

SERVICE MANUAL

TPU (Transparency Unit)



EPSON®

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PRECAUTIONS

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

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

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

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

DANGER

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

WARNING

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

PREFACE

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

CHAPTER 1. PRODUCT DESCRIPTIONS

Provides a general overview and specifications of the product.

CHAPTER 2. OPERATING PRINCIPLES

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

CHAPTER 3. TROUBLESHOOTING

Provides the step-by-step procedures for troubleshooting.

CHAPTER 4. DISASSEMBLY AND ASSEMBLY

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

CHAPTER 5. ADJUSTMENTS

Provides Epson-approved methods for adjustment.

CHAPTER 6. MAINTENANCE

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

APPENDIX

Provides the following additional information for reference:

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

REVISION STATUS

Rev.	Date	Page(s)	Contents
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CHAPTER

1

PRODUCT DESCRIPTIONS

1.1 Features

This transparency unit (TPU), is an exclusive option for GT-12000, and its main features are as follows:

- ☐ Supports large document
 - Maximum = 16.5 inch x 11.4 inch / 420 mm x 290 mm
- ☐ Reflective document can be scanned with the unit installed.
- ☐ Flat design makes the option easy to handle.

1.2 Product Description

BASIC SPECIFICATION

Type:	Lamp movement scanning system with the document fixed
Light source:	Xe-gas cold cathode fluorescent lamp
Document size:	16.5 inch x 11.4 inch / 420 mm x 290 mm (Maximum)
Color Separation:	Color filter separation (R/G/B)

DOCUMENT SUPPORTED

Document type:	- Positive film - Negative film
Document size:	- 35-mm film (Strip, Mount) - Brownie - 4x5 inch - 8x10 inch

ELECTRICAL SPECIFICATION

Power supply:	Supplied from the scanner (+24/+5VDC)
Consumption current:	- 1.3 A (+24VDC) - 0.3 A (+5 VDC)

ENVIRONMENTAL CONDITION

Temperature:	- Operation = 5 - 35°C - Storage = -25 - 60°C
Humidity:	- Operation = 10 - 80% * - Storage = 10 - 85% * * Without condensation

RELIABILITY

MCBF Carriage = 100,000 returns

OPERATING CONDITION

Dust: Ordinal office or home condition
(Should be kept away from extreme dust.)

Illumination: Operation under direct sunlight or near strong light source should be avoided.

PHYSICAL DIMENSIONS AND WEIGHT

Size: 25.8 x 17.8 x 2.24 inch / 656 x 452.2 x 57 mm
(Width x Depth x Height)

Weight: Approximately 6Kg

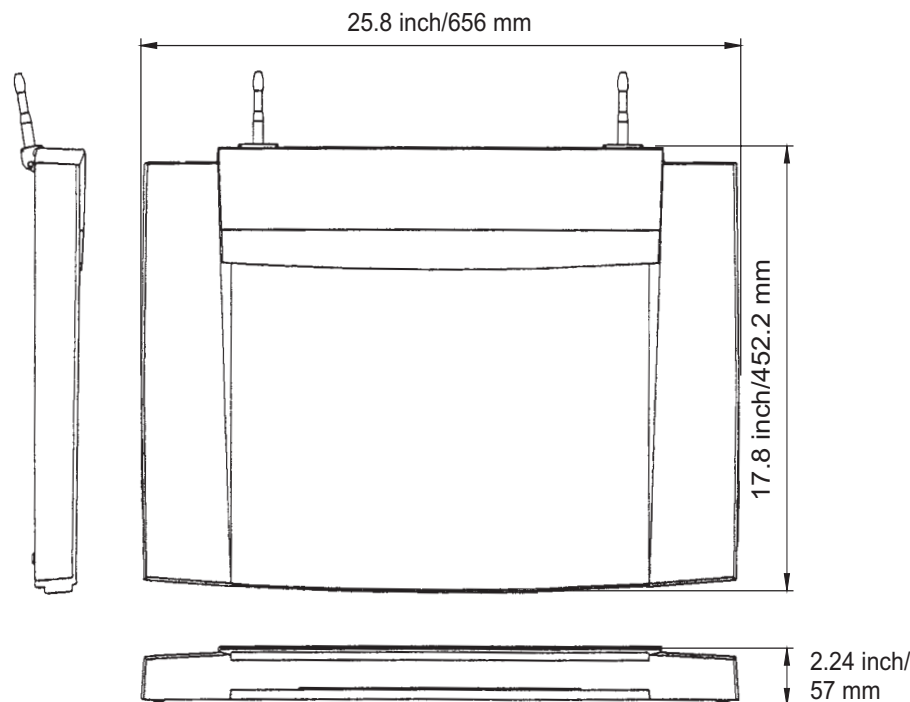


Figure 1-1. Transparency Unit Size

1.2.1 Readable Area

Origin for this TPU is located in the upper right corner of the document table (viewed from the front side of the scanner). The maximum readable area is as indicated in the figure below.

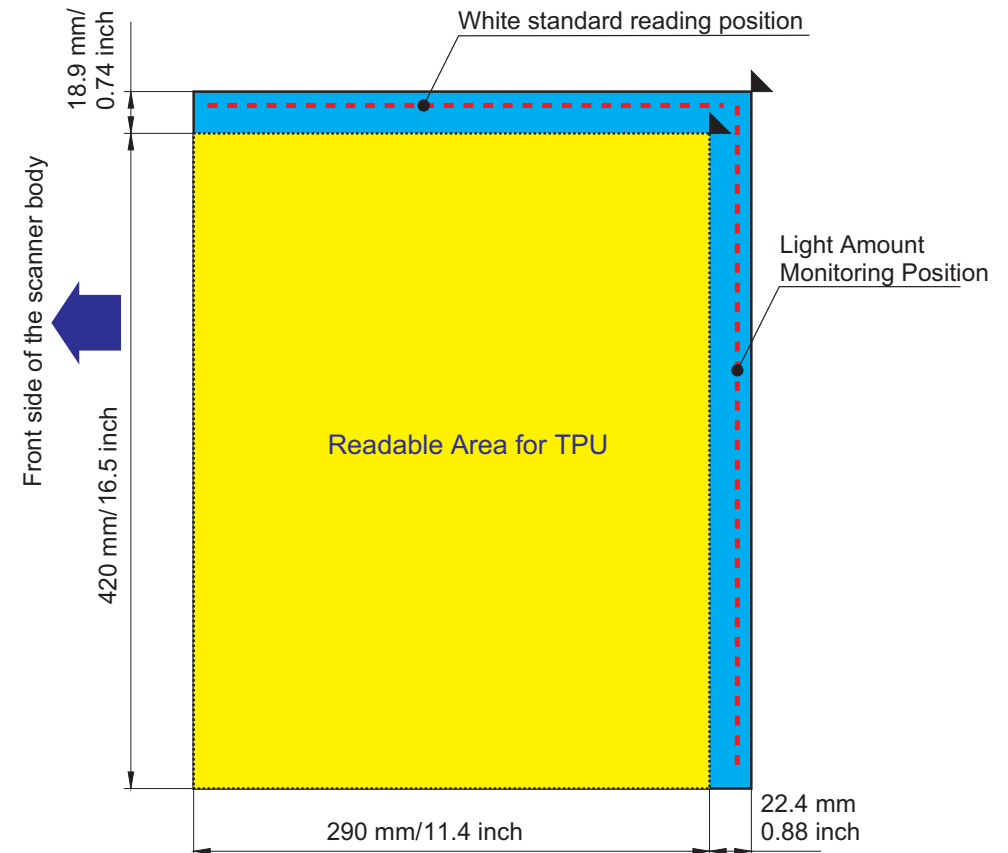


Figure 1-2. Readable Area for TPU



Never place the document over the white standard reading position and the light amount monitoring position. If so, reading operation will not be carried out properly.

1.2.2 Transportation Screw

Transportation screws are attached to the left part of the reverse side of the TPU unit. They are mounted to the positions marked "CLAMP" to secure the CR unit to protect it from damage due to transportation or movement. Be sure to remove the screws before turning the unit on before using the TPU. It is also necessary to store the removed screws at the position marked "STOCK" beside the "CLAMP".

"CLAMP" to which the screws are mounted to secure the CR.

"STOCK" used to store the screws.

