IMAGE SCANNER IS420
[HS-1P]

SERVICE MANUAL

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Ricoh Co., Ltd.
October 1995

i. Important Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This Digital Apparatus does not exceed the Class A limits for Radio Frequency noise from Digital Apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

Hiermit wird bescheinigt, daß dieses Gerät in Übereinstimmung mit den Bestimmungen der Verfügung Nr. 1046 des Amtsblatts Nr.163/1984 funkentstört ist.

Installing the Interface Connector

The use of cables other than the shielded I/O cables or equivalent specified will invalidate the certification of this Scanner and may cause interference levels which exceed the limits established for this equipment.

Safety Information

The input voltage to the PSU (Power Supply Unit) can be either 100~120 Vac or 220~240 Vac, without any adjustment. Make sure that the above voltage is used.

The power cord should be an approved type, in accordance with the regulations for the country in which the scanner is used.

Introduction

The equipment described in this manual is a flatbed scanner with an automatic document feeder, capable of scanning documents up to A3 in size. This user's manual explains how to use and maintain the scanner. Before using the scanner, please read this manual completely to be aware of how to assure maximum system performance and service life.

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IMPORTANT SAFETY NOTICES

PREVENTION OF PHYSICAL INJURY

1. Before disassembling or assembling parts of the copier and peripherals, make sure that the copier power cord is unplugged.
2. The wall outlet should be near the copier and easily accessible.
3. Note that some components of the copier and the paper tray unit are supplied with electrical voltage even if the main switch is turned off.
4. If any adjustment or operation check has to be made with exterior covers off or open while the main switch is turned on, keep hands away from electrified or mechanically driven components.
5. The inside and the metal parts of the fusing unit become extremely hot while the copier is operating. Be careful to avoid touching those components with your bare hands.

HEALTH SAFETY CONDITIONS

1. Never operate the copier without the ozone filters installed.
2. Always replace the ozone filters with the specified ones at the specified intervals.
3. Toner and developer are non-toxic, but if you get either of them in your eyes by accident, it may cause temporary eye discomfort. Try to remove with eye drops or flush with water as first aid. If unsuccessful, get medical attention.

OBSERVANCE OF ELECTRICAL SAFETY STANDARDS

1. The copier and its peripherals must be installed and maintained by a customer service representative who has completed the training course on those models.

– CAUTION –

2. The RAM pack on the main control board has a lithium battery which can explode if replaced incorrectly. Replace the battery only with an identical one. The manufacturer recommends replacing the entire RAM board. Do not recharge or burn this battery. Used batteries must be handled in accordance with local regulations.

SAFETY AND ECOLOGICAL NOTES FOR DISPOSAL

1. Do not incinerate the toner cartridge or the used toner. Toner dust may ignite suddenly when exposed to open flame.
2. Dispose of used toner, developer, and organic photoconductor according to local regulations. (These are non-toxic supplies.)
3. Dispose of replaced parts in accordance with local regulations.

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4. When keeping used lithium batteries in order to dispose of them later, do not put more than 100 batteries per sealed box. Storing larger numbers or not sealing them apart may lead to chemical reactions and heat build-up.

LASER SAFETY

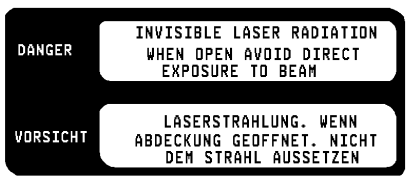
The Center for Devices and Radiological Health (CDRH) prohibits the repair of laser-based optical units in the field. The optical housing unit can only be repaired in a factory or at a location with the requisite equipment. The laser subsystem is replaceable in the field by a qualified Customer Engineer. The laser chassis is not repairable in the field. Customer engineers are therefore directed to return all chassis and laser subsystems to the factory or service depot when replacement of the optical subsystem is required.

WARNING:
Use of controls, or adjustment, or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

WARNING FOR LASER UNIT

WARNING: Turn off the main switch and standby switch before attempting any of the procedures in the Laser Unit section. Laser beams can seriously damage your eyes.

CAUTION MARKING:



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1. OVERALL MACHINE INFORMATION

1.1. SPECIFICATIONS

Scanning method:	Flat-bed and ADF
Book scan:	Horizontal: Max. 297 mm [11.7 ins] Vertical: Max. 432 mm [17.0 ins]
ADF:	Document size: - Width: 69~297 mm [2.7~11.7 ins] - Length: 120~432 mm [4.7~17.0 ins] all pages in a document must be the same width Document thickness: 0.07~0.16 mm (equivalent to 52~128 g/m^2) [2.8~6.3 mils, 14 - 34 lb] ADF capacity: 100 sheets (20 lb.) 85 sheets (24 lb.) Stack height must be less tham 12 mm
Scanning resolution:	Horizontal: 400 dpi Vertical: 200~800 dpi (in 1 dpi steps)
Grayscales:	8 bits/pixel
Initialization time:	About 20 seconds
Scanning speed:	1.4 s/200 dpi (A4, binary picture mode) 3 s/200 dpi (A3, binary picture mode)
Scanning throughput:	36 ppm/200 dpi (A4, binary picture mode) 18 ppm/400 dpi (A4, binary picture mode) (Counted from the second page)
Interface:	SCSI-2, high density; Video interface (option)
Power:	1) 85 to 138 V ac (45 to 65 Hz) 2) 176 to 276 V ac (45 to 65 Hz)
Power consumption (with all possible options):	Standby: 48 W Max. Scanning: 74 W Max.
Operating environment:	Temperature: 10 to 32°C [50 to 90 °F] Humidity: 20 to 80 % RH
Weight:	Less than 25 kg [55.1 lbs]
Dimensions (W x D x H):	450 x 670 x 282 mm [17.7 x 26.4 x 11.1 ins]

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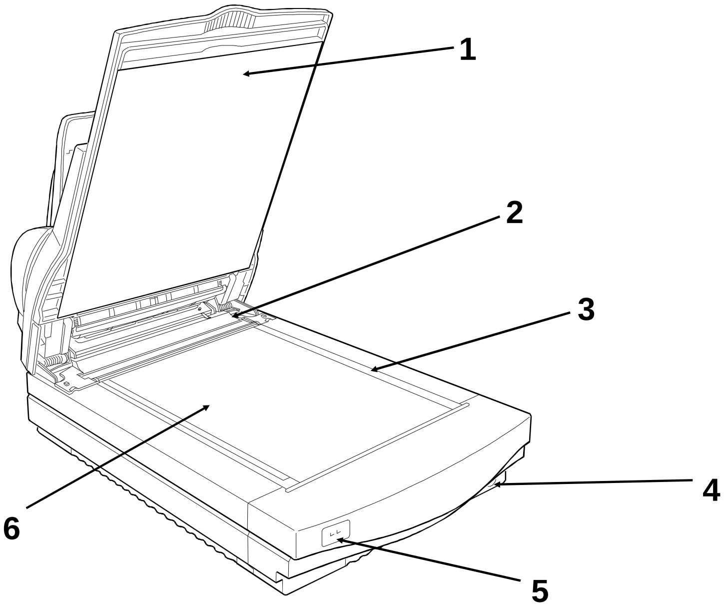
1.2. COMPONENT LAYOUT

1.2.1. Front View



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No.	Name	Function
1	Platen cover	Covers the document and serves as a neutral background for documents placed on the main exposure glass.
2	ADF exposure cover	Covers the scanner and closes the ADF exposure cover interlock switch. Also contains an exposure glass.
3	Scale	Used for positioning a document when placing it on the exposure glass.
4	Power switch	Turns the power on and off.
5	Scanner indicator lamps	The green and orange lights indicate the condition of the scanner.
6	Main exposure glass	A document to be scanned in book mode is placed face down on this glass.

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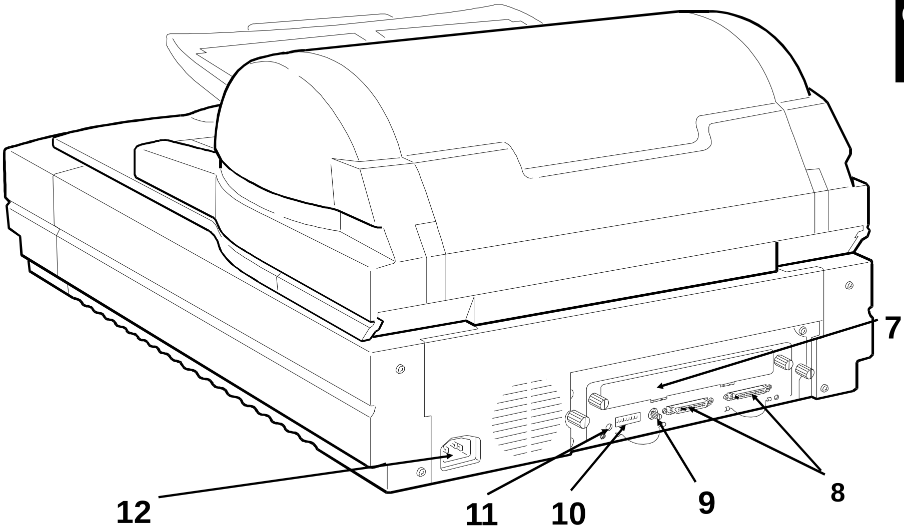
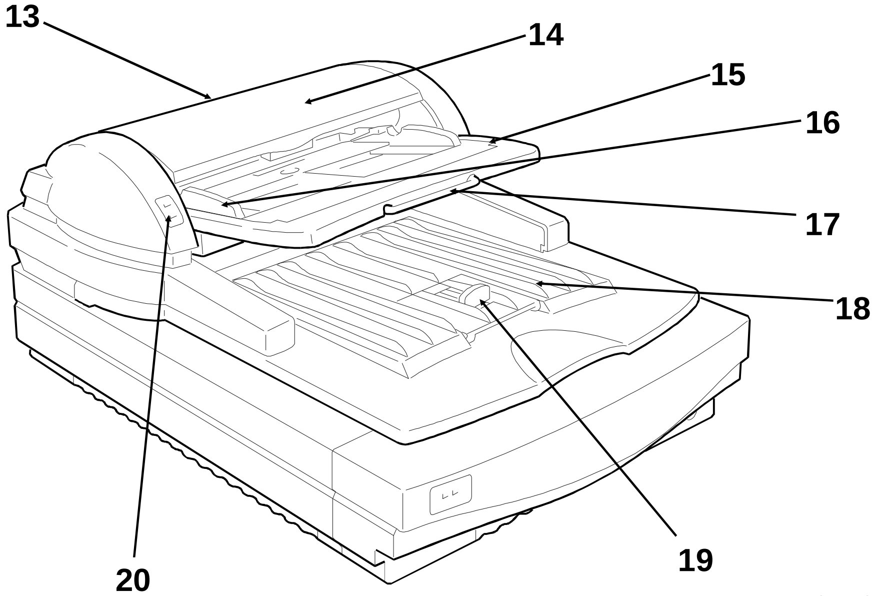
1.2.2. Rear View



g404v502.wmf

No.	Name	Function
7	Expansion board slot	Used to install an expansion board.
8	SCSI connectors	For connecting the SCSI cables.
9	SCSI ID rotary switch	Used to select the SCSI ID and to select diagnostic tests. Note that positions 8 and 9 are interpreted as SCSI ID 7.
10	DIP switches	Used to select various scanning modes and test modes.
11	Reset switch	If this is pressed, the machine is reset.
12	Power plug inlet	For connecting the power cord.

1.2.3. ADF

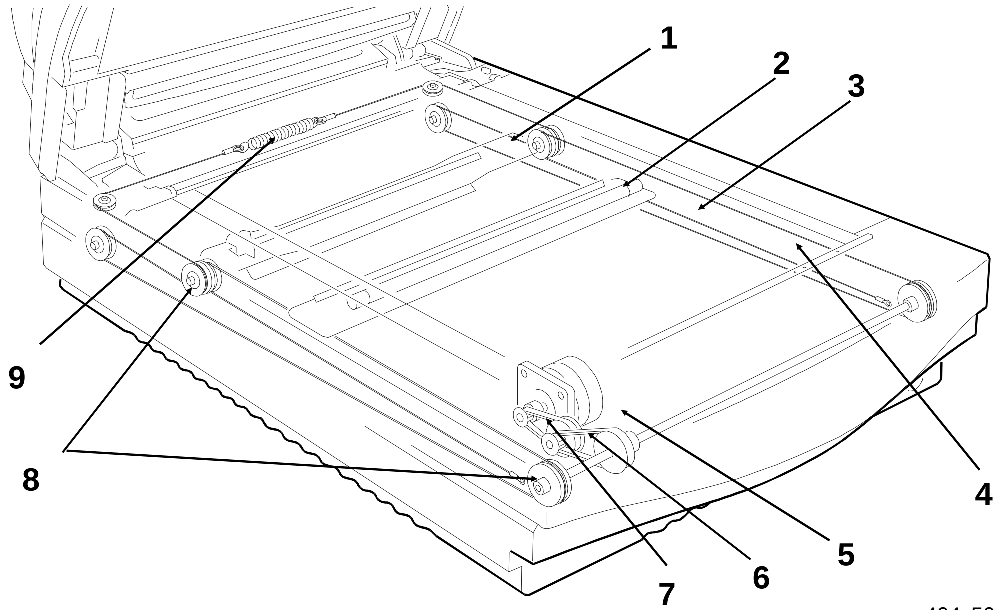


g404v503.wmf

No.	Name	Function
13	ADF	Automatically feeds multi-page documents into the scanner.
14	ADF cover	Open this cover to remove paper jammed at the input side.
15	Document table	Documents to be scanned using the ADF are placed here.
16	Document guides	Used to properly align the documents placed in the input tray.
17	Document support wire	If long documents are placed in the input tray, this helps to feed them correctly.
18	Exit table	Receives documents fed by the ADF after scanning.
19	Exit table extension	This holds the documents output from the ADF; it can be extended to support long documents.
20	ADF indicator lamps	The green and orange lights indicate the ADF operation condition.

1.3. DRIVE LAYOUT

1.3.1. Scanner



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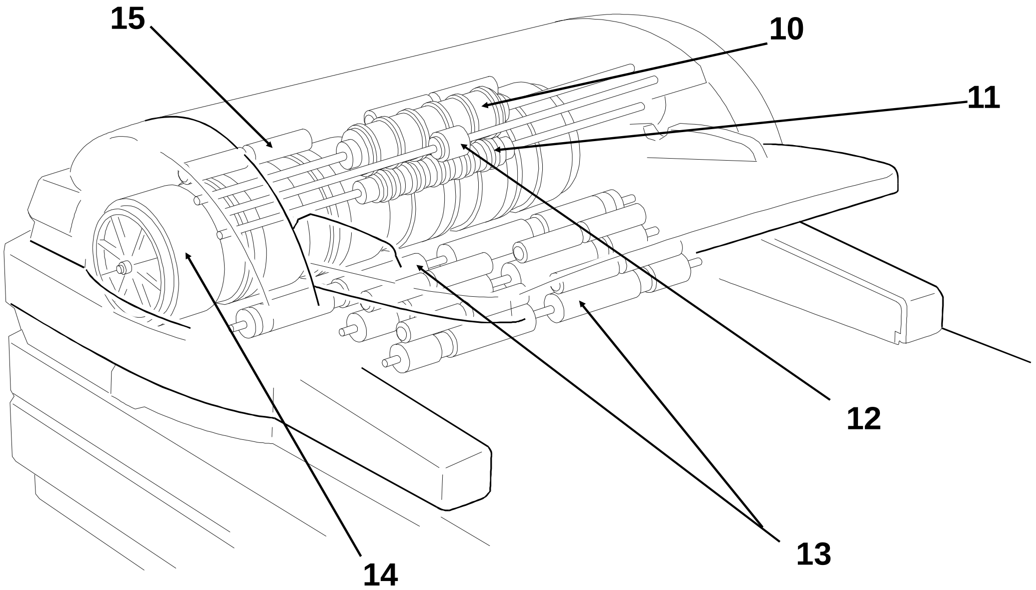
No.	Name	Function
1	Second carriage	Moves to keep the distance between the xenon lamp and the CCD constant, and sends light reflected from the 1st carriage to the CCD.
2	First carriage	Moves the xenon lamp along the document and sends the light reflected from the document to the 2nd carriage by means of a mirror.
3	Guide rails	Hold the first and second carriages and guide their movement.
4	Scanner drive wires	Transmit motor power to the 1st and 2nd carriages.
5	Motor gear box	The gears in this box drive the motor belts that drive the scanner.
6	Motor belt 2	Transmit motor power to the scanner drive wires.
7	Motor belt 1	
8	Pulleys	Hold the scanner drive wires.
9	Wire spring	Tightens the scanner drive wires.

1.3.2. ADF



g404v505.wmf

No.	Name	Function
10	Feed roller	Feeds the top page of the original into the ADF.
11	Separation roller	Stops the lower page of the original while allowing the top one to pass.
12	Pick-up roller	Picks up and transports the top page of the original placed on the document table.
13	Feed-out rollers	Feed the scanned original onto the exit table.
14	Paper transport drum	Transports the original to the scanning position.
15	Paper transport rollers	Hold the original against the paper transport drum.

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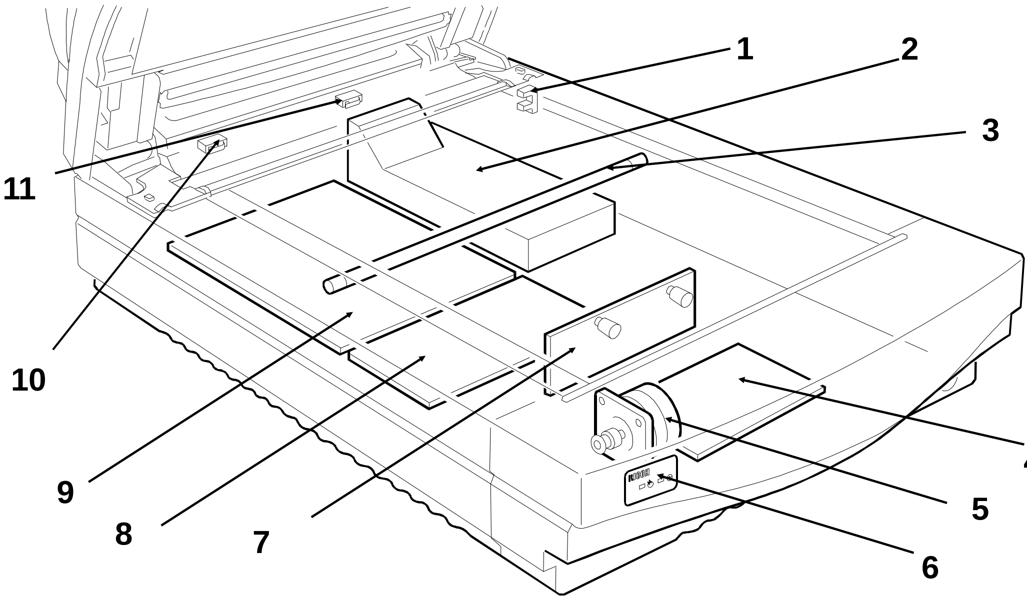
Overall Information

1.4. ELECTRICAL COMPONENT LAYOUT

1.4.1. Scanner



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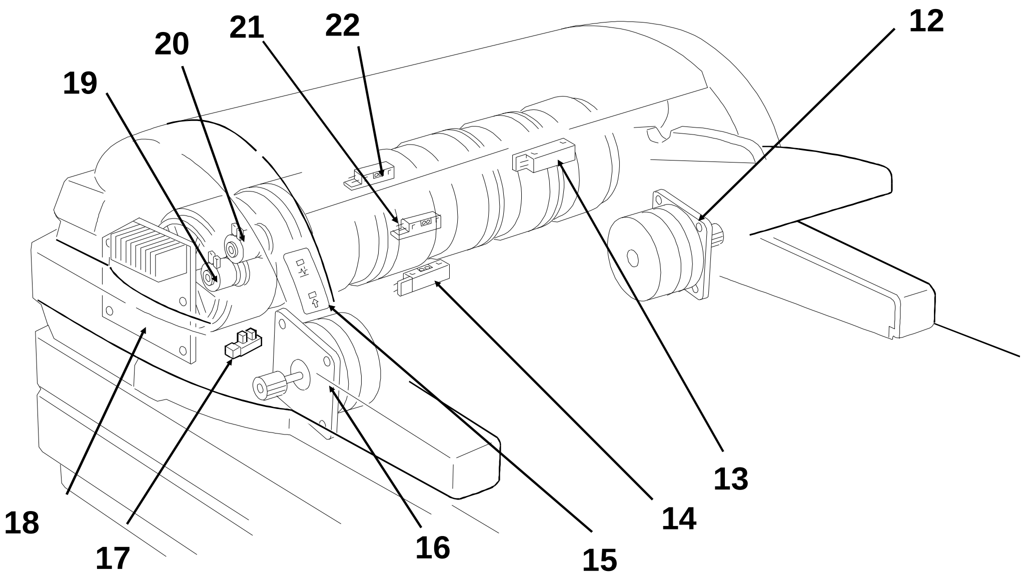
No.	Name	Function
1	Home position sensor	Detects whether the first carriage is at the home position.
2	PSU	This provides +24 V, ±5 V, and +12 V dc to the MBU.
3	Xenon lamp	This illuminates the document.
4	SDU	This contains a motor driver circuit and xenon lamp stabilizer.
5	Scanner motor	This drives the carriages.
6	SDP	This contains the scanner indicator lamps.
7	SBU	This contains a CCD and converts the light reflected from the original into a video signal.
8	MBU	This contains circuits for dc power distribution and interfaces with other boards.
9	SCU	This contains a CPU, an interface circuit, and other circuits.
10	Platen cover interlock switch	Detects whether the platen cover is open or closed, and cuts the power supply to the machine.
11	ADF exposure cover interlock switch	Detects whether the ADF exposure cover is open or closed, and cuts the power supply to the machine.

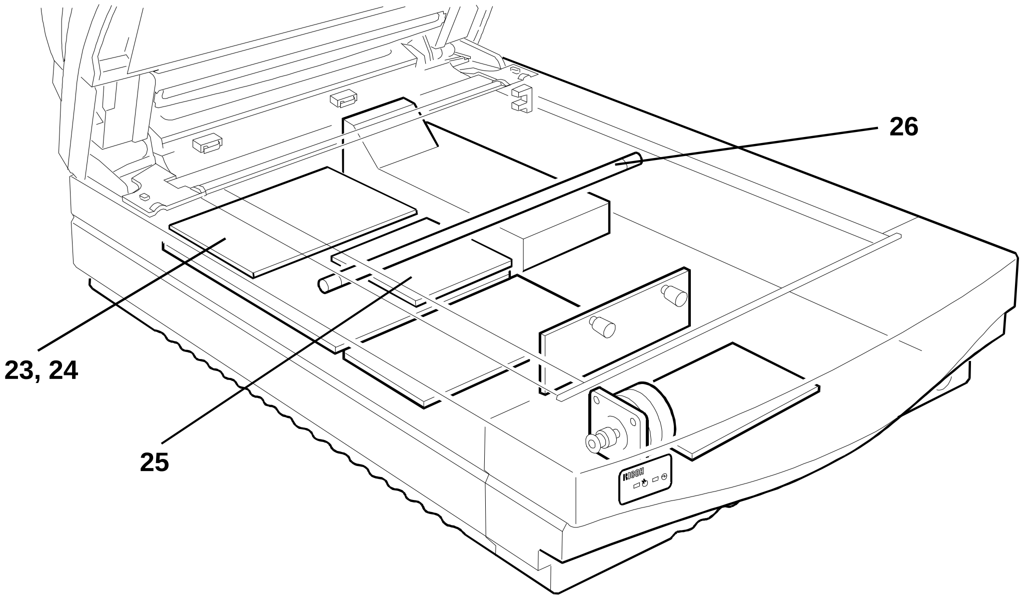
1.4.2. ADF



g404v507.wmf

No.	Name	Function
12	Paper feed motor	This drives the pick-up and feed rollers.
13	Document sensor	Detects when a document is placed on the document table.
14	Feed out sensor	Detects when a document is at the feed-out position.
15	ADP	This contains the ADF indicator lamps.
16	Paper transport motor	Drives the paper transport drum.
17	Document table position sensor	Detects if the input tray is at the feed position or not (approximate location indicated in this diagram).
18	ADU	This contains circuits for the ADF's motors, sensors, and other electrical components.
19	Document table lift clutch	Switches on to lift the document table up or down.
20	Pick-up clutch	Controls pick-up roller rotation.
21	Read sensor	Detects when a document is just before the reading position.
22	Feed sensor	Detects when a document is just before the feeding position.

1.4.3. Options

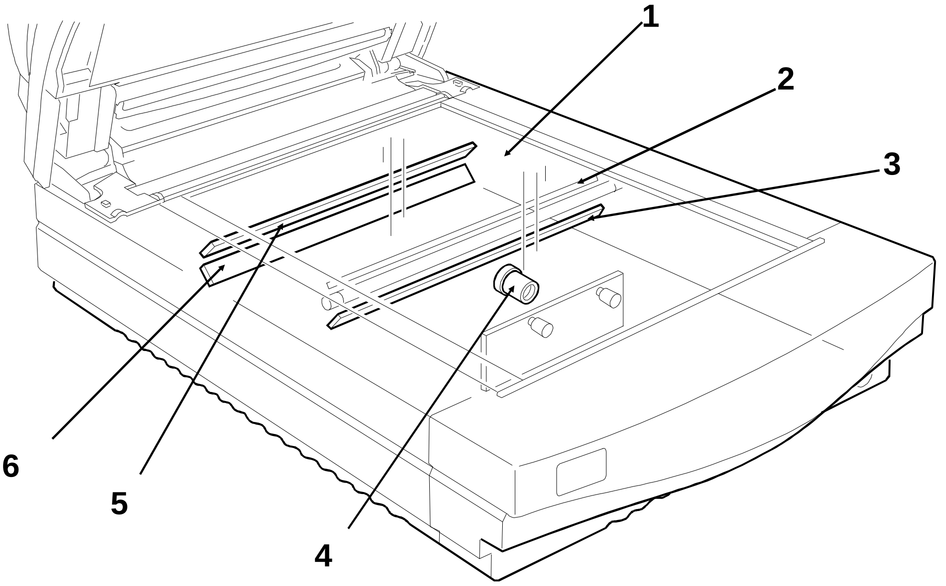


g404v510.wmf

No.	Name	Function
23	VIU	This optional board speeds up the video interface.
24	DCU	This is an optional board for compressing the scanned image data.
25	IEU	This optional board carries out image processing functions.
26	Xenon lamp (Red)	This red lamp causes red parts of originals, such as lines on OCR forms, not to be reproduced in the image data. After a red lamp has been installed, the machine adjusts the image processing circuits automatically to account for the lower signal level from the CCD.

The VIU and DCU cannot both be installed at the same time.

1.5. OPTICAL LAYOUT



g404v508.wmf

No.	Name	Function
1	Exposure glass	Any document to be scanned in book mode is placed here.
2	Reflector	Reflects the light from the xenon lamp onto the document.
3	1st mirror	Reflects light from the document to the second mirror.
4	Lens	Focuses the light from mirrors #1, 2, and 3 onto the CCD on the SBU.
5	2nd mirror	Reflects light from the first mirror to the third mirror
6	3rd mirror	Reflects light from the second mirror to the lens.

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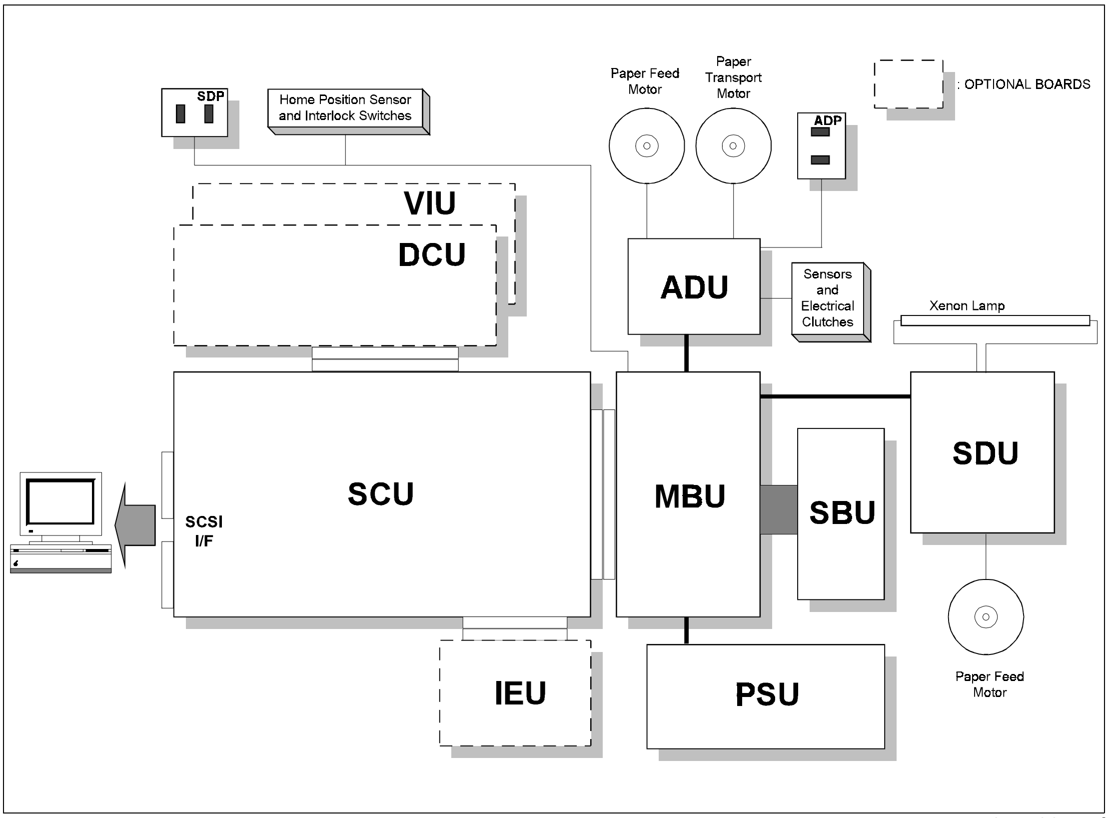
1.6. CONTROL SYSTEM OUTLINE



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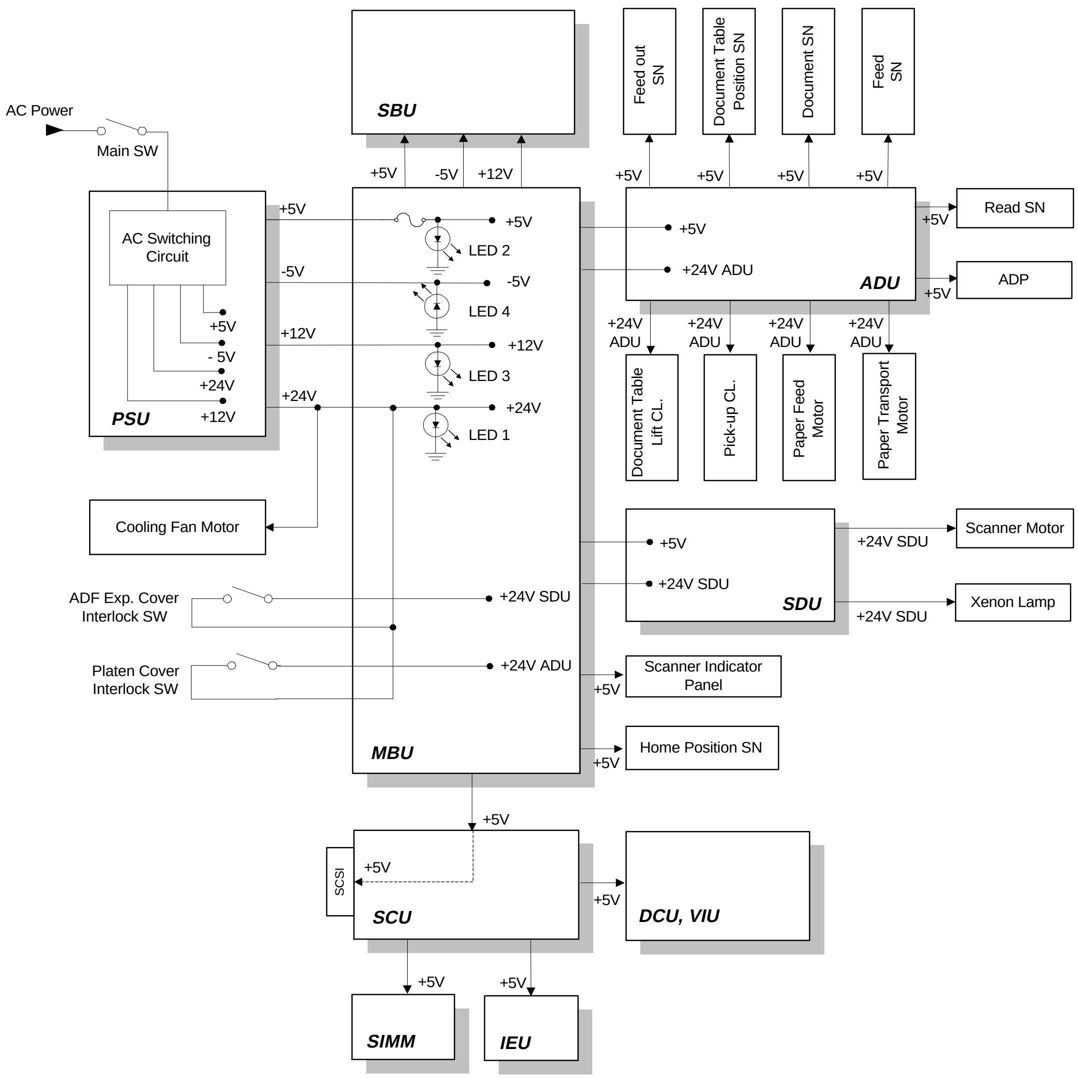
Name	Full Name	Function
SCU	Scanner Control Unit	This contains the scanner control cpu, the RAM, the ROM, and the SCSI controller.
MBU	Mother Board Unit	This contains a timing signal generator for the CCD basic drive clock.
SBU	Sensor Board Unit	This contains the CCD (charge-coupled device). After converting the analog video signal from the scanned image, it amplifies the signal and sends it to the MBU.
PSU	Power Supply Unit	This supplies +24V, ±5V, and +12V to the MBU.
SDU	Scanner Drive Unit	This controls the motors, lamp, and other components in the scanner.
SDP	Scanner Display Panel	This lights up green and orange LEDs to indicate the scanner condition.
ADU	ADF Drive Unit	This controls the motors, sensors, and other components in the ADF.
ADP	ADF Display Panel	This lights up green and orange LEDs to indicate the ADF condition.

Name	Full Name	Function
Options		
VIU	Video Interface Unit	This optional board speeds up the video interface.
DCU	Data Compression Unit	This is an optional board for compressing the scanned image data by methods known as MH, MR, and MMR.
IEU	Image Enhancement Unit	This carries out image processing functions.

1.7. POWER DISTRIBUTION



G404V500.wmf

The PSU supplies +24V, +5V, -5V, and +12V to the machine through the MBU.

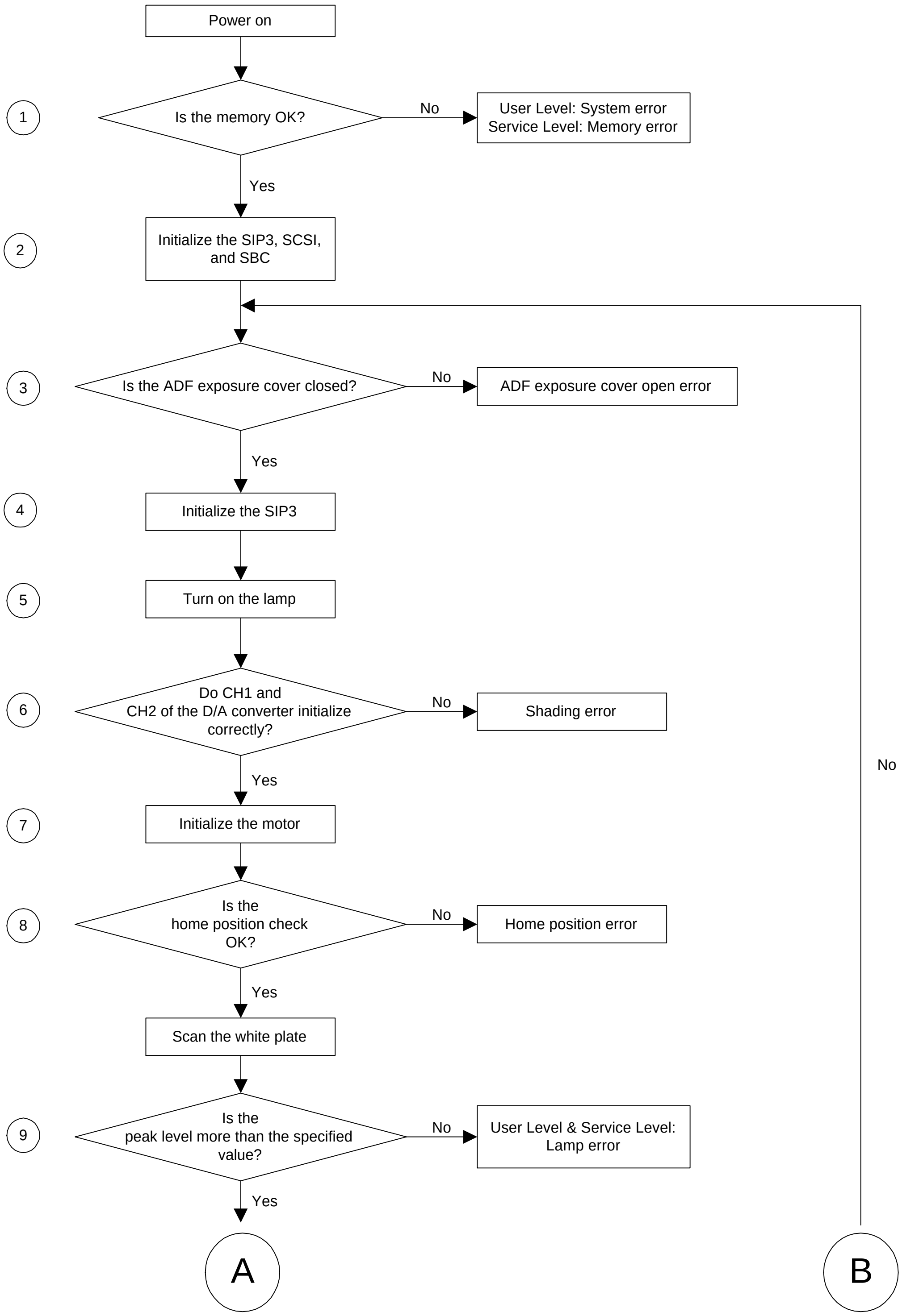
The ac switching circuit on the PSU generates one +24V supply. This supply also goes to the interlock switches. If the ADF exposure cover interlock switch is closed, the +24V SDU supply is generated, and this is supplied to the SDU board. If the platen cover interlock switch is closed, the +24V ADU supply is generated, and this is supplied to the ADU board.

The SCU board provides +5V terminator power to the SCSI connector.

There are four LEDs on the MBU (one on each power line) to indicate the condition of each power supply.

2. DETAILED SECTION DESCRIPTIONS

2.1. INITIALIZATION



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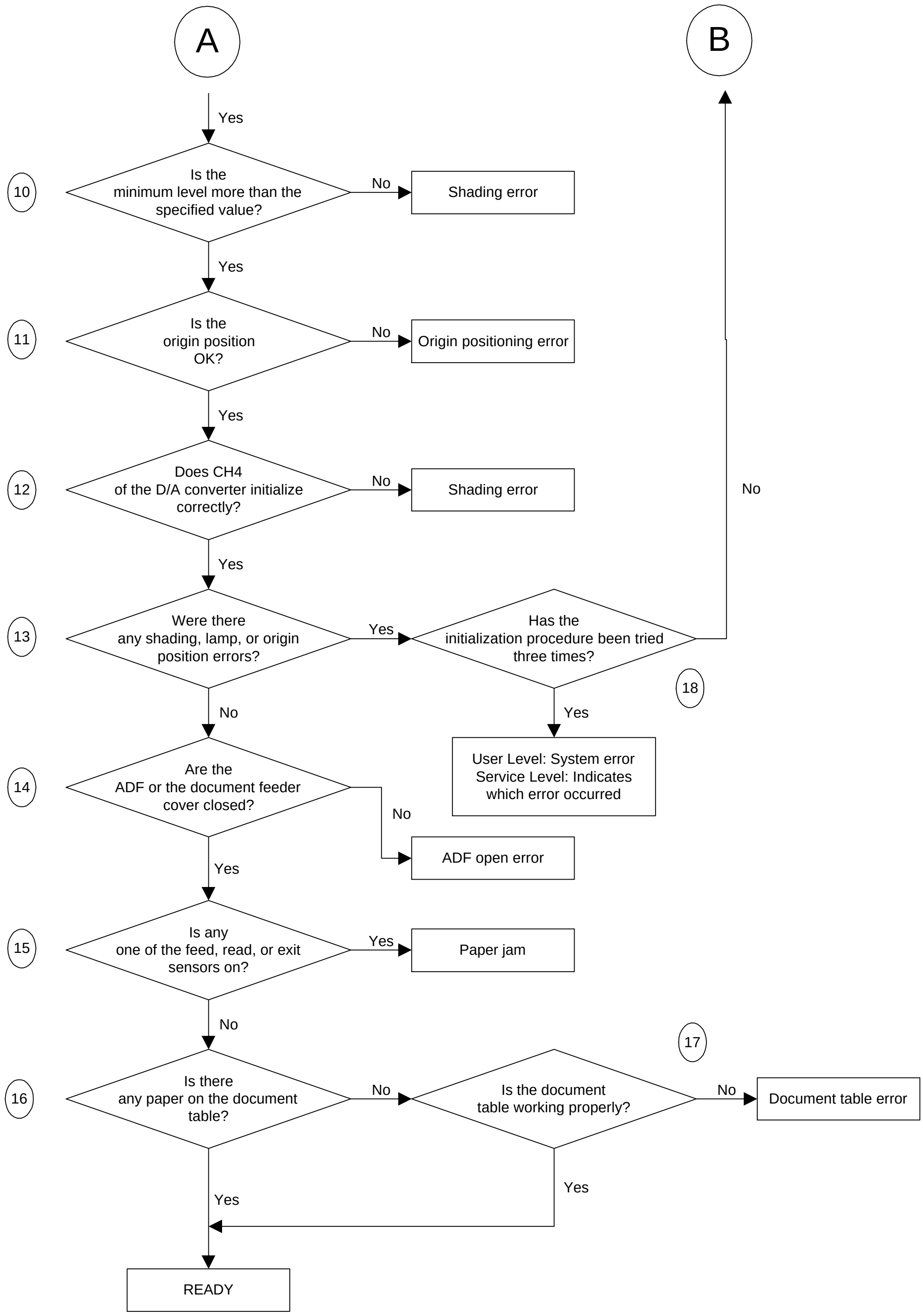


G404D512.wmf

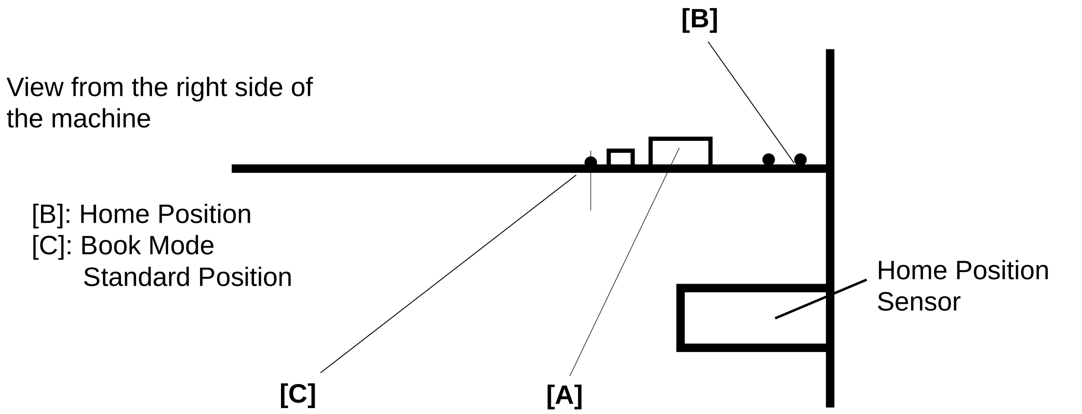
During power-up initialization, the scanner performs the following steps (refer to the flow chart on the previous page).

