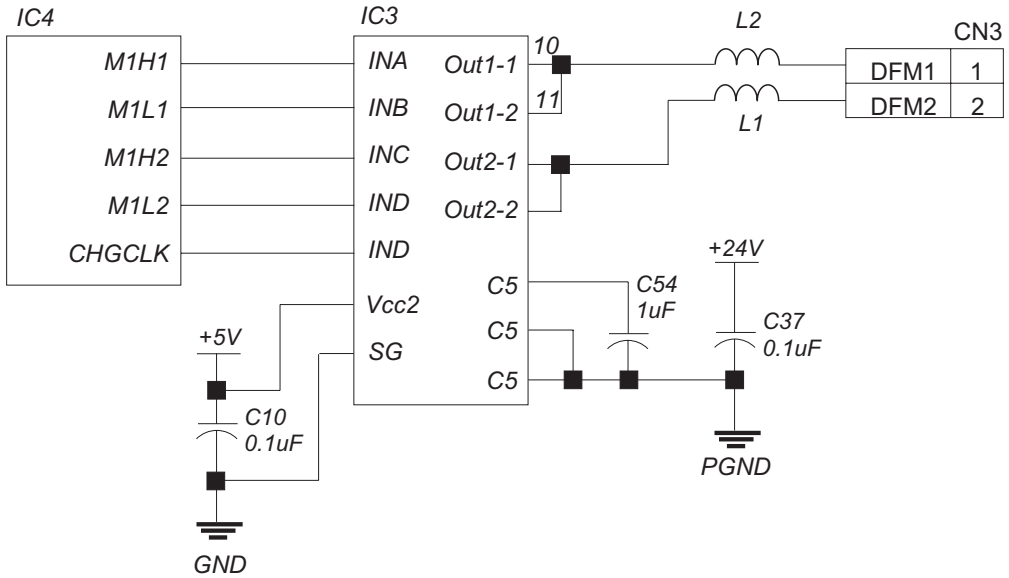


Figure 2-50. PF Motor Driver Circuit

2.1.2.10 Transportation/Paper Eject/Reverse Motor Driver Circuits

Stepping motors are used for the transportation motor and the paper eject/reverse motor. Each motor circuit controls constant current for the motor phase as well as direction for rotating and motor stopping . Phase excitation signals are input to Pins 13 - 16 of the IC7. Since this motor is driven by the constant current, PWM signal is output from Pin 17 of the gate array after current is input to the motor phase to regulate the current via the chopping regulator.

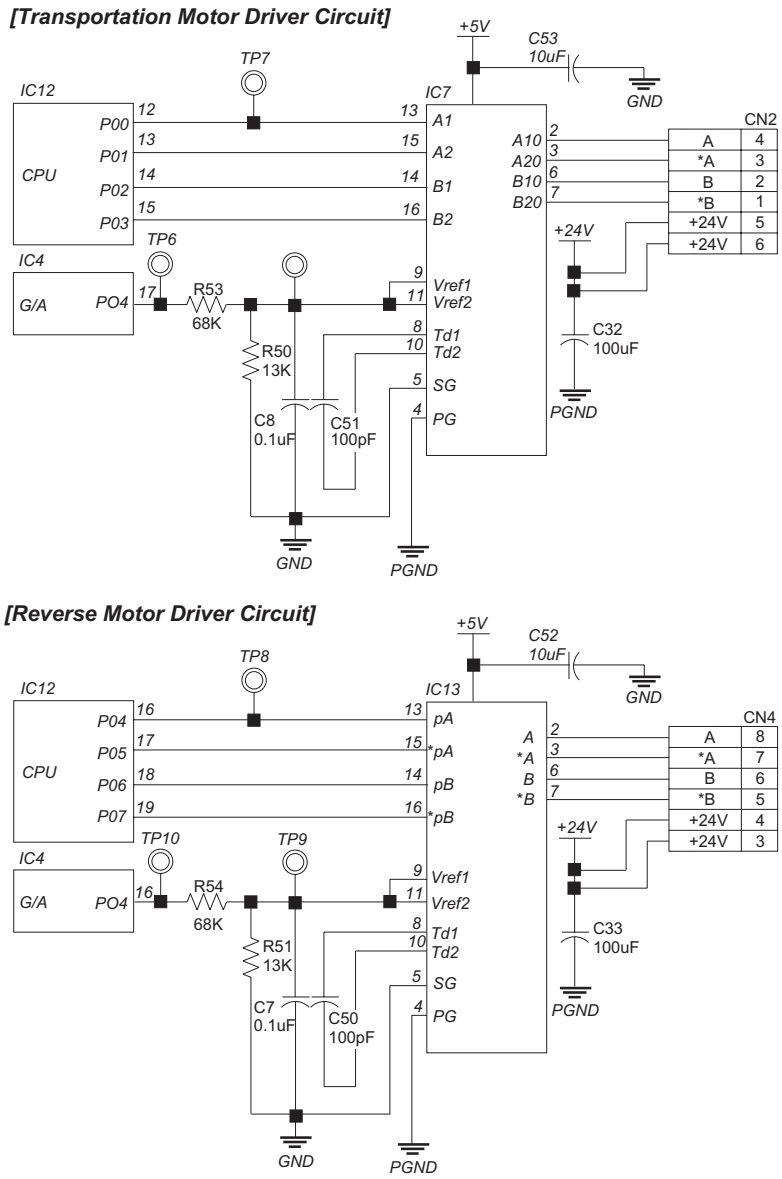


Figure 2-51.
Transportation & Paper Eject/Reverse Motor Driver Circuit Block Diagrams

2.1.2.11 Feeding Solenoid/Reverse Solenoid Sensor Circuits

This ADF is equipped with 2 solenoids; one is a feeding solenoid used for opening and closing the paper feed shutter, and the other is a flapper solenoid which drives the flapper used to reverse the document. In each circuit, the gate array outputs a signal to activate the FET. The coil inside the solenoid is then energized by the FET operation to produce magnetic field, and the iron core is induced as the result.

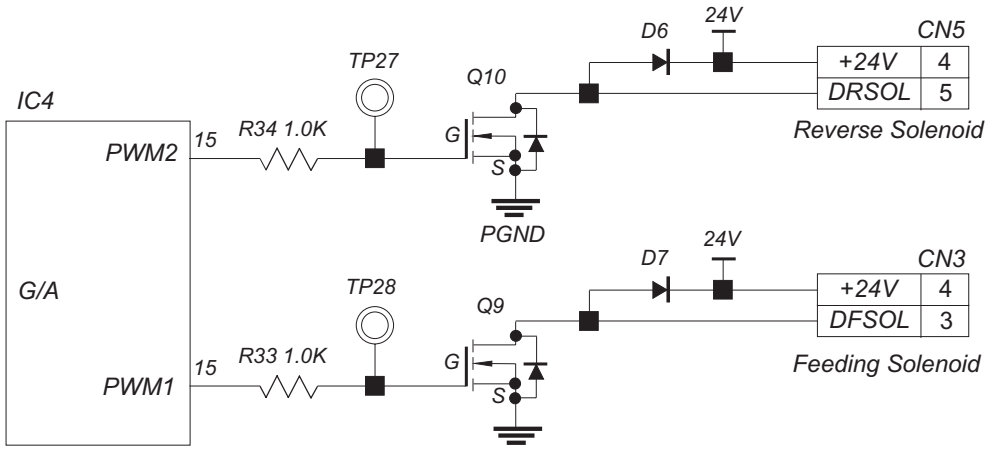


Figure 2-52. Solenoid Driver Circuit Block Diagram

2.1.2.12 Rush Current Limitation Circuit

The rush current limitation circuit consists of the limitation resistance and the FET which regulates the current level. Through this circuit, the level of the rush current which flows into the current regeneration condensers in the transportation and the paper eject/reverse motor circuits is suppressed at a proper level. When the ADF is turned on or ADF, paper feeding cover and the ejection cover are closed, current flow is limited by the limitation resistor (R31) until the cathode voltage for ZD3 rises to the specified level.

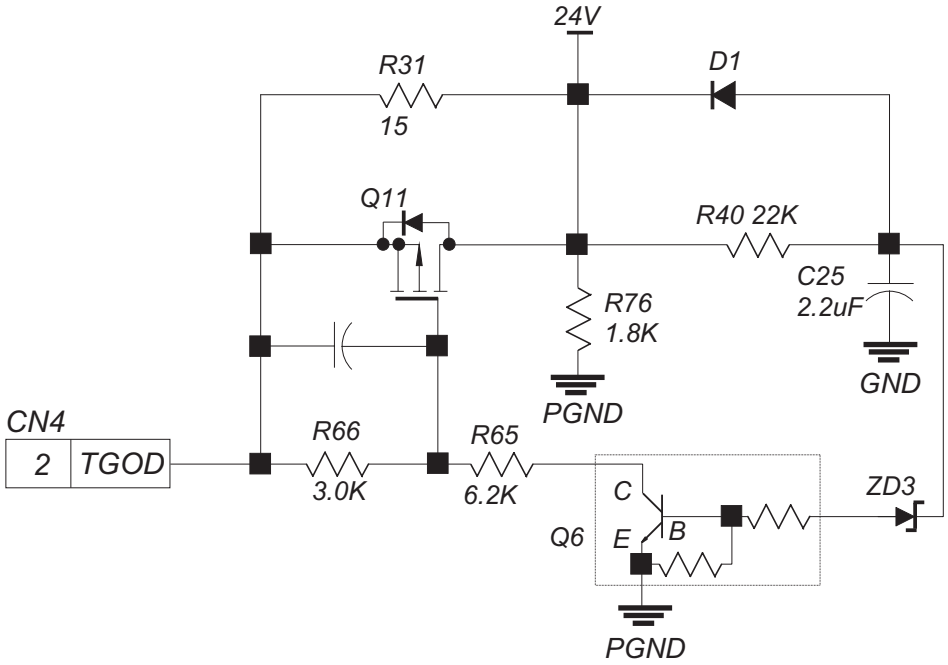


Figure 2-53 Rush Current Limitation Circuit

2.1.2.13 EEPROM Transmission/Write Circuit

Following values can be written into the EEPROM of this ADF:

- ❑ Reference value for the empty sensor sensitivity
- ❑ Reference value for the registration sensor sensitivity
- ❑ Reference value for the paper eject/reverse sensor sensitivity
- ❑ Total amount of fed document

To rewrite sensitivity values for the sensors listed above or initialize the EEPROM, run the automatic adjustment program built in the ROM.

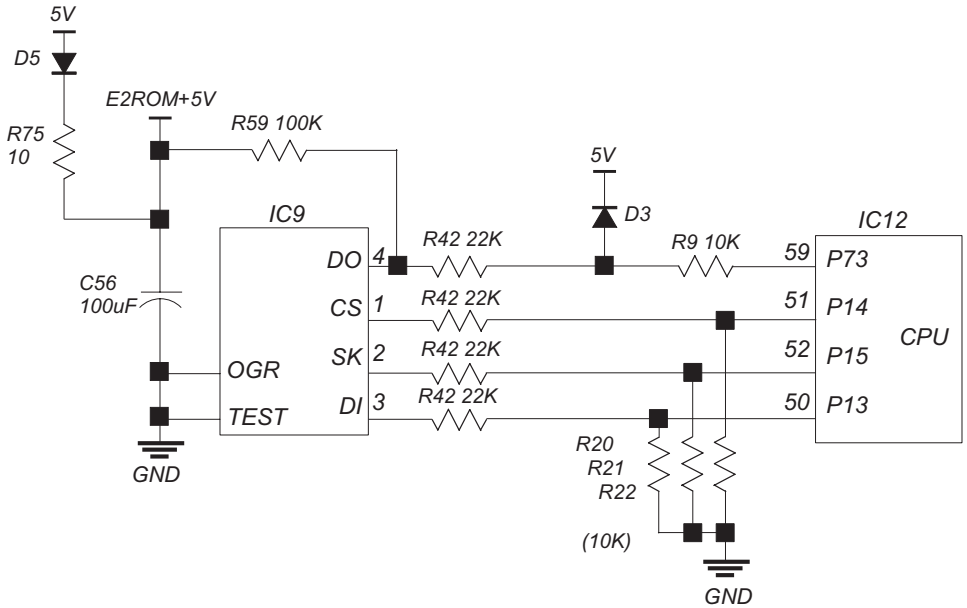


Figure 2-54. EEPROM Transmission/Write Circuit

CHAPTER

3

TROUBLESHOOTING

3.1 OVERVIEW

This chapter describes the troubleshooting required when this ADF functions abnormally. Generally, defective part can be found easily by running various test modes as long as the ADF is in operation. The test modes are described in the following sections.

3.1.1 Test Mode Overview

This ADF is equipped with 6 test modes. After activating each mode, you can roughly isolate the defective part according to the blinking pattern of the LED. Use of functions of these modes also brings you an early detection of the defective part at the on-sight service. However, you can refer to the resistance values for the motors and solenoids shown in Appendix as the error indication with LED is not distinguishable enough.

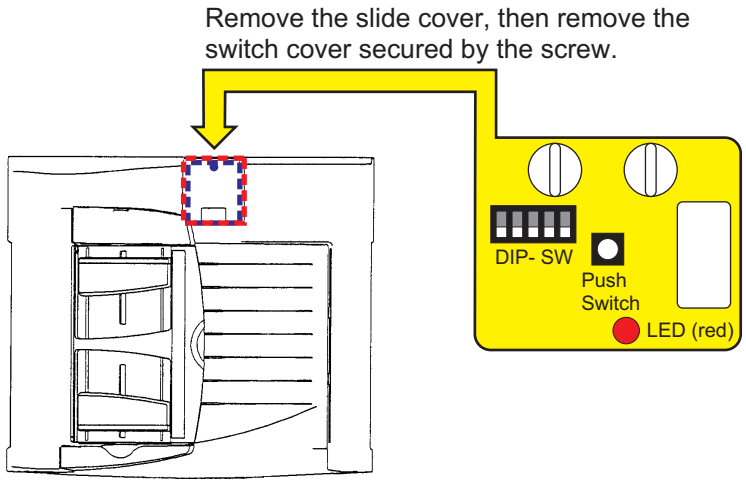


Figure 3-1. SW Cover Removal

Table 3-1. Test Modes and Test Methods

No.	Test Mode	Test Method
1	Single feeding mode	Feed the paper in the single feeding mode and check the operation.
2	Reverse feeding mode	Feed the paper in the reverse feeding mode and check the operation.
3	Single feeding without paper aging mode	Without any document set, the ADF performs single paper feeding motion at a high speed.
4	Reverse feeding without paper aging mode	Without any document set, the ADF performs reverse paper feeding motion at a high speed.
5	Motor line output check mode	Drive 3 motors in the ADF and check for the proper operations.
6	Solenoid line output check mode	Activate 2 solenoids in the ADF and check for the proper operations.

✓CHECK POINT

- ***If a sensor error occurs during a test mode, see Chapter 5 and perform any necessary adjustment.***
- ***If an error occurs during a test mode, refer to Table 3-2 and take proper actions.***

Table 3-2. Error Indication during the Test Modes

No.	LED Indication	Corresponding ADF Condition
1	Blinks (Interval: 1000 msec)	Test is done without any error.
2	Blinks (Interval: 500 msec)	Sensor error or motor error has occurred.
3	Blinks (Interval: 50 msec)	Paper is jamming.

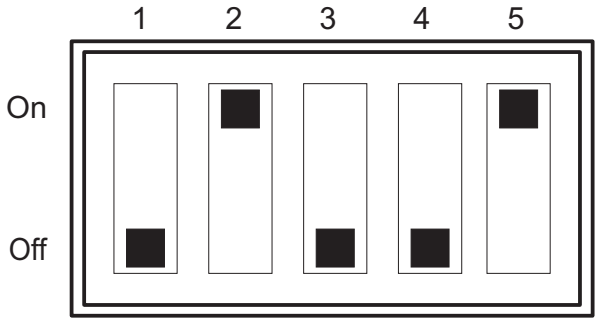
3.1.1.1 Single Feeding Test Mode

With this test mode, you can detect the defective part by setting the document (including a blank paper) and performing the single feeding.

✓CHECK POINT

Abnormal phenomenon does not necessary determine the test mode to be performed. Therefore, performing all test modes listed in Table 3-1 one by one in the listed order is recommended.

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

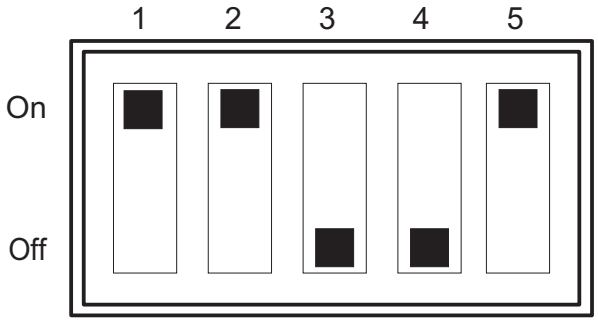
✓CHECK POINT

If the paper jam error occurs, open and close either feeding or eject cover to clear the error status.

3.1.1.2 Reverse Feeding Test Mode

With this test mode, you can detect the defective part by setting the document (including a blank sheet) and performing the reverse feeding.

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control board as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

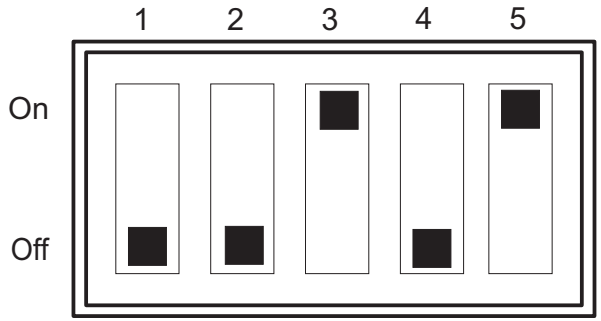
3.1.1.3 Single Feeding Without Paper Aging Test Mode

With this test mode, you can detect the defective part by putting the ADF in the single feeding aging mode without setting any document.

⚠CAUTION ***Do not feed any document during this test mode, or the document may be damaged.***

✓CHECK POINT ***Feeding timing varies depending on the setting condition of the Dip-switch No.5, as shown below:***
Switch = On: Timing for A3
Switch = Off: Timing for A4

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control board as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

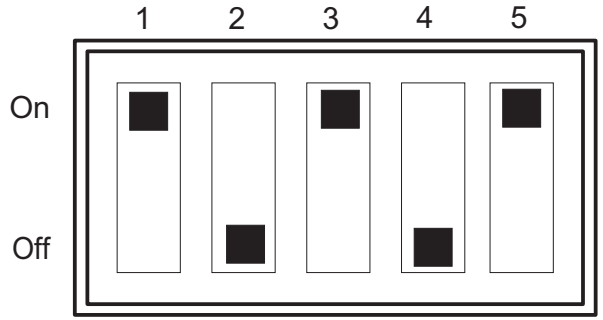
3.1.1.4 Reverse Feeding Without Paper Aging Test Mode

With this test mode, you can detect the defective part by putting the ADF in the reverse feeding aging mode without setting any document. Note that the abnormal phenomenon does not necessary determine the test mode to be performed. Therefore, Performing all test modes listed in Table 3-1 one by one in the listed order is recommended. The test method is as shown below:

⚠CAUTION ***Do not feed any document during this test mode, or the document may be damaged.***

✓CHECK POINT ***Feeding timing varies depending on the setting condition of the Dip-switch No.5, as shown below:***
Switch = On: Timing for A3
Switch = Off: Timing for A4

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control as shown below.

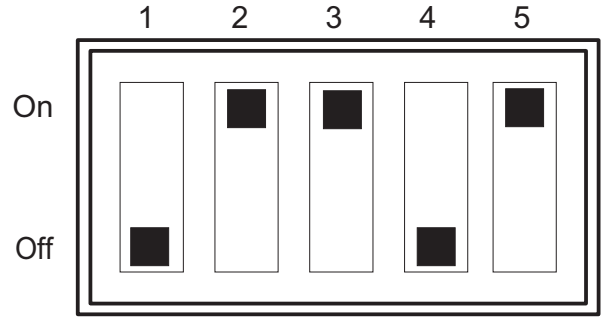


Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

3.1.1.5 Motor Line Output Test Mode

With this test mode, you can detect the defective part by driving 3 motors consecutively.

Step 1. Place the ADF on the scanner.
Step 2. Set the Dip-switch on the control as shown below.



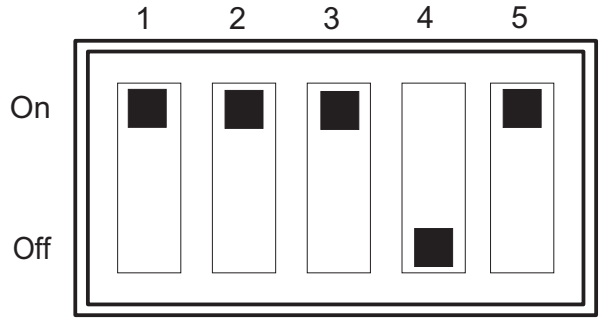
Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board. The motors are driven one by one in the order listed below as the switch is pressed each time.