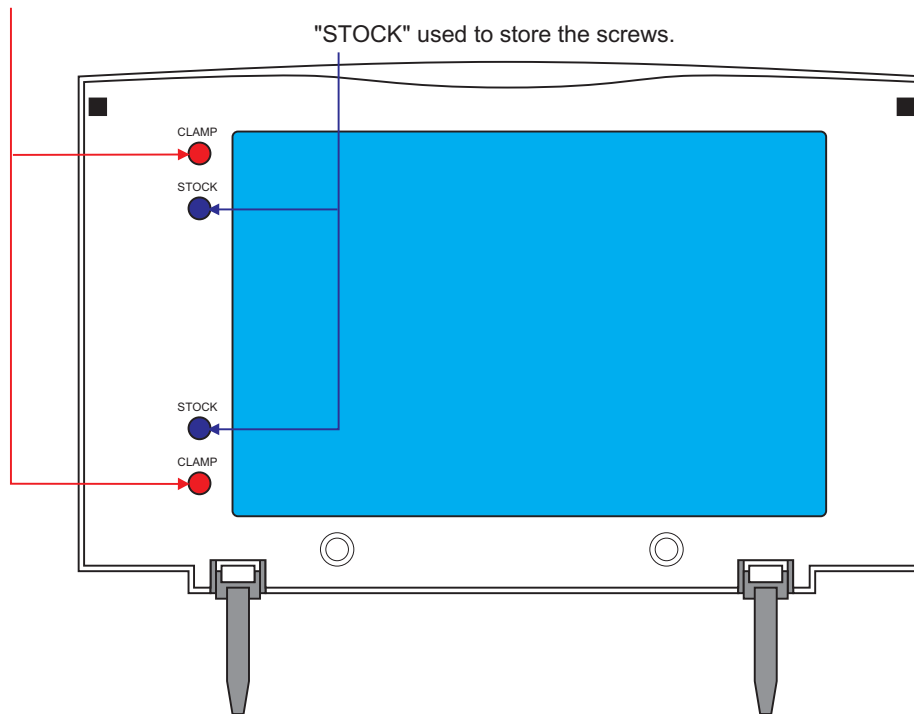


Figure 1-3. Transportation Screws

CHAPTER

2

OPERATING PRINCIPLES

2.1 OVERVIEW

This chapter describes operating principles of the transparency unit (TPU) for GT-12000. The basic scanning operation of the unit is carried out by the document fixed on the document glass and the lamp (light source) which moves synchronizing with the CR mechanism in the scanner side.

2.1.1 Mechanism Operation

The CR is driven by the torque sent from the CR motor assembly in the following order:

- ❑ Torque is sent to the drive pulley via the motor belt.
- ❑ The torque is then transmitted to the transfer pulleys on the right and left base frame ends via the transfer belt which engages with the shaft for the drive pulley. The CR belts, linking the transfer pulleys and corresponding driven, are tightened up in the direction in which the CR moves.
- ❑ The torque transmitted to the transfer pulleys is finally sent to the CR belts to move the CR attached to the CR belts.

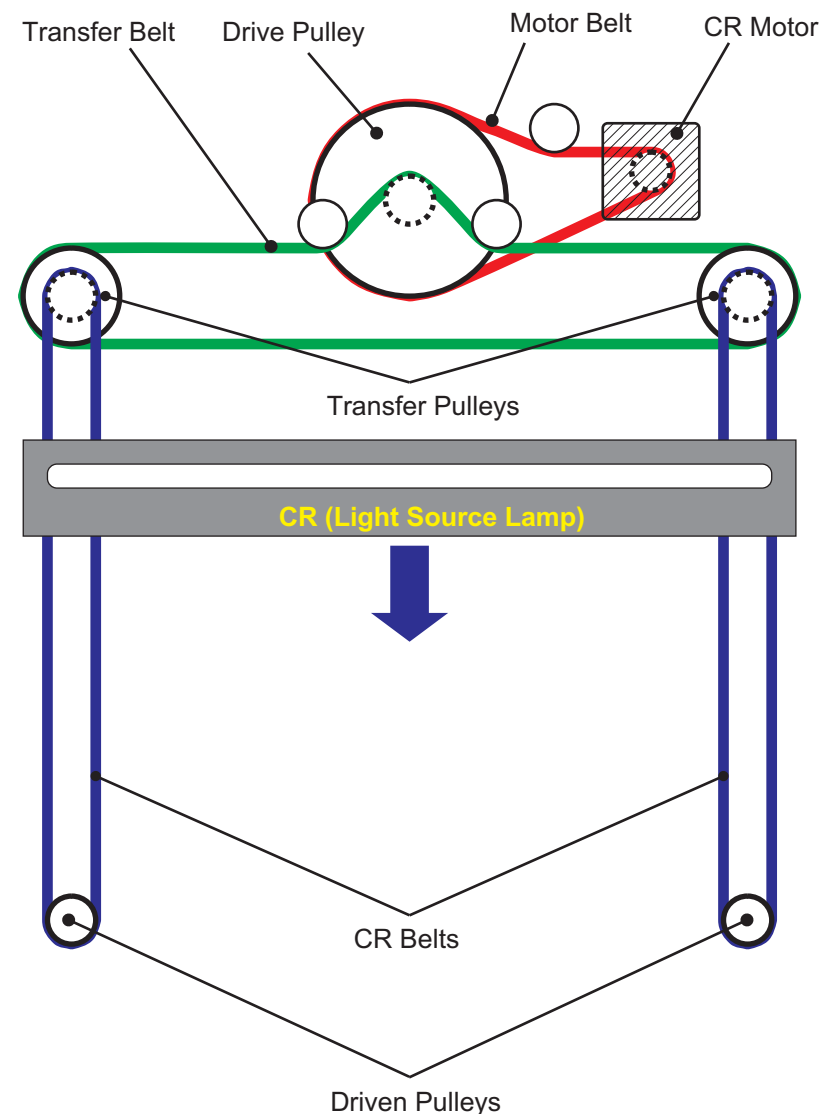


Figure 2-1. Mechanism Structure of the TPU

2.1.2 Electrical Circuit Operation

The electrical circuit of this unit is composed of the control circuit and the inverter circuit.

The control circuit controls the CR motor driven by the power supply voltage from the scanner side, and manages interface of signals with the scanner. On the other hand, the inverter circuit converts power supply voltage from the scanner into AC voltage used to light the lamp (Xe-gas cold cathode fluorescent lamp) built in the CR. The cover open sensor, directly attached on the control board, monitors open/close status of the unit. The sensor uses a photo-interrupter sensor. However, it has a bob attached to its flag, and as the bob moves in accordance with open/close motion of the unit, the sensor detects it as a change in flag condition.

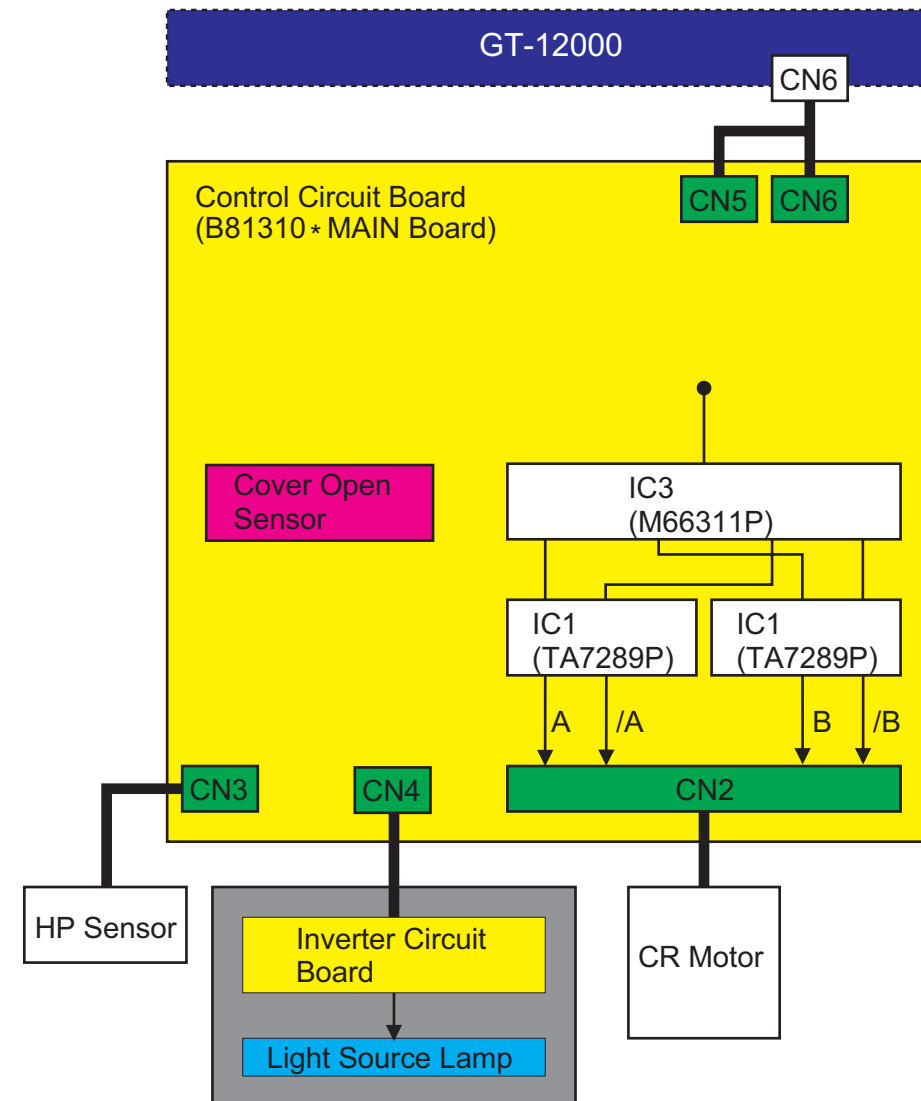


Figure 2-2. Electrical Circuit Board Circuit Block Chart

CHAPTER

3

TROUBLESHOOTING

3.1 OVERVIEW

This chapter describes the troubleshooting which enables you to solve the problem efficiently when the transparency unit (TPU) is operating abnormally. The remedies for the errors detected by the self-diagnostic function and the check points for each phenomenon are described in the following sections.