1. Checks the ROM checksum and makes a RAM read/write check.
2. Presets the main scan timing of the SIP3 (gate array for image processing), and initializes the SCSI controller and the SBC (Scan Buffer Controller).
3. Checks the ADF exposure cover switch signal. If the CPU detects that the cover is open, an ADF exposure cover open error occurs.
4. Sets the main scan timing to the default, and loads the gamma, dither, and error diffusion patterns into the SIP3.
5. Turns the xenon lamp on.
6. Adjusts the difference between the even and odd black levels by controlling the output level of channel 1 of the D/A converter. Adjusts the black level by controlling the output of channel 2 of the D/A converter. If the CPU cannot adjust them to the specified levels, the CPU determines that a shading error has occurred.
7. Initializes the scanner motor driver.
8. Checks the home position sensor signal timing while moving the carriages. If the CPU does not detect a signal change within the specified period, it determines that a home position error has occurred.
9. Checks the peak level of the auto gain control of the SIP3. If this value is below the specified value, the CPU determines that a lamp error has occurred.
10. Checks the minimum level of the white plate image data. If this value is below the specified value, the CPU determines that a shading error has occurred.
11. Looks for the origin mark within the specified area. If the CPU does not detect the origin mark, it determines that an origin positioning error has occurred.
12. Initializes channel 4 of the D/A converter. If the CPU fails to do this, it determines that a shading error has occurred.
13. If a shading error, lamp failure, or origin positioning error is detected during the above initialization process, the scanner retries the initialization up to three times. If the CPU detects an error at the third time (step 18), the CPU indicates a system error.
14. Checks the platen cover interlock switch signal. If the CPU detects that the switch is open, it determines that an ADF open error has occurred.

15. Checks the signals from the feed, read, and feed-out sensors. If any of them are on, the CPU determines that there is a paper jam.
16. Checks the document sensor signal. If a document is detected on the document table, check #17 is not performed.
17. Checks the document table position sensor signal timing while lifting and lowering the document table.
18. See step 13.

2.2. SCANNER PROCESS

2.2.1. Book Mode



G404D509.wmf

Basic Scanning Procedure

When the scan command is received from the host computer, the scanner starts scanning as explained in the following steps.

1. Initialization

The scanner checks the home position, scanner cover, and memory. If an error is detected, the scanner motor will stop.

The scanner scans the white plate [A] on the underside of the ADF exposure cover to perform the shading function.

2. Image Scanning

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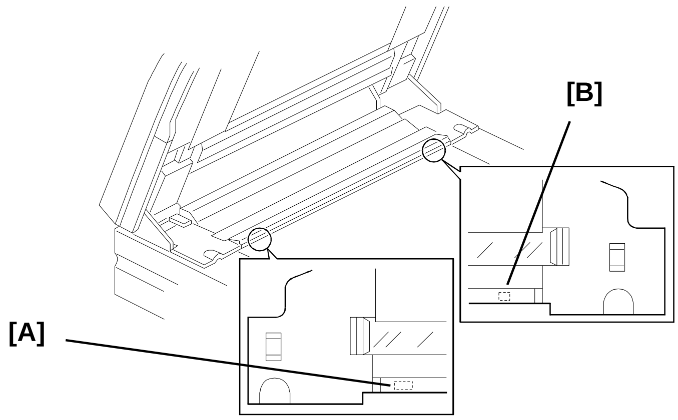

There are two rectangular black marks [A] and [B] (2 x 2 mm) for scanner position fine adjustment. The mark [A] is not used but the mark [B] is used for moving the carriage to the exact scan start position. At the start of scanning, the scanner moves from the scanner home position, and looks for the mark. The machine uses the black mark to move to the exact scan start position, which is nearby.

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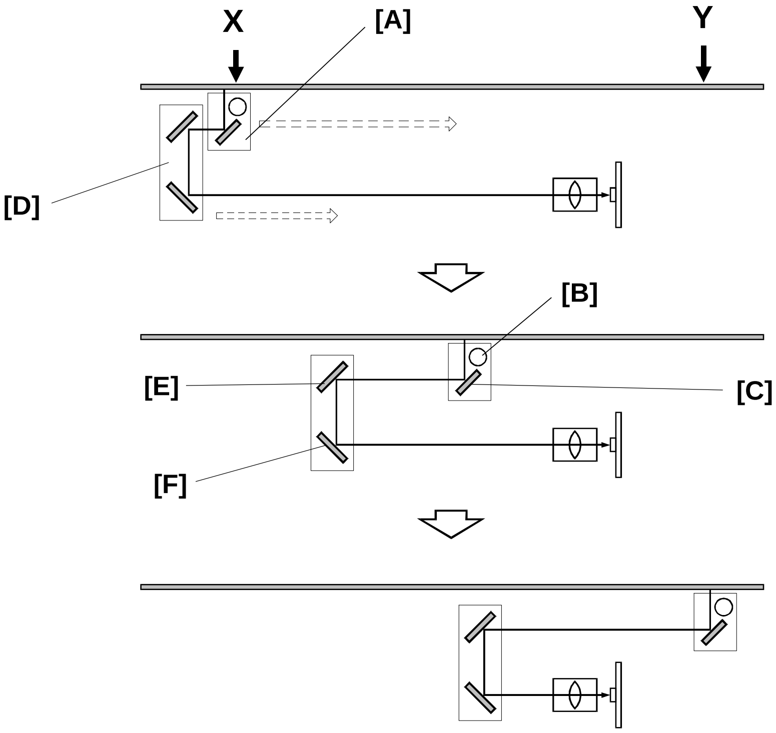
The scanner starts to scan the image area at the desginated position. The scanner stops after scanning the desginated image area.



g404d511.wmf

The lens focuses the image from the scanned original onto the CCD through the 1st, 2nd, and 3rd mirrors. The 1st carriage [A] which contains the xenon lamp [B] and 1st mirror [C], moves from X to Y to scan the original vertically. The 2nd carriage [D], which contains the 2nd [E] and 3rd [F] mirrors, moves to keep the distance between the document and the CCD constant.

3. Scanner Reversing

After the image has been scanned, the carriages return to the home position.

The carriages are stopped when the first carriage activates the home position sensor. If the scanner home position sensor is not activated within a certain time, a home position sensor error will occur.

Optional Steps

1. Size Detection

If selected, this is done after Initialization.

1-1. Main Scan Direction (Document Width)

The first carriage moves to the book mode standard position ([C] in the diagram at the start of section 2.2.1). Then, the scanner scans 5 mm from the book mode standard position.

The scanner determines the document width in the main scan direction from the output signal level. The edge of the document is detected by the difference between the level of the document data and the background signal which is provided by the silver plate attached to the platen cover across the main scan.

If there is a gap at the leading edge, such as a tear, extending more than 1 mm across the paper and more than 5 mm down the paper, the machine will not scan the document past this gap.

1-2. Sub Scan Direction (Document Length)

The scanner scans the maximum length.

The scanner determines the document length in the sub scan direction from the output signal level. The edge of the document is detected by the difference between the level of the document data and the background signal which is provided by the silver plate attached to the platen cover along the sub scan.

If there is a gap in the edge by the silver plate, such as a tear, extending more than 1 mm down the paper and more than 5 mm wide, the machine will not scan the document past this gap.

2. Read Size Command, Auto Size Mode

If selected, this is done after Initialization.

2-1. Read Size Command

If the scanner receives the Read Size Command in book mode, it detects the size in the main scan direction as described above.

The scanner sends the width data to the host computer.

2-2. Auto Size Mode

This mode can be set with the Set Window command, which is invoked by the driver software.

If the scanner is set in the Auto Size Mode with DIP switch #2 turned off (Pre Scan Mode), it detects the document size in both main and sub scan directions.

If the scanner is set in the Auto Size Mode with DIP switch #2 turned on (Standard Size Detection Mode), it detects the document size only in the main scan direction. The scanner determines that the document length is the same as for a standard paper size of the same width.
Note: The scanner always assumes the paper is in a lengthwise orientation (i.e., the main scan is the short side). Also, in USA models, if Letter width is detected, the paper is always assumed to be Letter size (the last few inches of a Legal-size original will not be scanned).

After detecting the document size, the scanner scans the detected area.

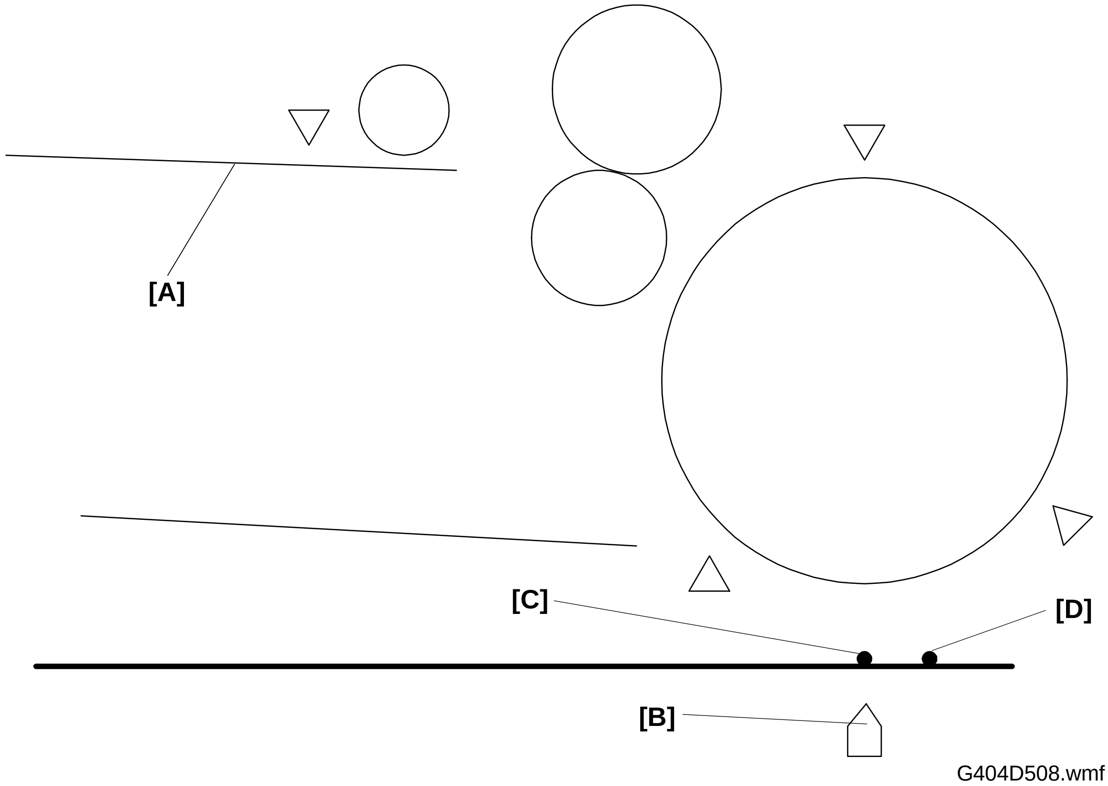
3. ABORT Command

This can occur at any time during the basic scanning procedure.

If the ABORT command is received during scanning, the scanner motor is stopped. Then the carriage returns to the home position ([B] in the diagram at the start of section 2.2.1).

If this command is received while the carriage is reversing or checking the home position, the operation is not interrupted.

2.2.2. ADF Mode



Basic Scanning Procedure

When the scanner receives the ADF scanning command, the scanner scans the original as described below.

1. Initialization

- ADF Mode -

The scanner performs the home position check and the shading process. If a home position error, ADF cover open, or memory error is detected, the carriages [B] will stop.

The first carriage moves to the ADF scanning position [C] from the scanner home position [D]. Then the paper transport motor starts.

- SADF Mode -

The scanner waits until the desginated time for the originals to be placed on the document table [A].

When the originals have been placed on the document table, the same procedure as for ADF mode is carried out.

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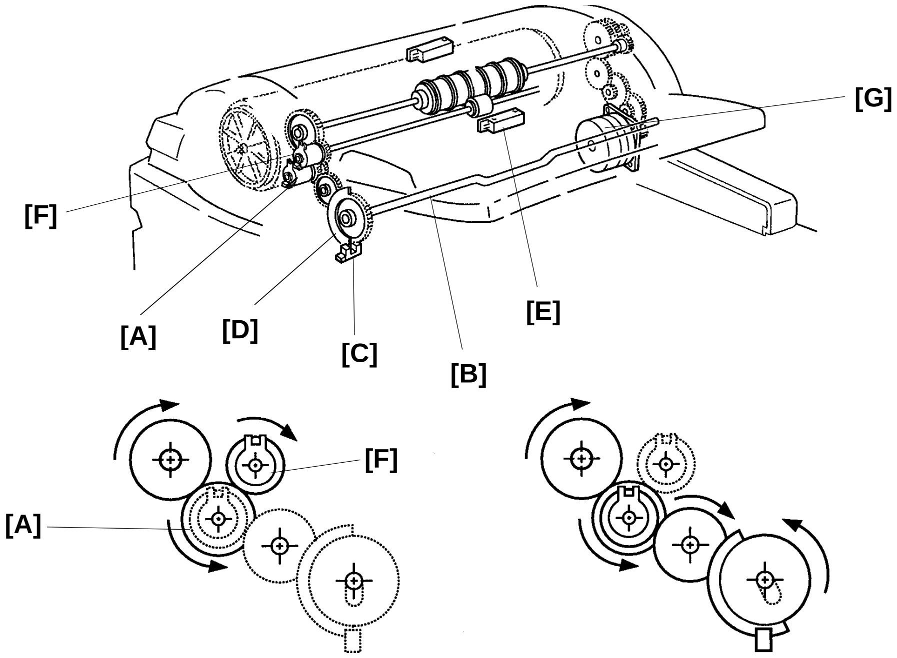
2. Document Table Lift



G404D510.pcx

The lift mechanism consists of the document table lift clutch [A], the lift shaft [B], the document table position sensor [C], and the sensor actuator on the gear [D].

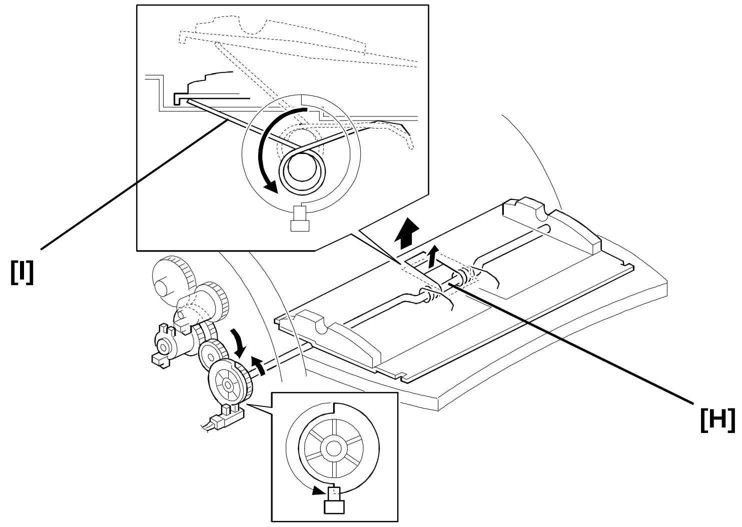
In standby mode, the bend in the lift shaft [H] is pointing downwards and the actuator is just inside the sensor (see the diagram on the next page).

When an original is placed on the document table, the document sensor [E] is activated. Then, the paper feed motor [G] turns on. At the same time, the document table lift clutch [A] turns on to rotate the lift shaft.

At this time, the actuator starts to turn anticlockwise, and the flat part of the spring [I] that is loosely attached to the bend in the lift shaft pushes up the document table (see the next page for a diagram).

When the top of the document stack is pushed up against the pick-up roller, it can rise no more. However, the mechanism continues to push up against the tray until a half-turn of the shaft has been completed (i.e., until the actuator leaves the document table position sensor). At that time, the document table lift clutch and the paper feed motor turn off. If the actuator does not leave the sensor within a certain time, a document table error will occur.

The feed motor turns on again at a motor speed which depends on the scanning resolution, and the pick-up clutch [F] turns on to feed the top sheet of the original (see Original Feed and Separation on the next page).

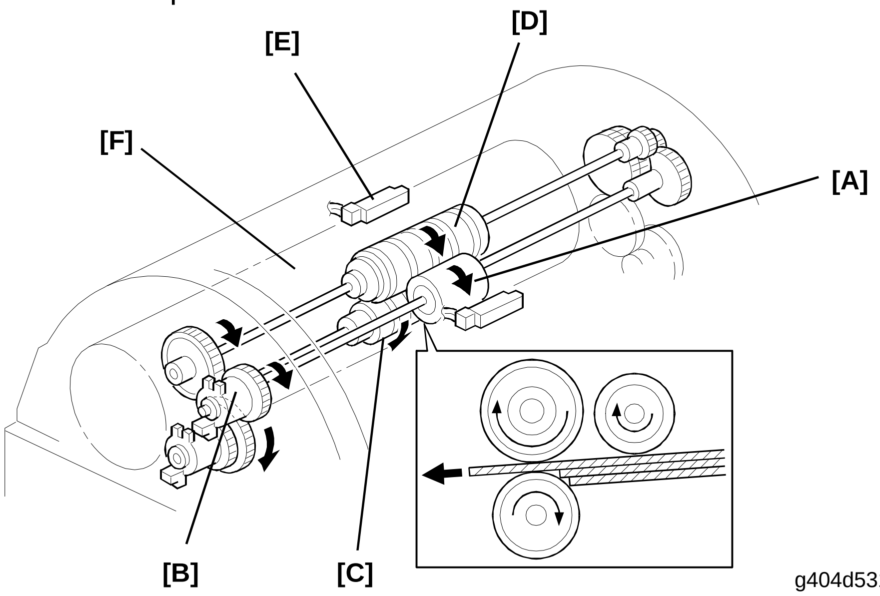


g404d532.wmf

When the first original is being fed, the bend in the lift shaft is pointing up, and the spring is at maximum compression. As sheets of the document are scanned, the spring pushes the document table upwards so that the top of the stack is always against the pick-up roller.

When all pages of the original have been fed out of the ADF, the document table lift clutch and paper feed motor are energized to lower the tray. They turn off when the document table sensor is deactivated. If the sensor is not deactivated within the desginated time, a document table error will occur.

3. Original Feed and Separation



g404d531.wmf

To feed the original, the paper feed motor and the paper transport motor (which drives the paper transport drum) turn on. The paper feed motor drives the pick-up roller [A] through a train of gears and the pick-up clutch [B]. The pick-up clutch turns on to feed the top sheet of the original. If the pick-up roller feeds multiple pages of the original, these pages are separated by the separation roller [C] and the feed roller [D] (the separation mechasnism is friction-based).

When the leading edge of the original activates the feed sensor [E], the paper feed motor and the pick-up clutch turn off. then the original is fed by the paper transport drum [F] to the scanning position.

4. Image Scanning

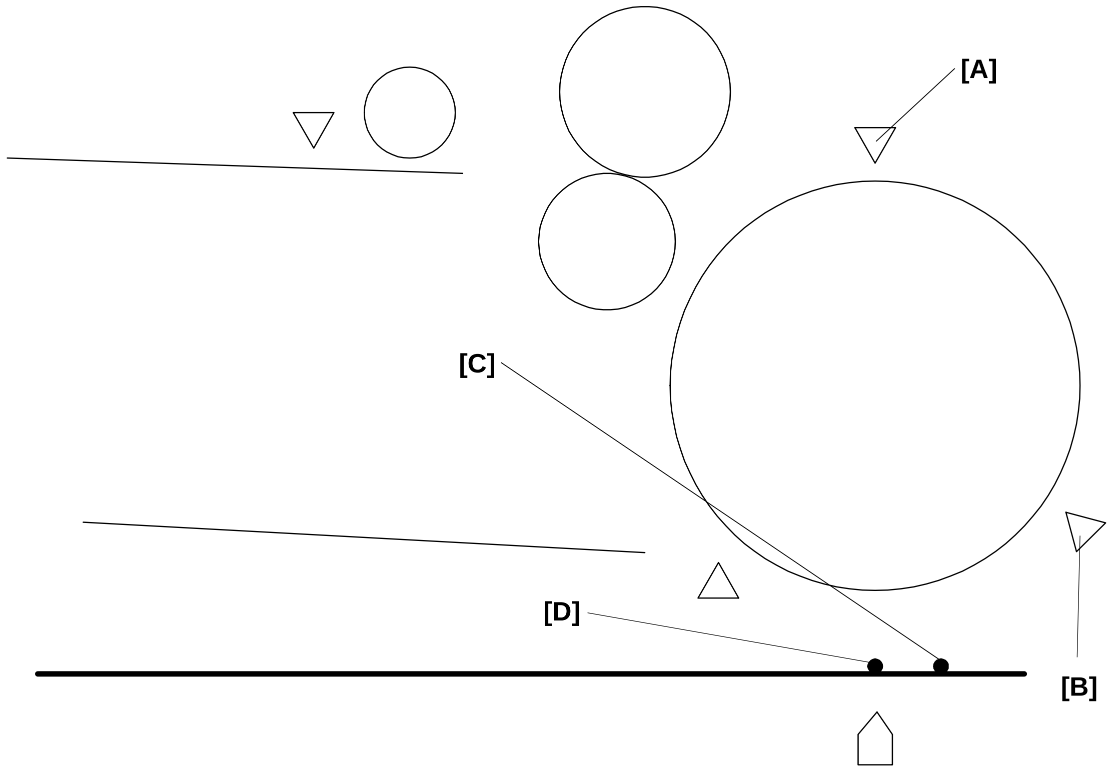
The scanner starts to scan the image when the leading edge has passed the read sensor by a certain distance (measured by motor pulses).

5. Scanning End

When the cpu has fed the trailing edge of the original 30 mm past the feed out sensor, the transport motor turns off.

Optional Steps

1. Size Detection



G404D508.wmf

If selected, this is done after document table lift/paper feed

1-1. Main Scan Direction (Document Width)

First of all, the original is fed to the scan ready position between the read sensor [B] and the size detection position [C]. Then the first carriage moves to the size detection position [C] from the ADF scanning position [D]. After that, the original is fed to the ADF scanning position.

As a result of the above operation, the original is fed 5 mm past the first carriage. During this operation, the CPU detects the original width. The edge of the document is detected by the difference between the level of the document data and the background level which is provided by the black bracket located over the ADF exposure cover.

If there is a gap at the leading edge, such as a tear, extending more than 1 mm across the paper and more than 5 mm down the paper, the machine will not scan the document past this gap.

After finishing the above operation, the first carriage returns to the ADF scanning position.

1-2. Sub Scan Direction (Document Length)

The length of the original is calculated by counting the motor pulses while the feed sensor [A] is on. (The length is detected during scanning.)

2. Read Size Command, Auto Size Mode

If selected, this is done after document table lift/paper feed

2-1. Read Size Command

If the scanner receives a Read Size Command in ADF mode, it detects the document size in the main scan direction as described above.

The scanner sends the width data to the host computer.

2-2. Auto Size Mode

This mode can be set with the Set Window command, which is invoked by the driver software.

If the scanner is set in the Auto Size Mode, it detects the document size only in the main scan direction. After this width detection, the scanner starts scanning the detected width.

The scanning length is determined by the detected length.

3. Abort and Unload commands

These can occur at any time during the basic scanning procedure.

When the cpu receives the Abort or the Unload command during paper transport, the scanner feeds out any original that is in the ADF.

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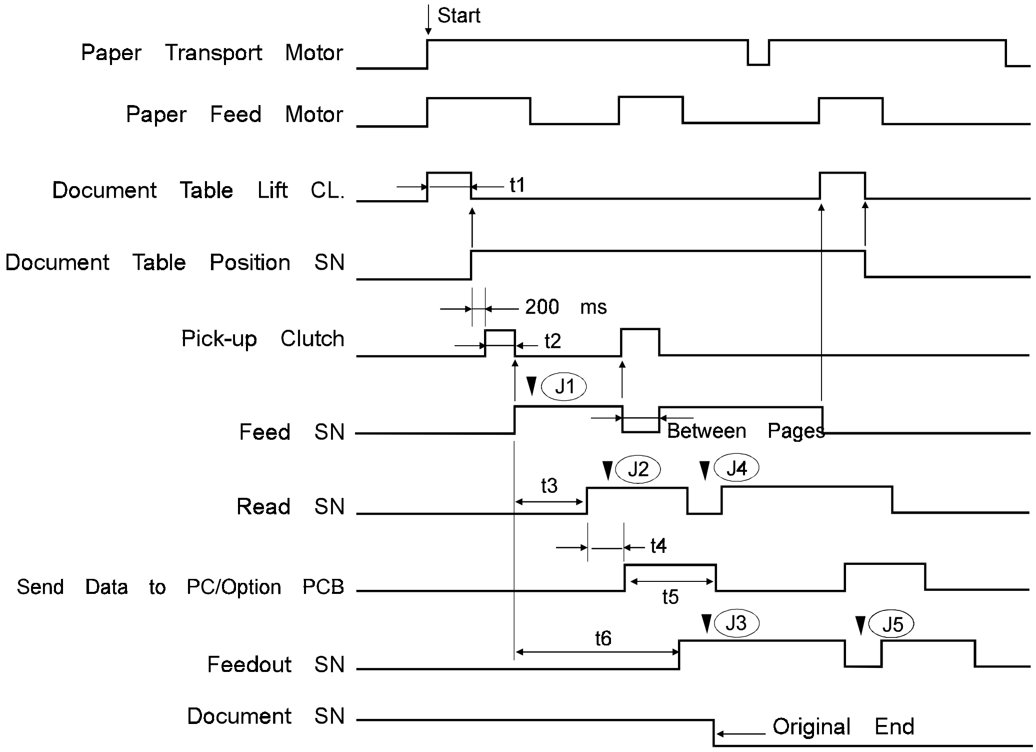
2.3. PAPER MISFEED DETECTION



NOTE: t* depend on the line speed and original size.
G404D500.wmf

	t 1 (s)	t 2 (s)	t 3 (s)	t 4 (s)	t 5 (s)	t 6 (s)	t 7 (s)
200 dpi A4 lengthwise, 8 1/2" x 11" Binary picture processing	Within 3	Within 3	0.33	0.29	1.24~ 1.31	1.2	0.26
400 dpi A3 lengthwise, 11" x 17" Binary picture processing	Within 3	Within 3	0.66	0.58	3.51~ 3.64	2.4	0.51~ 0.52
800 dpi A4 sideways Grayscale processing	Within 9	Within 9	3.95	3.47	10.5~ 11.3	14.3	3.06~ 3.12

J1: The leading edge of the original does not reach the feed sensor within 3 s (binary picture processing) or 9 s (grayscale processing) after the document table has been lifted up.

J2: The leading edge of the original does not reach the read sensor within the time required for feeding the distance between the feed sensor and the read sensor + 30 mm.

J3: The leading edge of the original does not reach the feed out sensor within the time required for feeding the distance between the feed sensor and the feed out sensor + 30 mm.

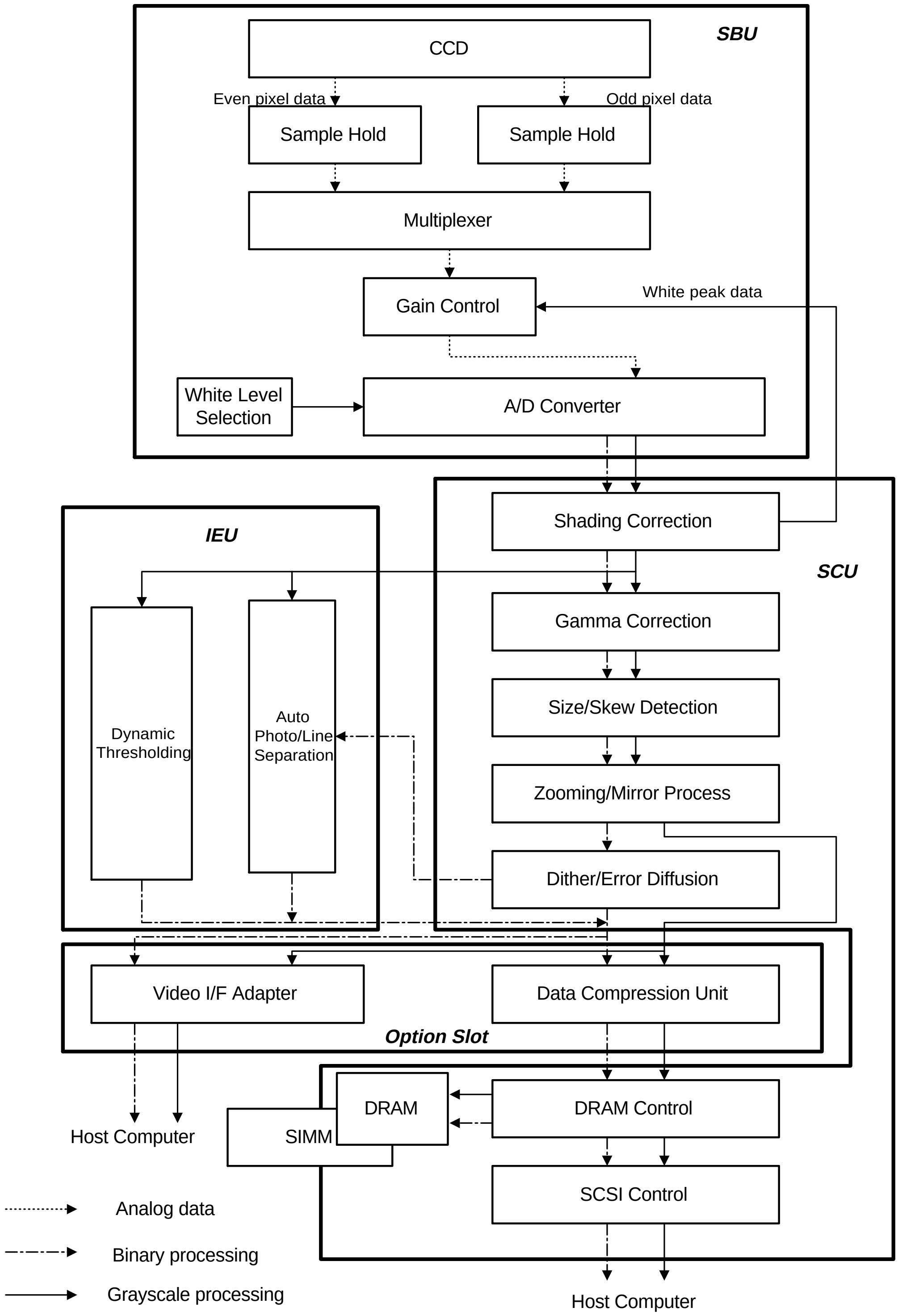
J4: The trailing edge of the original does not pass through the read sensor within the time required for feeding the original length + 30 mm after the feed sensor has been activated.

J5: The trailing edge of the original does not pass through the feed out sensor within the time required for feeding the original length + 30 mm after the feed sensor has been activated.

If an original jam or an original non-feed are detected, the paper transport motor, paper feed motor, and the xenon lamp turn off. Then, the appropriate LEDs inform the user of the machine’s status.

If an original remains in the ADF, the original is fed out and the paper transport motor stops.

2.4. VIDEO DATA PATH



G404D502.wmf

1. CCD

The CCD converts the light reflected from the original into an analog signal. The CCD contains a row of 5,000 pixels at a resolution of 400 dpi (15.7 lines/mm).

The CCD has two output lines, for odd and even pixels.

2. Sample Hold

The sample hold circuit removes noise which is generated when the CCD converts light to an analog signal.

3. Multiplexer

This merges the odd and even pixel analog signals from the CCD.

4. Gain Control

The output from the multiplexer is amplified. The gain range of the amplifier is controlled by the CPU on the SCU board by monitoring the feedback signals from the shading correction circuit.

5. A/D Conversion

The amplified analog signals are converted to 8-bit digital signals. This gives 256 gradations for each pixel.

6. Shading Correction

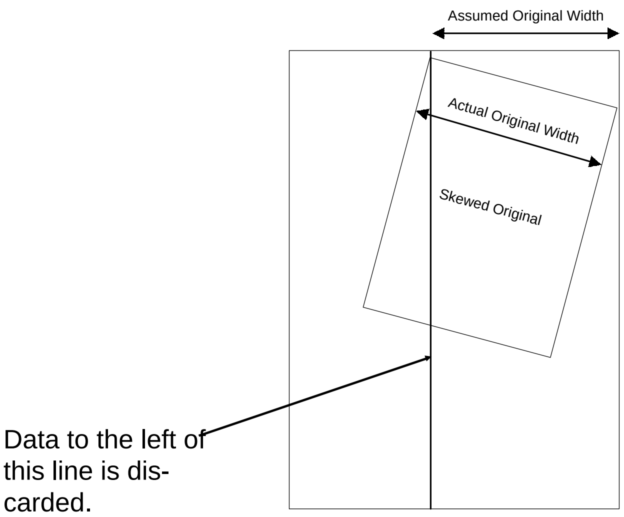
The machine scans the white plate opposite the ADF exposure glass to make a white waveform. Shading correction prevents uneven images caused by fluctuations in scanned data due to changes in light intensity and CCD sensitivity.

7. Gamma Correction

The gamma curve corrects the response of the CCD to grayscales on the original.

8. Size/Skew Detection

Size Detection: This is explained in the Scanner Process section.
Skew Detection (ADF mode only): The machine notes the pixel location across the main scan that data first appears. The machine determines whether the original is skewed by looking at the data either side of this point on subsequent main scans. The original width is taken to be the distance between the vertical scale and that point, so if the original is skewed, this is not the same as the actual original width, and the CPU discards data from outside this assumed original width.



g404d514.wmf

9. Zooming Processing

Reduction and enlargement in the sub scan direction are done by changing the scanner speed. However, reduction and enlargement in the main scan direction are done by the software.

10. Mirror Processing

A mirror image of the original must be made for output.

11. Dithering

Dither processing produces good quality grayscale images of photo originals.

12. Error Diffusion

The error diffusion process reduces the difference in contrast between light and dark areas of a halftone image. Each pixel is corrected using the difference between it and the surrounding pixels. The corrected pixels are then compared with a matrix table.

After video processing, the data goes to the host computer through the DRAM and SCSI controllers.

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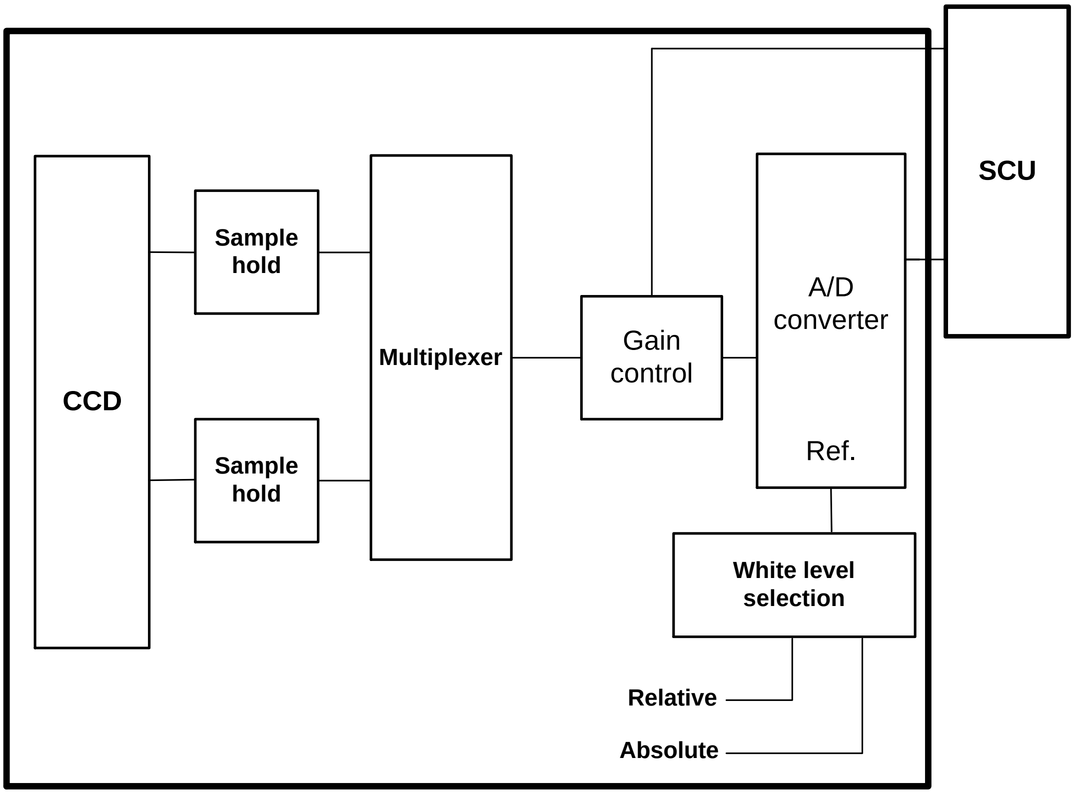
2.5. PCBs AND THEIR FUNCTIONS

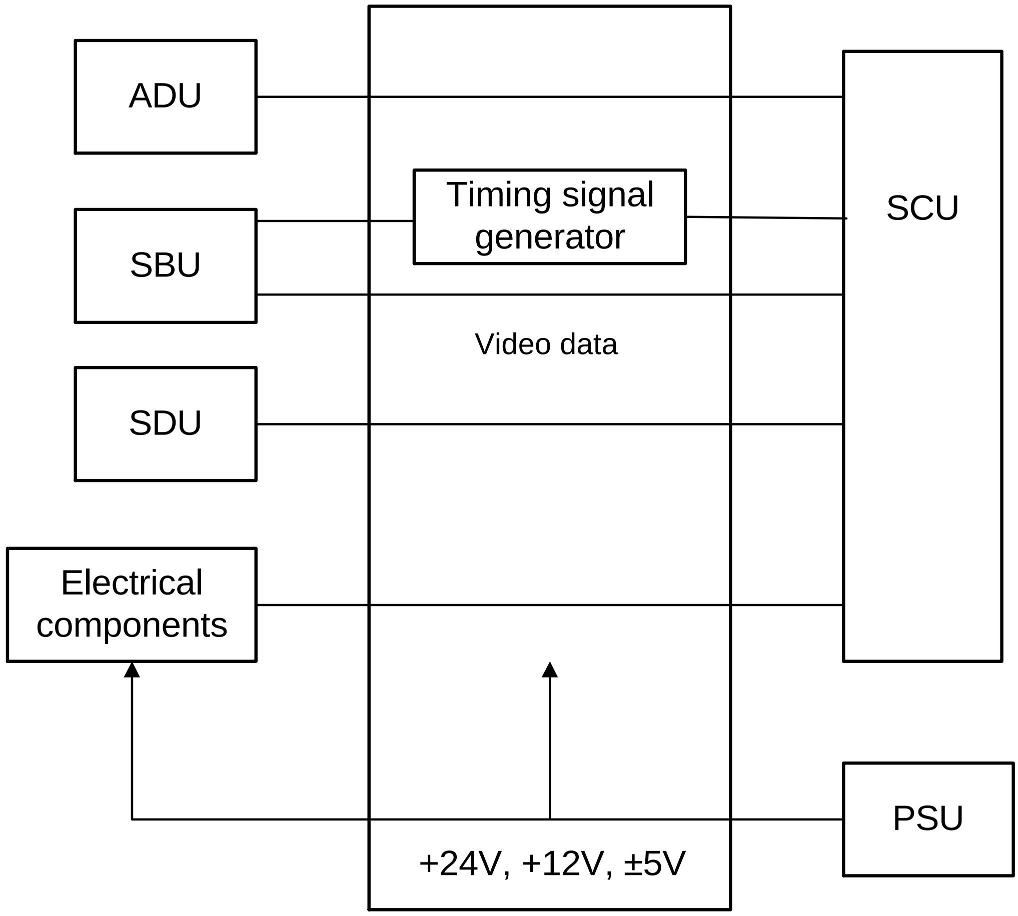
2.5.1. SBU (Sensor Board Unit)



G404D505.wmf

The light reflected from the document is picked up by the CCD (Charge Coupled Device) and converted into an electrical signal. The CCD sends both odd and even pixel video signals to the multiplexer, where these signals are merged. The signal is amplified and digitized then sent to the SCU.

2.5.2. MBU (Mother Board Unit)



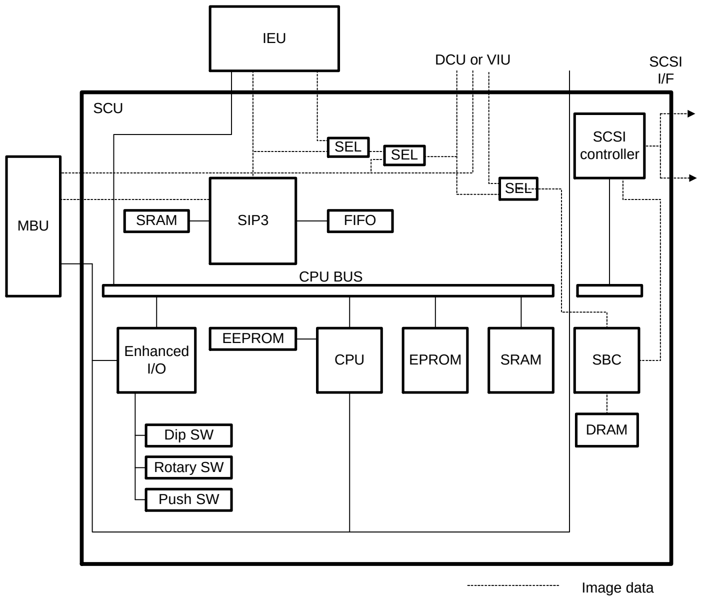
G404D504.wmf

The MBU passes signals between boards and generates the timing clocks for the CCD.

The MBU has four LEDs (LED1~LED4) on the dc power lines. The relationship between the LEDs and the dc power is as follows.

LED1	+24V
LED2	+5V
LED3	+12V
LED4	-5V

2.5.3. SCU (Scanner Control Unit)



G404D506.wmf

The image data from the SBU goes to the SCU through the MBU. Image processing on this data is done in the SCU. Then the data goes to the host computer through the SCSI interface (SCSI I/F). The functions of each component are as follows.

SIP3 (Scanner Imageing Peripheral):

- Generates the basic drive clock for the CCD.
- Shading correction
- Image processing (Mirror image, Reproduction ratios, MTF correction, Binary picture processing, Edge extraction, and so on)
- The connected FIFO (5 kbytes x 4) is used for line memory.
- The connected SRAM (8 kbytes x 3) is used as an image data buffer.

