

# Service Manual



*Color Image Scanner*

**EPSON Perfection 4870 Photo**

**EPSON**

SESC03-008

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I & I CS Quality Promotion Department

# PRECAUTIONS

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

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

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

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

## **DANGER**

1. ALWAYS DISCONNECT THE PRODUCT FROM THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURES.
2. NO WORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIAR WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.
4. WHEN DISASSEMBLING OR ASSEMBLING A PRODUCT, MAKE SURE TO WEAR GLOVES TO AVOID INJURIES FROM METAL PARTS WITH SHARP EDGES.

## **WARNING**

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGE IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY AC RATING DIFFERENT FROM AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. DO NOT REPLACE IMPERFECTLY FUNCTIONING COMPONENTS WITH COMPONENTS WHICH ARE NOT MANUFACTURED BY EPSON. IF SECOND SOURCE IC OR OTHER COMPONENTS WHICH HAVE NOT BEEN APPROVED ARE USED, THEY COULD CAUSE DAMAGE TO THE EPSON PRODUCT, OR COULD VOID THE WARRANTY OFFERED BY EPSON.

# About This Manual

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

## Manual Configuration

This manual consists of four chapters and Appendix.

### **CHAPTER 1.PRODUCT DESCRIPTION**

Describes the features and basic specifications of the product.

### **CHAPTER 2.OPERATING PRINCIPLES**

Describes the electrical and mechanical basic operating principles of the product.

### **CHAPTER 3.TROUBLESHOOTING**

Describes the step-by-step procedures for the troubleshooting.

### **CHAPTER 4.DISASSEMBLY/ASSEMBLY**

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

### **CHAPTER 5.ADJUSTMENT**

Provides Epson-approved methods for adjustment.

### **CHAPTER 6.MAINTENANCE**

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

**APPENDIX** Provides the following additional information for reference:

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

## Symbols Used in this Manual

Various symbols are used throughout this manual either to provide additional information on a specific topic or to warn of possible danger present during a procedure or an action. Be aware of all symbols when they are used, and always read NOTE, CAUTION, or WARNING messages.



Indicates an operating or maintenance procedure, practice or condition that is necessary to keep the product's quality.



Indicates an operating or maintenance procedure, practice, or condition that, if not strictly observed, could result in damage to, or destruction of, equipment.



May indicate an operating or maintenance procedure, practice or condition that is necessary to accomplish a task efficiently. It may also provide additional information that is related to a specific subject, or comment on the results achieved through a previous action.



Indicates an operating or maintenance procedure, practice or condition that, if not strictly observed, could result in injury or loss of life.



Indicates a product reassembly procedure, practice or condition that must be executed in accordance with the specified standards to keep the product's quality.

## Revision Status

Revision	Date of Issue	Description
A	December 10, 2003	First release

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CHAPTER

1

# PRODUCT DESCRIPTION



## 1.1 Features

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The main features of the Perfection 4870 Photo are as follows.

- Fast, high-quality A4 color image scanner optimum for consumer/SOHO applications.
  - Fast scanning
    - Monochrome binary : 27 seconds
    - Full Color : 27 seconds
    - \*A4 600dpi, reflective document, draft mode
  - High image quality
    - Resolution : 4800dpi
    - Gradation : 16 bit-in, 16 bit-out
- Lid type TPU equipped as standard
  - Lid Type TPU with Free angle hinge
  - Built-in 5.6" x 9.1" transparency unit included for scanning
    - 35mm strip film (24 frames)
    - 35mm mount film (8 frames)
    - Medium format (Max. 3 x 12cm) (3 frames)
    - 4" x 5" film (2 frames)

- Easy operation
  - EPSON Smart Panel 3.0
    - Scan to PDA and PDF support
    - Achieved easy scanning with a start button
    - Ease of exporting image data to an application
    - Monochrome negative film support
    - PRINT Image Matching 2 support
  - EPSON Scan
    - Graphic user interface: Full Mode, Home Mode and Professional Mode
    - In addition to the functions of the TWAIN driver, Image data can be saved as a standalone application without a graphic application such as Photoshop.
    - Addition of professional tools: Histogram, Multi level unshap mask, De-screening and Photoshop like Tone Curve Editor
    - Full automatic mode (Flatbed and Film)
    - Thumbnail view support
    - Scanning monochrome negative film
    - Addition of image enhancement functions: Dust Remover, Photo Restoration and Grain Reduction
  - Digital ICE for Photo and Film
    - Dust and scratch cancel with hardware
- Interface
  - USB2.0
  - IEEE1394

## 1.2 Basic specification

### SCANNER BASIC SPECIFICATION

- ☐ Product Type Flatbed color image scanner
- ☐ Scanning method Fixed document and CR moving
- ☐ Photoelectric device Alternative 6 lines Color CCD with micro lens
- ☐ Document size A4, US letter size document
- ☐ Max scan size 216mm x 297mm (8.5" x 11.7")
- ☐ Maximum effective picture element 40,800 x 56,160 pixels (4800dpi)
- ☐ Scanning resolution
  - Main 4800dpi
  - Sub 9600dpi with Micro Step
- ☐ Output resolution 25 - 12800 dpi (1dpi step)
- ☐ Pixel depth
  - Each pixel, each color 16 bits (input)
  - 16 bits (output)
- ☐ Scanning speed
  - 4800dpi Draft Mode

Monochrome (bi-level)	16.9 msec/line
Color	16.9 msec/line

- 600dpi Draft Mode

Monochrome (bi-level)	4.1 msec/line
Color	4.1 msec/line

- ☐ Command level ESC/I-B8  
FS
- ☐ Dimensions 304 (W) x 476 (D) x 134 (H) mm  
[Refer to Figure 1-3](#)
- ☐ Weight 6.7kg

- ☐ Warm up time
  - Within 30sec (25°C)
  - Within 45sec (5°C)
- ☐ Image processing function
  - Gamma Correction Output-by-output correction: Standard 5 level  
CRT 2 level (A, B)  
PRINTER 3 level (A, B, C)  
User defined 1 level
  - Color Correction Output-by-output correction: Standard 4 level  
Impact-Dot Printer  
Thermal Printer  
Ink-Jet Printer  
CRT Display  
User defined
  - Brightness 7 levels
  - Data processing Bi-level  
Error Diffusion 3 mode (A, B, C)  
Dither (Resident) 4 mode (A, B, C, D)  
TET, AAS  
Quad-level  
Error Diffusion 3 mode (A, B, C)  
Dither (Resident) 4 mode (A, B, C, D)
- ☐ Interface IEEE1394 and USB2.0 High speed  
Connector: 6pin connector x1 (IEEE1394)  
Standard B connector x1 (USB2.0)
- ☐ USB host The operation of the USB port should be guaranteed by the maker.
- ☐ Hub This device must be connected directly to the host or to the hub in the Tier 1 with the recommended USB cable.
- ☐ Light Source White Cold cathode Fluorescent Lamp  
IR LED (For Digital ICE for Film)
- ☐ Start Button 1 push Button: Ease of use with EPSON Smart Panel
- ☐ Driver EPSON Scan

- ☐ Dust/Scratch removal      Flatbed : Digital ICE for Print  
    TPU : Digital ICE for Film
- ☐ Compatible OS
- IEEE1394 I/F
    - Microsoft Windows XP Home, Professional Edition
    - Microsoft Windows 2000 Professional
    - Microsoft Windows Me
    - Mac OS 8.6 to 9.X (\*1)
    - Mac OS X 10.2 or later (\*6)
  - USB 1.1 I/F (\*2, \*3)
    - Microsoft Windows XP
    - Microsoft Windows 2000
    - Microsoft Windows 98/Me
    - Mac OS 8.6 to 9.X, Mac OS X 10.2 or later (\*6)
  - USB 2.0 I/F (\*2, \*3, \*4, \*5)
    - Microsoft Windows 2000 Professional/XP Home Edition/XP Professional
- \*1: Mac OS 8.6 need FireWire updater 2.1 or later  
 \*2: This device must be connected directly to the host or to the hub in the Tier 1 with the recommended USB cable.  
 \*3: The functionality of the USB port(s) must be ensured by the vender of the Host.  
 \*4: Microsoft USB2.0 driver is necessary.  
 \*5: For standard equipped by Pre-install PC or upgraded PC from Windows 2000 Professional model only  
 \*6: EPSON Scan (EPSON driver)/SilverFast® works independently or only with Adobe® Photoshop® 7.0 on Mac OS X native mode.  
 Some applications and/or functions only work in Mac OS X classic mode.

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**LID TYPE TPU BASIC SPECIFICATION**


---

- |  |  |
|--|--|
| <input type="checkbox"/> Type          | Moving carriage  |
| <input type="checkbox"/> Light source  | White cold cathode fluorescent lamp x 2<br>IR LED board x 2 (Each board has 30 LEDs)   |
| <input type="checkbox"/> Max scan size | 144mm x 231mm (5.7" x 9.1")  |
| <input type="checkbox"/> Applied film  | 35mm (135) Strip film : 24 frames<br>35mm (135) Mounted film : 8 frames<br>Medium format film(120/220) : 3 frames<br>4" x 5" film : 2 frames |
| <input type="checkbox"/> Place         | Available to be used as document cover for reflective (Lid-TPU)  |
| <input type="checkbox"/> Power supply  | Supply by scanner unit   |
| <input type="checkbox"/> Switch        | N/A  |
| <input type="checkbox"/> Indication    | Blue<br>(Blue is lit in synchronization with ON/OFF of the TPU lamp.)  |
| <input type="checkbox"/> Dimensions    | 290 (W) x 461 (D) x 51 (H) mm  |
| <input type="checkbox"/> Weight        | Approx. 2.0kg (TBD)  |
| <input type="checkbox"/> Warm up time  | <ul style="list-style-type: none"> <li>■ Within 30sec (25°C)</li> <li>■ Within 45sec (5°C)</li> </ul>  |

**ELECTRICAL SPECIFICATIONS**

<input type="checkbox"/> Rated Input voltage	AC100 - 120V (100V) AC220 - 240V (200V)
<input type="checkbox"/> Rated Input Frequency	50 - 60Hz (100V, 200V)
<input type="checkbox"/> Power consumption	Operation 24 W Standby Mode 16 W Sleep Mode 4.5 W
<input type="checkbox"/> Insulation Resistance	For DC500V, Above 100M $\Omega$ (AC input terminal & DC output terminal)
<input type="checkbox"/> Withstand Pressure	AC3000V, 1min. (AC input terminal & DC output terminal)

**COMPLIANT STANDARDS**

- ☐ Electromagnetic interference resistance and power supply harmonics
  - 100V system  
UL1950  
CSA C22.2 No.950  
VCCI Class B  
Guideline for the suppression of Harmonics in Household and General-use Equipment  
Self-imposed guideline of leak current (0.25mA or lower)  
FCC Part15 Subpart B Class B  
CSA C108.8
  - 200V system  
EN60950  
IEC60950  
EN55022 Class B  
EN61000-3-2  
EN61000-3-3  
EN55024  
AS/NZS-3548 Class B  
CISPR Pub22 Class B
- ☐ Environment protection International Energy Star Program

**ELECTRICAL NOISE RESISTANCE**

<input type="checkbox"/> Static electricity	Contact discharge 4.5kV Air discharge 8.5kV
---	--

**ENVIRONMENTAL CONDITIONS**

<input type="checkbox"/> Temperature	Operating 5°C to 35°C Storage -25°C to 60°C
<input type="checkbox"/> Humidity	Operating 10% to 80% (non-condensing) Storage 10% to 85% (non-condensing)

**RELIABILITY**

<input type="checkbox"/> Main unit	MCBF carriage reciprocating movement 30000 times
------------------------------------	--

**OPERATING CONDITIONS**

<input type="checkbox"/> Dust	Ordinary office or home condition (Extreme dust should be avoided)
<input type="checkbox"/> Luminous intensity	Avoid direct sunlight and vicinity of light source.

**DOCUMENTS**

<input type="checkbox"/> Reflective documents	Documents with smooth surface, such as photos and prints
<input type="checkbox"/> Transparent documents	35mm strip film (negative/positive) 35mm mount film (negative/positive) Brownie film (120/220) 4" x 5" film

## 1.3 Interface Specifications

The interfaces of this scanner are shown below.

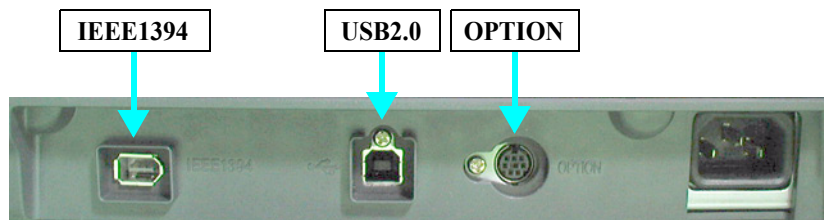


Figure 1-1. Interface

### 1.3.1 IEEE1394

- In compliance with IEEE Std 1394a-2000
- In compliance with ANSI X3T10 Serial Bus Protocol 2 Revision4L (SBP-2)
- 6 pin connector x 1

### 1.3.2 USB

- In compliance with Universal Serial Bus specification Revision 2.0
- Hi-speed device (480Mbps) (Full speed capable (12Mbps))
- Self powered
- Standard B connector x 1

## 1.4 Exterior Specifications

### 1.4.1 Explanation of switches

- ☐ Power Button  
Turns the scanner on and off  
When the power is turned on, the scanner is initialized.
- ☐ Start Button  
Starts the EPSON Smart Panel.  
The status of this button can be checked by [ESC !]

### 1.4.2 Explanation of indications

- ☐ Explanation of indications
  - Status LED (green + red)  
Lit, flashing or extinguished to indicate the Ready, Busy or Error status of the scanner.

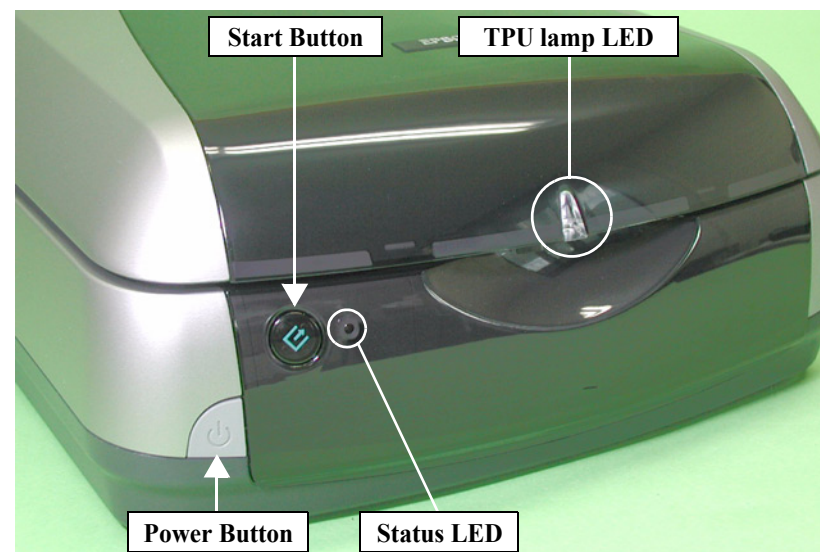
**Table 1-1. Statuses and Indications of Status LED**

Indication	Status
Lit green	Ready
Flashing green slowly	Busy*1
Flashing red fast	Error*2
Extinguished	Operate off

\*1: Warm-up, scan, initialization, etc.

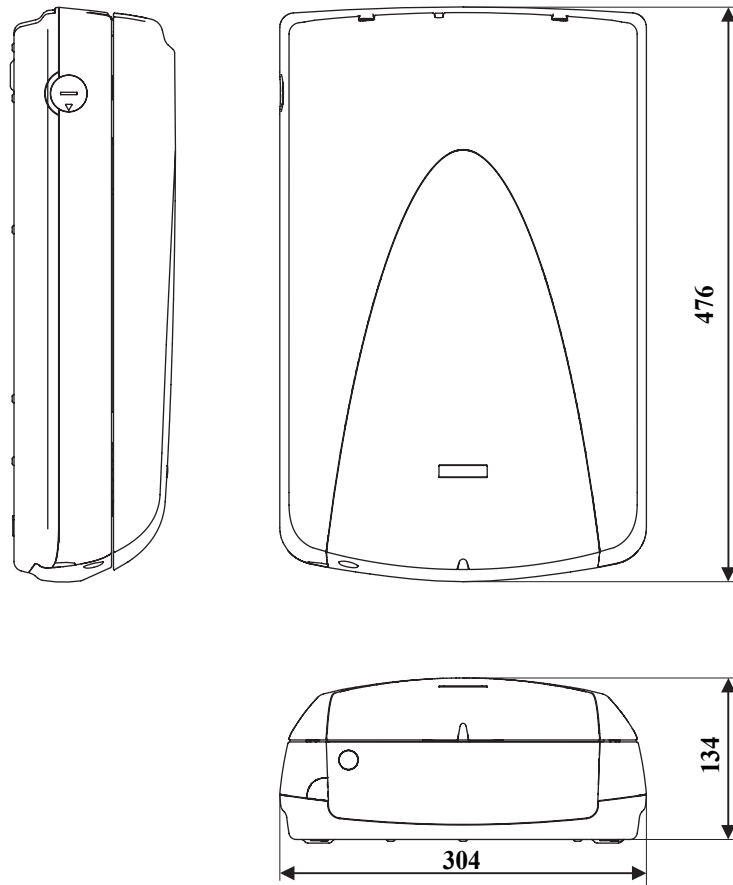
\*2: May not be lit red depending on the error (option error, command error).

- TPU lamp LED (blue)  
Lights up in synchronization with ON/OFF of the TPU lamp.



**Figure 1-2. Locations of Switches and LEDs**

### 1.4.3 Outside Drawing



Unit: mm

Figure 1-3. Outside Drawing of Perfection 4870 Photo

#### □ Dimensions and Weight

■ Dimensions 304 (W) x 476 (D) x 134 (H) mm

■ Weight 6.7kg

#### □ Package size

■ Dimensions 405 (W) x 573 (D) x 230 (H) mm

## 1.5 Control Codes

Following table is the list of control codes of the scanner.

**Table 1-2. Control Code List**

Category	Command Name	Code
Execution command	ID request	ESC I
	Status request	ESC F
	Extended status request	ESC f
	Status setting request	ESC S
	Scan start	ESC G
	Push Button status request	ESC !
	Extended ID request	FS I
	Scanner status request	FS F
	Scanning parameter request	FS S
	New scan start	FS G
Data form setting	Data format setting	ESC D i
	Resolution setting	ESC R n1 n2
	Zooming setting	ESC H i1 i2
	Scanning area setting	ESC A n1 n2 n3 n4
	Color setting	ESC C i
	Mirroring setting	ESC K i
	Scanning parameter setting	FS W
Correction processing	Brightness correction setting	ESC L i
	Gamma correction setting	ESC Z i
	Gamma correction table setting	ESC z i d [256]
	Sharpness control setting	ESC Q i
Image processing	Halftone process setting	ESC B i
	Auto area segmentation setting	ESC s i
	Dither pattern setting	ESC b i j d [j^2]
	Color correction setting	ESC M i
	Down load color correction setting	ESC m d [9]
	Threshold value setting	ESC t i

**Table 1-2. Control Code List**

Category	Command Name	Code
Support, and others	Scan mode setting	ESC g i
	Initialization	ESC @
	Line counter setting	ESC d i
	Option control	ESC e i
	Film type designation	ESC N i
	Focus position setting	ESC p i
	Focus position request	ESC q
Control	Paper exit	FF
	Normal response	ACK
	Abnormal response	NACK
	Scanning stop	CAN
	Header	STX



## 1.6 Error-time Processing

**Table 1-3. Error Definition and Remedy List**

Category	LED Indication	Cause	Remedy	Recovery	Receivable Command
Command error	None	An undefined command or undefined command parameter was detected.	<ul style="list-style-type: none"> <li>The scanner ignores the incorrect command or parameter. (Current setting maintained)</li> <li>The scanner returns NACK and waits for the next command parameter.</li> </ul>	The error condition is cleared when the scanner receives a correct command.	
Fatal error	Red LED flashes in sort interval.	<ul style="list-style-type: none"> <li>The lamp is dead.</li> <li>The main unit is faulty.</li> <li>Firmware downloading failed.</li> </ul>	<ul style="list-style-type: none"> <li>Turn the lamp off and stop the operation.</li> <li>Set Bit 7 of the status bit.</li> </ul>	<ul style="list-style-type: none"> <li>Turn the scanner off and then back on.</li> <li>Send the initialization command (ESC@).</li> </ul>	ESC F, ESC f, ESC @

## 1.7 Scanning Range

### 1.7.1 Reflective document

□ Size 216 x 297mm (horizontal x vertical)

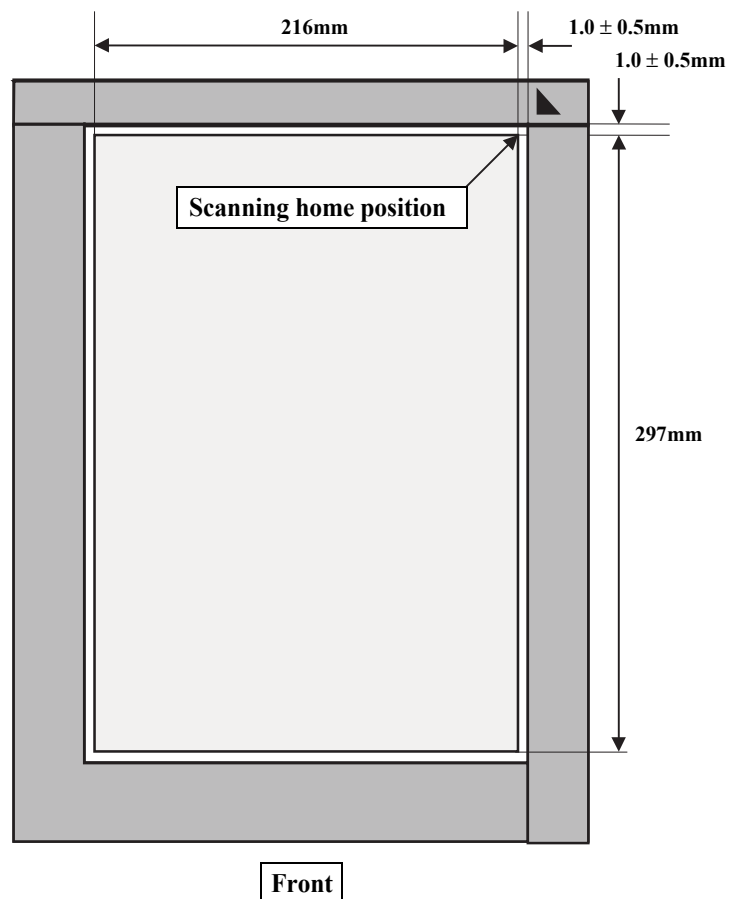


Figure 1-4. Reflective Document Scanning Range

### 1.7.2 Transparent document

□ Size 144 x 231mm (horizontal x vertical)

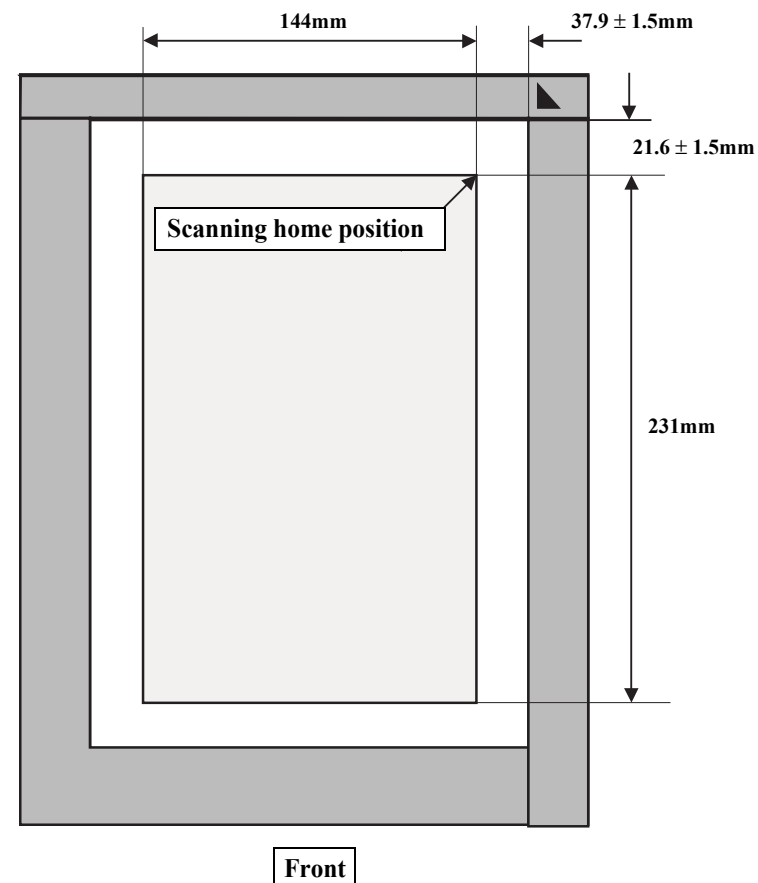


Figure 1-5. Transparent Document Scanning Range

CHAPTER

2

## OPERATING PRINCIPLES

## 2.1 Engine Operation Outline

This section explains the functions and operating principles of the Perfection 4870 Photo Engine. The Engine is roughly divided into the Carriage Unit and Carriage Moving Mechanism.

### 2.1.1 Outline

#### 2.1.1.1 Carriage Unit outline

The Carriage Unit consists of the CCD Board, Inverter Board, Lamps (light source), Mirror/Lens Mechanism, Glass Plate, and Solenoid. (Refer to figure 2-1, and 2-2.)

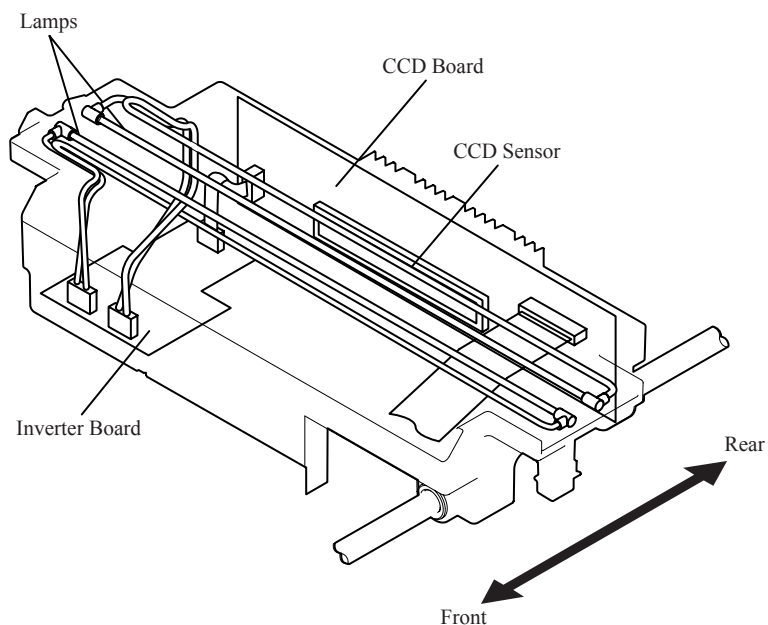


Figure 2-1. Carriage Unit Configuration

- ❑ **CCD Board** Forms an alternative six-lines color CCD (R, G, B independent) and its control and drive circuits.
- ❑ **Inverter Board** Boosts +24VDC and converts DC to AC to generate the voltage for driving the Lamps (white cool cathode fluorescent lamps).
- ❑ **Lamps** White cool cathode fluorescent lamps are used as a light source. When the amount of light is not stable, the Panel LED flashes and enter the standby mode until it becomes stable.
- ❑ **Mirror/Lens Mechanism** The beam applied to the scanned document is reflected, passes through the Mirror/Lens Mechanism in the Carriage Unit for correction of the beam axis, and then reaches the CCD Sensor. The light components R, G, B are extracted by the Color CCD Sensor itself, not by switching between R, G and B of the light source as previously.
- ❑ **Glass Plate** Adjusts the difference of wavelength between the infrared light and visible light when the Digital Ice function is used.
- ❑ **Solenoid** Used to operate the Glass Plate.