Be sure to turn the scanner off before removing the TPU.

3.1.1 Error Detection by the Self-Diagnostic Function

The self-diagnostic function equipped with this unit automatically detects operating status of each part. The abnormal phenomenon detected by the function and remedies are as follows:



Fatal Error

LED Status	Cause	Operation/Condition
 READY  ERROR	<Defect in the hardware> <ul style="list-style-type: none"> • The lamp does not light. • TPU is turned on with the CR locked. • Other defects in the TPU. 	<ul style="list-style-type: none"> • The lamp goes off and the unit stops operating. • Sets the status bit "7".
Remedy	Turn the scanner Off and back On or press the "RESET" switch.	



Always make sure that the transportation screw is removed prior to servicing.

Option Error

LED Status	Cause	Operation/Condition
 READY  ERROR	<Defect in the options> <ul style="list-style-type: none"> • The unit cover is open. • Paper end, etc.. 	Sets the status bit "7".
Remedy	Remove the cause of the error.	



[Option Error] is only detected when the option is installed in the operative condition.

3.1.2 Troubleshooting

This section provides test points for each major unit and check points for each abnormal phenomenon.

3.1.2.1 Test Points

Test points for the motor and sensors are shown in the tables below.

Motor

❑ Condition: Test the motor without any cables connected.

Motor	Test Point	Signal Level
Motor (for CR drive)	<Cable connector> Between Pin 1 and Pin 2 Between Pin 3 and Pin 4	4.0 Ω

Sensors

❑ Condition: Test with the TPU powered on.

Motor	Test Point	Signal Level
HP sensor	<B81310*MAIN board> CN3: Pin 1 (Signal) Pin 2 (GND)	H: In the home position L: Off the home position
Cover open sensor	<B81310*MAIN board> IC7: Pin 1 (Signal) Pin 2 (GND)	H: Open L: Close



Be careful not to short-circuit the signals while checking them.

3.1.2.2 Check Points for Abnormal Phenomenon

See the table below which shows the abnormal phenomenon typically occurs.

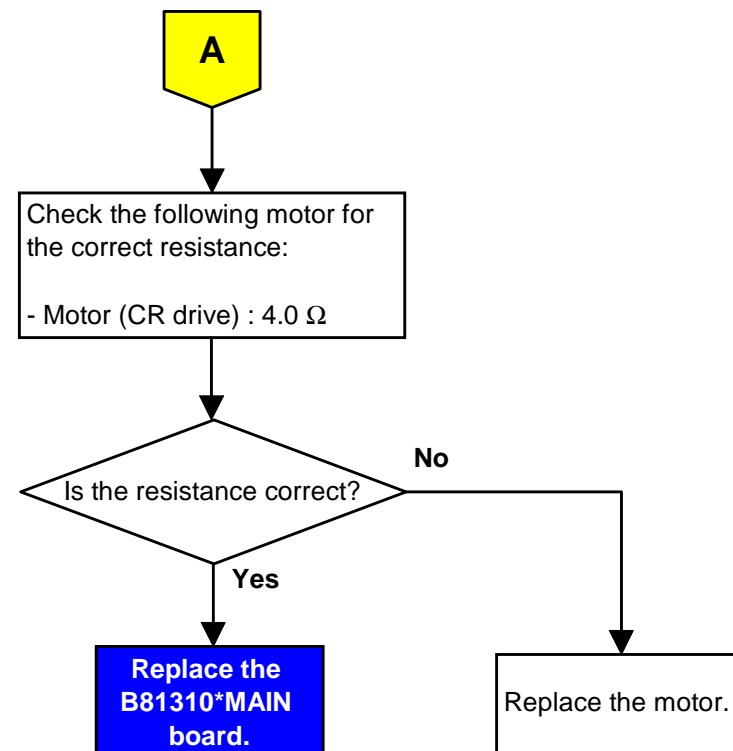
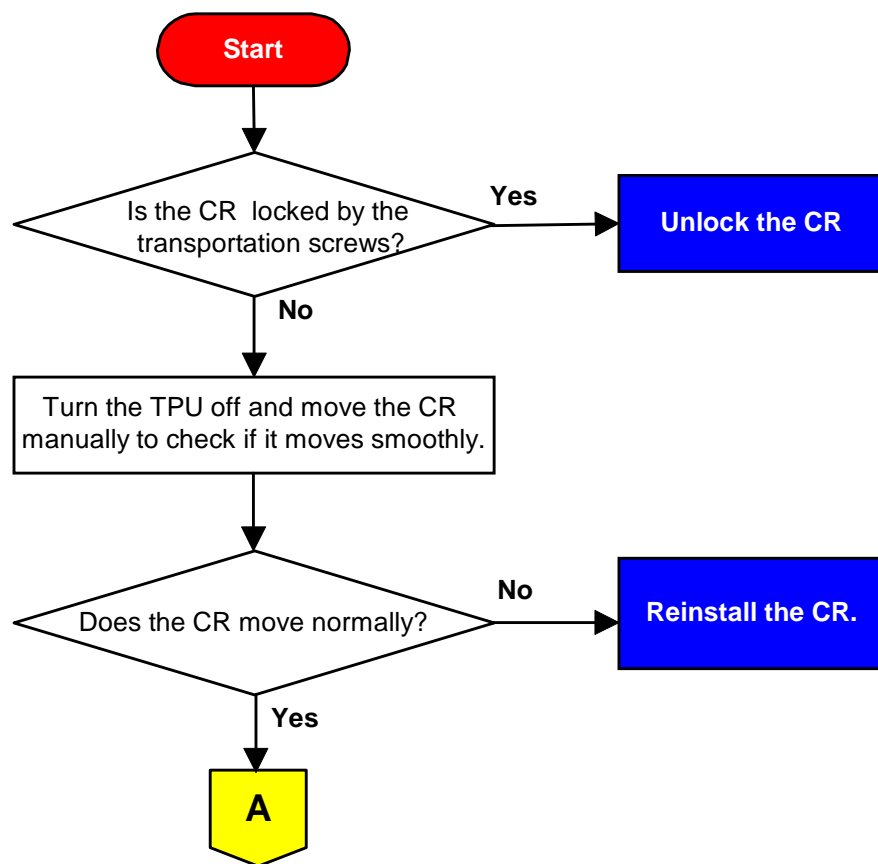
Table 3-1. Abnormal Phenomenon

Abnormal Phenomenon	Description	Flowchart to refer
“Fatal Error” is indicated and is not cleared after the TPU is turned off and back on.	CR does not move.	3-1
	Abnormal movement of CR, such as crashing into the frame.	3-2
	Lamp does not light.	3-3
Scanned image is abnormal.	Black line, White banding, and so on	3-4

Check points for the major units listed for each phenomenon are shown in the following pages.