SBC (Scan Buffer Controller):

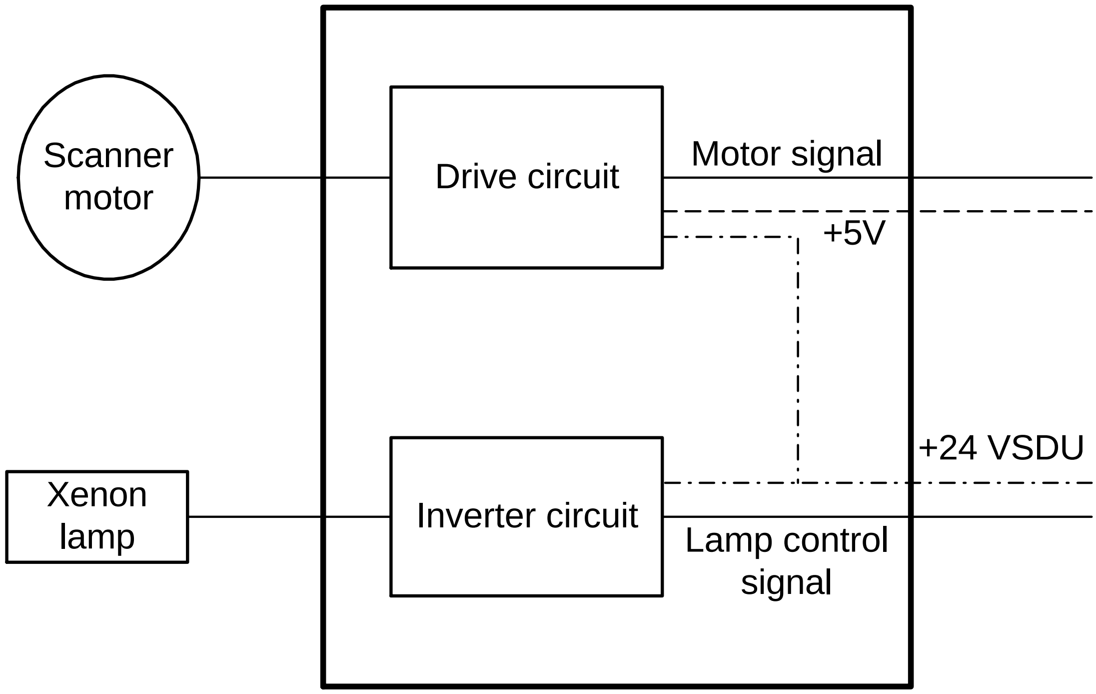
- Stores the image data from the SIP3 in the memory (DRAM 512 kbytes x 2).
- Address control when recalling the data from the memory.

SCSI controller: SCSI Interface controller.
SRAM: Work area (32 kbytes)
EPROM: Contains the program.
Enhanced I/O:

- Extension for the I/O port.
- DIP switches (mode selection), rotary switches (SCSI ID setting), and a push switch (reset button) are connected.

EEPROM: Holds the book, ADF, and lamp counter values.

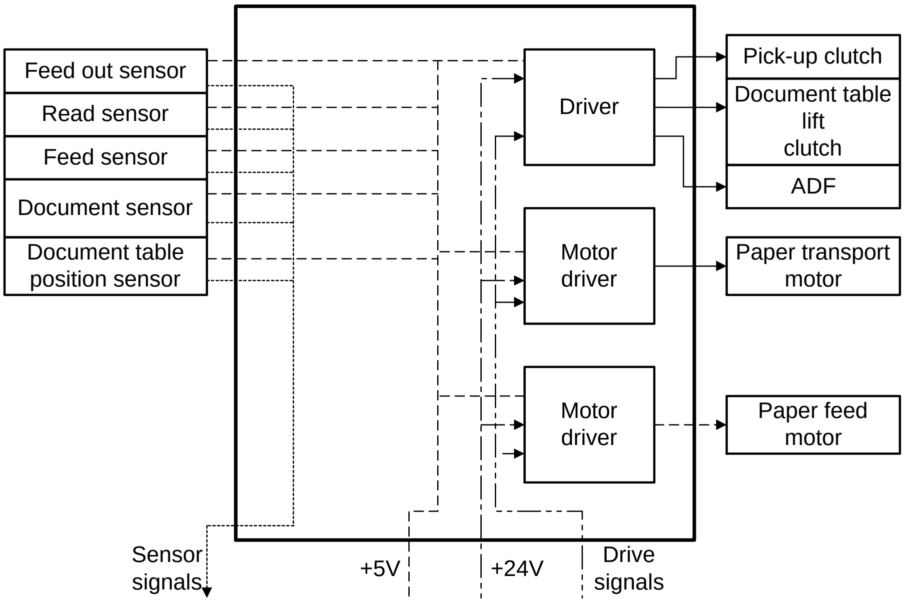
2.5.4. SDU (Scanner Drive Unit)



G404D507.wmf

The SDU contains the drive circuits for the scanner drive motor and the xenon lamp. The control signals such as drive, rotating direction, and drive current for the scanner motor come from the SCU through the MBU. Also, the control signal for the xenon lamp comes from the SCU through the MBU.

2.5.5. ADU (ADF Drive Unit)



G404D503.wmf

The ADU controls the motors, clutches, and the indicators on the ADP board. Also, it informs the sensor status to the SCU.

The SCU generates the control signals for each electrical component, then these are sent to the ADU through the MBU. The drivers on the ADU convert the control signals into drive pulses for the motors.

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3. INSTALLATION

3.1. ENVIRONMENT

Please observe the following precautions in order to ensure safe operation of the scanner and to realize its full performance.

- Do not use the scanner in any location that is exposed to direct sunlight.
- Do not use the scanner in any location that is exposed to frequent vibration.
- Do not expose the scanner to open flame, excessive humidity, or high temperatures.
- Do not expose the scanner to dusty or corrosive atmospheric conditions.
- Ensure that the area in which the scanner is used is well ventilated.
- Make sure that the surface on which you place the scanner is stable and level.

3.1.1. Environmental Conditions

Temperature	**Humidity**
10 to 32 °C (50 to 90 °F)	20 to 80 %

3.1.2. Space Requirements

- The following are the minimum space requirements to ensure proper ventilation and operation.

Space				
Behind	Right	Left	Front	Height
15 cm (5.5 ins)	**2 cm (0.8 ins)**	**2 cm (0.8 ins)**	**For operating**	**50 cm (20 ins)**

3.2. INSTALLATION PROCEDURES

Please refer to the operator's manual for details.

3.2.1. Before Connecting the Power Cables

The PSU (Power Supply Unit) automatically recognizes the input voltage.

- Input voltage: 100 to 120 / 220 to 240 V ac
- Input frequency: 50 / 60 Hz

I WARNING
Please note that using a supply voltage other than specified above may damage the scanner or reduce its operating life.

3.3. PACKING

When transporting the scanner, do the following.

3.3.1. Power Cord

1) Make sure that the power switch is off.

2) Pull out the power cord from the wall outlet.

3) Pull out the power cord from the scanner.

4) Coil the power cord and place it into the inner box.

3.3.2. Packing

Move the carriage to its home position (this locks it into position).

Set the shipping pads on the right and left of the scanner, then place the scanner in the shipping carton.

Please refer to the installation section in the operator's manual for details.

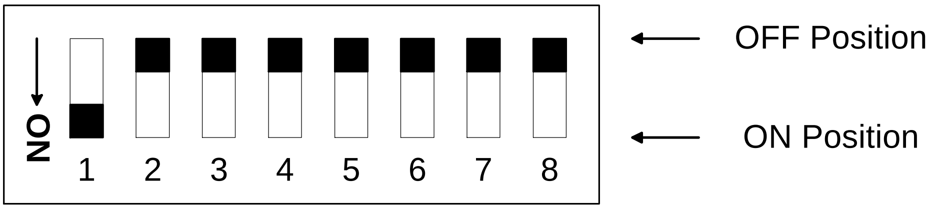
4. SERVICE LEVEL FUNCTIONS

4.1. DIP SWITCH SETTINGS

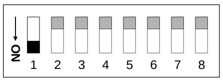
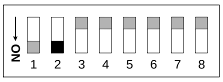
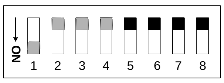
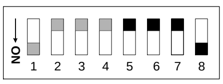
The factory default position of the dip switches is indicated in the diagram below.

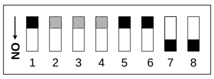
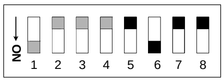
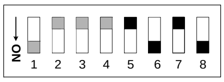
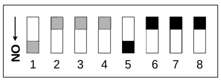
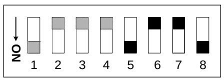
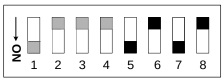
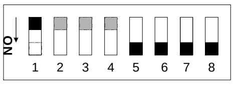
After changing a dip switch setting, either switch the power off and then on again, or press the reset switch.

g404m500.wmf



Dip Switch Setting Table

Dip Switch	Item	Contents
	Reset switch	OFF: Reset switch disabled ON: Reset switch enabled
	Paper size detection method in auto size mode	OFF: Detected by pre scan (width and length both measured) ON: Detected by scanning the original width and assuming a length (Note: The width is assumed to be the short side, so, for example, A5 sideways will be scanned as A4 lengthwise)
Do not adjust switches 3 and 4. These are for factory use only.		
Service level test modes		
	Various tests for the scanner are carried out using dip switches 5 to 8. Within each test mode, tests are selected by turning the SCSI ID rotary switch, and the machine's condition is indicated by the four LEDs on the covers. Note the position of the SCSI ID rotary switch before you change it. To return to normal operation mode after testing, switch dip switches 5 to 8 all off, return the rotary SCSI switch to its operating position, then press the reset button.	
	Demonstration mode	Scanner demonstration in book and ADF modes; Refer to Table A later in this section.

Dip Switch	Item	Contents
	Component test mode	Each component can be tested; refer to Table B later in this section. **DIP Switch 1 must be OFF.**
	Sensor test mode	Each sensor can be tested; refer to Table C later in this section.
	Self diagnostic mode	Results of the diagnosis are indicated through a combination of the LEDs on the covers; refer to Table D later in this section and "Troubleshooting" in section 6.
	ADF counter indication	The number of pages scanned in ADF mode is indicated through a combination of the SCSI rotary switch position and the LEDs; refer to Table E later in this section. (Unit= 1 sheet, Max. value= 2500K sheets)
	Book mode counter indication	The number of pages scanned in book mode is indicated in the same way as described above for ADF mode; refer to Table E later in this section. (Unit= 1 sheet, Max. value= 1000K sheets)
	Xenon lamp on time indication	The total illumination time of the lamp is indicated in the same way as above. (Unit= 1 hour, Max. value= 3000 hours)
	EEPROM reset mode	After the dip switches are set to on, and the reset switch is held down for more than 3 seconds, all LEDs are turned off, and the data stored in the EEPROM is cleared. (The EEPROM contains the book mode, ADF mode, and xenon lamp counter data.) **DIP Switch 1 must be OFF.**

NOTE: If you change the position of the SCSI rotary switch during these tests, be sure to put it back to the original position after you have finished.

Table A: Demonstration Mode

Rotary Switch No.	Contents
0	200 dpi scan in book mode
1	400 dpi scan in book mode
2	200 dpi scan in ADF mode *[1]
3	400 dpi scan in ADF mode *[1]
4	200 dpi scan in ADF mode *[2]
5	400 dpi scan in ADF mode *[2]
6	ADF free run *[3]
7	Not used
8	Not used
9	Not used

*[1]: The motor stops just before the paper is scanned.
*[2]: The motor does not stop before the paper is scanned.
*[3]: The scanner drives the ADF without any documents.
Note: During the demonstration, the LEDs indicate the machine status as usual. But if an error occurs during the demonstration (e.g. mis-feed, jam, etc.), the scanner stops, and the LEDs indicate the error condition.

Table B: Component Test Mode

Rotary Switch No.	Contents
0	All components off
1	Lamp on/off *[1]
2	Not used
3	Clutches on/off *[2]
4	Not used
5	Not used
6	Not used
7	Not used
8	Not used
9	Not used

*[1]: When the reset switch is pressed to start the test, the lamp turns on and off repeatedly.
*[2]: When the reset switch is pressed to start the test, the following operations are carried out.

Doc. table lift clutch on / Pick-up clutch on → Doc. table lift clutch off / Pick-up clutch on → Doc. table lift clutch off / Pick-up clutch off → (back to) Doc. table lift clutch on / Pick-up clutch on

Note: Dip Switch 1 must be off for the component test mode.

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Table C: Sensor Test Mode

Rotary Switch No.	Contents
0	Document Sensor
1	Feed Sensor
2	Read Sensor
3	Feed Out Senor
4	ADF Exposure Cover Interlock Switch
5	Platen Cover Interlock Switch
6	Home Position Sensor
7	Document Table Position Senor
8	Not used
9	Not used

If the selected sensor is on, all LEDs turn on. If the selected sensor is off, all LEDs turn off.

Table D: Self Diagnostic Mode

The following error conditions are indicated by a combination of four LEDs.

Error Items	Scanner LEDs		ADF LEDs	
	Amber	Green	Amber	Green
Memory error	--	Blinking	--	--
Shading error	Blinking	--	--	--
Origin positioning error	Blinking	Blinking	--	--
Lamp failure	Blinking	Blinking	On	On
Document table error	--	On	Blinking	Blinking
Home position error	Blinking	Blinking	On	Blinking

On = LED on, Blinking = LED Blinking, -- = LED off

Table E: Counter Indication Mode

Rotary Switch Table

Rotary Switch No.	Contents
0	Not used
1	Units
2	Tens
3	Hundreds
4	Thousands
5	Ten thousands
6	Hundred thousands
7	Millions
8	Not used
9	Not used

LED Indication Table

Counter Value	Scanner LEDs		ADF LEDs	
	Green	Amber	Green	Amber
0	--	--	--	--
1	--	--	--	On
2	--	--	On	--
3	--	--	On	On
4	--	On	--	--
5	--	On	--	On
6	--	On	On	--
7	--	On	On	On
8	On	--	--	--
9	On	--	--	On

On = LED on -- = LED off

Service Tables

Use the rotary switch to select a digit of the counter. The value of the selected digit is indicated by a combination of the four LEDs. For the LEDs, "ON" represents a 1 and "OFF" a 0. The four LEDs are read off as a four-bit number.

Example:

Rotary switch no	LED condition (scanner green, amber, ADF green, amber)		
1 (units)	(ON, OFF, OFF, OFF)	= 1000	= 8
2 (tens)	(OFF, OFF, ON, ON)	= 0011	= 3
3 (hundreds)	(OFF, ON, OFF, ON)	= 0101	= 5
4 to 7	(OFF, OFF, OFF, OFF)	>>> Total counter value= 538 sheets	

4.2. PCBs

SCU

LED1	+5V	SW1	Reset Switch
LED2	+5VG	SW2	DIP Switches
		SW3	SCSI Rotary Switch

SDU

F2 1.25A, 250V

JP1 Do not change the position of this jumper.

MBU

LED1	+24V	TP1	COM
LED2	+5V	TP2	PHSH (base CCD clock)
LED3	+12V		
LED4	-5V	F1, F2	5A, 250V

SBU

VR1 to VR4 See Appendix B: Electrical Adjustments

4.3. SPECIAL TOOLS

Part Number	Part Name
G4049000	Scanner Positioning Tool (2 pcs/set)
G4049002	Optical Adjustment Harness (Jig Harness)
G4049001	Optical Adjustment Glass (Jig Glass)
A0129110	Resolution Chart
G4049003	RS-13 Chart (A5)
G4049005	RS-13 Chart (A4)
G4049004	RS-13 Chart (A3, 55 kg)
G4049006	RS-13 Chart (A3, 90 kg)
H2039114	RS-12 Chart (A3)
G4043102	White Sheet

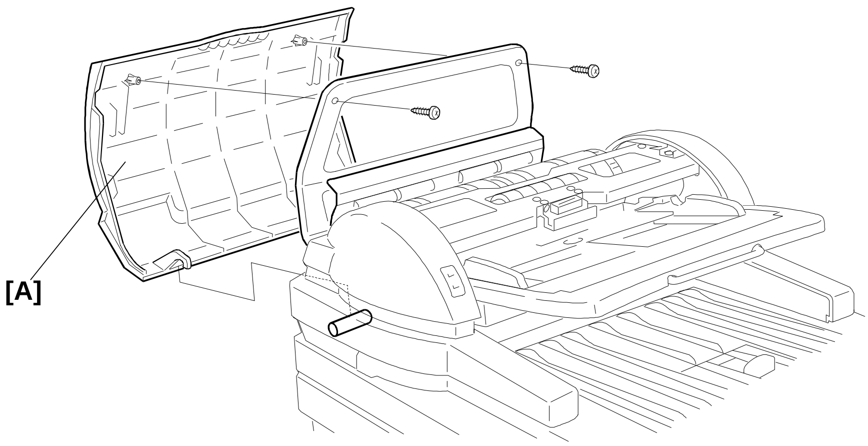
5. REMOVAL AND REPLACEMENT

CAUTION:

Before starting disassembly, be sure to turn off the main switch and disconnect the power cord and interface cable(s) for safety.

5.1. COVERS

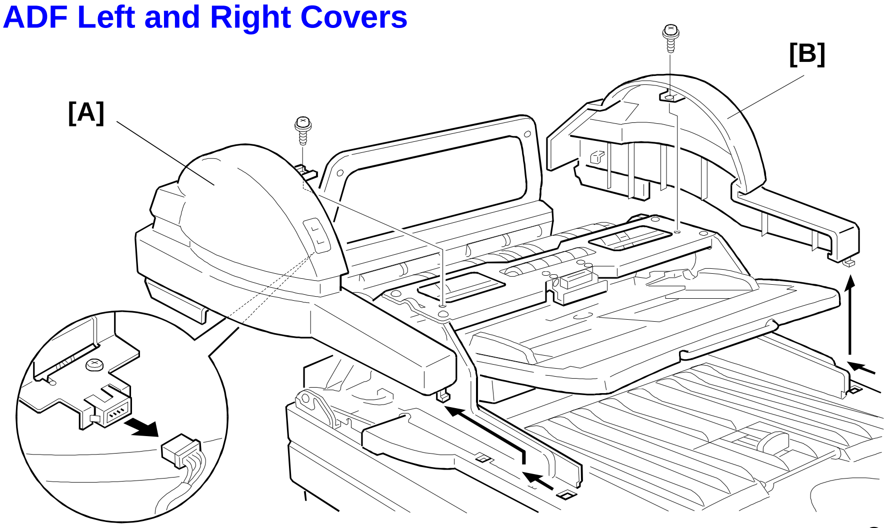
5.1.1. ADF Upper Cover



G404R500.wmf

[A]: ADF Upper Cover (2 screws)

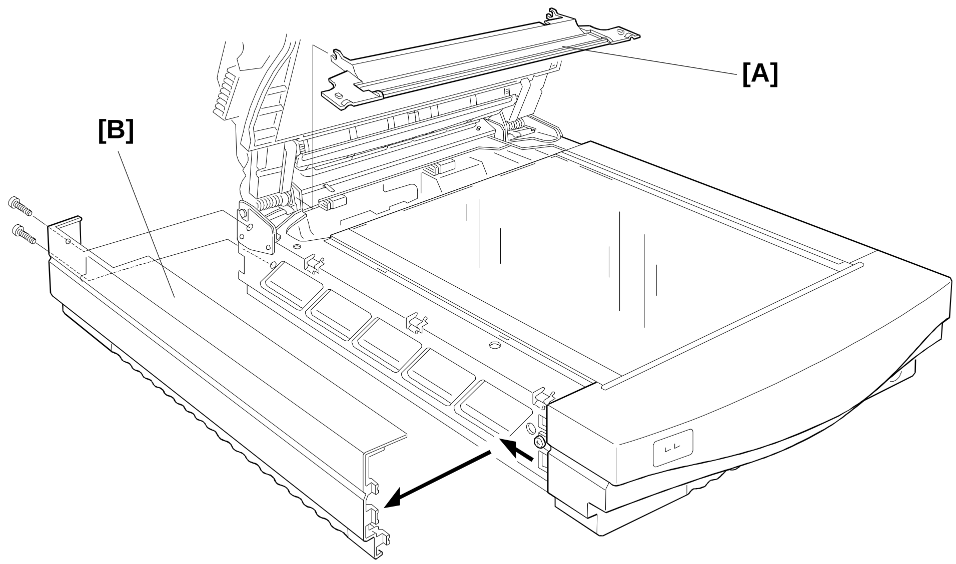
5.1.2. ADF Left and Right Covers



G404R501.wmf

[A]: ADF Left Cover (1 screw; 1 connector)
[B]: ADF Right Cover (1 screw)

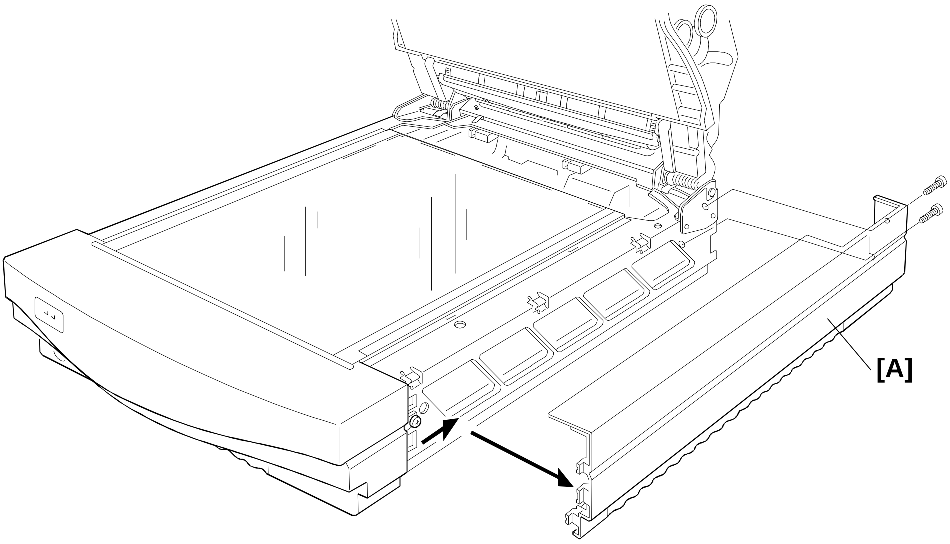
5.1.3. Left Cover



G404R502.wmf

[A]: ADF Exposure Cover
[B]: Left Cover (2 screws)

5.1.4. Right Cover



G404R503.wmf

[A]: Right Cover (2 screws)

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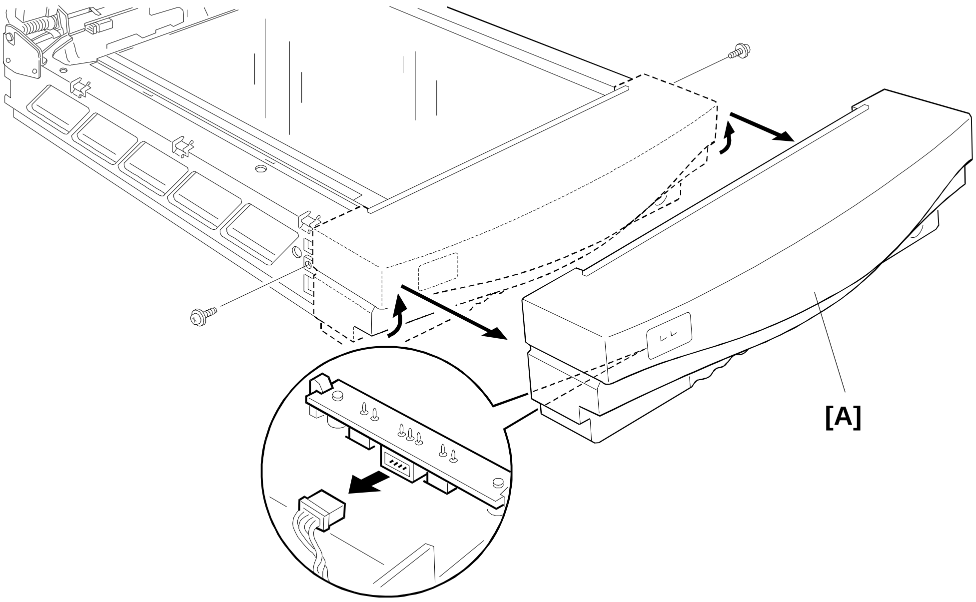
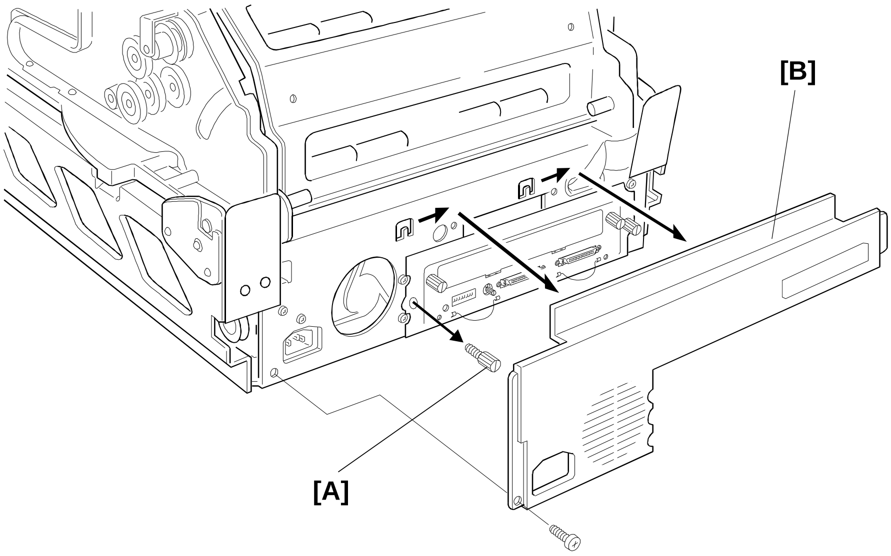
5.1.5. Front Cover



G404R504.wmf

First, remove the left and right covers (see section 5.1.3 and 5.1.4).
[A]: Front Cover (2 screws; 1 connector)

5.1.6. Rear Cover

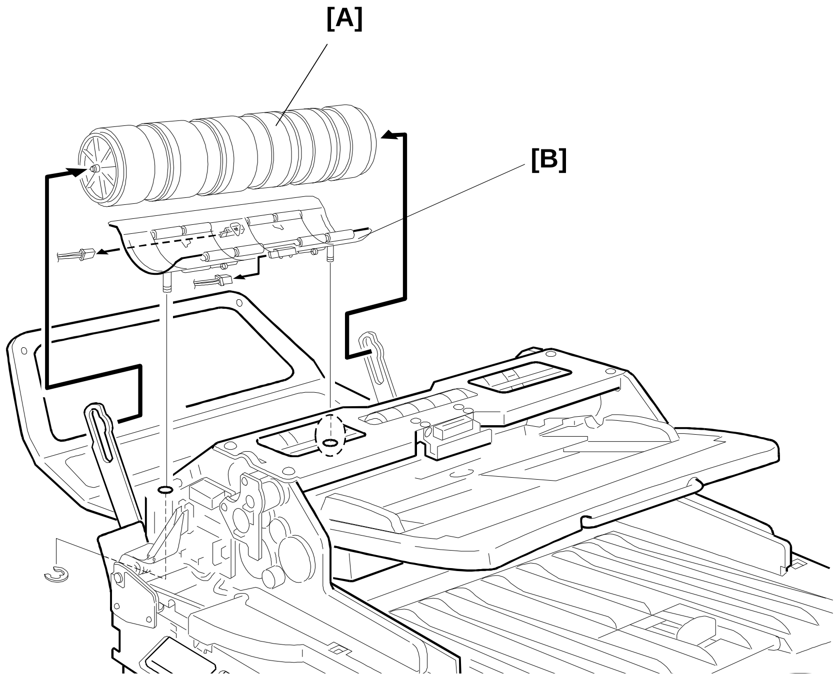


G404R505.wmf

First, remove the left and right covers (see section 5.1.3 and 5.1.4).
[A]: Knob Screw
[B]: Rear Cover (2 hooks)

5.2. ADF AND UPPER SIDE

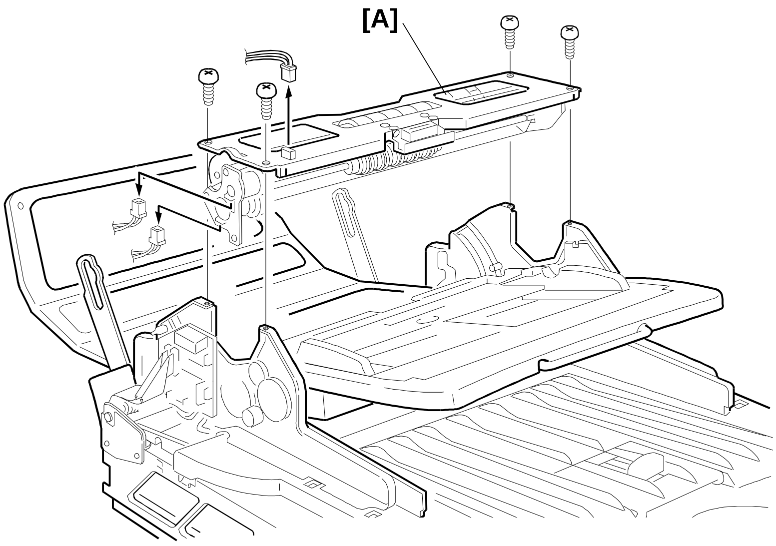
5.2.1. Paper Transport Unit



G404R506.wmf

First, remove the ADF Upper Cover (see section 5.1.1), ADF Left Cover, and ADF Right Cover (see section 5.1.2).
[A]: Paper Transport Drum
[B]: Paper Transport Unit (2 E-rings; 2 springs; 2 connectors)

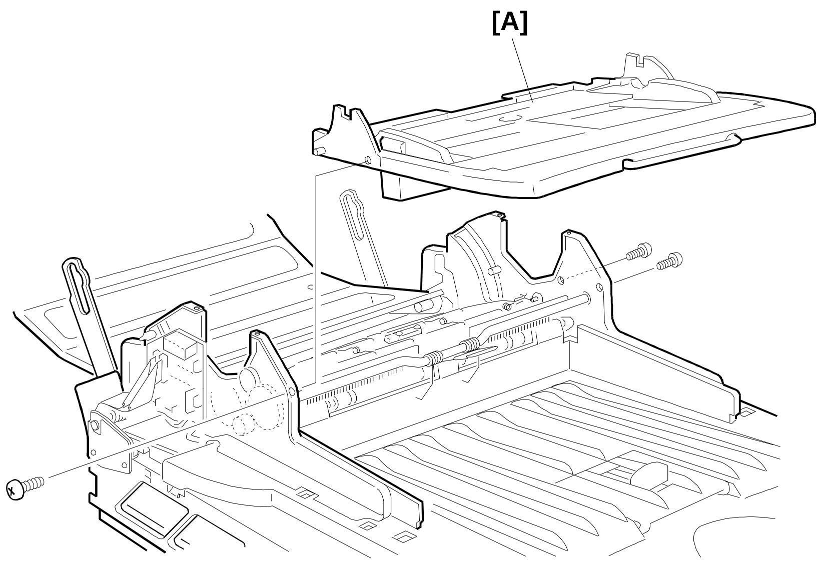
5.2.2. Separation Unit



G404R507.wmf

First, remove the ADF Upper Cover (see section 5.1.1), ADF Left, and ADF Right Covers (see section 5.1.2).
[A]: Separation Unit (4 screws; 3 connectors)

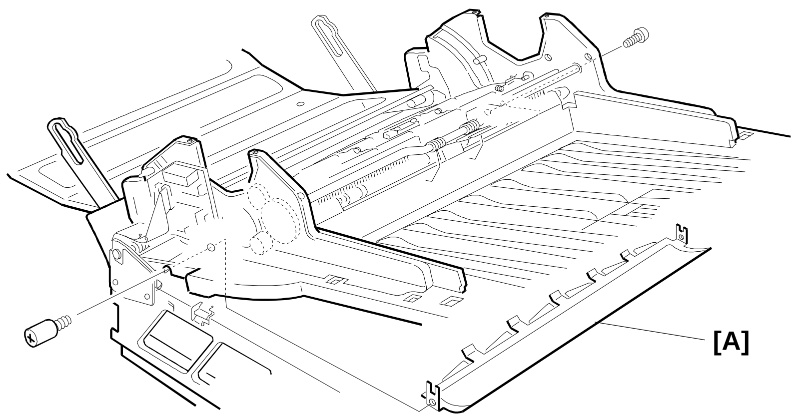
5.2.3. Document Table Assembly



G404R509.wmf

First, remove the Separation Unit (see section 5.2.2).
[A]: Document Table Assembly (3 screws)

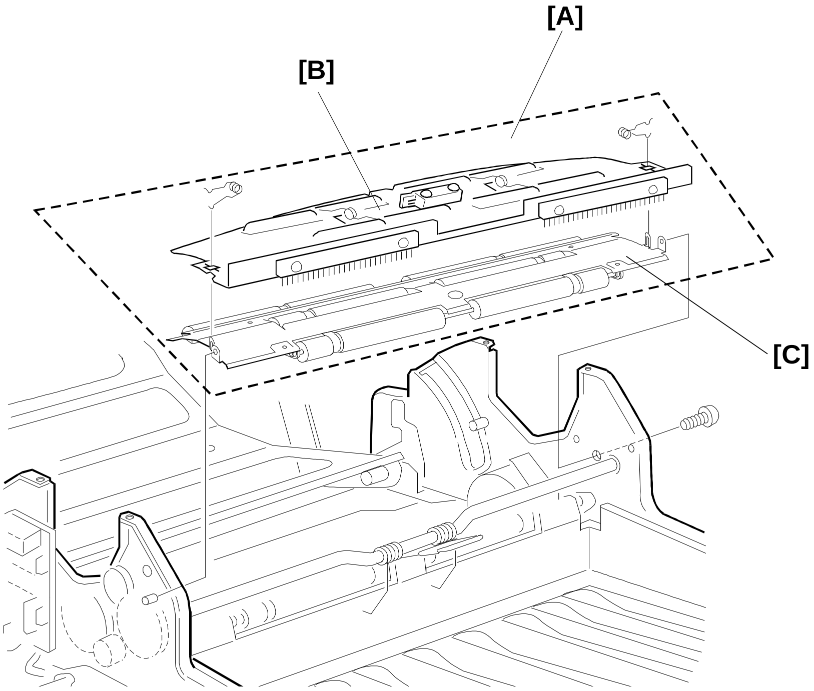
5.2.4. Scanning Guide Plate



G404R511.wmf

First, open the platen cover.
[A]: Scanning Guide Plate (2 screws)

5.2.5. Paper Feed-out Assembly



G404R512.wmf

First, remove the Document Table Assembly (see section 5.2.3).
[A]: Paper Feed-out Assembly (1 stepped screw; 1 connector)
[B]: Upper Feed-out Unit
[C]: Lower Feed-out Unit

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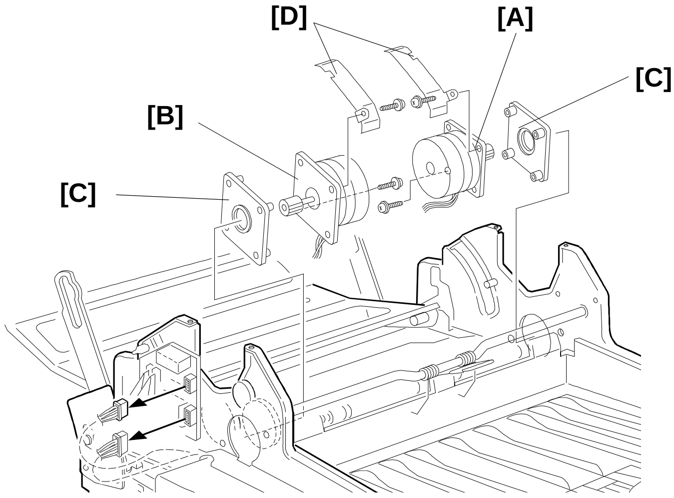
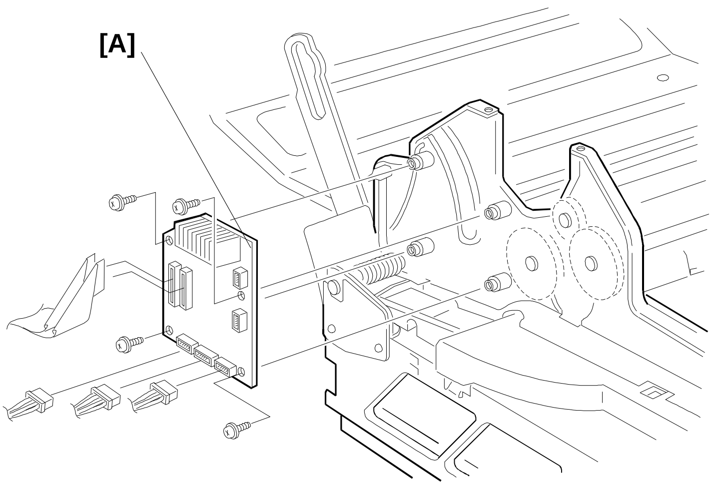
5.2.6. Motors



G404R513.wmf

First, remove the Paper Feed-out Assembly (see section 5.2.5).
[A]: Paper Feed Motor (2 screws; 1 harness)
[B]: Paper Transport Motor (2 screws; 1 harness)
[C]: Motor Cushions
[D]: Spring Plates

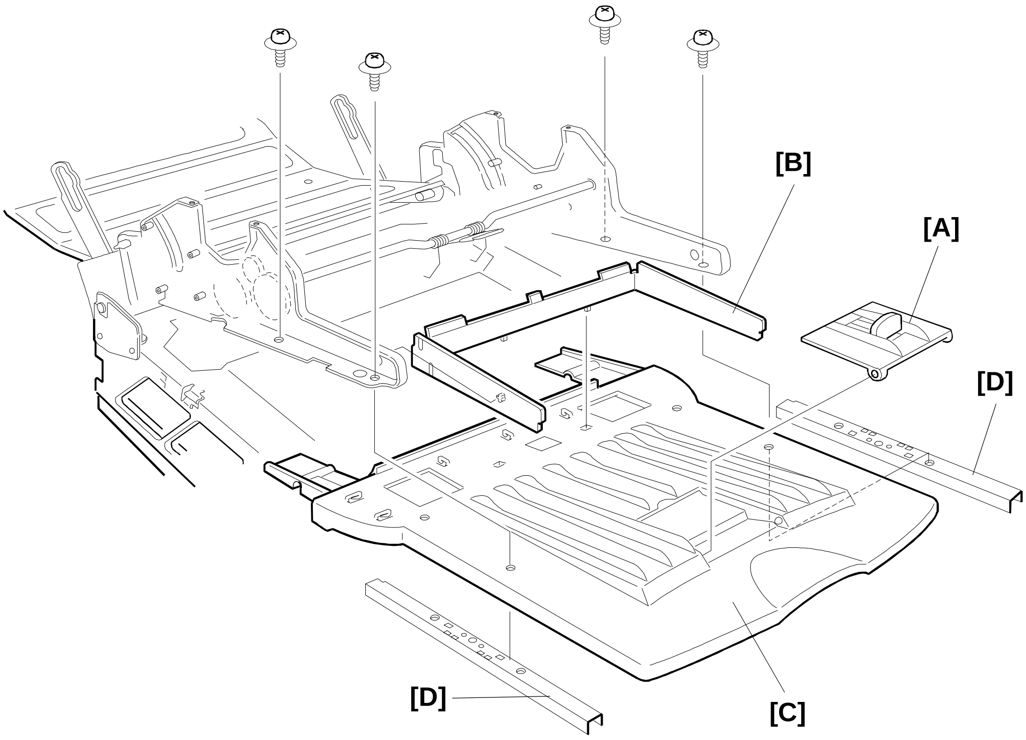
5.2.7. ADU



G404R514.wmf

First, remove the ADF Left Cover (see section 5.1.2).
[A]: ADU (4 screws; 5 connectors; 2 flat cables)

5.2.8. Platen Cover Assembly



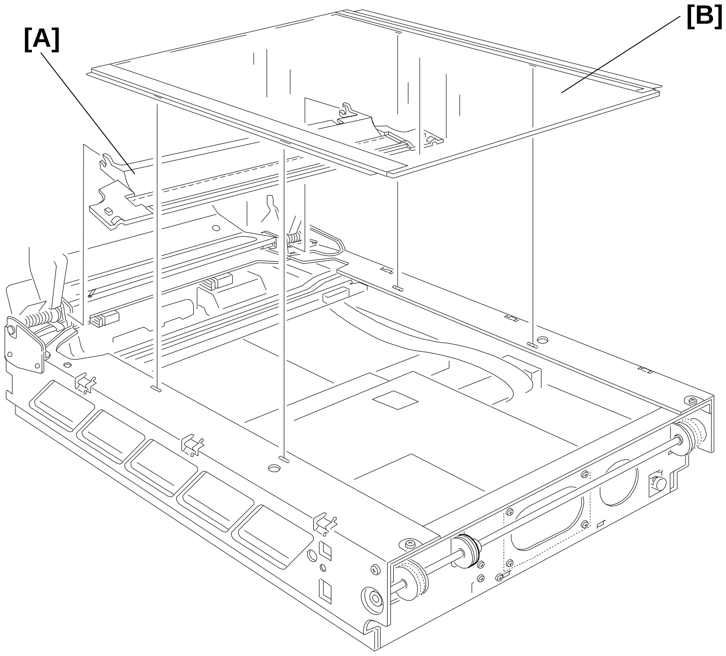
platencv.wmf

First, remove the ADF Left Cover and ADF Right Cover (see section 5.1.2).
[A]: Exit Table Extension
[B]: Paper Output Guide
[C]: Platen Cover (4 screws)
[D]: Platen Cover Support Brackets

Note: When replacing the platen cover, take out all harnesses routed on the platen cover carefully.

5.3. LOWER SIDE

5.3.1. Main Exposure Glass Assembly



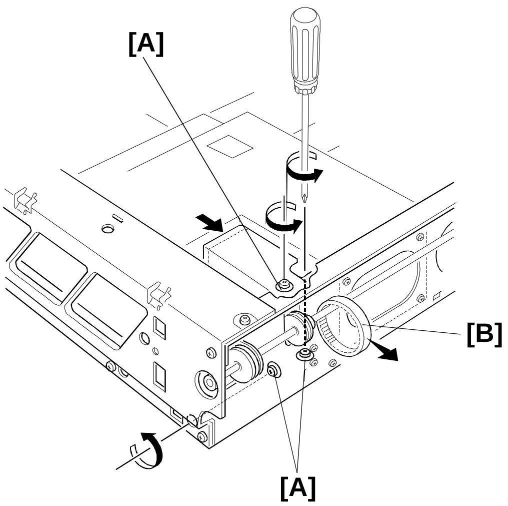
G404R516.wmf

First, remove the Left Cover and Right Cover (see section 5.1.3 and 5.1.4) and Front Cover (see section 5.1.5).