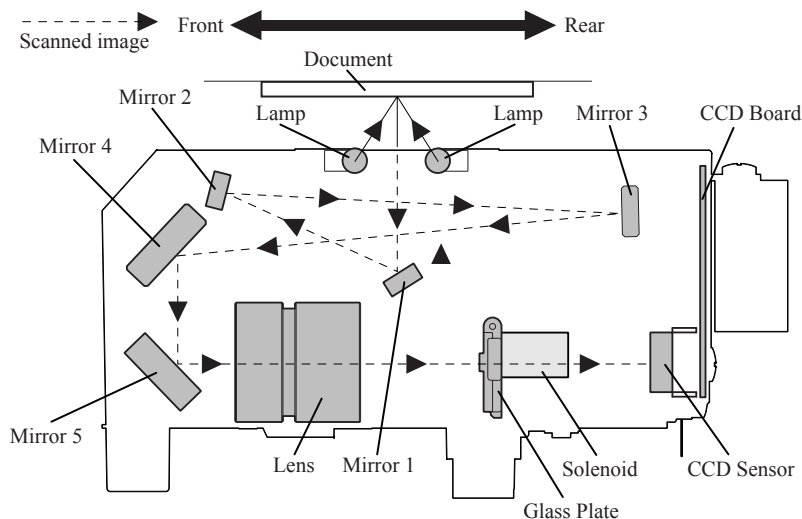


Figure 2-2. Mirror/Lens Mechanism

### 2.1.1.2 TPU Carriage Unit outline

The TPU Carriage Unit consists of TPU Inverter Board, Lamps (light source), SUB\_C Board, and SUB\_D Board. (Refer to figure 2-3.)

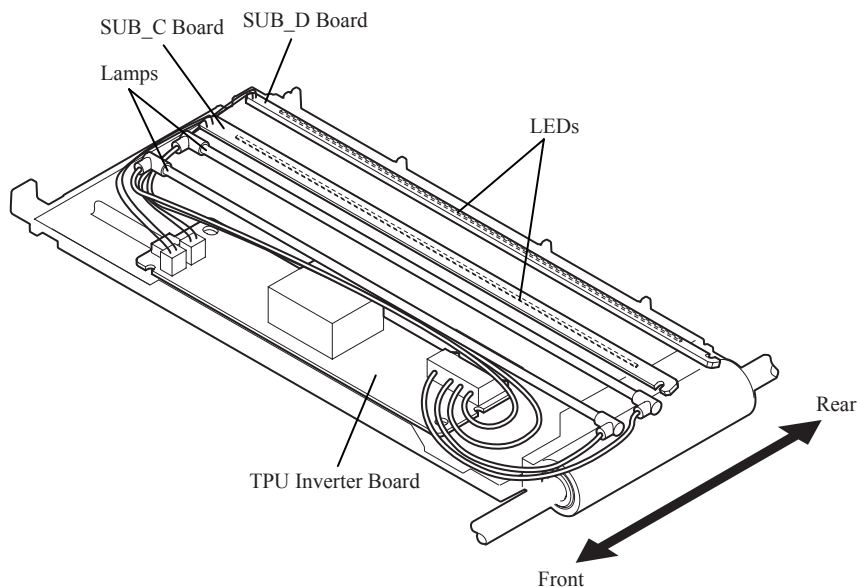


Figure 2-3. TPU Carriage Unit Configuration

#### □ TPU Inverter Board

Boosts +24VDC and converts DC to AC to generate the voltage for driving the Lamps (white cool cathode fluorescent lamps).

#### □ Lamps

White cool cathode fluorescent lamps are used as a light source. When the amount of light is not stable, the Panel LED is flashes and enter the standby mode until it becomes stable.

#### □ SUB\_C Board/ SUB\_D Board

Each board has LEDs to generate an infrared light.

## 2.1.2 Moving Mechanism operation

### 2.1.2.1 Carriage Moving Mechanism operation

The image data of a document are scanned in the combination of the main scanning direction (one line: CCD Sensor) and sub scanning direction (multiple lines: Carriage Unit movement). (Refer to figure 2-4.)

The line type color CCD Sensor can only scan the data of one line in the main scanning direction (in parallel with the Carriage Unit) at one time. To scan the data of the second and latter lines in the sub scanning direction, the Carriage Unit having a built-in CCD Sensor is moved by CR drive. The scanned data are sent to the Control Board. The scanning of Line n data and the processing of Line n-1 image data are performed consecutively at the same time.

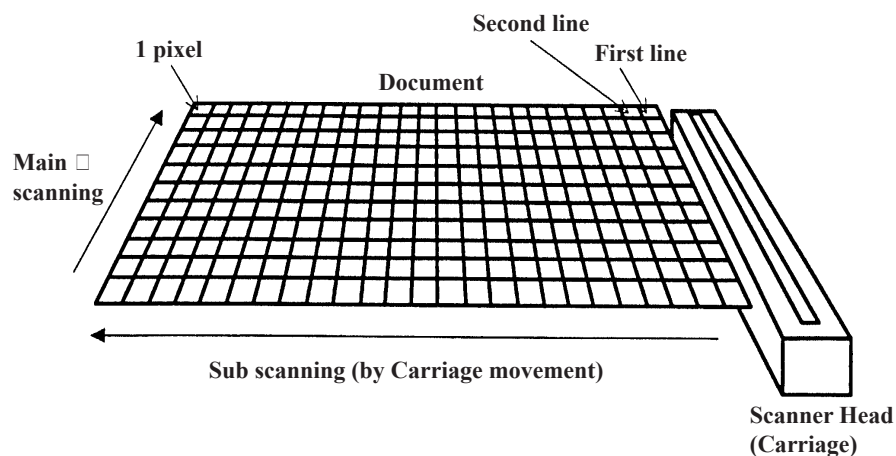


Figure 2-4. Carriage Movement

The Carriage Unit slides along the guide rail in the sub scanning direction. To perform this sliding operation, the CR (Carriage) Motor transmits its drive power to the CR Timing Belt, which is fixed to the Carriage Unit, via the Drive Pulley and Deceleration Gear. The image data scanning start position is determined by the CR HP Sensor located on the Control Board. A stepping motor used as the CR Motor is driven under open loop control. (Refer to figure 2-5.)

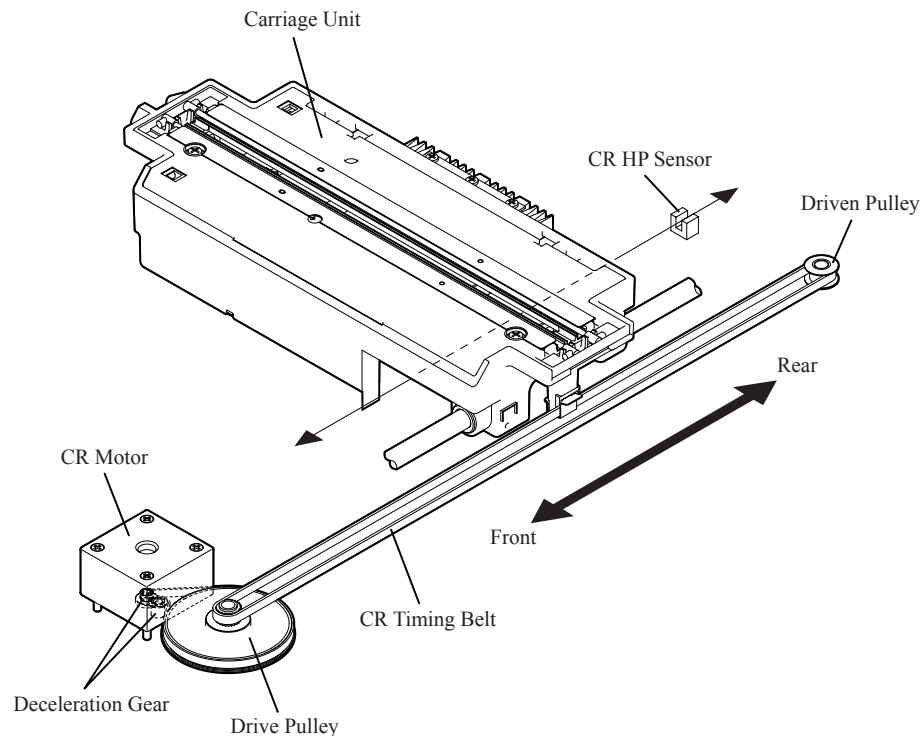
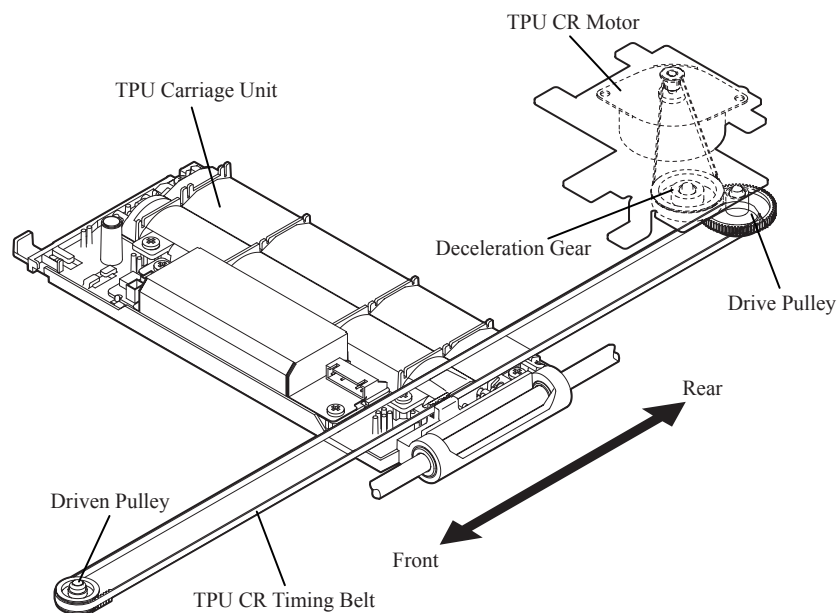


Figure 2-5. Carriage Operation

### 2.1.2.2 TPU Carriage Moving Mechanism operation

The TPU Carriage Unit slides along the guide rail in the sub scanning direction. To perform this sliding operation, the TPU CR (Carriage) Motor transmits its drive power to the TPU CR Timing Belt, which is fixed to the Carriage Unit, via the Drive Pulley and the Deceleration Gear. The TPU CR Motor uses a stepping motor and is driven under open loop control. (Refer to figure 2-6.)



**Figure 2-6. TPU Carriage Operation**

## 2.2 Digital Ice function operation

This scanner has the Digital Ice function, which is divided into two types according to the document type. Use the Print-Ice function for photos, and use the Film-Ice function for positive films, color negative films and monochrome negative films.

### 2.2.1 Print-Ice function

#### □ Print-Ice function outline

This scanner has two visible light lamps for reflection. The lamps are placed symmetrically to provide the same image when a scan is made twice. One of the properties of a visible light is that it reflects irregularly when it radiates a flaw or dust.

For this reason, the images obtained with the Lamps A and B have an inconsistent portion if there is a flaw or dust. This function determines the inconsistent portion as a flaw or dust and then automatically removes the flaw or the dust.

#### □ Print-Ice function sequence

1. Lights up the lamp A and scans the image.
2. Lights up the lamp B and scans the image.
3. Superimposes the images obtained from each lamp and determines the inconsistent portion as a flaw or dust.
4. Erases the portion on the hardware, which has been detected in the step 3 and obtains the image without any flaw and/or dust.

### 2.2.2 Film-Ice function

#### □ Film-Ice function outline

Longer in wavelength than a visible light, an infrared light has a property that it scans a transparent document transparently. Hence, when a document with dust and/or flaws are scanned using an infrared light, the infrared light is blocked at that portion, providing an image that only the dust and/or the flaws are highly visible. By superimposing the images scanned with an infrared light and a visible light, it detects the dust and/or the flaws on the document and automatically removes them using the interpolated and corrected image data near there.

However, since the wavelength differs between the infrared light and visible light, the obtained images differ in size. To prevent this, the Carriage contains the Solenoid-operated Glass Plate. When an image is scanned with a visible light, it is read into the CCD via the Glass Plate to match it with the size of the image obtained with an infrared light.

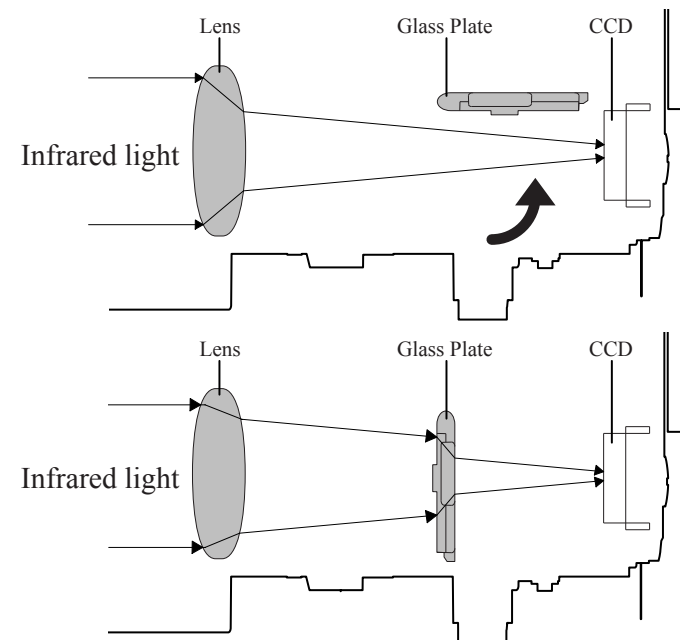
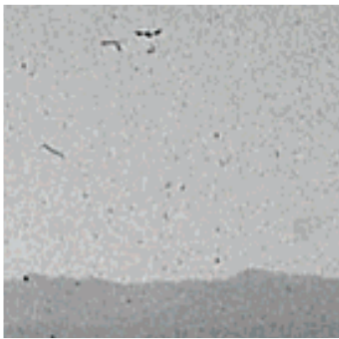


Figure 2-7. Refraction of Infrared Light and Visible Light



❑ Film-Ice function sequence

1. Read the visible light position (To recognize the home position of image scanning, it reads two holes of the Upper Housing Scale section).
2. Scan a visible-light image.
3. Scan an infrared-light image.
4. Superimposes the images obtained from each light and detects the flaws and/or the foreign matter.
5. Erases the flaws and/or the foreign matter on the hardware, which have been detected in the step 4 and obtains the image without any flaw and/or foreign matter.



Dirt extraction



After correction

**Figure 2-8. Extraction/Correction of Dust by Film-Ice Function**

## 2.3 Power Supply Circuit

This Power Supply Circuit Board generates DC power necessary to drive the Control Board and Scanner Engine. [Table 2-1](#) indicates the Power Supply Circuit Boards on a destination basis.

**Table 2-1. Destination-based Power Supply Circuit Boards**

Specifications	Unit Part No.	Fuse Rating
100-120VAC region	2027705	2.5 A/125 VAC
220-240VAC region	2027704	T2.5AH/250 VAC

The output of the Power Supply Circuit Board is provided by closing/opening the No. 4 pin of the CN102 Connector. When the pin is open, the output voltages indicated in [Table 2-2](#) become active. The output voltages have their respective overcurrent protection and overvoltage protection circuit functions.

**Table 2-2. Power Supply Circuit Board Outputs and Protective Functions**

Output Voltage	Output Current	Overcurrent Protection (Protective circuit operation current value)	Overvoltage Protection (Protective circuit operation voltage value)
5 VDC	1.2 A	Voltage droop with current decrease. Automatic recovery. (1A or less)	Shutdown. Switch power off, then on again to recover. (5.5 to 7.5VDC)
12 VDC	0.2 A	Depending on the drooping characteristic of the regulator. Automatic recovery. (0.5A or less)	Shutdown. Switch power off, then on again to recover. (14 to 17VDC)
24 VDC	0.7 A	Shutdown. Switch power off, then on again to recover.	Shutdown. Switch power off, then on again to recover. (28 to 33VDC)

**NOTE 1:** If any of the outputs shuts down, all the other outputs also shut down.  
**2:** The input OFF time necessary for recovery is 5 minutes (maximum).

## 2.4 Control Circuit

### 2.4.1 Power Supply Circuit operation outline

The Control Circuit of this scanner consists of the following circuits.

☐ Main Board

**Table 2-3. IC Explanation**

Location	IC	Location	IC
IC1	A3957SLB-ATR	IC8	ISP1581BD (GX)
IC2	A3957SLB-ATR	IC9	K4S561632D-TC75000
IC3	AT93C46-10SI-1.8	IC10	74LVC138AD
IC4	UPC37M32	IC11	S80927CLMCGGX
IC5	E01A23EB	IC12	74LVC02AD
IC6	MR27V402EJA	IC13	K4S561632D-TC75000
IC7	AS7C31025-15TJC	IC14	TSB43AA82APGE

☐ CCD Board

**Table 2-4. IC Explanation**

Location	IC	Location	IC
IC1	ILX183K	IC5	NJU7665CF-TE1
IC2	BA178M05FP-E2	IC6	74HCT4053PW
IC3	AD9826KRS-REEL	IC7	74ACT244
IC4	E02A41YA	IC8	74ACT244

☐ TPU Main Board

**Table 2-5. IC Explanation**

Location	IC	Location	IC
IC1	A3957SLB-ATR	IC3	74HCT595
IC2	A3957SLB-ATR	IC4	74HCT595

☐ SUB\_C Board

**Table 2-6. IC Explanation**

Location	IC	Location	IC
IC1	PSSI2021SAY	IC2	PSS2021SAY

☐ SUB\_D Board

**Table 2-7. IC Explanation**

Location	IC	Location	IC
IC1	PSSI2021SAY	IC2	PSS2021SAY

☐ SUB\_A Board (Power Button)

Switch: PS-132-B22PBS

☐ SUB\_B Board (LED: Built in the Lid TPU)

LED: ON/OFF LED (blue)

☐ Panel Board (Start Button)

Switch : EVQPEE04M

LED : READY LED (green)

ERROR LED (red)

☐ Power supply

220-240V: MPW0709

## 2.4.2 Image processing operation

The sequence of scanned image processing is explained in order below.

1. CCD Board (CCD Image Sensor)
  - Optoelectronic transformation processing (reflected light (optical energy) from a document surface is transformed into electric charge (electric energy))
  - Amplification processing
2. Main Board (Scanned image data processing)
  - A/D conversion processing (scanned image data generated as an analog electric signal is converted to a digital signal)
  - Shading correction processing (scanned image data is corrected on the basis of the white and black reference values)
  - Various image correction processing (gamma correction, color correction, halftone correction, etc. are executed under the set conditions from the host side)
3. The above processing is performed and the scanned image data are output to the host side at the end.

CHAPTER

3

## TROUBLESHOOTING

## 3.1 Overview


This chapter explains the remedies for errors detected by the self-diagnostic function as well as the check points on a fault phenomenon basis, which are required for efficient troubleshooting at occurrence of any error.

### 3.1.1 Self-diagnostic Function

This scanner has a self-diagnostic function that automatically diagnoses the operating status of each section, and uses an LED indication to show the error status. This function detects the following error statuses, and their remedies are as described below.


#### COMMAND ERROR

**Table 3-1. Command Error**

LED Indication	Cause	Corrective Action
 (No indication)	An undefined command or undefined command parameter was received.	<ul style="list-style-type: none"> <li>The scanner ignores the incorrect command or parameter. (Current setting maintained)</li> <li>The scanner returns NACK and waits for the next command parameter.</li> </ul>
Recover	The error status is canceled on receipt of a correct command.	

#### FATAL ERROR

**Table 3-2. Fatal error**

LED Indication	Cause	Corrective Action
 (Fast flickering)	<ul style="list-style-type: none"> <li>The lamp is dead.</li> <li>The main unit is faulty.</li> <li>Firmware downloading failed.</li> </ul>	Switch power off. Set Bit 7 of the status bit.
Recover	(After removing the error cause) <ul style="list-style-type: none"> <li>Switch power off, then on again.</li> <li>Send the initialization command (ESC@).</li> <li>Receivable command [ESC F, ESC f, ESC @]</li> </ul>	

## 3.2 Troubleshooting

This section explains troubleshooting from the superficial phenomena.

In this section, troubleshooting is divided on a unit level, based on the superficial phenomena at occurrence of trouble. Refer to Table 3-3, find the corresponding phenomenon, and make checks according to the flowchart.

**Table 3-3. Trouble Phenomena, Causes and Reference Flowcharts**

Phenomenon	Trouble Definition	Cause Location	Reference Flowchart
If powered ON, the Main Unit does not operate.	The Main Unit does not perform initialization operation.	<ul style="list-style-type: none"> <li>• Connector</li> <li>• Power Supply Board</li> <li>• Carriage Motor</li> <li>• Main Board</li> </ul>	3-1
Occurrence of "Fatal error". (The LED flashes red.) After occurrence of the above error, recovery cannot be made if power is switched on again.	The Carriage Unit does not operate.	<ul style="list-style-type: none"> <li>• Carriage Lock</li> <li>• Upper Housing</li> <li>• Connector</li> <li>• Harness</li> <li>• Carriage Moving Mechanism</li> <li>• CR Motor</li> <li>• Main Board</li> </ul>	3-2
	The Fluorescent Lamps are not lit.	<ul style="list-style-type: none"> <li>• Connector</li> <li>• Fluorescent Lamps</li> <li>• Carriage</li> <li>• Main Board</li> </ul>	3-3
Scanned image quality error	An image cannot be scanned clearly.	<ul style="list-style-type: none"> <li>• Smudge on Document Glass</li> <li>• Smudge on Mirror</li> <li>• Sheet White Section</li> <li>• CCD Board</li> <li>• Main Board</li> </ul>	3-4

**Table 3-3. Trouble Phenomena, Causes and Reference Flowcharts**

Phenomenon	Trouble Definition	Cause Location	Reference Flowchart
Occurrence of "Communication error". (The LED flashes red.) After occurrence of the above error, "Communication error" occurs when communication is made with the host again.	The host does not recognize the scanner if power is switched on.	<ul style="list-style-type: none"> <li>• Condition of host support (USB, IEEE1394)</li> <li>• TWAIN Driver</li> <li>• Cable (USB, IEEE1394)</li> <li>• Main Board</li> </ul>	3-5
	The TPU does not operate.	<ul style="list-style-type: none"> <li>• Cable</li> <li>• TPU Main Board</li> <li>• Main Board</li> </ul>	3-6
	The TPU Carriage Unit does not operate.	<ul style="list-style-type: none"> <li>• TPU Carriage Lock</li> <li>• TPU Lower Housing</li> <li>• Connector</li> <li>• TPU Harness</li> <li>• TPU Carriage Moving Mechanism</li> <li>• TPU CR Motor</li> <li>• TPU Main Board</li> </ul>	3-7
	The Fluorescent Lamps of the TPU do not light up.	<ul style="list-style-type: none"> <li>• Connector</li> <li>• Fluorescent Lamps</li> <li>• TPU Carriage</li> <li>• TPU Main Board</li> </ul>	3-8
	The LED of the TPU does not light up.	<ul style="list-style-type: none"> <li>• Connector</li> <li>• Sub_C Board</li> <li>• Sub_D Board</li> <li>• TPU Carriage</li> <li>• TPU Main Board</li> </ul>	3-9

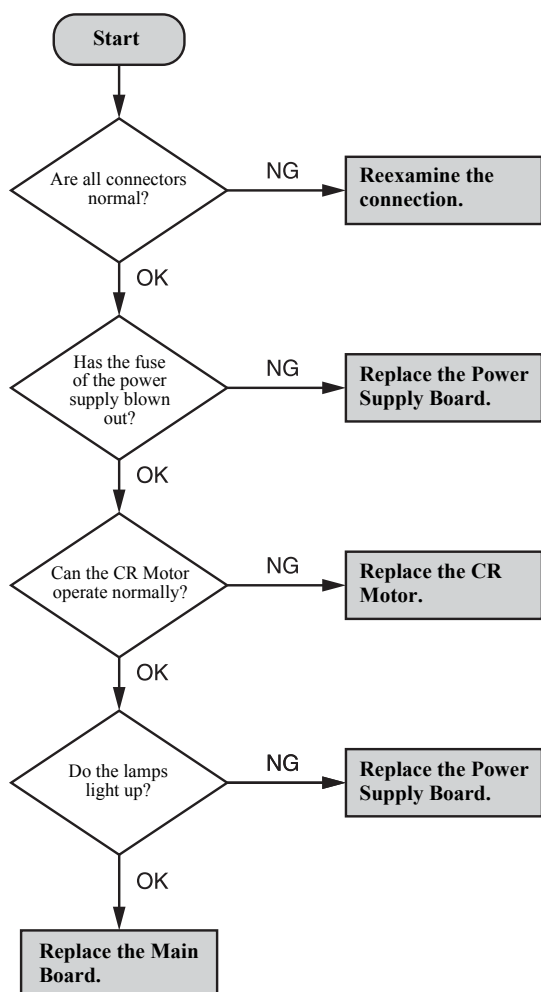


Figure 3-1. The Main Unit does not perform initialization operation.

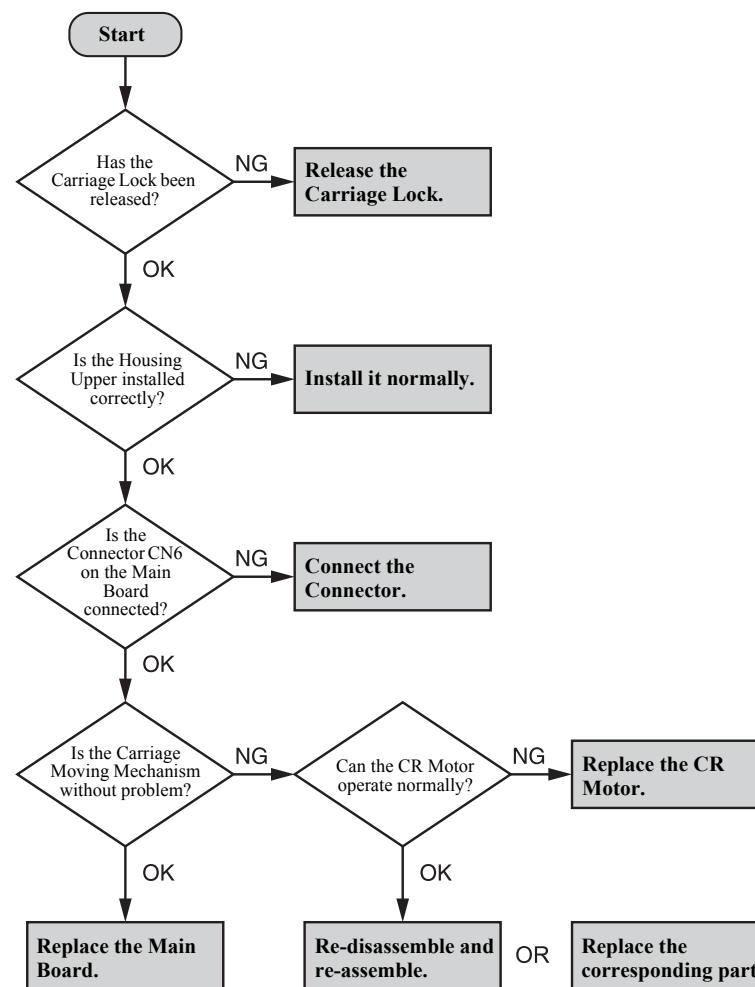


Figure 3-2. The Carriage Unit does not operate.