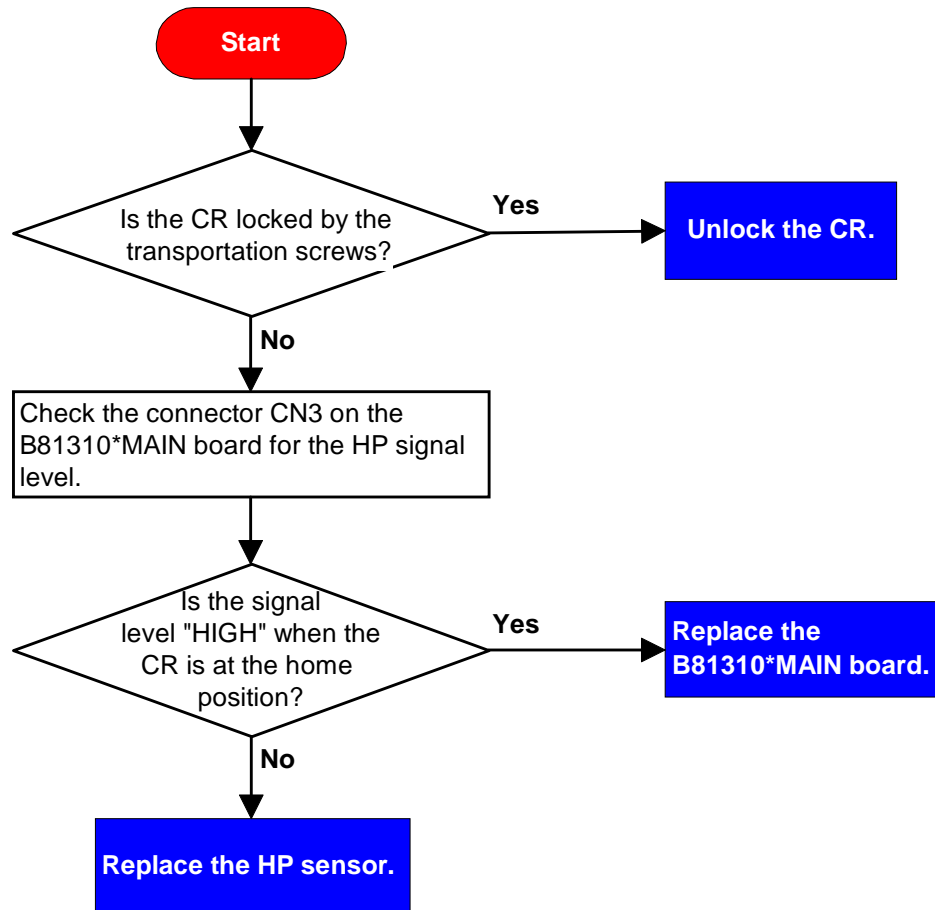
Flowchart 3-1

Phenomenon: CR (Lamp) does not move.



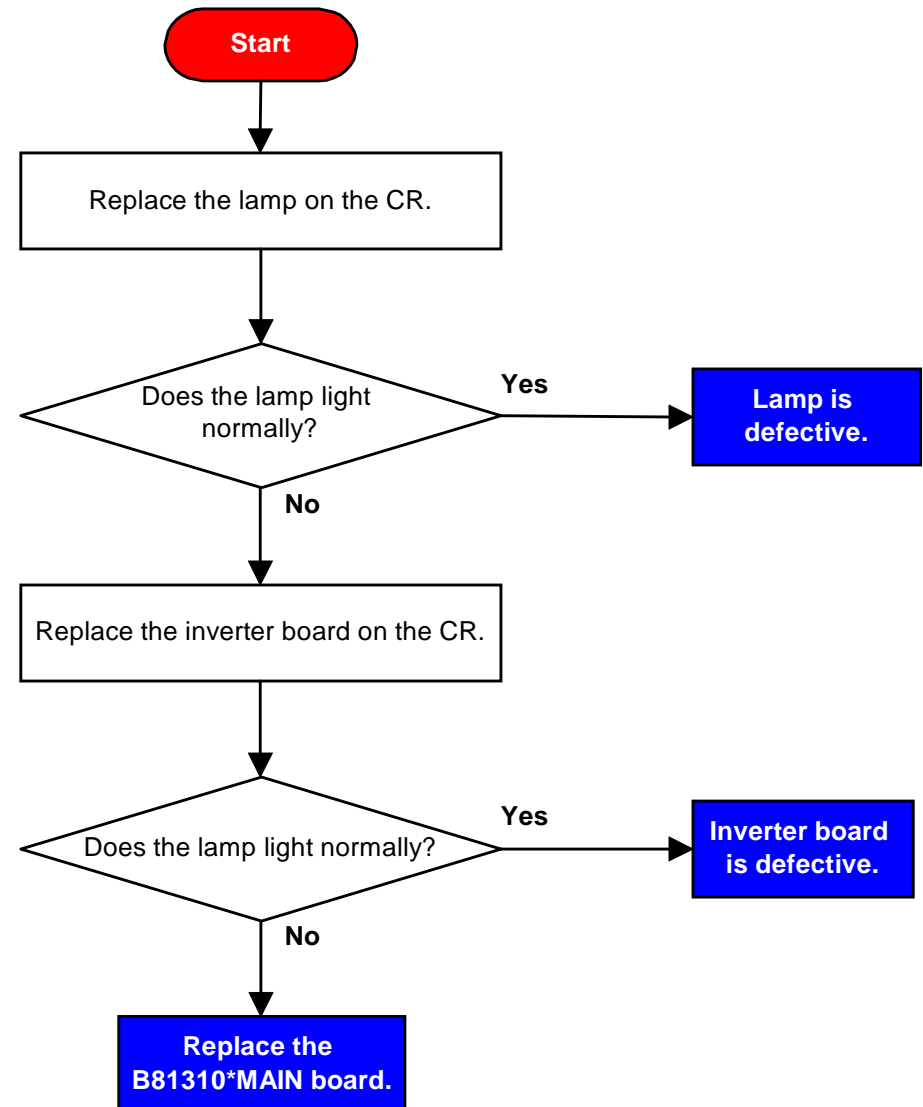
Flowchart 3-2

Phenomenon: CR moves abnormally. (Crashing into the frame)



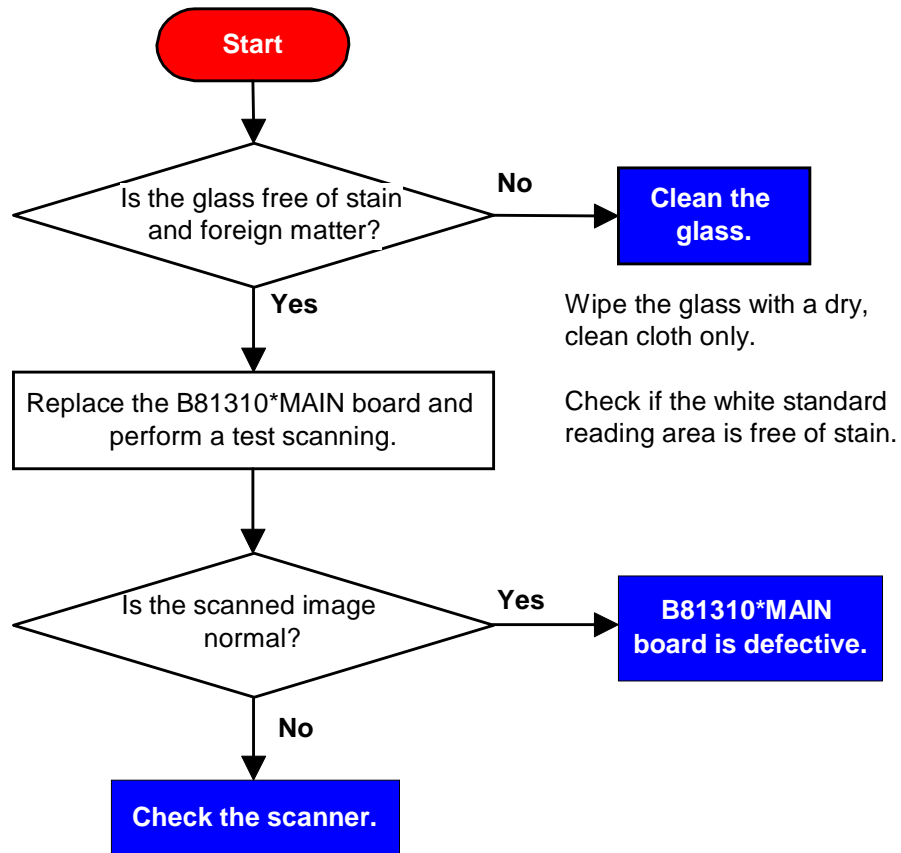
Flowchart 3-3

Phenomenon: Lamp does not light.



Flowchart 3-4

Phenomenon: Scanned image is abnormal.



CHAPTER

4

DISASSEMBLY AND ASSEMBLY

4.1 OVERVIEW

This chapter describes how to disassemble the transparency unit (TPU). If no instruction is given, assembly can be carried out by reversing the disassembly procedures.