1)	Feeding motor:	Forward rotation for 150 m Sec. (Weight shutter solenoid: On)
2)	Feeding motor:	Backward rotation for 150 m sec.
3)	Feeding motor:	Backward rotation for 400 m sec.
4)	Transportation motor:	Forward rotation for 400 m sec.
5)	Transportation motor:	Backward rotation for 250 m sec.
6)	Transportation motor:	Backward rotation for 400 m sec.
7)	Reverse Motor:	Forward rotation for 250 m sec.
8)	Reverse Motor:	Forward rotation for 400 m sec.
9)	Reverse Motor:	Forward rotation for 400 →250 m sec

3.1.1.6 Solenoid Line Output Test Mode

With this test mode, you can activate 2 solenoids to check for the correct operation.

Step 1. Place the ADF on the scanner.
Step 2. Set the Dip-switch on the control board as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board. The solenoids are activated in the order listed below as the switch is pressed each time.

1) Weight shutter solenoid
2) Flapper solenoid

3.1.2 Motor/Solenoid Internal Coil Resistance

This section provides the check points for the motors which are found defective through the test modes described in Section 3.1.1.

✓CHECK POINT

- ***Since a DC motor is used for the paper feeding motor, check continuity for 2 lines in case this motor is found defective.***
- ***The reference coil resistance for the DC motor is 3.4 Ω. However, do not judge the motor condition based on the value, because current is measured to check the motor condition only.***

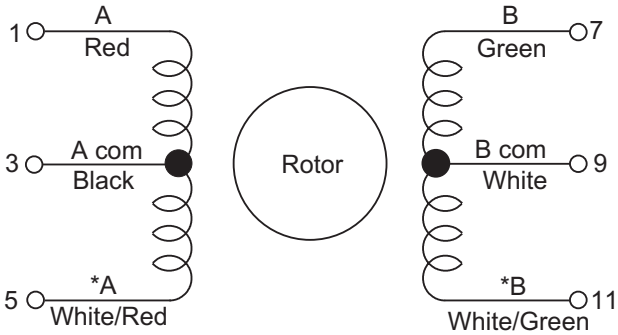


Figure 3-2. Internal Connection of the Transportation Motor

3.1.2.1 Transportation Motor Check Points

A 4-phase motor is used for the transportation motor. The coil resistance between each coil is 1.1Ω ± 10%. Figure 3-2 shows the internal connection of the transportation motor.

The connector is directly soldered onto the transportation motor. See Figure 3-3 which shows pin configuration appears when the connector is removed.

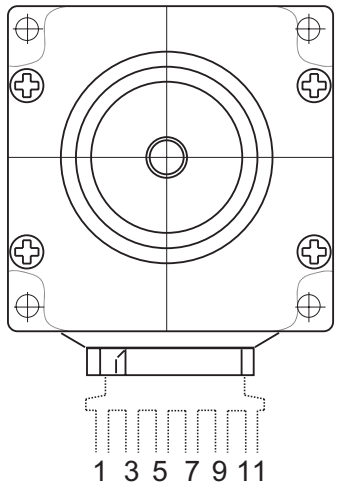


Figure 3-3. Transportation Motor Pin Configuration

3.1.2.2 Paper Eject/Reverse Motor Check Point

A 4-phase stepping motor is also used for the paper eject/reverse motor, and coil resistance between each coil is 2.6Ω ± 10%. Internal coil connection is shown below.

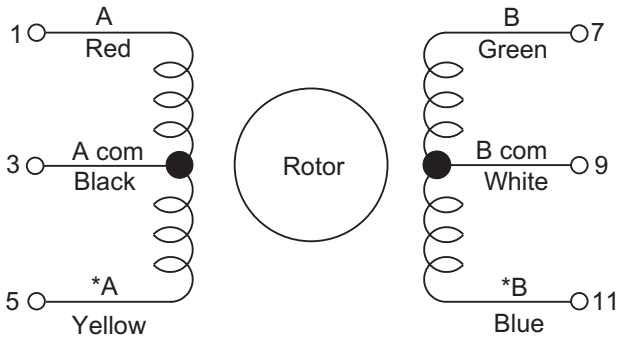


Figure 3-4. Internal Connection of the Reverse Motor

3.1.2.3 Solenoid Check Point

This ADF is equipped with 2 solenoids; shutter weight solenoid and reverse solenoid. They are easily activated by turning on the coils. Therefore, you can check the condition of the solenoid by measuring the resistance between 2 pin cables. Refer to Table 3-3 for the correct resistance of the solenoids.

Table 3-3. Solenoid Resistance

Solenoid	Coil Resistance
Shutter weight solenoid	28 Ω ± 10%
Reverse solenoid	80 Ω ± 10%

3.1.2.4 Paper Size Sensor

Size of the document set in the ADF paper tray is detected by aligning the edge guide with the document. The document width measured by the edge guides is converted into the corresponding sliding resistance, which is fed back to the scanner. Since failure in outputting appropriate VR causes the scanner to operate inappropriately for the document size, the sensor must be checked for the correct resistance when necessary. Refer to Table 3-4 for different document sizes and corresponding VR output values.

Table 3-4.
Document Size and Corresponding VR Output

Document Size	VR Output
B5 (Portrait)	3.53 to 3.18 V
A4 (Portrait)	2.78 to 2.47 V
B5 (Landscape)	1.53 to 1.27 V
A4 (Landscape) A3 (Portrait)	0.45 to 0.27 v

CHAPTER

4

DISASSEMBLY AND ASSEMBLY

4.1 OVERVIEW

This chapter describes how to dissemble the auto document feeder (ADF). If no instruction is given, assembly can be carried out by reversing the disassembly procedures.

⚠CAUTION ***Since the ADF consists of many metal frames, be careful not to cut yourself with the frame edges.***

4.1.1 Tools

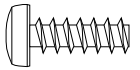
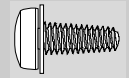
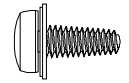
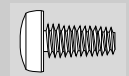
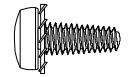
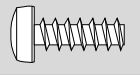
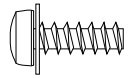
The tools required to disassemble/assemble the TPU are as listed below:

Tool Name	Availability	SE Part No.
Phillips screw driver (No.2)	○	
Thickness gauge set (#F518)	SE exclusive	B776702201

4.1.2 Screws

Types of screws used for the ADF are listed in the table below. Make sure that you use the specified type and number of screws for each part.

Table 4-1. Screw List

No.	Screw Type / Specification	Appearance	Color
1	CBP M3x12		Silver
2	CBS Sems M3x8		Silver
3	CBS Sems (2) M3x6		Red copper
4	CBS M3x6		Red copper
5	CPS Sems B M3x5		Red copper
6	CBP M3x10		Black
7	CB with toothed washer M3x12		Gold

4.2 DISASSEMBLY PROCEDURE

Disassembly/Removal procedures for the major units in the ADF are described in the following sections.

4.2.1 ROM Replacement

The main control circuit board of the ADF is equipped with a program ROM containing the program controls all ADF mechanism. The procedure below explains how to replace the ROM on the control board.

1. Remove the slide cover on top of the ADF.
2. Remove the switch cover located underneath the slide cover, by removing 1 screw fixing the cover.
3. Remove the ROM on the control circuit board.

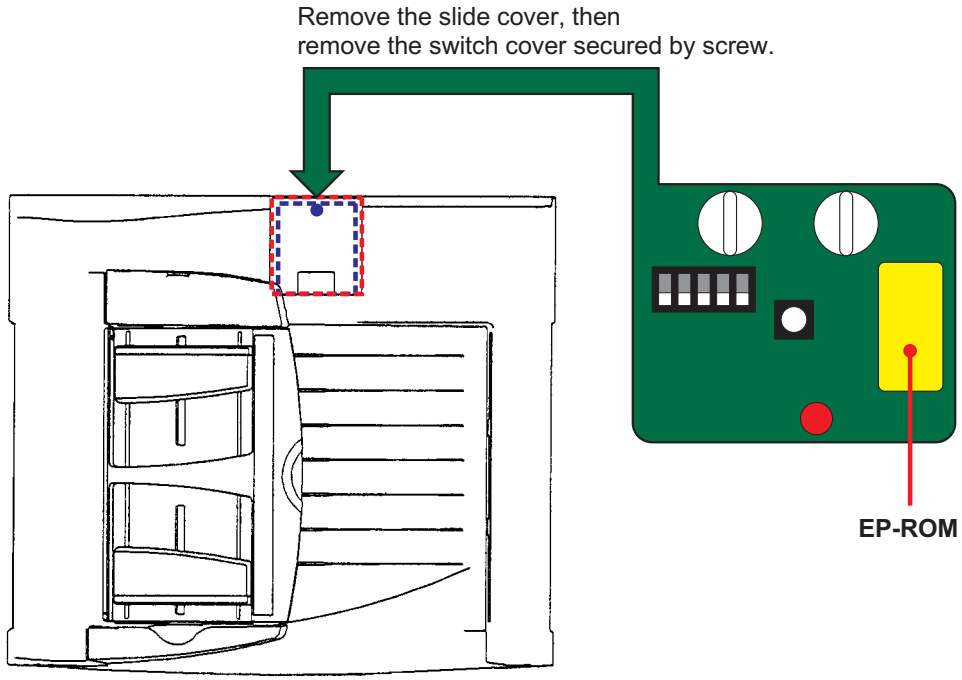


Figure 4-1. ROM Replacement

4.2.2 Paper Feed Tray Removal

1. Remove the ADF unit from the scanner body.
2. Move the edge guides (blue) to the center.
3. Remove 2 screws and remove the paper feed tray along with the extension tray.
4. Turn the tray over and disconnect the connector cable for the paper size sensor from the relay connector.

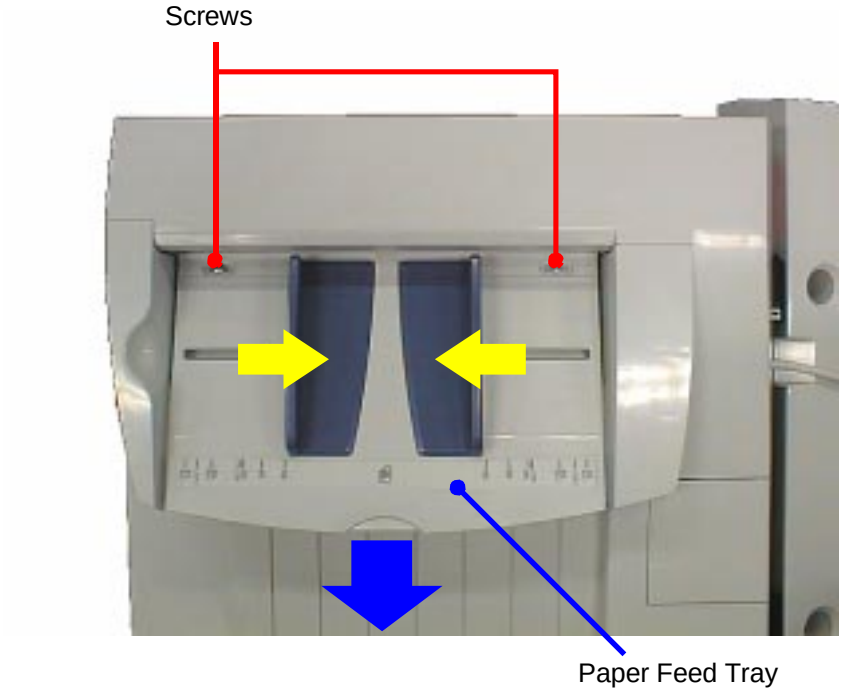


Figure 4-2. Paper Feed Tray Removal

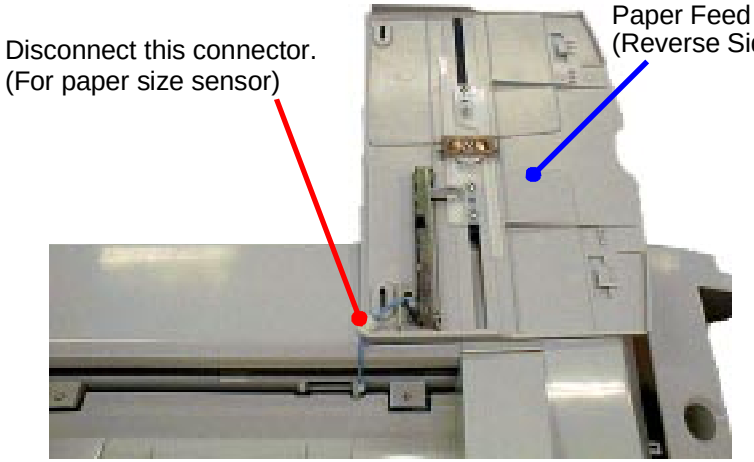


Figure 4-3. Connector Removal

4.2.3 Control Board Unit Removal

1. Turn the ADF over and remove 3 screws, then remove the shield cover.
2. Disconnect all connector cables from the connectors on the control board. (See Figure 4-5 for connector location indicated with the yellow broken lines.)
3. Remove 2 screws and remove the control board unit.

✓CHECK POINT ***When installing the control board unit, make sure that the bottom edge of the board properly fits in the edge holder.***

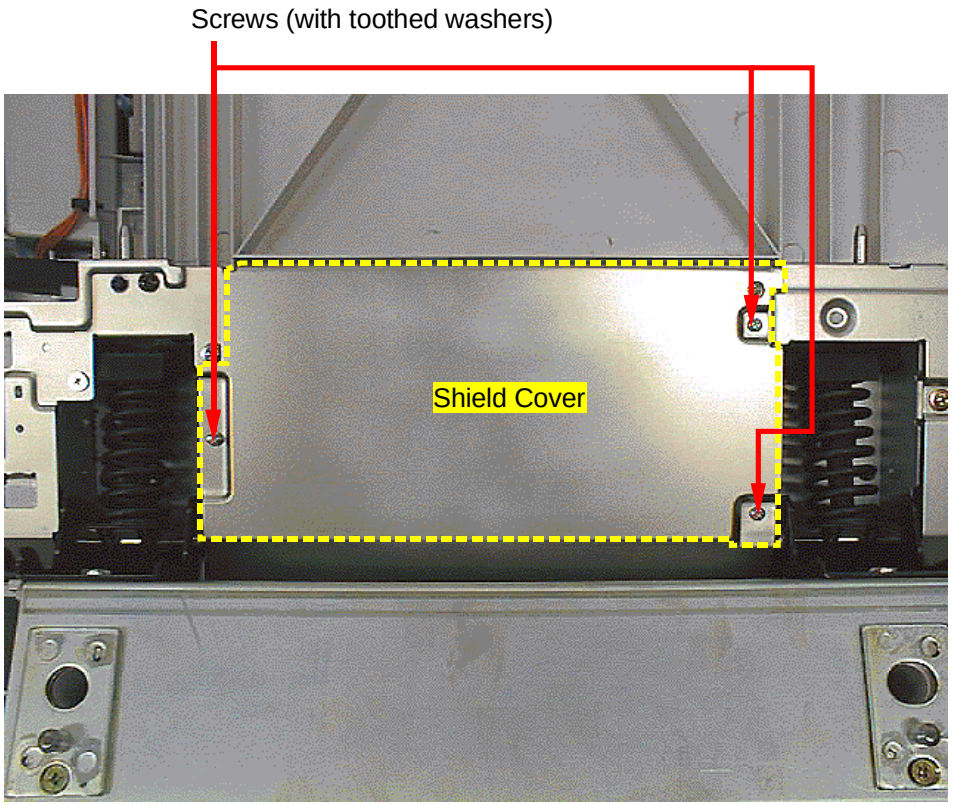


Figure 4-4. Shield Cover Removal

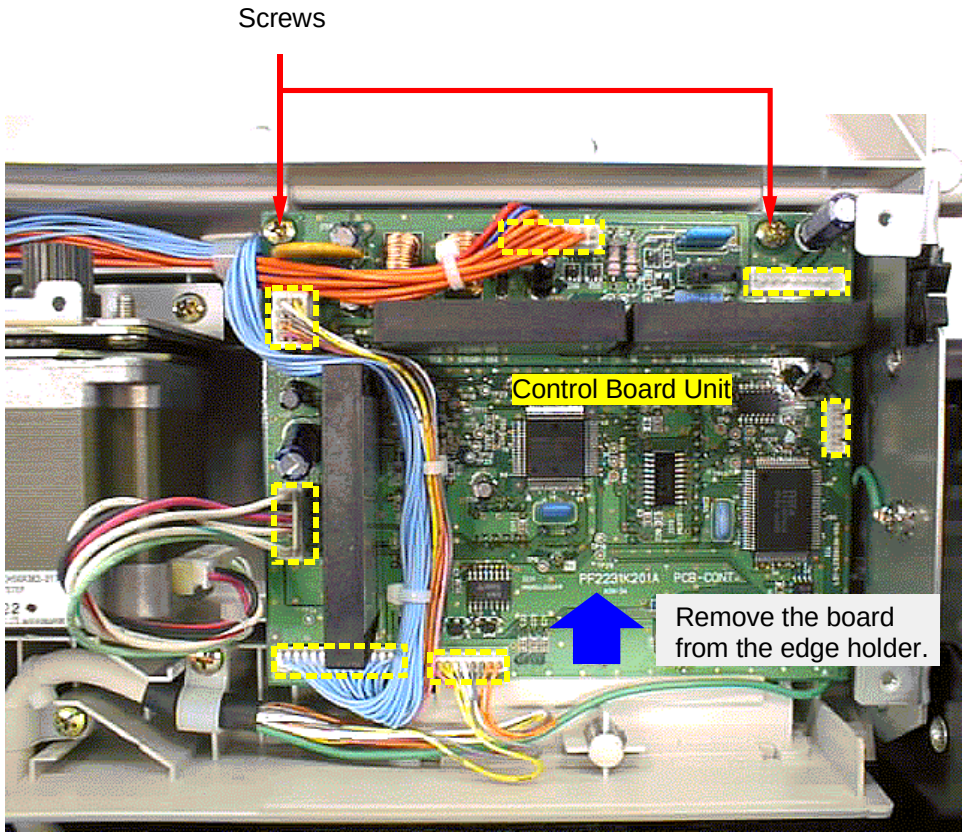


Figure 4-5. Control Board Unit Removal

4.2.4 Transportation Belt Unit Removal

1. Turn the ADF over.
2. Fold 2 areas of the belt (indicated areas in Figure 4-6.) inside.
3. Remove 2 right and left transportation belt unit fixing screws indicated in Figure 4-7, then hold the top edge of the belt and pull it forward and remove the whole belt unit by pulling it upward.

✓CHECK POINT

When reinstalling the transportation belt unit, ensure that the drive transmission belt is properly engaged with the belt drive gear at the lower left .