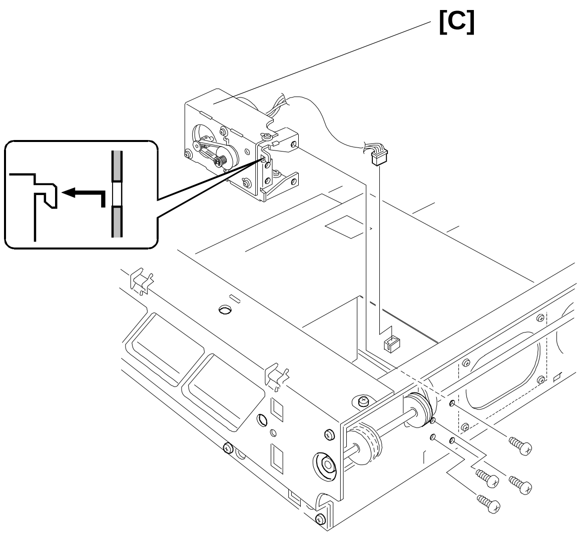
[A]: ADF Exposure Cover

[B]: Main Exposure Glass Assembly

5.3.2. Scanner Motor Assembly



G404R517.wmf



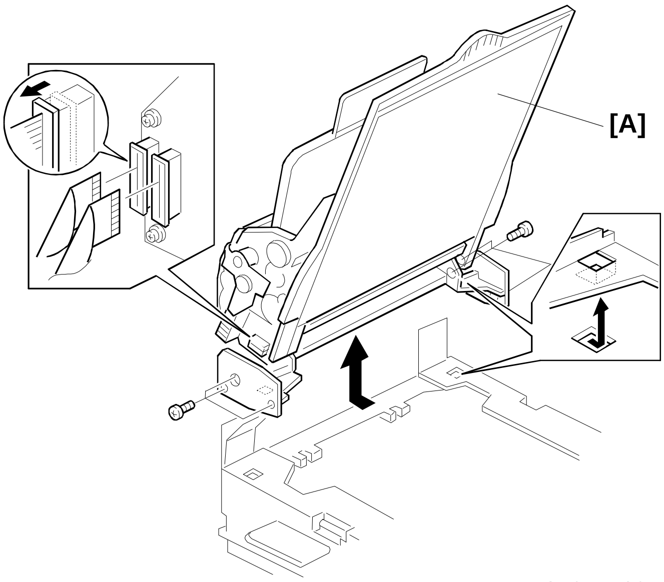
G404R518.wmf

First, remove the Main Exposure Glass (see section 5.3.1) and Shield Plate (see section 5.3.5).
[A]: 3 screws to loosen*
[B]: Timing Belt
[C]: Scanner Motor Assembly (4 screws, 1 connector)

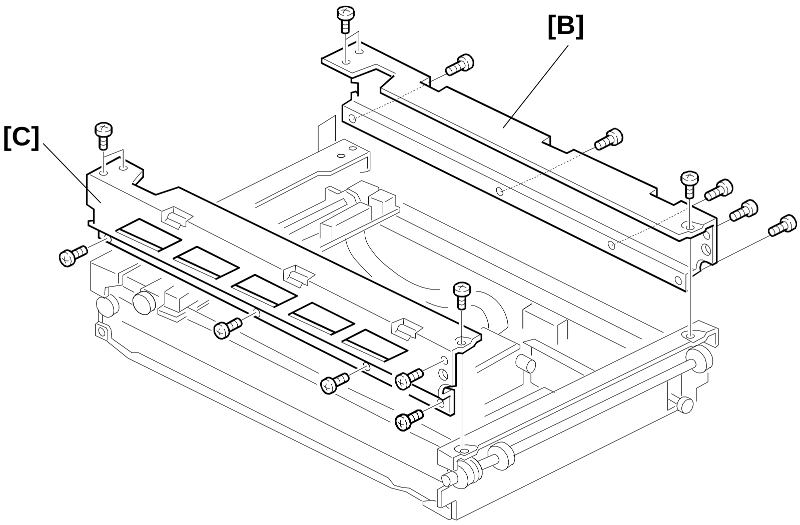
* Before taking out the motor assembly, loosen the scanner drive wire timing belt. To do this, loosen three screws.

5.3.3. First Carriage Assembly

- Removal -



G404R526.wmf



G404R527.wmf

First, remove the Lens Block Assembly (see section 5.3.7).
[A]: Upper Unit (6 screws, 2 flat cables)
Note: Open the platen cover while removing the upper unit, or the upper unit will be damaged.
[B]: Right Side Plate (8 screws), [C]: Left Side Plate (8 screws)

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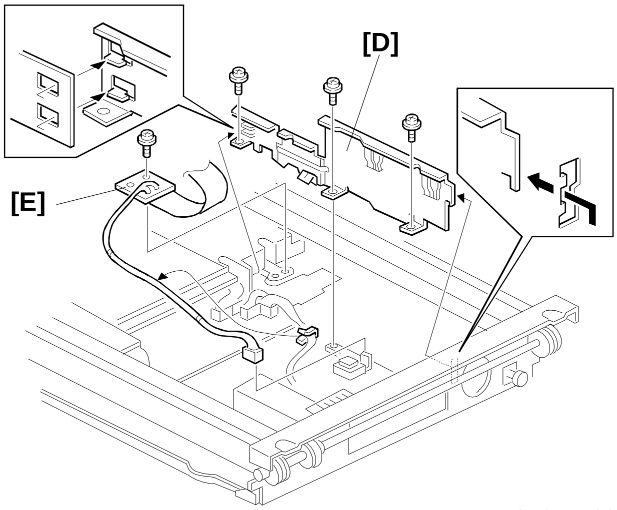
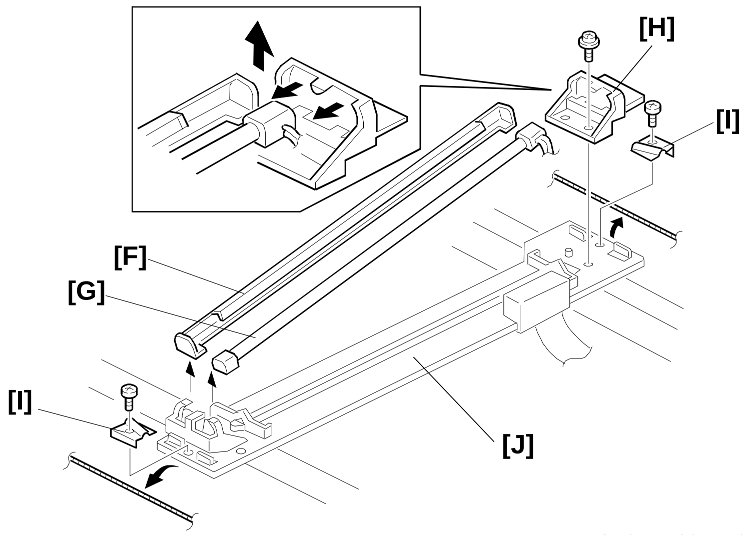


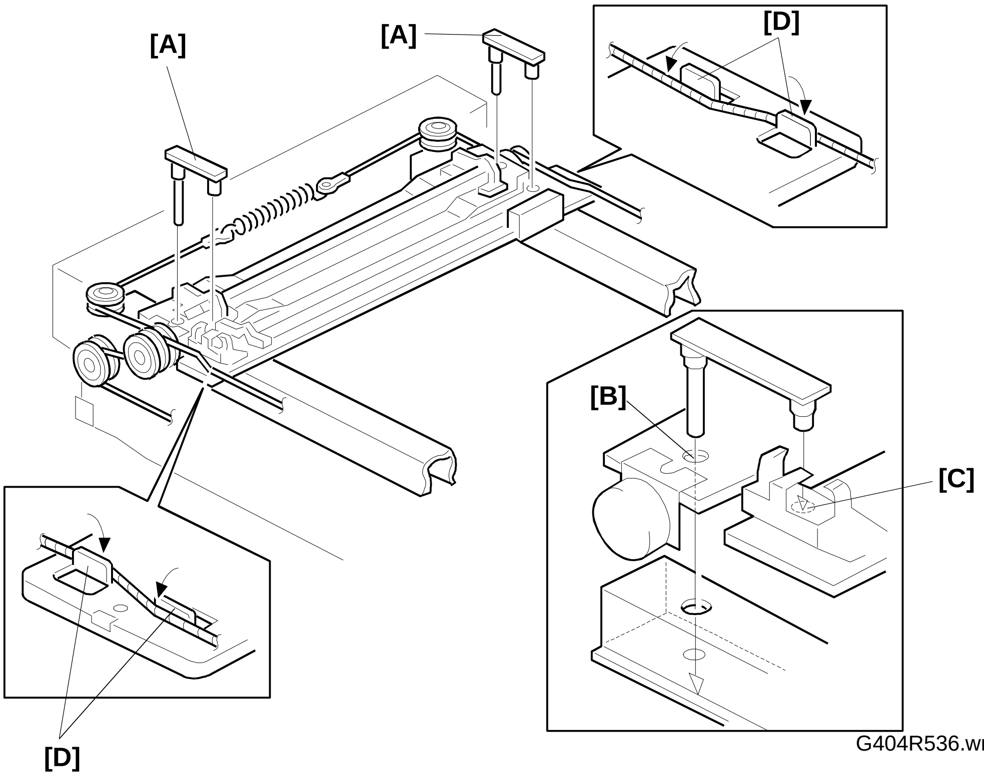
G404R508.wmf



G404R528.wmf

[D]: Right Shield Plate (3 screws)
[E]: Lamp Harness (1 screw, 1 connector)
[F]: Reflector
[G]: Xenon Lamp
[H]: Lamp Holder (1 screw)
[I]: Wire Securing Plates (1 screw each)
[J]: First Carriage Assembly

- Assembly -

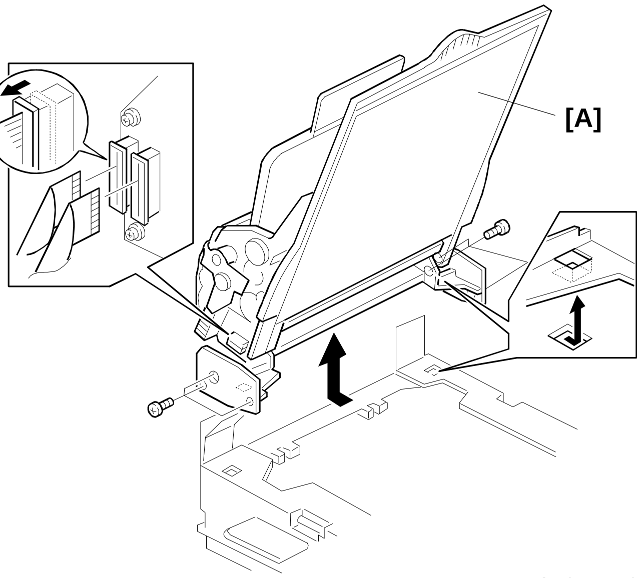


G404R536.wmf

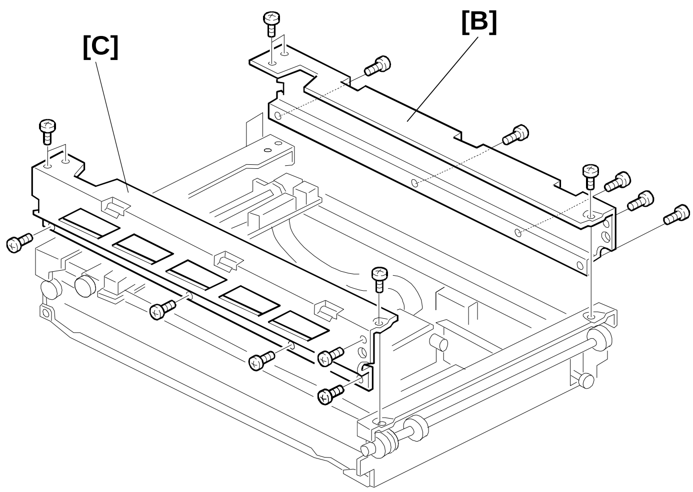
1. Slide the first and second carriage to the rear side of the machine.
2. Insert the carriage positioning tools [A] into positioning holes [B] and [C].
3. Thread the scanner wire through the hooks [D] in the carriage.
4. Install the wire securing plates (see [I] on the previous page).
5. Remove the positioning tools.
6. Reassemble the machine.

5.3.4. Second Carriage Assembly

- Removal -

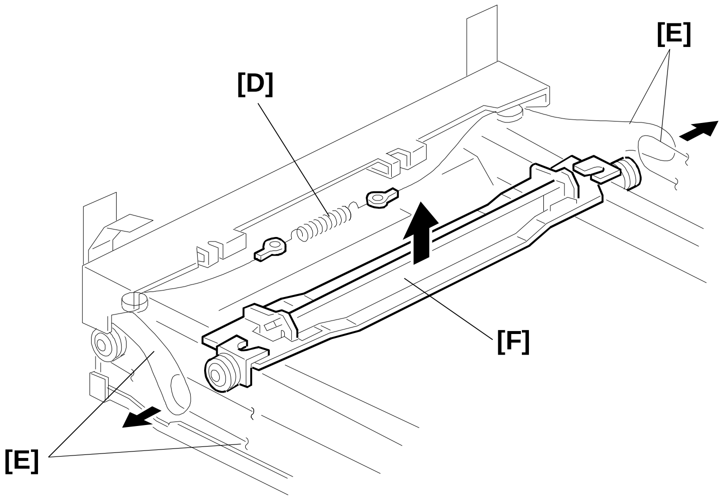


G404R510.wmf



G404R538.wmg

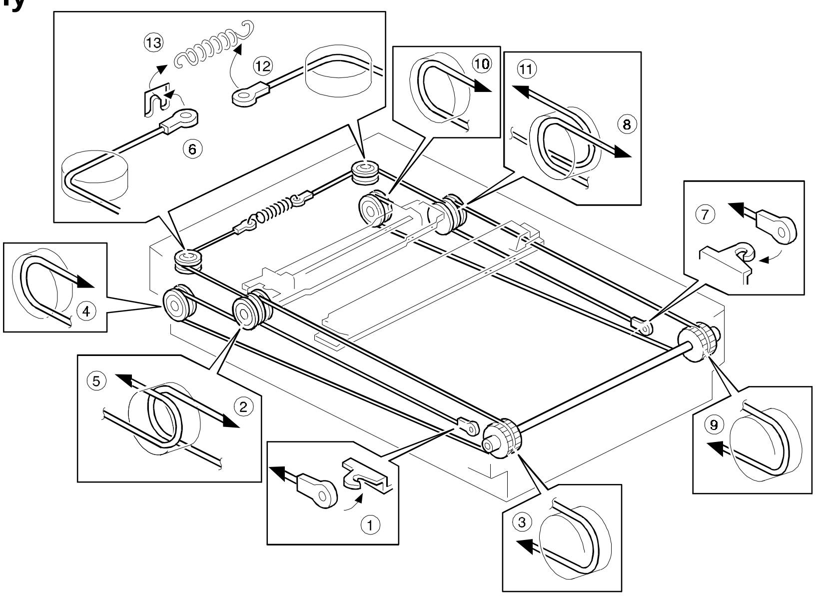
First, remove the Main Exposure Glass Assembly (see section 5.3.1).
[A]: Upper Unit (6 screws)
Note: Open the platen cover while removing the upper unit, or the upper unit will be damaged.
[B]: Right Side Plate (8 screws)
[C]: Left Side Plate (8 screws)



R404R529.wmf

[D]: Tension Spring
[E]: Scanner Wires
[F]: Second Carriage

- Assembly -



G404R530.wmf

1. Route the scanner wires as shown above.

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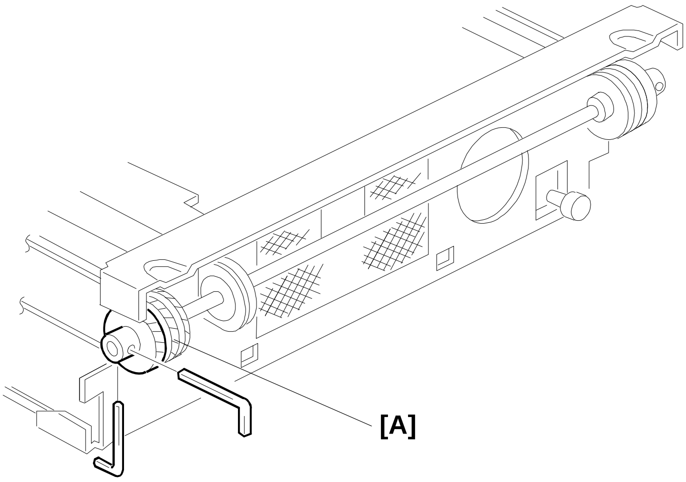
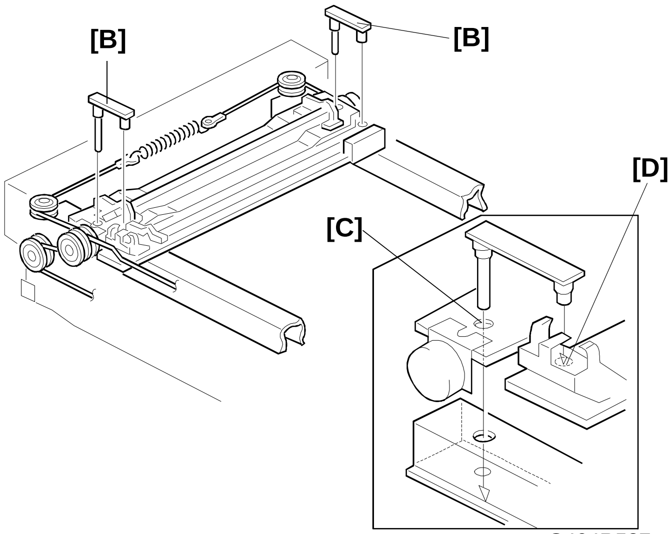


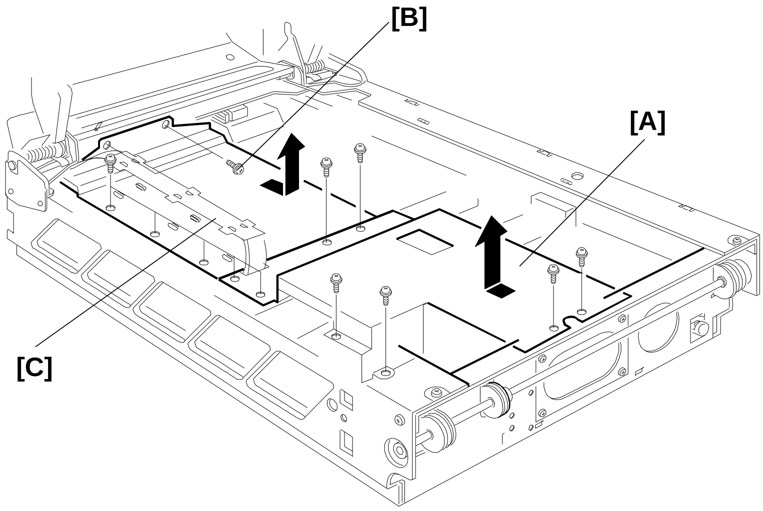
G404R531.wmf



G404R537.wmf

2. Loosen two allen screws in the pulley [A].
3. Slide the first and second carriages to the rear of the machine.
4. Insert the carriage positioning tools [B] into positioning holes [C] and [D].
5. Tighten the allen screws in the pulley.
6. Remove the positioning tools.
7. Reassemble the machine.

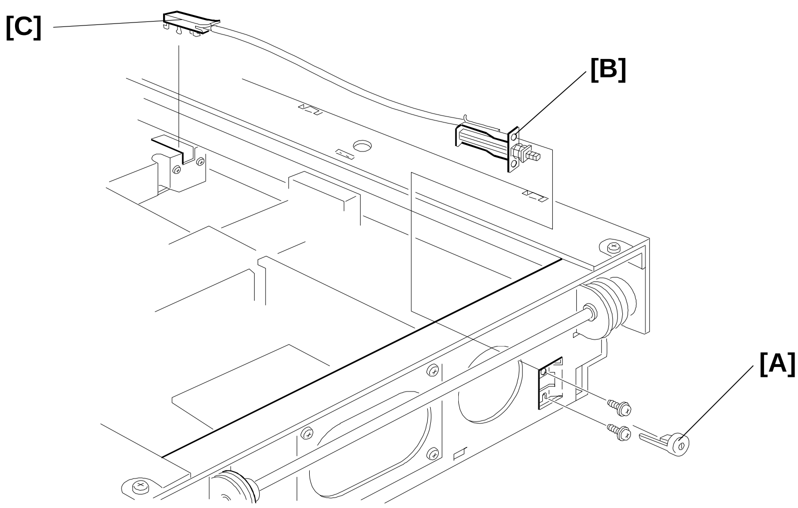
5.3.5. Shield Plates



G404R519.wmf

Fisrt, remove the main exposure glass (see section 5.3.1).
[A]: Front Shield Plate (8 screws)
[B]: Rear Shield Plate (5 screws)
[C]: Flat Cable

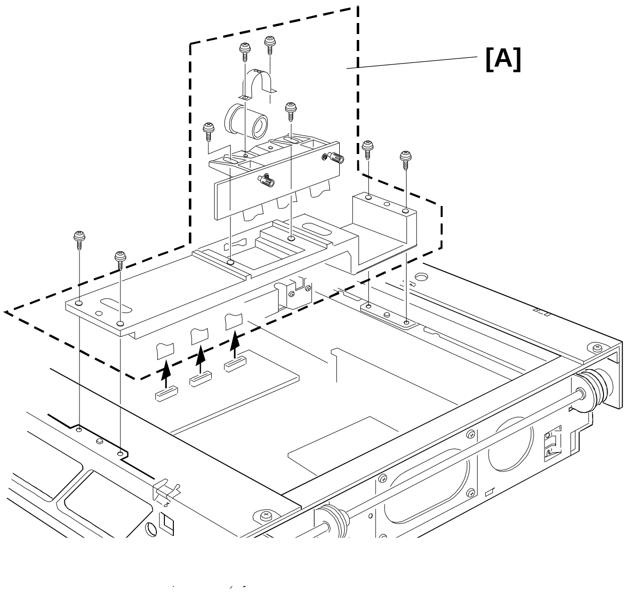
5.3.6. Power Switch Assembly



G404R520.wmf

First, remove the main exposure glass (see section 5.3.1).
[A]: Key Top
[B]: Power Switch (2 screws)
[C]: Switch Wire

5.3.7. Lens Block Assembly



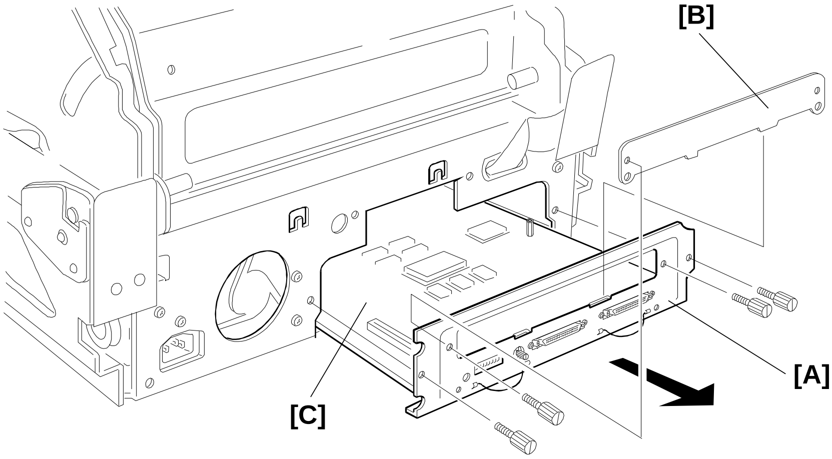
G404R521.wmf

First, remove the front shield plate (see section 5.3.5).
[A]: Lens Block Assembly (4 screws, 3 flat cables)

Replacement
Adjustment

5.4. PCBs

5.4.1. SCU Assembly

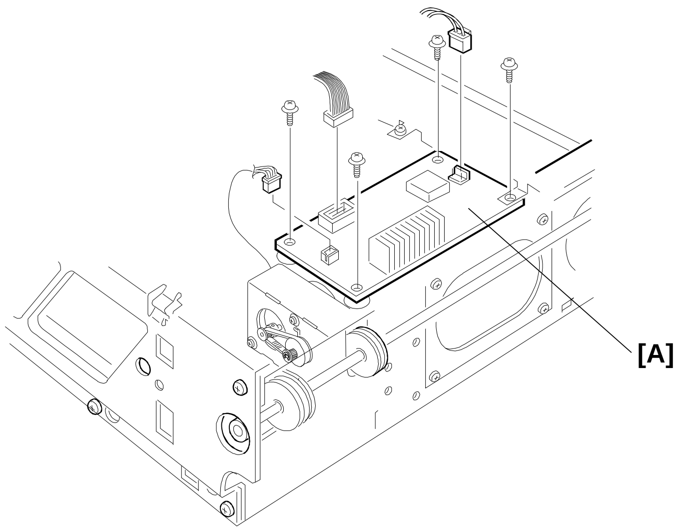


G404R522.wmf

[A]: SCU Assembly (2 screws)
[B]: Interface Bracket (2 screws)
[C]: SCU

NOTE: When replacing the SCU, put the old ROM (IC13) on the new SCU.

5.4.2. SDU



R404R523.wmf

First, remove the front shield plate (see section 5.3.5).
[A]: SDU (4 screws; 3 connectors)

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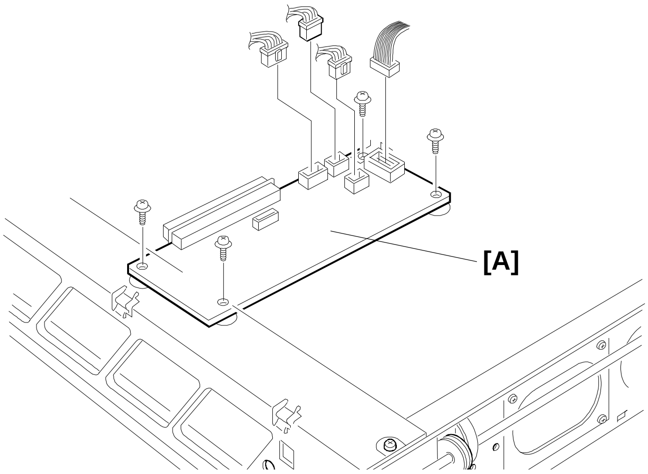
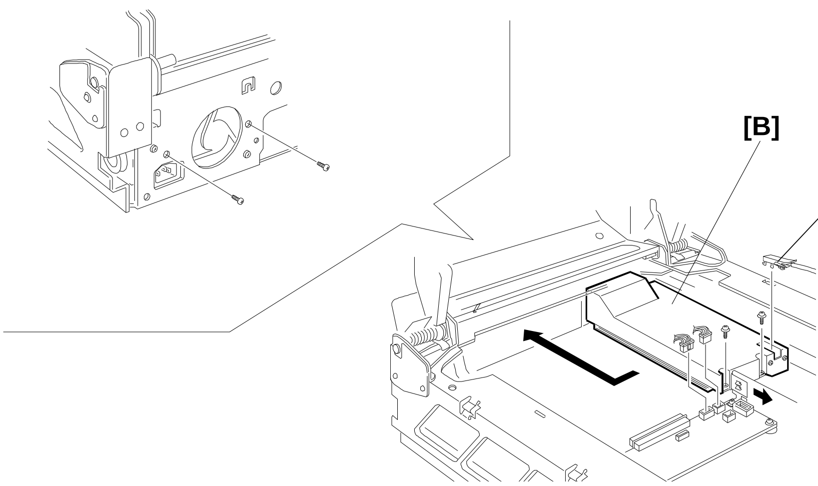
5.4.3. MBU



G404R524.wmf

First, remove the lens block assembly (see section 5.3.7) and the SCU assembly (see section 5.4.1.)
[A]: MBU (4 screws; 4 connectors; 2 flat cables)

5.4.4. PSU



G404r525.wmf

First, remove the front shield plate and rear shield plate (see section 5.3.5).
[A]: Power Switch Cable
[B]: PSU (4 screws; 2 connectors)

6. TROUBLESHOOTING

6.1. SELF-DIAGNOSTICS

The scanner automatically performs a series of self-diagnostic checks each time the power is turned on. If an error is detected, it is displays the type of error using the four LEDs on the scanner and the ADF. See "Detailed Section Descriptions - Initialization" for more details of the initialization procedure.

6.2. CHECK ITEMS

6.2.1. Items Checked During Initialization

The self diagnostics check the following items at power-up.

1. ADF exposure cover open
   Is the ADF exposure cover in the right position?
2. Lamp error
   Is the lamp installed properly? Is it intact?
3. Document feeder cover open
   Is the document feeder cover closed?
4. Paper jam: Is there a paper jam?
5. Document table error (System error)
   Does the document feeder table work properly?
6. Memory error (System error)
   Does the memory in the scanner work properly?
7. Shading error (System error)
   Has the scanner done shading correction correctly?
8. Origin positioning error (System error)
   Has the scanner detected the origin position properly?
9. Home position error (System error)
   Have the carriages reached home position properly?

Notes:
- If an error is detected for any of items 5) to 9), "System Error" is indicated, and the details can be checked with the self-diagnostics (see section 6-3).
- Even if an error is detected for item (3), scanning can start in book mode.
- A paper jam can only be detected when the document feeder cover is closed.

6.2.2. Items Checked During Operation

The following items are checked during operation. They are not checked in stand-by mode except for "ADF exposure cover open" and "Document feeder cover open".

1. Paper jam
   Is there a paper misfeed?

2. All items listed in Section 6.2.1.

6.3. ERROR INDICATION

If the self diagnostics find an error, the error is displayed by a combination of the four LEDs on the Scanner and the ADF. If the dip switches on the rear of the machine are set up for normal operation, the error is indicated roughly for users. When the dip switches are set to the self diagnostic mode position, the system error is indicated in detail for technicians.

6.3.1. User Level Error Indication

Conditions	Contents	Originals on the table	Scanner LEDs		ADF LEDs	
			Amber	Green	Amber	Green
Machine Initialization	Overall machine check		On	On	On	On
Demonstration Mode			On	On	On	On
Stand-by	Normal mode	No	--	On	--	--
		Yes	--	On	--	On
	Original prefeeding	No	--	On	--	Blinking
		Yes	--	On	--	On
Scanning	Normal mode	No	On	On	--	--
		Yes	On	On	--	On
User-visible Error Conditions	ADF cover interlock sw. is open		Blinking	Blinking	On	--
	Lamp error		Blinking	Blinking	On	On
	Platen cover interlock sw. open		--	On	On	--
	Document jam		--	On	On	Blinking
	Document misfeed		--	On	On	On
	Document table error		--	On	Blinking	Blinking
System Error			Blinking	Blinking	Blinking	Blinking

On= LED on, Blinking = LED Blinking, -- = LED off

6.3.2. Technician Level Error Indication

Error Items	Scanner LEDs		ADF LEDs	
	Amber	Green	Amber	Green
Memory error	--	Blinking	--	--
Shading error	Blinking	--	--	--
Origin positioning error	Blinking	Blinking	--	--
Lamp error	Blinking	Blinking	On	On
Document table error	--	On	Blinking	Blinking
Home position error	Blinking	Blinking	On	Blinking

On = LED on   Blinking = LED Blinking   -- = LED off

Trouble-
shooting

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6.4. TROUBLESHOOTING PROCEDURES

There are two types of troubleshooting procedure.

- For user-visible error conditions that the user could not clear up
- For technician level error conditions

6.4.1. User-visible Error Conditions

1. Lamp Cover Open (ADF exposure cover interlock switch open)

Symptom:

The error remains even if the ADF exposure cover is closed properly.

Possible Cause:

- ADF exposure cover broken
- ADF exposure cover interlock switch is broken.
- The SCU is broken.
- The harness between the switch and SCU is damaged.
- +24V power line failure

Procedure:

Does 24 volts come to the interlock switch?		
Yes	No	
	Is the harness damaged?	
	Yes	No
		Replace the SCU.
	Replace the harness.	
Replace the interlock switch.		

2. Lamp Error

Symptom:

The problem cannot be solved with the procedures in the user's manual.

Possible Cause:

- A mirror is out of position.
- Misalignment.
- SCU damaged.
- SBU damaged.
- SDU damaged.
- PSU damaged.

Procedure:

Does the lamp light during scanning?			
Yes	No		
	Does the 24V LED light on the MBU?		
	Yes	No	
		Is the PSU harness damaged?	
		Yes	No
			Replace the PSU.
		Replace the harness.	
	Does the SDU generate 24 volts?		
	(Connect the tester probes to pin 1 and 2 of CN3.)		
	Yes	No	
		Replace the SDU.	
	Replace the lamp harness.		
Are all mirrors installed properly?			
Yes	No		
	Reseat any mirrors that are out of place.		
Does the SBU generate the correct signals?			
Yes	No		
	Replace the SBU.		
Replace the SCU. If that does not work, try changing the MBU.			

3. Document Feeder Cover Open (Platen cover interlock switch open)

Symptom:

The problem cannot be solved with the procedures in the user’s manual.

Possible Causes:

- The platen cover interlock switch is damaged.
- The harness between the platen cover interlock switch and the SCU is damaged.
- The MBU is damaged.

Procedure:

Does 24 volts come to the platen cover interlock switch?

Yes — No

 Is the harness damaged?

 Yes — No

  Replace the MBU.

 Replace the harness.

Replace the platen cover interlock switch.

4. Paper Jam

Symptom:

The problem cannot be solved with the procedures in the user's manual.

Possible Causes:

- The separation unit is damaged.
- The paper transport drum ass'y is damaged.
- The paper feed-out unit is damaged.
- The paper transport motor or paper feed motor is broken.
- The read sensor or feed-out sensor is broken
- The SCU or ADU is broken.

Procedure:

First of all, check the sensors with demonstration mode. See page 4-3.
Are all the sensors OK?
Yes No
Is the harness damaged?
Yes No
Replace the defective sensor.
Replace the harness.
Does the jam always happen at the same position?
Yes No
Is the 24 volt line from the MBU to the ADF for the transport motor OK?
Yes No
Is the harness damaged?
Yes No
Replace the MBU.
Replace the harness.
Are the 24 volt lines from the ADU to the motors OK?
Yes No
Is the harness damaged?
Yes No
Replace the ADU.
Replace the harness.
Replace the transport motor.
Note: If the feed motor is dead, a "Document Table Error" is generated.

Continued on the next page

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Did the jam occur at the paper transport drum ass'y?
Yes No
Replace the paper feed-out ass'y.
Replace the paper transport drum ass'y.

5. Paper Misfeed

Symptom:

The problem cannot be solved with the procedures in the user's manual.

Possible Causes:

- The separation unit is damaged.
- The pick-up clutch is broken.
- The ADU is broken.
- The SCU is broken.
- The feed sensor is broken.

Procedure:

Does the pick-up roller mechanism work?
Yes No
Is 24 volts supplied to the pick-up clutch?
Yes No
Is the harness damaged?
Yes No
Replace the ADU.
Replace the harness.
Is there an open circuit in the clutch?
Yes No
Replace the SCU.
Replace the pick-up clutch.
Does the jam happen at the separation unit?
Yes No
Replace the pick-up roller.
Replace the separation unit.

6. Document Table Error

Symptom:

The problem cannot be solved with the procedures in the user's manual.

Possible Causes:

- The document table position sensor is broken.
- The document table clutch is broken.
- The feed motor is broken.
- The ADU is broken.
- The SCU is broken.
- The document table is broken.

Procedure:

Is the document table itself OK?
Yes No
Replace it.
Does the table work (up/down operation)?
Yes No
Does the separation roller mechanism work?
Yes No
Does 24 volts come to the feed motor and the document table lift clutch?
Yes No
Is the harness damaged?
Yes No
Replace the ADU.
If the 24 volts from the MBU has is defective, another error will be generated.
Replace the harness.
Replace the motor, or the clutch if it has a break in its internal wiring.
Replace the separation roller.
Replace the SCU.

Note: If the 5 volts line is defective, the ADF LEDs will not work, so the error type will not be visible. Therefore it can be assumed that there is a problem with a timing signal. All timing signals are generated in the SCU and the problem can be fixed by replacing the SCU.

6.4.2. Service Call Errors (System Errors)

If a system error occurs, the following errors can be detected with the self-diagnostics using the dip switches. See page 4-2.

1. Memory Error

Symptom:

This error occurs in the following conditions.

- SRAM read/write error
- EPROM sum error
- Memory over run error

Possible Cause:

The SCU is broken.

Procedure:

Is the SCSI interface being used?

Yes	No
	Replace the SCU.

2. Origin Positioning Error

This error is detected when the scanner fails to detect the origin position.

Possible Cause: There is some dust on the origin position sensor patch.

Procedure: Clean the sensor patch.

3. Lamp Error

Same as for the user-visible error condition. See section 6-4-1.

4. Document Table Error

Same as for the user-visible error condition. See section 6-4-1.

5. Shading Error

Symptoms:

A shading error occurs when one of the following conditions occurs.

- The difference in black level based on CH1 of the DAC setting between even and odd pixels is not within ± 1.
- The black level based on CH2 of the DAC setting is not within 3 ± 1.
- The minimum hold value of the auto gain control circuit in the SIP3 is not over 128.
- The value of CH4 for the DAC cannot be adjusted.

Possible Causes:

- A mirror is out of position.
- Misalignment.
- SCU damaged.
- SBU damaged.
- The lamp is defective.
- The shading seal is dirty.

Procedure:

Is there any problem with the lamp?
Yes — No
  Is the shading seal dirty?
  Yes — No
    Are all the mirrors installed properly?
    Yes — No
      Reseat the mirror.
    Does the SBU generate the correct signals?
    Yes — No
      Replace the optical unit.
    Replace the SCU.
  Replace the ADF cover.
Replace the lamp.

Note: The read signal goes to the SCU through the MBU, but the MBU does not do any image processing. Therefore the MBU probably does not have a problem. However, if the problem is not solved even after replacing the SCU, try changing the MBU.

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6. Home Position Error

Symptom:

This error is detected when the home position sensor cannot detect the first carriage.

Possible Causes:

- The scanner motor is damaged.
- The harness between the scanner motor and the SDU is damaged.
- The SDU is damaged.
- The home position sensor is damaged.
- The harness between the home position sensor and the MBU is damaged.
- The MBU is damaged.

Procedure:

Does the home position sensor work? Check it with sensor test mode. (See page 4-2.)

- Yes
- No
  - Does 5 volts reach the sensor?
  - Yes
  - No
    - Is the harness between the home position sensor and the MBU OK?
    - Yes
    - No
      - Replace the harness.
    - Replace the MBU.
  - Replace the sensor.

Is the drive wire OK?

- Yes
- No
  - Replace it.

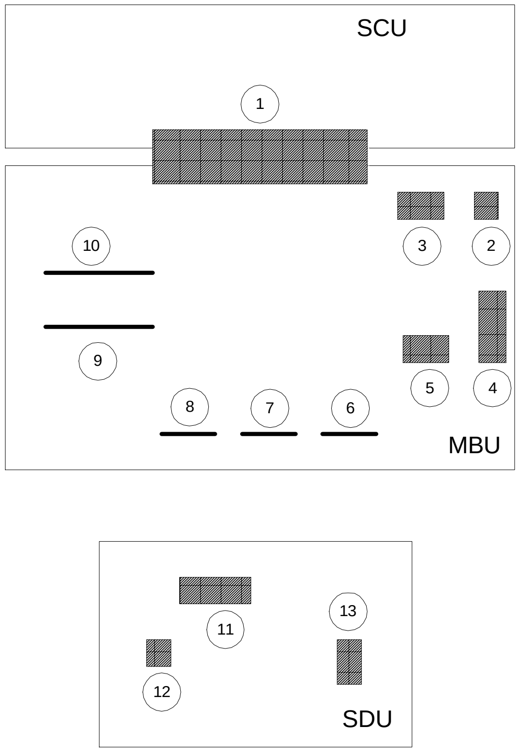
Does 24 volts reach the scanner motor?

- Yes
- No
  - Is the harness between the motor and the SDU damaged?
  - Yes
  - No
    - Replace the SDU.
  - Replace the harness.

Replace the scanner motor.

6.5. INDICATION WHEN A CONNECTOR IS OUT OF POSITION

6.5.1. Scanner

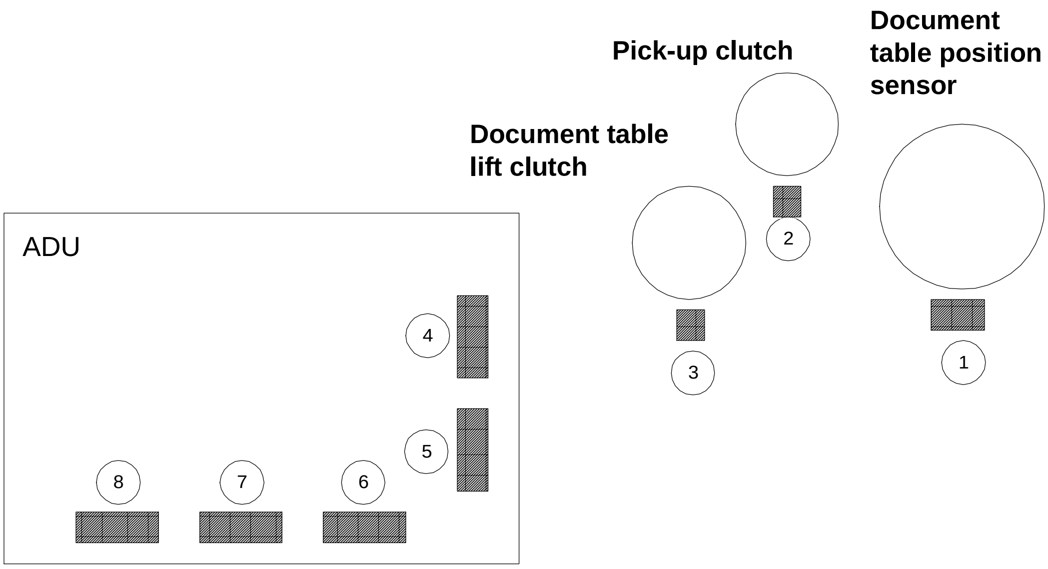


g404t500.wmf

Connector	Scanner LEDs		ADF LEDs		Remarks
	Amber	Green	Amber	Green	
1	Off	Off	Off	Off	
2	Blinking	Blinking	--	Off	ADF exposure cover open
3	--	--	--	--	Relay clicking can be heard from the PSU
4	--	--	Blinking	Blinking	
5	Blinking	Blinking	--	Off	System error
6	Blinking	Blinking	Blinking	Blinking	System error
7	Blinking	Blinking	Blinking	Blinking	System error
8	Blinking	Blinking	--	--	Lamp error
9	Off		--	--	
10	Off	--	--	Blinking	
11	Blinking	Blinking	Blinking	Blinking	System error
12	Blinking	Blinking	Blinking	Blinking	System error
13	Blinking	Blinking	Blinking	Blinking	System error

When the machine is switched on, all LEDs should light briefly. However, "--" in these tables indicates that the LED does not light up briefly at power-up.

6.5.2. ADF



g404t501.wmf

Connector	Scanner LEDs		ADF LEDs		Remarks
	Amber	Green	Amber	Green	
1	Off	--	Blinking	Blinking	Document table error
2	Off	--	Off	Off	Ready, but a non-feed occurs
3	Off	--	Blinking	Blinking	Document table error
4	Off	--	Off	Off	Ready, but a jam occurs
5	Off	--	Blinking	Blinking	Document table error
6	Off	--	--	--	When the connector is reconnected, "Document table error" is indicated.
7	Off	--	--	Blinking	Paper jam
8	Off	--	--	Blinking	Paper jam

A. OPTICAL ADJUSTMENT (MECHANICAL)

When adjusting the scanner, do the optical adjustments first, then the electrical adjustments (Appendix B).

A.1. Tools

These adjustments require the following special tools.

1) Oscilloscope

2) Resolution chart (test chart): P/N A0129110

3) Optical adjustment harness (jig harness): P/N G4049002

4) Optical adjustment glass (jig glass): P/N G4049001

A.2. Adjustment items

1) White level adjustment
   Temporary adjustment of the CCD read position to where the maximum image signal from the document is detected by the CCD.
2) MTF (Modulation Transfer Function) adjustment
   Adjustment of focus to where the CCD detects the greatest image signal level.
3) Magnification adjustment
   Adjustment of the magnification to where a 400-dpi image is formed on the CCD.
4) Horizontal scanning starting position adjustment
   Adjustment to determine the position at which reading of a document starts in the horizontal scanning direction.
5) Scan line
   Adjustment of the CCD position to get the proper scan line.
6) Final while level adjustment
   Adjustment of the image signal level from the CCD. The procedure is the same as for step 1 (white level adjustment).