4.1.1 Tools

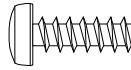
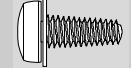
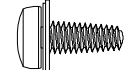
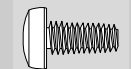
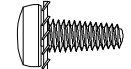
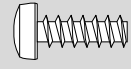
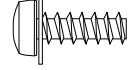

The tools required to disassemble/assemble the TPU are as listed below:

Tool Name	Availability	SE Part No.
Phillips screw driver (No.2)	○	
Exclusive tool (CR installation position fixing tool)	SE exclusive	Code: 1039142

4.1.2 Screws

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

Table 4-1. Screw List

No.	Screw Type / Specification	Appearance	Color
1	CBP M3x12		Silver
2	CBS Sems M3x8		Silver
3	CBS Sems (2) M3x6		Red copper
4	CBS M3x6		Red copper
5	CPS Sems B M3x5		Red copper
6	CBP M3x10		Black
7	CB with toothed washer M3x12		Gold
8	CR;B damper shaft (Thread part: M3x3)		Gold

4.2 DISASSEMBLY PROCEDURE

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

4.2.1 Lower Housing Removal

1. Disconnect the connector cable from the connector for the option on the scanner, and remove the TPU from the scanner.
2. Turn the unit over and place it on the flat table.
3. Remove 8 screws (4 for each of No.1 and No.2) and remove the lower housing.

✓CHECK POINT

When installing the Lower Housing, ensure that the glass is free of stain. If any stain or foreign matter is noticed on the glass, clean the glass thoroughly.

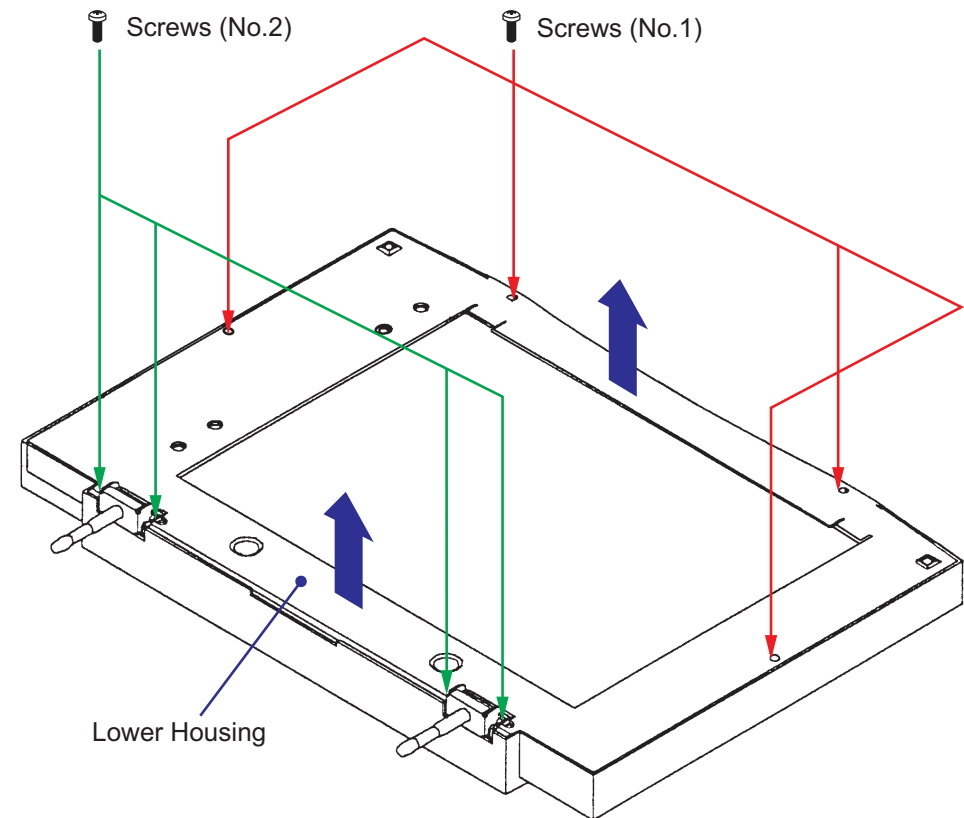


Figure 4-1. Lower Housing Removal

4.2.2 MAIN Board Assembly Removal

1. Remove the Lower Housing. (See Section 4.2.1.)
2. Remove 1 screw (No.3, with a plain washer) and remove the Main Shield; B.
3. Disconnect the following connector cables from the MAIN Board:
CN2, CN3, CN4, CN5, CN6
4. Remove 4 screws (No.4) securing the board (one of the screws is also fixing the shield earth used as a harness for connection with the scanner), and remove the MAIN Board Assembly.

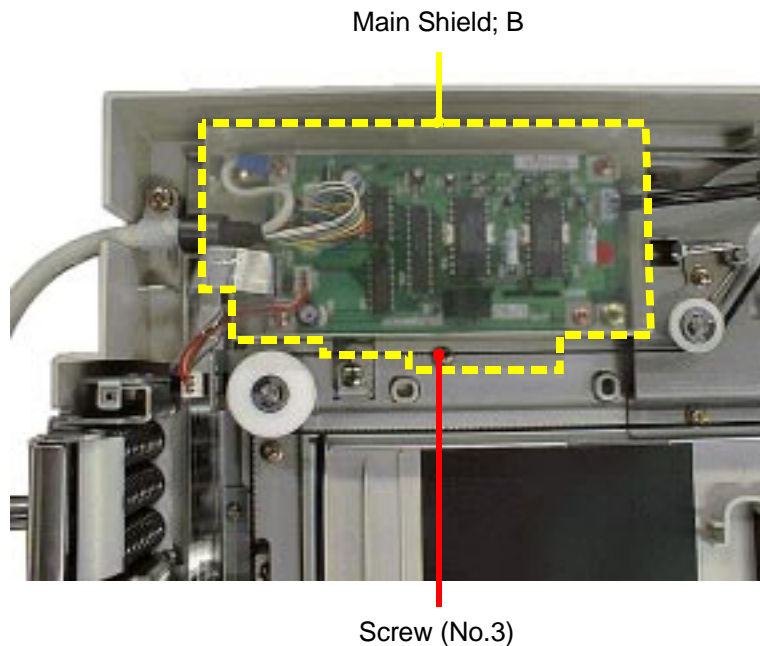


Figure 4-2. Main Shield; B Removal

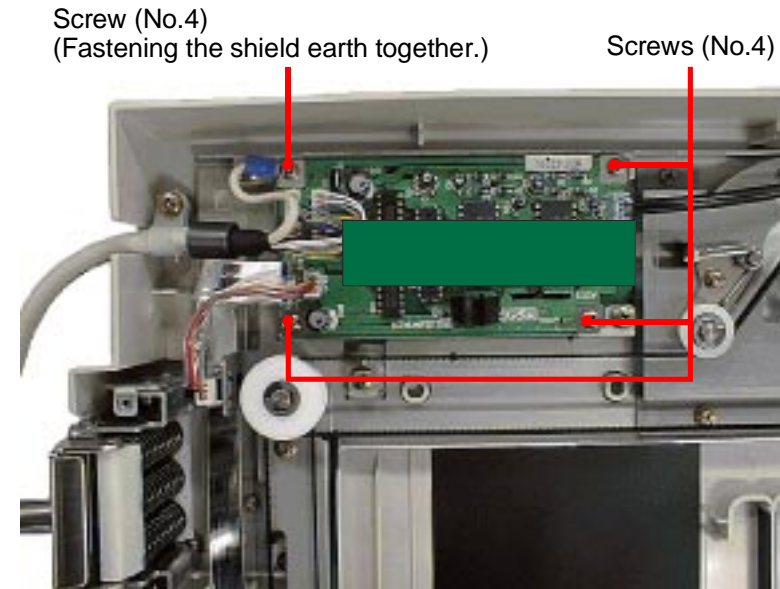


Figure 4-3. MAIN Board Assembly Removal

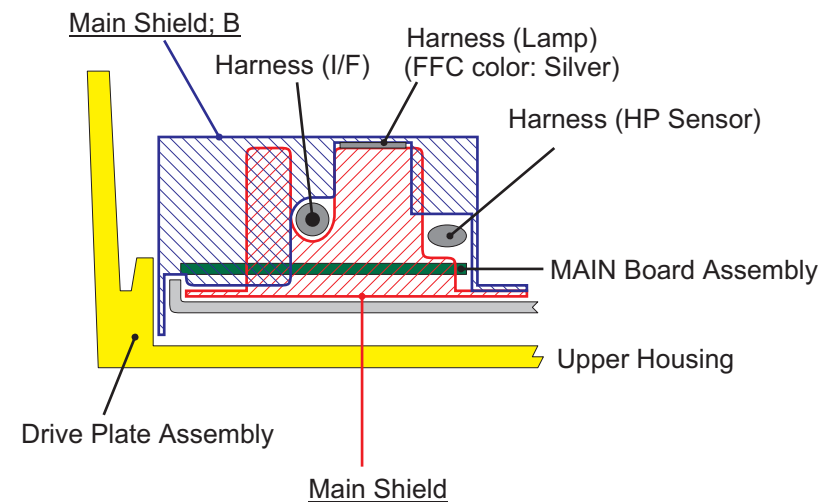


Figure 4-4. Main Shield; B Installation

4.2.3 CR Motor Assembly Removal

1. Remove the Lower Housing. (See Section 4.2.1.)
2. Unhook one end of the torsion spring and loosen 1 screw (No.3, with 2 plain washers) securing the Tension (M) Assembling Lever.
3. Remove the connector cable from the motor and remove 3 screws (No.4) securing the Motor Assembling Frame*, then remove the Motor Assembling Frame.
* *Motor Assembling Frame: Consists of the Motor Frame Assembly with the CR Motor Assembly attached to it.*
4. Remove 4 screws (No.8; CR; B damper shaft) securing the CR motor at the back of the CR Motor Assembly and remove the CR Motor Assembly from the Motor Frame Assembly.