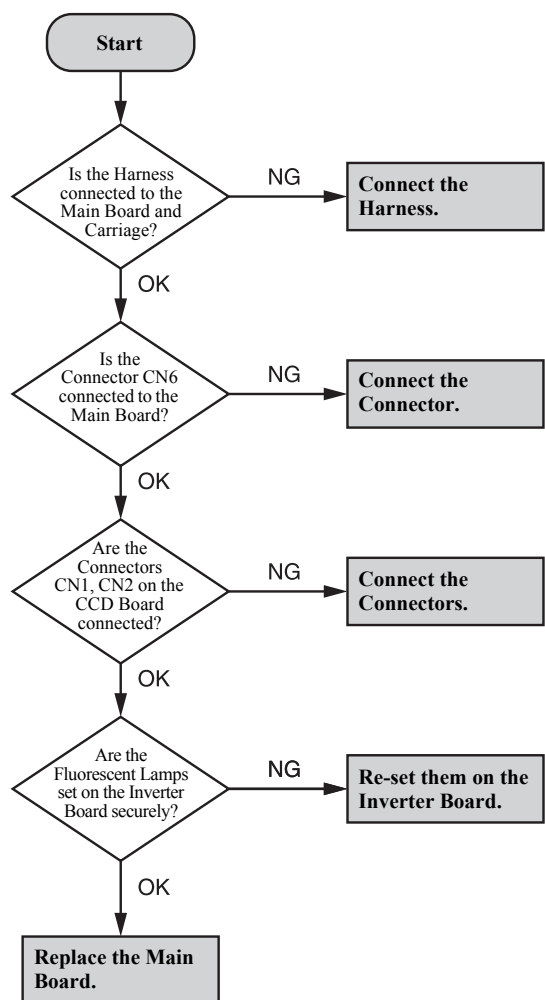


Figure 3-3. The Fluorescent Lamps are not lit.

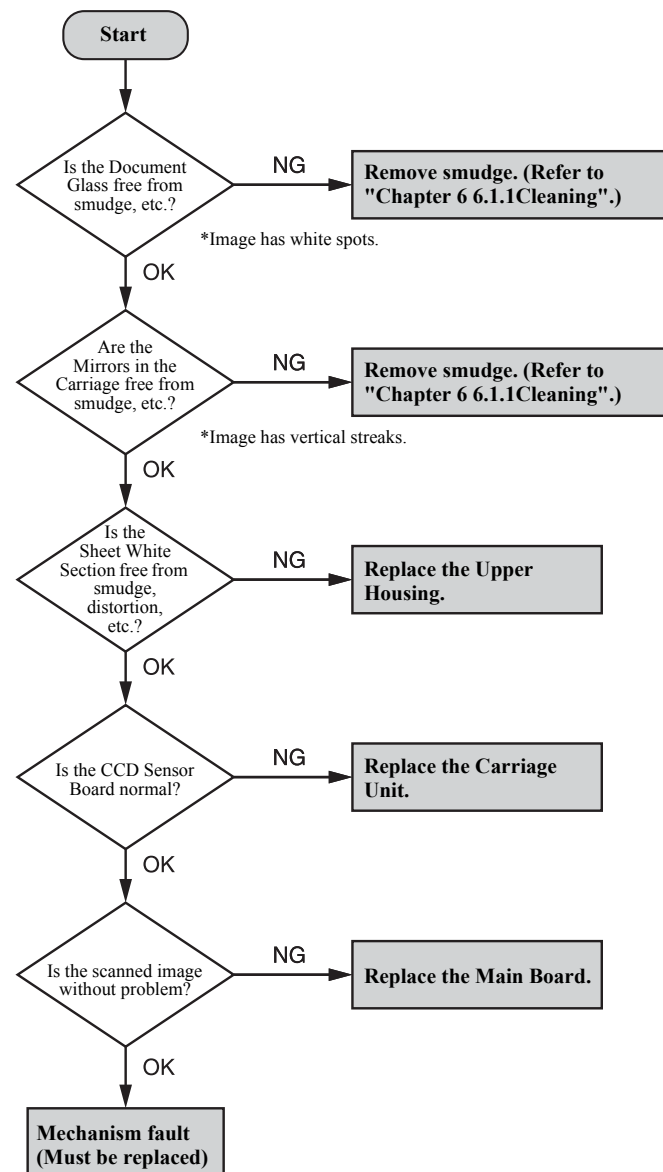


Figure 3-4. An image cannot be scanned clearly.

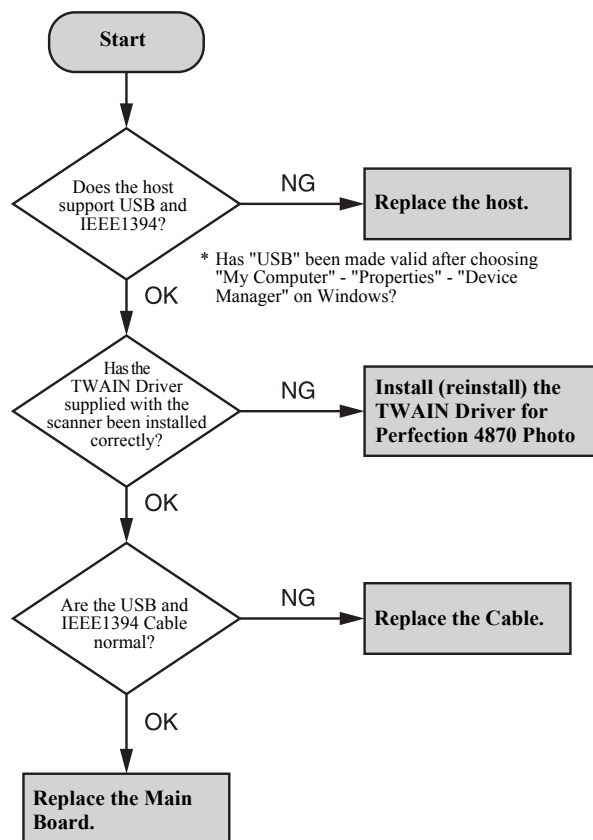


Figure 3-5. The host does not recognize the scanner if power is switched on.

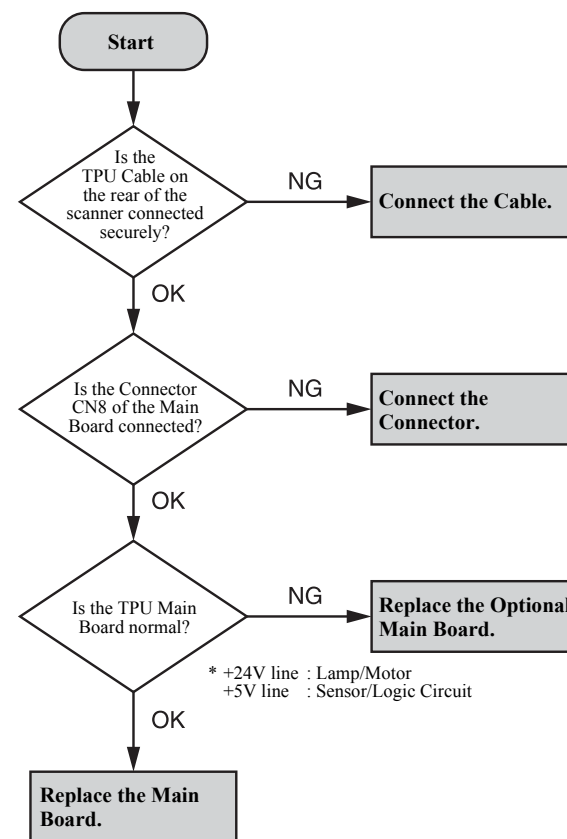


Figure 3-6. The TPU does not operate.

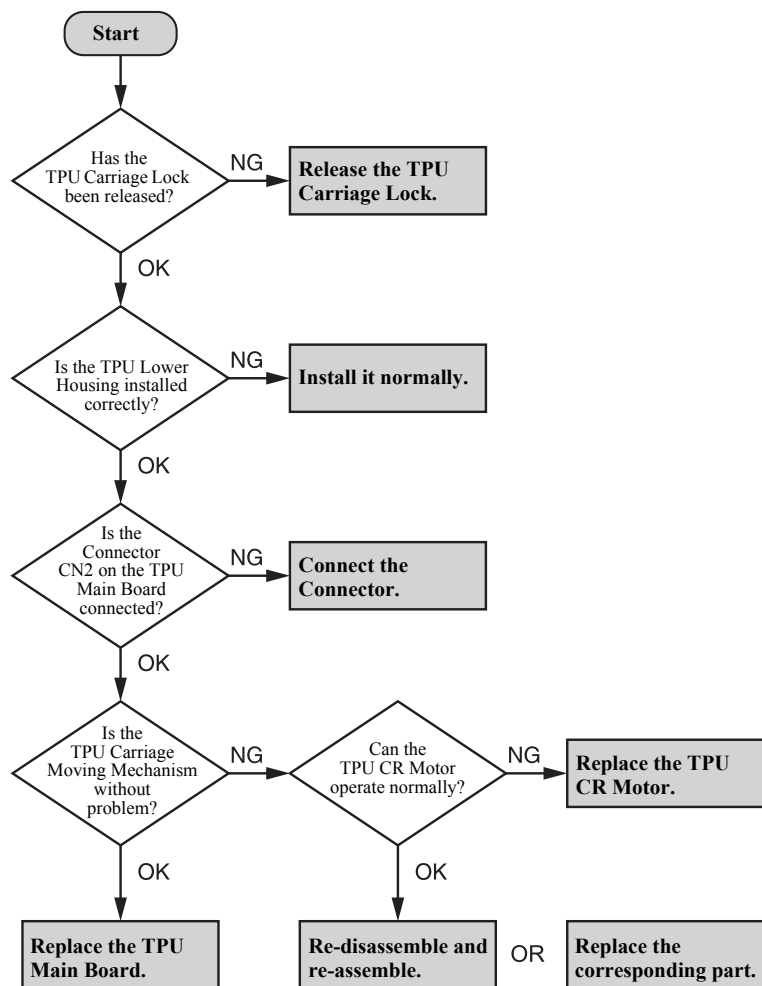


Figure 3-7. The TPU Carriage Unit does not operate.

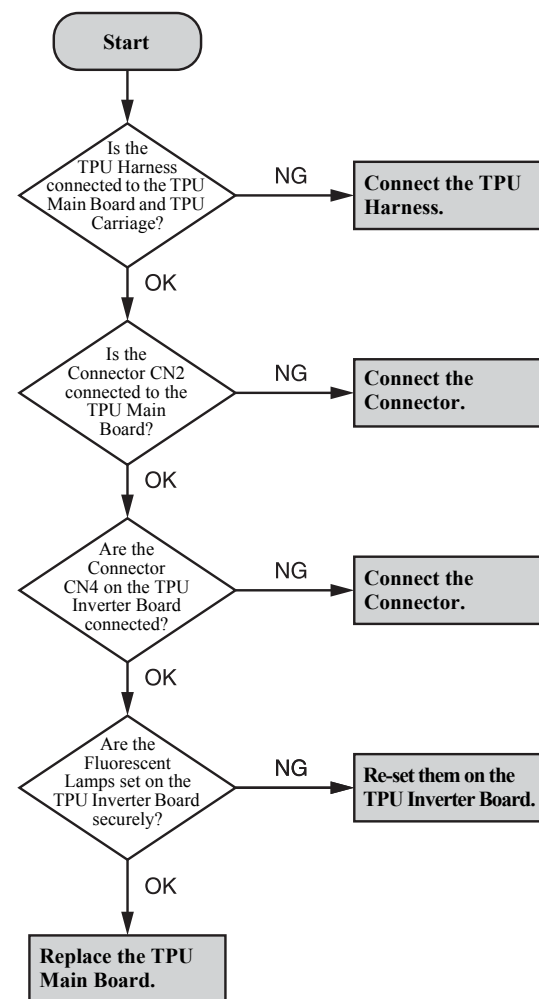


Figure 3-8. The Fluorescent Lamps of the TPU do not light up.

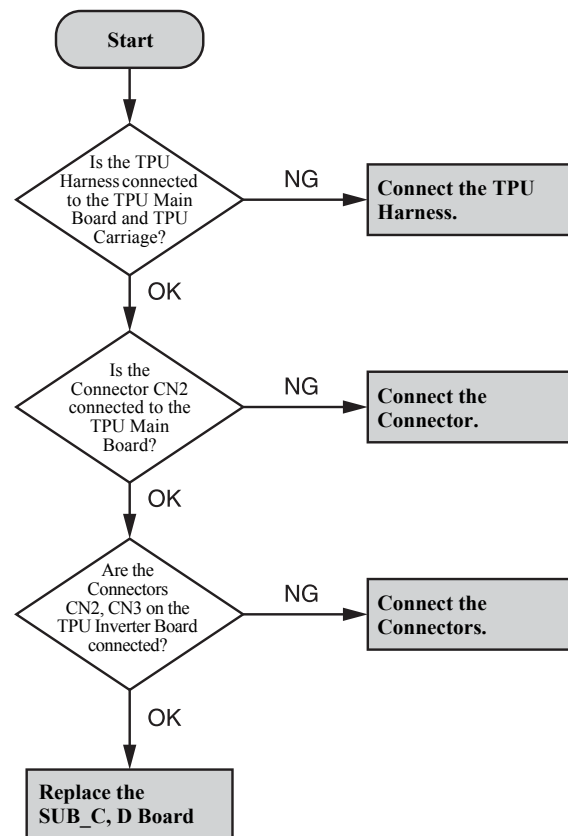


Figure 3-9. The LED of the TPU does not light up.

**CHAPTER**

**4**

# **DISASSEMBLY/ASSEMBLY**

## 4.1 Overview

This chapter explains the procedures for disassembling the major units and parts of the product. Unless otherwise explained, reassembly should be carried out in the reverse order of the disassembly procedure. When you have to remove any units or components that are not described in this chapter, refer the exploded diagram in the Appendix.

Before starting disassembly, always read the precautions described in the next section.

### 4.1.1 Precautions

Before starting the disassembly or reassembly of the product, always read the following precautions given under the headings "WARNING" and "CAUTION".

#### WARNING



- Before disassembling or reassembling this product, always disconnect the Power Cable and Interface Cable. However, when you have to work with power ON for voltage measurement, etc., use extreme care not to get an electric shock and do the work in accordance with the procedure given in this manual.
- To prevent your hands from being cut by sharp edges, always wear gloves before starting disassembly/reassembly.
- When touching any internal components, use a static electricity discharger such as anti-static wrist straps, and handle them carefully to protect the microprocessors and circuits.

#### CAUTION



- Provide sufficient work space for disassembling and reassembling.
- Always use only the recommended tools for disassembly, reassembly and adjustment.
- Be sure to tighten the screws to the specified torque.
- Use the specified grease for lubrication. (Refer to Chapter 6 for details.)

The following figure shows the definition of the scanner orientations explained in the disassembly procedure.

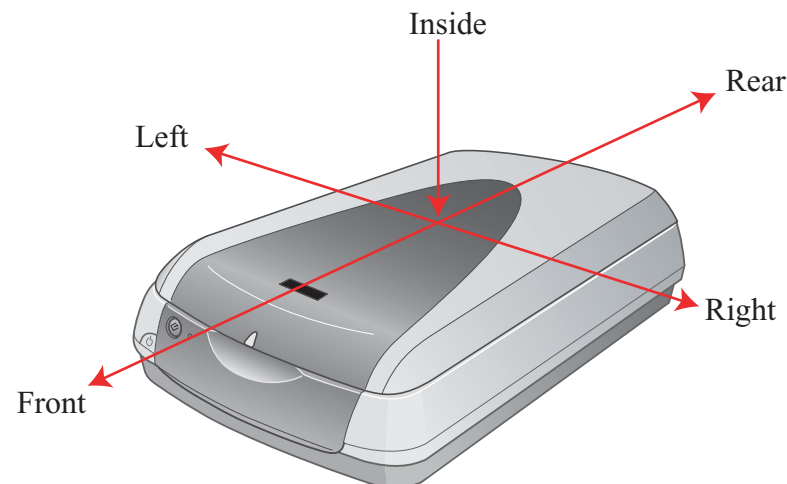


Figure 4-1. Orientation Definition

### 4.1.2 Recommended Tools

To protect this product from damage, use the specified tools indicated in the following table.

Table 4-1. Specified Tools

Tool Name	Supplier	Part Number
Phillips screwdriver No. 2	EPSON	1080532
Flat-blade screwdriver	EPSON	1080527
Tweezers	EPSON	1080561
Opposite-side 5mm box screwdriver	EPSON	-
Long-nose pliers	EPSON	1080561
Single-ended wrench	EPSON	-

### 4.1.3 The List of Recommended Screws

The following table indicates the screws used in the Perfection 4870 Photo.

**Table 4-2. The List of Recommended Screws**

No.	Standard	Outline
1	C.B.P M3x6	(+) Bind P-tite Screw
2	C.B.P M3x8	(+) Bind P-tite Screw
3	C.B.P M3x12	(+) Bind P-tite Screw
4	C.B.P M4x12	(+) Bind P-tite Screw
5	C.B.S M3x5	(+) Bind S-tite Screw
6	C.C.P M3x6	(+) Cup P-tite Screw
7	C.P M3x4	(+) Pan Head Screw
8	C.B M3x3	(+) Bind Screw
9	6N, 5	-

## 4.2 Disassembly Procedure

This section illustrates how to remove the main components of this product. Unless otherwise specified, the reassembly procedure is omitted here since the product can be reassembled in the reverse order of the disassembly procedure. For the engagement of the main components, refer to the general exploded views in the Appendix.

The following flowchart shows the disassembling procedure step-by-step. When disassembling any unit, refer to the corresponding page number shown in the following figure.

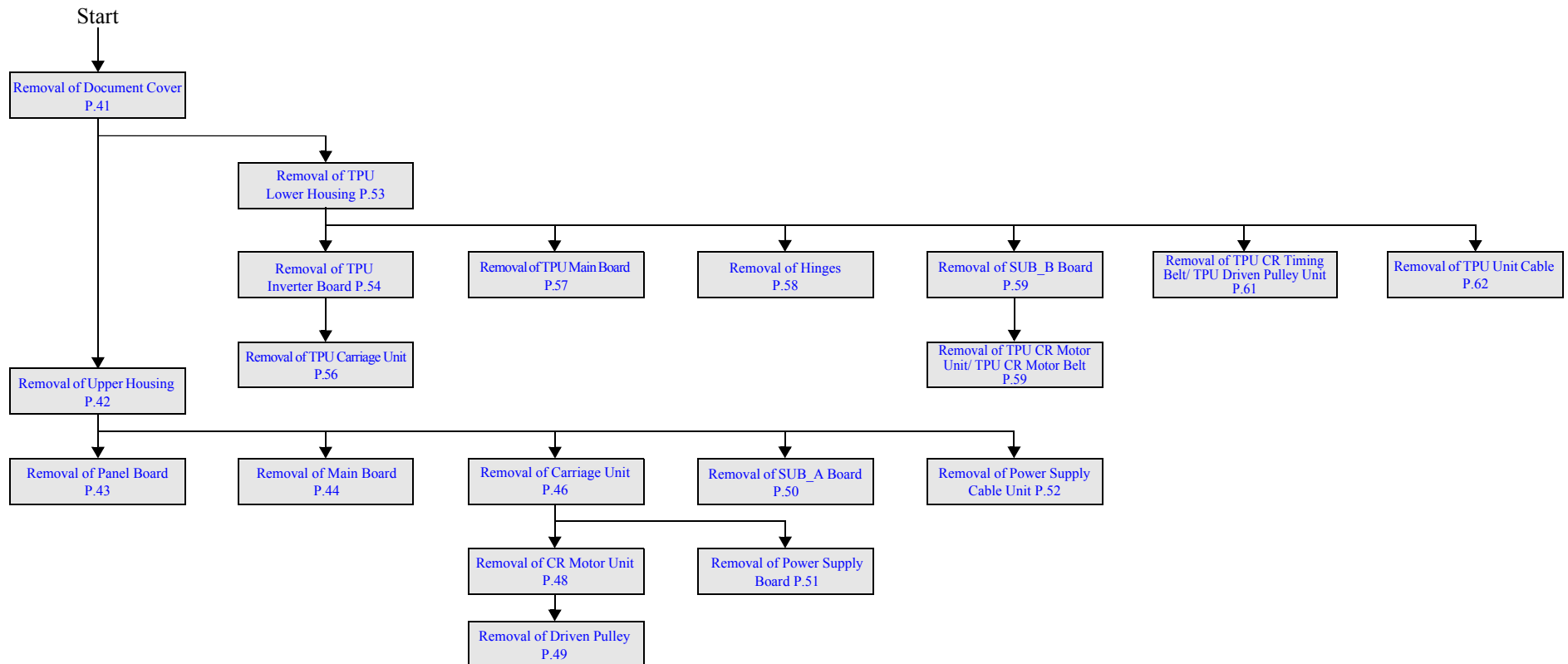


Figure 4-2. Disassembly/Assembly Flowchart



### 4.2.1 Removal of Document Cover

1. Disconnect the TPU Unit Connector on the rear side of the Main Unit.

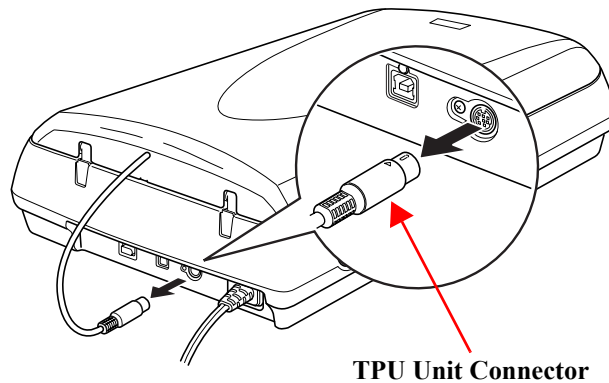


Figure 4-3. Disconnection of TPU Unit Connector

2. Open the Document Cover.



Figure 4-4. Removal of Document Cover (1)

3. Hold both ends of the Document Cover and then lift and remove it.

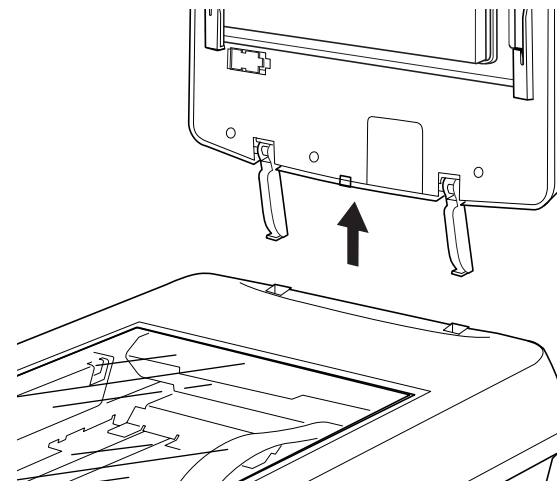


Figure 4-5. Removal of Document Cover (2)

## 4.2.2 Removal of Upper Housing

1. Remove the Document Cover. (*Refer to 4.2.1 Removal of Document Cover*)
2. Release the Carriage Lock on the left side of the Main Unit with a coin or like.

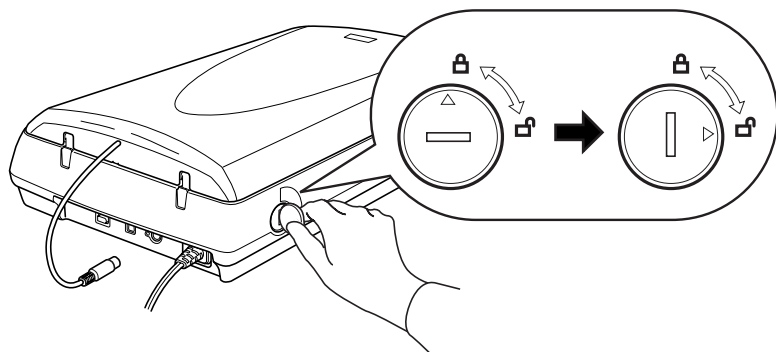


Figure 4-6. Releasing of Carriage Lock

3. Remove the two screws (C.B.P M3x8) which secure the Upper Housing.

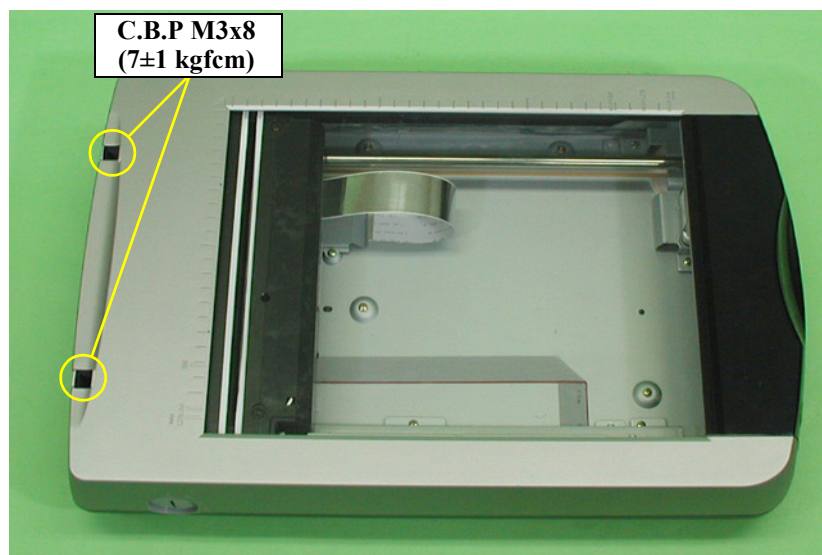


Figure 4-7. Removal of Upper Housing (1)

4. Lift the rear side of the Upper Housing, slide it to the front, release the three hooks, and remove the Upper Housing.