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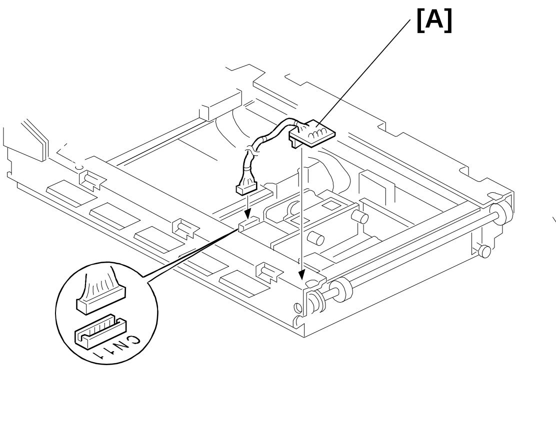
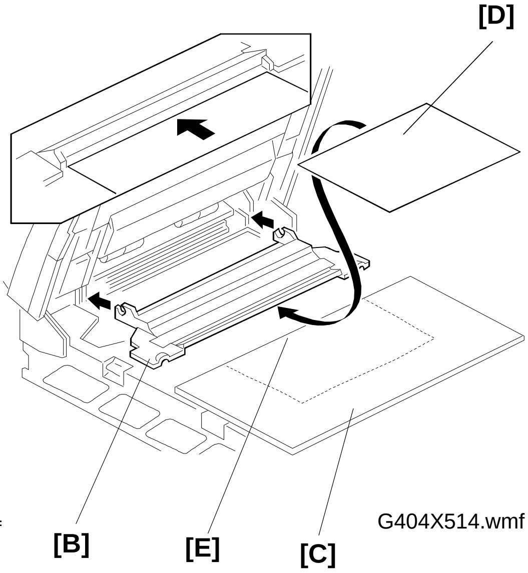
A.3. Adjustment

A.3.1. Preparation



G404X516.wmf



G404X514.wmf

1. Remove the ADF exposure glass and the main exposure glass.
2. Remove the top shield plate.
3. Connect the optical adjustment harness [A] to CN11 on the MBU board.
4. Set the ADF exposure glass [B] and the optical adjustment glass [C] as shown above.
5. Set the resolution chart [D] on the optical adjustment glass so that the leading edge of the chart is against the ADF exposure glass.

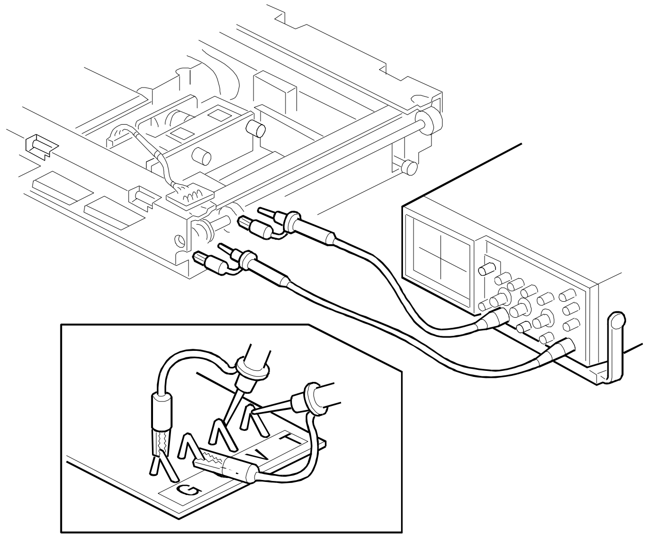
NOTE: Make sure that the end of the test chart with the thin white line pattern is on the edge [E] of the glass that is nearest the ADF exposure glass.

6. Loosen the four screws on the SBU.
7. Set dip switches 1, 7, and 8 to the ON position.
8. Set the SCSI rotary switch to 1.
9. Turn on the power.

I **CAUTION:**
Cover the transformer with some paper, to avoid electric shocks.

10. Press the reset switch to put the lump on.

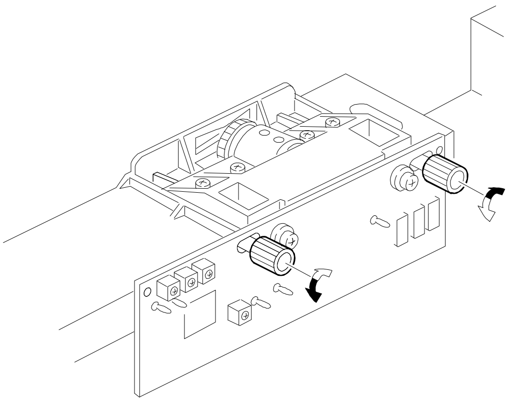
A.3.2. White Level Adjustment



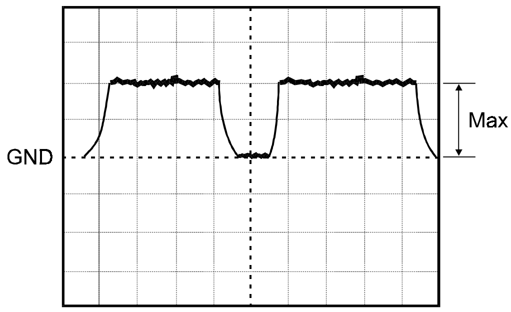
G404X501.wmf

1. Move the carriage to where the white part of the resolution chart is in position for reading.
2. Connect the probes of the oscilloscope as shown above.

CN1: V CN2: T



G404X502.wmf

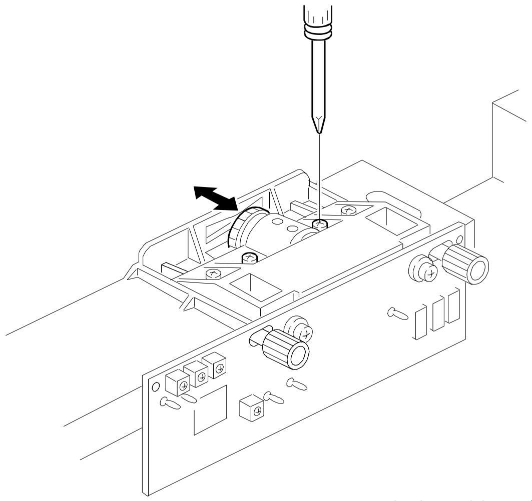


Time: 0.1 ms
V: 1 V

G404X508.wmf

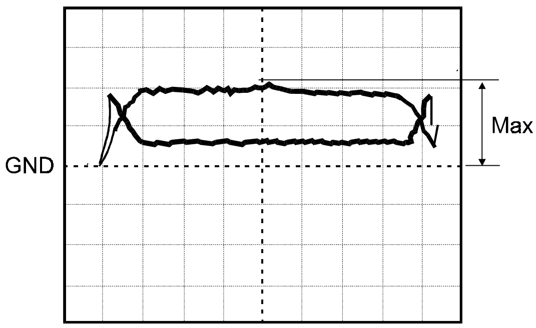
3. Turn the adjustment knobs on the SBU to where the CCD detects the white level (the white level trace must be flat) and the output is greatest.

A.3.3. MTF Adjustment



G404X503.wmf

G404X515.wmf

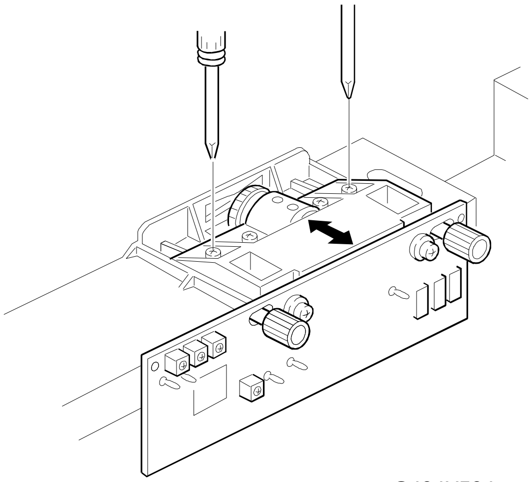


V: 1 V
T: 0.1 ms

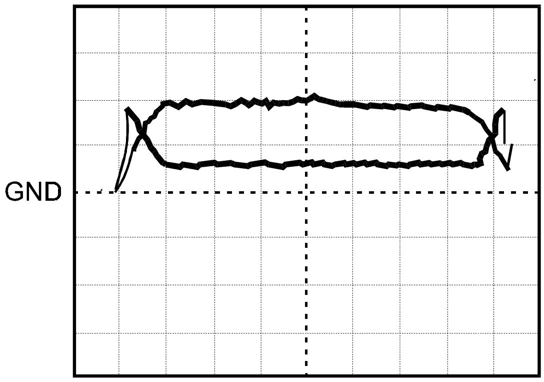
G404X509.wmf

1. Move the carriage so that the 200 dpi chart [A] affixed to the resolution chart is in the read position.
2. Loosen the lens retaining screw, then move the lens as indicated by the arrow to where the oscilloscope waveform output is maximized.
3. Tighten the lens retaining screw to immobilize the lens.

A.3.4. Magnification Adjustment



G404X504.wmf



V: 1 V
T: 0.1 ms

G404X510.wmf

1. Loosen the two optical block retaining screws, then move the optical block back and forth to where the number of waveform intersections displayed is reduced to six or less.
2. Tighten the two optical block retaining screws.

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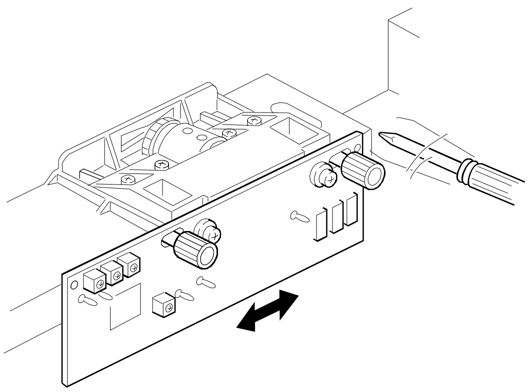
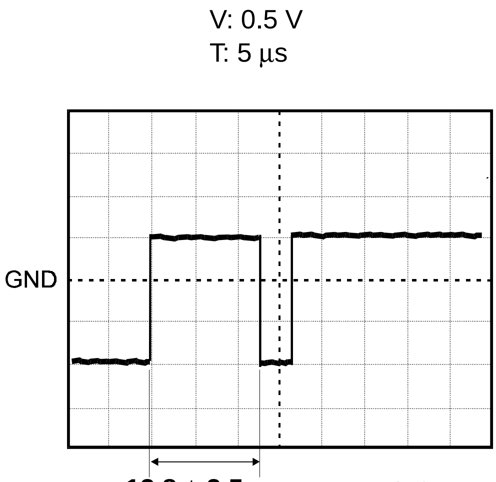
A.3.5. Horizontal Scanning Starting Position Adjustment



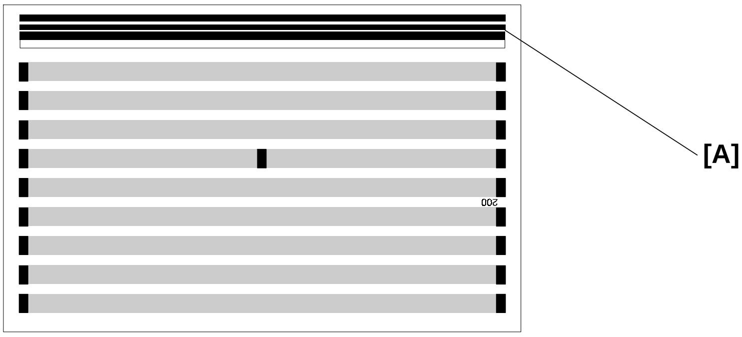
G404X505.wmf



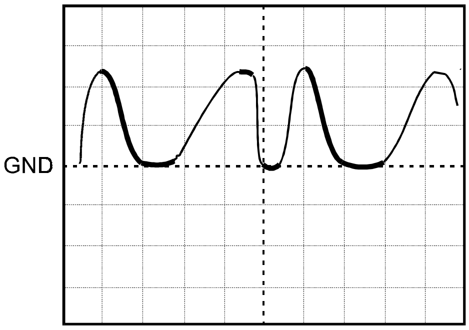
G404X511.wmf

1. Move the carriage so that the black dot on the ADF exposure glass is in the read position.
2. Change the time range setting of the oscilloscope to 5 µs.
   Move the SBU left or right to where the time between the dummy bit and the beginning of the effective read data is 12.8 ± 2.5 µs.

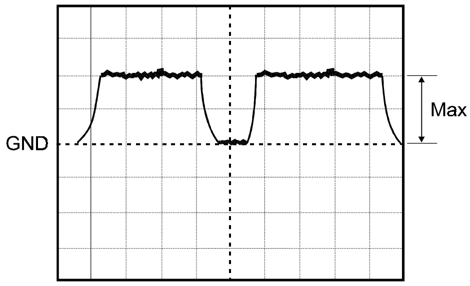
A.3.6. Scan Line Adjustment



G404X515.wmf



G404X512.wmf



G404X508.wmf

V: 1 V
T: 0.1 ms

1. Move the carriage so that the thin white line pattern [A] on the resolution chart is in the read position.
   The CCD detects the white line pattern when the output becomes as shown to the above left.
2. To align the CCD, turn the adjustment knob on the SBU to where the CCD output becomes as shown above right.

   Note: Turning the adjustment knob on the SBU may disturb the horizontal scanning starting position adjustment. Check whether the adjustment has been affected and adjust if necessary.
3. Tighten the screws on the CCD board.

A.3.7. Final White Level Adjustment

Repeat the White Level Adjustment procedure.

B. OPTICAL ADJUSTMENT (ELECTRICAL)

B.1. General

This procedure adjusts the electrical characteristics of the SBU. The SBU mechanical adjustments (MTF, scan line, etc.) must be performed before this procedure. The scanner firmware includes the functions for these adjustments. The scanner responds to commands from the PC and runs the adjustment program.

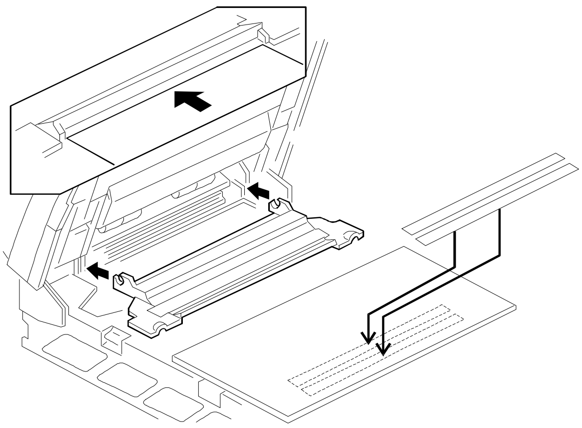
B.2. Tools

B.2.1. Hardware

- IBM PC-AT or compatible
- RS-232C Cable (Either Cross or Straight)
- VIU (Video Interface Unit): G4045901
- Jig Glass: G4049001
- White Chart: G4043102
- Gray Chart

Note:
- The white and gray charts should be attached to the jig glass with adhesive tape as shown in the following diagram. Note that the gray chart should be attached to the glass with its printed (gray) side in contact with the glass. The white chart should be attached to the glass with its white side (not the peel off side) contacting the glass.
- For the gray chart, use the 9th grayscale from the top (white pattern) of the GS-20 chart.

g404x517.wmf



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B.2.2. Software

- Terminal (One of the Windows Accessories)

B.3. Adjustments

- GCA (Gain Control Amplifier) Gain Curve
  This adjusts the GCA amplification ratio. The GCA on the SBU amplifies analog image data.
- White level difference between the even pixel and odd pixel channels of the CCD
  The even pixel channel output level is adjusted to equal the odd pixel channel output level.
- White level when scanning the white reference sheet (Absolute white level)
  The analog output level when the machine scans a white sheet is adjusted.
- White level for background detection mode (Relative white level)
  This adjusts the analog ASIC peak hold value (used for generating the reference voltage of the A/D converter). Analog image data is converted to digital data using this reference voltage.

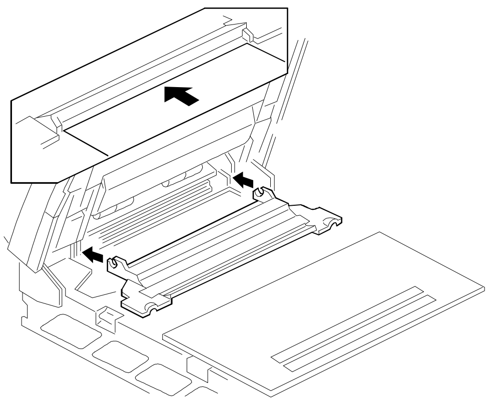
B.4. Adjustment Procedure

B.4.1. Setup

1. Make sure that the exposure glass has been removed and that the jig glass has been placed on the scanner as shown below.

   Note: The side of the glass with the charts attached should be facing up, so that the charts are face down.

g404x518.wmf



2. If the user shipped the machhine to the warehouse with a VIU installed, remove it and replace it with the warehouse's VIU. The jumper and switch settings of the warehouse VIU must be as follows.
   - Switch 1 of DIP switch 2 must be OFF. (DIP switch 2 is the one with only one switch.)
   - Jumper pins TB1-4 must be as follows.
     When using a cross cable: Short TB2 and TB4
     When using a straight cable: Short TB1 and TB3
   - The jumpers must be removed from TB5 and TB8, and jumpers TB6 and TB7 must be shorted.

3. Install the VIU in the scanner. (Refer to the operation manual for the VIU.)

4. Connect the scanner to the PC with the RS-232C cable.

5. Switch on the PC and start Windows.

6. Run the "Terminal" program in the Windows accessories.

7. Select Communications in the Settings menu

8. Set up each item as follows.
   - Baud Rate: 9,600
   - Data Bits: 8
   - Stop Bits: 1
   - Parity: None
   - Flow Control: None

9. Switch on the scanner. The scanner initialization messages appear.

```
+--------------------------------------+
| HS1P b-TEST    Program          |
|                                                  |
|'92-10-21  Start                         |
|'95-01-09  0R25                        |
|      by M.Miya, Y.Hatt, F.Kita    |
 +--------------------------------------+
[ SIP3 RESET ]
Initial chk start (001)
 [KURO GAP OK e,o (0011,0011)]
 [KURO AJST END e,o (0003,0002)]
 [ SHADING END AGC peak hold(0252), minimum hold(0219)]
 [SIP3 INT (KUROPOCHI) shu_data(0113)DOT fuku_data(0037)STEP]
 [KURO POCHI OK  shu_data(0113) fuku_data(0078)*0.01mm]
[DAC4 OK   RSEC ON_DATA, OFF_DATA, DAC4_DATA (0223,0218,0182) ]
---------------- Initial chk end (0001)times ----------------
```

10. Hit the Enter key on the PC and confirm that the "Undefined Command !!" message appears on the display. If the PC fails to communicate, this message does not appear on the display.

Appendix B

B.4.2. Adjustment

The following pages describe the adjustment procedures, along with the prompts that appear on the screen. After finishing the adjustments, turn off the scanner, and reassemble the scanner.

1. Type =, then press Enter.

```
Usage:[= command])
 [ = ] is the SBU volume ajustment command.
 <<<< = command menu >>>>
 =0 : Print usage
 =1 : All ajustment
 =2 : Ajust gain curve
 =3 : Ajust white odd/even
 =4 : Ajust white levek ( absolute )
 =5 : Ajust white levek ( relative )
 =6 : Comfirm gain curve
 =7 : Culcurate white level
Notice: (1) Make sure [ p command is already send ]
    ex. p100 - move lump 100mm from home position
```

2. Type =1, then press Enter.

```
*******************************
**** Calcurate White Level ****
*******************************
Mesurement CCD output voltage (377usec after TP1's falling edge)
Input Data (CCD output voltage [mV]) =
```

3. Input 400 then press Enter.

```
Target White Level =  [  220 ]

[ Next : Hit Enter Key !! ]
```

4. Press the Enter key. The Gain Curve Adjustment begins.

```
**************************
**** AJUST GAIN CURVE ****
**************************
 ---- Put the Gray Chart on the Lamp position !! ----
<< Then , Hit Enter Key >>
```

5. Move the 1st carriage to the position of the gray chart.

6. Press the Enter key.

```
<<<< AGC=11 >>>>
<<<< Absolute white level (W1) >>>>
  Ajust VR4  :  [X]== 220 +/- 2
**** Image Data (#3584) ****  [ Exit : '!' key ]
                                                 [X]
005,002,222,217 (217,215 <+>002)  [216]    Ave-(O:216,E:215 <+>002) [215]
```

7. The bottom line of the screen shows data coming from the scanner. This data is continually being refreshed. You can begin to adjust immediately.

   Adjust VR4 on the SBU until the value of X is within the required range. (In the example screen above, the value on the bottom line below the X must be 220 +/- 2.) Then input !.

```
<<<<<< EXIT >>>>>>
[ Next : Hit Enter Key !! ]
```

8. Press the Enter key.

```
<<<< AGC=27 >>>>

**** Image Data (#3584) ****
                                                    [X]
002,002, 100,099 (098,097 <+>001)  [097]    Ave-(E:098,O:097 <+>001) [097]
<<<<<< EXIT >>>>>>
  Ajust VR2  :  [X] == 099  +/- 2
**** Image Data (#3584) ****  [ Exit : '!' key ]
                                                 [X]
003,002,104,101 (101,099<+>002)  [100]    Ave-(O:100,E:098 <+>002) [099]
```

9. Adjust VR2 on the SBU until the value of X is within the required range. (In the example screen above, the value on the bottom line below the X must be 99 +/- 2.) Then input !. This ends the Gain Curve Adjustment.

```
<<<<<< EXIT >>>>>>
[ Finish gain curve ajustment!! ]
[ Next : Hit Enter Key !! ]********************************
```

10. Press the Enter key. The Gain Curve Confirmation procedure starts.

```
************************
****CONFIRM GAIN CURVE ****
************************
<<<< Absolute white level (W1) >>>>
<<<< AGC=11 >>>>
   Ajust VR4  :  [X]== 220 +/- 2****
Image Data (#3584) ****  [ Exit : '!' key ]
                                                  [X]
005,002,226,226 (221,224 <->003)  [222]    Ave-(O:221,E:222 <->001) [221]
```

11. Adjust VR4 on the SBU until the value of X is within the required range. (In the example screen above, the value on the bottom line below the X must be 220 +/- 2.) Then input !.

```
<<<<<< EXIT >>>>>>
[ Next : Hit Enter Key !! ]
```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12. Press the Enter key.

```
<<<< AGC=20 >>>>
   Be sure  :  [X]== 121 +/- 10
**** Image Data (#3584) ****  [ Exit : '!' key ]
                                                  [X]
003,003,125,124 (122,119 <+>003)  [120]    Ave-(O:121,E:118 <+>003) [119]
```

13. Check that X is within the required range. (In the example screen above, the value on the bottom line below the X must be 121 +/- 10.) Then press !. If X is not within the required range, do the Gain Curve Adjustment procedure again (complete the entire adjustment procedure without adjusting anything, then start again from the beginning).

```
<<<<<< EXIT >>>>>>
[ Next : Hit Enter Key !! ]
```

14. Press the Enter key.

```
<<<< AGC=27 >>>>
   Be sure  :  [X]== 90 +/- 10
**** Image Data (#3584) ****  [ Exit : '!' key ]
                                                  [X]
002,002,087,084 (085,082 <+>003)  [083]    Ave-(O:084,E:082 <+>003) [083]
```

15. Check that X is within the required range. (In the example screen above, the value on the bottom line below the X must be 90 +/- 10.) Then press !. If X is not within the required range, do the Gain Curve Adjustment procedure again (complete the entire adjustment procedure without adjusting anything, then start again from the beginning).

```
<<<<<< EXIT >>>>>>
If NG , ajust gain curve again !!
[ Next : Hit Enter Key !! ]
```

16. Press the Enter key.

```
 [ Next : Hit Enter Key !! ]
```

17. Press the Enter key again. The Gain Curve Confirmation procedure is finished, and the White Level Difference Adjustment starts.

```
******************************
**** AJUST WHITE EVEN ODD ****
******************************
---- Put the White Chart on the Lamp position !! ----
<< Then , Hit Enter Key >>
```

18. Move the 1st carriage to the white chart position. Then press the Enter key.

```
<<<< AGC=27 >>>>
<<<< Absolute white level (W1) >>>>
   Ajust VR3  :  <W0X> == 0 +/- 3
**** Image Data (#3684) ****  [ Exit : '!' key ]
                                                                [X]
003,003, 085,085 (082,082 <+>000)  [082]    Ave-(O:082,E:082 <+>000) [082]
```

19. Adjust VR3 on the SBU until the value of X is within the required range. (In the example screen above, the value on the bottom line below the X must be 0 +/- 3.) Then input !.

```
<<<<<< EXIT >>>>>>
[ Finish white odd even ajustment!! ]
[ Next : Hit Enter Key !! ]
```

20. Press the Enter key. This ends the White Level Difference Adjustment and starts the Absolute White Level Adjustment.

```
**************************************
**** AJUST WHITE LEVEL (ABSOLUTE) ****
**************************************
---- Put the White Chart on the Lamp position !!
---- << Then , Hit Enter Key >>
```

21. Make sure that the 1st carriage is at the white chart position. Then press the Enter key.

```
<<<< AGC=27 >>>>
<<<< Absolute white level (W1) >>>>
  Ajust VR4  :  [X] == 220 +0 /-10
**** Image Data (#3584) ****  [ Exit : '!' key ]
                                                                      [X]
002,002, 219,217 (217,215 <+>002)  [216]    Ave-(O:217,E:214 <+>002) [215]
```

22. Adjust VR4 on the SBU until the value of X is within the required range. (In the example screen above, the value on the bottom line below the X must be 220 +0 / - 10.) Then input !.

```
<<<<<< EXIT >>>>>>
[ Finish white level (absolute) ajustment!! ]
[ Next : Hit Enter Key !! ]
```

23. Press the Enter key. This ends the Absolute White Level Adjustment and starts the Relative White Level Adjustment.

```
**************************************
**** AJUST WHITE LEVEL (RELATIVE) ****
**************************************
---- Put the White Chart on the Lamp position !! ----
<< Then , Hit Enter Key >>
```

24. Make sure that the 1st carriage is at the white chart position. Then press the Enter key.

```
<<<< AGC=27 >>>>
<<<< Relative white level (W0) >>>>
  Ajust VR1  :  [X] == 218 +/- 3
**** Image Data (#3584) ****  [ Exit : '!' key ]
                                                                      [X]
002,002,222,218 (220,216 <+>004)  [218]    Ave-(O:219,E:216 <+>004) [217]
```

25. Adjust VR1 on the SBU until the value of X is within the required range. (In the example screen above, the value on the bottom line below the X must be 218 +/- 3.) Then input !.

```
<<<<<< EXIT >>>>>>
[ Finish white level (relative) ajustment!! ]
[ Finish All Ajustment!!]
```

The adjustment procedure has finished. Switch off the scanner, remove the VIU, and reassemble the machine.

C. DCU (DATA COMPRESSION UNIT)

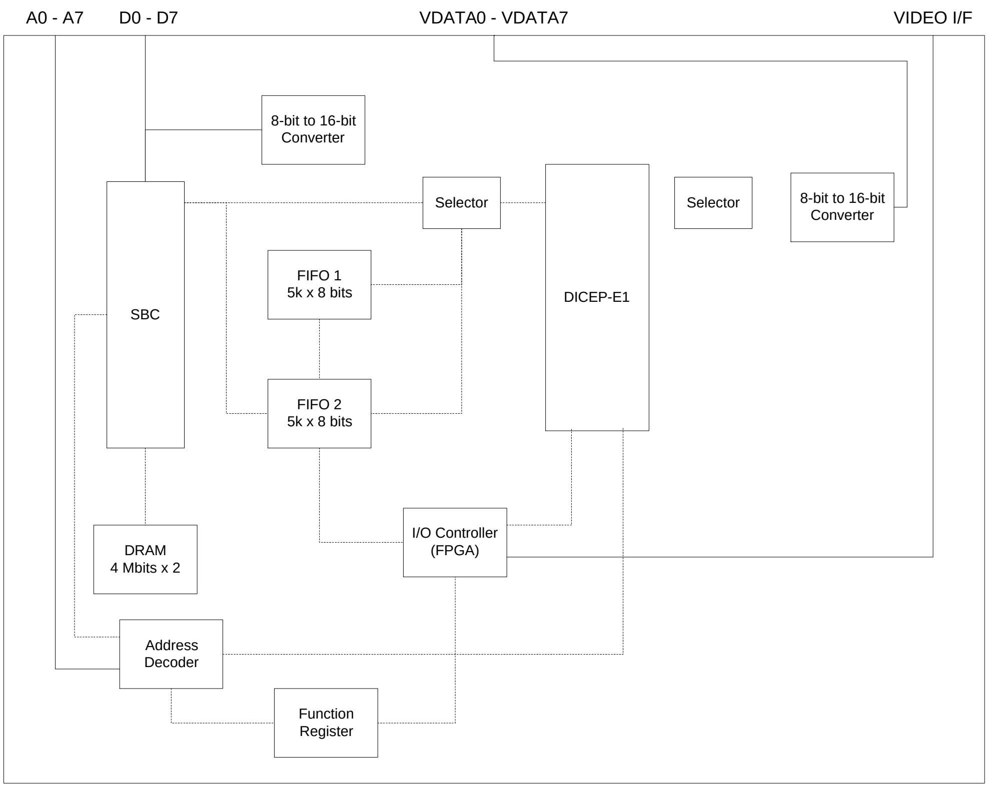
C.1. OVERVIEW

The DCU receives scanned images in binary video data form from the image processor (SIP3) on the SCU board and compresses the data using MH, MR, or MMR, whichever is selected. The DCU sends the compressed data to the SBC (Scan Buffer Controller) on the SCU board.

C.2. FEATURES

For high speed processing, the input/output data processing in the DCU is 16-bit. To make the DCU compact, the FPGA is used for both data input and output processing.

C.3. BLOCK DIAGRAM



G404O501.WMF

Appendix C

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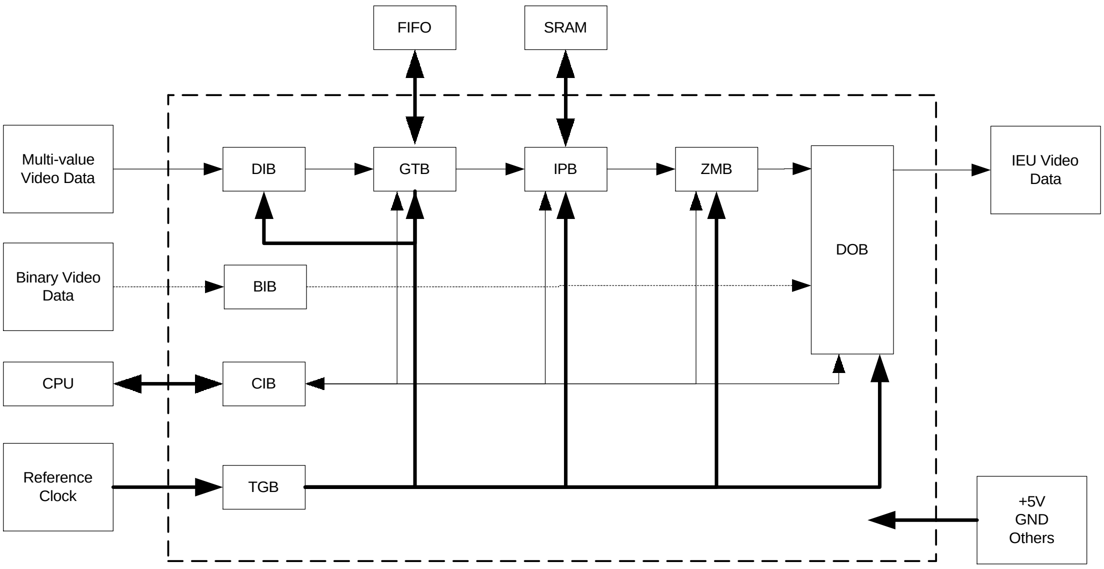
D. IEU (IMAGE ENHANCEMENT UNIT)

D.1. OVERVIEW

The IEU processes Photo/Text separation and Binary conversion automatically.

- **Automatic Photo/Text Separation**: To improve image reproduction of Photo/Text documents, text and photo areas are distinguished automatically and the appropriate image processing is done on them.
- **Automatic Binary Conversion:** To improve image reproduction of text which is printed in various densities, the density is detected automatically and the threshold level is adjusted accordingly.

D.2. BLOCK DIAGRAM



G404O500.WMF

The IEU consists of the following 8 blocks.

1. DIB (Video Data Input Block)

The DIB has the following functions: controlling the input of multi-value (8 bit) video data, generating the line reset signal and the page reset signal, and transmitting multi-value video data to the GTB.

2. BIB (Binary Video Data Input Block)

The BIB has the following functions: controlling the binary video input data, adjusting the delay time for each pixel, and transmitting multi-value video data to the DOB.

3. GTB (Gamma Translation Block)

The GTB does the following: gamma conversion using an internal 256 byte SRAM, grayscale conversion of multi-value video data (8-bit to 6-bit), and transmission of multi-value video data to the IPB.

4. IPB (Image Processing Block)

The IPB has the following functions: MTF correction, averaging of input data, edge extraction, gray level separation, determination of photo and text areas, automatic binary processing, operation for erasure of single black dots, unevenness correction, interfacing with the FIFO memory, and transmission of data to the ZMB.

5. ZMB (Zooming & Mirroring Block)

The ZMB has the following functions: changing magnification, mirroring images, interfacing with SRAM, and data transmission to the DOB.

6. DOB (Video Data Output Block)

The DOB has the following functions: generating text/photo separation data, black/white image inversion, serial/parallel conversion, MSB/LSB reversal, and video data transmission.

7. CIB (CPU Interfacing Block)

The CIB interfaces with the CPU and controls register use by other blocks.

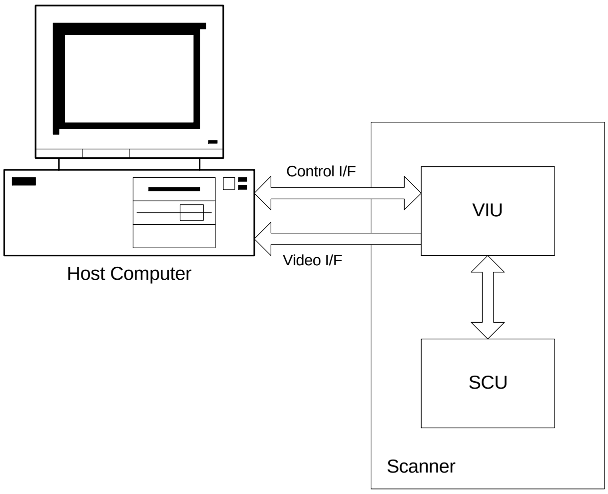
8. TGB (Timing Generator Block)

The TGB generates all timing signals for all blocks.

E. VIU (VIDEO INTERFACE UNIT)

E.1. OVERVIEW

This card speeds up the video interface between the scanner and the host computer.



G404O502.WMF

There are two connectors from the VIU to the host computer.

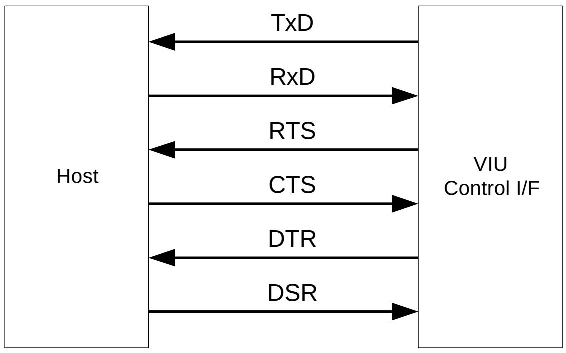
- Scanner control interface
- Video interface (for sending image data to the host computer)

E.2. SCANNER CONTROL INTERFACE

E.2.1. Specifications

Communication method:	EIA RS-232C equivalent
Transmission Method:	Half duplex transmission
Synchronization Method:	Start-stop transmission
Data Length:	8 bits
Stop Bit:	1 bit
Parity Check:	Odd parity
Data Rate (bps):	2400, 4800, 9600, 19200 (Default: 4800)
Maximum Cable Length:	5 m

E.2.2. Signal Description



G404O503.WMF

TxD: Response to the command from the host (scanner to host)

RxD: Command from the host (host to scanner)

RTS: The scanner requests to send data to the host (scanner to host)

CTS: The host is ready to receive data from the scanner (host to scanner)

DTR: The scanner is ready to send or receive data (scanner to host)

DSR: The host is ready to send or receive data (host to scanner)

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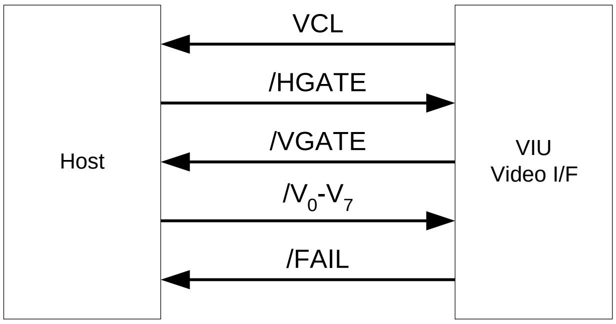
E.3. VIDEO INTERFACE

E.3.1. Signal Description



G404O504.WMF

VCL:	Video data sampling clock (scanner to host)
/HGATE:	Gate signal for the main scan direction (host to scanner)
/VGATE:	Gate signal for the sub-scan direction (scanner to host)
$/V_0$-V_7:	Video data (0: Black)
/Fail:	Indicates that the scanner has a ROM/RAM error.

E.4. SWITCHES AND JUMPERS

There are three switches on the VIU; two are DIP switches and one is a DIC switch.

E.4.1. DIP Switch 1

Switch Type: 2-bit DIP Switch

Function: Data Transfer Speed Setting

Settings

1	2	
off	off	4,800 bps (Default)
off	on	2,400 bps
on	off	9,600 bps
on	on	19,200 bps

E.4.2. DIP Switch 2

Switch Type: 1-bit DIP switch

Function: Normal/Service Mode Selection

Settings

1

off Service Mode
on Normal Mode (Default)

E.4.3. DIC Switch

Switch Type: 8 pairs of jumper pins

Function: 1-4 Cable Type Selection, 5-8 Normal/Service Mode Selection

Settings

Cable Selection
Straight Cable: Short pins 1 and 3 (Default)
Cross Cable: Short pins 2 and 4 pins

Mode Selection
Normal Mode : Short pins 5 and 8 (Default)
Service Mode :Short pins 6 and 7

RICOH Modification Bulletin

Model: IS420	Date: 28-Feb-99	No.: 1

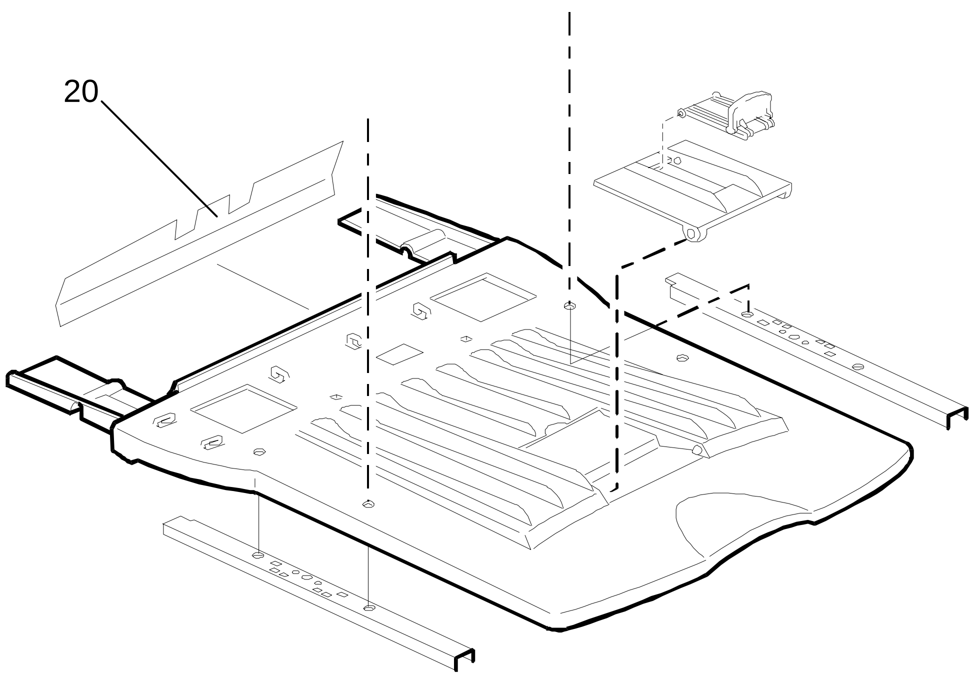
Modified Article: ADF-1	Prepared by: S. Tomoe
From: GTSS Field Information Dept	

Reason for Modification:	☐ Parts catalog correction ☐ To facilitate assembly ☐ Part standardization	☐ Vendor change ☐ To improve reliability ☒ Other	☐ To meet standards ( )

As par field request, the following part has been registered as a service part.

Old part number	New part number	Description	Qty	Int	Page	Index	Note
	G4044124	Guide - ADF	1		13	20	1

Note: The above part should be added to the parts catalog (depot version).



RICOH

Modification Bulletin

Model: IS420	Date: 31-May-99	No.: MG404002

Modified Article: ADF-4	Prepared by: S. Tomoe
From: Technical Service Dept., GTS Division	

Reason for Modification:			
	☒ Parts catalog correction	☐ Vendor change	☐ To meet standards ( )
	☐ To facilitate assembly	☐ To improve reliability	
	☐ Part standardization	☐ Other	

The following should be corrected. Please correct your parts catalog.

Old part number	New part number	Description	Qty	Int	Page	Index	Note
G4046817	G0136817	Transport Belt	1 - 1		19	7	

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Modification Bulletin

PAGE: 1/1

Model: IS420	Date: 31-May-99	No.: MG404003

Modified Article: Ball Bearing			Prepared by: S. Tomoe
From: Technical Service Dept., GTS Division			
Reason for Modification:	☒ Parts catalog correction ☐ To facilitate assembly ☐ Part standardization	☐ Vendor change ☐ To improve reliability ☐ Other	☐ To meet standards ( )

The following should be corrected. Please correct your parts catalog.