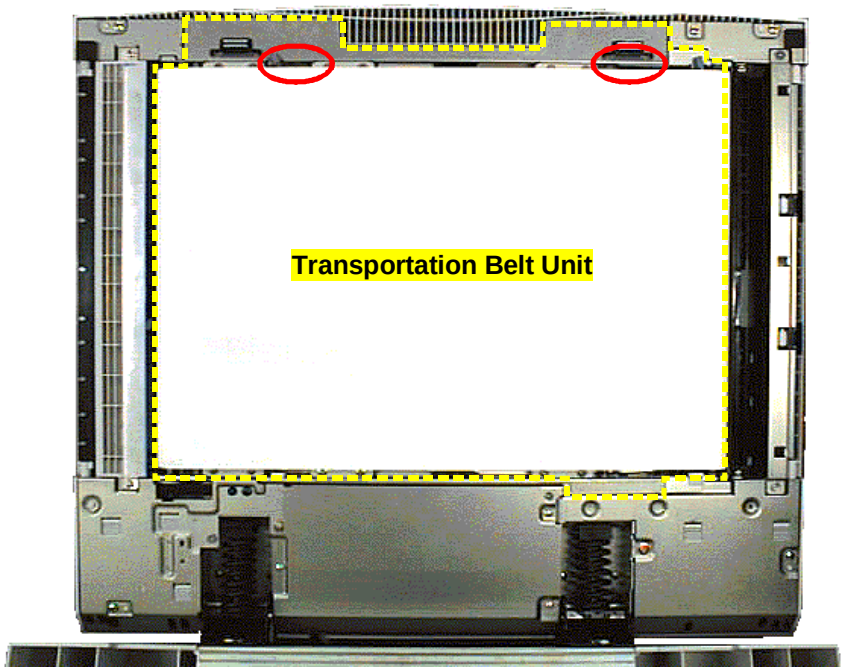


Figure 4-6. Transportation Belt Unit Fixing Position

<Screw (right) fixing position>

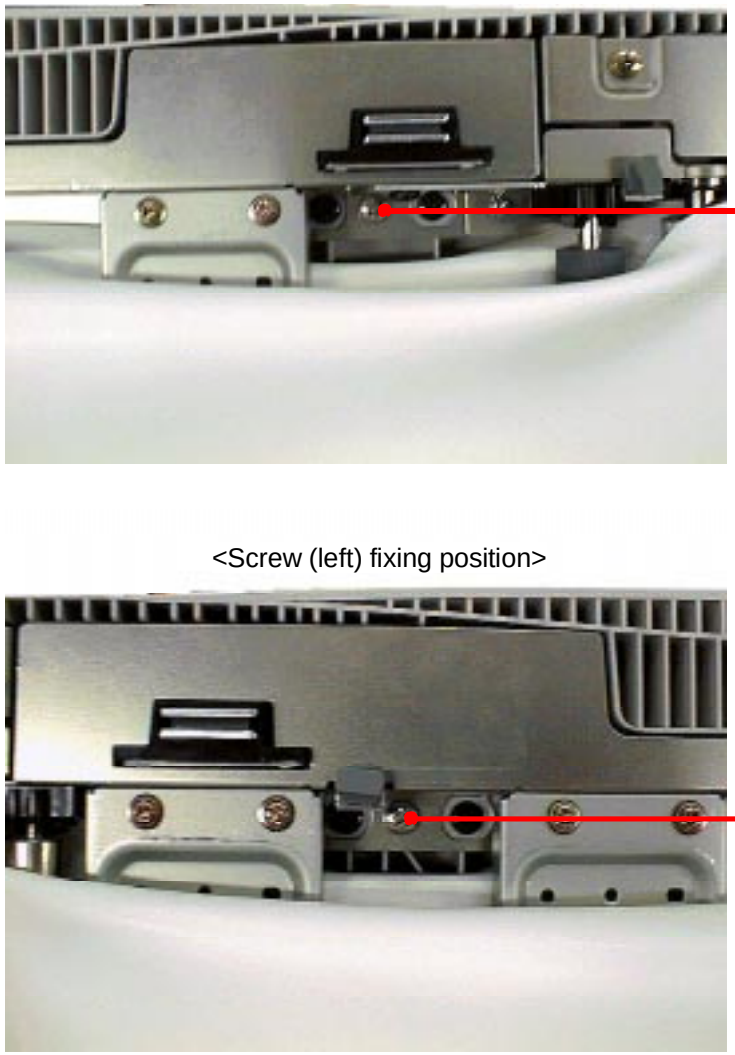


Figure 4-7. Transportation Belt Unit Fixing Screw Removal

4.2.5 Paper Feed Unit Removal

1. Turn the ADF over.
2. Remove 4 screws securing the paper feed unit and 1 screw securing the GND line.
3. Open the access cover located on the paper feed unit side and remove 1 fixing screw indicated in Figure 4-9.
4. Disengage the belt from the pinion gear of the transportation belt drive motor.
5. Disconnect 4 cables for the paper feed unit from the relay connector.
6. Remove the paper feed unit from the housing.

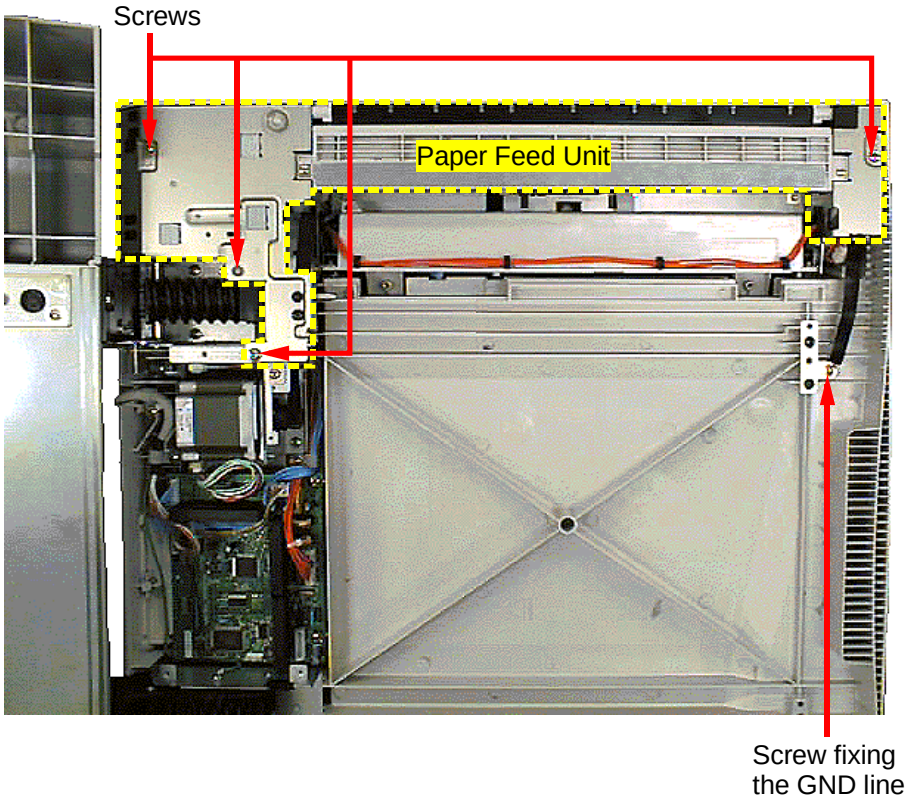


Figure 4-8. Paper Feed Unit Removal (1)

Figure 4-9. Paper Feed Unit Removal (2)

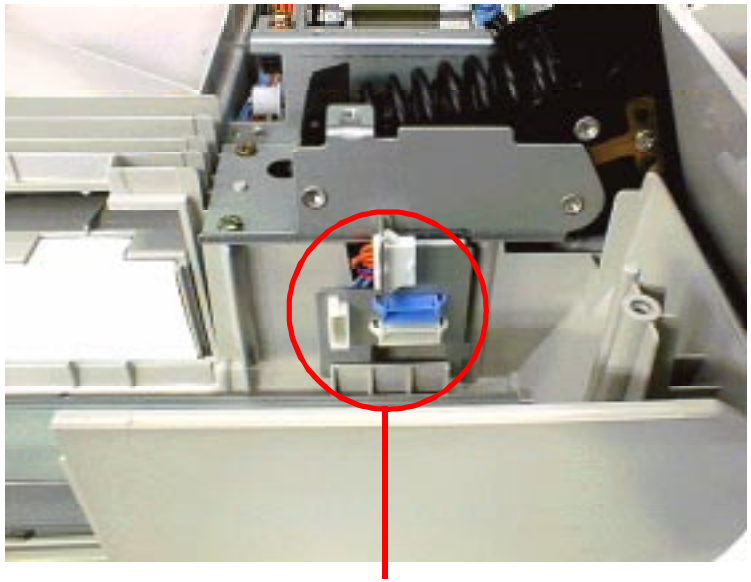


Figure 4-10. Cable Removal

4.2.6 Paper Eject/Reverse Unit Removal

1. Turn the ADF over.
2. Remove 4 screws securing the paper eject/reverse unit and 1 screw securing the GND line.
3. Disconnect 2 cables which connect the paper eject/reverse unit to the connectors on the control board unit.
4. Remove the paper eject/reverse unit from the housing.

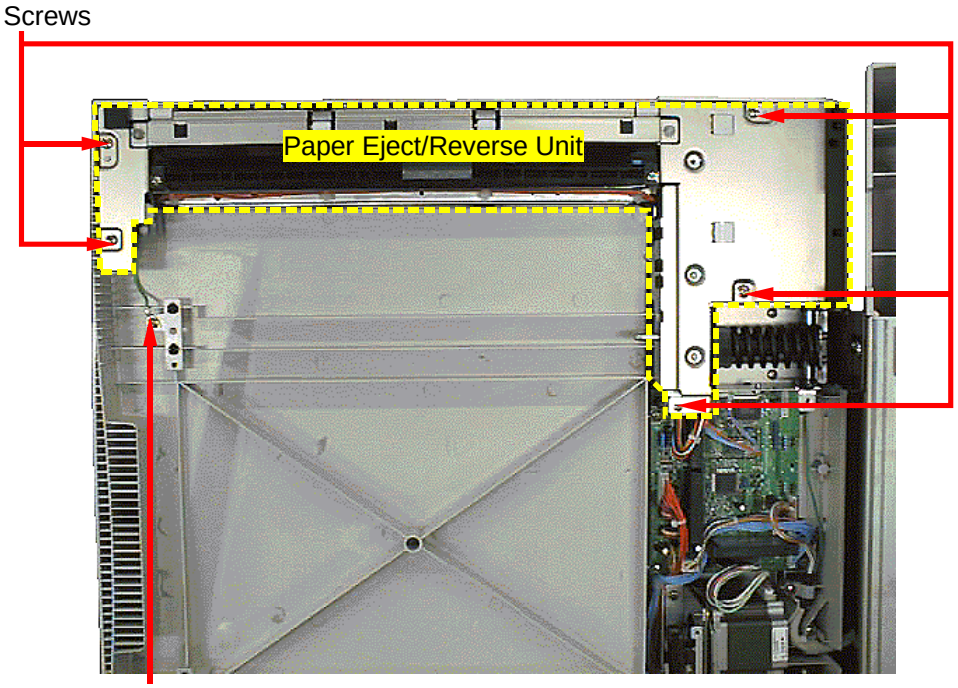


Figure 4-11. Paper Eject/Reverse Removal

4.2.7 Transportation Belt Drive Motor Removal

1. Remove the transportation belt unit. (See Section 4.2.4.)
2. Remove the shield cover. (See Section 4.2.3.)
3. Disengage the belt from the motor pinion gear.
4. Disconnect the cable from the motor, then unhook the tension spring from the tension roller holder plate.
5. Remove 3 screws securing the transportation belt drive motor and remove it.

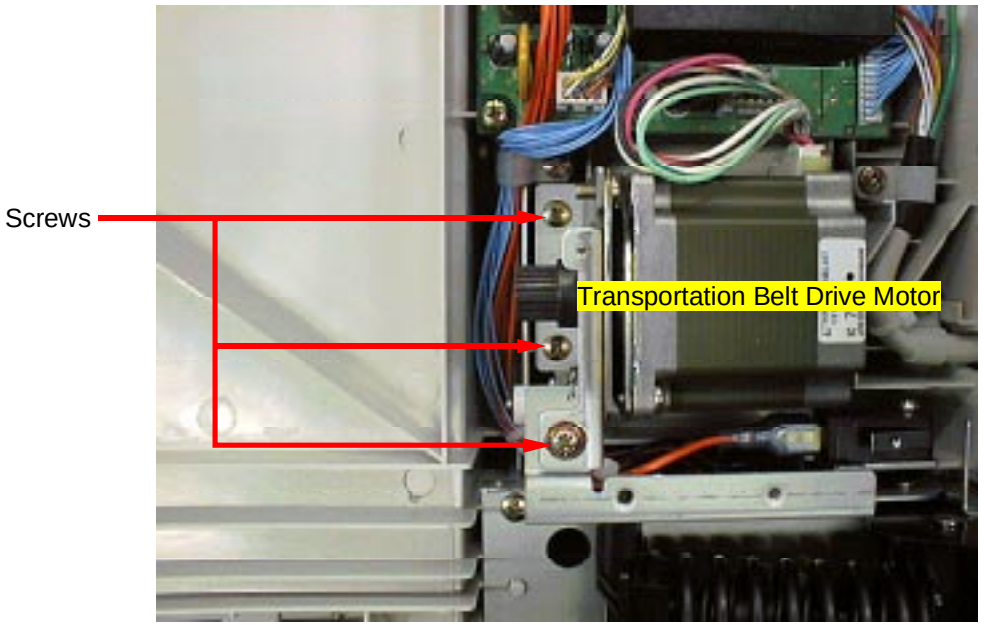


Figure 4-12. Transportation Belt Drive Motor Removal

4.2.8 Paper Feed Motor Unit Removal

This section describes the procedure for removing the paper feed motor in the paper feed unit.

1. Remove the paper feed unit. (See Section 4.2.4.)
2. Loosen the screw and remove the harness cover.
3. Release all cables from the cable hooks attached to the paper feed motor unit.
4. Remove 4 fixing screws and remove the paper feed motor unit.

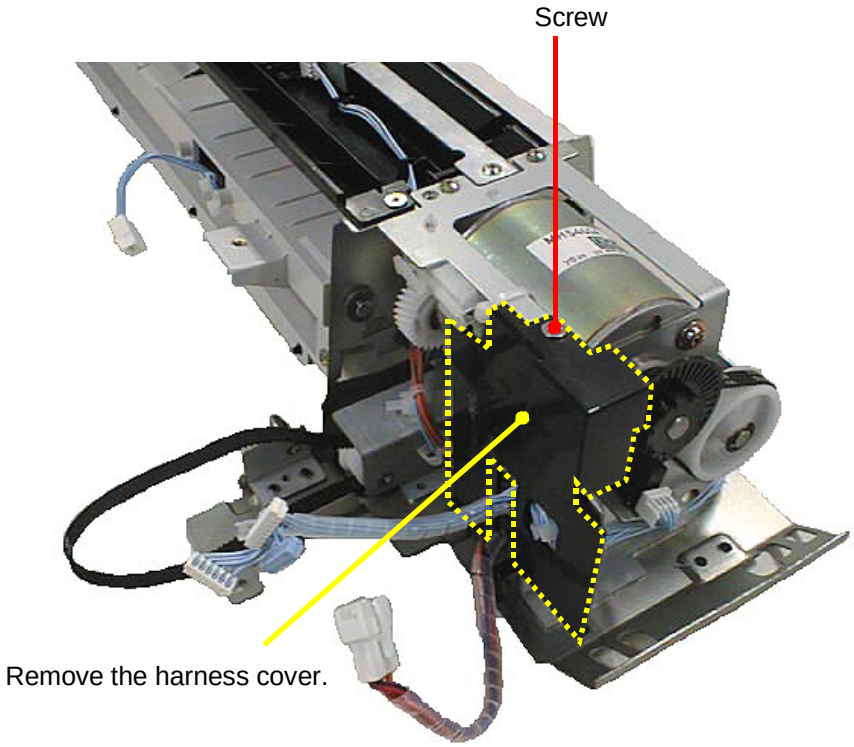


Figure 4-13. Harness Cover Removal

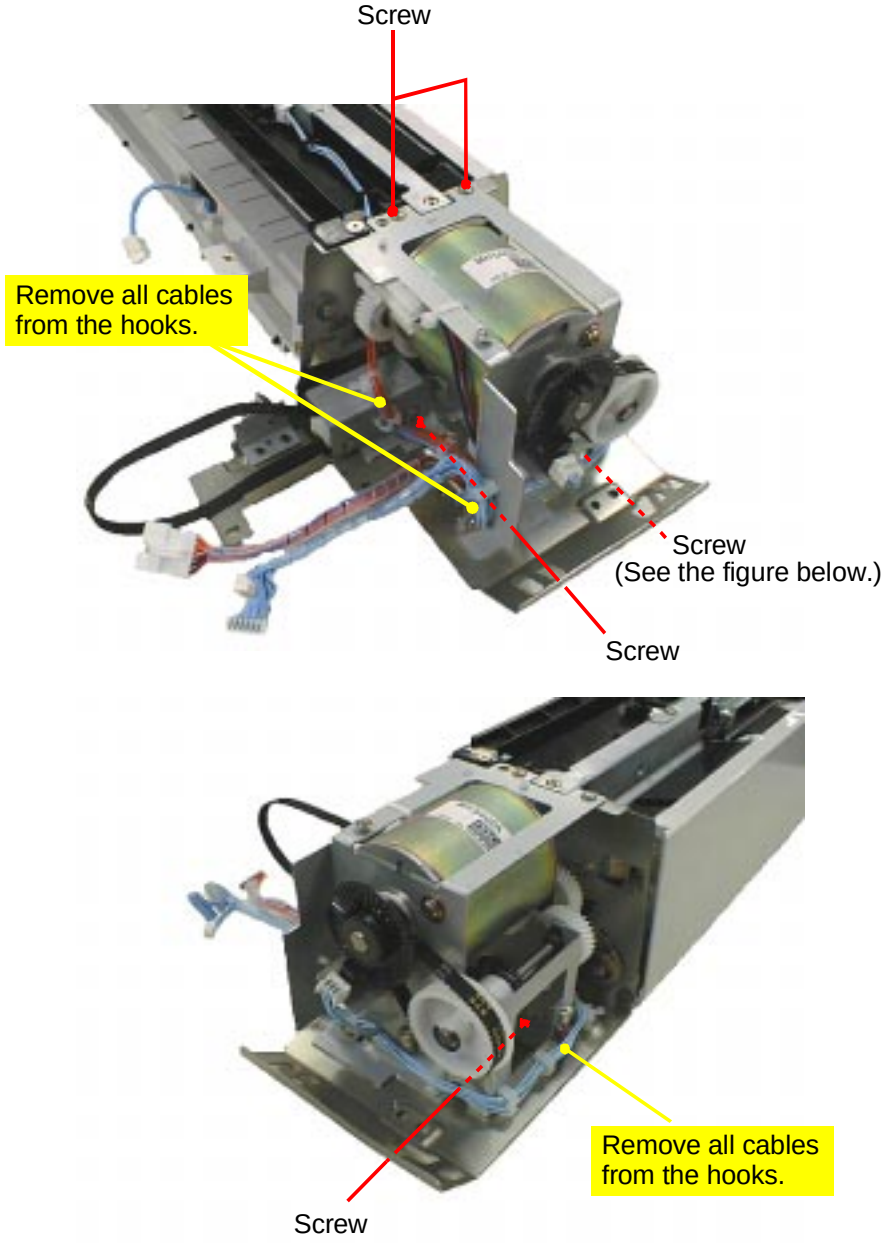


Figure 4-14. Paper Feed Motor Unit Removal

4.2.9 Registration/Timing Sensor Removal

This section describes how to remove the registration sensor and timing sensor in the paper feed unit.

1. Remove the paper feed unit. (See Section 4.2.4.)
2. Remove the paper guide.
   The fixing screws to be removed are:
   - 2 screws: From each of the right and left sides of the paper guide
   - 2 screws: From each of the right and left sides of the paper guide viewed from the top. (Remove them through the holes on the top frame of the paper guide.)
3. Lift up the paper guide to release the cable from the hooks on the paper guide, then remove the paper guide.
4. Remove the fixing screws securing the registration sensor and the timing sensor, and remove the sensors.