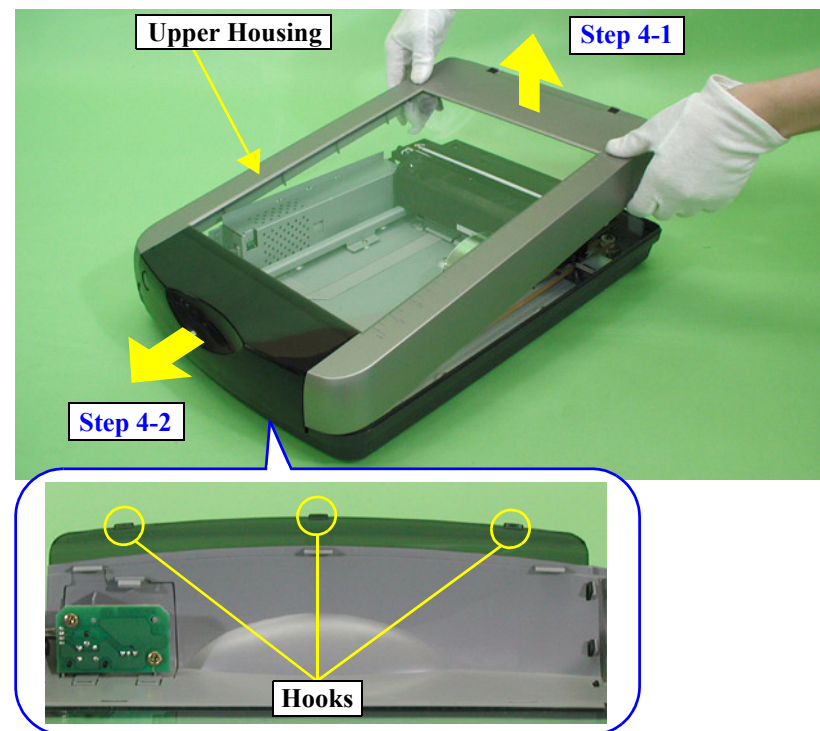


Figure 4-8. Removal of Upper Housing (2)

5. Disconnect the SW Connector from the SUB\_A Board.

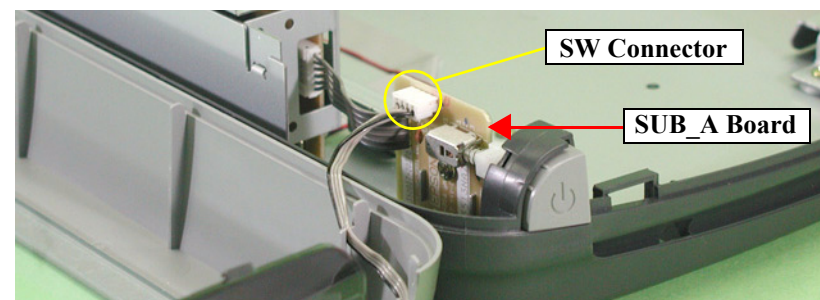


Figure 4-9. Removal of Upper Housing (3)

### 4.2.3 Removal of Panel Board

1. Remove of Upper Housing. (*Refer to 4.2.2 Removal of Upper Housing*)
2. Remove the two screws (C.B.P M3x8) which secure the Panel Board and then remove it.

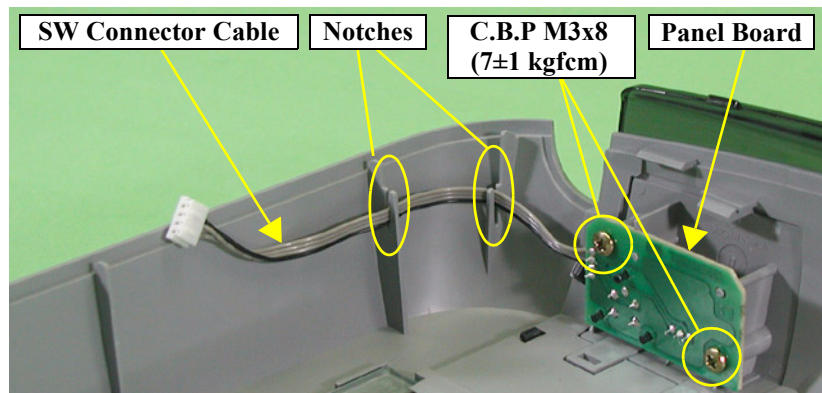


Figure 4-10. Removal of Panel Board

#### Reassembly



- Route the SW Connector Cable by passing it through the notches of the Upper Housing as shown in [Figure 4-10](#).
- After installing the Function Button on the Panel Board in the orientation shown in [Figure 4-11](#), install the Panel Board on the Upper Housing.

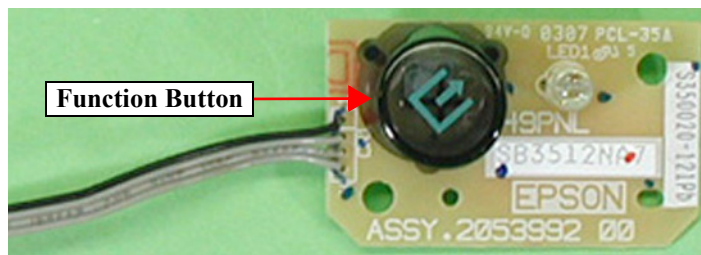


Figure 4-11. Installation of Function Button

#### 4.2.4 Removal of Main Board

1. Remove of Upper Housing. (*Refer to 4.2.2 Removal of Upper Housing*)
2. Move the Carriage Unit to the centre.

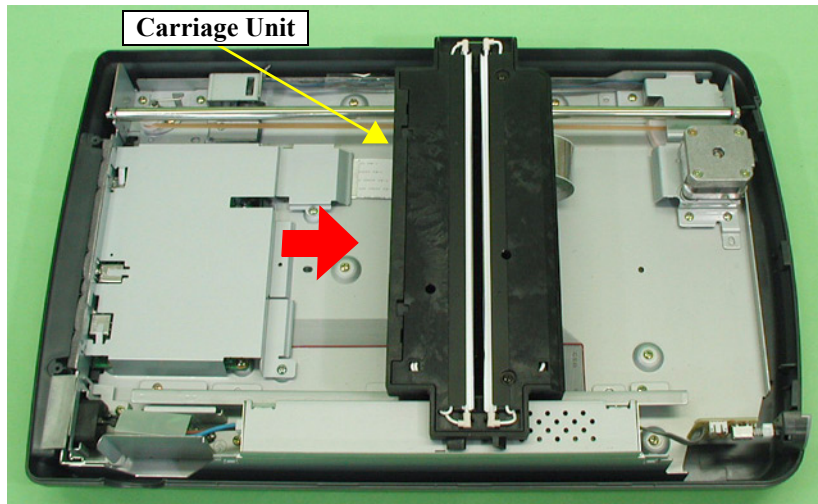


Figure 4-12. Moving Carriage Unit

3. Remove the two screws (C.B.S M3x5) which secure the Main Board Cover.
4. Remove the Main Board Cover in the following procedure.
  1. Release the hook A and the hook B, and lift the rear side of the Main Board Cover.
  2. With the Main Board Cover lifted, slide it to the rear, release the hook C and then remove the Main Board Cover.

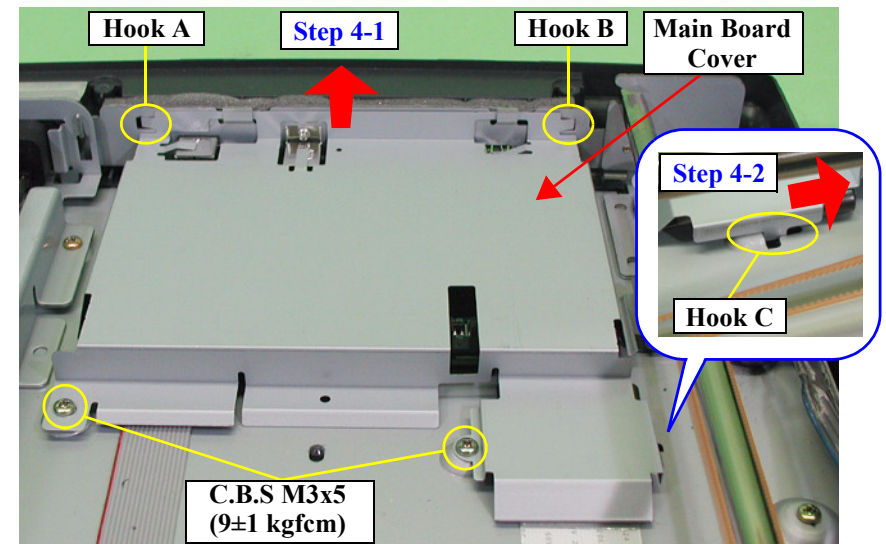


Figure 4-13. Removal of Main Board Cover



5. Disconnect the CR Motor Connector, Carriage FFC, and Power Supply Board Connector connected to the Main Board.
6. Remove the four screws (C.B.S M3x5) and two Main Unit rear screws (C.P M3x4) which secure the Main Board and then remove the Main Board.

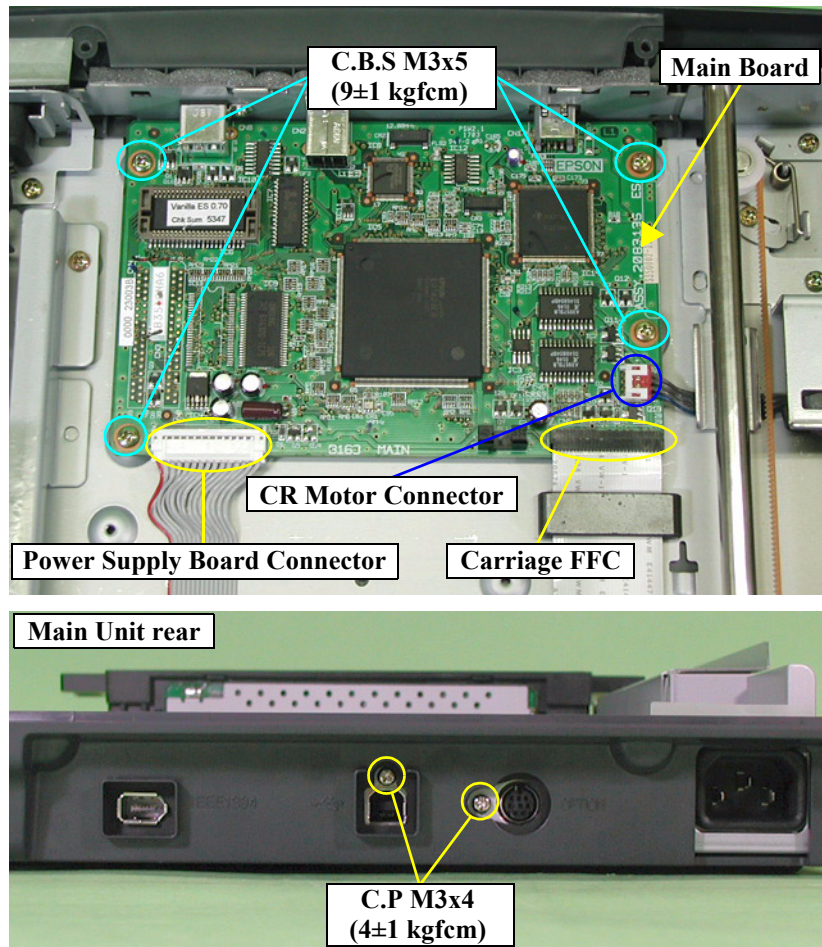


Figure 4-14. Removal of Main Board



- Pass the Carriage FFC through the Ferrite Core and adhere it with a two-sided tape at the position shown in [Figure 4-15](#).

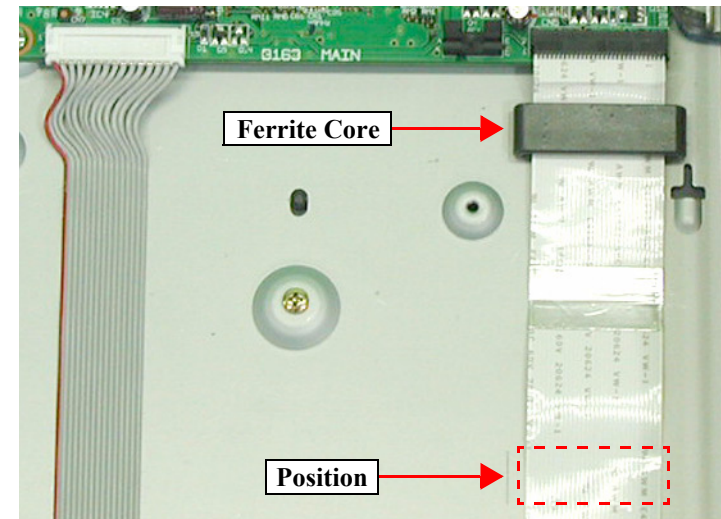


Figure 4-15. Installation of Carriage FFC

- Pass the CR Motor Cable under the Shaft Holder as shown in [Figure 4-16](#).

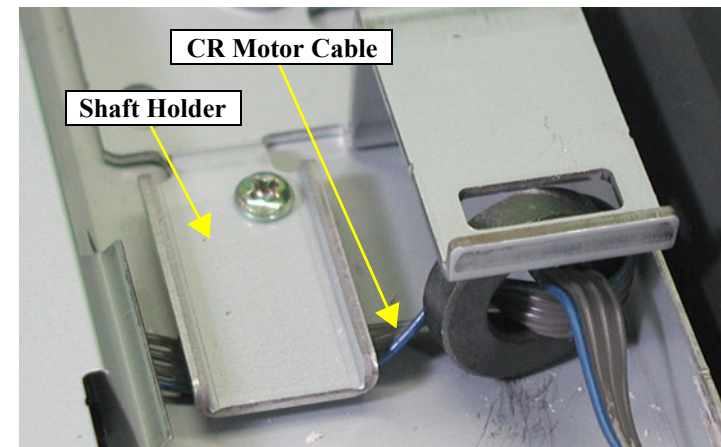


Figure 4-16. Routing CR Motor Cable

## 4.2.5 Removal of Carriage Unit

1. Remove of Upper Housing. *(Refer to 4.2.2 Removal of Upper Housing )*
2. Move the Carriage Unit to the centre. *(Refer to 4.2.4 Removal of Main Board Step 2 )*
3. Remove the hexagon nut (6N, 5) which secures the Carriage Shaft.

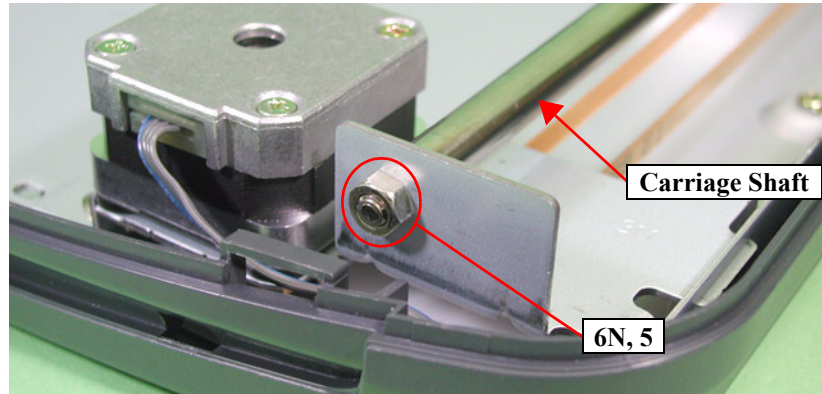


Figure 4-17. Removal of Carriage Shaft (1)

4. Using a spanner, turn the Carriage Shaft until its flat surfaces match the notch.

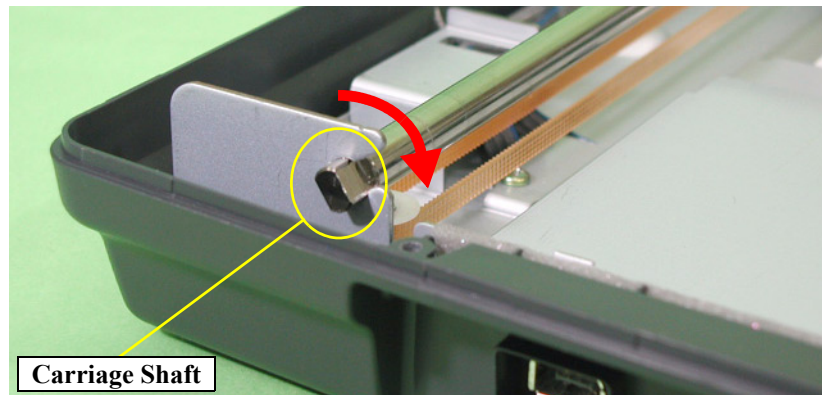


Figure 4-18. Removal of Carriage Shaft (2)

5. While lifting the Carriage Unit as shown in Figure 4-19, remove the rear part of the Carriage Shaft from the notch, and pull the front part out of the Bushing.
6. Pull the Carriage Shaft out of the Carriage Unit.

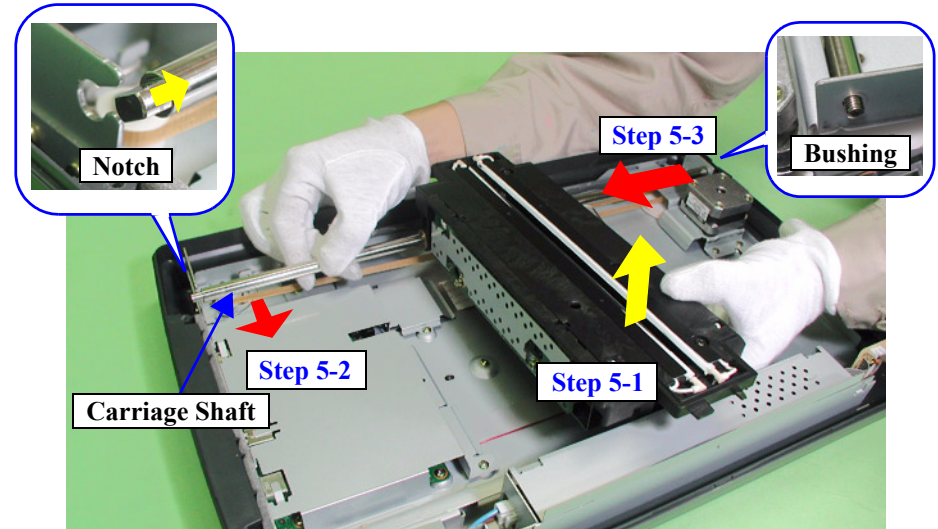


Figure 4-19. Removal of Carriage Shaft (3)

7. Lift the Carriage Unit, remove the lock plate and then remove the CR Timing Belt.

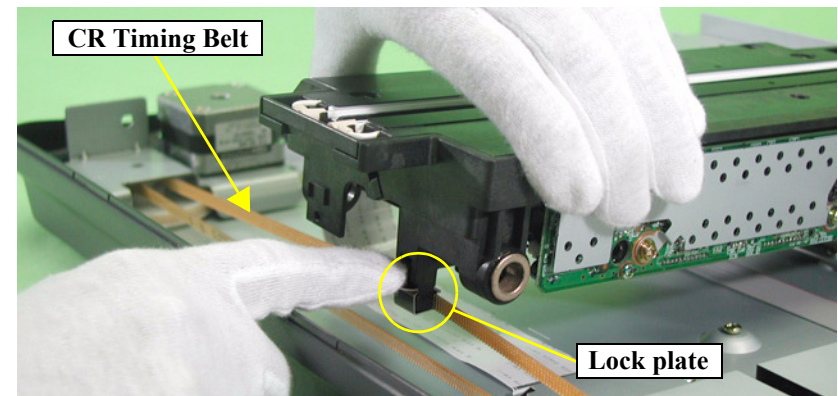


Figure 4-20. Removal of CR Timing Belt

8. Disconnect the Carriage FFC from the Main Board. (*Refer to Step 3 to Step 5 in 4.2.4 Removal of Main Board.*)
9. Remove the Carriage FFC from the Base Frame and then remove the Carriage Unit.



Pass the Carriage FFC through the Ferrite Core, and adhere it with a two-sided tape at the position shown in [Figure 4-15](#).



## 4.2.6 Removal of CR Motor Unit

1. Remove of Carriage Unit. (*Refer to 4.2.5 Removal of Carriage Unit*)
2. Remove the three screws (C.B.S M3x5) which secure the CR Motor Unit and then remove the CR Motor Unit.

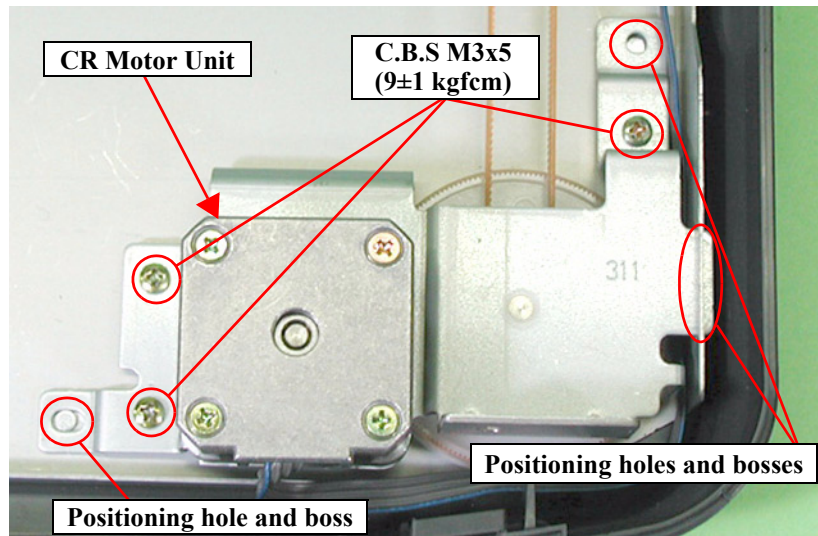


Figure 4-21. Removal of CR Motor Unit

Reassembly



Install the CR Motor Unit by matching the positioning holes and the bosses as shown in [Figure 4-21](#).

3. Remove the CR Timing Belt from the Driven Pulley.

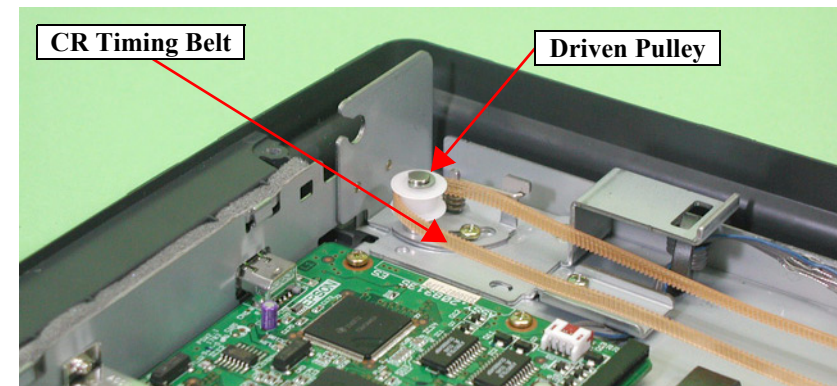


Figure 4-22. Removal of CR Timing Belt

4. Disconnect the CR Motor Connector from the Main Board.
5. Remove the CR Motor Cable from the Base Frame and then remove the CR Motor Unit.

**CAUTION**



Remove the CR Motor Cable carefully as it may be broken and left on the Base Frame side.

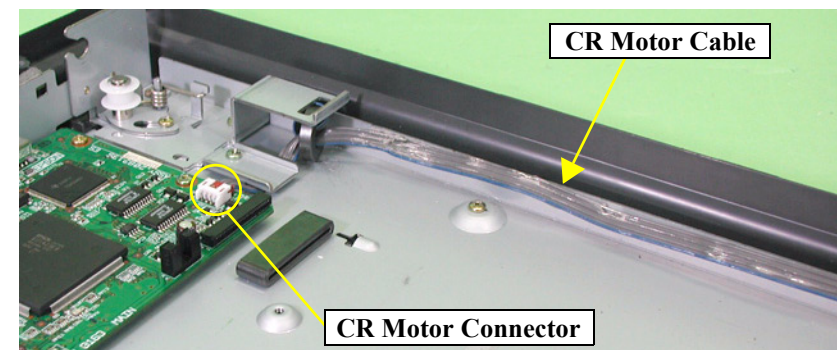


Figure 4-23. Removal of CR Motor Cable



## 4.2.7 Removal of Driven Pulley

1. Remove the CR Timing Belt from the Driven Pulley. (Refer to Step 1 to Step 3 in 4.2.6 Removal of CR Motor Unit.)
2. Remove the screw (C.B M3x3) which secures the Driven Pulley Unit and then remove the Driven Pulley Unit.

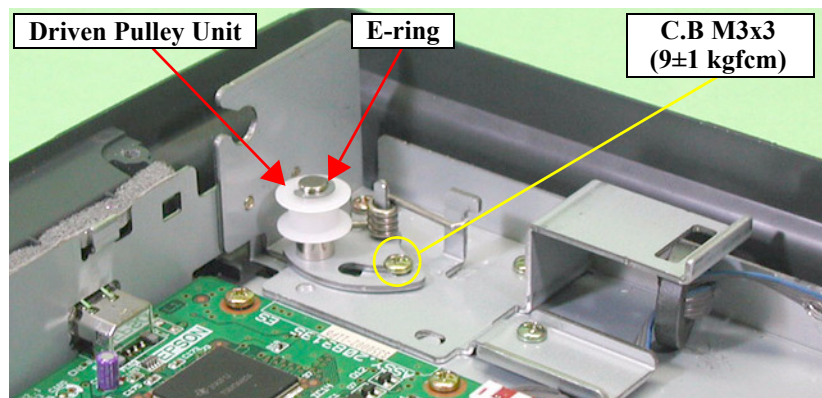


Figure 4-24. Removal of Driven Pulley Unit

3. Remove the E-ring and then remove the Driven Pulley.

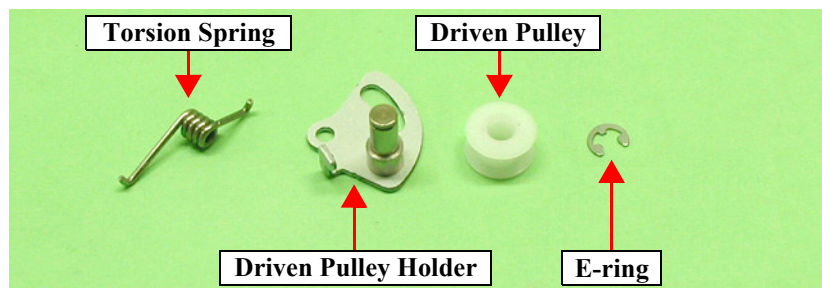


Figure 4-25. Removal of Driven Pulley

Reassembly



Get the ends of the Torsion Spring caught in the two hooks as shown in Figure 4-26.

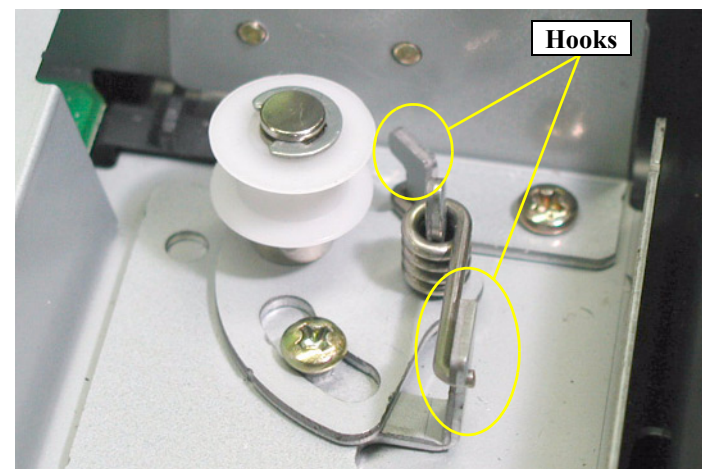


Figure 4-26. Installation of Torsion Spring

### 4.2.8 Removal of SUB\_A Board

1. Remove of Upper Housing. (*Refer to 4.2.2 Removal of Upper Housing*)
2. Remove the five screws (C.B.P M3x8) which secure the Base Frame.
3. Disconnect the SUB\_A Board Connector from the Power Supply Board.