Old part number	New part number	Description	Q'ty	Int	Page	Index	Note
50530447		Bushing – 6 mm	1-1		19	6	
	07413706	Ball Bearing – 6x10x3					

RICOH Modification Bulletin

Model: IS420	Date: 15-Sep-99	No.: MG404004

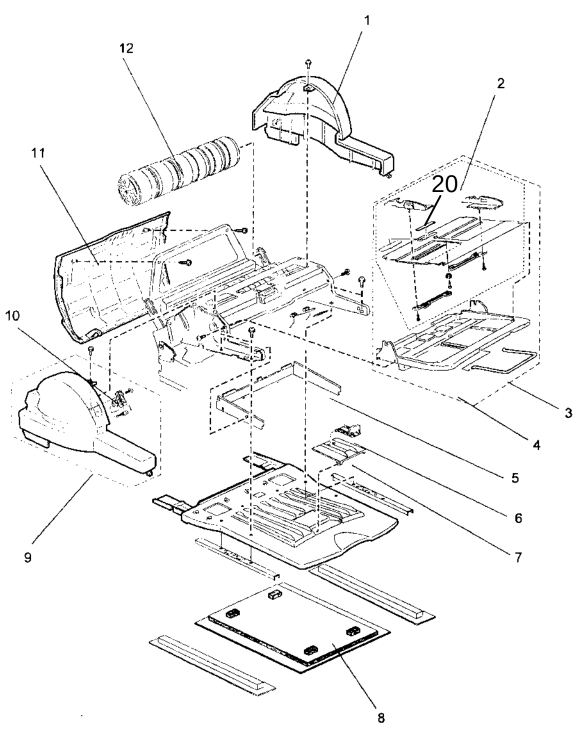
Modified Article: Bottom Tray Pad and Guide Plate	Prepared by: E. Fukuyama
From: Technical Service Dept., GTS Division	

Reason for Modification:			
	☐ Parts catalog correction	☐ Vendor change	☐ To meet standards ( )
	☐ To facilitate assembly	☐ To improve reliability	
	☐ Part standardization	☒ Other	

The following part has been registered as a service part.
Please add this to your parts catalog.

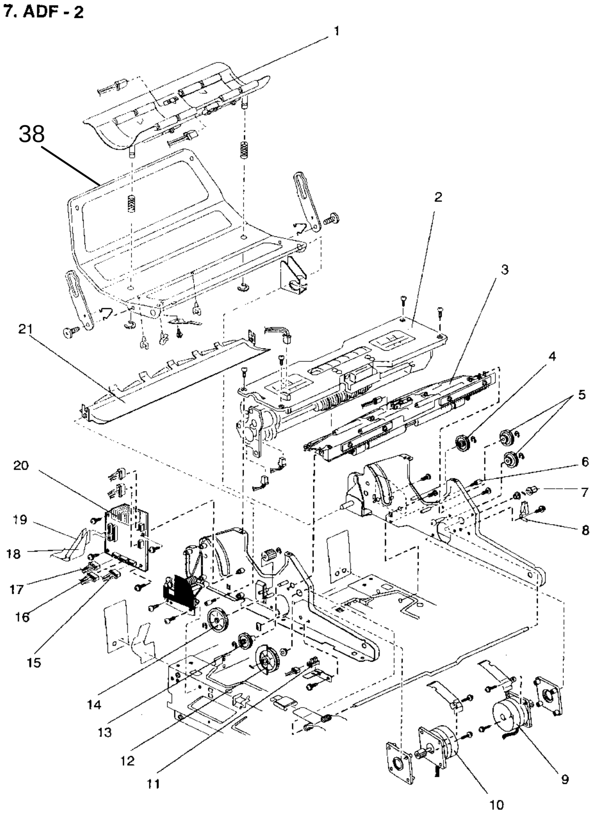
Part number	Description	Q'ty	Page	Index
G404 3522	Bottom Tray Pad	1	13	20
G404 3911	Guide Plate Reverse Sub-unit: ADF	1	15	38

6. ADF - 1



12

7. ADF - 2



14

PARTS CATALOG (DEPOT)

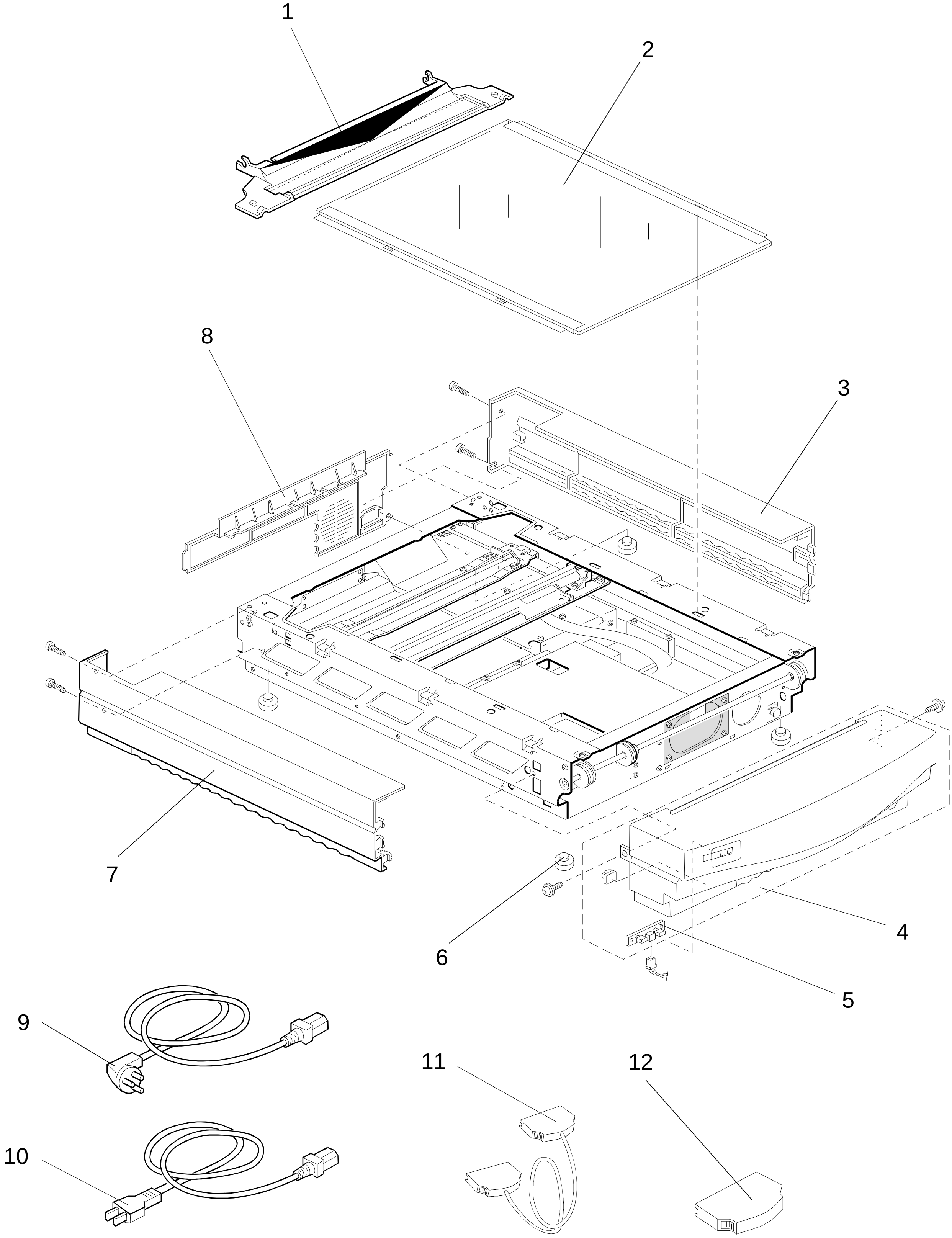
IMAGE SCANNER IS420

[HS-1P]

MODEL NUMBER: G404-03/G404-04

FIRST EDITION:October, 1995

1. SCANNER -1



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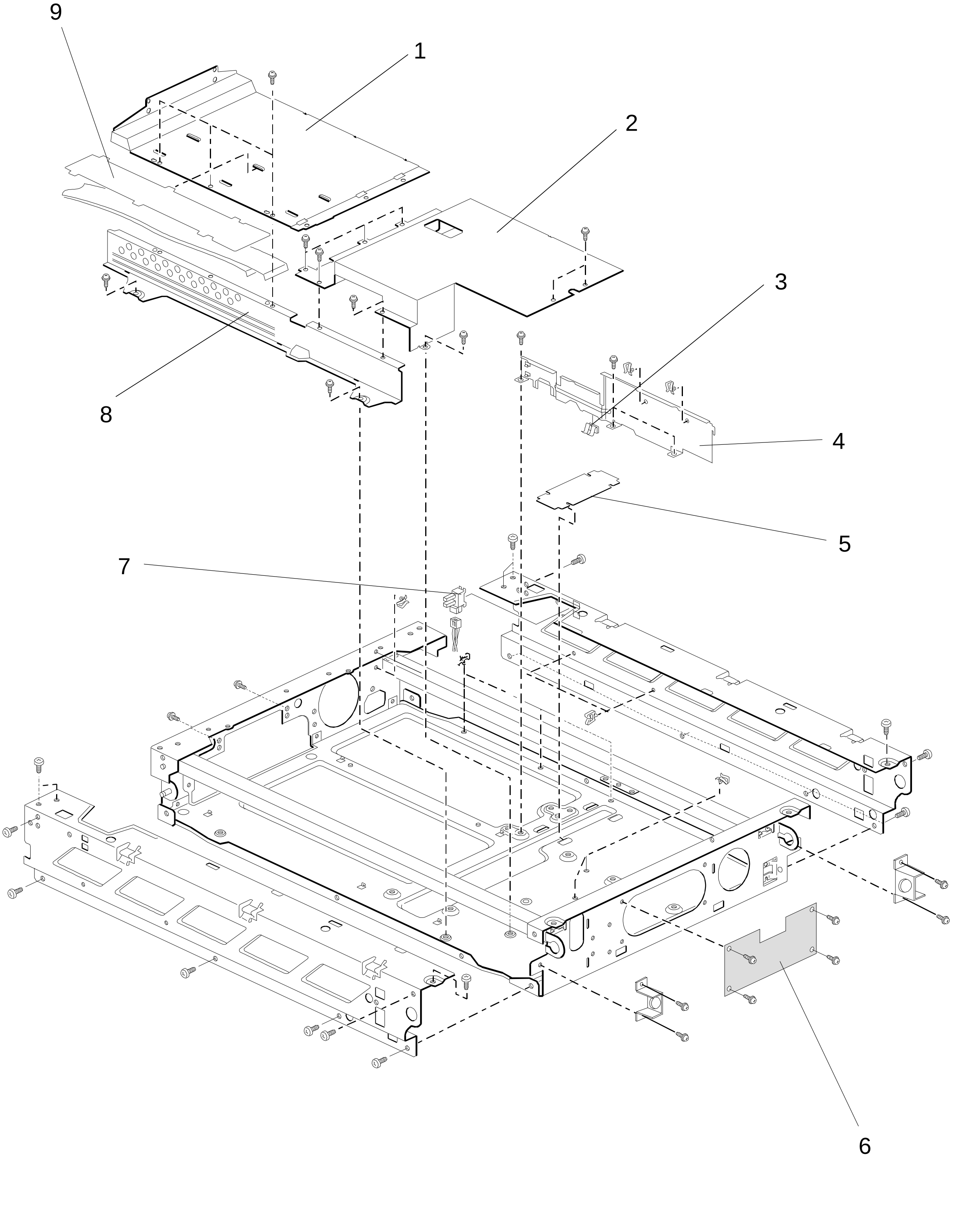
1. SCANNER - 1

Index No.	Part Number	Description
1	G4043110	ADF Exposure Glass Ass’y
2	G4043010	Main Exposure Glass
3	G4041540	Right Cover
4	G4041509	Front Cover
5	G4045451	SDP Board
6	G0121060	Rubber Foot
7	G4041530	Left Cover
8	G4041545	Rear Cover
9	11500025	Power Supply Cord - 250V 10A
10	54905212	Power Supply Cord - UL/CSA 2W
11	G4045570	SCSI Cable (Europe only)
12	11027267	Ternimator - NHA050-TM05-1

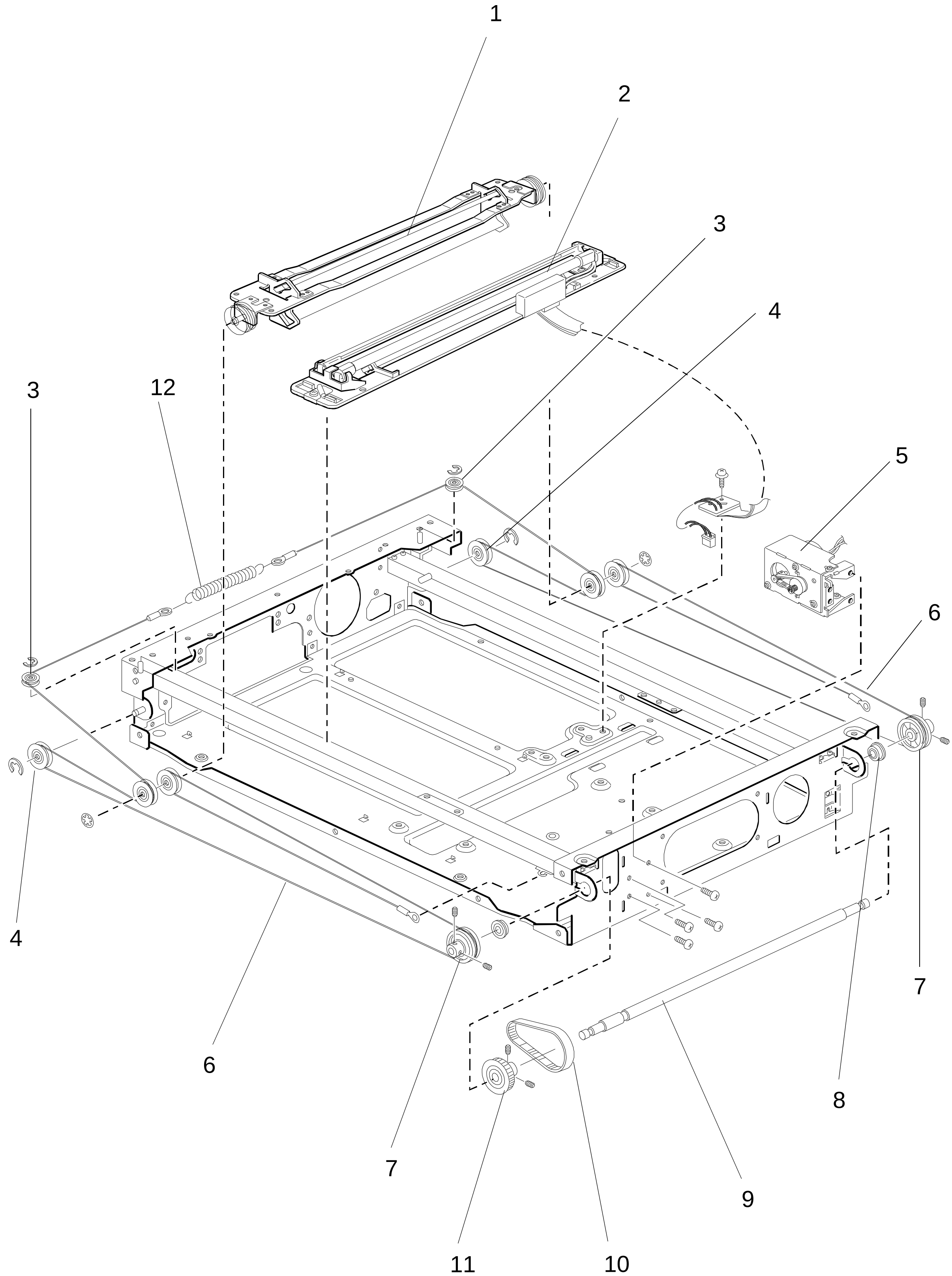
2. SCANNER - 2



2. SCANNER - 2

Index No.	Part Number	Description
1	G4041221	Rear Shield Plate
2	G4041211	Front Shield Plate
3	G4041232	Grounding Plate
4	G4041231	Right Shield Plate
5	G4041283	Guard - Harness
6	G4041271	Shield Plate - Front Side Plate
7	AW020075	Photointerrupter
8	G4041201	Left Shield Plate
9	G4041281	Guard - Flat Cable

3. SCANNER - 3



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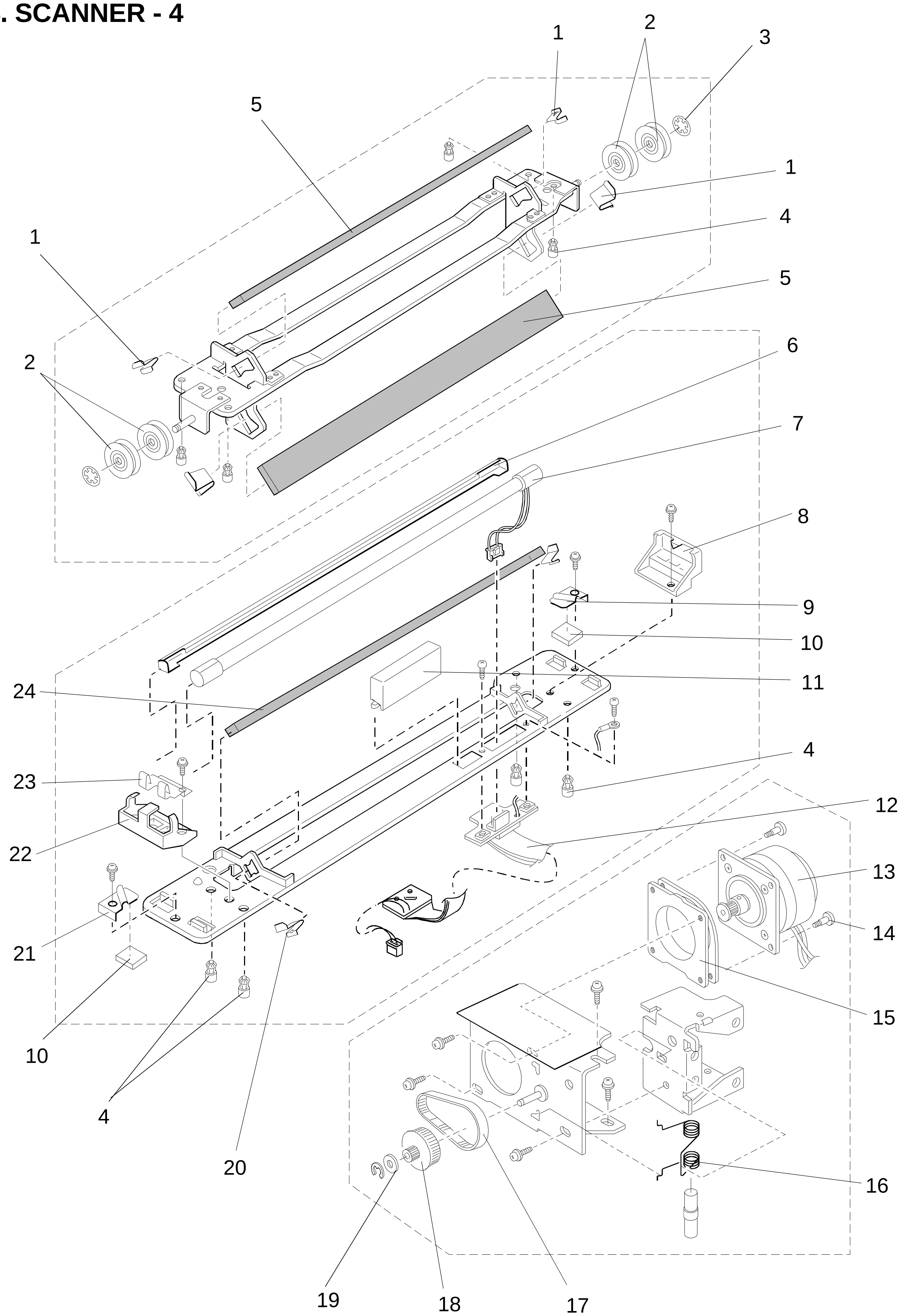
3. SCANNER - 3

Index No.	Part Number	Description
1	G4042800	2nd. Carriade Ass'y
2	G4042750	1st. Carriade Ass'y
3	H2031378	Pulley - Drive Wire
4	H2031316	Pulley - 2nd. Carriade
5	G4041111	Scanner Feed Motor Ass'y
6	G4041134	Carriage Drive Wire
7	H2031310	Pulley - Front Drive
8	07423808	Ball Bearing - 8X16X5
9	G4041131	Shaft - Scanner Drive
10	G4041133	Timong Belt - L180
11	G4041132	Pulley - 49T
12	G4041135	Spring - Drive Wire

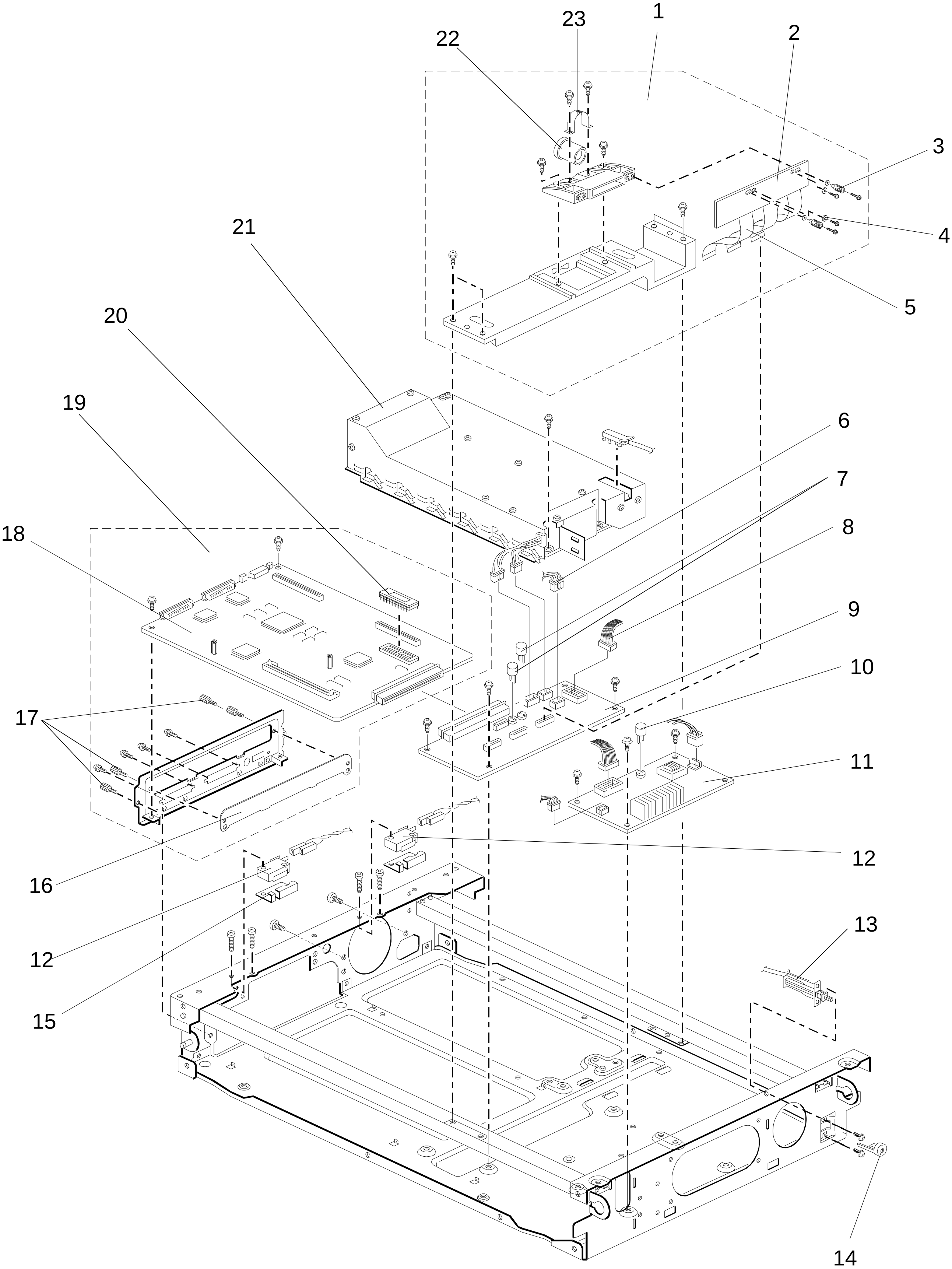
4. SCANNER - 4



4. SCANNER - 4

Index No.	Part Number	Description
1	A1341791	Spring Plate - 2nd. Mirror
2	H2031316	Pulley - Second Carriage
3	G4042809	C-ring - M6
4	A1001737	Slider - Scanner
5	AC030070	Mirror - Second
6	G4042760	Reflector
7	G4045600	Xenon Lamp
8	G4042709	Right Holder - Xenon Lamp
9	G4042712	Right Stopper Plate - Drive Wire
10	G4042715	Cushion - Stopper Plate
11	G4042713	Cover - Flexible Harness
12	G4045550	Flexible Harness
13	G4041101	Scanner Feed Motor DC 34W
14	AA143289	Stopped Screw - M4X7.5
15	G4041105	Cushion - Motor
16	G4041122	Tension Spring
17	G4041116	Timing Belt - L144
18	G4041118	Pulley - 44/21T
19	H2031317	Frange - Pulley
20	H2031118	First Mirror Clamp
21	G4042711	Left Stopper Plate - Drive Wire
22	G4042707	Left Holder - Xenon Lamp
23	G4042708	Spring Plate - Xenon Lamp
24	H0811062	Scanner Mirror

5. SCANNER - 5



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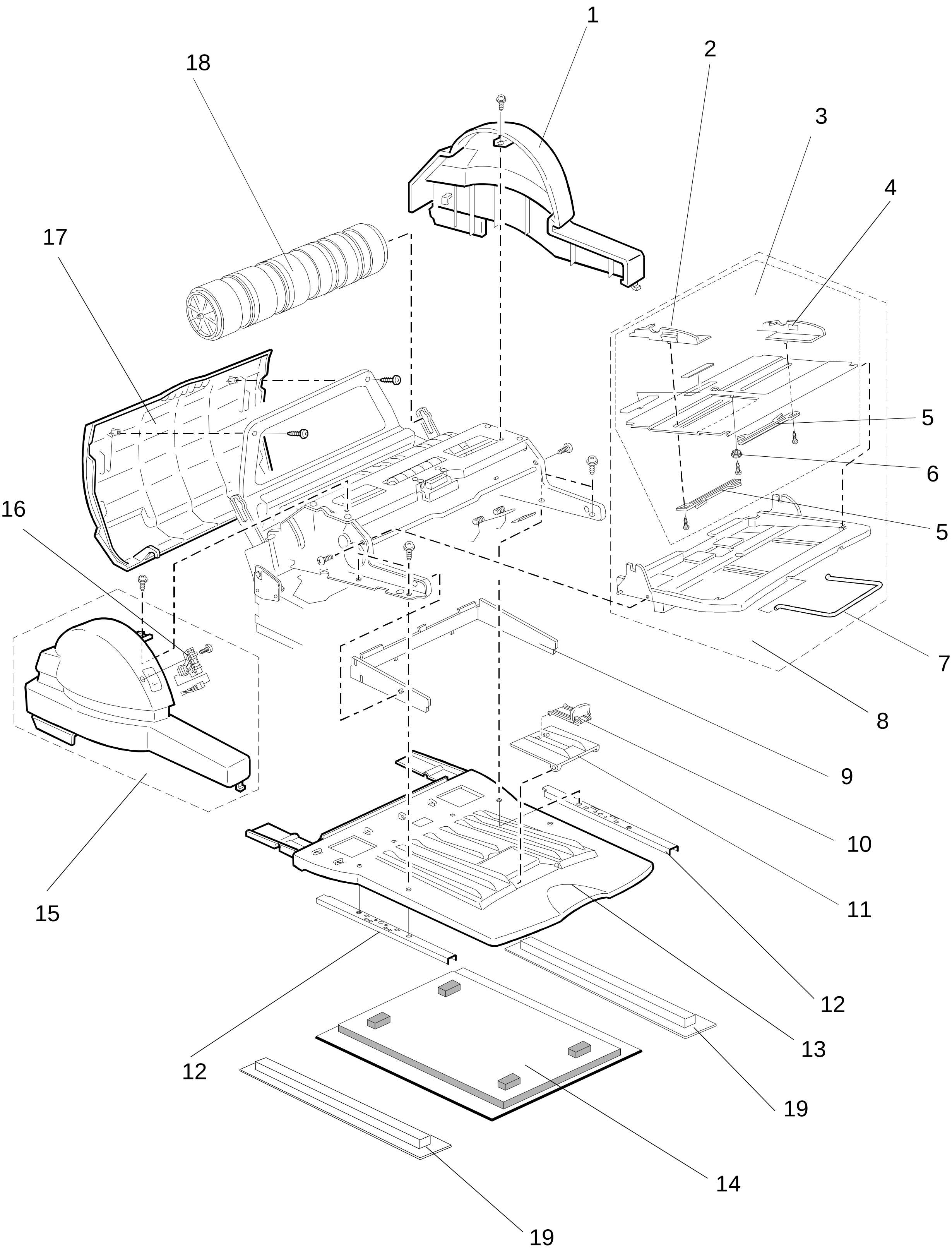
5. SCANNER - 5

Index No.	Part Number	Description
1	G4042900	Scanner Unit
2	G4045102	SBU Board
3	H0001210	Adjustment Knob - SBU
4	54663198	Washer - SBU
5	G4045536	Harness - SBU-MBU
6	G4045510	Harness - Interlock Switch
7	11070712	Fuse - K19374-5A
8	G4045515	Harness - MBU-SDU
9	G4045201	MBU Board
10	11070720	Fuse - K19374-1.25A
11	G4045301	SDU Board
12	G4041261	Microswitch
13	G4041250	Main Switch
14	G4041520	Buttom - Main Switch
15	G4041262	Bracket - Switch
16	G4041245	Cover - Option
17	G4041246	Knob Screw - M3
18	G4045651	SCU Board
19	G4045010	SCU Board Ass’y
20	G4045690	Programmed ROM - SCU
21	G4045011	Power Supply Board
22	AC020046	CCD Lens - F4/F3
23	H2031204	Lens Holder

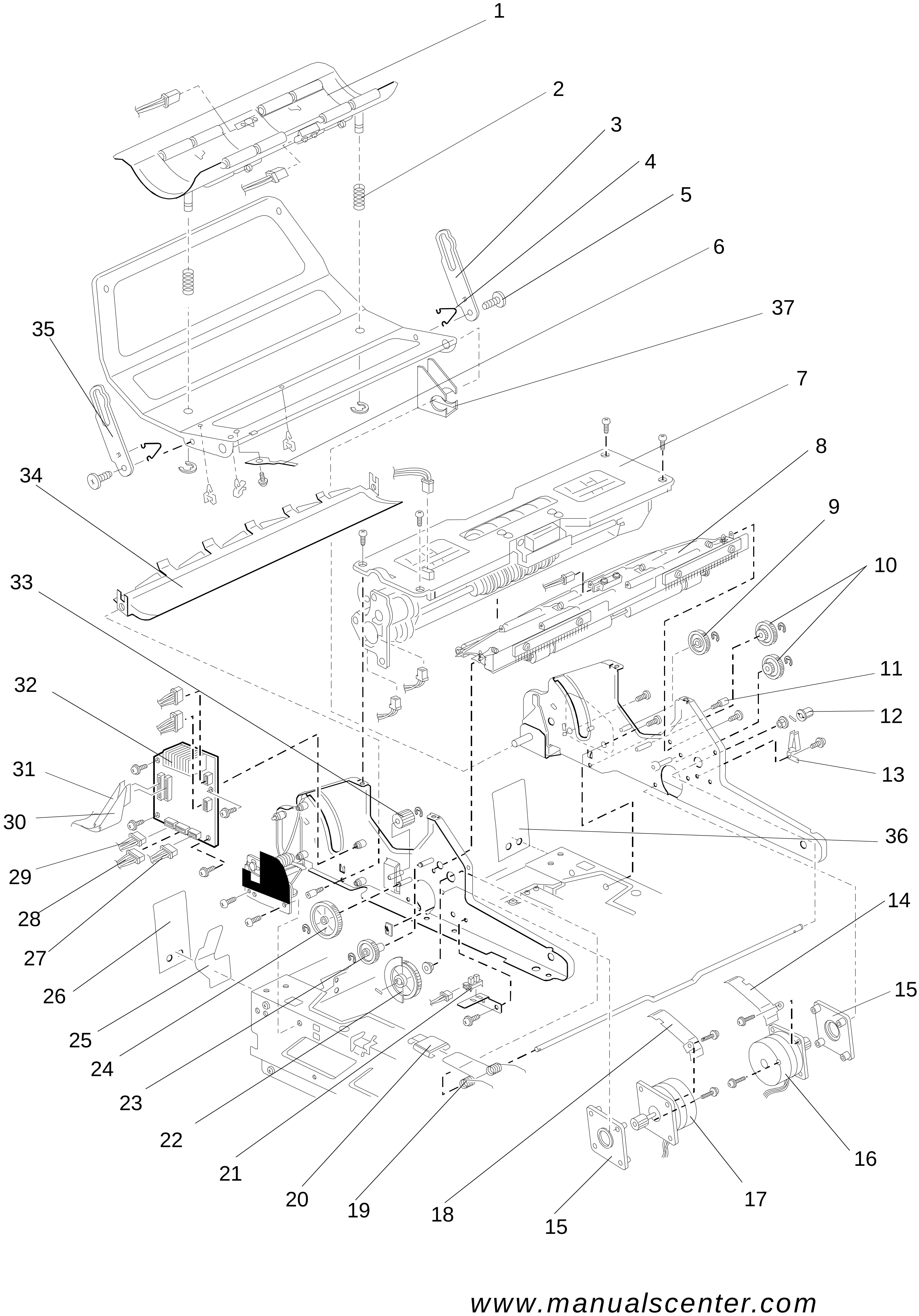
6. ADF - 1



6. ADF - 1

Index No.	Part Number	Description
1	G4041722	ADF Right Cover
2	G4043530	Left Side Fence
3	G4043520	Original Table Ass'y
4	G4043540	Right Side Fence
5	G0123325	Side Fence Rack
6	AB013492	Gear - 16Z
7	G4043515	Document Support Lever
8	G4043500	Document Table Ass'y
9	G4044113	ADF Lower Cover
10	G4044112	Paper Stopper - Exit Table
11	G4044111	Sub - Exit Table
12	G4044114	Bracket - Platen Cover
13	G4044101	Platen Cover
14	G4044130	Platen Cover Sheet
15	G4041710	ADF Left Cover
16	G4041718	ADP Board
17	G4041732	ADF Upper Cover
18	G4043800	Paper Transport Drum
19	G4044150	Sub Platen Cover Sheet

7. ADF - 2



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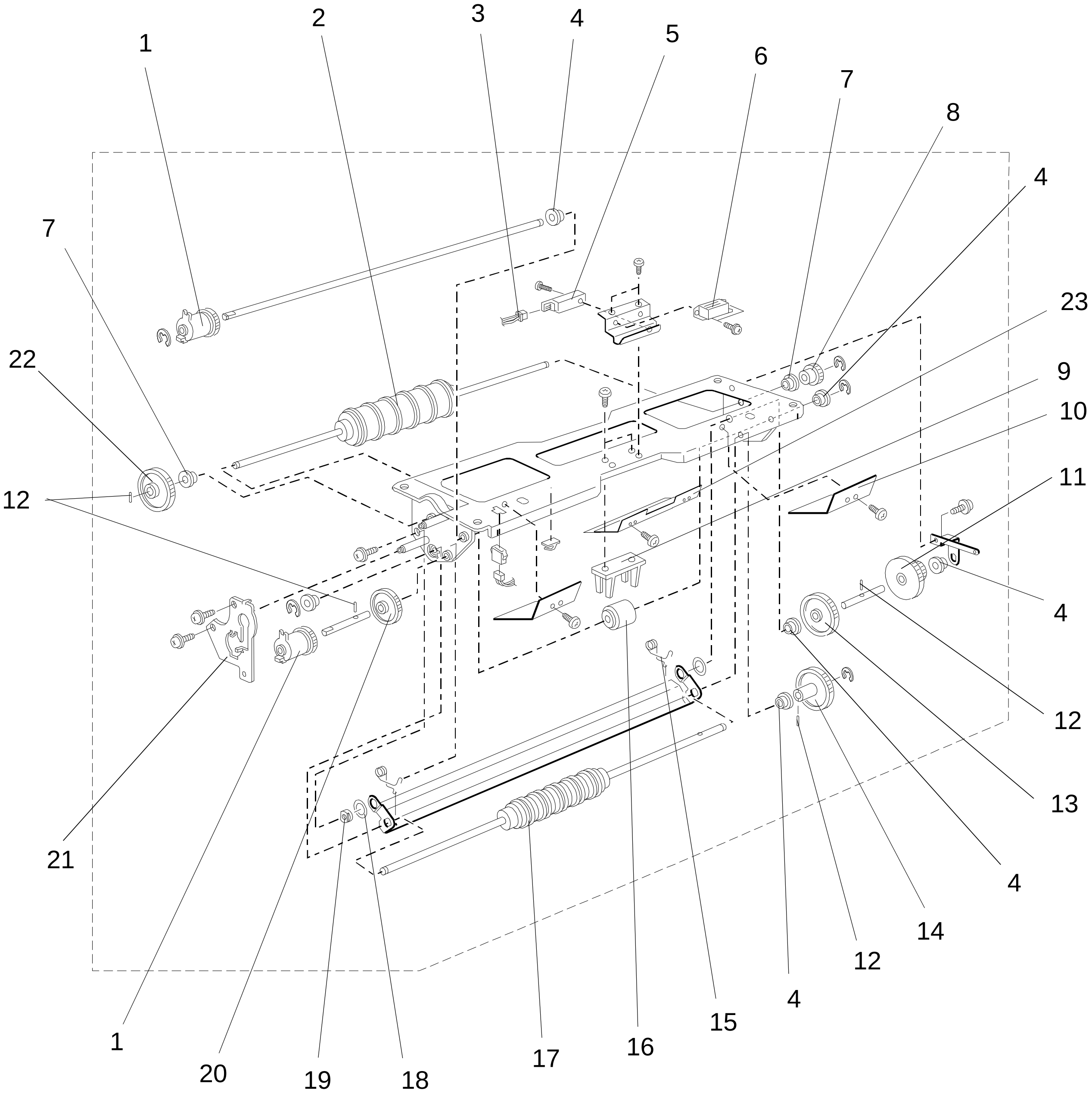
7. ADF - 2

Index No.	Part Number	Description
1	G4043916	Transport Guide Ass'y
2	G4043940	Pressure Spring
3	G4043913	Right Drum Arm
4	G4043914	Spring - Drum Arm
5	AA140065	Stepped Screw - M3X6
6	G4043915	Actuator - Interlock Switch
7	G4043600	Separation Unit
8	G4044005	Feed-out Unit
9	G4043331	Gear - 38Z
10	G4043330	Gear - 45/22Z
11	52053966	Set Screw
12	G4043403	Cam - Document Table
13	G4043350	Spring Plate - Cam
14	G4043341	Right Spring Plate - Motor
15	G4043241	Cushion - Motor
16	G4043340	Paper Transport Motor - 2.25V DC 1.5A
17	G4043240	Paper Feed Motor - 2.25V DC 1.5A
18	G4043242	Left Spring Plate - Motor
19	G4043404	Spring - Document Table
20	G4043410	Pad - Sensor
21	AW020075	Photointerrupter
22	G4043402	Gear - 52Z
23	G4043230	Gear - 43Z
24	G4043231	Gear - 59Z/19Z
25	G4041282	Supporter - Flat Cable
26	G4041754	Left Harness Guard
27	G4045520	Harness - ADP
28	G4045525	Harness - Feed-in
29	G4045530	Harness - Feed-out
30	G4045500	Harness - ADU-MBU - 16 pin
31	G4045505	Harness - ADU-MBU - 18 pin
32	G4045401	ADU Board
33	G4043232	Gear - 25Z
34	G4043950	Lower Transport Guide
35	G4043912	Left Drum Arm
36	G4041755	Right Harness Guard
37	G4041756	Hinge Cover

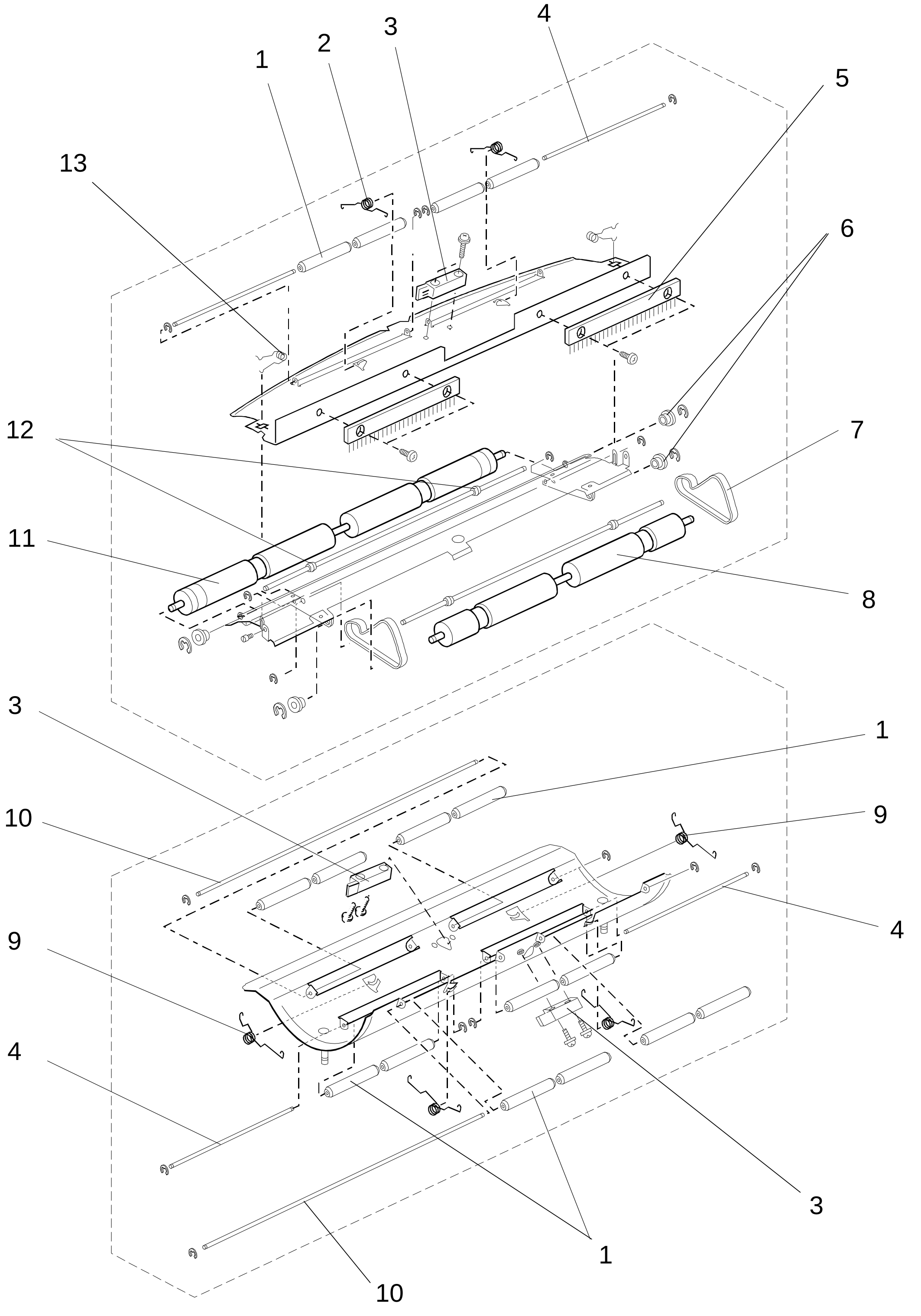
8. ADF - 3



8. ADF - 3

Index No.	Part Number	Description
1	G0125360	Magnet Clutch Feed
2	G4043640	Paper Transport Drum
3	G4045540	Harness - Document Sensor
4	50530447	Bushing - 6mm
5	A0105700	Sensor
6	AG070004	Magnetic Catch
7	54466214	Shaft Holder - Pick-up Roller
8	G4043651	Gear - 23Z
9	G4043632	Pick-up Roller Holder
10	G4043602	Upper Guide Plate
11	G4043678	Gear - 45/25Z
12	G4043407	Parallel Pin - M 1.5
13	G4043677	Gear - 45Z
14	G4043672	Gear - 48Z
15	G4043673	Spring - Separation Unit
16	G4043630	Pick-up Roller
17	G4043660	Separation Roller
18	G4043682	Washer - Separation Roller
19	G4043674	Bushing - Separation Roller
20	G4043692	Gear - 45Z
21	G4043633	Left Bracket - Separation
22	G4043652	Gear - 50Z
23	G4043684	Upper Paper Support