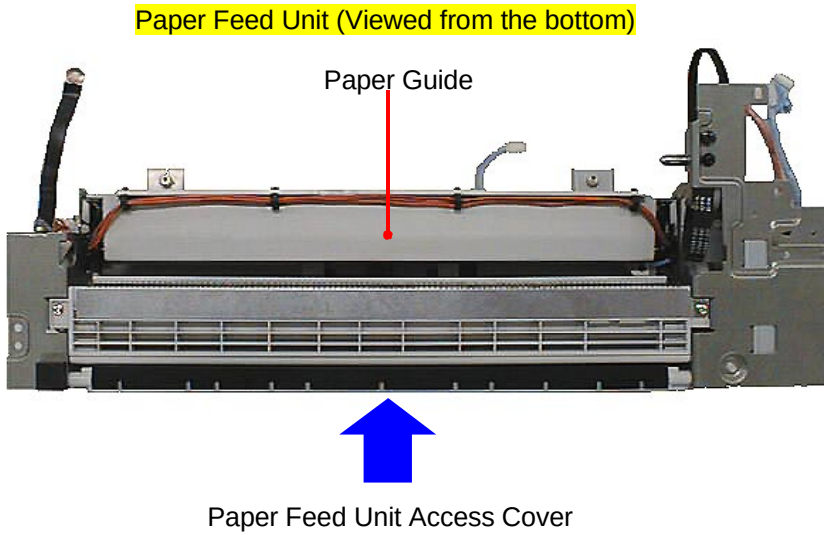


Figure 4-15. Paper Guide Installation Position

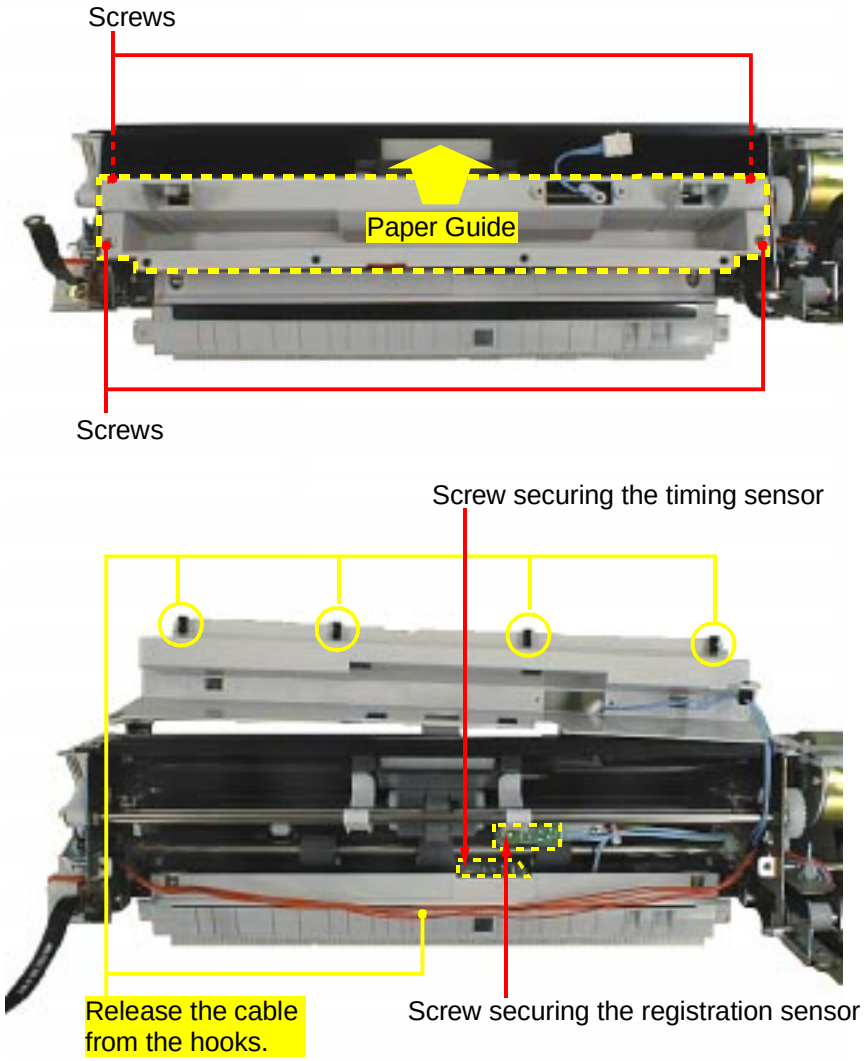


Figure 4-16. Registration/Timing Sensor Removal

4.2.10 Paper Eject/Reverse Motor Unit Removal

This section describes how to remove the paper eject/reverse motor unit from the paper eject/reverse unit.

1. Remove the paper eject/reverse motor unit. (See Section 4.2.5.)
2. Remove 3 screws and remove the paper eject/reverse motor unit.

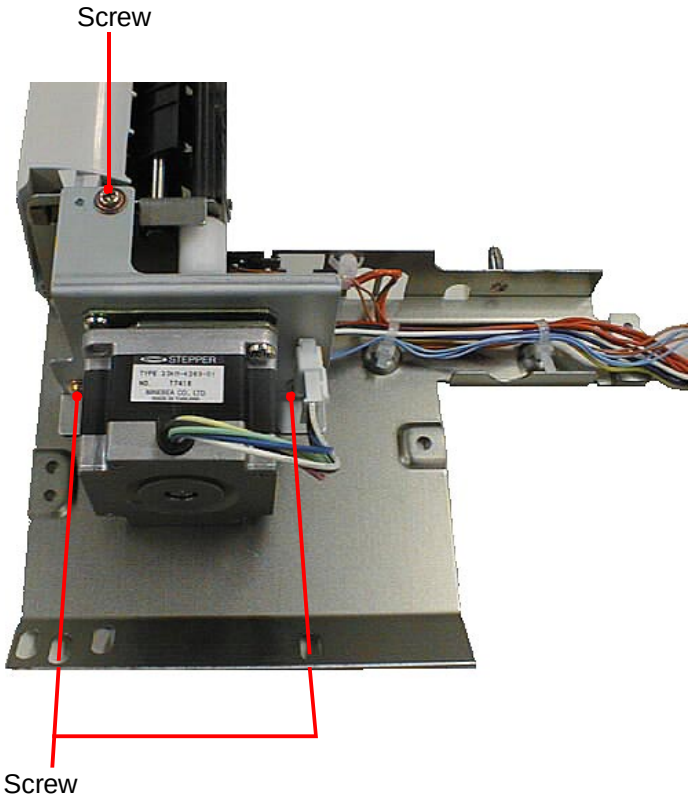


Figure 4-17. Paper Eject/Reverse Motor Unit Removal

4.2.11 Paper Eject Sensor Removal

This section describes how to remove the paper eject sensor in the paper eject/reverse unit.

1. Remove the paper eject/reverse unit. (See Section 4.2.5.)
2. Remove 2 screws at the bottom of the paper eject/reverse unit and remove the paper eject guide.
3. Remove 4 screws, including 2 shoulder screws on the left, and remove the paper guide.
4. Remove 1 fixing screw from the back of the removed paper guide and remove the paper eject sensor.

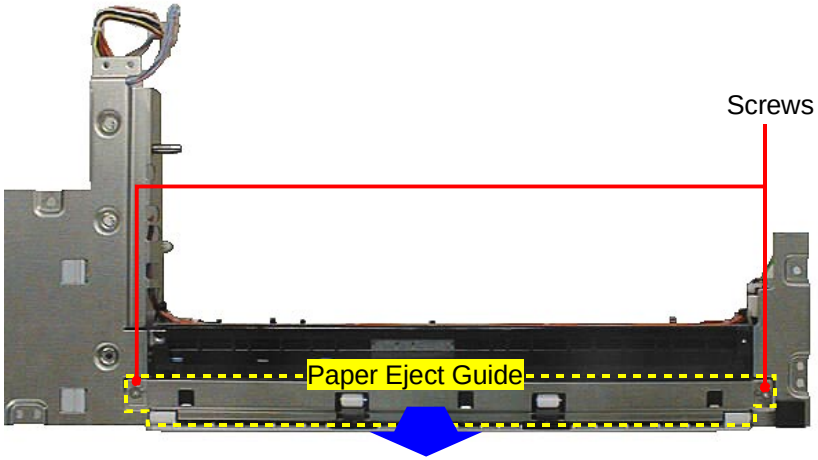


Figure 4-18. Paper Eject Guide Removal

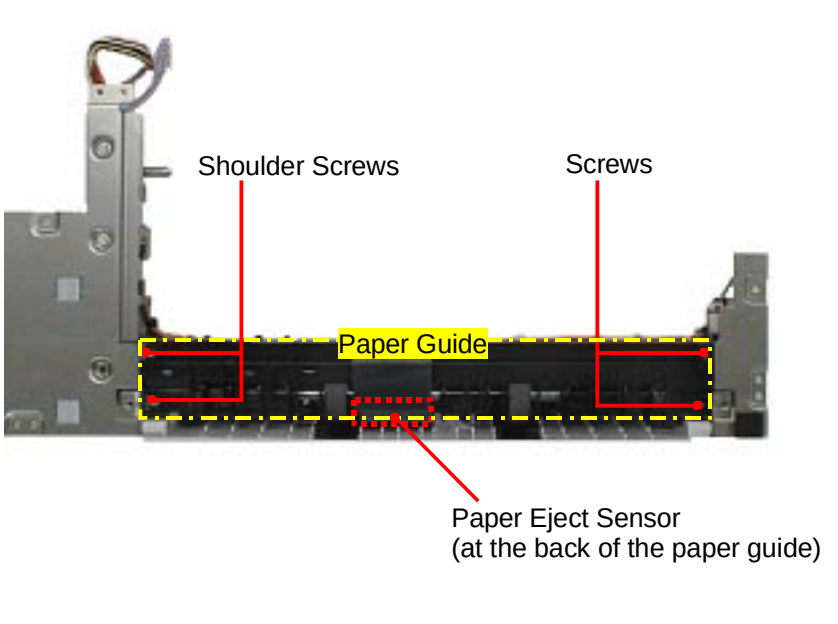


Figure 4-19. Paper Eject Sensor Removal

✓CHECK POINT ***2 of the 4 screws securing the paper guide are shoulder screws. Be sure to mount them to the left end of the paper guide.***

CHAPTER

5

ADJUSTMENT

5.1 OVERVIEW

This chapter describes adjustments required after disassembling and assembling the ADF or replacing specified parts. Adjustment items of this ADF fall in 2 categories: mechanical adjustment and electrical adjustment.

5.1.1 Adjustment Tools

The tools used for the mechanical and electrical adjustment are described below:

Table 5-1. Tool List

Tool Names	Availability	SE Part No.
Thickness Gauge	Available	B776702201
Tension Gauge	Available	B765114601

The electrical adjustments are made on the built-in program. Therefore, no tool is required.

5.1.2 Mechanical Adjustment

This section describes the mechanical adjustment for the ADF. The table below lists the adjustment items and the corresponding occasions.

Table 5-2. Mechanical Adjustment Items

Adjustment items	Occasions
Flapper solenoid installation position adjustment (Refer to Section 5.1.2.1.)	– Flapper solenoid is removed. – Flapper solenoid is replaced.
Separation plate gap adjustment (Refer to Section 5.1.2.2.)	– Separation plate is removed. – Separation plate is replaced.
Belt tension adjustment (Refer to Section 5.1.2.3.)	– Whole belt roller (left) fixing unit is removed. – The belt is loosened.
Magnet catch installation position adjustment (Refer to Section 5.1.2.4.)	– Magnet catch is removed. – Magnet catch is replaced.
ADF open/close micro switch installation position adjustment (Refer to Section 5.1.2.5.)	– Micro switch is removed. – Micro switch is replaced.
Skew correction adjustment (Refer to Section 5.1.2.6.)	– ADF is removed from the rear case. – Scanned image is skewed. – Fed document jams.

5.1.2.1 Flapper Solenoid Installation Position Adjustment

This adjustment is made to fix the flapper solenoid at the position where proper operation of the flapper is ensured. A flapper is used to reverse/eject the document, and if it is set at an improper position, it may cause malfunctions such as paper jam at ejecting the document and failure in reversing the document. Therefore, be sure to follow the steps exactly as instructed below. You must make this adjustment under the following conditions:

- ❑ Flapper solenoid is removed.
- ❑ Flapper solenoid is replaced.
- ❑ Flapper is replaced.

1. Set the solenoid manually to On condition (induced condition).
2. Keeping the solenoid On, move the whole solenoid backward/forward to make it meet the flapper rubber (*Gap between the flapper and rubber: 0 - 0.5 mm)* and fasten 2 fixing screws to fix the flapper solenoid.
3. Apply some lock-tight to fix the screws.

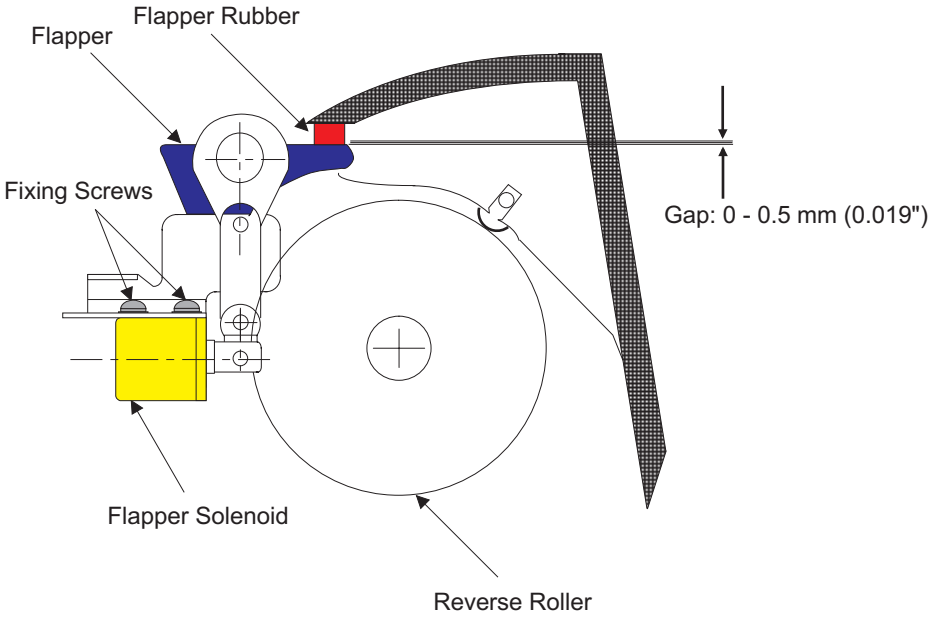


Figure 5-1. Flapper Solenoid Installation Position Adjustment

5.1.2.2 Separation Plate Gap Adjustment

To feed paper one by one from the paper feed tray into ADF in order, the gap between the paper separation plate and paper feed roller must be properly set. Failure in this adjustment may cause jamming or multiple feeding of the document. Make this adjustment under the following conditions:

- ❑ Separation plate is removed.
- ❑ Separation plate is replaced.
- ❑ 2 screws fixing the plate are loosened.
- ❑ PF roller is replaced.

1. Loosen 2 fixing screws securing the separation plate.
2. Insert a thickness gauge between the bottom edge of the separation plate and the PF roller surface. Make sure that the gauge is set at a right angle with the plate.
3. Push the plate down onto the thickness gauge surface and fasten the fixing screws.

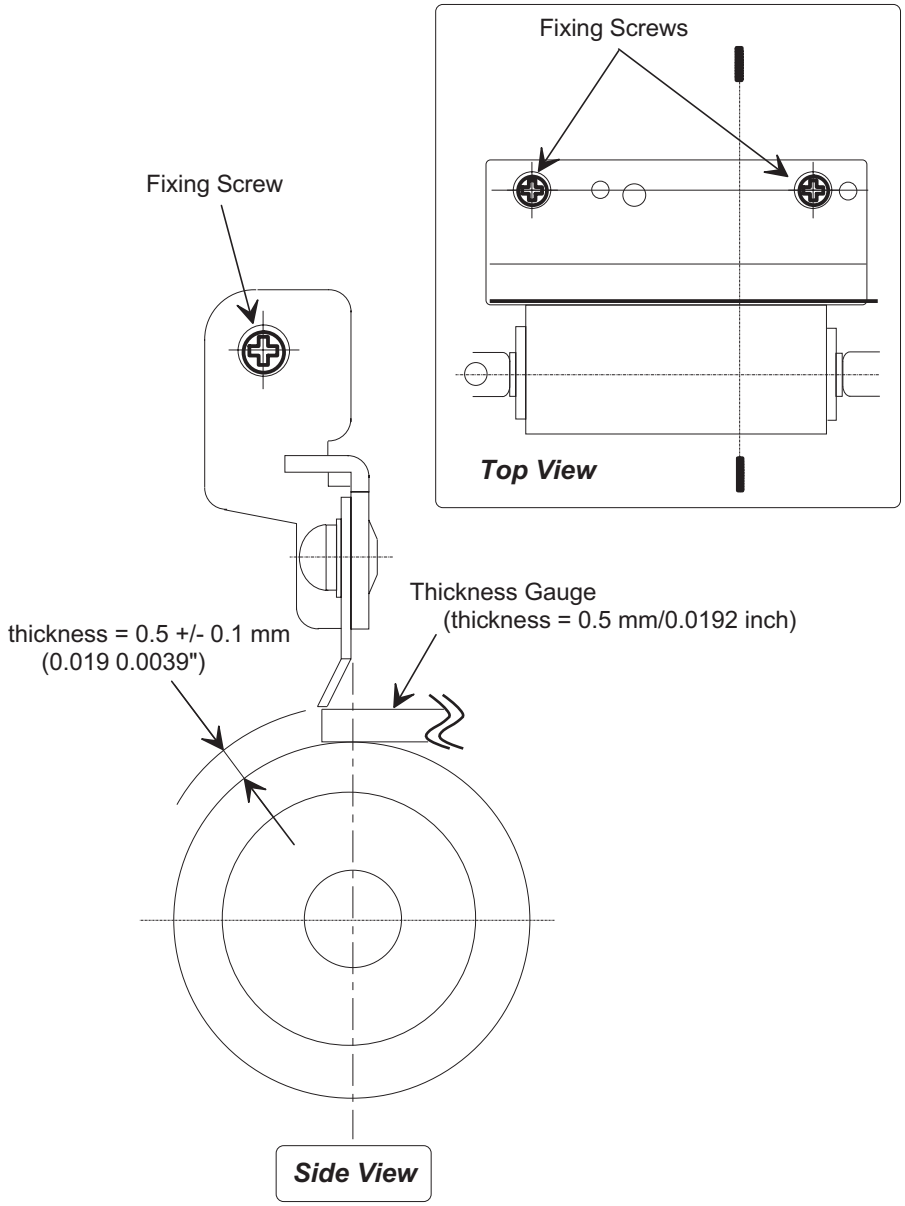


Figure 5-2. Separation Plate Gap Adjustment

5.1.2.3 Belt Tension Adjustment

This adjustment is made to adjust tension of the timing belt used to transmit drive sent from the transportation motor to the transportation belt unit. Failure in this adjustment loses proper play of the belt, and document skew or jam may occur. This adjustment must be made under the following conditions:

- ❑ 2 Screws securing the DF supporting plate are loosened.
- ❑ DF supporting plate is replaced.
- ❑ Belt roller (L) is removed.
- ❑ Belt roller (L) is replaced.

1. With 1 fixing screw on the DF support plate * loosened, push the tension gage to the shoulder screw (M3, 1.4) *[2], then fasten the fixing screw when the gauge indicates 200 g.
   ** Viewed from the front.*

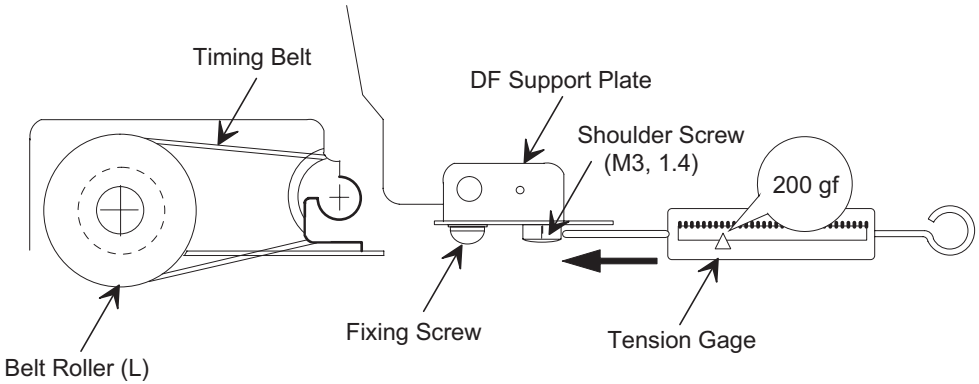


Figure 5-3. Belt Tension Adjustment

5.1.2.4 Magnet Catch Installation Position Adjustment

This adjustment is made to install the magnet catch securely to a proper position after removing or replacing the magnet catch.

1. Install the ADF to the scanner.
2. With the ADF closed, position the magnet catch so that the gap between the platen glass on the scanner and each of 2 spacer rubbers (on the left and right side of the ADF) is 0 - 0.5mm. Then fix the magnet catches with 2 screws.

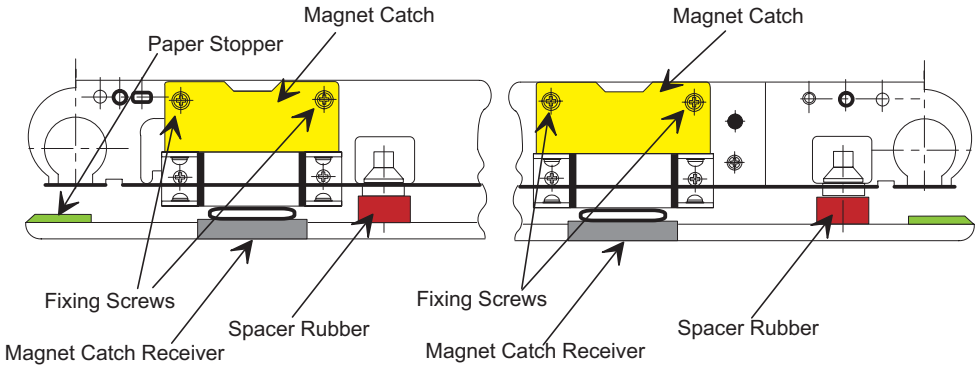


Figure 5-4. Magnet Catch Installation Position Adjustment

5.1.2.5 Micro Switch Installation Position Adjustment

This adjustment is made to adjust the micro switch installation position. With this adjustment, open/close condition of the ADF is correctly detected. At the factory level, the micro switch comes on when the gap between the front edge of the ADF and the document glass of the scanner is 70 mm - 80 mm. Make this adjustment under the following conditions:

- ❑ Micro switch is removed.
- ❑ Micro switch is replaced.
- ❑ DF open switch plate is released.
- ❑ DF open switch is replaced.