✓CHECK POINT

When assembling, ensure that the Motor Belt is securely engaged with the pinion gear of the CR Motor Assembly.

Screw (No.3, with 2 plain washers)

* Only to be loosened.

Screws (No.4)

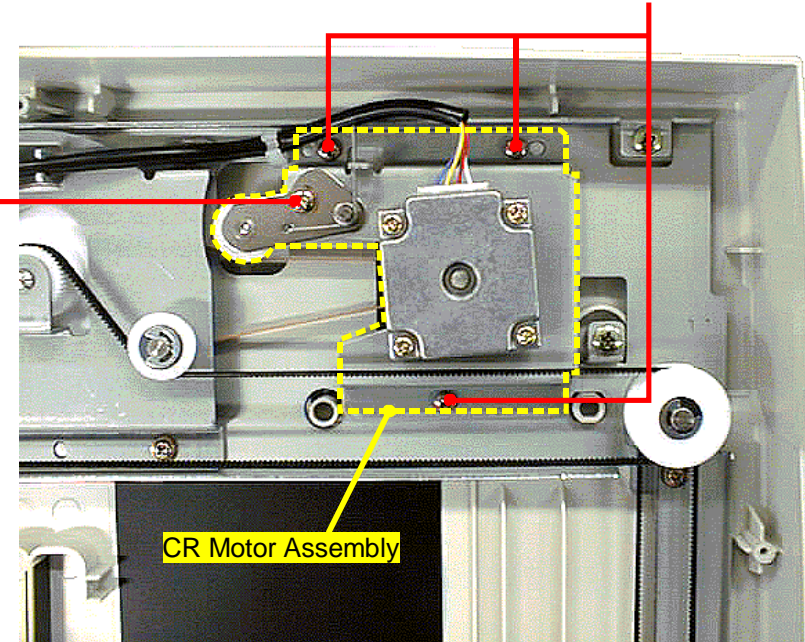


Figure 4-5. CR Motor Assembly Removal

4.2.4 CR Disassembly

This section describes how to remove the Inverter Board Assembly and the light source lamp unit (Option Lamp) in the CR .

4.2.4.1 Inverter Board Assembly Removal

1. Remove the Lower Housing. (See Section 4.2.1.)
2. Remove 4 screws (2 for each of No.5 and No.6) securing the CR cover, and remove the cover.
3. Lift up the Inverter Board Assembly and disconnect all connector cables from the board, then remove the Inverter Board Assembly.

✓CHECK POINT

When assembling, be sure to connect all connector cables to the connectors on the board.

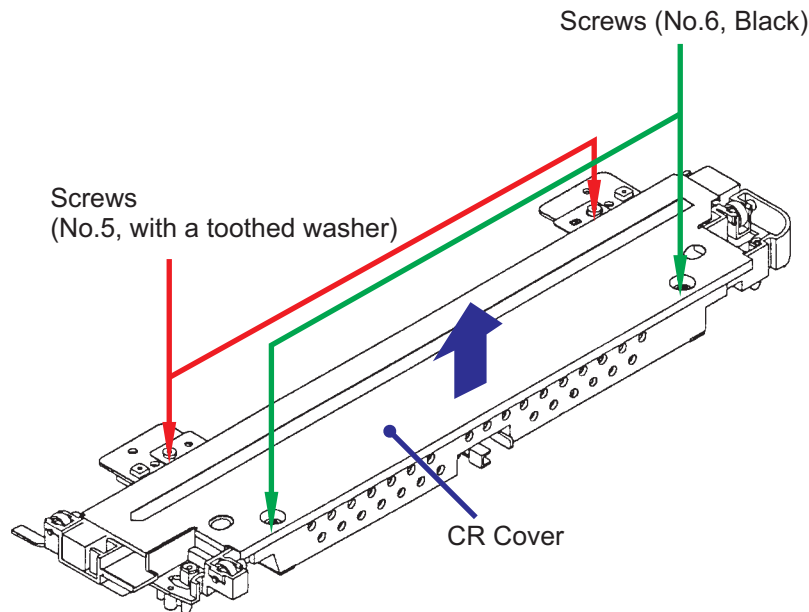


Figure 4-6. CR Cover Removal

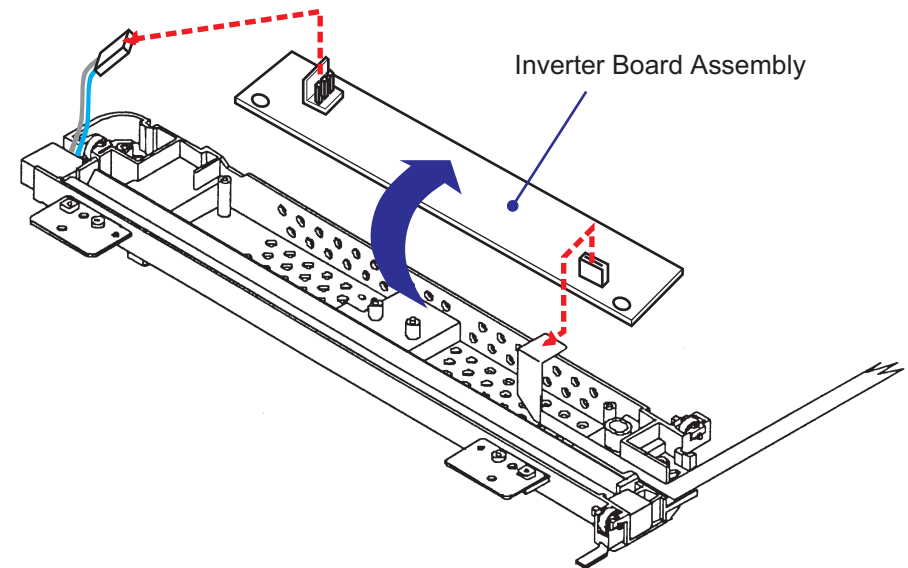


Figure 4-7. Inverter Board Assembly Removal

4.2.4.2 Option Lamp Removal

1. Remove the Lower Housing. (See Section 4.2.1.)
2. Remove 4 screws (2 for each of No.5 and No.6) securing the CR cover, and remove the cover.
3. Lift up the Inverter Board Assembly and disconnect the connector cable for the Option Lamp, then remove the Option Lamp.

✓CHECK POINT

When assembling, make sure that the location pins on the electrode sockets at the lamp ends securely fit in the location holes in the CR Frame.

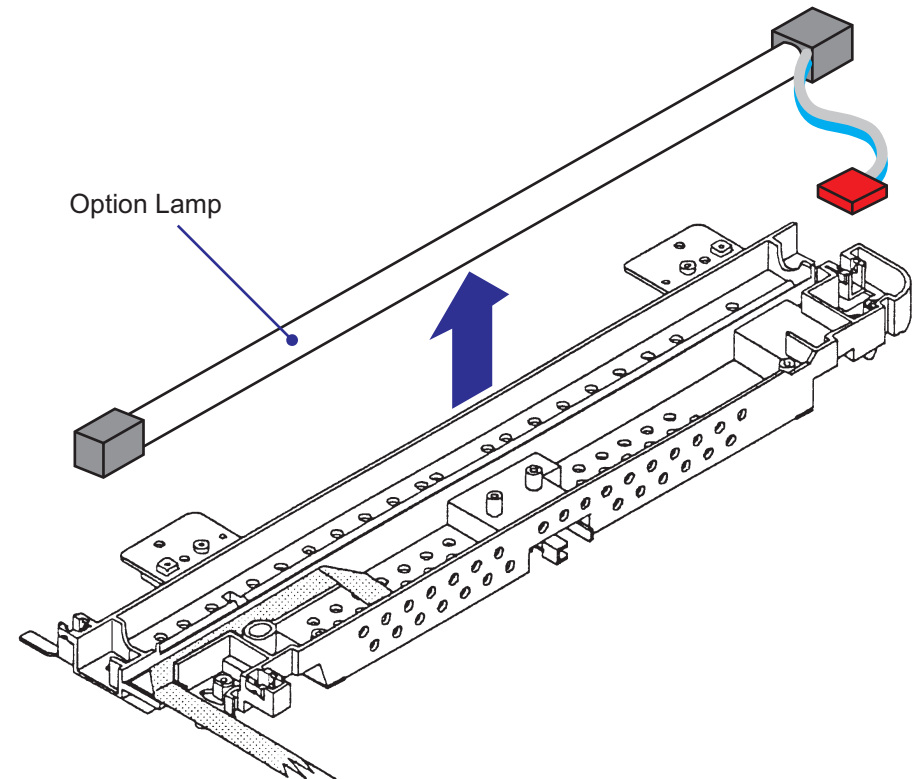


Figure 4-8. Option Lamp Removal

4.2.5 CR Removal

This section describes the procedure for removing the whole CR.