9. ADF - 4



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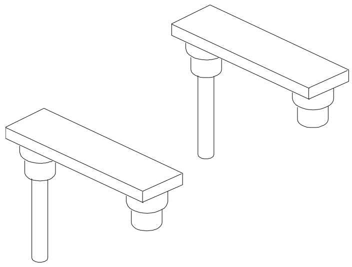
9. ADF-4

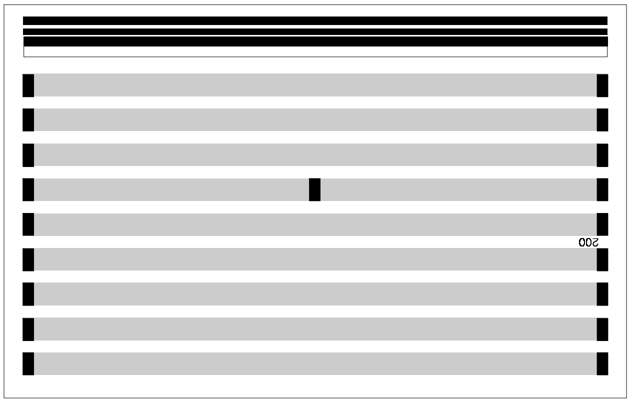
Index No.	Part Number	Description
1	G4043934	Paper Transpoprt Roller
2	G4044017	Spring - Roller
3	A4225270	Photosensor
4	G4043936	Short Shaft - Roller
5	G4044020	Antistatic Brush
6	50530447	Bushing - 6 mm
7	G4046817	Transport Belt
8	G4044050	Exit Roller
9	G4043933	Spring - Transport Roller
10	G4043935	Long Shaft - Roller
11	G4044040	Drive Roller - Paper Feed
12	G4044052	Pulley - Transport Belt
13	G4044060	Spring - Feed Out

10. SPECIAL TOOLS

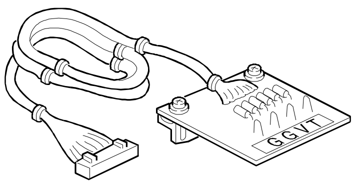
1



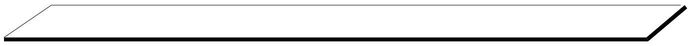
4



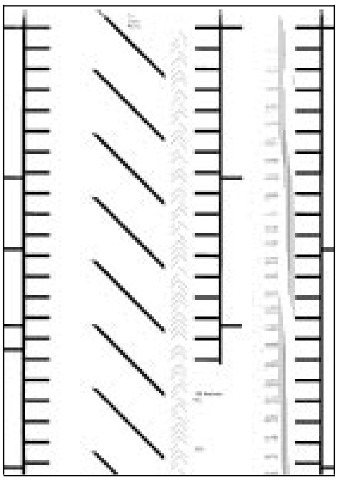
2



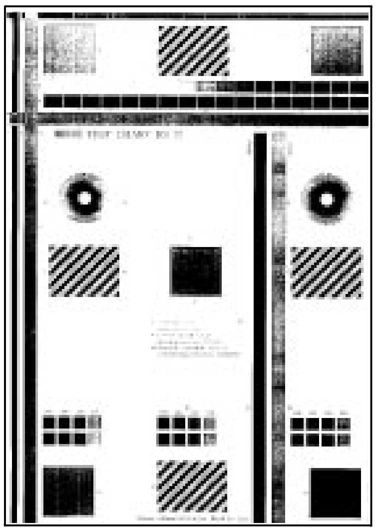
5



6



7



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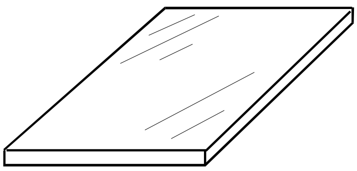
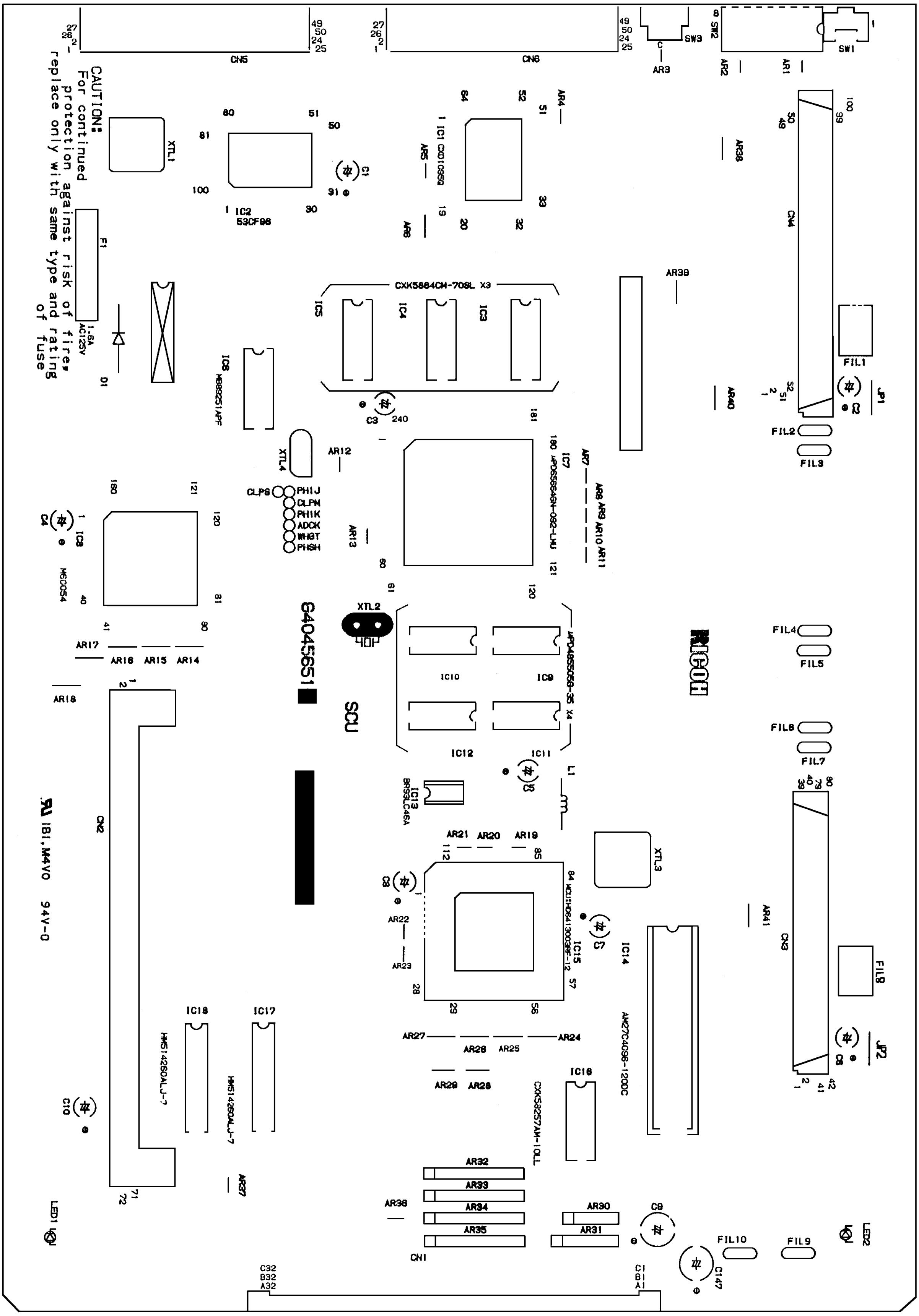


10. SPECIAL TOOLS

Index No.	Part Number	Description
1	G4049000	Scanner Positioning Tool
2	G4049002	Jig Harness
3	G4049001	Jig Glass
4	A0129110	Resolution Chart
5	G4043102	White Sheet
6	G4049003	RS-13 Chart (A5)
6	G4049005	RS-13 Chart (A4)
6	G4049004	RS-13 Chart (A3, 55 kg)
6	G4049006	RS-13 Chart (A3, 90 kg)
7	H2039114	RS-12 Chart (A3)

11. SCU BOARD (G4045651)



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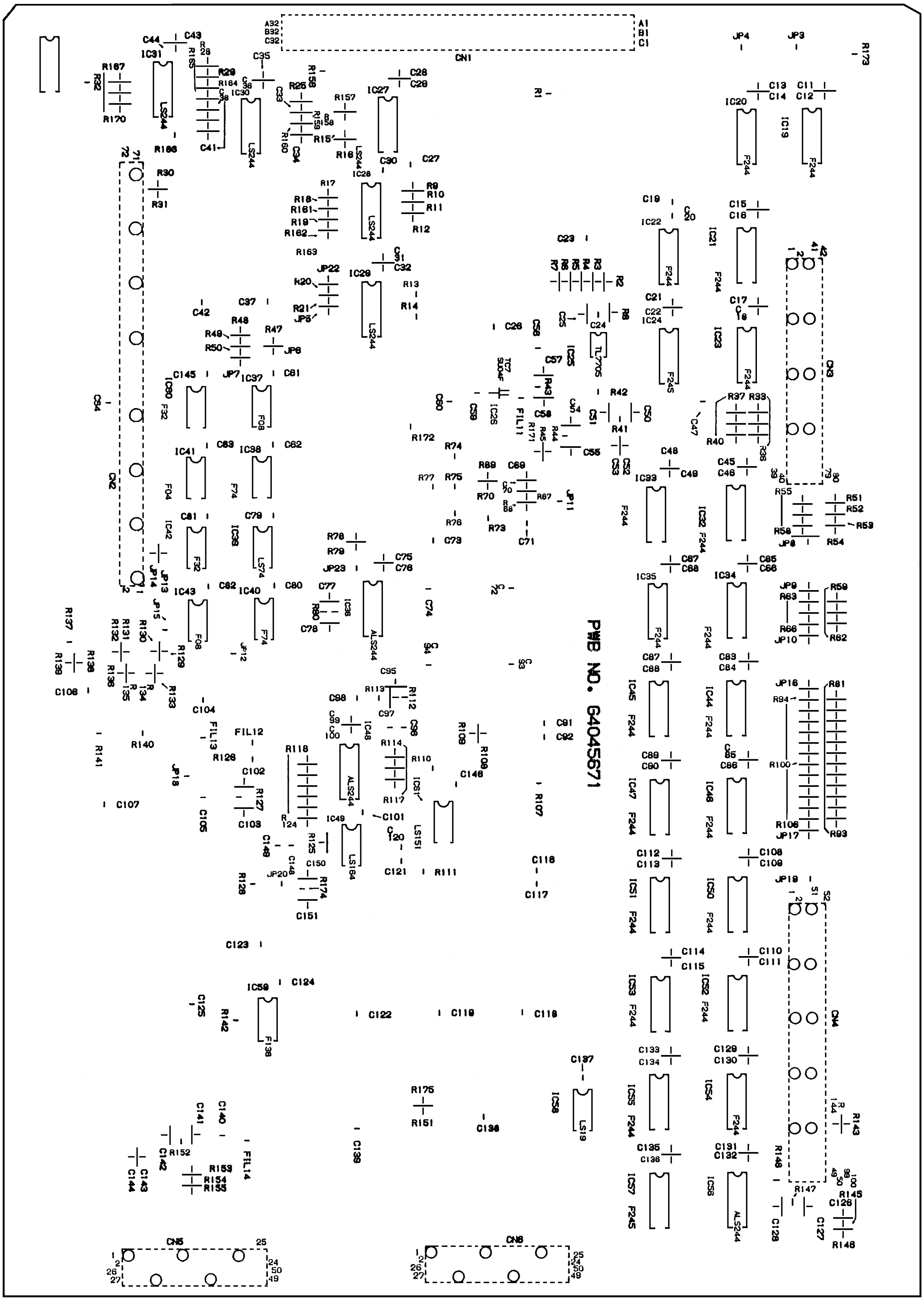
PWB NO. G4045671
CN1
CN2
CN3
CN4
CN5
CN6
CN8

11. SCU BOARD (G4045651)

Symbol Code	Part No.	Description	Front Side	Reverse Side	Q'ty
CN1	11026130	Connector - 96 pin	❍		1
CN2	11026498	SIMM Connector	❍		1
CN3	11026540	Connector - 80 pin	❍		1
CN4	11026811	Connector - 176380-4	❍		1
CN5, 6	11027032	Connector - 5-179583-4	❍		2
SW1	12042124	Switch - Vertical	❍		1
SW2	12042320	Dip Switch - DISP8CB-1	❍		1
SW3	12042352	Rotary Switch - DRR-4110	❍		1
(SW3)	12042361	Knob - Switch - MD0050798	❍		1
IC1	14072746	IC - CXD1095Q	❍		1
IC2	14074347	IC - 53CF96-2	❍		1
IC3 ~ 5	19020002	IC - DRAM-4MB	❍		3
IC7	G4045960	IC - µPD65664GN-092-LMU	❍		1
IC8	G4045950	IC - M60054-0216QFP	❍		1
IC9 ~ 12	14074341	IC - µPD485505G-35	❍		4
IC13	14074304	IC - EEPROM-BR93LC46A	❍		1
(IC13)	11040511	IC Socket - 8 pin	❍		1
IC14	G4045690	Programmed ROM - SCU	❍		1
(IC14)	11040612	IC Socket - 40 pin	❍		1
IC15	14074461	IC - HD6413003F-12	❍		1
IC16	19020010	IC - SRAM-2MB	❍		1
IC17, 18	19010023	IC - DRAM-4MB	❍		2
IC21~23, 32~35, 44~47, 50, 52, 54, 55	14072143	IC - 74F244SJ		❍	15
IC24, 57	14072144	IC - 74F245SJ		❍	2
IC25	14080537	IC - TL7705CPS-B		❍	1
IC26	14073764	IC - TC7SU04F		❍	1
IC27~31	14074192	IC - SN74LS244M		❍	5
IC36, 48, 56	14073008	IC - SN74ALS244BNS		❍	3
IC37, 43	14072130	IC - 74F08SJ		❍	2
IC38, 40	14072135	IC - 74F74SJ		❍	2
IC39	14072052	IC - SN74LS74ANS		❍	1
IC41	14072129	IC - SN74LS74F04SJ		❍	1
IC42, 60	14072134	IC - SN74F32SJ		❍	2
IC49	14074382	IC - SN74LS164M		❍	1
IC58	14073128	IC - SN74LS19ANS		❍	1
IC59	14072137	IC - 74F138SJ		❍	1
IC61	14072594	IC - SN74LS151NS		❍	1
AR1~3	16017734	Resistor Array - 3.3 KΩ ±5%	❍		3
AR4~5, 19~23	16017752	Resistor Array - 10 KΩ ±5%	❍		7
AR6	16014021	Resistor Array - 10 KΩ ±5%	❍		1
AR7~11, 13	16017706	Resistor Array - 68 Ω ±5%	❍		6
AR12	16017756	Resistor Array - 22 Ω ±5%	❍		1
AR14~18, 24~27	16017743	Resistor Array - 33 Ω ±5%	❍		9
AR28, 29, 38~41	16012957	Resistor Array - 4.7 KΩ ±5%	❍		6

Symbol Code	Part No.	Description	Front Side	Reverse Side	Q'ty
AR32	16017368	Resistor Array - 470 Ω ±5%	❍		1
AR33	16017576	Resistor Array - 1 KΩ ±5%	❍		1
AR36	16011413	Resistor Array - 33 ΩW ±5%	❍		1
AR37	16017708	Resistor Array - 470 Ω ±5%	❍		1
R2, 3, 8, 11, 12, 19~21, 30, 31, 45, 49, 67, 68, 73, 76, 111, 128, 142, 153, 154, 155, 171, 172, 176, 177	16303103	Resistor - 10 KΩ ±5% 1/10W		❍	26
R5~7, 9, 10, 15~18, 28, 29, 50, 126, 129~141, 148	16303330	Resistor - 33 Ω ±5% 1/10W		❍	27
R13, 32, 173	16303331	Resistor - 330 Ω ±5% 1/10W		❍	3
R14	16303271	Resistor - 270 Ω ±5% 1/10W		❍	1
R25	16303222	Resistor - 2.2 KΩ ±5% 1/10W		❍	1
R33~36, 51~54, 59~62, 78, 81~93, 143, 159, 160	16303471	Resistor - 470 Ω ±5% 1/10W		❍	29
R37~40, 42, 55~58, 63~66, 79, 94~106, 112, 144, 145	16303102	Resistor - 1 KΩ ±5% 1/10W		❍	30
R41	16303120	Resistor - 12 Ω ±5% 1/10W		❍	1
R125	16303220	Resistor - 22 Ω ±5% 1/10W		❍	1
R69, 74, 151, 175	16303472	Resistor - 4.7 KΩ ±5% 1/10W		❍	4
R75, 77	16303104	Resistor - 100 KΩ ±5% 1/10W		❍	2
R107~110, 114~124	16303680	Resistor - 68 Ω ±5% 1/10W		❍	15
R113	16303105	Resistor - 1 MΩ ±5% 1/10W		❍	1
R146	16303100	Resistor - 10 Ω ±5% 1/10W		❍	1
R43, 44, 80, 147, 156~158, 161~170, JP8~11, 16~20	16330000	Resistor - 0 Ω ±1% 1/10W		❍	26
C1~8, 10	16422100	Capacitor - 10 µF ±20% 10V		❍	9
C9, 147	16420101	Capacitor - 100 µF ±20% 10V		❍	2

Symbol Code	Part No.	Description	Front Side	Reverse Side	Q'ty
C15, 17, 19, 23~28, 31, 35, 37, 42, 43, 45, 47, 48, 52, 56, 59~65, 67, 71~75, 79~83, 85~87, 89~91, 93, 94, 97, 99, 101, 104~108, 110, 116, 118, 119, 121, 122, 124, 125, 129, 131, 133, 137~140, 145, 146	16061140	Capacitor - 0.1 µF 25V		❍	70
C16, 18, 20~22, 29, 30, 32, 36, 44, 46, 49, 53, 66, 68, 76, 84, 88, 92, 96, 100, 109, 111, 117, 120, 126, 130, 132, 134~136	16061139	Capacitor - 0.01 µF 50V		❍	31
C50, 51, 98	16061133	Capacitor - 22 pF 50V		❍	3
C95	16061932	Capacitor - 47 pF 50V		❍	1
LED1, 2	14030842	LED - SLR-332VR-3F	❍		2
XTL2	15030606	Oscylator - 19.028 MHz	❍		1
XTL3	15030607	Oscylator - 24.0 MHz	❍		1
FIL11~14	16070664	Filter - HB-H2012A		❍	4
JP1, 2	10020307	Jamper Wire	❍		0.1M
	G4045701	Spacer - 18mm	❍		2
	07100025G	Nut - M2.5	❍		2
	09502512G	Screw with Spring Washer - M2.5X12	❍		2
	09503008Z	Screw with Spring Washer - M3X8	❍		2

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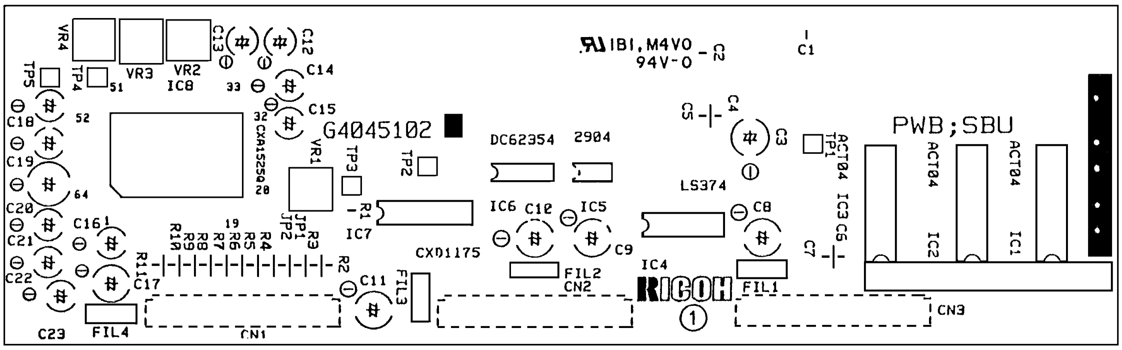
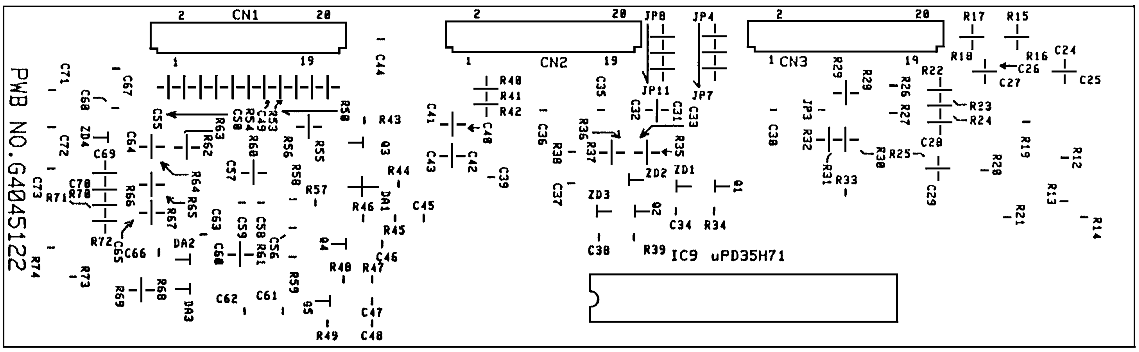
12. SBU (G4045102)



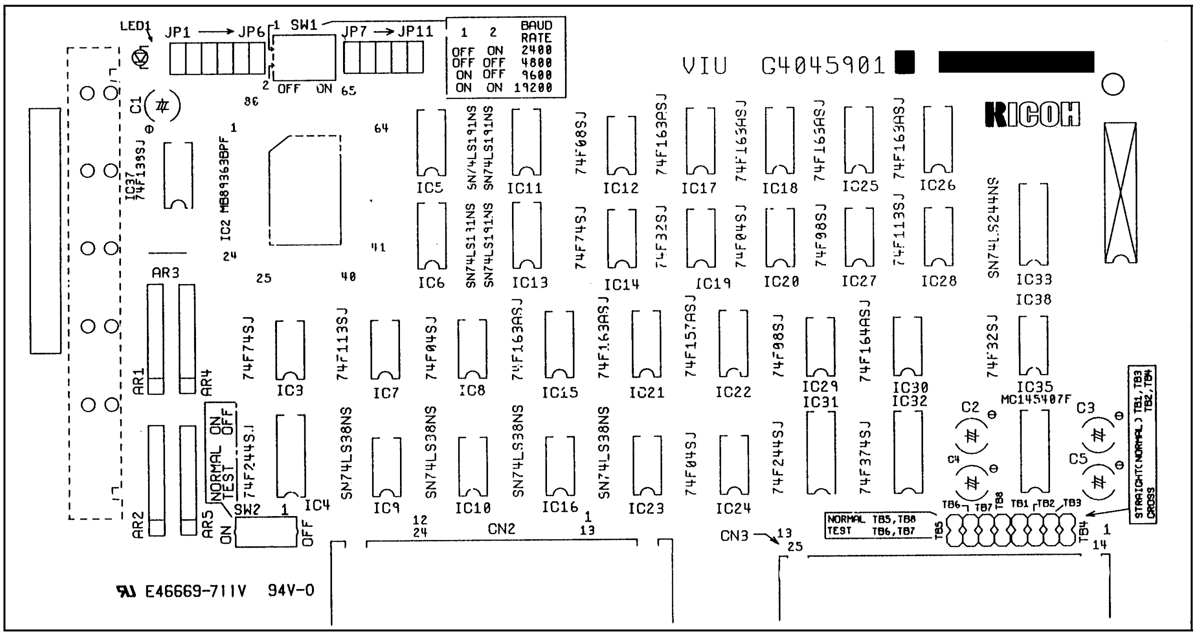


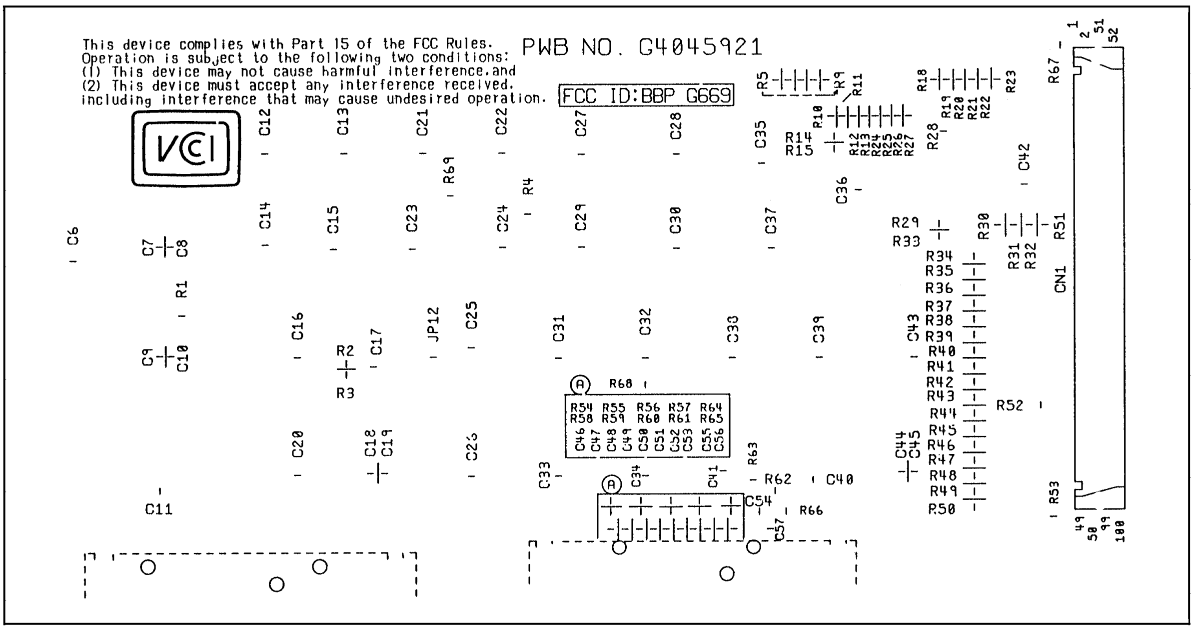
12. SBU (G4045102)

Symbol Code	Part No.	Description	Q'ty
IC1~3	14074455	IC - TC74ACT04P	3
IC4	14071792	IC - SN74LS374NS	1
IC5	14080595	IC - NJM2904M	1
IC6	14081082	IC - M62354FP	1
IC7	14074109	IC - CXD1175AM	1
IC8	A1005406	IC - CXA1525Q	1
IC9	14030838	IC - UPD35H71AD	1
Q1, 2	14000621	Transistor - 2SA1162-GR	2
Q3~5	14000448	Transistor - 2SC2712-GR	3
DA1	14021144	Diode Array - 1SS319	1
DA2, 3	14020478	Diode Array - 1SS226	2
ZD1, 3	14021145	Zener Diode - RD2.7MB2	2
ZD2, 4	14020744	Zener Diode - RD5.6MB2	2
C1, 5~7, 24~27, 30, 32~38, 41, 43~48, 61~64, 67, 68, 71~73	16061140	Capacitor - 0.1µF +80 -20% 25V	32
C2, 4, 31, 39, 40, 42, 56~59, 65, 66, 69, 70	16061139	Capacitor - 0.01µF ±20% 50V	14
C3, 8~11, 17, 20	16422470	Capacitor - 47µF ±20% 25V	7
C12~14, 18, 19	16405479	Capacitor - 4.7µF ±20% 50V	5
C15, 16, 21~23	16405100	Capacitor - 10µF ±20% 50V	5
C28, 29	16061136	Capacitor - 1000pF ±10% 50V	2
C49~55, 60	16061190	Capacitor 150pF ±5% 50V	8
FIL1~4	16027027	Filter - DSS306-55E222Z100	4
R1	16303273	Resistor - 27kΩ ±5% 1/10W	1
R2~11, 15, 16, 22, 26, 28, 32, 35, 40~43, 45, 47, 49, 52, 54~56, 59, 64, 68, 70, 71, 74	16303102	Resistor - 1kΩ ±5% 1/10W	34
R12, 13, 19, 21, 33	16303229	Resistor - 2.2Ω ±5% 1/10W	5
R14, 20, 34, 39, 46, 48	16303470	Resistor - 47Ω ±5% 1/10W	6
R17, 18, 23, 27, 29, 31, 50, 51, 53	16303332	Resistor - 3.3kΩ ±5% 1/10W	9
R24, 25, 30	16303680	Resistor - 68Ω ±5% 1/10W	3
R36	16332701	Resistor - 2.7kΩ ±1% 1/10W	1
R37	16338201	Resistor - 8.2kΩ ±1% 1/10W	1
R38, 60, 61, 67	16303101	Resistor - 100Ω ±5% 1/10W	4
R44	16303510	Resistor - 51Ω ±5% 1/10W	1
R57	16332702	Resistor - 27kΩ ±1% 1/10W	1
R58	16337501	Resistor - 7.5kΩ ±1% 1/10W	1
R62	16331602	Resistor - 16kΩ ±1% 1/10W	1

Symbol Code	Part No.	Description	Q'ty
R63	16331202	Resistor - 12kΩ ±1% 1/10W	1
R65	16303511	Resistor - 510Ω ±5% 1/10W	1
R66	16303514	Resistor - 510kΩ ±5% 1/10W	1
R69	16303202	Resistor - 2kΩ ±5% 1/10W	1
R72	16303392	Resistor - 3.9kΩ ±5% 1/10W	1
R73	16303302	Resistor - 3kΩ ±5% 1/10W	1
JP1~11	16330000	Resistor - 0Ω ±1% 1/10W	11
TP1~5	11010328	Test Pin	5
VR1, 4	16018145	Variable Resistor - 5kΩ 1/2W	2
VR2	16018139	Variable Resistor - 50kΩ 1/2W	1
VR3	16018460	Variable Resistor - 3kΩ 1/2W	1
CN1~3	11027024	Connector - SLEM20S-2	3

13. VIU(G4045901)





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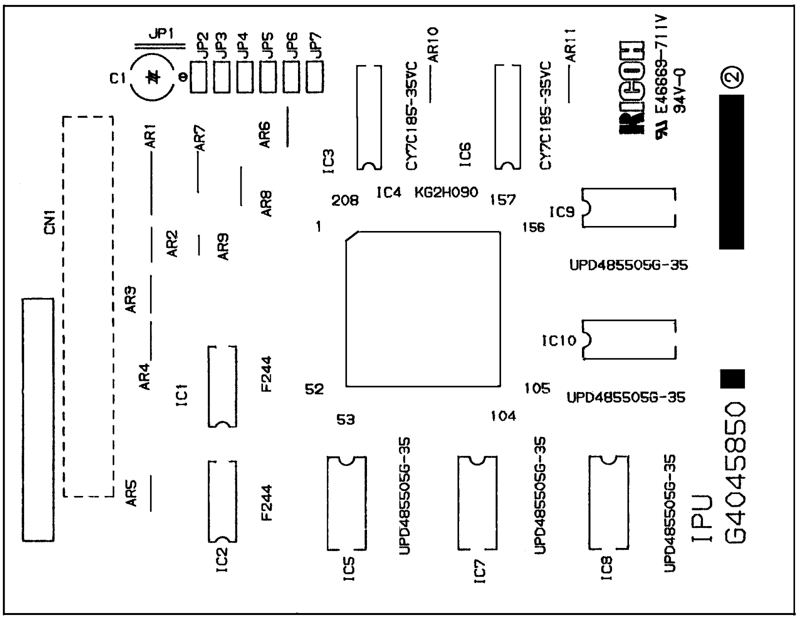
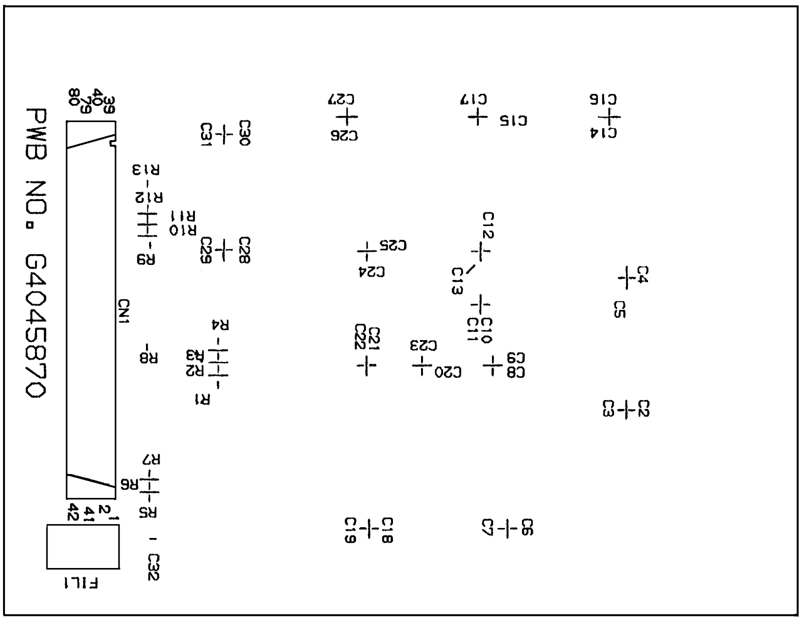
13. VIU (G4045901)

Symbol Code	Part No.	Description	Q'ty
TB1-8	11010314	DIC - 149 - 2P	8
CN3	G0125756A	Connector - 25P: SP7/8	1
CN1	11027247	Connector - 176378-4	1
CN2	11027342	Connector - 57RE-40240-830B	1
SW2	12041015	Switch - J-S8750-#01	1
LED1	14030842	Diode - SLR-332VR3F	1
IC33	14071600	IC - SN74LS244NS	1
IC9, 10, 16, 23	14071743	IC - SN74LS38NS	4
IC8, 20, 24	14072129	IC - 74F04SJ	3
IC12, 27, 29	14072130	IC - 74F08SJ	3
IC19, 38	14072134	IC - 74F32SJ	2
IC3, 14	14072135	IC - 74F74SJ	2
IC37	14072137	IC - 74F138SJ	1
IC15, 17, 18, 21, 25, 26	14072140	IC - 74F163ASJ	6
IC4, 31	14072143	IC - 74F244SJ	2
IC32	14072147	IC - 74F374SJ	1
IC5, 6, 11, 13	14072461	IC - SN74LS19INS	4
IC30	14072645	IC - 74F164ASJ	1
IC7, 28	14072896	IC - 74F113SJ	2
IC2	14073853	IC - MB89363BHPF	1
IC35	14074064	IC - MC145407F	1
AR1, 2	16017444	Resistor - 470Ω: ±5%	2
AR4, 5	16017690	Resistor - 1kΩ: ±5%	2
AR3	16017743	Resistor - 33Ω: ±5%	1
R67	16303331	Resistor - 330Ω: ±5%: 1/10W	1
R63	16330000	Resistor - 0Ω: ±5%: 1/10W	1
R1, 30~32, 34~52	16333309	Resistor - 33Ω: ±5%: 1/10W	23
R54~62, 64~66, JP12	16340000	Resistor - 0Ω: ±5%: 1/16W	13
R2~9, 15, 18~23, 27~29, 33	16341002	Resistor - 10Ω: ±5%: 1/16W	19
R10~14, 24~26, 53	16343301	Resistor - 3.3kΩ: ±5%: 1/16W	9
C1	16430220	Capacitor - 10V 22µF ±20%	1
C2~5	16430220	Capacitor - 25V 10µF ±20%	4
C7, 18, 44	16606103	Capacitor - 0.01µF 25V	3
C8, 9, 11~17, 19~43, 45	16608104	Capacitor - 0.1µF 25V	35
R68, 69	16342209	Resistor - 22Ω ±5% 1/16W	2

14. IPU

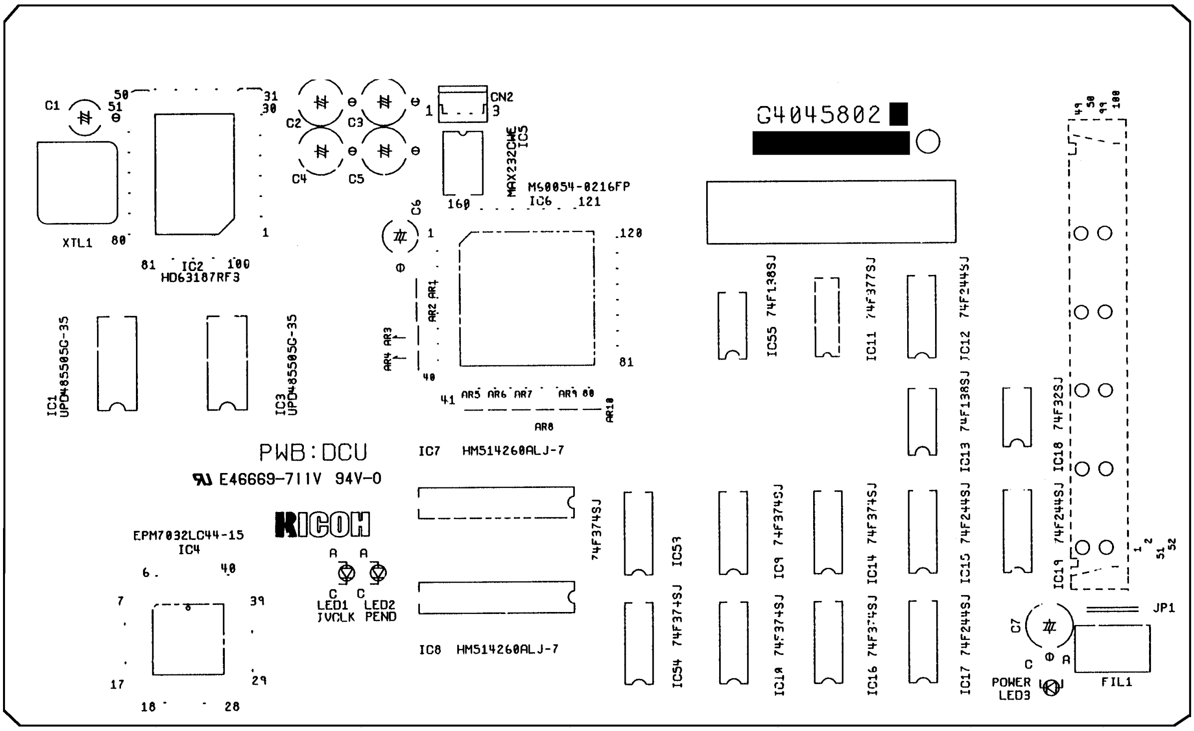


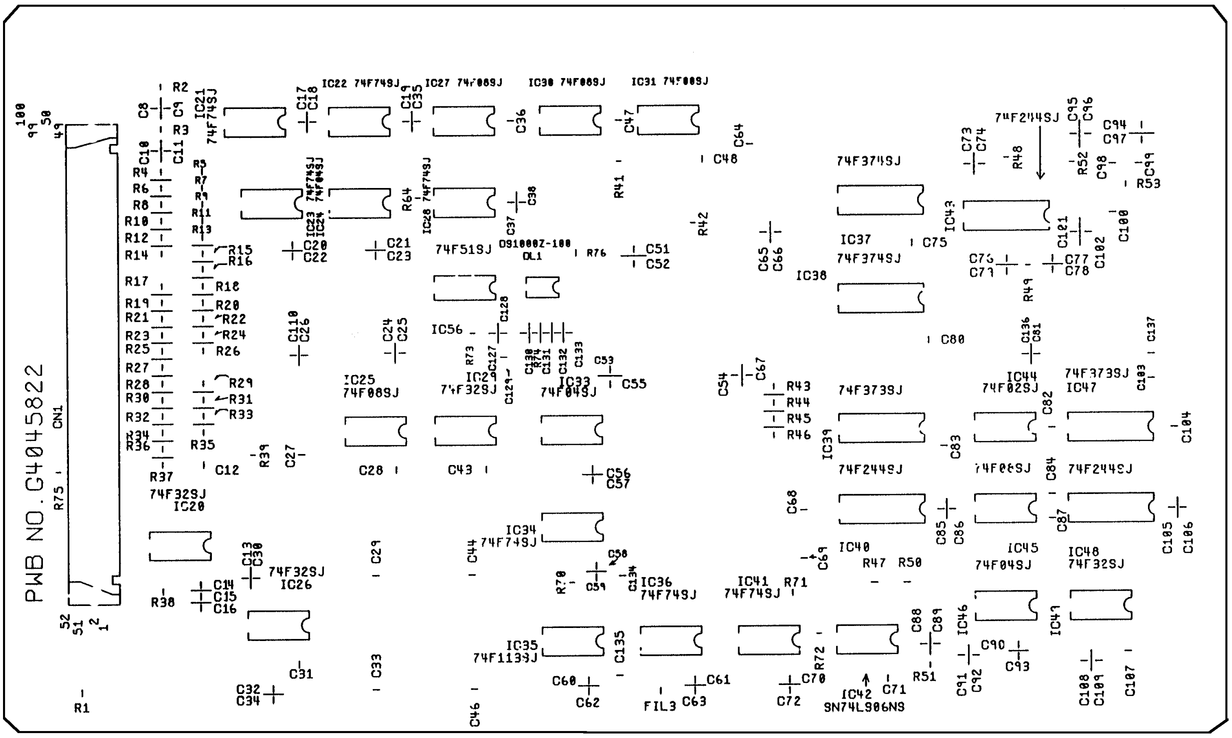


14. IPU

Symbol Code	Part No.	Description	Q'ty
CN1	11027259	Connector - 176378-3	1
IC1, 2	14072143	IC - 74F244SJ	2
IC3, 6	19040004	IC - RAM-64k x8 35µs	2
IC4	G4045890	IC - KG2H090	1
IC5, 7, 8, 9, 10	14074341	IC - µPD485505G-35	5
AR1	16017779	Resistor - 470Ω ±5%	1
AR2	16017778	Resistor - 470Ω ±5%	1
AR3, 4, 5, 8	16017743	Resistor - 33Ω ±5%	4
AR6, 7	16017744	Resistor - 1kΩ ±5%	2
AR9	16017755	Resistor - 1kΩ ±5%	1
AR10, 11	16017758	Resistor - 4.7kΩ ±5%	2
R1, 4, 9	16303330	Resistor - 33Ω ±5% 1/10W	3
R2, 3, 8, 10, 11, 12, 13	16304330	Resistor - 33Ω ±5% 1/16W	7
R5, 6, 7	16304120	Resistor - 1kΩ ±5% 1/10W	3
C1	16430470	Capacitor - 10V 47µF ±20%	1
C2, 4, 6, 8, 10, 12, 16, 17, 18, 20, 22, 25, 27, 29, 31, 32	16606103	Capacitor - 50V 0.01µF +80 -20%	16
C3 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 24, 26, 28, 30	16608104	Capacitor - 25V 0.01µF +80 -20%	15
FIL1	16070758	Filter - DSS710D223A12-22	1
JP2, 3, 4, 5, 6, 7	10020307	Jamper - Wire	