1. With 1 fixing screw securing the DF open switch plate loosened, mount the ADF onto the scanner. Then open the ADF fully and start closing gradually .
2. Monitoring the micro switch, shift the DF open switch plate to the position, where the micro switch comes on without fail when the .gap between the front edge of the ADF and the scanner is 70mm.

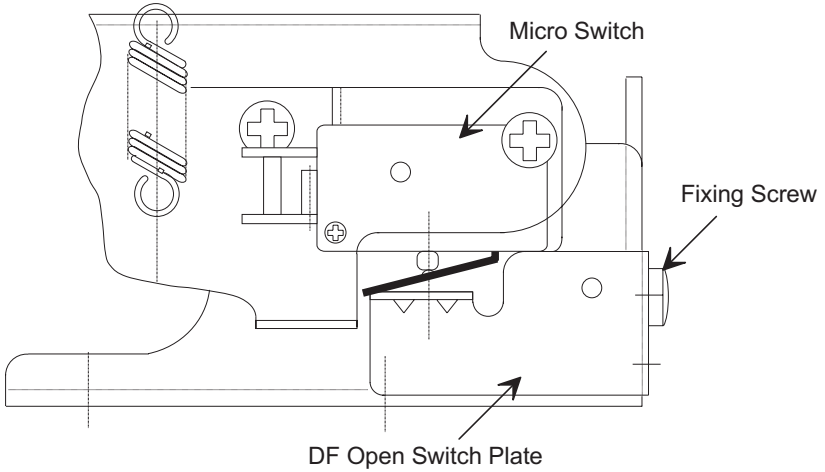
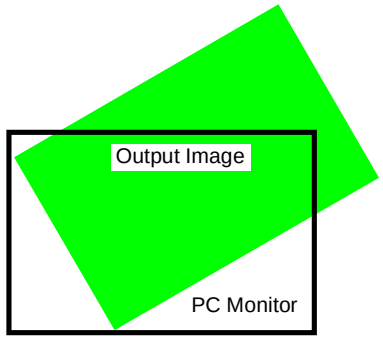


Figure 5-5. ADF Micro Switch Adjustment

5.1.2.6 Skew Correction Adjustment

You must make this adjustment when the output image appears skewed on the PC monitor or ADF is removed from the ADF rear case. To make the adjustment, use the scale on the right hinge base which supports the ADF with the left hinge base. Since the direction for moving the screw varies depending on how the image is skewed, see the skew patterns shown below and perform adjustment properly.

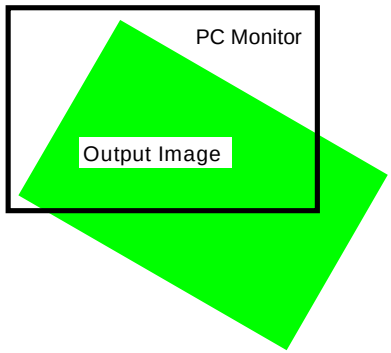
- ❑ If the fed document (output image) is skewed as shown below, loosen the fixing screw in the hinge base (R) and move it toward “B”, then fix it.



Right side upper

- ❑ If the fed document (output image) is skewed as shown below, loosen the fixing screw in the hinge base (R) and move it toward “A”, then fix it.

Right side lower



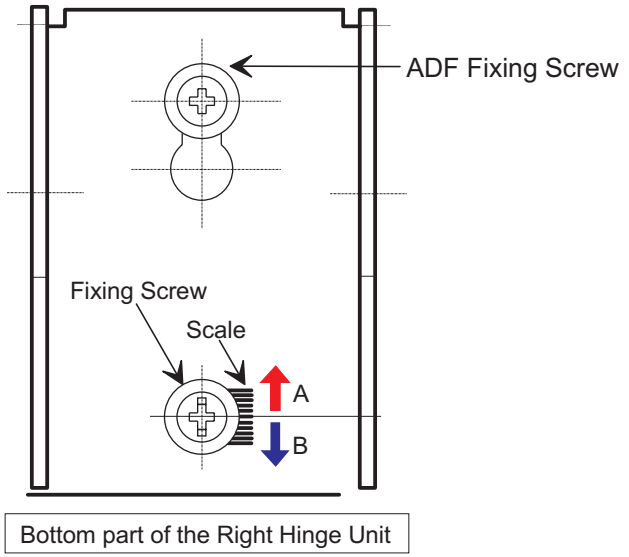


Figure 5-6. Direction for Moving the Screw

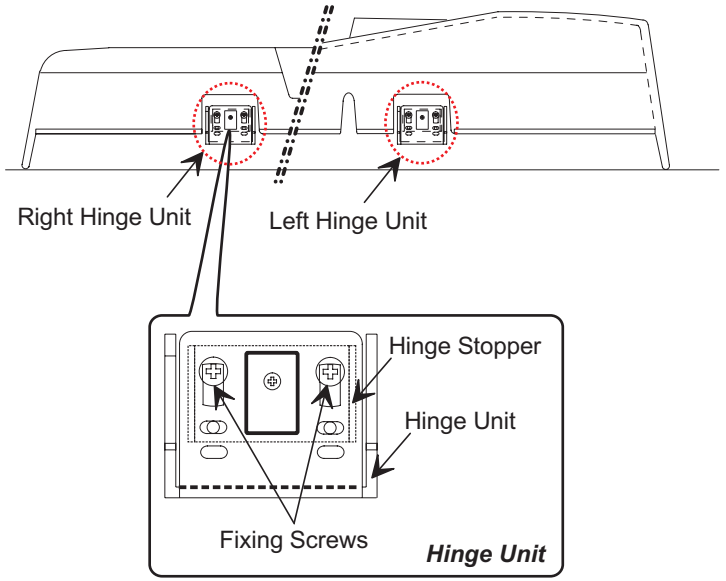


Figure 5-7. Adjusting using the Hinge Base

5.1.3 Electrical Adjustment

This section describes the electrical adjustment for ADF. It consists of 3 adjustment items which must be made after specified actions are taken, as shown in Table 5-3.

Table 5-3. Electrical Adjustment

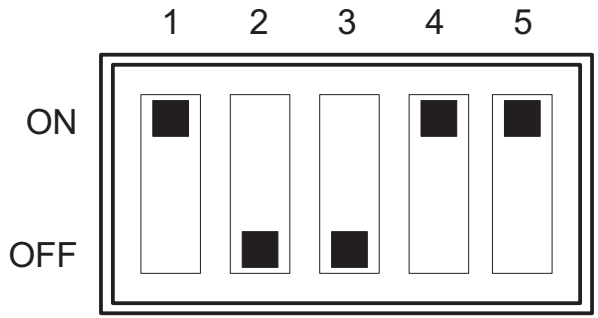
Adjustment Item	Actions taken
Sensor adjustment (Refer to Section 5.1.2.1.)	• The Control board unit is replaced. • Any of the sensors is replaced. • Any of the sensors is cleaned.
EEPROM initialization (Refer to Section 5.1.2.2.)	• The control board is replaced.
Scan stop position adjustment *1 *2 (Refer to Section 5.1.2.3.)	Usually performed by the user. (Set scan stop positions for single and reverse feedings with a increment of 1 mm.)

5.1.3.1 Sensor Adjustment

This ADF is internally equipped with the following 3 photo-interrupter sensors; empty sensor, registration sensor, and reverse sensor.
Since these sensors function by transmitting infrared ray, paper debris and dust built up around the sensors bring change in the voltage level of the signals returned to the CPU, and paper is not detected correctly as a result. Generally, photo-interrupter sensors are inevitably produced with uneven sensitivities. Therefore, the amount of light emitted from the LED must be controlled by the ADF side. This ADF increases LED emission when the voltage level of the signal sent to the CPU drops blow specified level. For this reason, it is essential to provide periodical cleaning to the specified parts as well as to write the highest voltage level, which is electrically unique to each sensor, into the EEPROM under paper empty condition after any of the photo-interrupter sensors is replaced. Without this operation, the ADF continues to refer to the value stored before replacement, and the following may occur as the result:

- ❑ Document is not fed.
- ❑ Document jams near the entrance on the transporting belt.
- ❑ Document jams in the reverse mechanism.

1. Set the ADF to the scanner.
2. Open the switch cover on the ADF and remove 1 screw securing the rotary switch cover, then remove the rotary cover.
3. Set the Dip-switches as shown below.



4. Open and then close either the paper eject cover or the paper feed cover. (The sensor adjustment mode is set with this motion.)
5. Press the push button directly attached to the control board, and the automatic sensor adjustment program starts running to make adjustment and setting for each sensor.

While the program is running, the LED (red) on the control board lights up, and goes off when the adjustment is properly carried out. If the LED indicates an error status as shown in the table below, take any necessary actions.

Table 5-4. LED Status

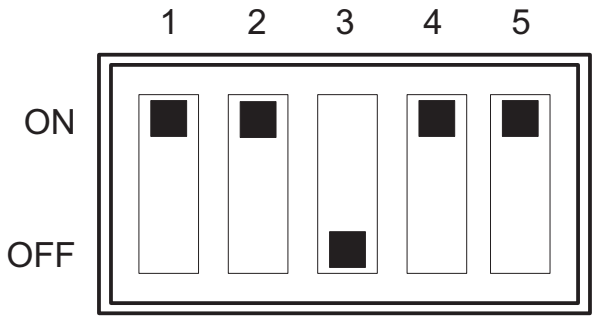
LED indication	Corresponding condition
OFF	The adjustment is properly executed.
ON	EEPROM initialization has failed. (Refer to Section 4.1.2.2.)
Blinks (Interval: 1000 ms)	Registration sensor is defective.
Blinks (Interval: 500 ms)	Timing sensor is defective.
Blinks (Interval: 50 ms)	Reverse sensor is defective.

⚠CAUTION ***The factory setting for the Dip-switches are all OFF. Therefore, set all the switches back to Off after adjustment.***

5.1.3.2 EEPROM Initialize and Sensor Adjustment

This adjustment must be made after the control board unit is replaced. The EEPROM on the control board stores values for sensor sensitivity and scan stop position. Therefore, whenever you replace the control board, you must perform EEPROM initialization, which is followed by the sensor adjustment consecutively.

1. Set the ADF on the scanner.
2. Open the switch cover on the ADF and remove 1 screw securing the rotary switch cover. Then remove the rotary switch cover.
3. Set the Dip-switches as shown below.



4. Open and then close either the paper eject cover or the paper feed cover. (The EEPROM initialization and sensor adjustment mode is set with this motion.)
5. Press the push button directly attached to the control board to run the adjustment program, and EEPROM initialization and the sensor adjustment for each sensor are carried out.

5.1.3.3 Scan Stop Position Adjustment

This adjustment must be made to adjust the scanning position after the document is transported into the ADF. It is performed by turning the rotary switch located under the switch cover at the top of the ADF.
This adjustment, a user performable adjustment, must be separately made for the single feeding and reverse feeding. The table below shows the rotary switch settings and corresponding amount shifted.

Table 5-5. Switch Setting and Corresponding Shifting Length

Rotary Switch Setting	Amount shifted (mm)
0	0 (Reference position)
(+) value	1mm / step
(-) value	1mm / step

✓CHECK POINT

Adjustment for the single and reverse feedings are made as follows:
[Single feeding] Made by controlling the rotational number of the reverse motor after paper empty condition is detected by the timing sensor.
[Reverse feeding] Made after paper empty condition is detected by the reverse sensor

CHAPTER

6

MAINTENANCE

6.1 OVERVIEW

Maintaining of this ADF includes the following 3 items: cleaning, lubrication and adhesion. This chapter provides information on the lubricants and adhesives used for maintaining this ADF.

⚠CAUTION

- ***Never apply thinner, trichloroethylene, or ketone-based solvents, since these substances may cause plastic or rubber parts to deform or degenerate.***
- ***Use lubricant or adhesive which are recommended for this printer. Otherwise, nearby parts may be damaged.***

✓CHECK POINT

This ADF requires cleaning when it has fed 40,000 documents in total. Therefore, be sure to check the total number of the fed documents and perform any necessary cleaning on occasion such as repair or periodic maintenance service. (Refer to Section 6.1.1.)

Table 6-1. Lubricants and Adhesives

Name	Availability	Part code
Grease (EM-50L)	EPSON-Exclusive	TBD
Lock-tight (#2)	EPSON-Exclusive	B730200200

6.1.1 Cleaning

This ADF requires cleaning when the total number of fed documents is 40,000. The cleaning items are listed in the table below. However, the total fed number does not always determine the exact time for cleaning. Therefore, whenever you find the abnormal operations such as a failure in feeding or transporting paper and paper jam, clean any relevant parts which brought the problem.

Table 6-2. Cleaning Items

Parts to be cleaned	Description
Pickup roller	Wipe off the paper debris and dust with a moistened cloth squeezed tightly.
Paper feed roller	
Separation roller	
Transportation belt	
Registration roller	
Paper eject/Reverse roller	
Paper eject roller	
Registration sensor	Wipe off the paper debris and dust with cotton swabs.
Timing sensor *	
Paper eject/Reverse sensor *	

Note: *Remove the cover before cleaning the timing sensor and the paper eject/reverse sensor,*

6.1.1.1 Cleaning Points

Pickup Roller

The pickup roller, a half-moon-shape roller with a toothed side on it, is located in the bottom part of the paper feed tray. Turn the roller manually and clean it with a cloth moistened with alcohol or water.

Figure 6-1. Pickup Roller Location

Paper Feed Roller, Separation Roller, Registration Roller and Registration Sensor

Open the paper feed cover and clean the PF roller, separation roller, registration roller and registration sensor.

✓CHECK POINT

Use cotton swabs to reach the narrow corners when cleaning the registration sensor and reflection plate.

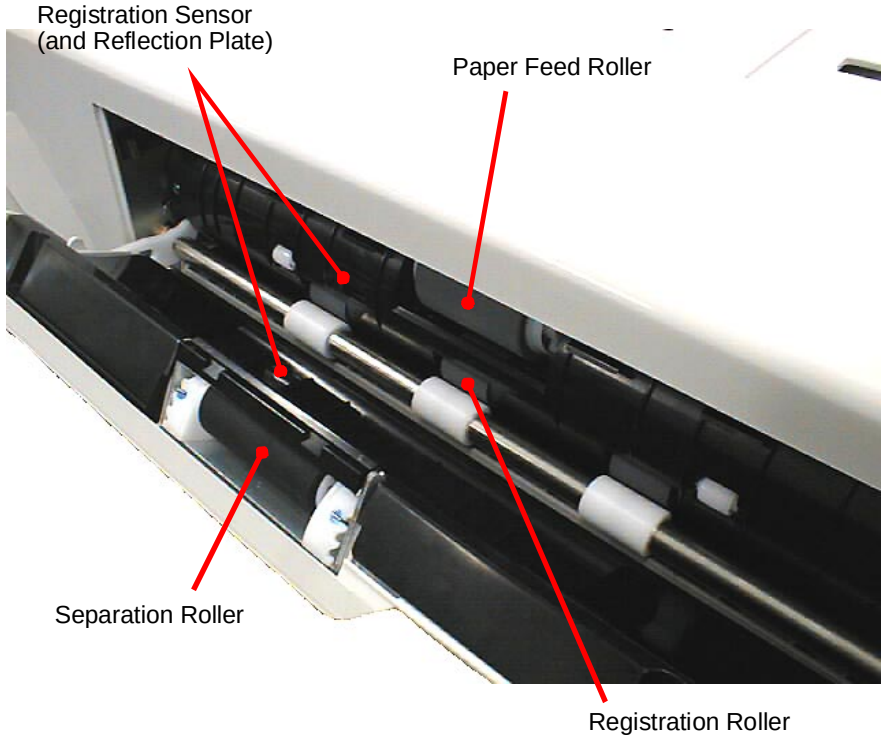


Figure 6-2. Rollers and Registration Sensor

Transportation Belt

With the ADF fully open, clean the belt by turning it manually.

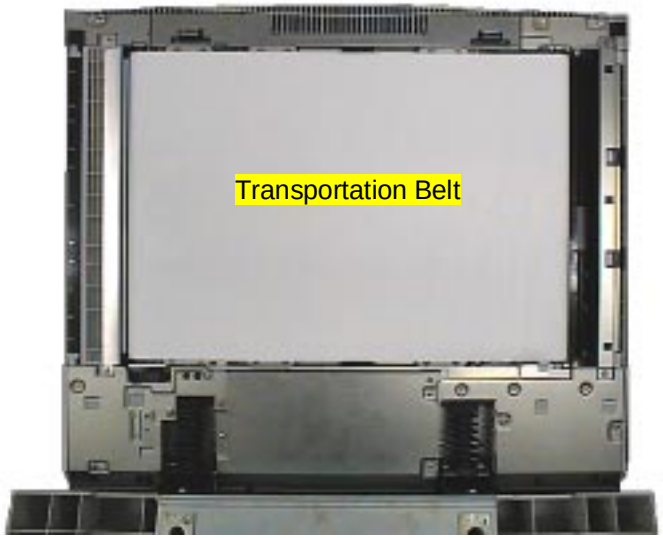


Figure 6-3. Transportation Belt Cleaning

Reverse Roller

2 reverse rollers are located under the paper eject cover. Clean the rollers by turning them manually.

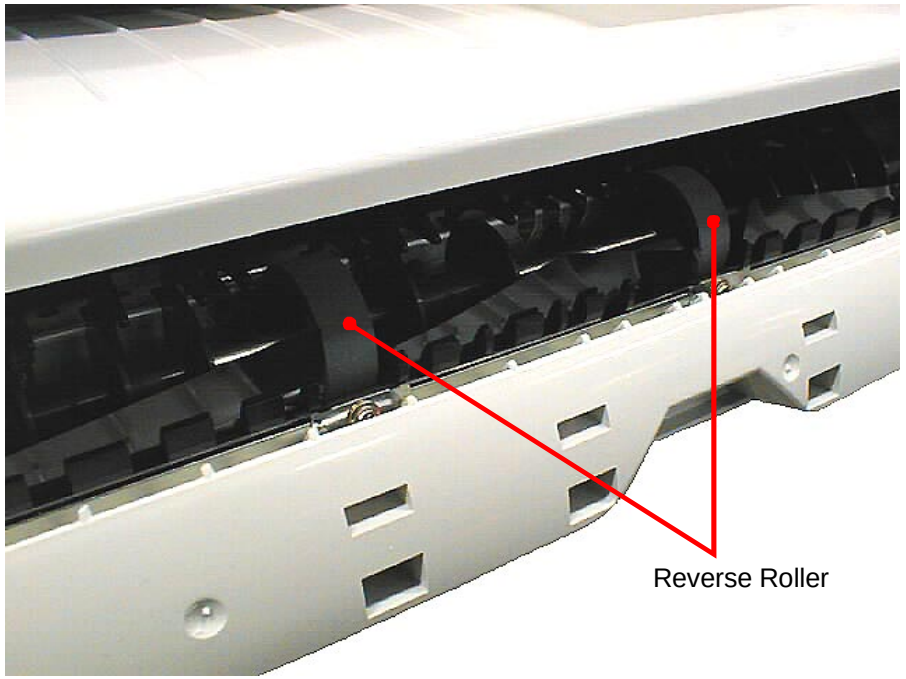


Figure 6-4. Reverse Roller Cleaning

Paper Eject Roller

2 paper eject rollers are located near the slot where document is ejected. Clean the rollers by turning them manually.

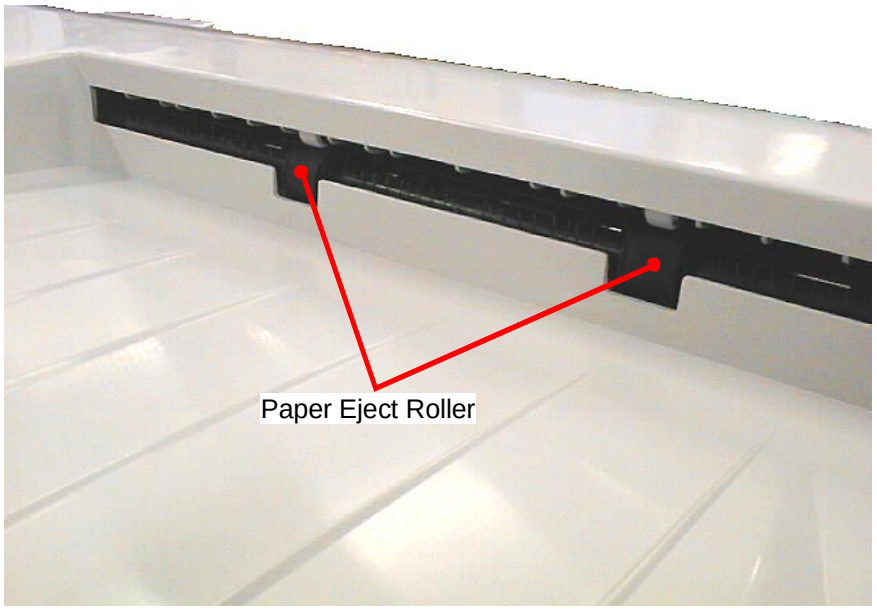


Figure 6-5. Paper Eject Roller

Timing Sensor

With the ADF open, remove 2 screws securing the registration guide on the left. Then clean the timing sensor.