When you remove the whole CR unit, reinstall it in the procedure described in Section 4.2.5.1.

1. Remove the Lower Housing. (See Section 4.2.1.)
2. Remove 4 screws (2 for each of No.5 and No.6) securing the cover for the CR assembly, and remove the cover.
3. Lift up the Inverter Board Assembly and disconnect the Lamp Harness (a silver flat cable) from the connector on the Inverter board.
4. Remove 2 screws (No.7) securing the Belt Levers fixed to the right and left sides of the CR, and remove the Belt Levers.
5. Pinch the tension lever attached to the center of the CR top* to release the tension, then lift up the CR to remove it.

* Note that the CR top is facing down since the TPU is turned over.

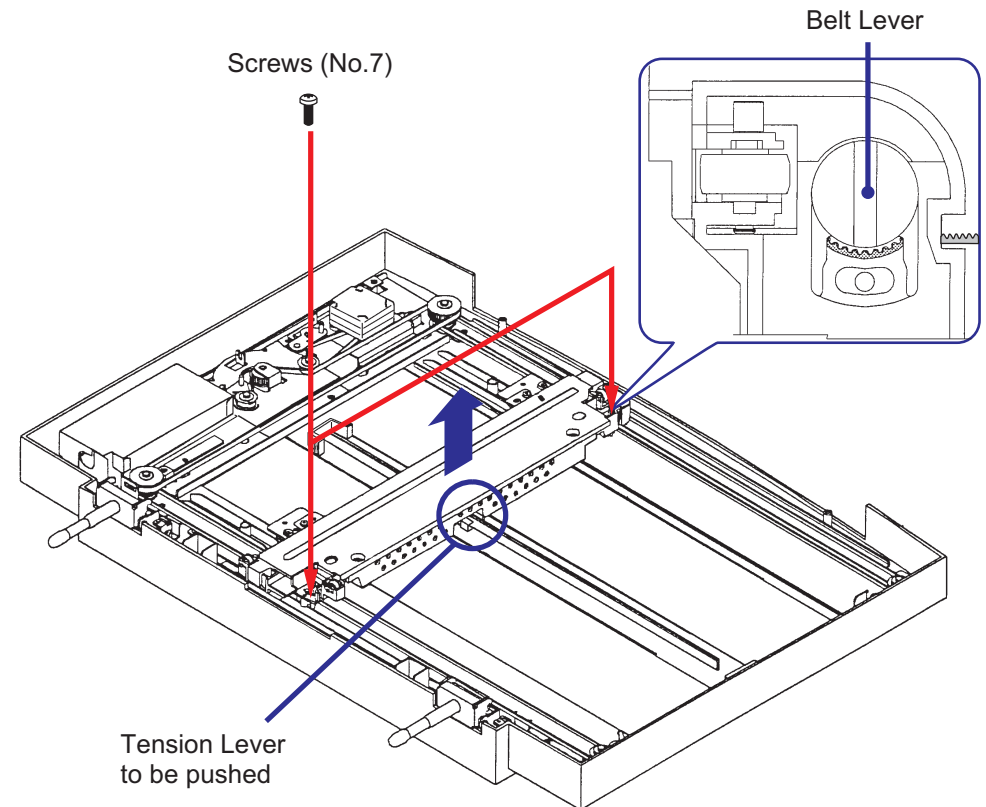


Figure 4-9. CR Removal

4.2.5.1 CR Installation

When the CR is reinstalled, the exclusive adjusting tools must be used. They are used to correct slant installation of the CR toward the direction in which the CR moves (sub scan direction). Therefore, be sure to reinstall the CR in the procedure described below.

1. Pinching the tension lever located on the CR top which is faced down, install the CR on the TPU.
2. Move the CR to the position where the right and left location holes in the CR are aligned with the right and left location holes in the upper housing.
3. Loosen the fixing screws for the right and left Tension Levers.

✓CHECK POINT

When installing the CR, push the tension lever and set it to the center rail in the upper housing, making sure that the guide rollers built in the tension lever assembly are securely holding the center rail between them.

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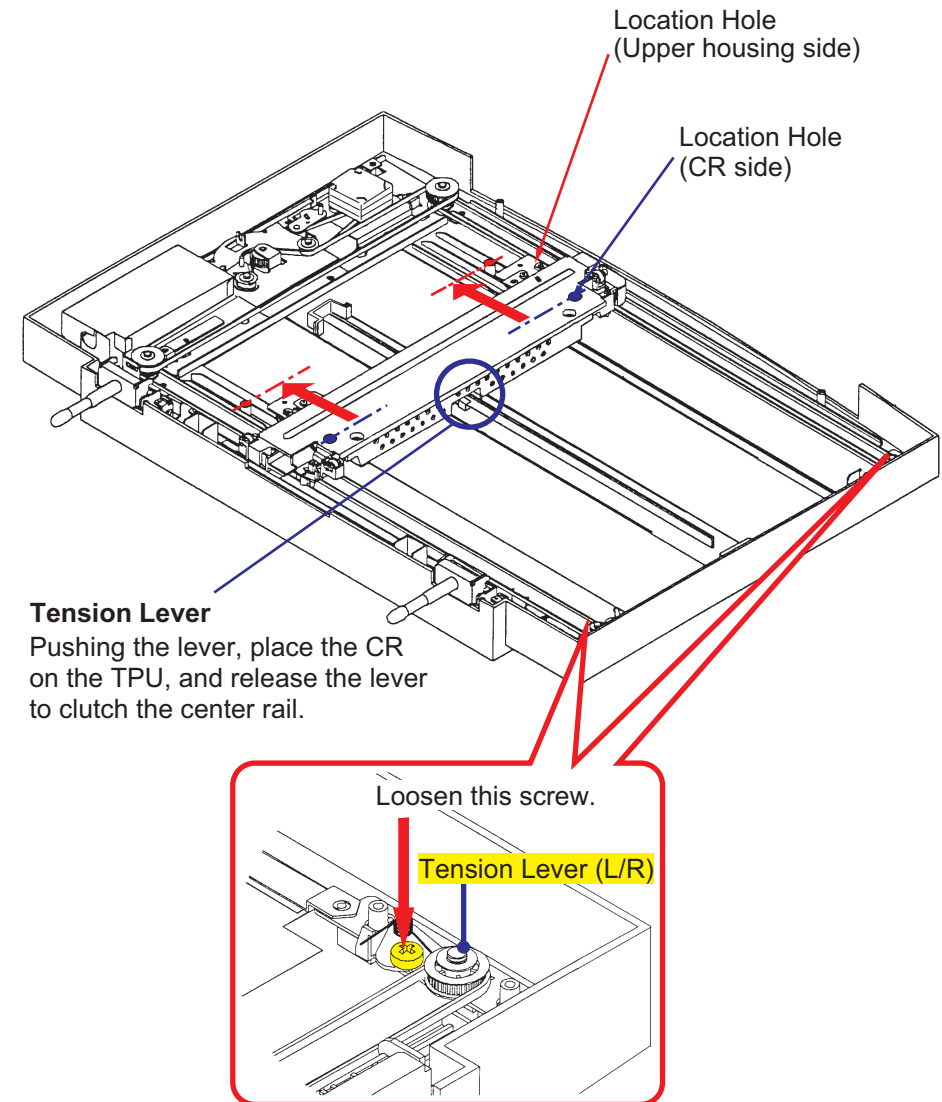


Figure 4-10. Positioning the CR

4. Insert the "location blocks" (exclusive CR installation position fixing tool) until they meet the location holes in the Upper Housing, then fit the "fixing pins" in the location holes in the CR.
5. Set the Belt Levers on the right and left ends of the CR with the CR Belts engaged with them, then fasten 2 screws (No.7) to secure the Belt Levers. After fixing them, remove the tools ("Location Blocks" and "Fixing Pins").
6. Fasten the fixing screws for the right and left Tension Levers loosened in the step 3.