15. DCU





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15. DCU

Symbol Code	Part No.	Description	Q'ty
CN1	11027247	Connector - 176378-4	1
IC1, 3	14074341	IC - µPD485505G-35	2
IC2	G4045610	IC - HD63187RFS	1
IC4	G4045609	IC - PAL-D10C	1
IC6	G4045950	IC - M60054-0216FP	1
IC7, 8	19010022	IC - 256Kx16 70ns G2	2
IC9, 10, 14, 16, 37, 38, 53, 54	14072147	IC - SN74F374SJ	8
IC11	14074590	IC - SN74F377SJ	1
IC12, 15, 17, 19, 40, 43,48	14072143	IC - SN74F138SJ	7
IC13, 55	14072137	IC - SN74F138SJ	2
IC18, 20, 26, 29, 49	14072134	IC - SN74F32SJ	5
IC21~23, 28, 34, 36, 41	14072135	IC - SN74F74SJ	7
IC24, 33, 46	14072129	IC - SN74F04SJ	3
IC25, 27, 30, 45	14072130	IC - SN74F08SJ	4
IC31	14072896	IC - SN74F00SJ	1
IC35	14072896	IC - SN74F113SJ	2
IC39, 47	14072560	IC - SN74F373SJ	2
IC44	14072128	IC - SN74F02SJ	1
IC56	14073177	IC - SN74F51SJ	1
LED3	14030842	LED - SLR-332VR-3F	1
XTL1	15030664	Oscilator - CXO-829-16.0MHz	1
AR1~10	16011413	Resistor - 33Ω ±5%	10
DL1	16070851	Delay Line - DS1000Z-100	1
FIL3	16330000	Resistor - 0Ω 1/10W	1
R1	16304331	Resistor - 330Ω ±5% 1/10W	1
R2	16304120	Resistor - 12Ω ±5% 1/16W	1
R3~36, 41, 43~46, 51, 53, 64, 70~72, 74, 76	16304330	Resistor - 33Ω ±5% 1/16W	47
R37~39, 42, 48, 52, 73	16304103	Resistor - 10Ω ±5% 1/16W	7
R49	16304220	Resistor - 22Ω ±5% 1/16W	1
R75	16340000	Resistor - 0Ω ±5% 1/16W	1
C1, 6	16432110	Capacitor - 10µF ±20% 25V	2
C7	16432330	Capacitor - 33µF ±20% 25V	1
C8~10, 76, 79, 98, 99, 130, 131	16602220	Capacitor - 22pF ±5% 50V	9

Symbol Code	Part No.	Description	Q'ty
C12, 14, 16, 17, 22, 23, 25, 27~31, 33~36, 38, 43, 44, 46~48, 52, 54, 55, 57, 59, 62, 63, 66, 68, 69, 72, 73, 75, 78, 80, 82, 83, 86, 87, 92~94, 96, 102, 104, 106, 107, 109, 110, 128, 129, 132, 134~137	16608104	Capacitor - 0.1µF +80 -20% 25V	58
C13, 15, 18~21, 24, 26, 32, 37, 51, 53, 56, 58, 60, 61, 65, 67, 70, 74, 77, 81, 84, 85, 90, 91, 95, 97, 101, 103, 105, 108, 127, 133	16606103	Capacitor - 0.01mF +80 -20% 25V	34
C100	16602221	Capacitor - 220pF ±5% 50V	1
C11, 88, 89	16602151	Capacitor - 150pF ±5% 50V	3
JP1	10020307	Jamper - Wire	

16. PSU

Symbol Code	Part No.	Description	Q'ty
R21	16001824	Resistor - 10Ω ±5% 1/4W	1
R22	16001825	Resistor - 15Ω ±5% 1/4W	1
R27	16001826	Resistor - 270Ω ±5% 1/4W	1
IC1	14081229	IC - MH1210-4104	1
IC21	14080987	IC - FA5310P	1
IC101	14080356	IC - NJM2903D	1
IC201	14081231	IC - AN78N12	1
IC301	14081232	IC - HA17431PA	1
IC401	14081230	IC - AN79N05	1
PC1	14030809	IC - TLP621-2	1
F1	11070884	Fuse - 5A 250V	1
SW1	12042434	Switch - ESA-29A12V	1
VZ3, 4	14040365	Varistor - AVR-G10D271KAAS	2
RL1	12081399	Relay - JZ1aPF-18V	1
FAN	12000771	Fan Motor - DFD0624M	1
INLET	11027477	Inlet - AC-P06CS11	1

PARTS CATALOG
(FRU)

IMAGE SCANNER IS420

[HS-1P]

MODEL NUMBER:
G404-03/G404-04

FIRST EDITION: October, 1995

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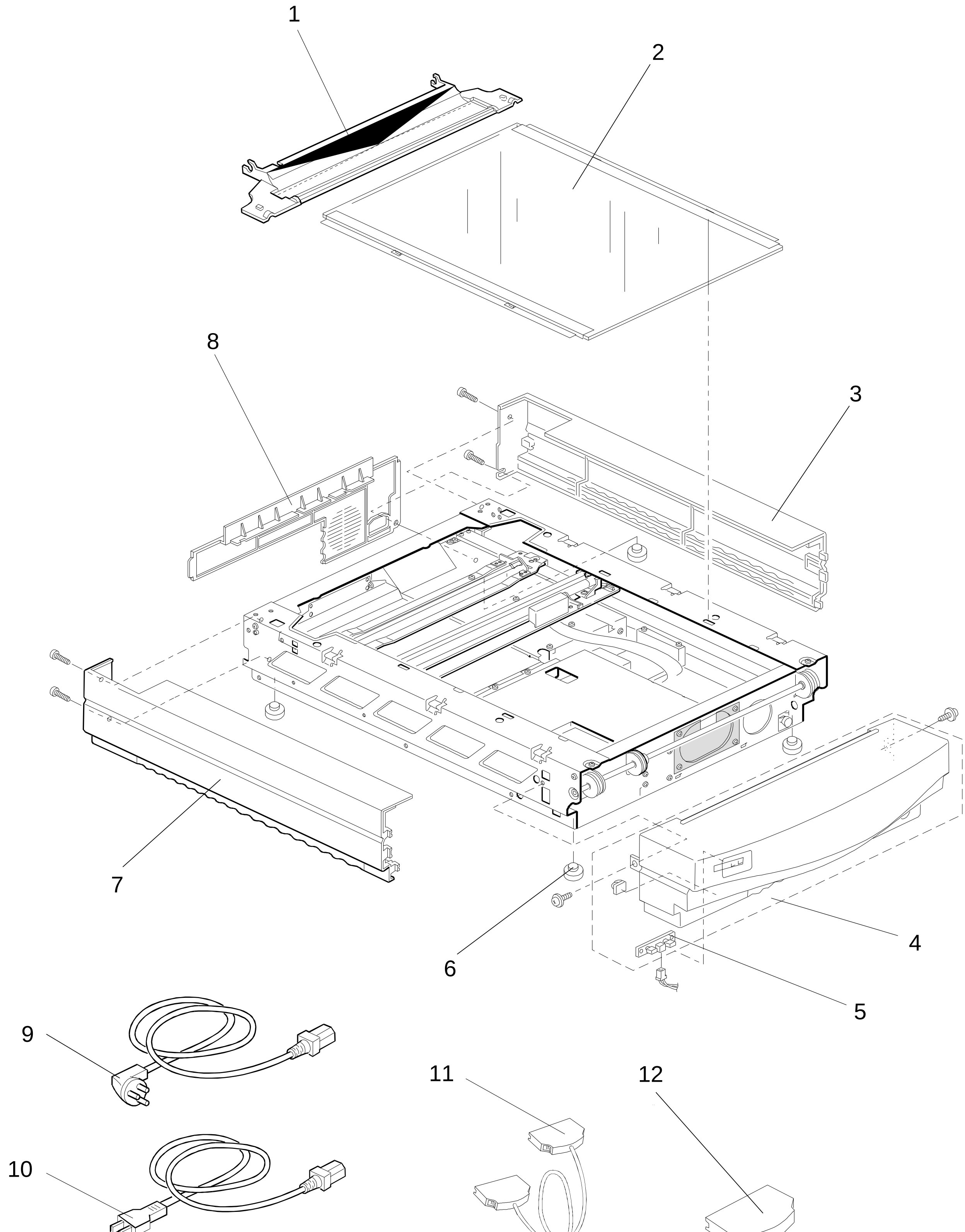
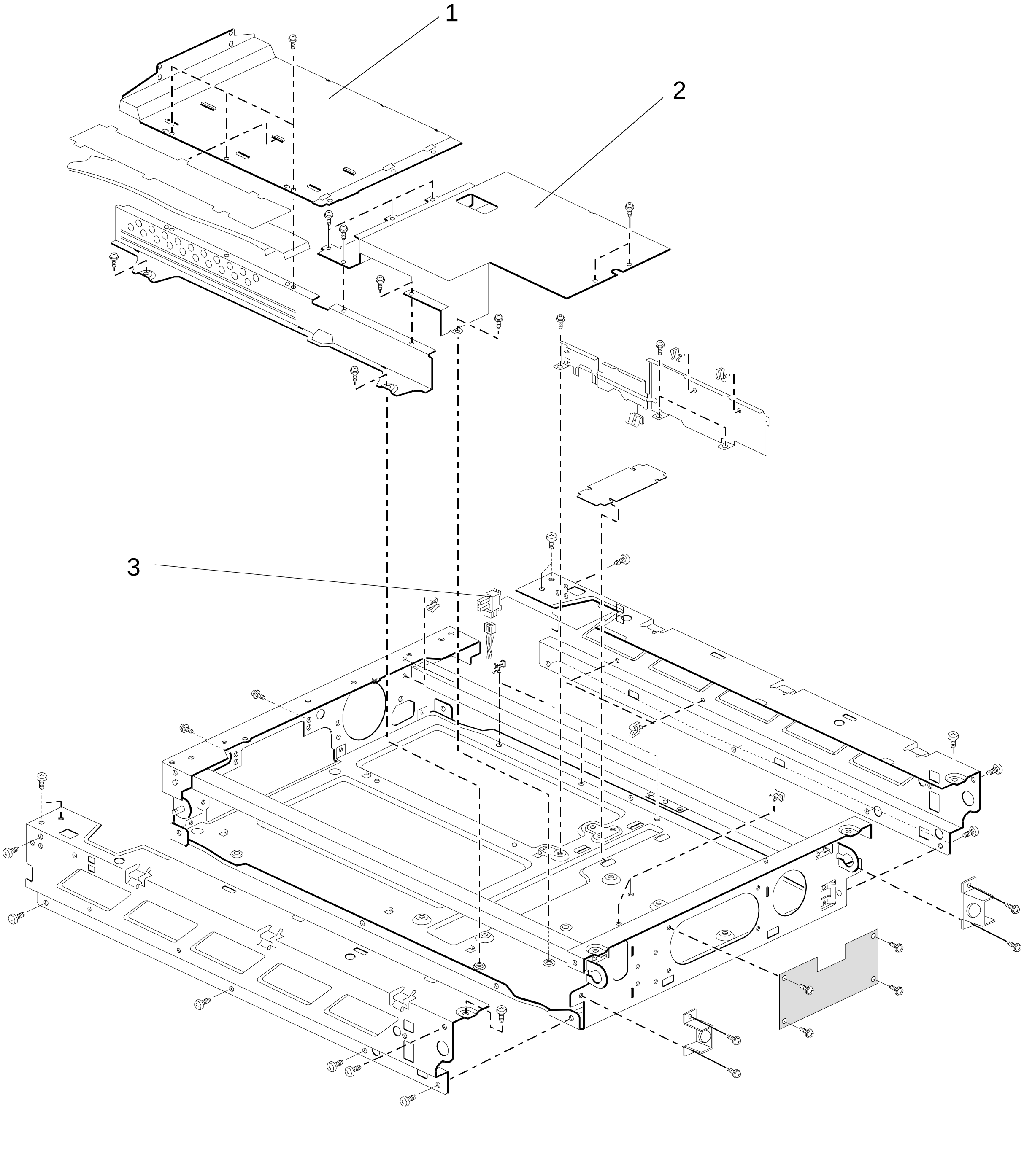
1. SCANNER -1



1. SCANNER - 1

Index No.	Part Number	Description
1	G4043110	ADF Exposure Glass Ass’y
2	G4043010	Main Exposure Glass
3	G4041540	Right Cover
4	G4041509	Front Cover
5	G4045451	SDP Board
6	G0121060	Rubber Foot
7	G4041530	Left Cover
8	G4041545	Rear Cover
9	11500025	Power Supply Cord - 250V 10A
10	54905212	Power Supply Cord - UL/CSA 2W
11	G4045570	SCSI Cable (Europe only)
12	11027267	Ternimator - NHA050-TM05-1

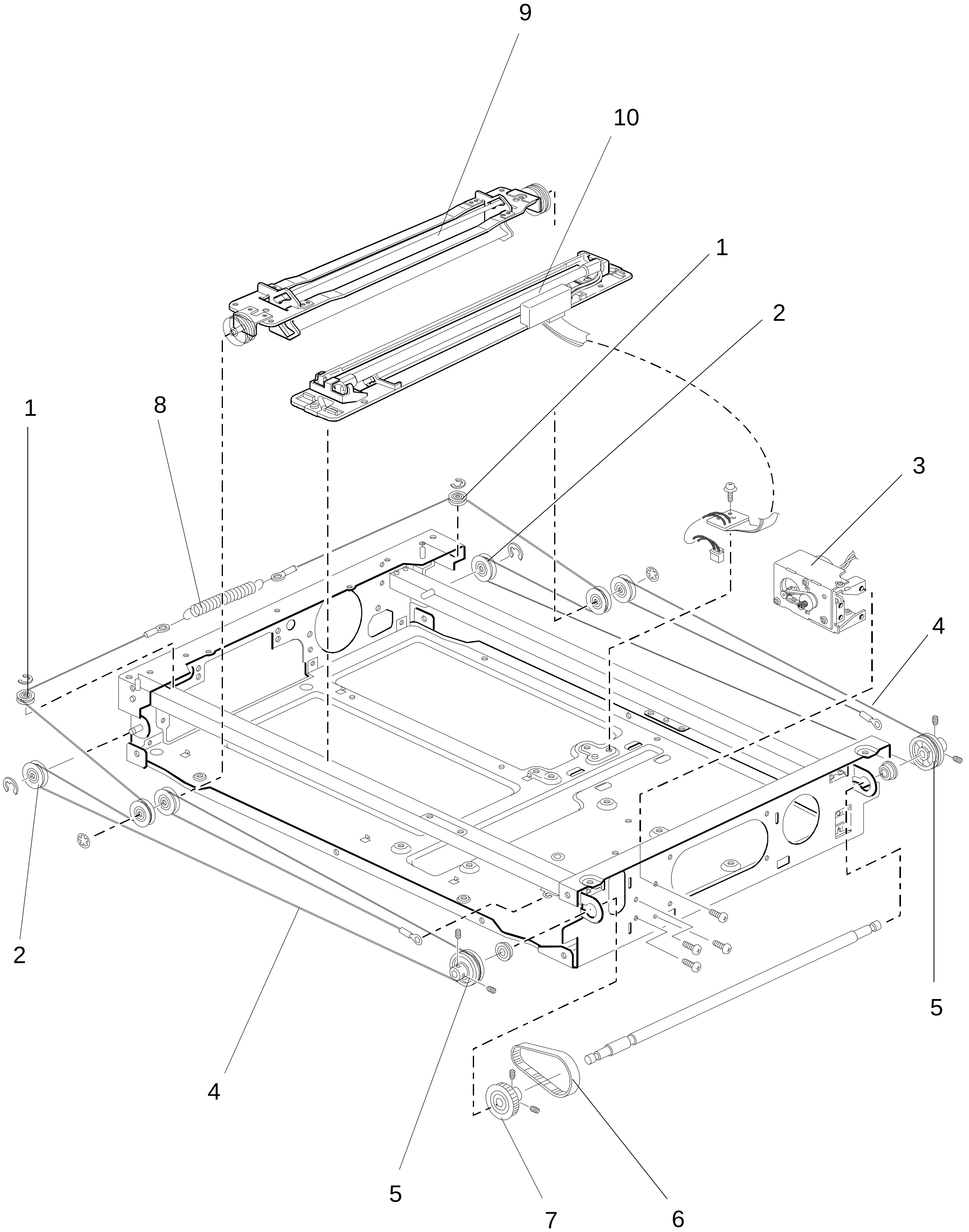
2. SCANNER - 2



2. SCANNER - 2

Index No.	Part Number	Description
1	G4041221	Rear Shield Plate
2	G4041211	Front Shield Plate
3	AW020075	Photointerrupter

3. SCANNER - 3



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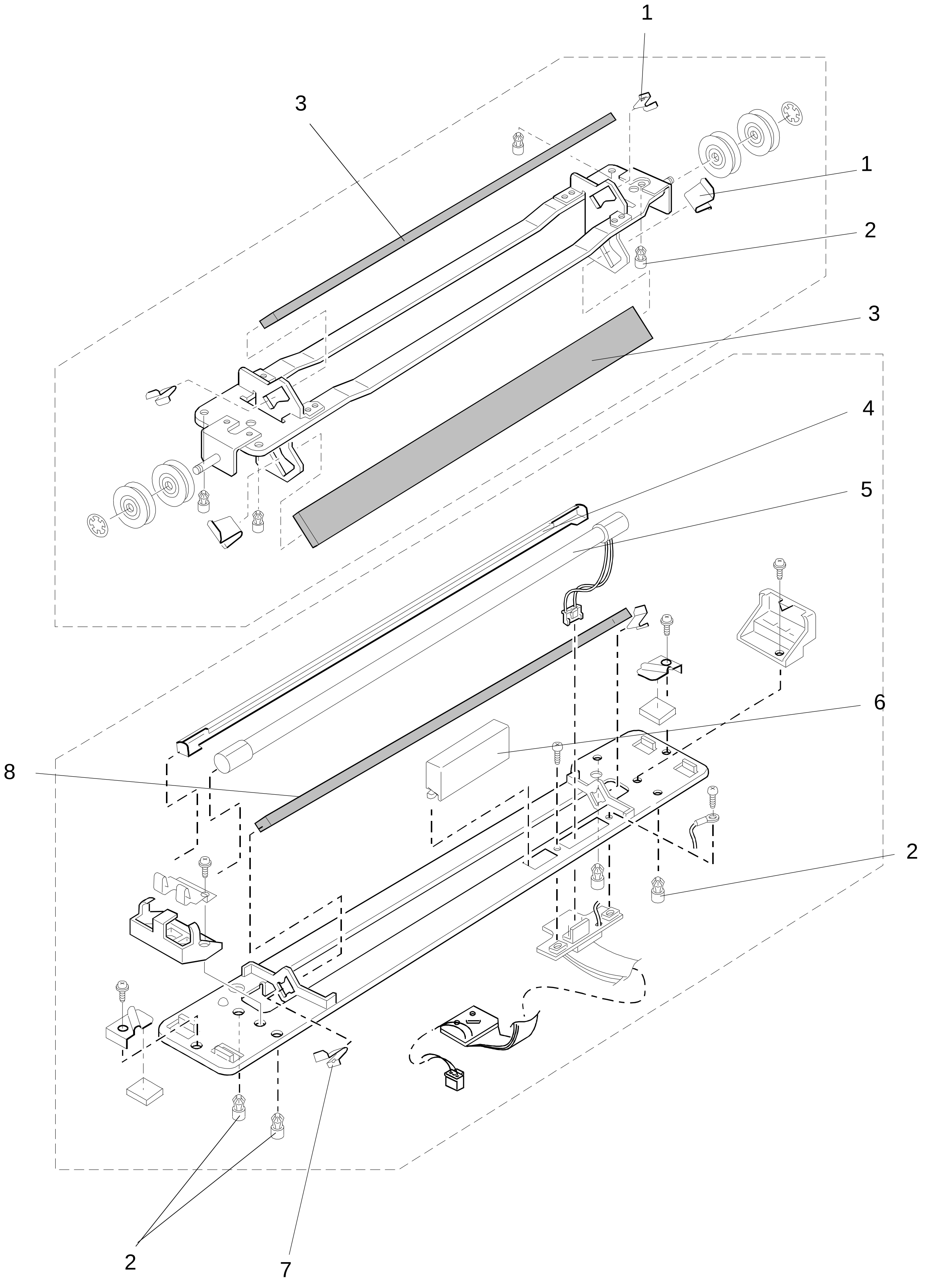
3. SCANNER - 3

Index No.	Part Number	Description
1	H2031378	Pulley - Drive Wire
2	H2031316	Pulley - 2nd. Carriade
3	G4041111	Scanner Feed Motor Ass’y
4	G4041134	Carriage Drive Wire
5	H2031310	Pulley - Front Drive
6	G4041133	Timong Belt - L180
7	G4041132	Pulley - 49T
8	G4041135	Spring - Drive Wire
9	G4042800	2nd. Carriade Ass’y
10	G4042750	1st. Carriade Ass’y

4. SCANNER - 4



4. SCANNER - 4

Index No.	Part Number	Description
1	A1341791	Spring Plate - 2nd. Mirror
2	A1001737	Slider - Scanner
3	AC030070	Mirror - Second
4	G4042760	Reflector
5	G4045600	Xenon Lamp
6	G4042713	Cover - Flexible Harness
7	H2031118	First Mirror Clamp
8	H0811062	Scanner Mirror

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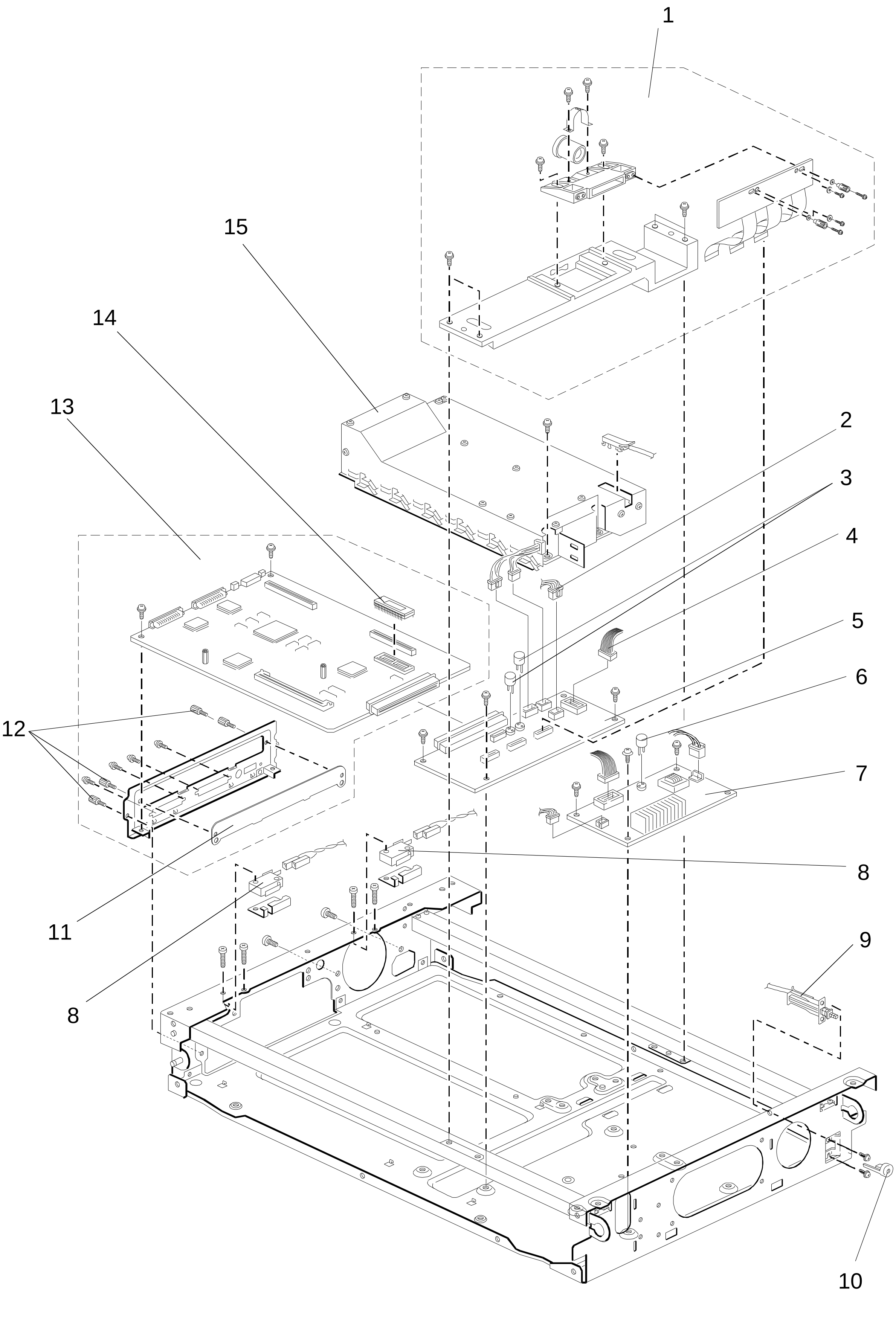
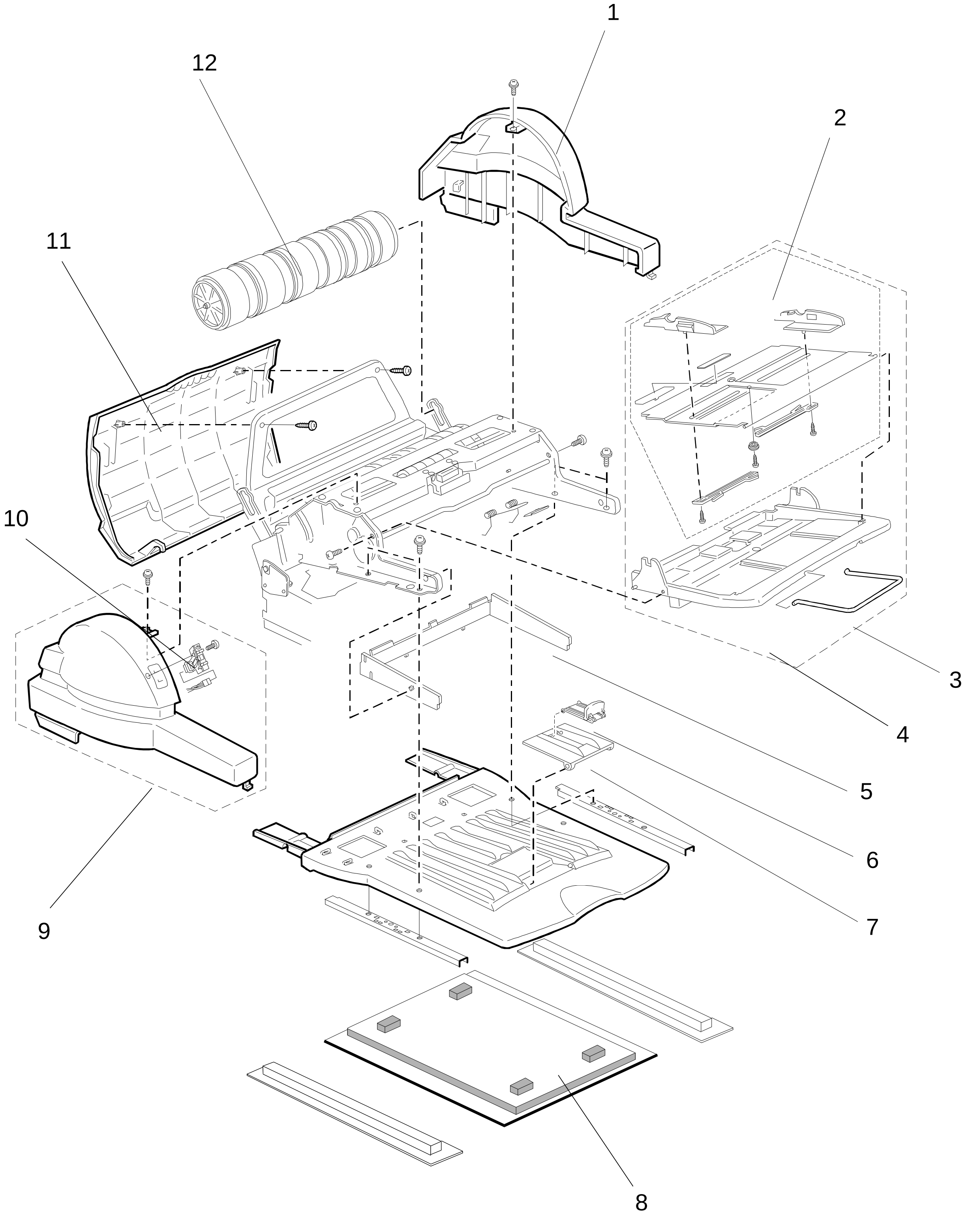
5. SCANNER - 5



5. SCANNER - 5

Index No.	Part Number	Description
1	G4042900	Scanner Unit
2	G4045510	Harness - Interlock Switch
3	11070712	Fuse - K19374-5A
4	G4045515	Harness - MBU-SDU
5	G4045201	MBU Board
6	11070720	Fuse - K19374-1.25A
7	G4045301	SDU Board
8	G4041261	Microswitch
9	G4041250	Main Switch
10	G4041520	Buttom - Main Switch
11	G4041245	Cover - Option
12	G4041246	Knob Screw - M3
13	G4045010	SCU Board Ass’y
14	G4045690	Programmed ROM - SCU
15	G4045011	Power Supply Board

6. ADF - 1



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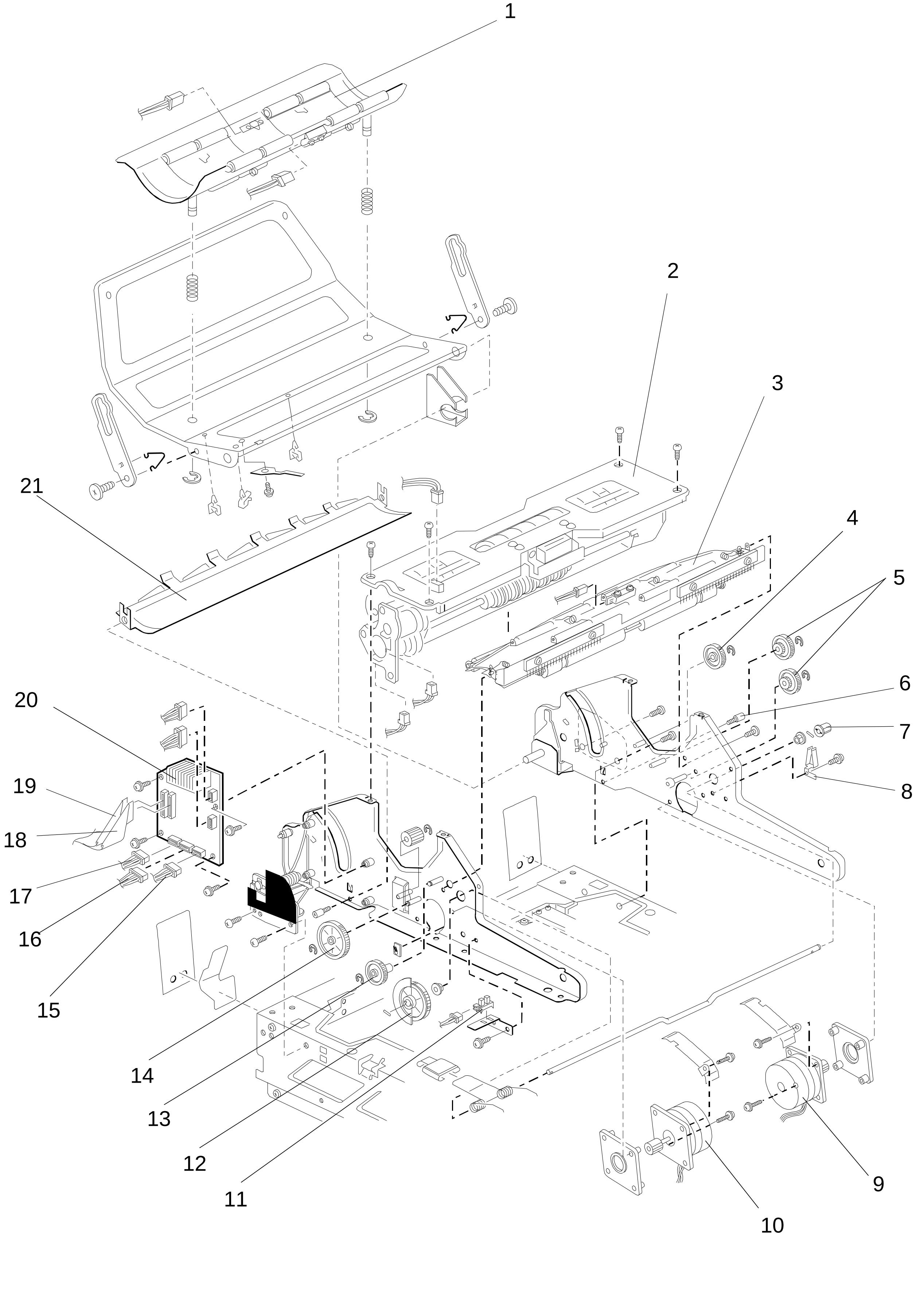
6. ADF - 1

Index No.	Part Number	Description
1	G4041722	ADF Right Cover
2	G4043520	Original Table Ass’y
3	G4043515	Document Support Lever
4	G4043500	Document Table Ass’y
5	G4044113	ADF Lower Cover
6	G4044112	Paper Stopper - Exit Table
7	G4044111	Sub - Exit Table
8	G4044130	Platen Cover Sheet
9	G4041710	ADF Left Cover
10	G4041718	ADP Board
11	G4041732	ADF Upper Cover
12	G4043800	Paper Transport Drum

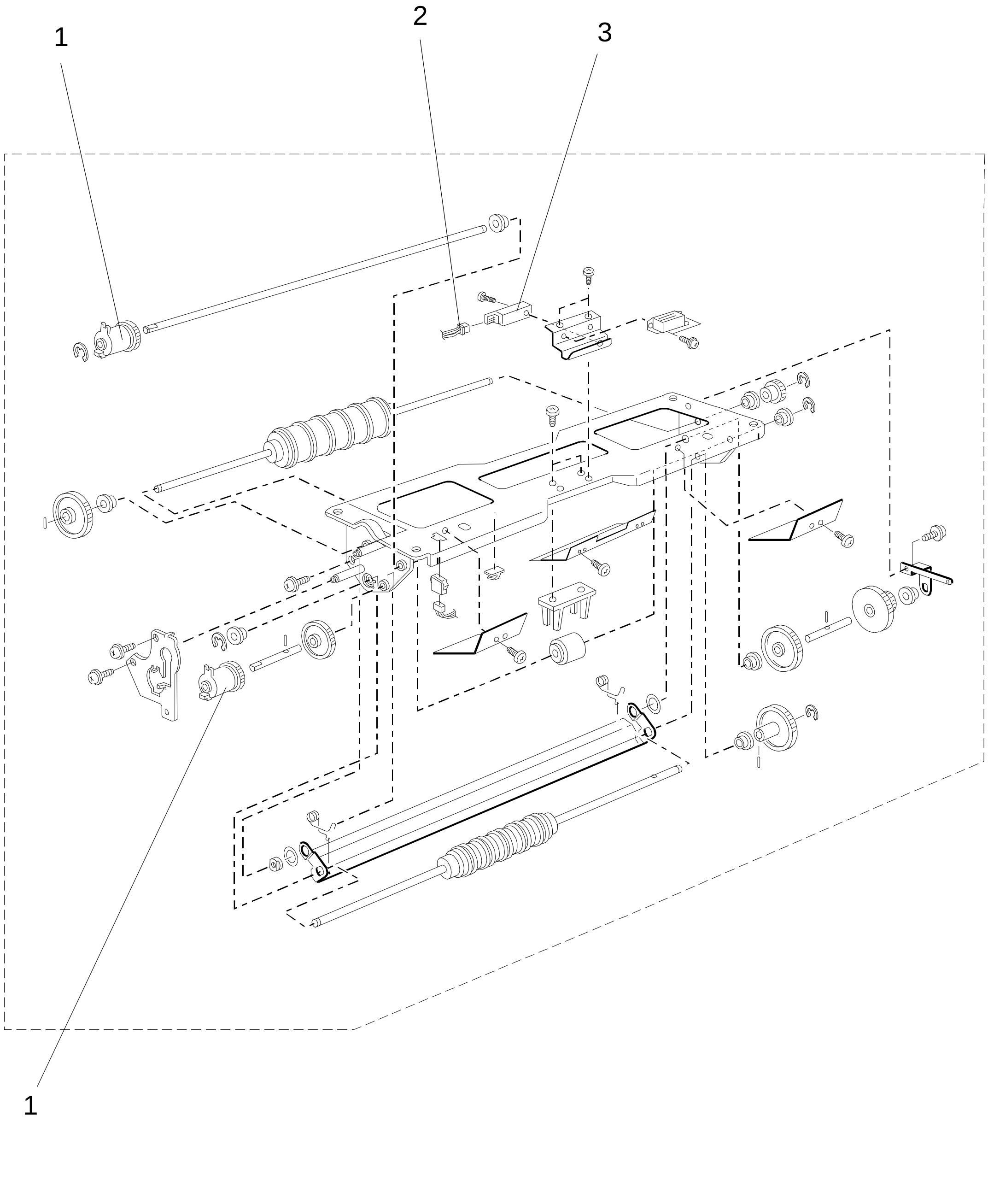
7. ADF - 2



7. ADF - 2

Index No.	Part Number	Description
1	G4043916	Transport Guide Ass’y
2	G4043600	Separation Unit
3	G4044005	Feed-out Unit
4	G4043331	Gear - 38Z
5	G4043330	Gear - 45/22Z
6	52053966	Set Screw
7	G4043403	Cam - Document Table
8	G4043350	Spring Plate - Cam
9	G4043340	Paper Transport Motor - 2.25V DC 1.5A
10	G4043240	Paper Feed Motor - 2.25V DC 1.5A
11	AW020075	Photointerrupter
12	G4043402	Gear - 52Z
13	G4043230	Gear - 43Z
14	G4043231	Gear - 59Z/19Z
15	G4045520	Harness - ADP
16	G4045525	Harness - Feed-in
17	G4045530	Harness - Feed-out
18	G4045500	Harness - ADU-MBU - 16 pin
19	G4045505	Harness - ADU-MBU - 18 pin
20	G4045401	ADU Board
21	G4043950	Lower Transport Guide

8. ADF - 3



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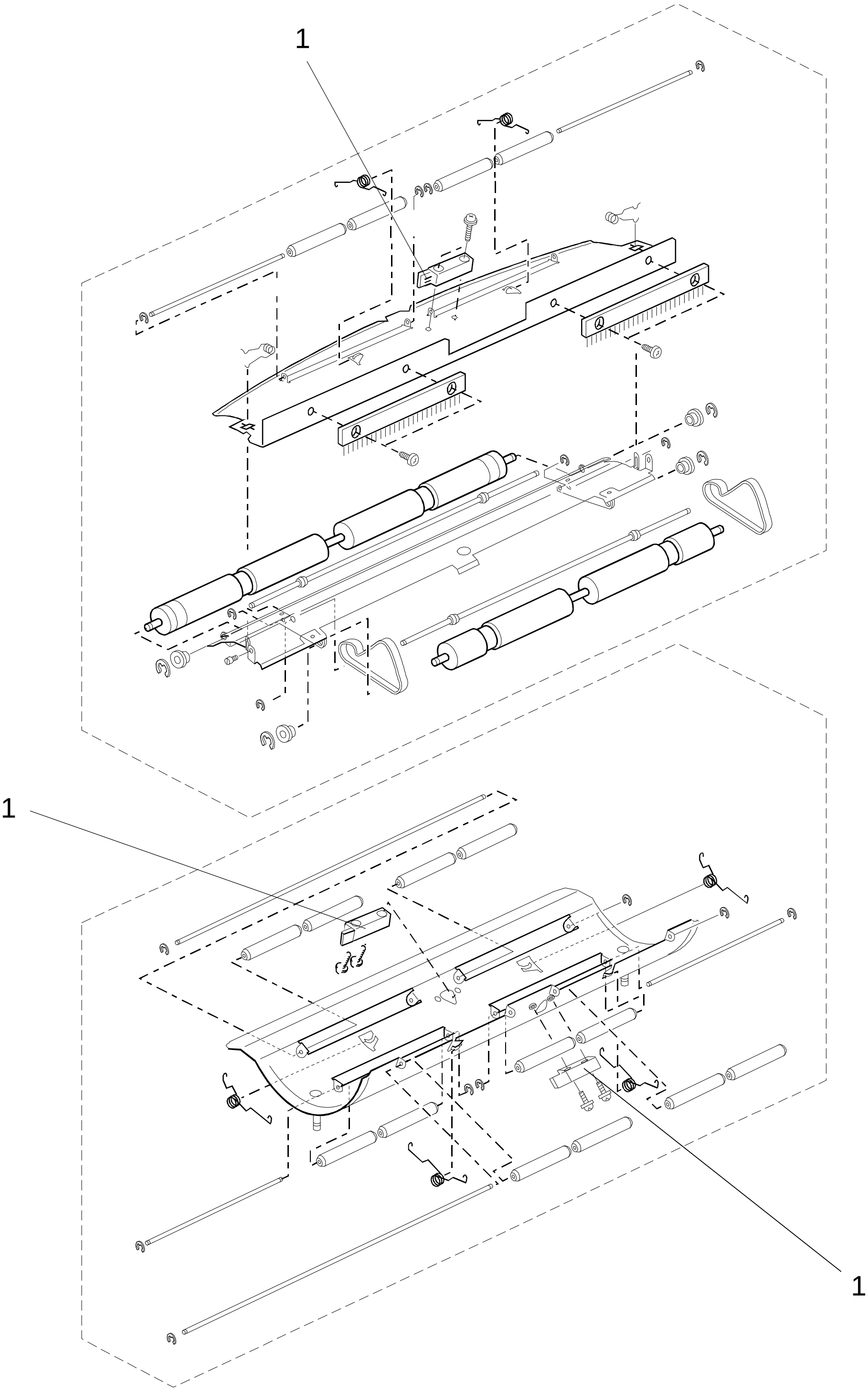
8. ADF - 3

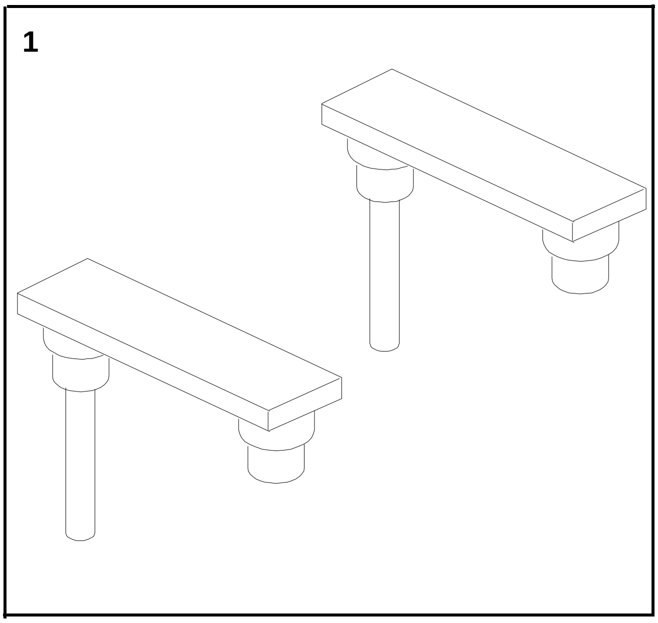
Index No.	Part Number	Description
1	G0125360	Magnet Clutch Feed
2	G4045540	Harness - Document Sensor
3	A0105700	Sensor

9. ADF - 4



Index No.	Part Number	Description
1	A4225270	Photosensor

10. SPECIAL TOOL



Index No.	Part Number	Description
1	G4049000	Scanner Positioning Tool

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