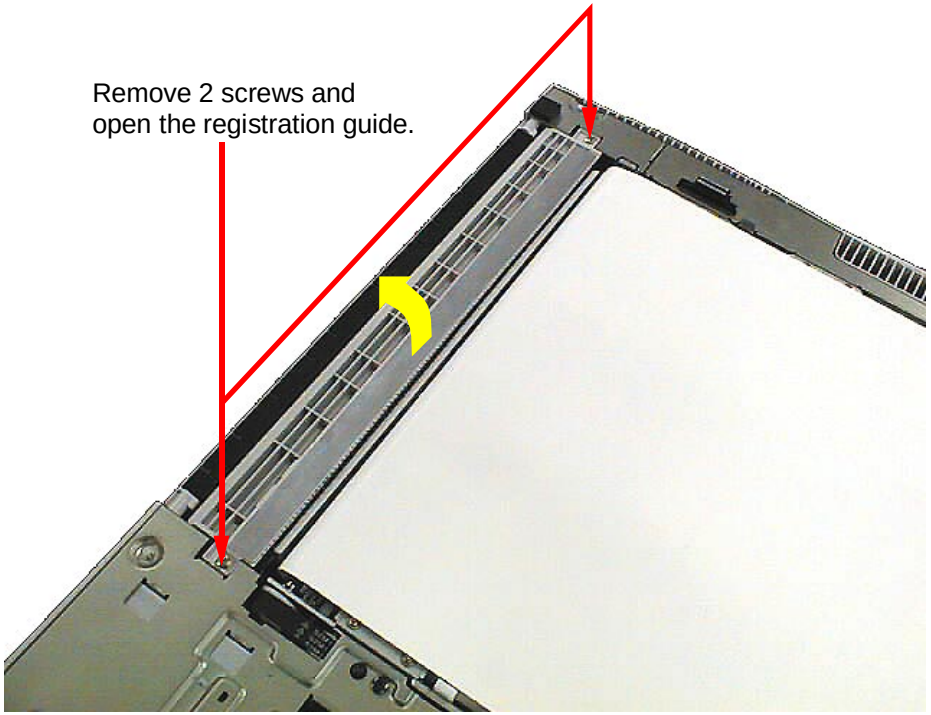


Figure 6-6. Releasing the Registration Guide

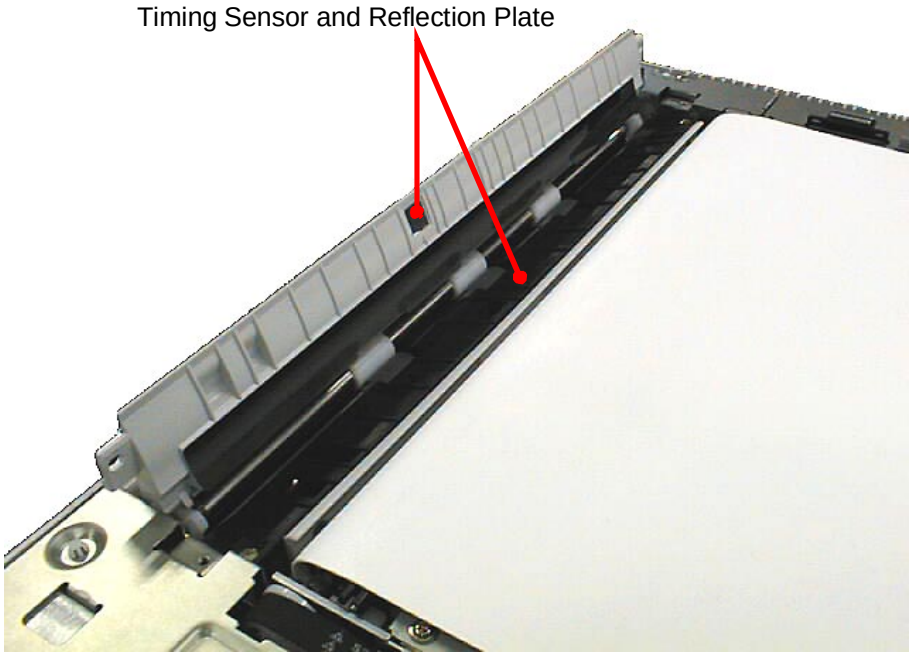


Figure 6-7. Timing Sensor

Paper Eject/Reverse Sensor

With the ADF open, remove 2 screws securing the reverse guide on the right. Then clean the reverse sensor.

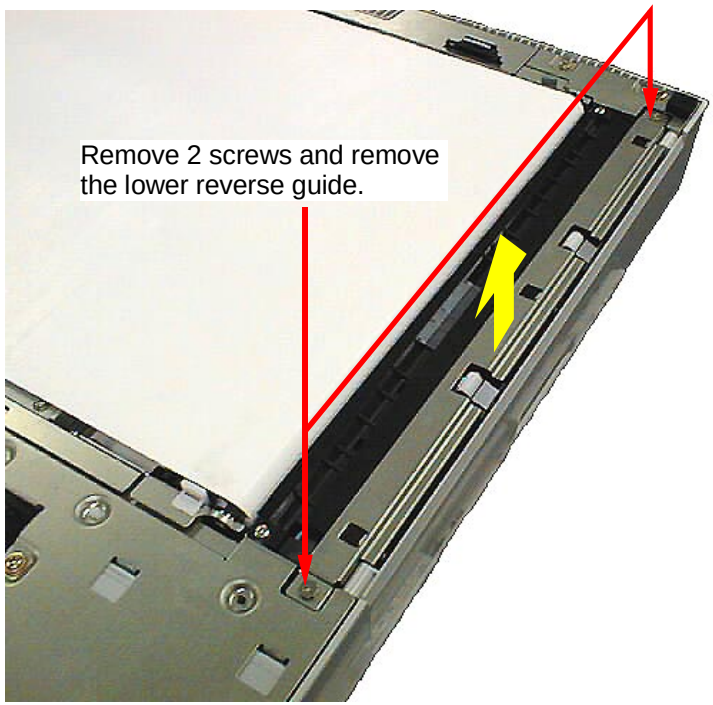


Figure 6-8. Paper Eject/Reverse Sensor

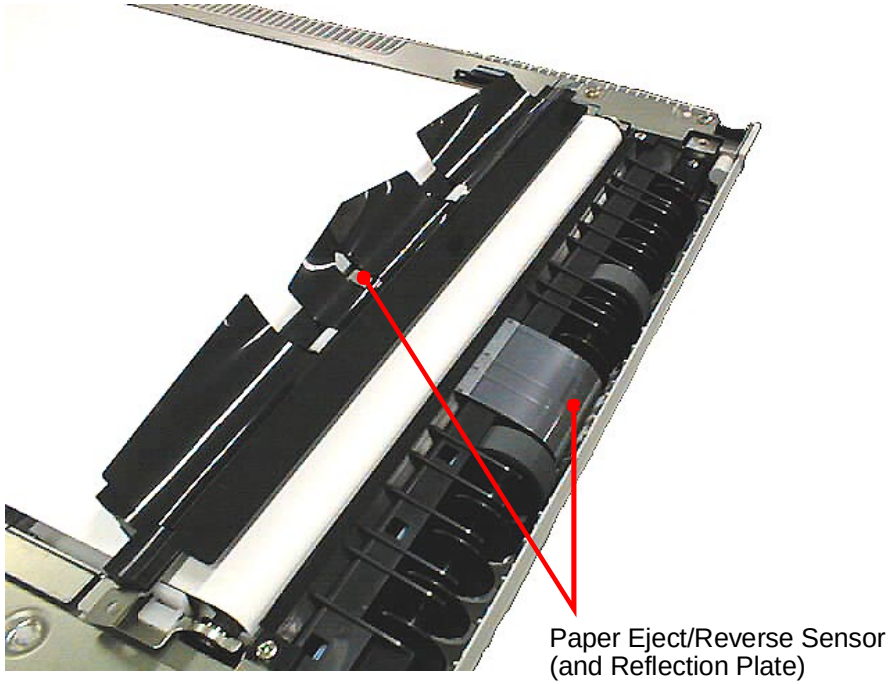


Figure 6-9. Paper Eject/Reverse Sensor

6.1.2 Lubrication

This section gives information on where to lubricate in the ADF.

⚠WARNING ***Use only the lubricant specified for this ADF, since use of other lubricants may damage nearby parts. The lubricant specified is TBD.***

Lubricating Point (1)

Points:
- ❑ Cutouts in the registration links which slide along the shoulder screws (M3, 3.3)
- ❑ Locking leaf springs (Colored areas in Figure 6-10)

Amount:
- ❑ Cutouts in the links: 30 mg each
- ❑ Locking leaf springs: 10 mg each

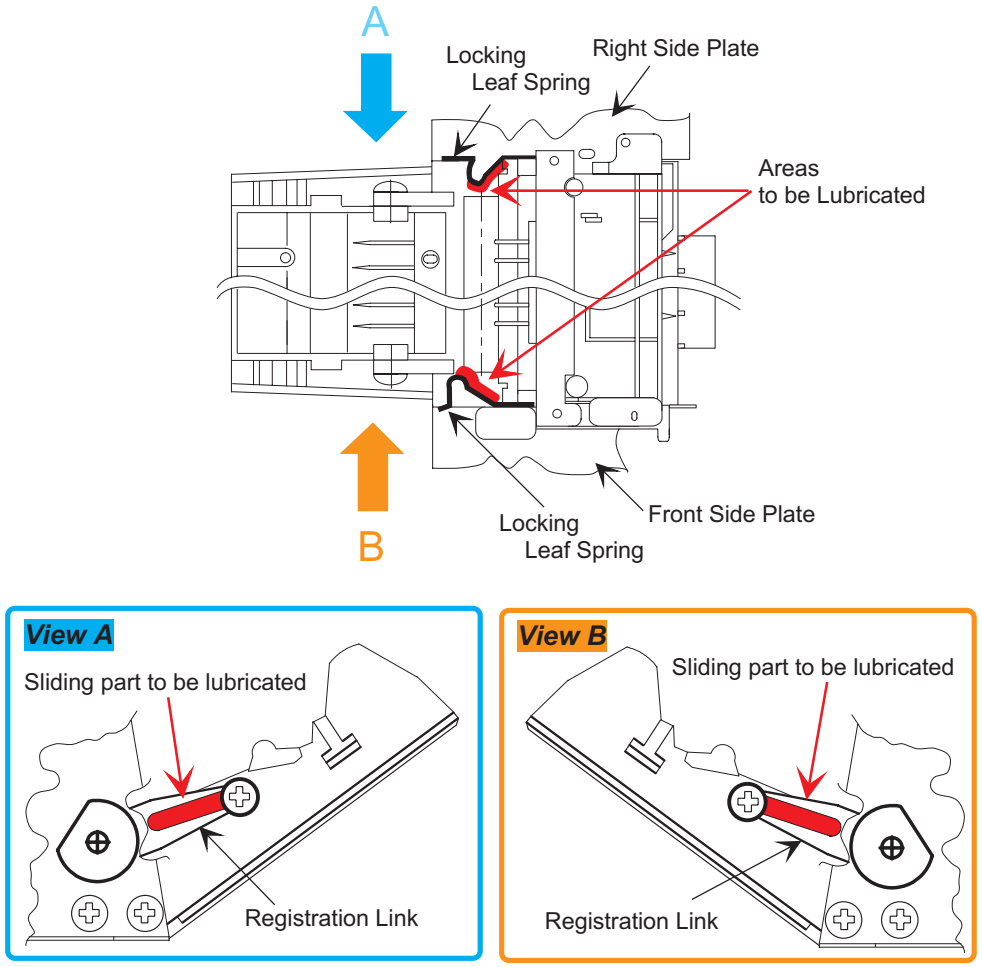


Figure 6-10. Lubricating Point (1)

Lubricating Point (2)

Points:
- ❑ Sliding part for the bushing and the pulley roller holder
- ❑ Sliding part for the slide shaft bushing and the pulley holder

Amount: 10 mg each

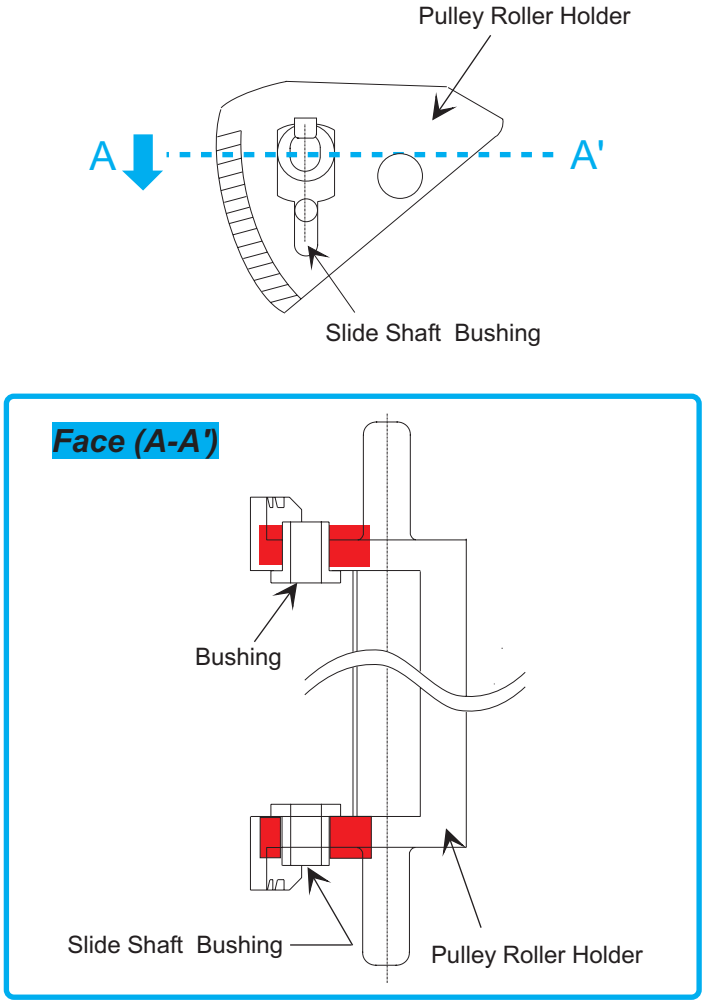


Figure 6-11. Lubricating Point (2)

Lubricating Point (3)

Points: Sliding parts in the dropping roller holders (Colored areas in Figure 6-12)

Amount: 5 mg each

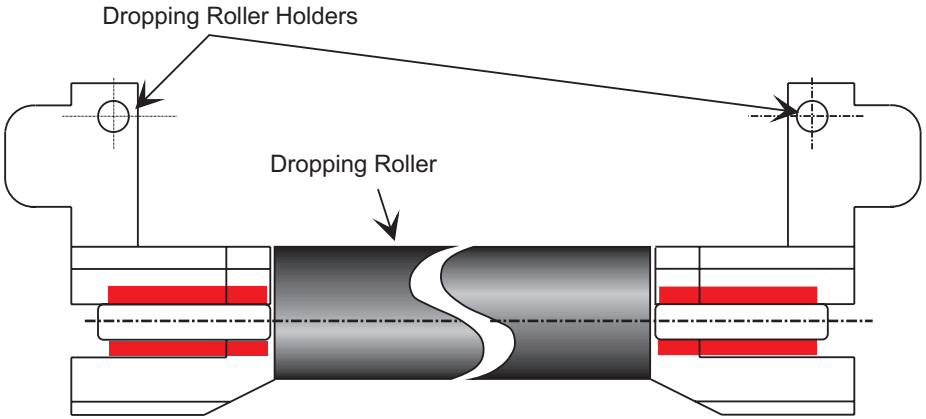


Figure 6-12. Lubricating Point (3)

Lubricating Point (4)

Points: Sliding parts in the leaf spring for the holding roller (Colored areas in Figure 6-13)

Amount: 5 mg each

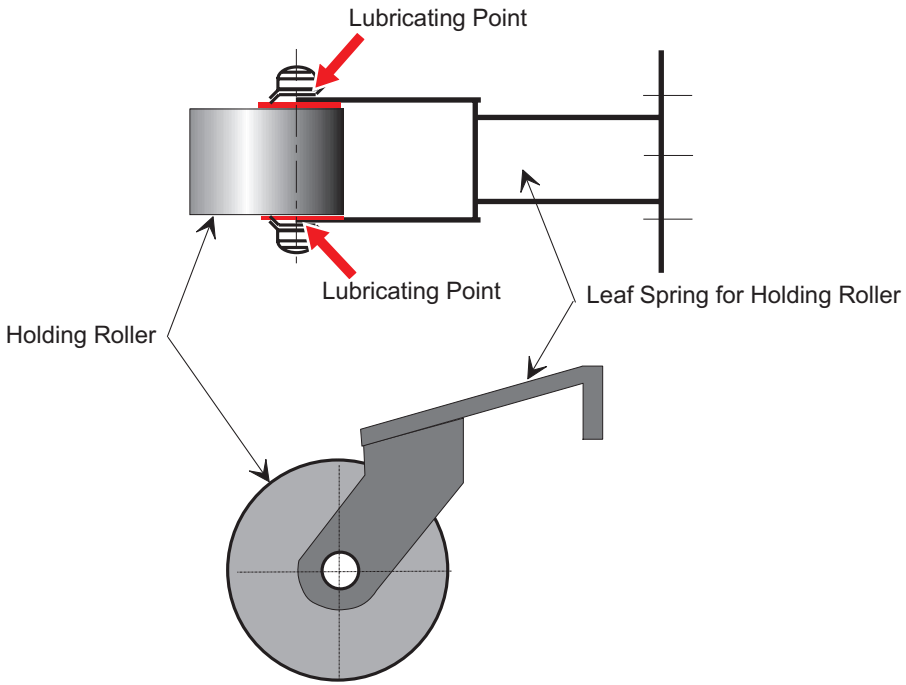


Figure 6-13. Lubricating Point (4)

Lubricating Point (5)

Points: Sliding parts for the belt holders and the belt holding roller (2). (Colored areas in Figure 6-14)

Amount: 5 mg each

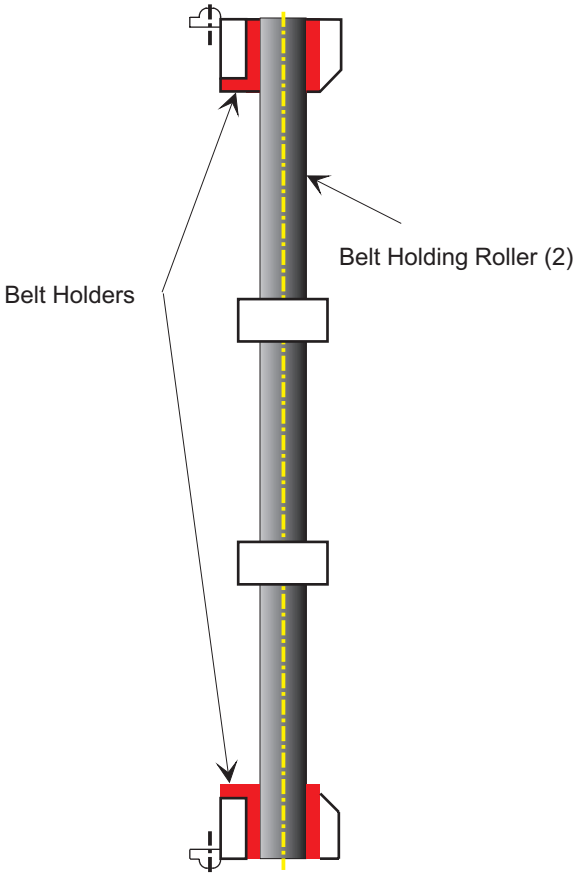


Figure 6-14. Lubricating Point (5)

Lubricating Point (6)

Points: Sliding parts for the belt holders and belt holding roller K-S (Colored areas in Figure 6-15)