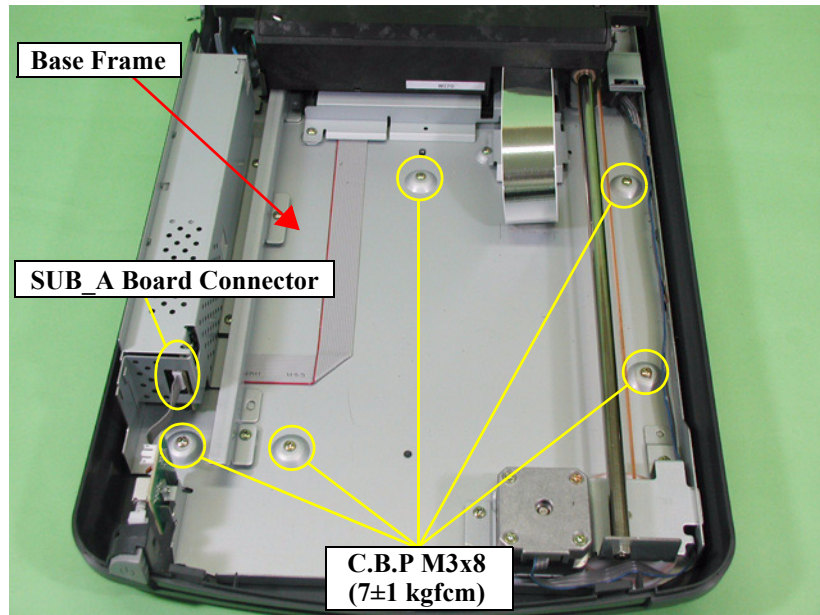


Figure 4-27. Screws Securing Base Frame

4. While lifting the front part of the Base Frame, remove the screw (C.B.S M3x5) and two hooks which secure the SUB\_A Board and then remove the SUB\_A Board.

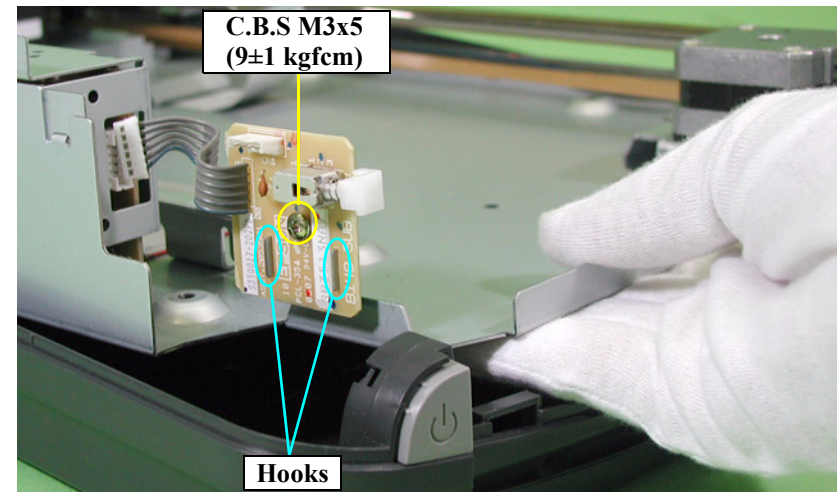


Figure 4-28. Removal of SUB\_A Board

## 4.2.9 Removal of Power Supply Board

1. Remove of Carriage Unit. (*Refer to 4.2.5 Removal of Carriage Unit*)
2. Disconnect the SUB\_A Board Connector and the Power Supply Connector from the Power Supply Board.
3. Remove the two screws (C.B.S M3x5) which secure the Power Supply Board Unit.

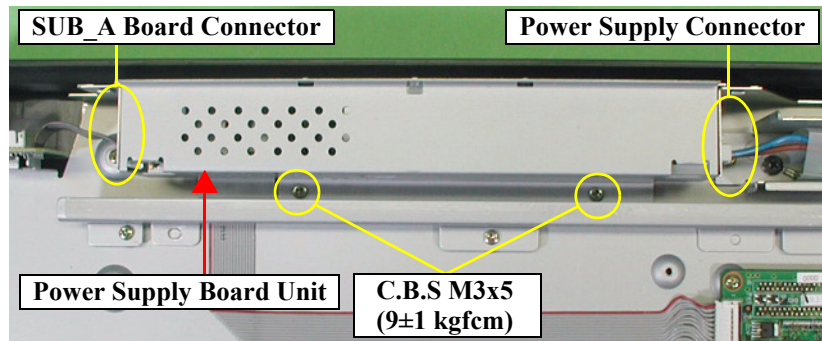


Figure 4-29. Removal of Power Supply Board Unit (1)

4. Lift the Power Supply Board Unit, release the five hooks on the right side and then remove the Power Supply Board Unit.

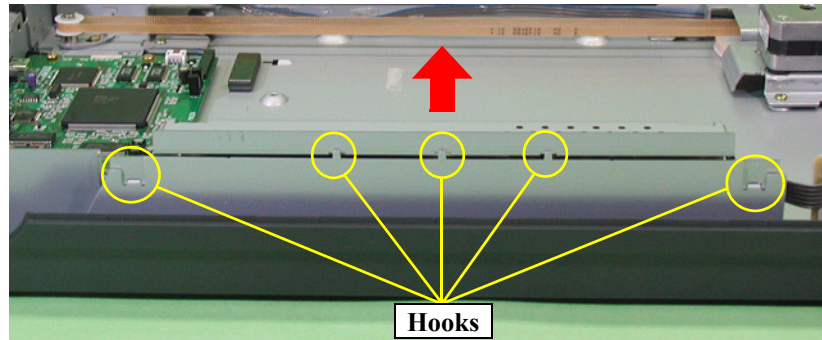


Figure 4-30. Removal of Power Supply Board Unit (2)

5. Disconnect the Main Board Connector from the Power Supply Board.
6. Remove the five screws (C.B.S M3x5) which secure the Power Supply Board and then remove the Power Supply Board from the Power Supply Board Cover.

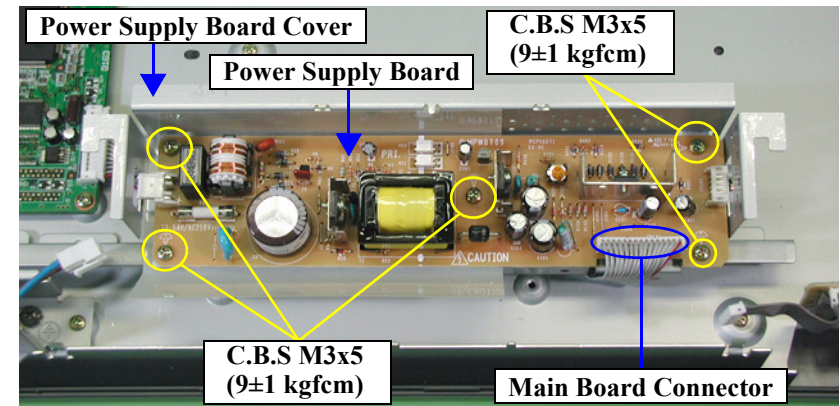


Figure 4-31. Removal of Power Supply Board



### 4.2.10 Removal of Power Supply Cable Unit

1. Remove of Upper Housing. (*Refer to 4.2.2 Removal of Upper Housing*)
2. Move the Carriage Unit to the centre. (*Refer to 4.2.4 Removal of Main Board Step 2*)
3. Disconnect the Power Supply Connector from the Power Supply Board.
4. Remove the Power Supply Cover from the Lower Housing.
5. Remove the three screws (C.B.S M3x5) which secure the Power Supply Cable Unit.

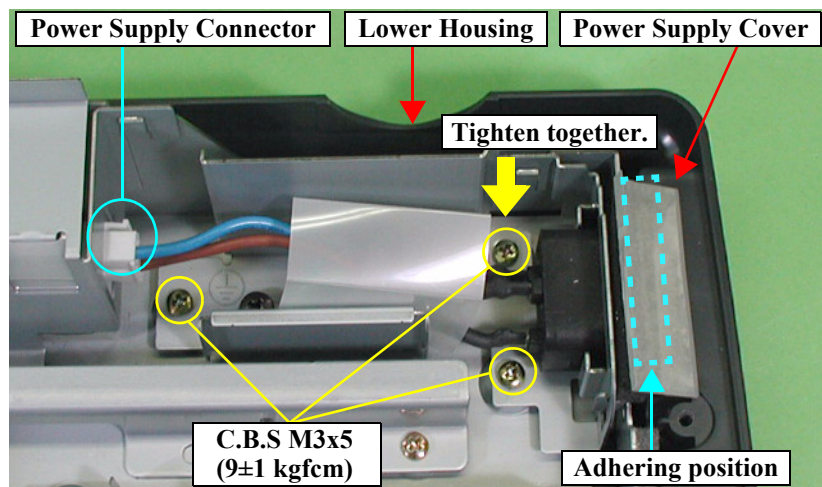


Figure 4-32. Removal of Power Supply Cable Unit (1)



- Adhere the Power Supply Cover to the Lower Housing with a two-sided tape at the position shown in [Figure 4-32](#).
- Tighten together the screws shown in [Figure 4-32](#), which secure the Power Supply Cover and the Power Supply Cable Unit Frame.

6. Release the two hooks and then remove the Power Supply Cable Unit.

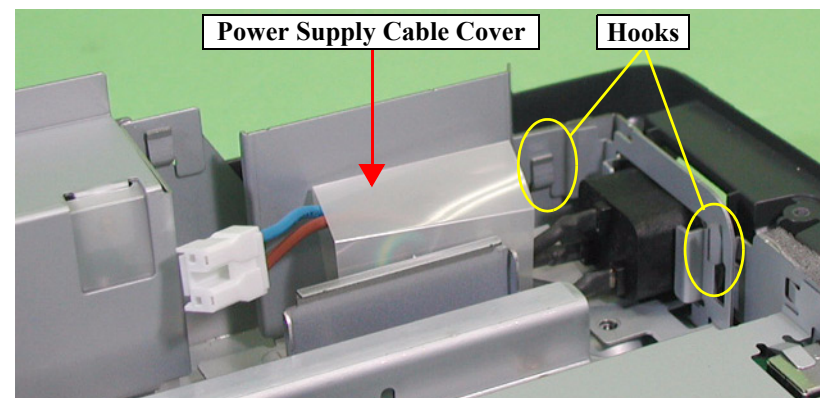


Figure 4-33. Removal of Power Supply Cable Unit (2)

### 4.2.11 Removal of TPU Lower Housing

1. Remove of Document Cover. *(Refer to 4.2.1 Removal of Document Cover)*
2. Release the TPU Carriage Lock.

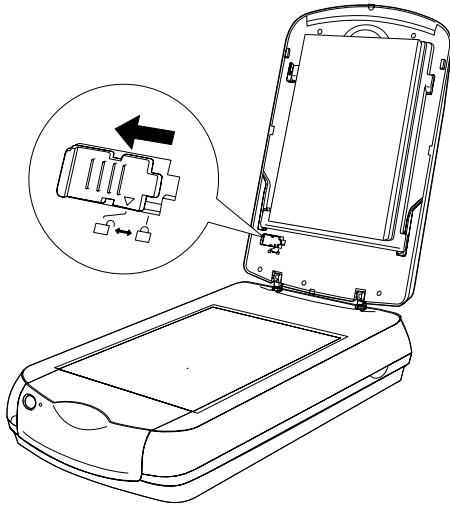


Figure 4-34. Releasing TPU Carriage Lock

3. Remove the seven screws (C.B.P M3x12) which secure the TPU Lower Housing.
4. By inserting a flat-blade screwdriver, release the eight hooks which secure the TPU Lower Housing and then remove the TPU Lower Housing.

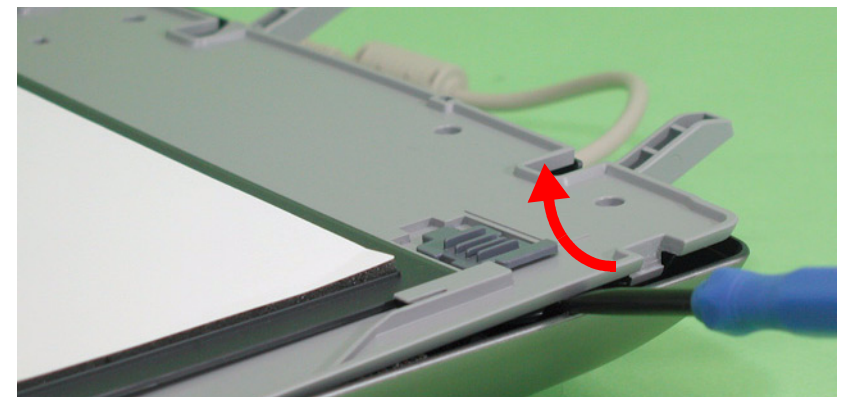
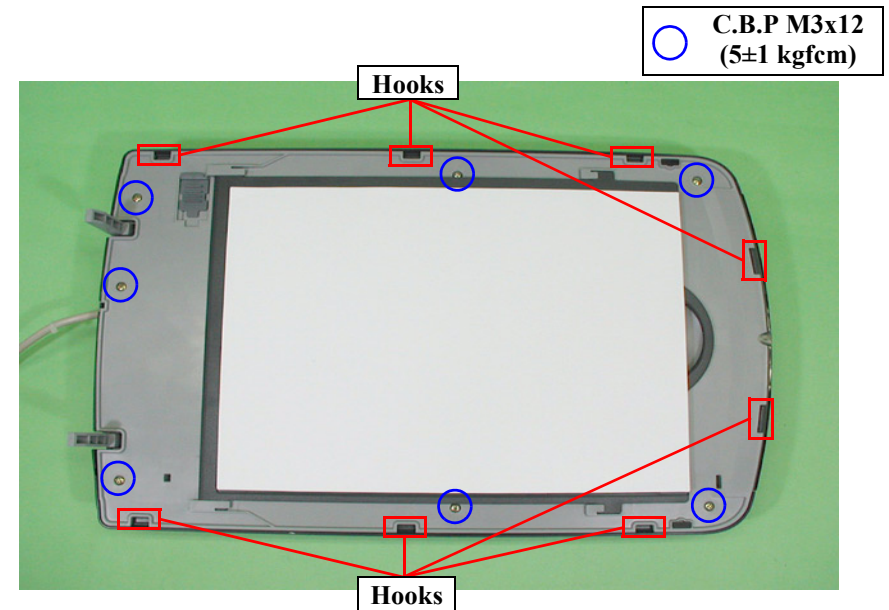


Figure 4-35. Removal of TPU Lower Housing

## 4.2.12 Removal of TPU Inverter Board

1. Remove of TPU Lower Housing. (*Refer to 4.2.11 Removal of TPU Lower Housing*)
2. Remove the two screws (C.B.P M3x6) which secure the FFC Cover and then remove the FFC Cover.

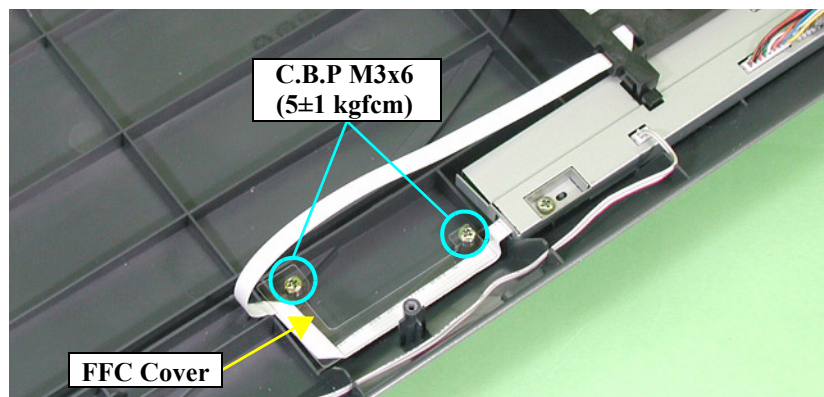


Figure 4-36. Removal of FFC Cover

3. Disconnect the TPU Carriage FFC from the TPU Main Board.

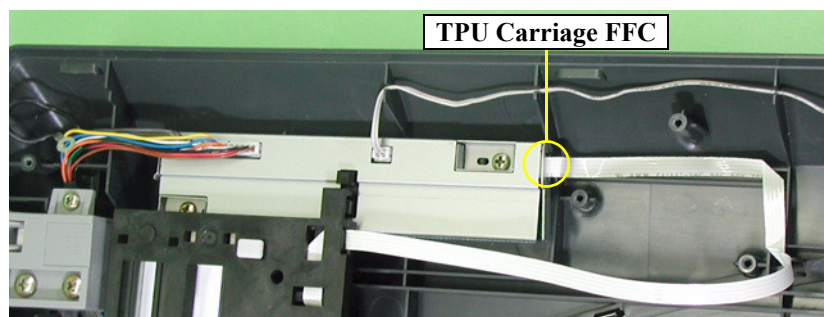


Figure 4-37. Disconnection of TPU Carriage FFC

4. While setting up the TPU Carriage Unit vertically, disconnect all the connectors and the TPU Carriage FFC on the TPU Inverter Board.
5. Remove the two screws (C.C.P M3x6) which secure the Inverter Board Unit and then remove the TPU Inverter Board Unit.

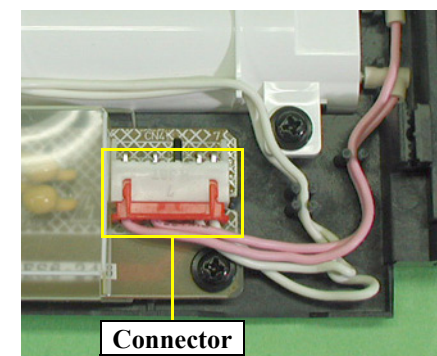
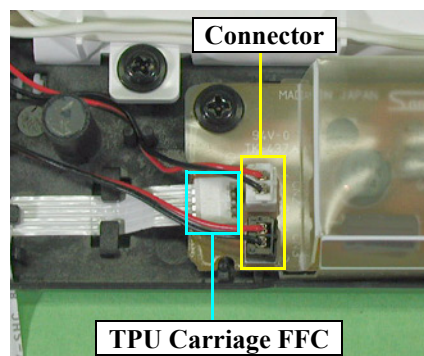
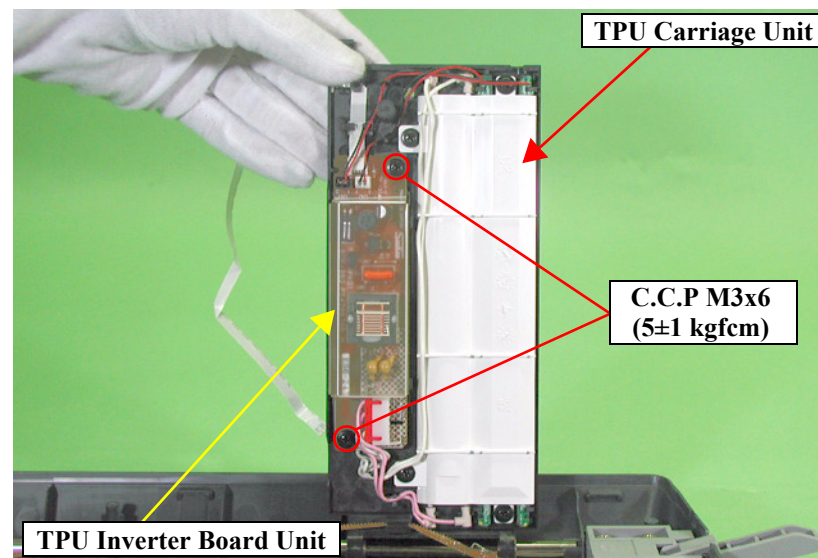


Figure 4-38. Removal of TPU Inverter Unit



6. Open the Protective Sheet and remove the Inverter Board.

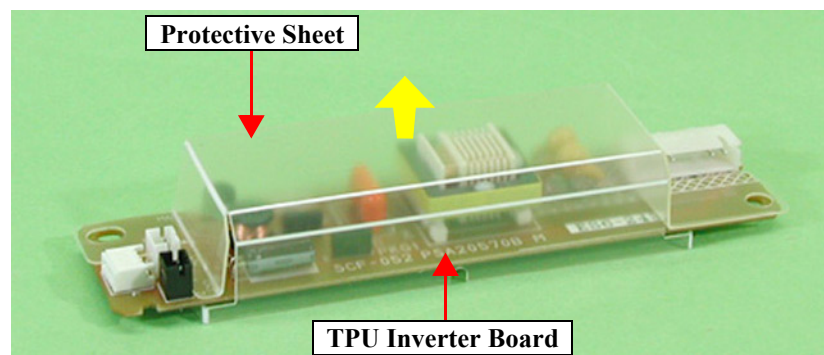


Figure 4-39. Removal of TPU Inverter Board

Reassembly



When reconnecting the connectors and the FFC, route the cables by passing them through the notches as shown in [Figure 4-40](#).

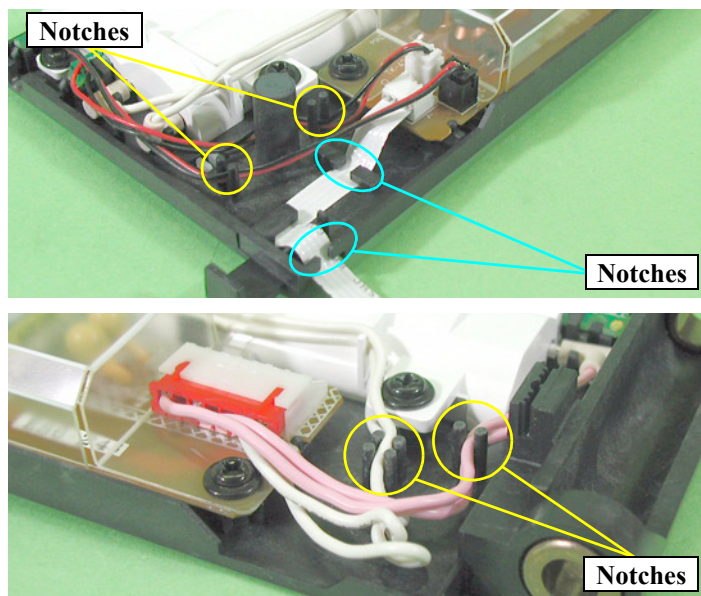


Figure 4-40. Routing of FFC and Connector Cables

### 4.2.13 Removal of TPU Carriage Unit

1. Remove of TPU Inverter Board. (*Refer to 4.2.12 Removal of TPU Inverter Board*)
2. Move the TPU Carriage Unit to the centre.

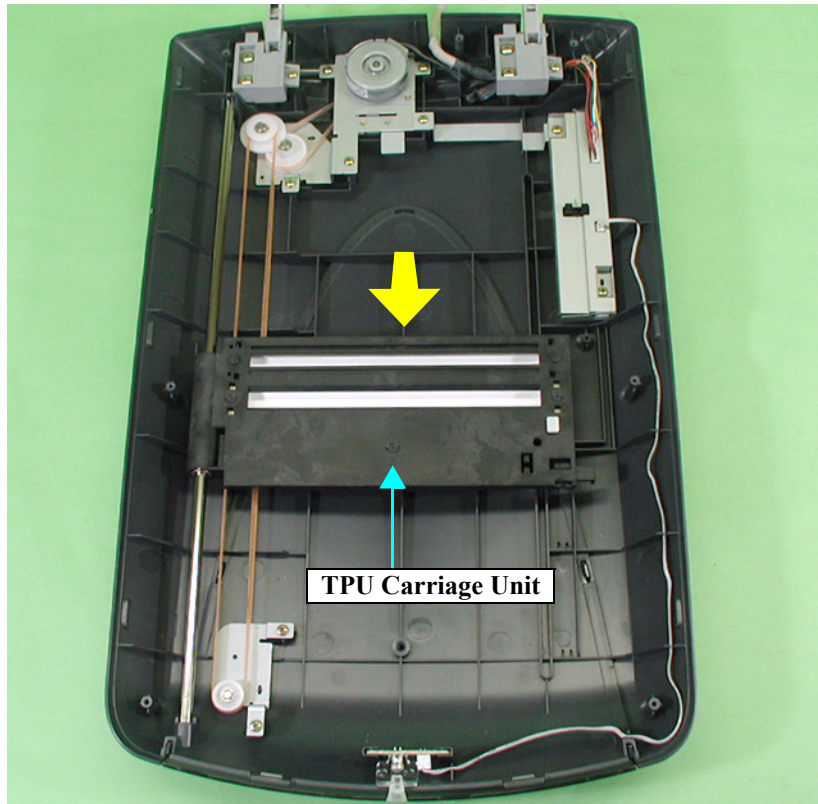


Figure 4-41. Moving TPU Carriage Unit

3. While lifting the TPU Carriage Unit, pull the TPU CR Timing Belt out of the hook.

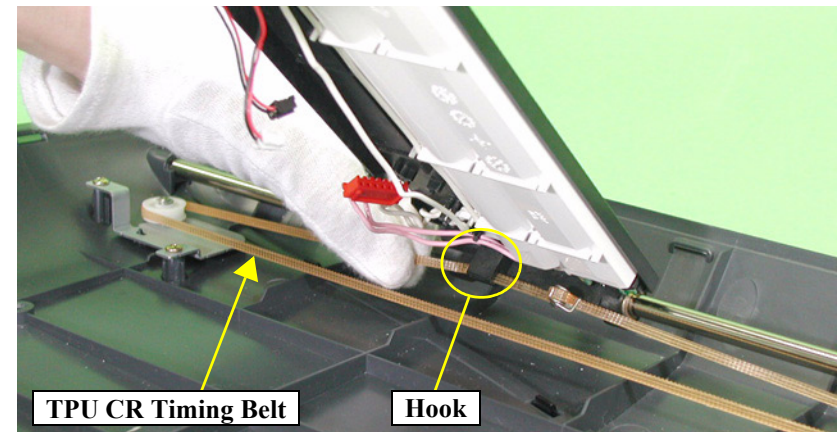


Figure 4-42. Removal of TPU CR Timing Belt

4. Remove the TPU Carriage Shaft from the Bushing on the rear of the TPU Upper Housing, and while supporting the TPU Carriage Unit by hand, remove the TPU Carriage Shaft from the Bushing on the front of the TPU Lower Housing.
5. Pull out the TPU Carriage Shaft and then remove the TPU Carriage Unit.

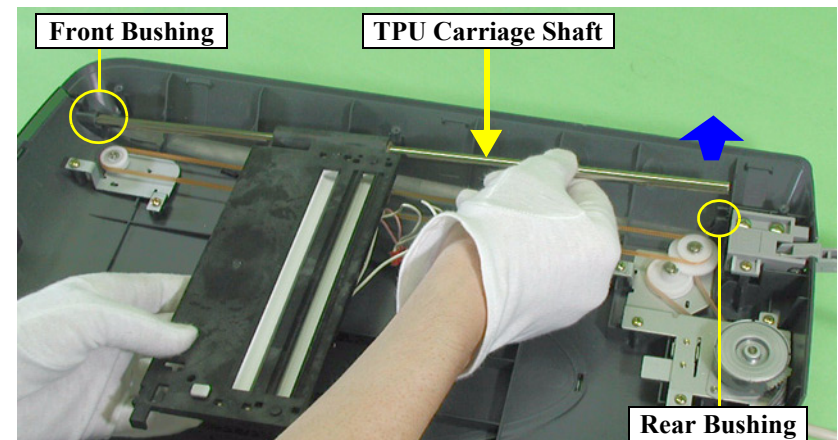


Figure 4-43. Removal of TPU Carriage Unit



### 4.2.14 Removal of TPU Main Board

1. Remove of TPU Lower Housing. *(Refer to 4.2.11 Removal of TPU Lower Housing)*
2. Move the TPU Carriage Unit to the position shown in [Figure 4-44](#).

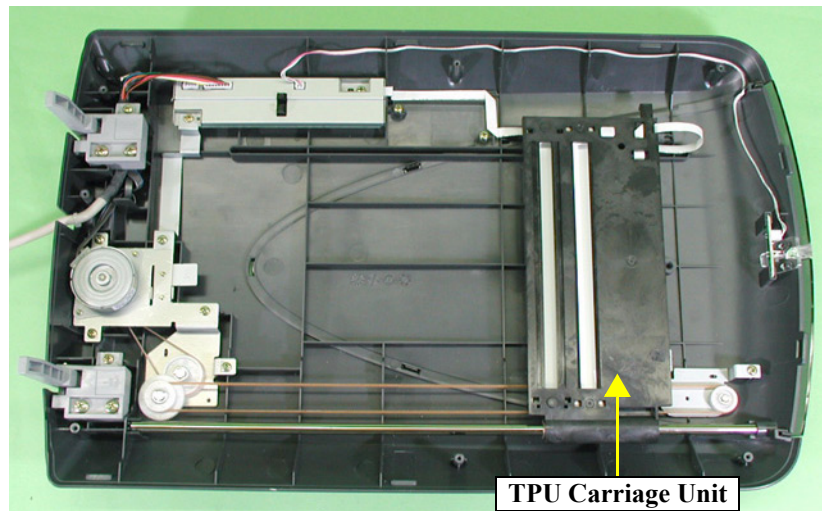


Figure 4-44. Moving TPU Carriage Unit

3. Disconnect the TPU Carriage FFC from the TPU Main Board. *(Refer to Step 2 to Step 3 in 4.2.12 Removal of TPU Inverter Board.)*
4. Disconnect the three connectors from the TPU Main Board.
5. Remove the two screws (C.B.P M3x8) which secure the TPU Main Board Unit.
6. Remove the TPU Main Board Cover and then remove the TPU Main Board.

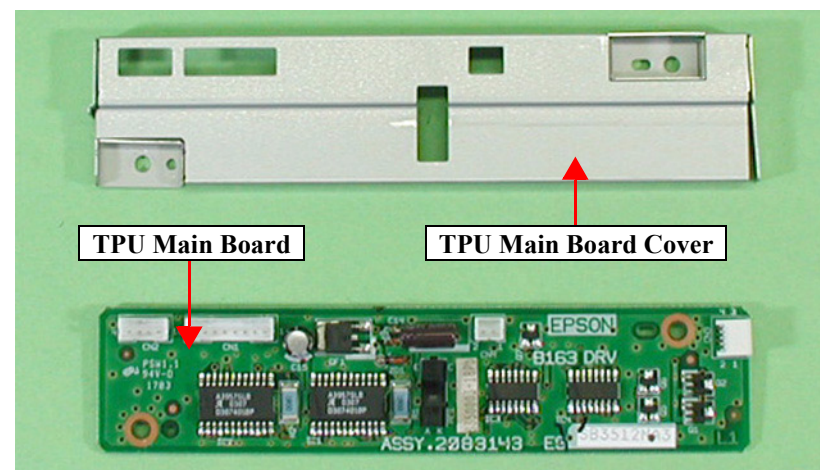
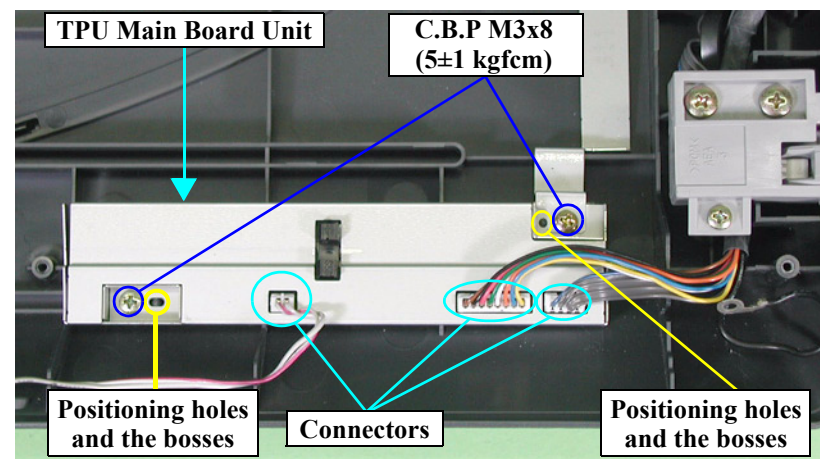


Figure 4-45. Removal of TPU Main Board

## Reassembly



- When reinstalling the TPU Main Board and the TPU Main Board Cover, match the positioning holes and the bosses as shown in [Figure 4-45](#).
- Put the recessed part of the TPU Main Board Cover under the Shield Plate, and tighten it together with the Shield Plate.

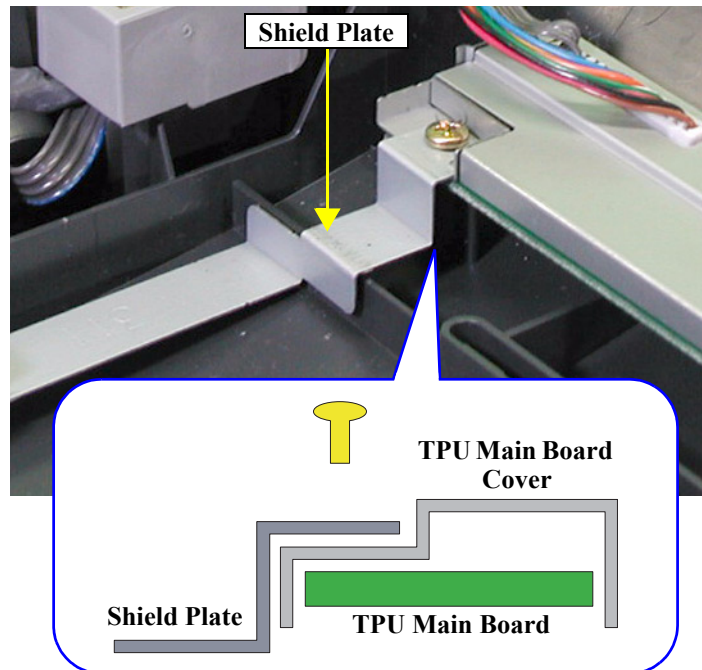


Figure 4-46. Tightening Together With Shield Plate and Cover

## 4.2.15 Removal of Hinges

1. Remove of TPU Lower Housing. (*Refer to 4.2.11 Removal of TPU Lower Housing*)
2. Remove the three screws (two screws (C.B.P M4x12), one screw (C.B.P M3x12)) which secure each of the Hinges and then remove the Hinges.

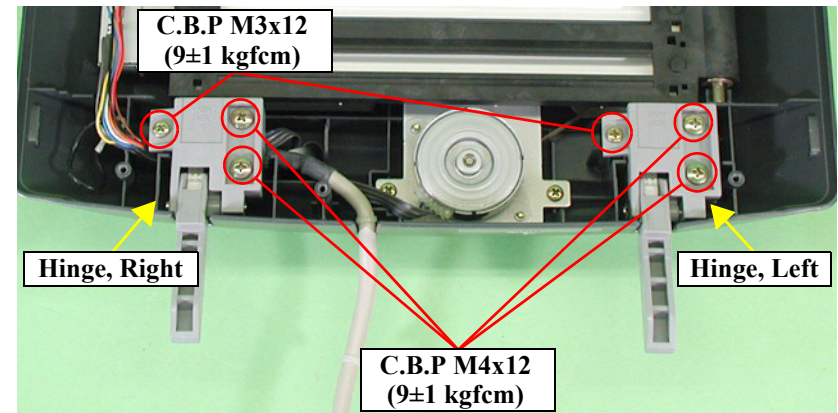


Figure 4-47. Removal of Hinges



## 4.2.16 Removal of SUB\_B Board

1. Remove of TPU Lower Housing. (*Refer to 4.2.11 Removal of TPU Lower Housing*)
2. Remove the SUB\_B Board and then disconnect the SUB\_B Board Connector.

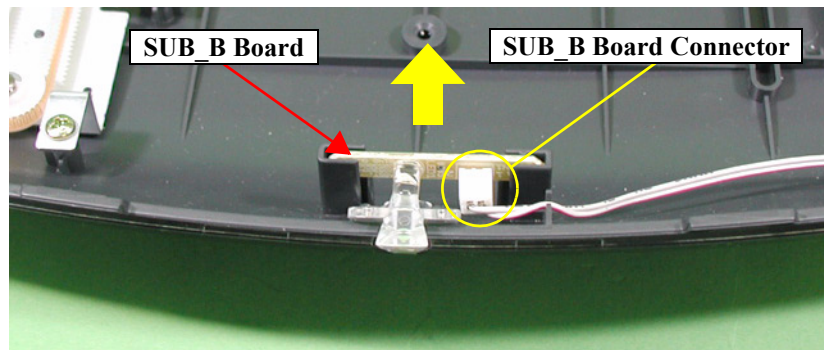


Figure 4-48. Removal of SUB\_B Board



Route the SUB\_B Board Cable by passing it into the notches as shown in [Figure 4-49](#).

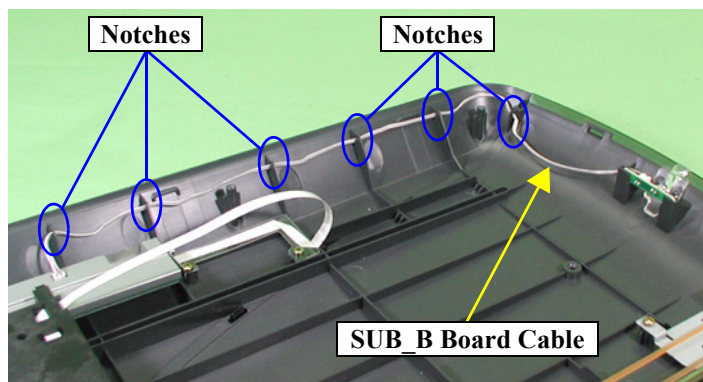


Figure 4-49. Routing of SUB\_B Board Cable

## 4.2.17 Removal of TPU CR Motor Unit/TPU CR Motor Belt

1. Remove the Hinge (Right). (*Refer to 4.2.15 Removal of Hinges*)
2. Disconnect the TPU CR Motor Connector from the TPU Main Board.

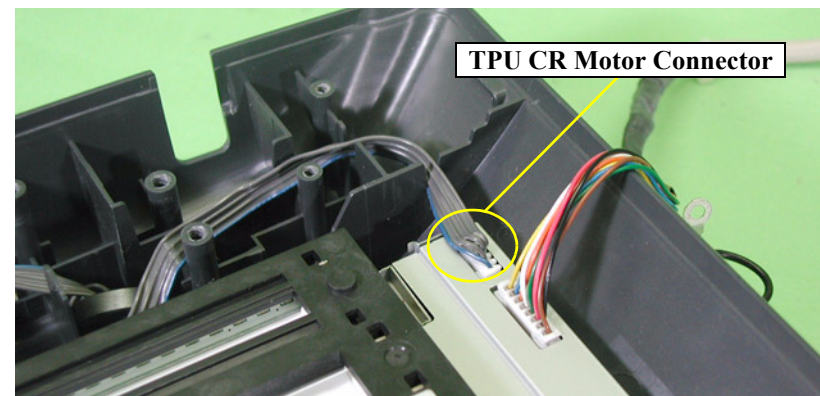


Figure 4-50. Disconnection of TPU CR Motor Connector



Route the TPU CR Motor Cable by passing it through the notches as shown in [Figure 4-51](#).

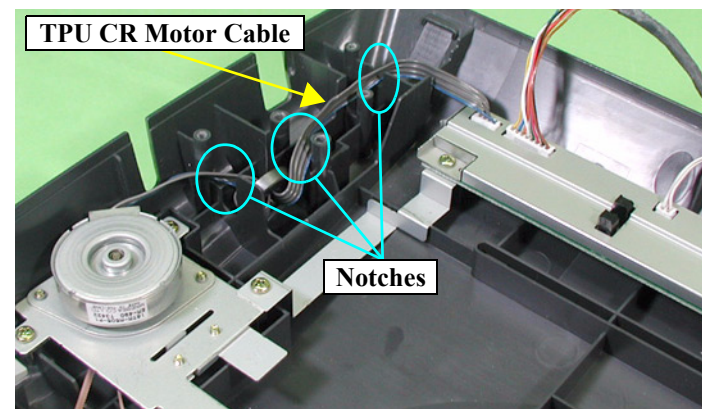


Figure 4-51. Routing of TPU CR Motor Cable

3. Move the TPU Carriage Unit to the position where the TPU Motor Unit can be seen.
4. Remove the five screws (C.B.P M3x8) which secure the TPU CR Motor Unit and the TPU CR Timing Belt, and then remove the TPU CR Motor Unit.

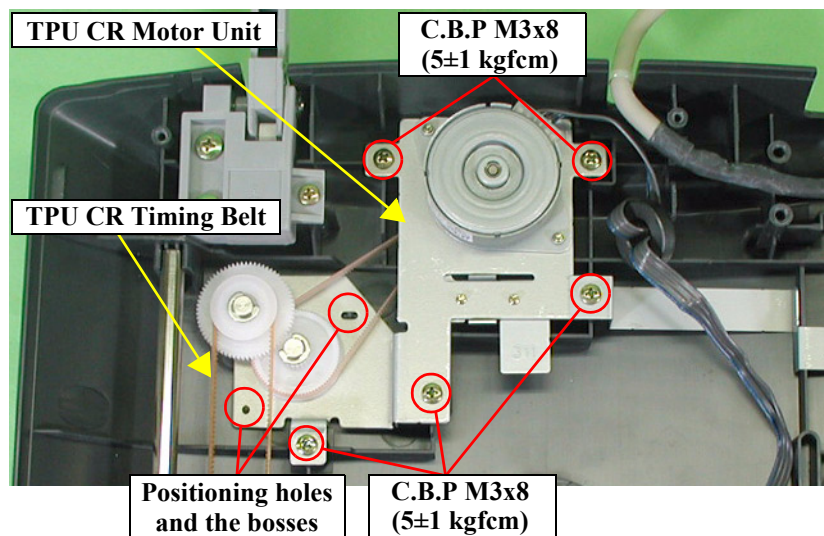


Figure 4-52. Removal of TPU CR Motor Unit



When reinstalling the TPU CR Motor Unit, match the positioning holes and the bosses as shown in [Figure 4-52](#).

5. Remove the E-ring and the Driven Pulley and then remove the TPU CR Motor Belt.

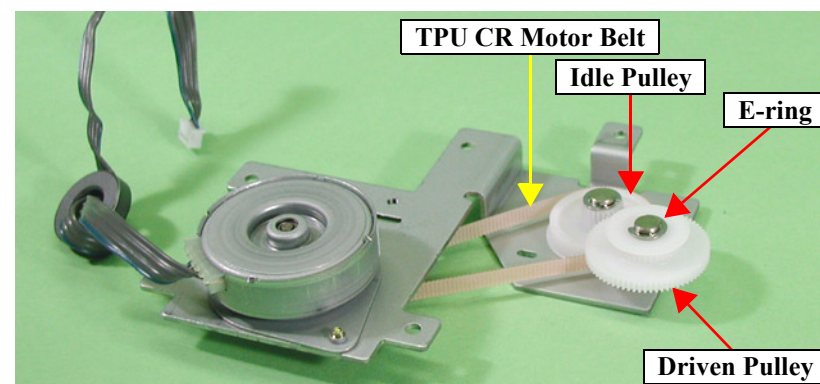


Figure 4-53. Removal of TPU CR Motor Belt



Loop the TPU CR Motor Belt over the Idle Pulley and the Pinion Gear of the TPU CR Motor as shown in [Figure 4-53](#) and [4-54](#).

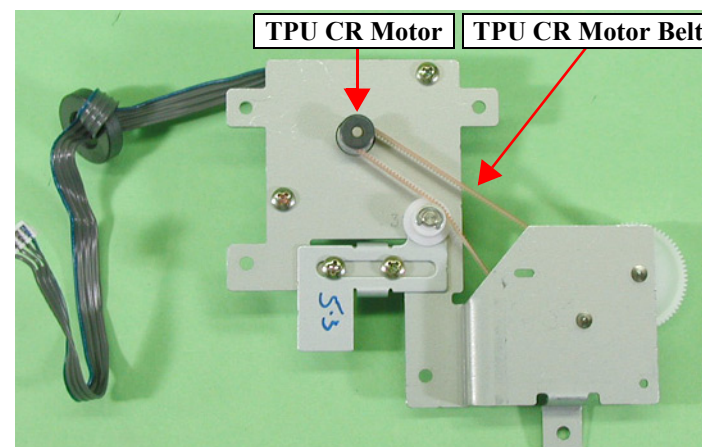


Figure 4-54. Installation of TPU CR Motor

### 4.2.18 Removal of TPU CR Timing Belt/ TPU Driven Pulley Unit

1. Remove of TPU Lower Housing. (*Refer to 4.2.11 Removal of TPU Lower Housing*)
2. Move the TPU Carriage Unit to the centre. (*Refer to 4.2.13 Removal of TPU Carriage Unit Step 2*)
3. Remove the two screws (C.B.P M3x8) which secure the TPU Driven Pulley Unit and then remove the TPU Driven Pulley Unit.

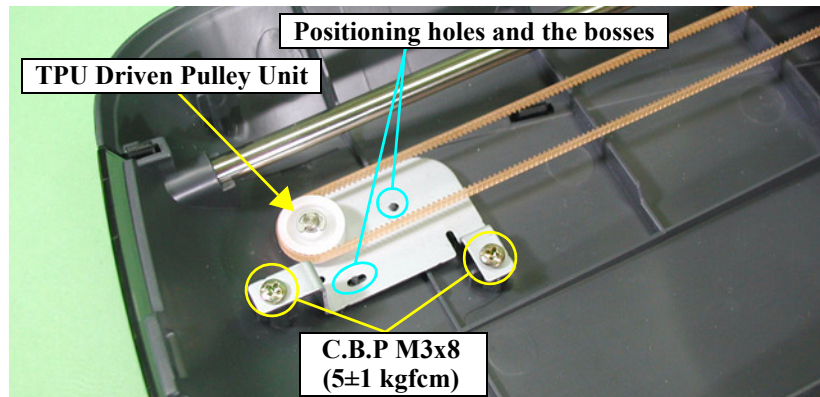


Figure 4-55. Removal of TPU Driven Pulley Unit

4. Pull the TPU CR Timing Belt out of the hook of the TPU Carriage Unit and then remove the TPU CR Timing Belt.

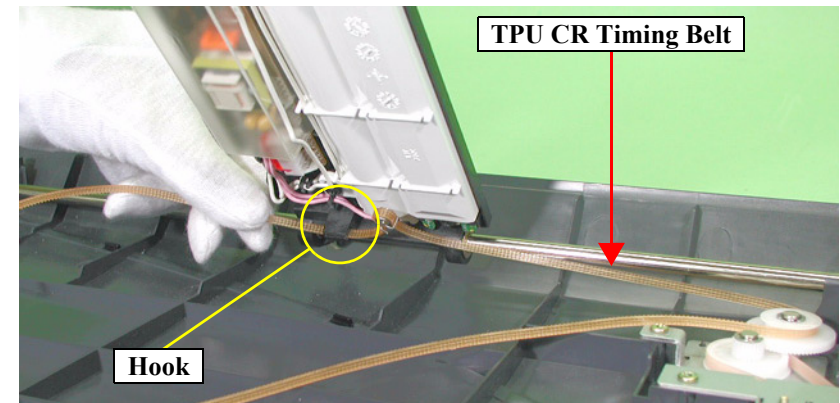


Figure 4-56. Removal of TPU CR Timing Belt

#### Reassembly



When reinstalling the TPU Driven Pulley Unit, match the positioning holes and the bosses as shown in [Figure 4-55](#).



### 4.2.19 Removal of TPU Unit Cable

1. Remove the Hinge (Right). (*Refer to 4.2.15 Removal of Hinges*)
2. Disconnect the TPU Unit Connector from the TPU Main Board.

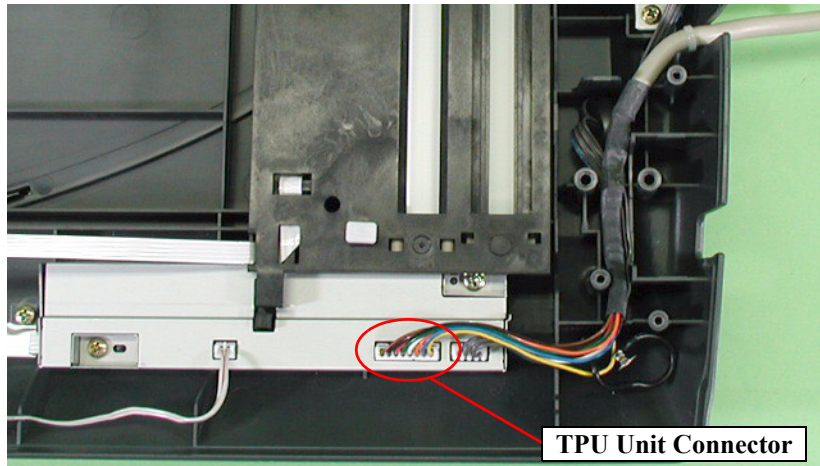


Figure 4-57. Removal of TPU Unit Cable

Reassembly



Route the TPU Unit Cable by passing it through the notches as shown in [Figure 4-58](#).

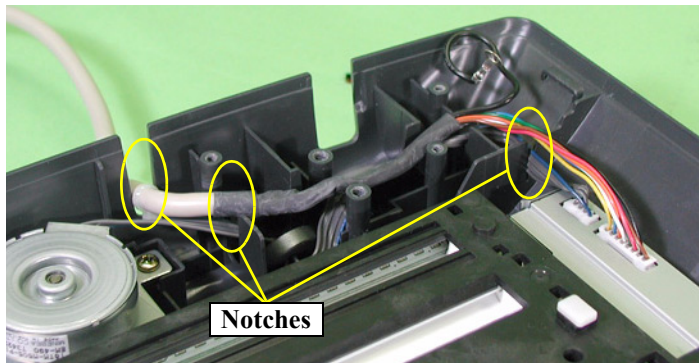


Figure 4-58. Routing of TPU Unit Cable

CHAPTER

5

## ADJUSTMENT

This product does not require any adjustment in the range of the disassembly and reassembly explained in Chapter 4.



CHAPTER

6

MAINTENANCE

## 6.1 Overview

---

This chapter explains the maintenance work necessary to keep this product in the best condition and to prevent problems.

### 6.1.1 Cleaning

Clean the outside of the product with a neutral detergent, and clean its inside with a vacuum cleaner. Special care must be taken when cleaning the Document Glass since it affects the quality of image scanning. If it is dirty, wipe it with a clean, soft and dry cloth.

**CAUTION**

Never use organic solvents, such as thinner and benzene, because they may deteriorate or degrade the plastic and rubber parts.

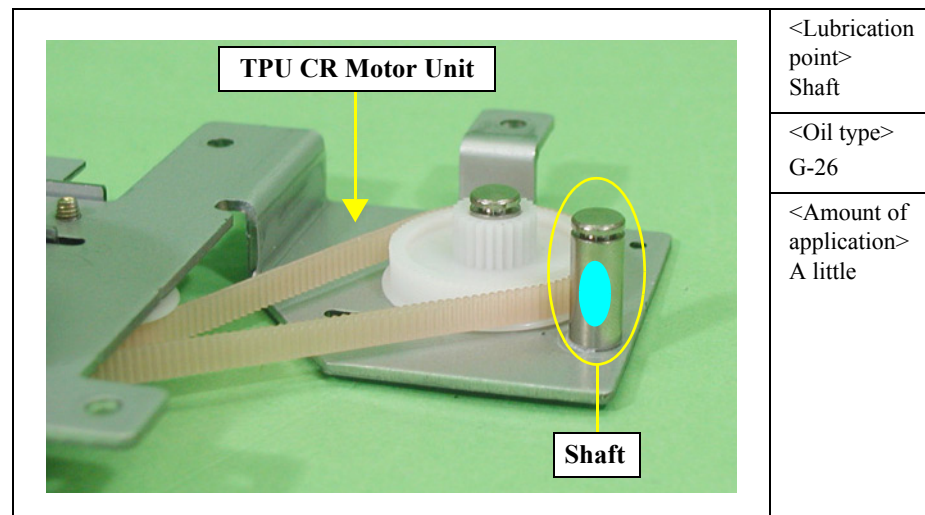
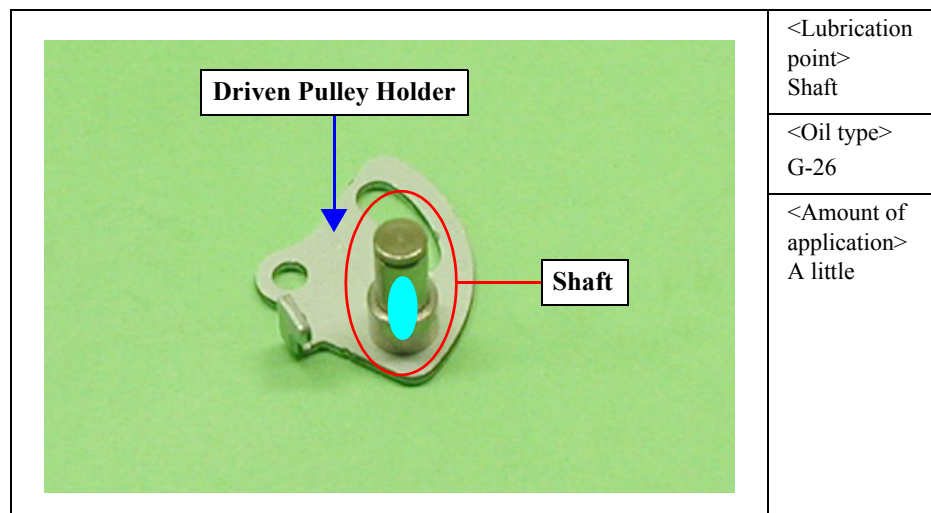
- ☐ Exterior  
After wetting a clean cloth with water and then completely squeezing water out of it, wipe the exterior with that cloth. If the exterior is extremely dirty, wipe it with a cloth moistened with a small amount of detergent.
- ☐ Document Glass  
Clean it with a clean, dry cloth. When the Document Glass is especially dirty or has foreign matter on its surface, wipe it with a cloth moistened with a small amount of pure water. If the Document Glass has traces of wiping after cleaning, completely wipe it with a dry, clean cloth again.
- ☐ Scanner inside  
Before reinstall the Upper Housing after it had been removed, make sure to remove the dust inside of the scanner and the Upper Housing. Squirt them with plenty of air.