Amount: 5 mg each

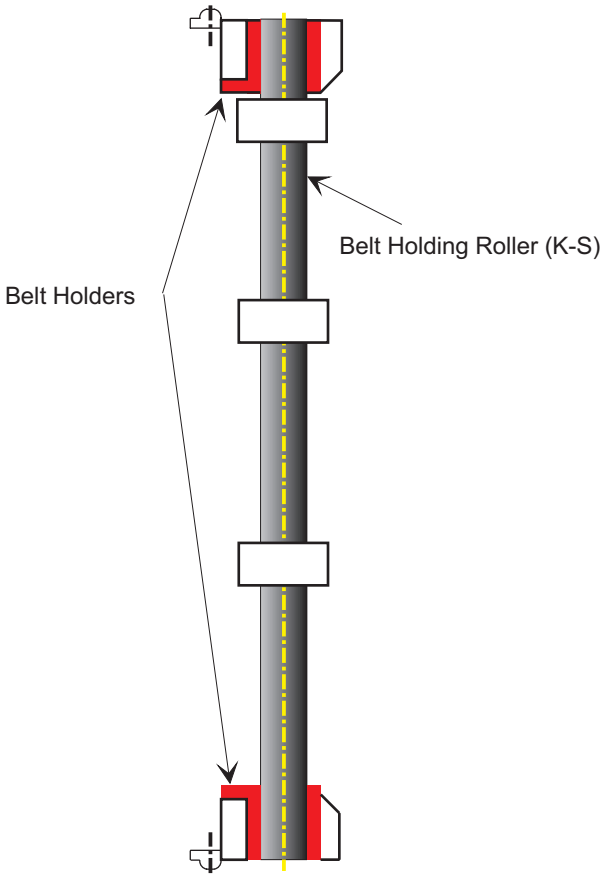


Figure 6-15. Lubricating Point (6)

Lubricating Point (7)

Points: Sliding part for the DF support shaft and right DF side plate. (Colored area in Figure 6-16)

Amount: 10 mg each

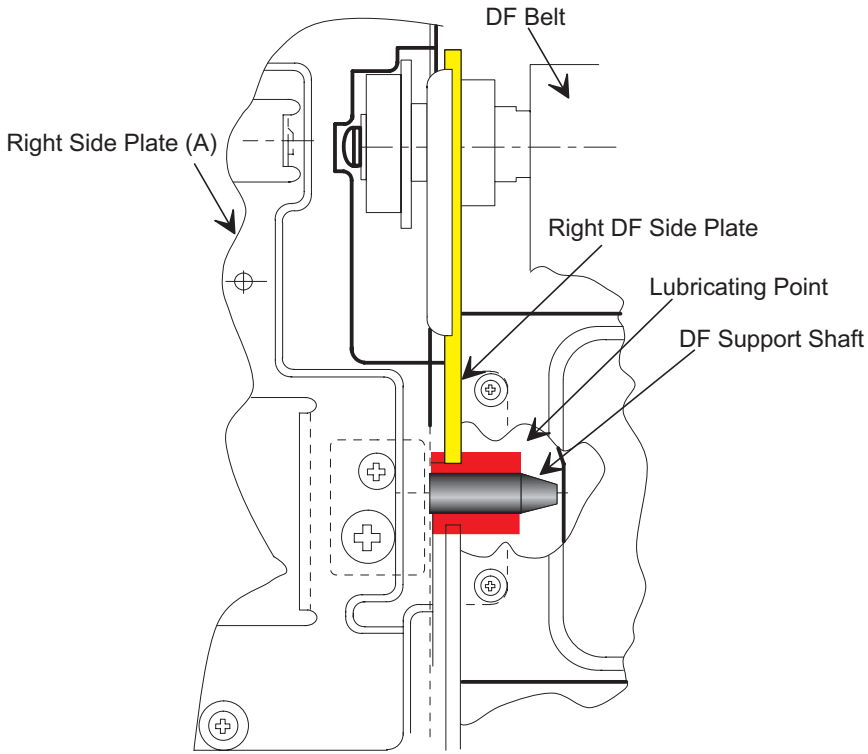


Figure 6-16. Lubricating Point (7)

Lubricating Point (8)

Points: Tension shaft surface around which the right tension roller turns

Amount: 5 mg

Note: *Do not lubricate the external surface of the right tension roller.*

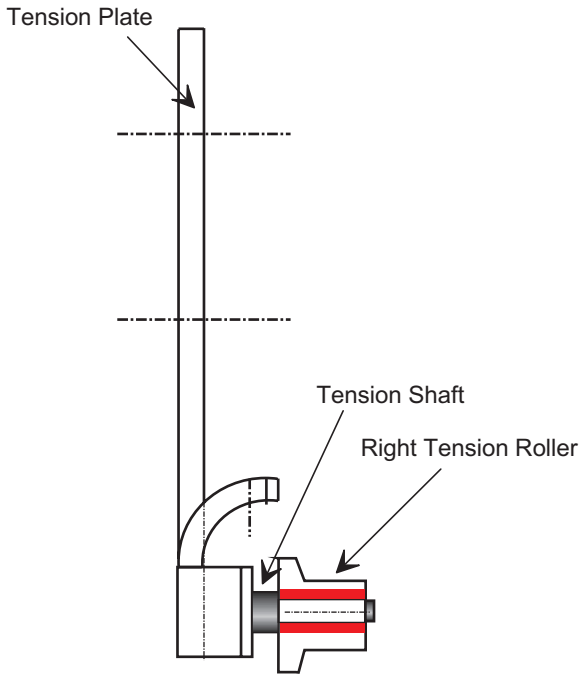


Figure 6-17. Lubricating Point (8)

Lubricating Point (9)

Points: Contact Points for the eject roller and eject leaf spring (Colored points in Figure 6-18)

Amount: 5 mg each

Note: *Do not lubricate the external surface of the eject roller.*

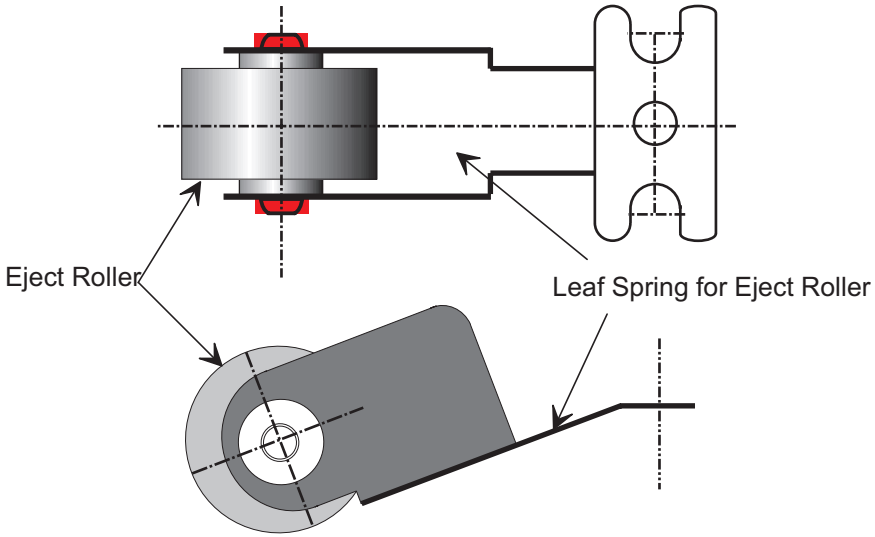


Figure 6-18. Lubricating Point (9)

Lubricating Point (10)

Points: Sliding part of the reverse roller shaft
(Colored area in Figure 6-19)

Amount: 5 mg each

Note: *Do not lubricate the external surface of the reverse roller.*

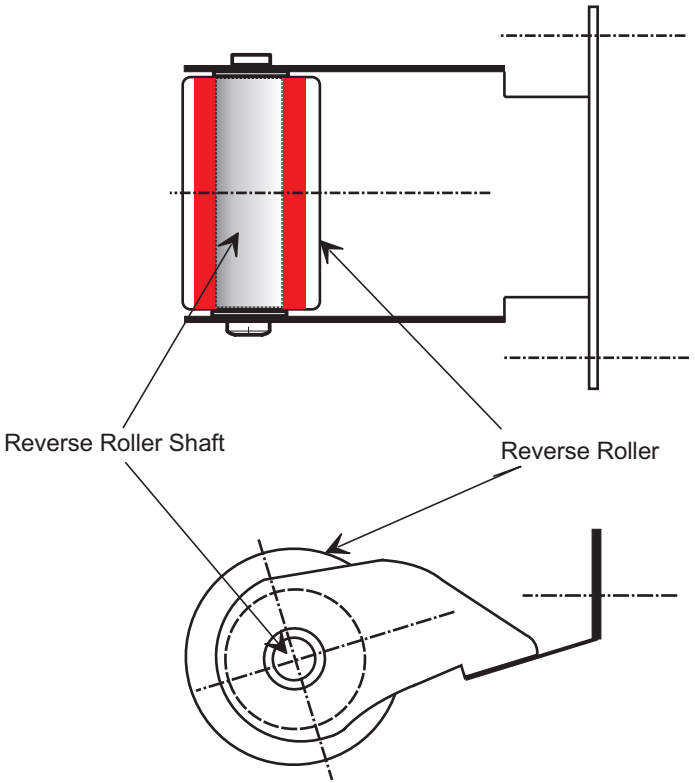


Figure 6-19. Lubricating Point (10)

Lubricating Point (11)

Points: Sliding parts of the reverse roller shafts (U)
(Colored areas in Figure 6-20)

Amount: 5 mg each

Note: *Do not lubricate the external surface of the reverse roller.*

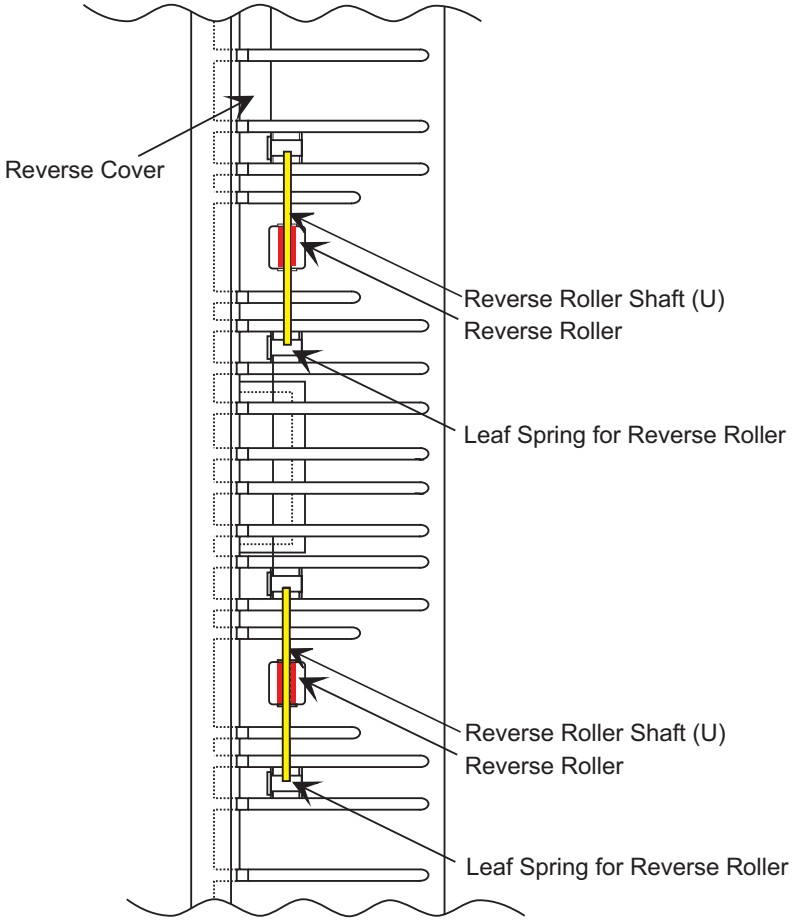


Figure 6-20. Lubricating Point (11)

Lubricating Point (12)

Points:
- ❑ Sliding parts for the flapper shaft and front and rear reverse side plates. (Colored areas in Figure 6-21)
- ❑ Colored areas of the key locks
  (Wipe off the lubricant with a cloth after applying.)

Amount: 10 mg each

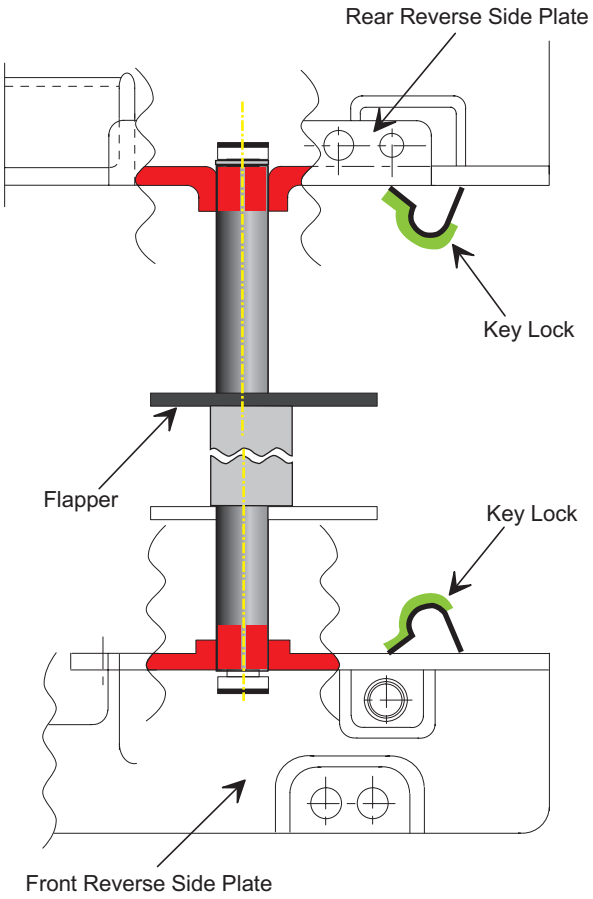


Figure 6-21. Lubricating Point (12)

Lubricating Point (13)

Points: Sliding parts of the registration roller bushings(8MM) (Colored areas in Figure 6-22)

Amount: 10 mg each

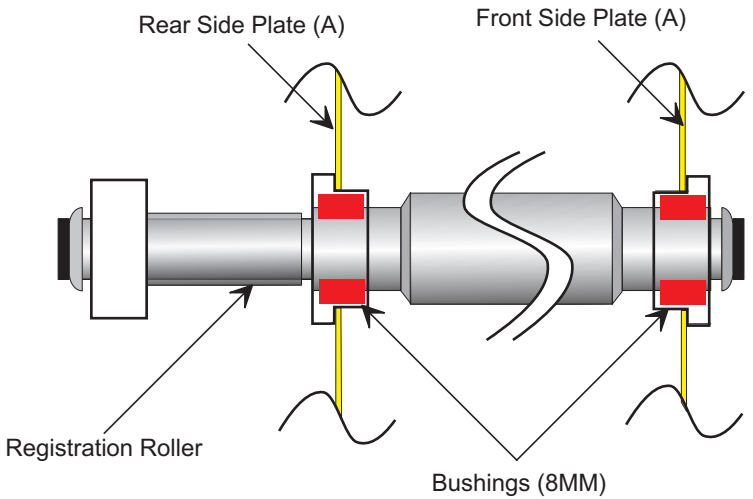


Figure 6-22. Lubricating Point (13)

Lubricating Point (14)

Points: Sliding parts for the bushings (MF) and the registration pinch roller (Colored areas in Figure 6-23)

Amount: 10 mg each

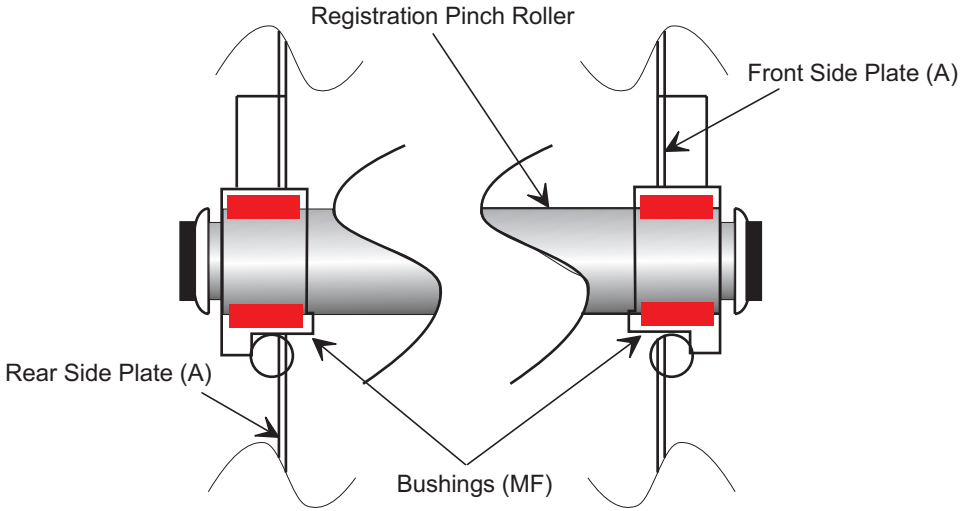


Figure 6-23. Lubricating Point (14)

Lubricating Point (15)

Points: Sliding parts for the registration links and registration pinch roller (Colored areas in Figure 6-24)

Amount: 10 mg each

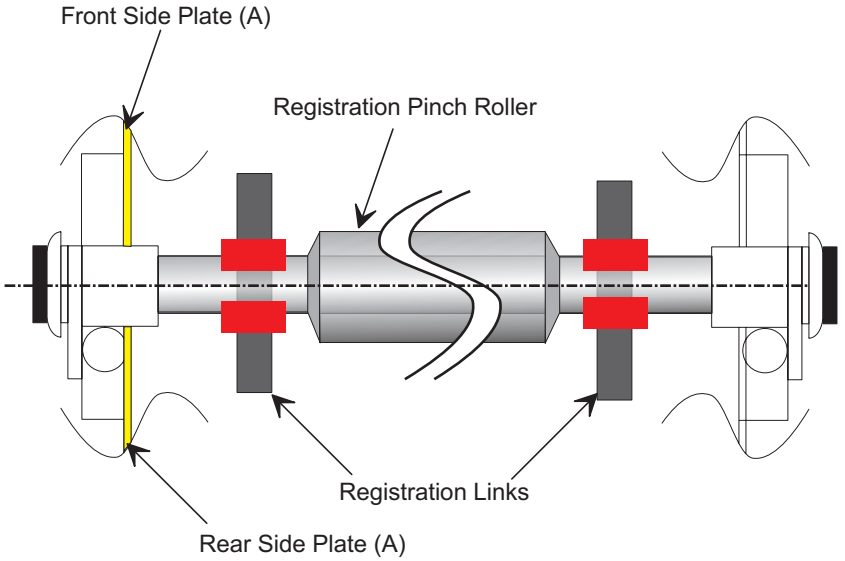


Figure 6-24. Lubricating Point (15)

6.1.3 Adhesion

This section provides adhering points in the ADF.

⚠WARNING ***Use only the adhesive specified for this ADF, since use of other adhesives may damage nearby parts. The specified adhesive is lock-tight #2 (B730200200).***

Adhering Point (1)

- ❑ **Occasion:** Front and rear pulley compression springs installation
- ❑ **Amount:** 5 mg each
- ❑ **Method:** Apply lock-tight to the points in the pulley roller holder where the front and rear compression springs are hooked.

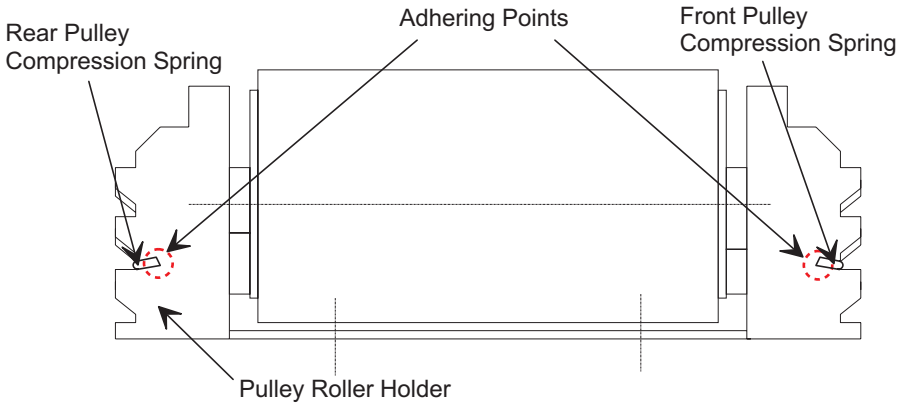


Figure 6-25. Adhering Point (1)

Adhering Point (2)

- ❑ **Occasion:** Belt Pulley (A) installation
- ❑ **Amount:** 5 mg each
- ❑ **Method:** Apply lock-tight to the upper half of the screw shaft (Colored area in the figure below), then fasten the screw.

  Note: *Do not apply any adhesives to the external surface of the pulley.*

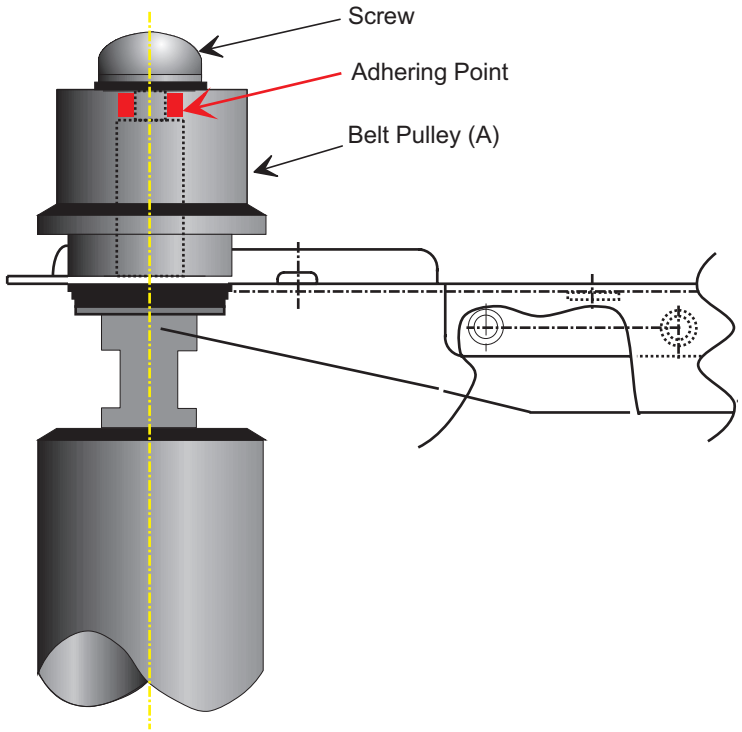


Figure 6-26. Adhering Point (2)

Adhering Point (3)

- ❑ **Occasion:** Discharging brush installation
- ❑ **Amount:** 5 mg each
- ❑ **Method:** Apply lock-tight to the half of the screw shaft from the head; then fasten the screw.

Note: *Do not apply any adhesives to the* brush.

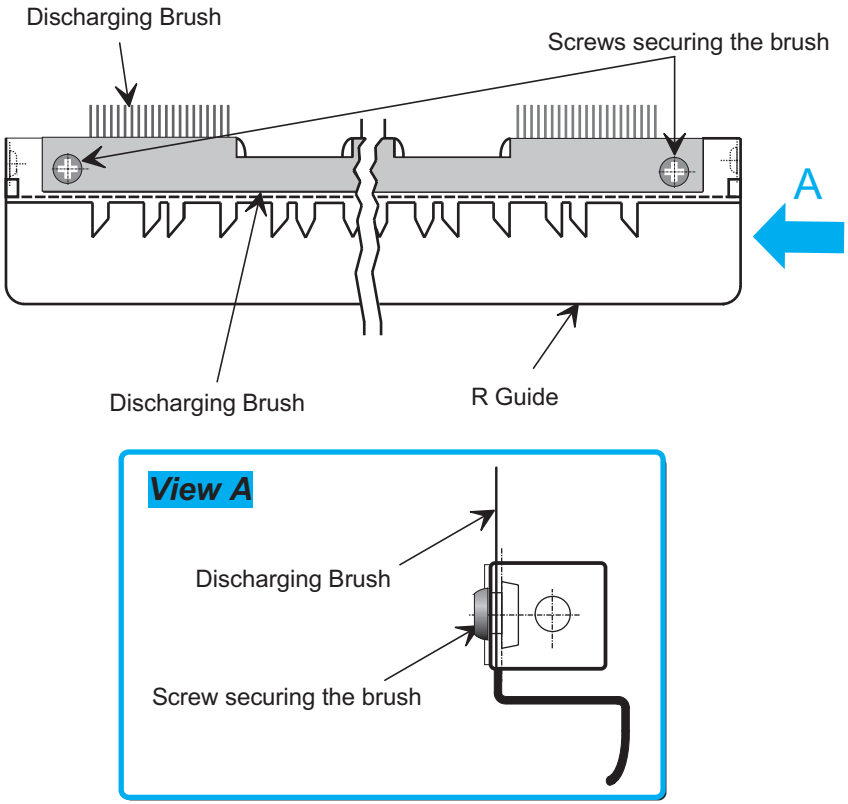


Figure 6-27. Adhering Point (3)

CHAPTER

7

APPENDIX

7.1 CONNECTOR SUMMARY

This section describes all connectors on the control board for the ADF and their corresponding signals and functions.

Table 7-1. Connector Pin Assignment (CN1)

Pin No.	Signal name	I/O destination	Signal level	Function
1	+5V	Document width detection volume	+5V	Inputs +5VDC for the volume resistance.
2	DWVR		0-5V	Outputs document width detection signal.
3	SGNG		----	GND
4	+5V	Empty sensor	+5V	Inputs +5VDC applied to the empty sensor.
5	SGND		----	GND
6	EMP		0 or 5V	Outputs paper empty sensor signal
7	+ 5V	Paper feed motor sensor	+5V	Inputs +5VDC for the photo-interrupter sensor.
8	SGND		----	GND
9	KM CLK		Pulse signal	Outputs motor rotation amount signal.
10	+5V	Timing sensor	+5V	Inputs +5VDC for the photo-interrupter sensor.
11	TIMS		– 3V or more: Present – 1V or less: Empty	Outputs paper empty/presence detection signal.
12	TIMS DA		– 3.8V: LED = On – 5V: LED = Off	Inputs LED drive signal. – Pre-feeding almost complete : On – Whole document through : Off
13	AN+24V	Registration sensor	+24V	Inputs +24VDC applied to the photo-interrupter sensor.
14	REGE		– 0.3 - 5V : Present – 1 - 15V : Empty	Outputs paper empty/presence detection signal.
15	RDDLED		0 - 24V	Inputs the LED light amount control signal.

Table 7-2. Connector Pin Assignment (CN2)

Pin No.	Signal name	I/O destination	Signal level	Function
1	*B	Transportation motor	Pulse signal	Outputs transportation motor drive signal change trigger.
2	B			
3	*A			
4	A			
5	+24V		+24V	Outputs +24VDC for motor drive.
6	+24V			

Table 7-3. Connector Pin Assignment (CN3)

Pin No.	Signal name	I/O destination	Signal level	Function
2	DFM 1 DFM 2	Paper feed motor	Pulse signal	Outputs paper feed motor drive signal change trigger.
3	DFSOL	Paper feed solenoid	Pulse signal	Outputs solenoid drive signal change trigger.
4	+24V	Paper feed solenoid	+24V	Outputs voltage for inducing solenoid.
5	FGOD	Paper feed cover open/ close sensor	– 0V: Open – 24V: Close	Inputs paper feed cover open/close status signal.
6	ADF +24V		+24V	Outputs +24VDC for inducing solenoid.
7	AUOD	ADF open/ close sensor		Inputs ADF open/close status signal.
8	DC +24V			Outputs +24VDC for the ADF open/close sensor.
9	----	----	----	----

Table 7-4. Connector Pin Assignment (CN4)

Pin No.	Signal name	I/O destination	Signal level	Function
1	FD+24V	Ejection cover open/close detection switch	+24V	Outputs +24VDC applied to the ejection cover open/close switch.
2	TGOD		▪ 0V: Open ▪ 24V: Close	Inputs ejection cover open/close status signal.
3 4	+24V +24V		+24V	Outputs +24VDC for reverse motor drive.
5 6 7 8	*B B *A A	Paper eject/Reverse motor	Pulse signal	Outputs reverse motor drive signal change trigger.

Table 7-5. Connector Pin Assignment (CN5)

Pin No.	Signal name	I/O destination	Signal level	Function
1	+5V	Paper eject/ Reverse sensor	+5V	Outputs +5VDC for Paper eject/Reverse sensor.
2	HANS		– 1V or less: Present – 3V or more: Empty	Inputs paper eject/reverse sensor detection signal.
3	HANS DA		– 3.8V: LED = On – 5.0V: LED = Off	Paper eject/reverse sensor photo-interrupter LED drive control signal.
4	+24V	Paper eject/ Revers solenoid	+24V	Outputs +24VDC for inducing solenoid.
5	DRSOL		Pulse signal	Outputs solenoid drive signal change trigger.

Table 7-6. Connector Pin Assignment (CN6)

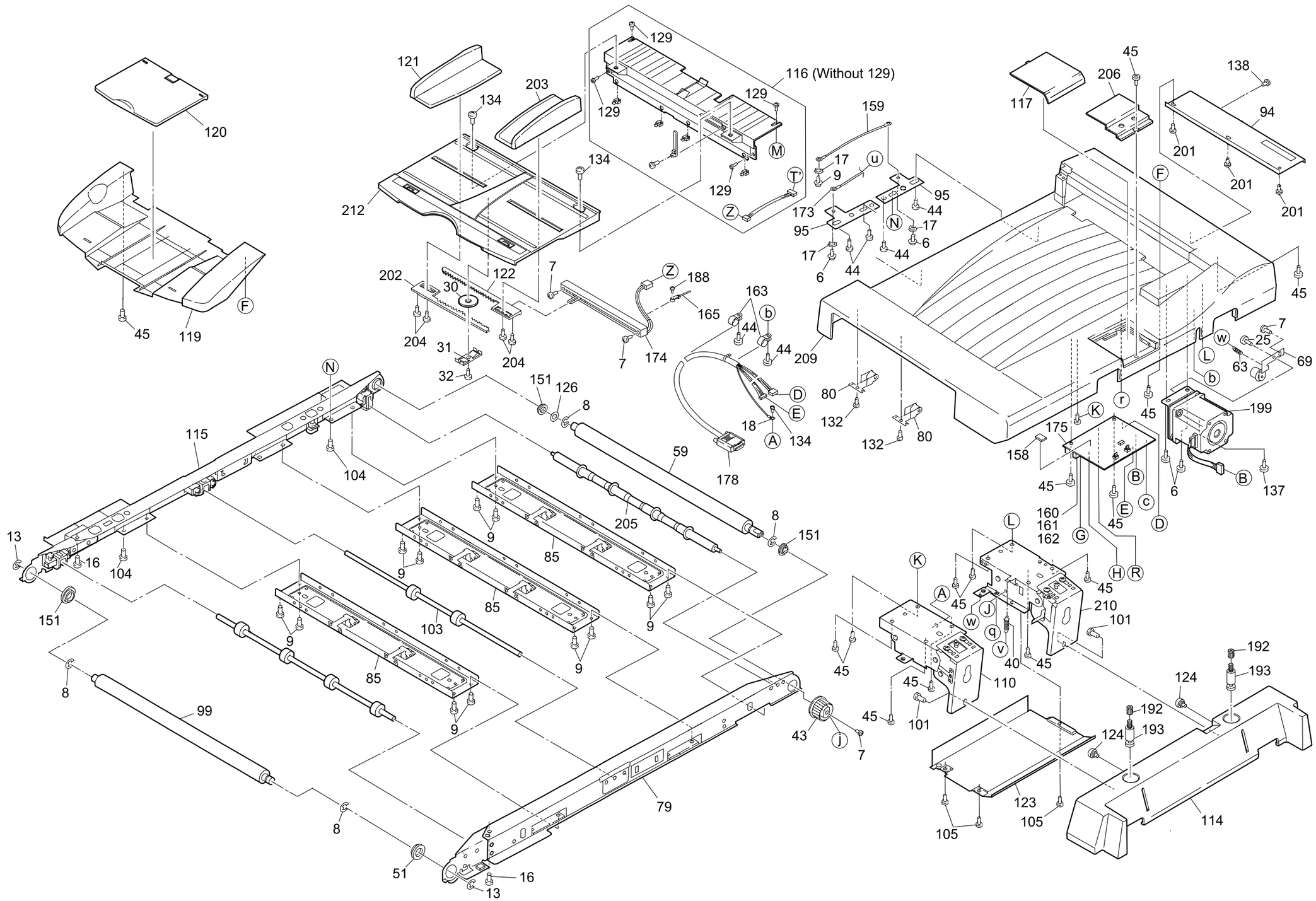
Pin No.	Signal name	I/O destination	Signal level	Function
1	TXD (RXD)	I/F cable	Pulse signal	Data receive signal
2	*TXD (*RXD)		Pulse signal	Inverse receive signal
3	RXD (TXD)		Pulse signal	Data transmission signal
4	*RXD (*TXD)		Pulse signal	Inverse transmission signal
5	DTR (DSR)		Request data	Data transmission request signal
6	DSR (DTR)		Accept request	Data transmission accept signal
7	GND		----	GND
8 9	OP1 OP2		GND	Option recognition signal (Out of SEC specification)

Notes: *Signals marked with ( ) are descriptions when viewed from the scanner side.*

Table 7-7. Connector Pin Assignment (CN7)

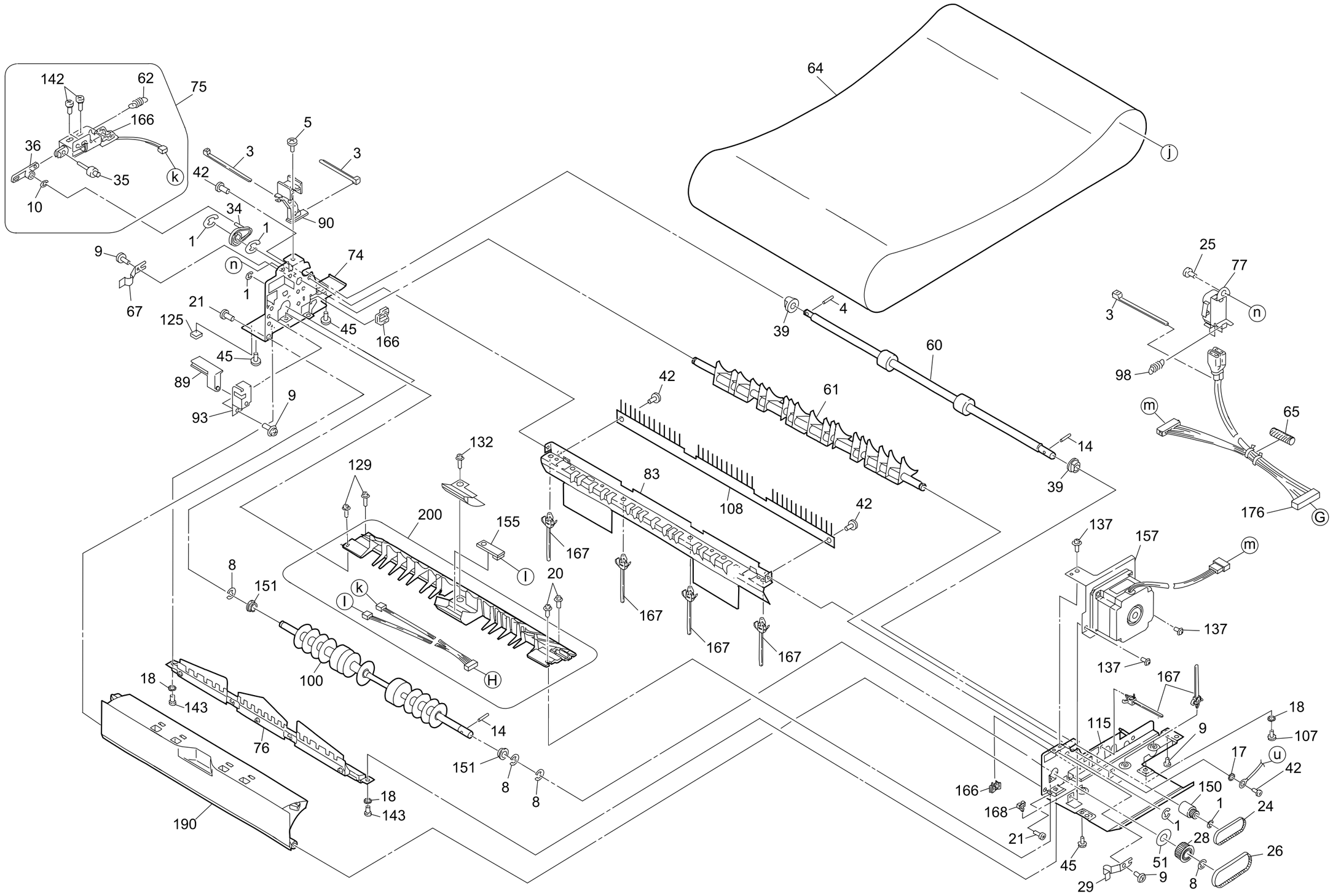
Pin No.	Signal name	I/O destination	Signal level	Function
1 2 3	+5V	I/F cable	+5V	Outputs +5VDC for system circuit.
4	GND		----	GND
5 6 7	+24V		+24V	Outputs +24VDC for drive circuit.
8	GND		----	GND

7.2 EXPLODED DIAGRAMS



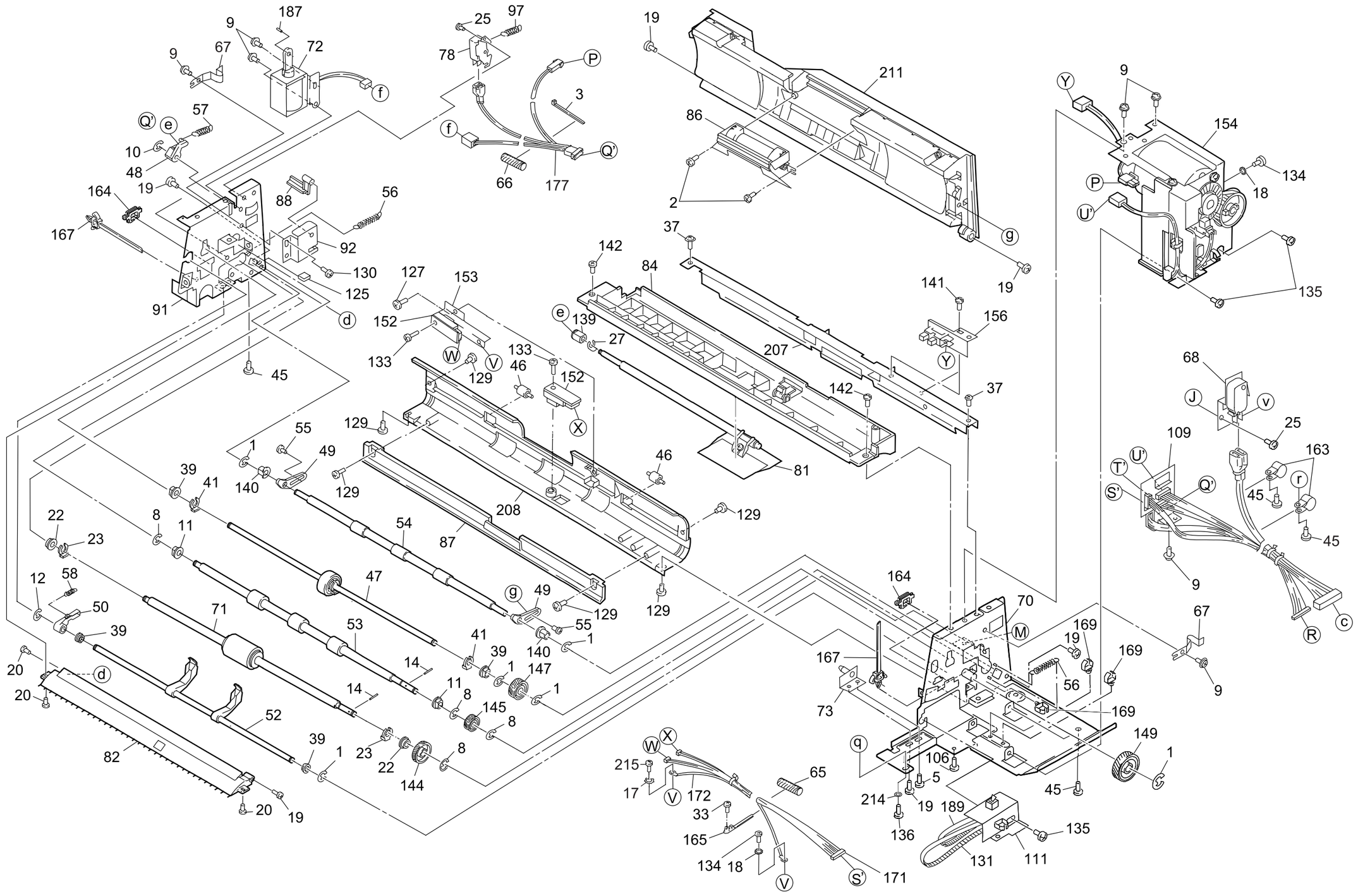
EXPLODED DIAGRAM FOR ESA3ADF EHC1(1/3)

Figure 7-1. Exploded Diagram (1)



EXPLODED DIAGRAM FOR ESA3ADF EHC1(2/3)

Figure 7-2. Exploded Diagram (2)



EXPLODED DIAGRAM FOR ESA3ADF EHC1(3/3)

Figure 7-3. Exploded Diagram (3)