## 6.1.2 Lubrication

Lubrication is required when any part of the Carriage Unit of the scanner has been replaced or the Carriage moves with noticeably large operation noise. The specified grease is indicated in [Table 6-1](#), and the lubrication points are shown in [Figure 6-1](#).

**Table 6-1. Specified Grease**

Type	Name	Part Number	Supplier
Grease	G-26	1080614	EPSON



**Figure 6-1. Lubrication Points**

### CAUTION



Note that a failure to strictly observe the specified amount of application will contaminate the mechanisms or lead to a malfunction.

CHAPTER

7

APPENDIX

## 7.1 Connector Configuration

The following table indicates the connector signal wiring on the electrical circuit boards of this product.

### 7.1.1 Connector Configuration

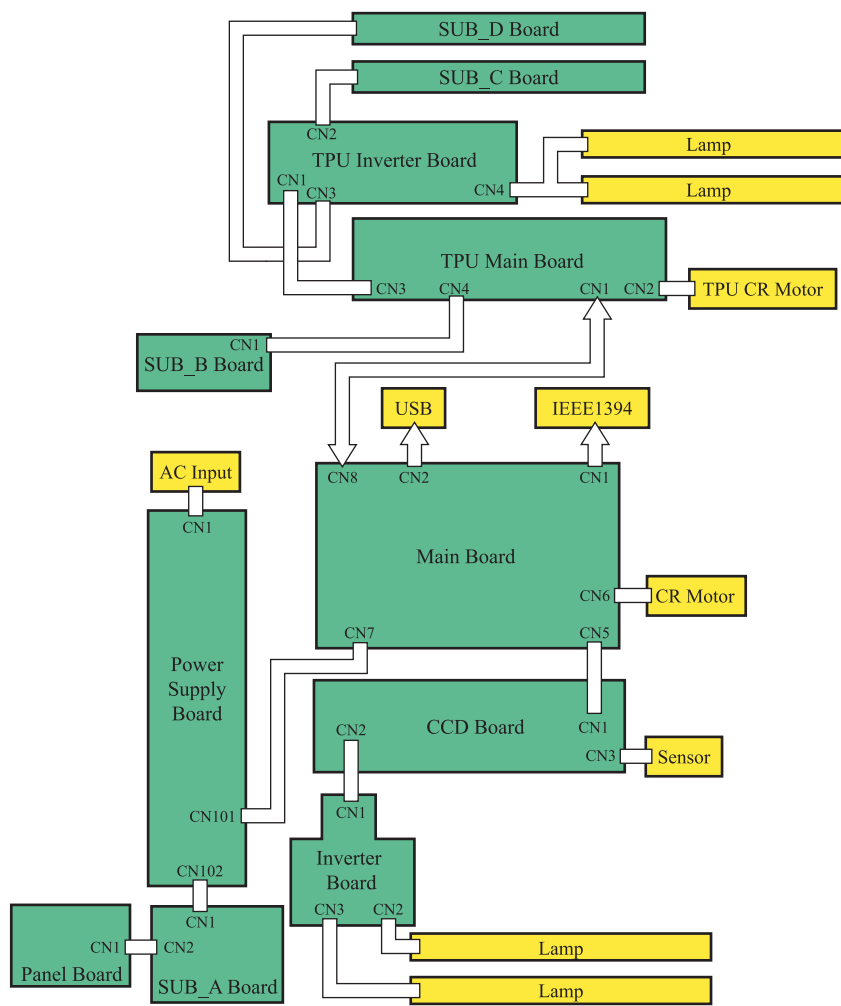


Figure 7-1. Diagram of Wiring Connectors

### 7.1.2 Connector Connection Table

Table 7-1. Connector Connection Table

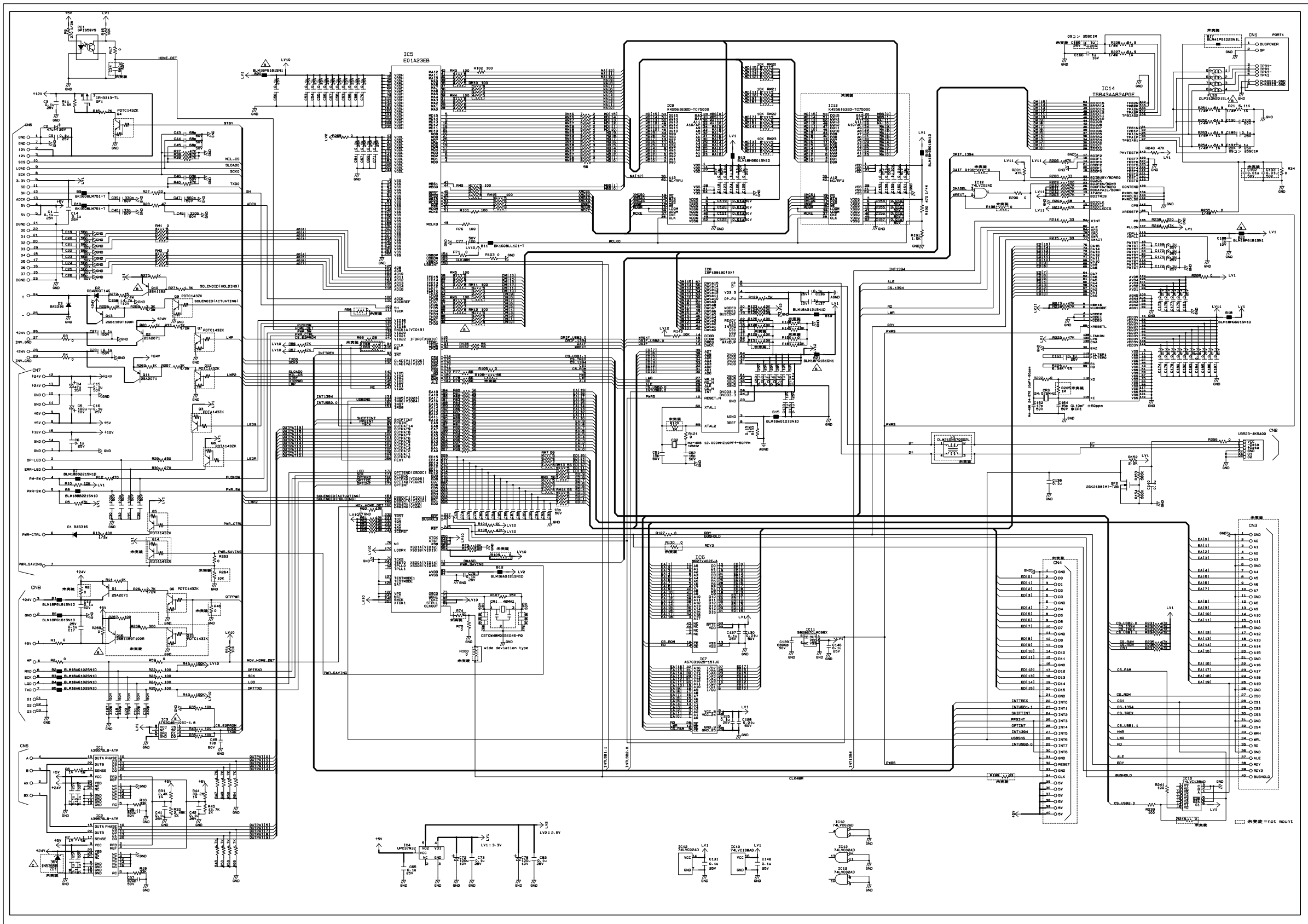
Board	Connector	Description	Number of Pins
Main Board	CN1	IEEE-1394	8
	CN2	USB	4
	CN5	CCD Board	29
	CN6	CR Motor	4
	CN7	Power Supply Board	15
	CN8	TPU Inverter Board	8
Power Supply Board	CN1	AC Input	2
	CN101	Main Board	15
	CN102	SUB_A Board	6
SUB_A Board	CN1	Panel Board	4
	CN2	Power Supply Board	6
Panel Board	CN1	SUB_A Board	4
CCD Board	CN1	Main Board	29
	CN2	Inverter Board	4
	CN3	Sensor	2
Inverter Board	CN1	CCD Board	4
	CN2	Lamp	2
	CN3	Lamp	2
TPU Main Board	CN1	Main Board	8
	CN2	TPU CR Motor	4
	CN3	TPU Inverter Board	4
	CN4	SUB_B Board	2
SUB_B Board	CN1	TPU Main Board	2
TPU Inverter Board	CN1	TPU Main Board	4
	CN2	SUB_C Board	2
	CN3	SUB_D Board	2
	CN4	Lamp x 2	7

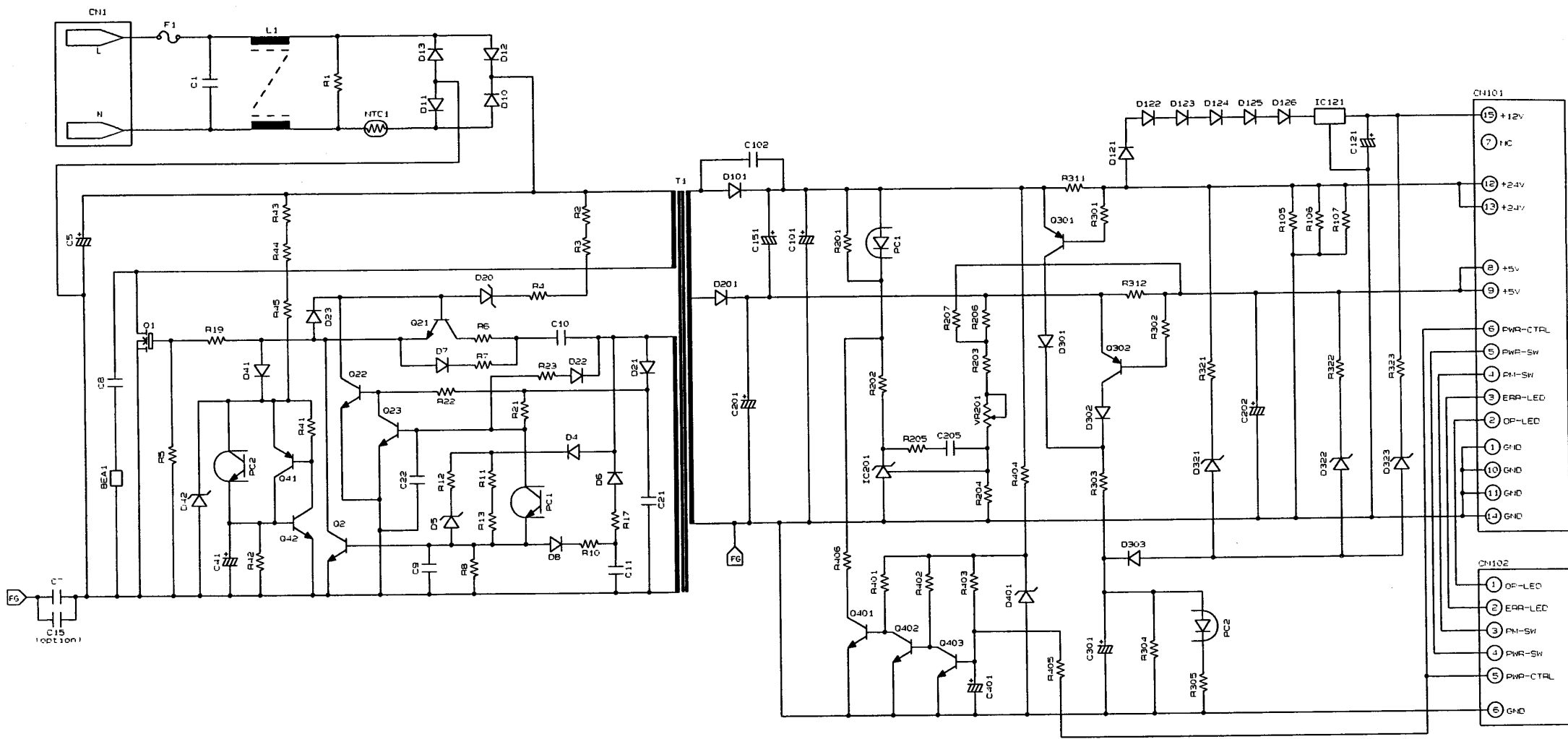
## 7.2 Circuit Diagrams

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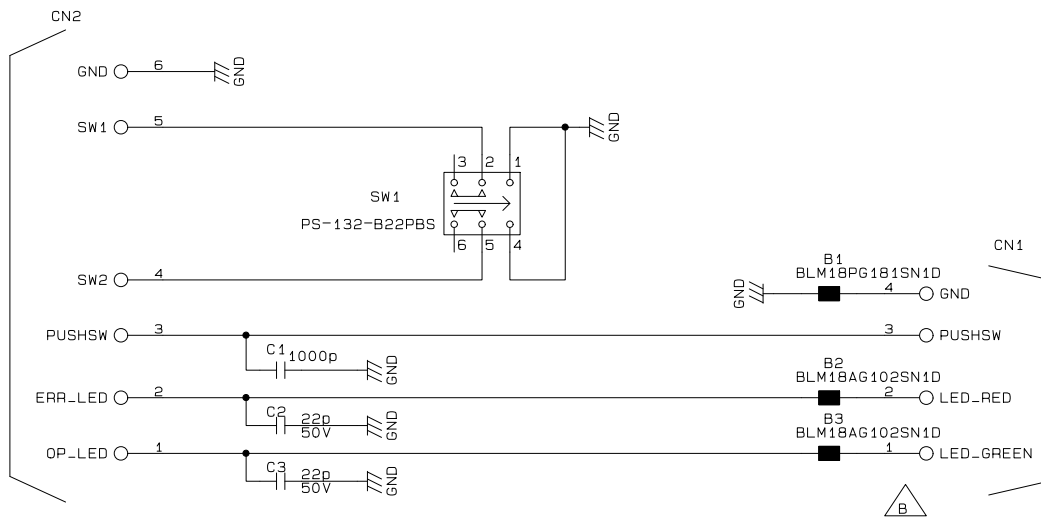
The control electrical circuit diagrams of this product are shown on the following pages.

- ☐ Main Board
- ☐ Power Supply Board
- ☐ SUB\_A Board
- ☐ Panel Board
- ☐ CCD Board
- ☐ Inverter Board
- ☐ TPU Main Board
- ☐ SUB\_B Board
- ☐ TPU Inverter Board
- ☐ SUB\_C Board
- ☐ SUB\_D Board









A

B

C

D

E

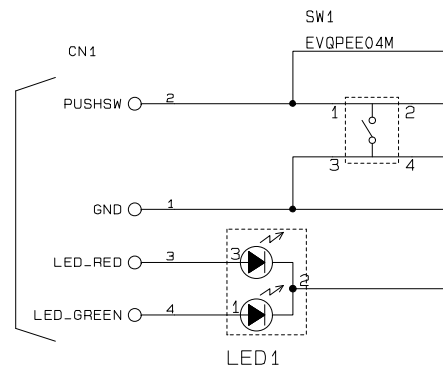
F

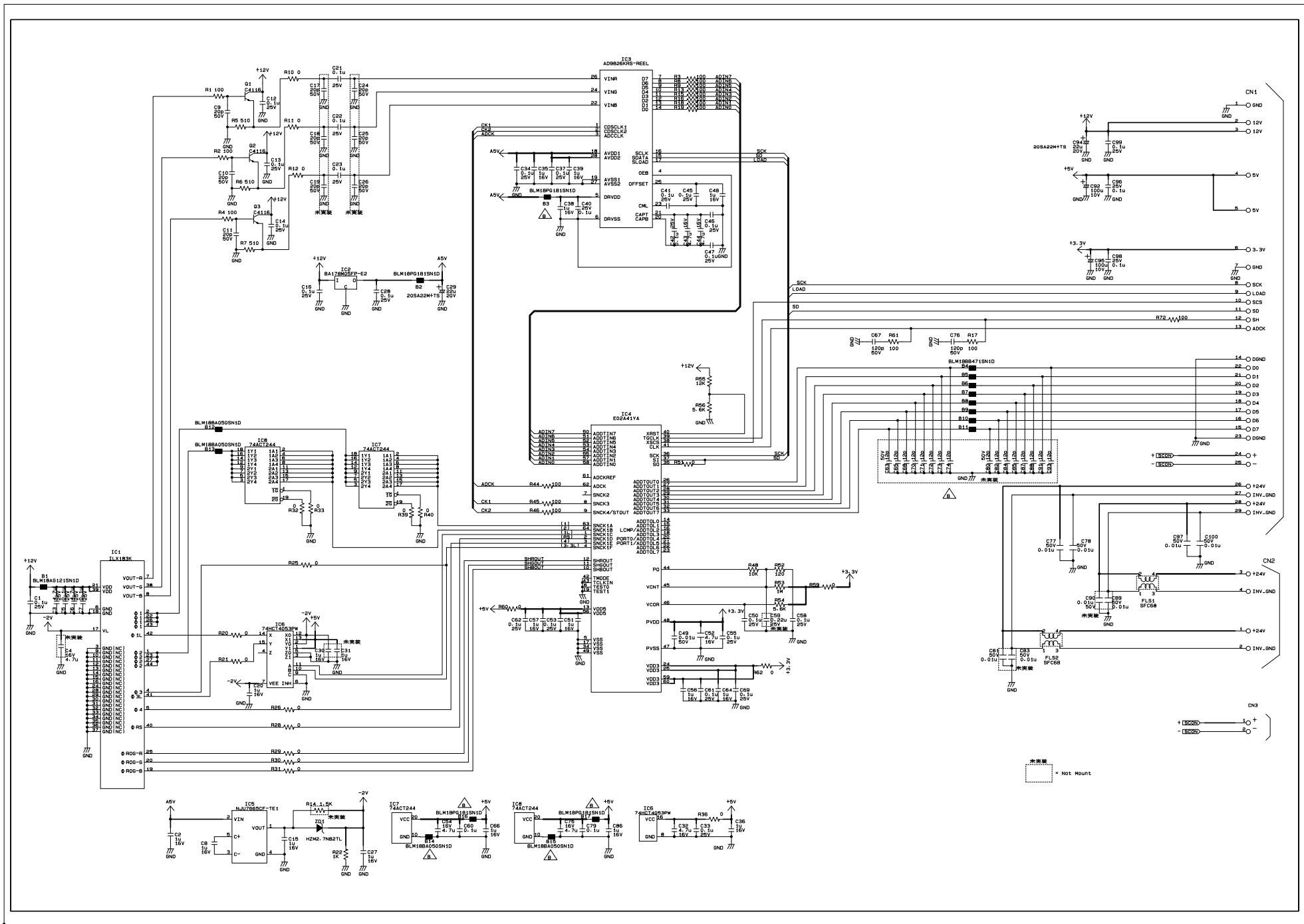
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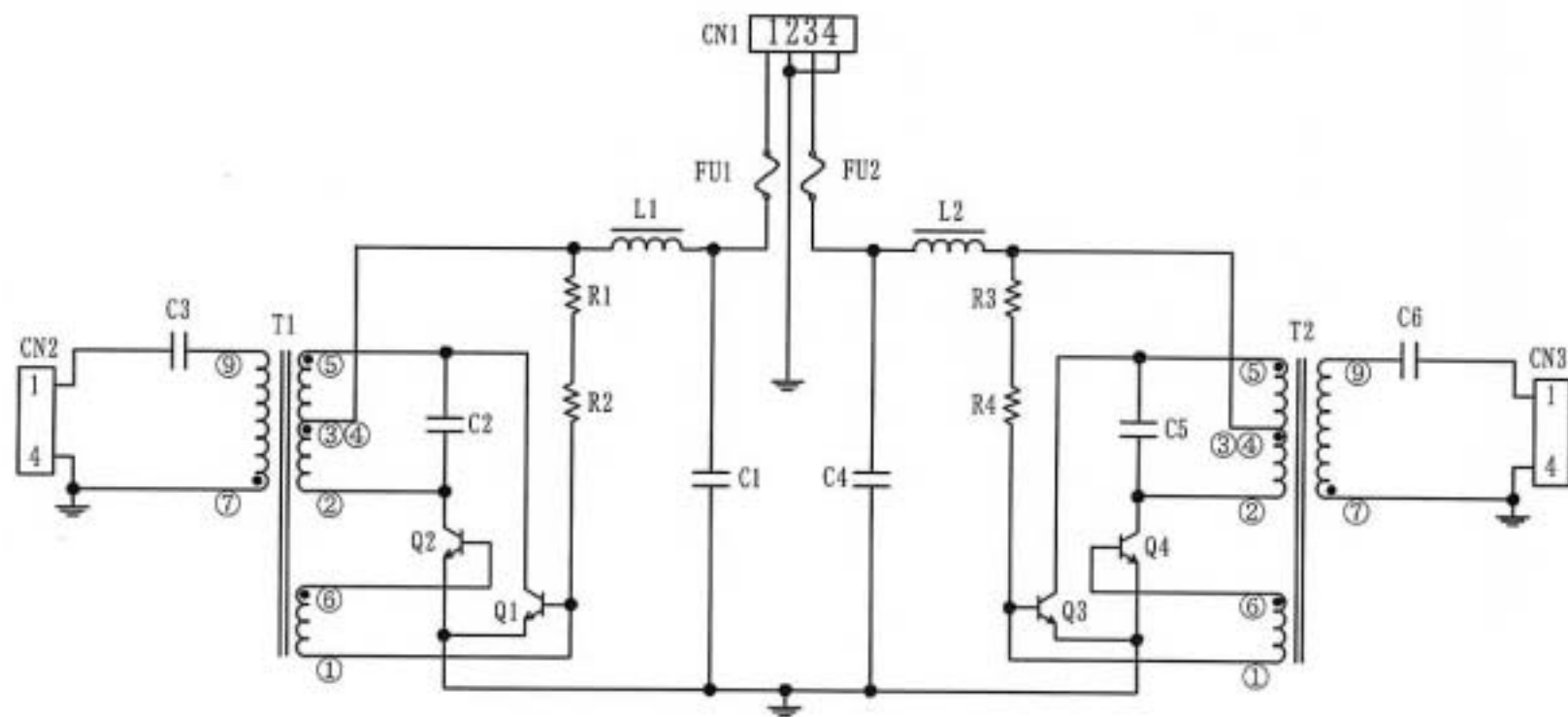
2

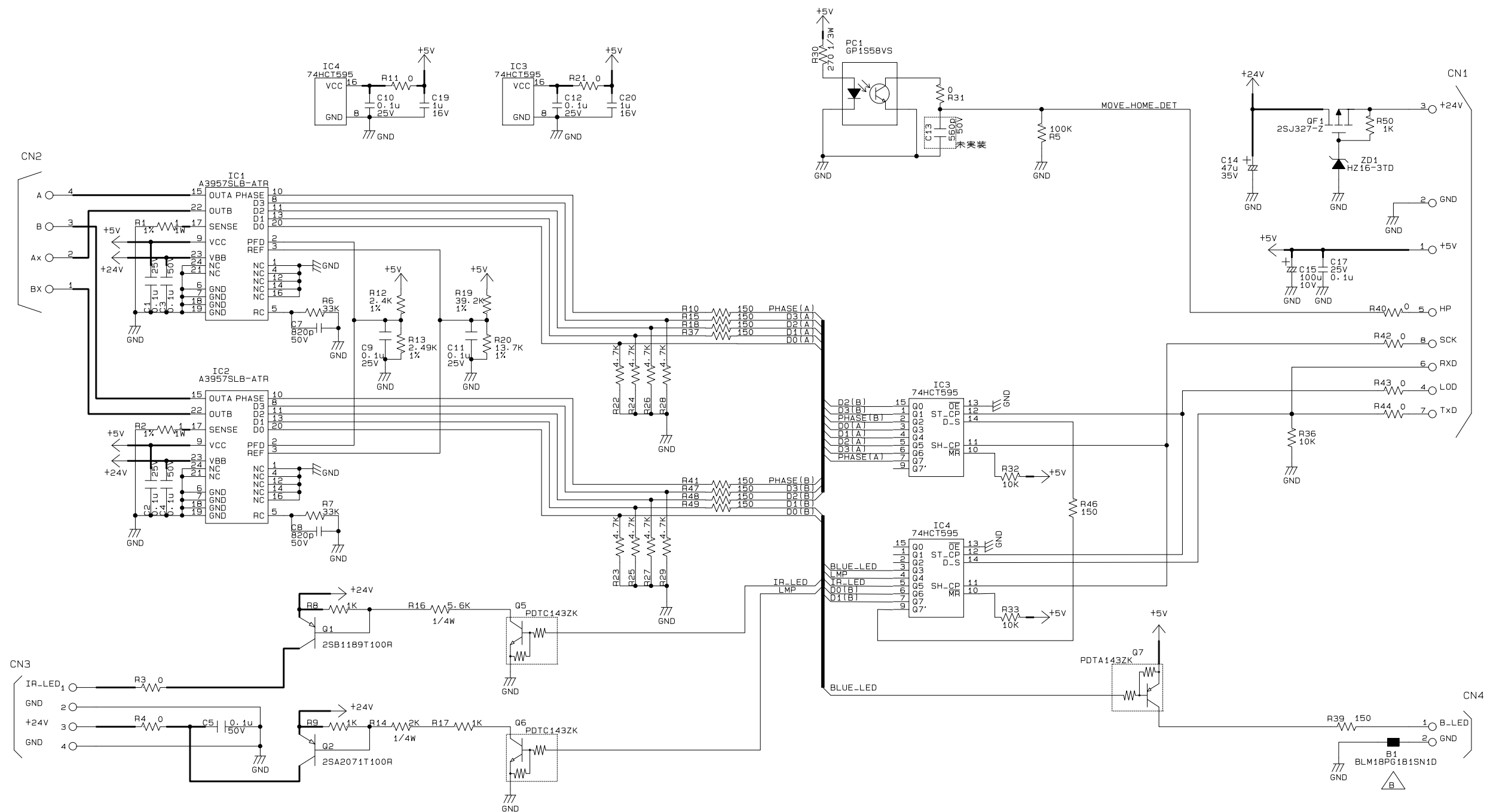
3

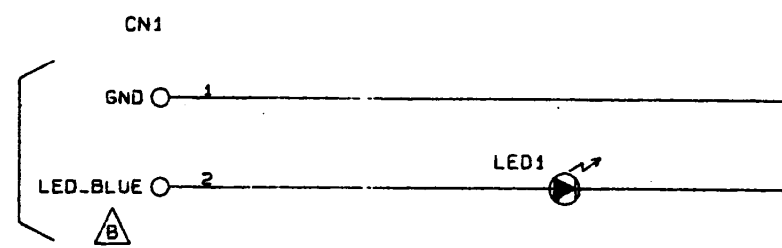
4

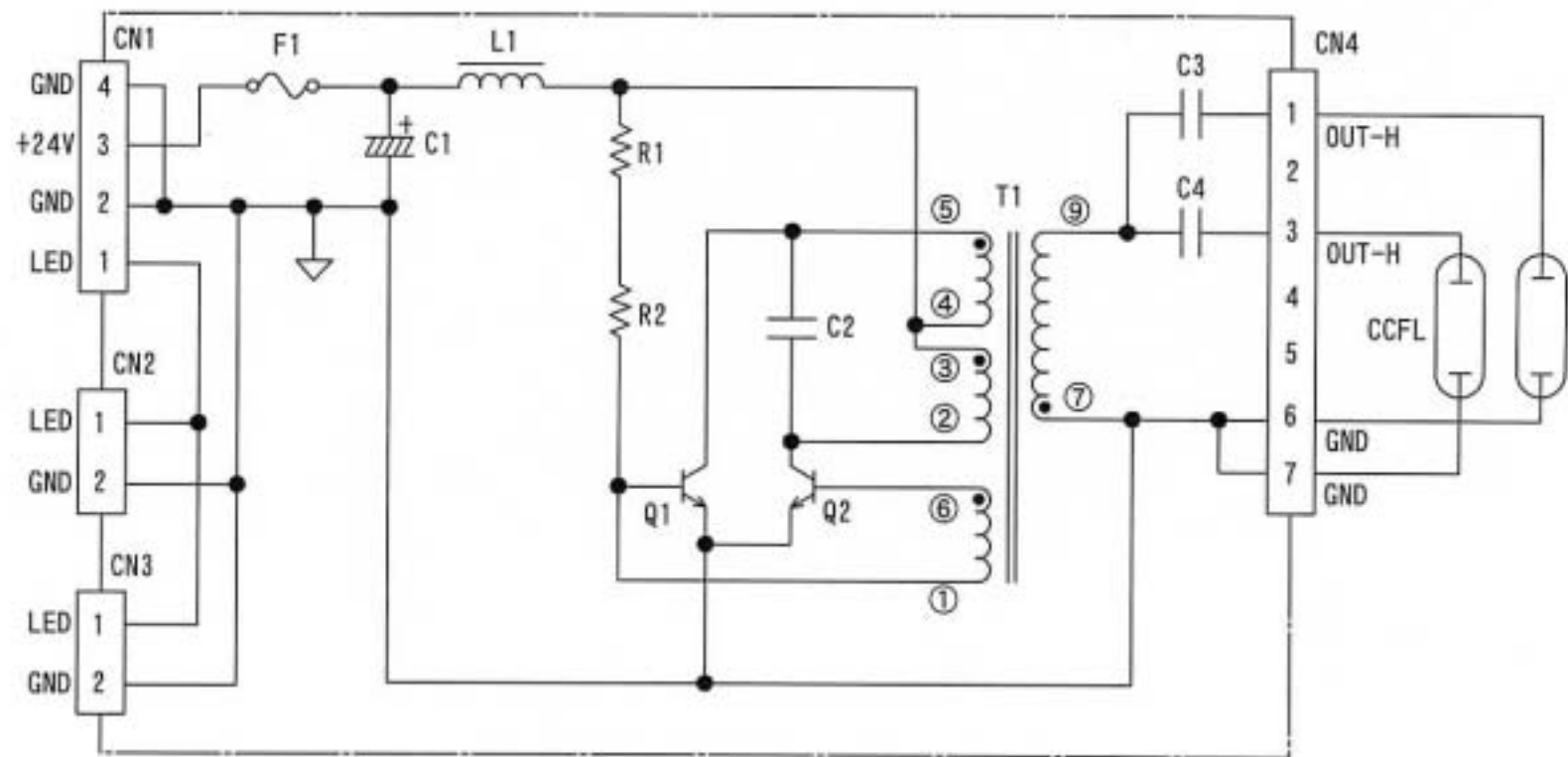


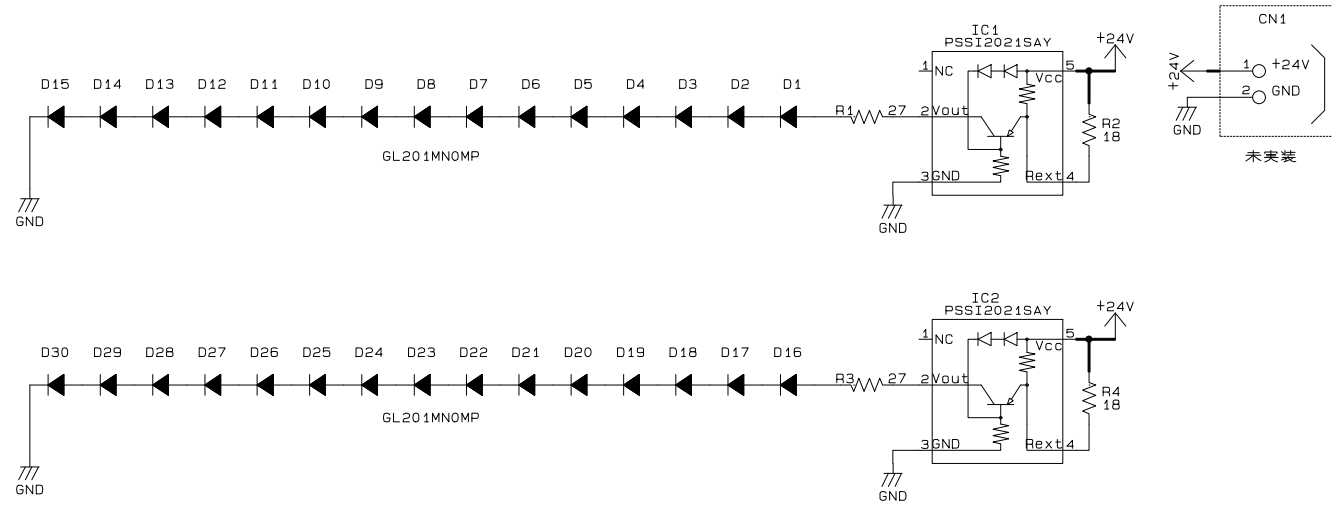




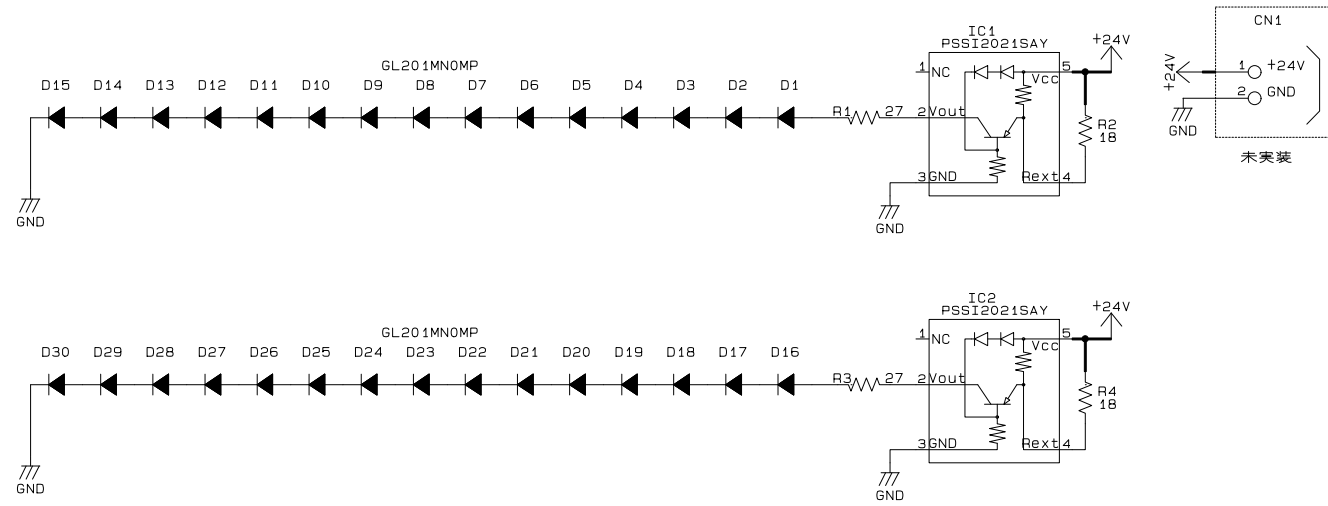




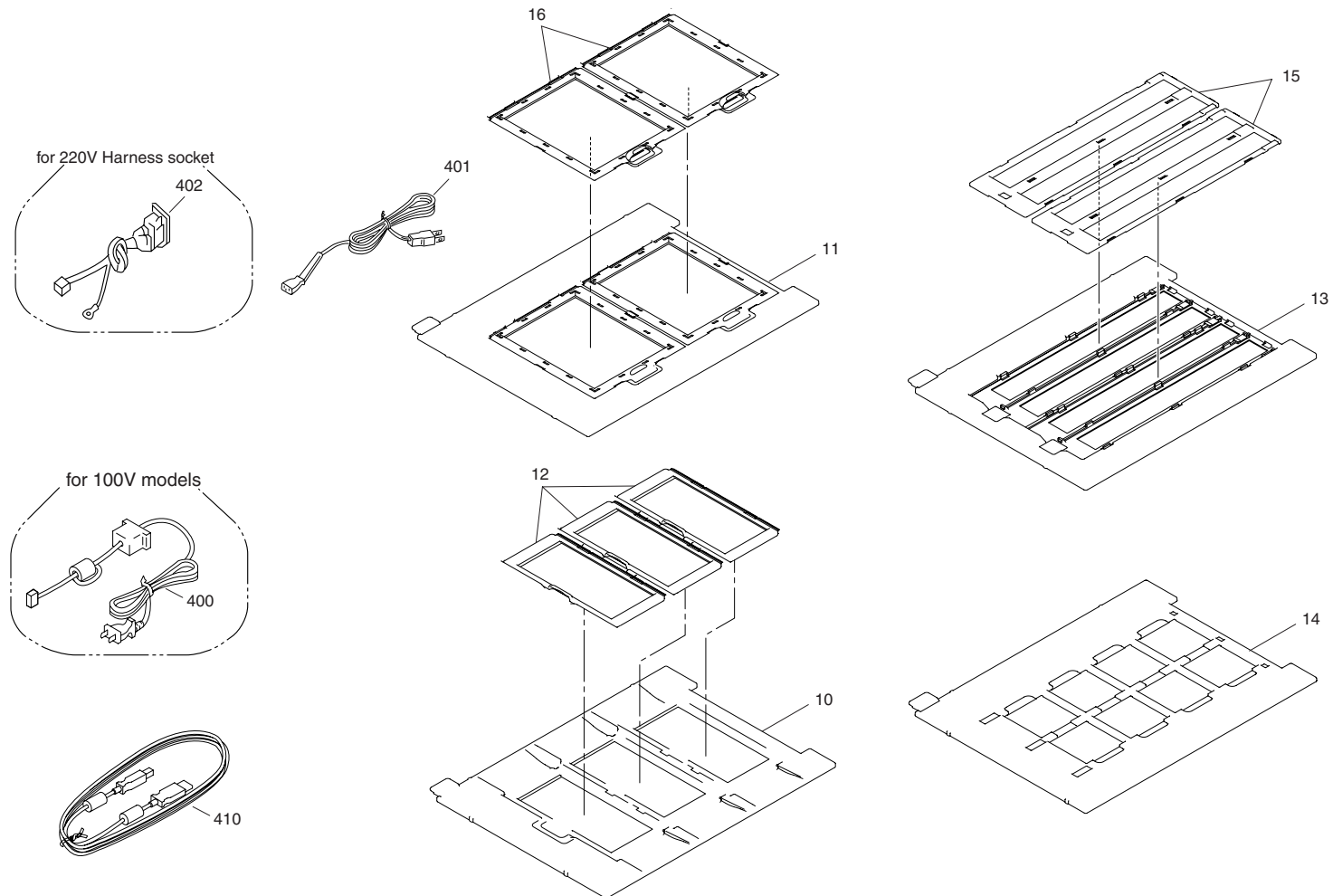








## 7.3 Exploded diagram



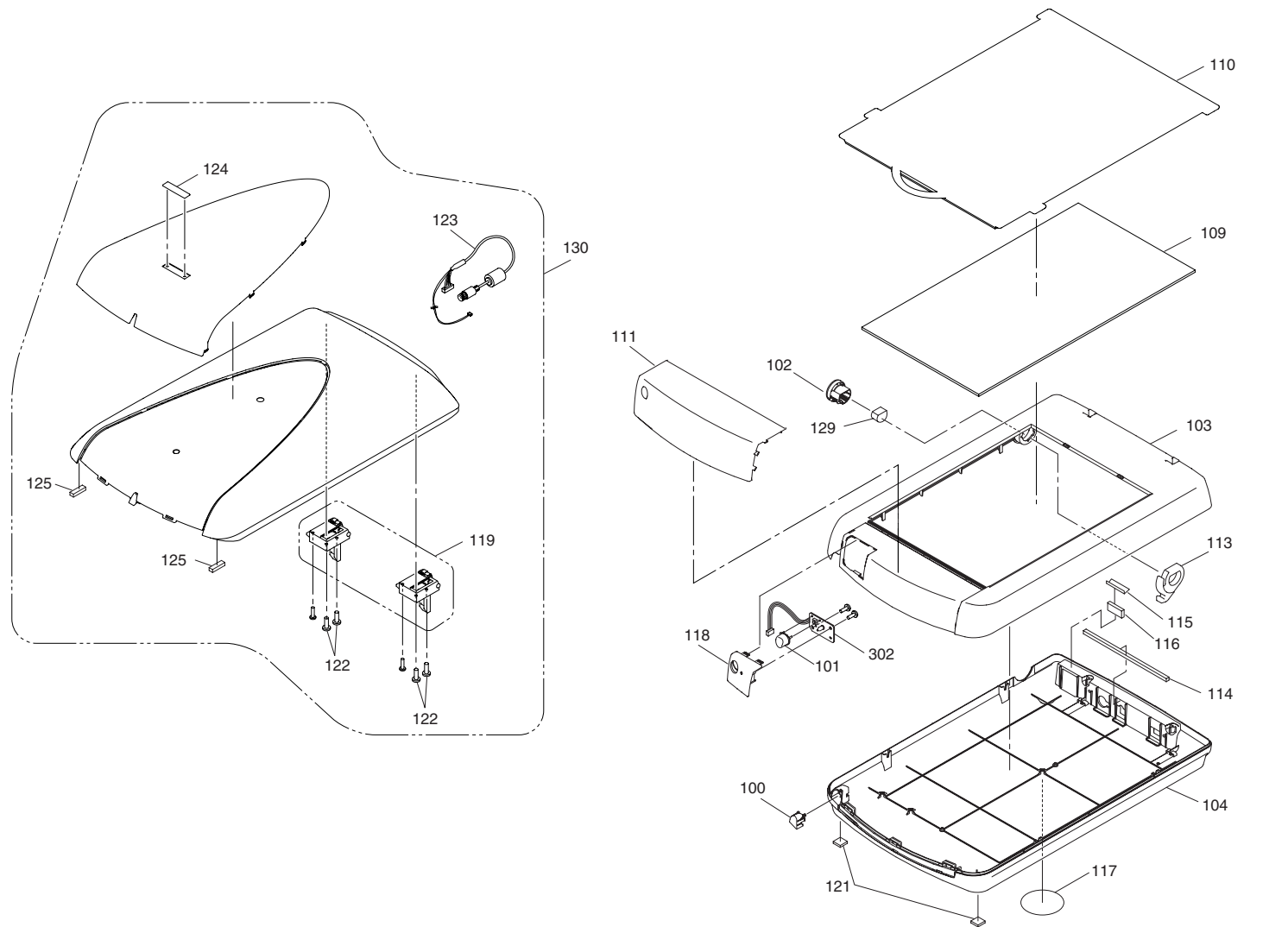
GT-X700 / PERFECTION 4870 PHOTO / 4870 PRO

NO.1

Rev.01

B163-ACCE-011

Figure 7-2. Exploded diagram (1)



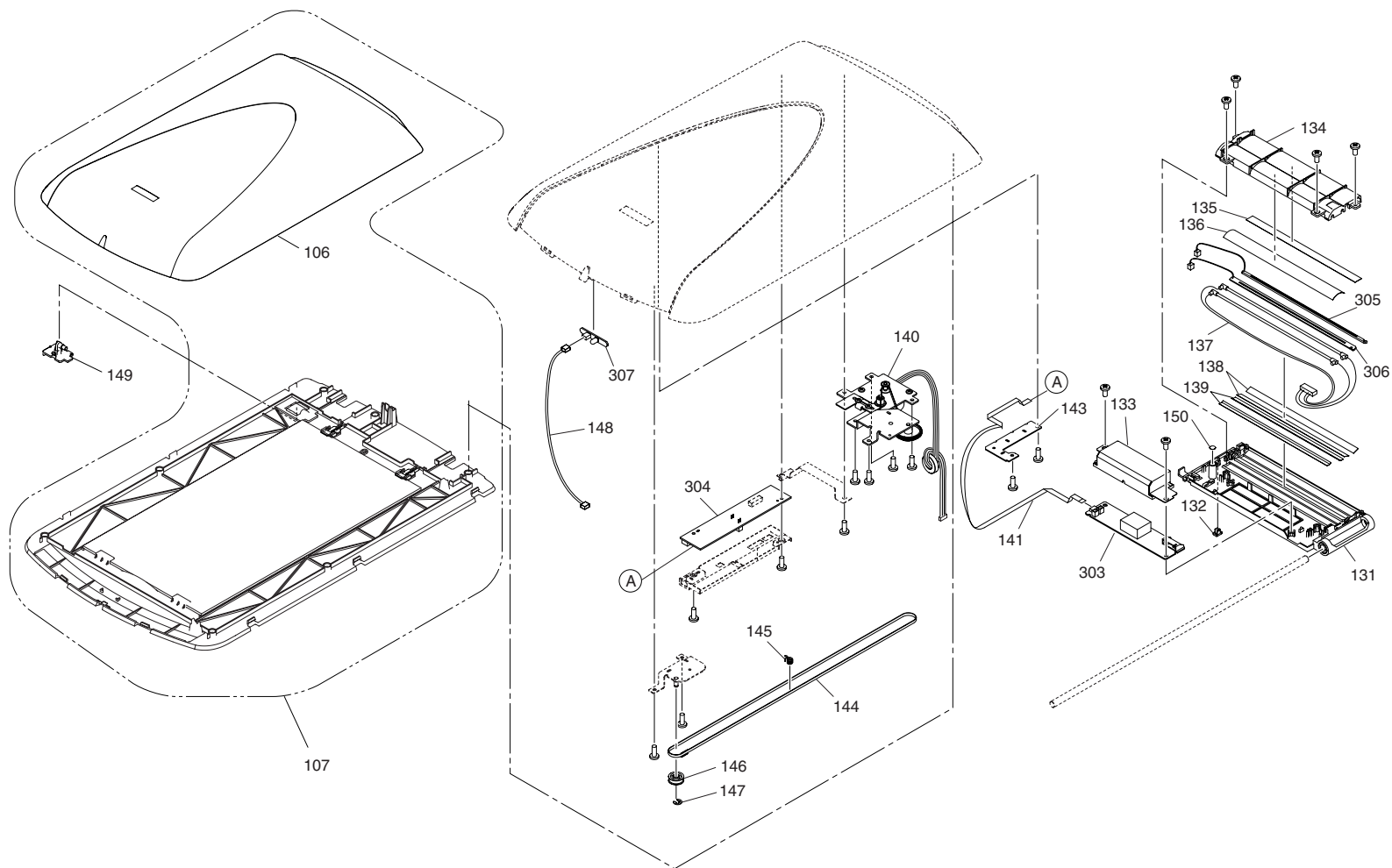
GT-X700 / PERFECTION 4870 PHOTO / 4870 PRO

NO.2

Rev.01

B163-CASE-011

Figure 7-3. Exploded diagram (2)



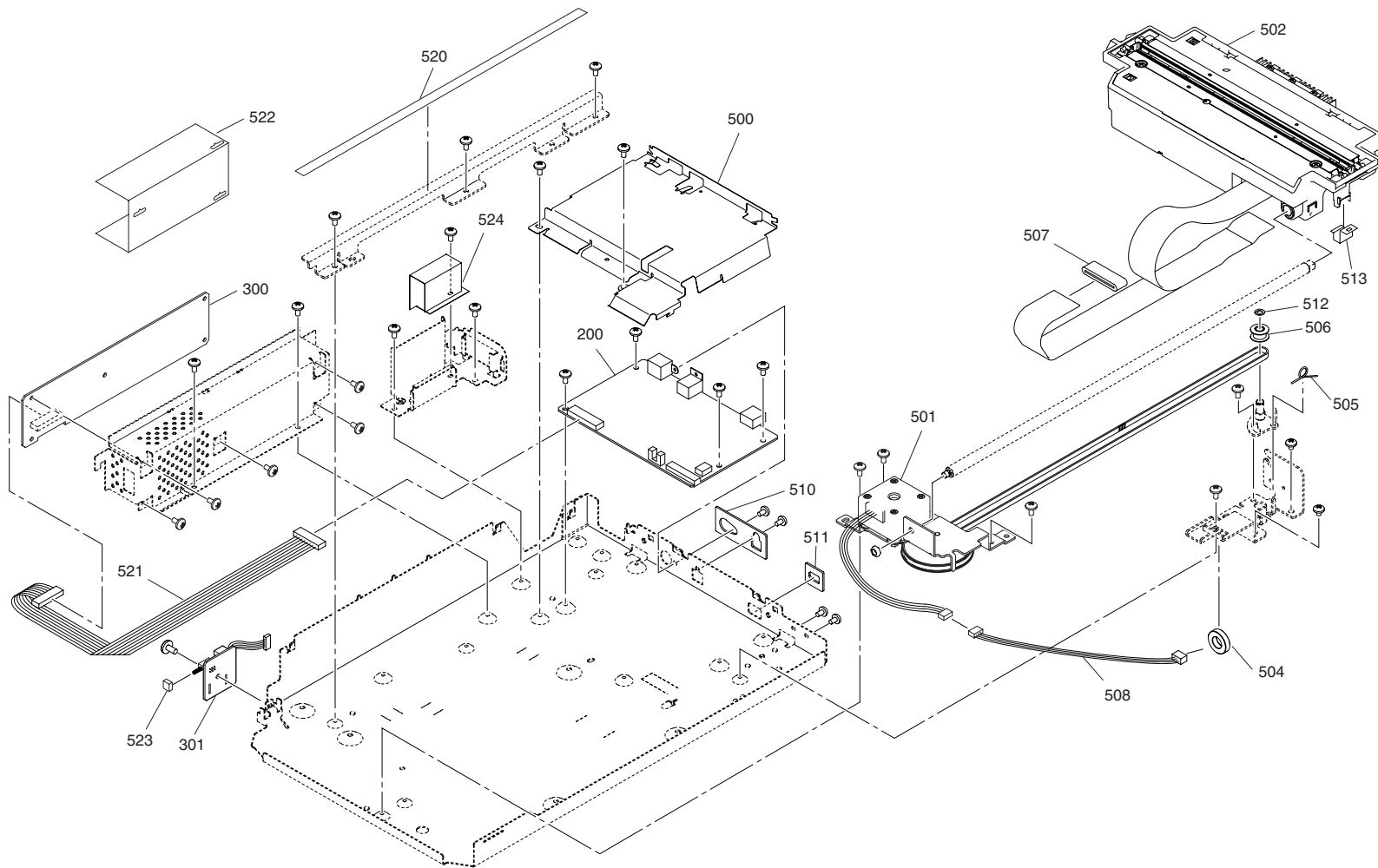
GT-X700 / PERFECTION 4870 PHOTO / 4870 PRO

NO.3

Rev.01

B163-CASE-021

Figure 7-4. Exploded diagram (3)



GT-X700 / PERFECTION 4870 PHOTO / 4870 PRO

NO.4

Rev.01

B163-MECH-011

Figure 7-5. Exploded diagram (4)

## 7.4 Service Parts List

□ Parts list for Perfection 4870 Photo

**Table 7-2. Perfection 4870 Photo Parts List**

Ref No.	Part Name
10	HOLDER,FILM,BROWNIE
11	HOLDER,FILM,4X5
12	COVER,FILM,BROWNIE
13	HOLDER,FILM,35
14	HOLDER,FILM,SLIDE
15	COVER,FILM,35
16	COVER,FILM,4X5
400	POWER CABLE ASSY,120V
NON FIG	APPLICATION CD-ROM
NON FIG	MEDIA PACK
100	KEYTOP,POWER SWITCH
101	KEYTOP,FUNCTION SWITCH
102	KNOB,MOUNT,CARRIAGE
103	HOUSING ASSY.,UPPER,ASP
104	HOUSING,LOWER
106	HOUSING ASSY.,UPPER,TPU,ASP
107	CASE,TPU,ASP
109	MAT,COVER,DOCUMENT
110	HOUSING,MAT
111	COVER,FRONT;B
113	LEVER,MOUNT,CARRIAGE
114	CUSHION,160X5
115	SHEET,DUST COVER
116	CUSHION,45X6
117	SHEET,COVER,35
118	HOLDER,FSW BOARD
119	HINGE SET

**Table 7-2. Perfection 4870 Photo Parts List**

Ref No.	Part Name
121	FOOT
122	C.B.P.SCREW,4X12,F/ZN
123	HARNESS,TPU
124	LOGO PLATE
125	FOOT
129	LEVER LOCK
130	TPU ASSY.,Lid,ASP
131	CARRIAGE,TPU,ASP
132	CHIP SLIDER
133	COVER,BOARD ASSY.,INVERTOR
134	REFLECTOR,TPU
135	REFLECTOR,LAMP,TPU;B
136	REFLECTOR,LAMP,TPU;C
137	LAMP ASSY.
138	REFLECTOR,LAMP,TPU
139	REFLECTOR,LAMP,TPU;D
140	MOTOR ASSY.,TPU,ASP
141	HARNESS,DRV-INV
143	COVER,FFC
144	TIMING BELT,CR,TPU
145	TORSION SPRING,65
146	PULLEY,DRIVEN,TPU
147	E-RING,3,U/FC
148	HARNESS,DRV-SUB_B
149	LOCK,CARRIAGE,TPU
150	SHEET,SLIDE;B
303	BOARD ASSY.,INVERTOR
304	BOARD ASSY., DRV
305	BOARD ASSY., SUB, B163 SUB-C
306	BOARD ASSY., SUB, B163-D

Table 7-2. Perfection 4870 Photo Parts List

Ref No.	Part Name
307	BOARD ASSY., SUB
200	BOARD ASSY., MAIN
300	BOARD ASSY.,POWER SUPPLY
301	BOARD ASSY., SUB
302	BOARD ASSY.,PANEL
500	COVER,MAIN BOARD
501	MOTOR ASSY.,ASP
502	CARRIAGE ASSY.,ASP
504	FERRITE CORE
505	TORSION SPRING
506	PULLEY,DRIVEN
507	FERRITE CORE
508	HARNESS, MOTOR
510	FOAM,DUSTPROOF;B
511	FOAM,DUSTPROOF
512	RETAINING RING(B150300711)
513	CLAMP,TIMING BELT
520	SHEET,SLIDE
521	HARNESS,PS
522	SHEET,P/S BOARD
523	SUPPORT,P-SW
524	COVER,COVER INLET
NON FIG	OTPROM(BLANK)