✓CHECK POINT

- **Make sure that the "Location Blocks" are pushed enough to meet the location holes in the upper housing.**
- **When installing the Belt Lever, be sure to engage the tooth of the lever with the CR Belt securely.**

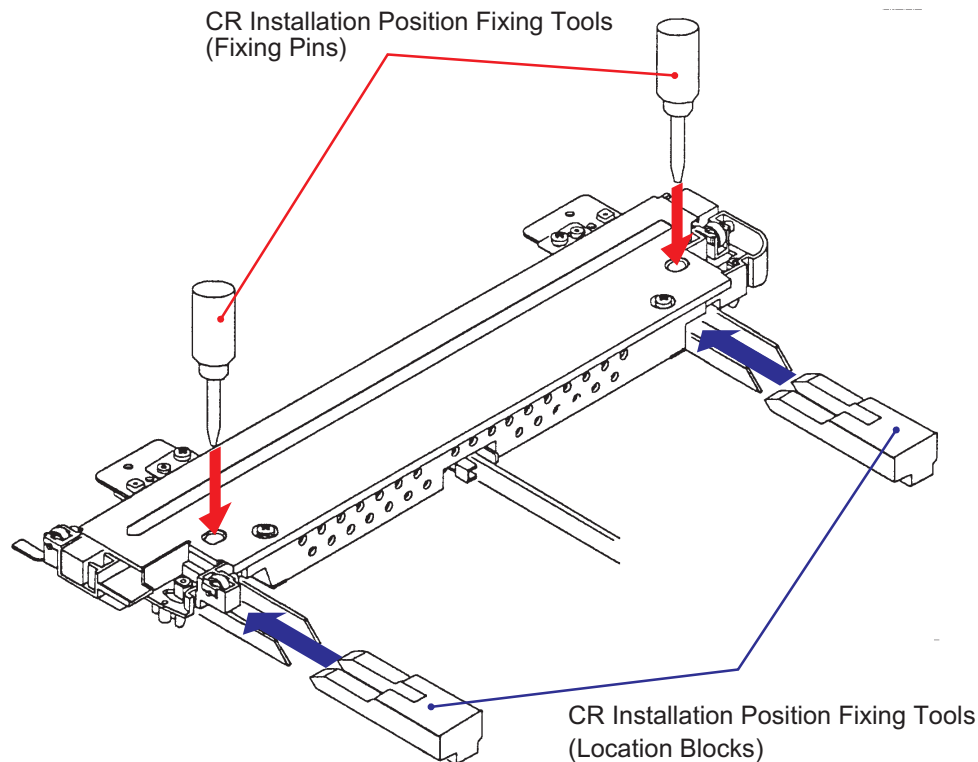


Figure 4-11. Setting the CR Installation Position Fixing Tool Set

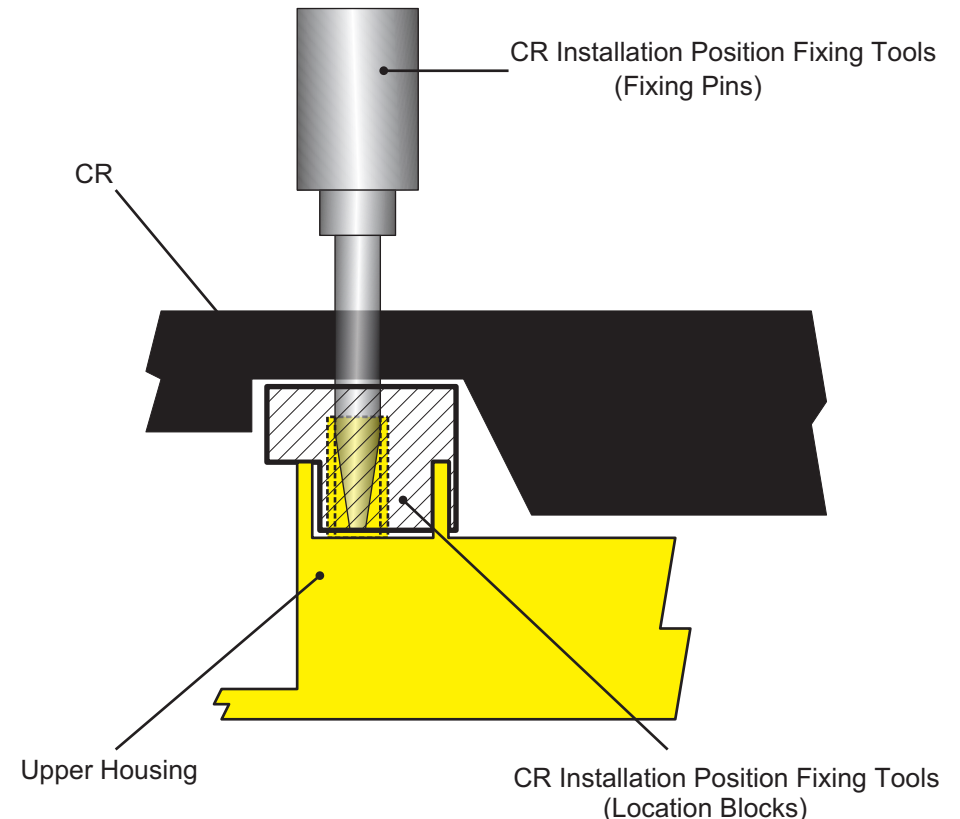


Figure 4-12. Tool Installation

ADJUSTMENT

This TPU requires no adjustment after disassembling/replacing any parts.

CHAPTER

6

MAINTENANCE

6.1 OVERVIEW

This TPU requires neither regular/irregular maintenance nor lubrication/adhesion after disassembling/replacing any parts.

CHAPTER

7

APPENDIX

7.1 OVERVIEW

This chapter provides information necessary for servicing.

7.1.1 Connector Pin Assignment

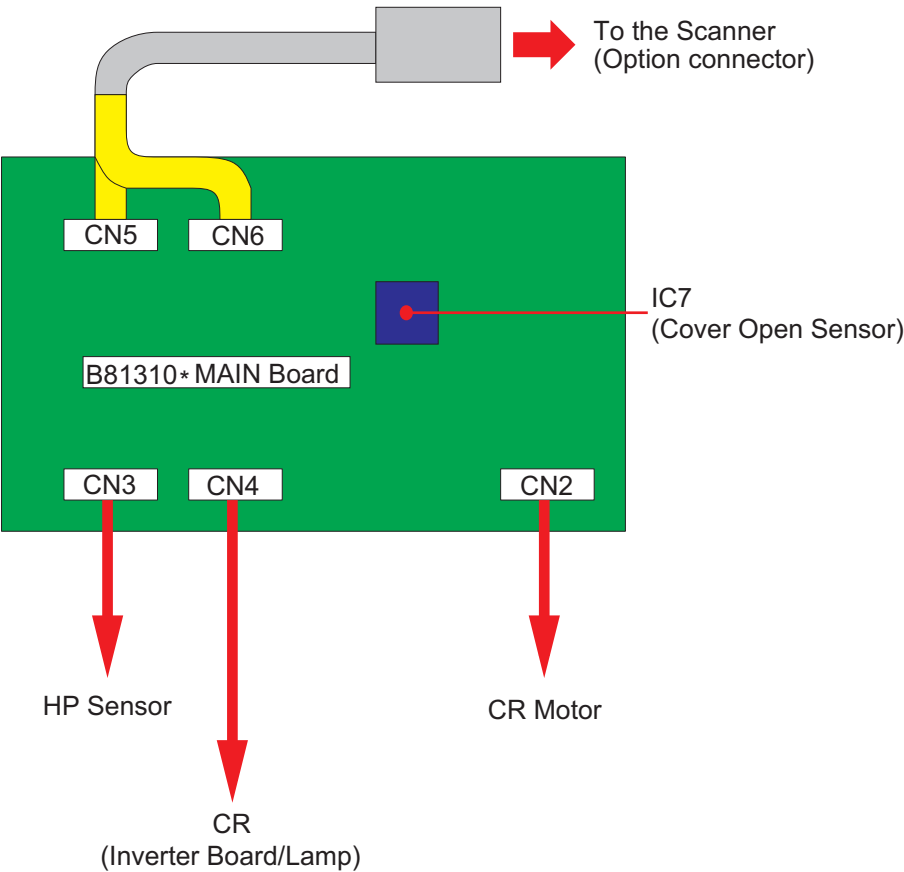


Figure 7-1. Connector Pin Assignment

7.1.2 Connector Summary

Connectors used for the control circuit board (B81310*MAIN Board) are summarized in the table below.

Table 7-1. Connector Summary

CN No.	Function	Ref.
CN2	⇒ CR motor	Page 7-2
CN3	⇒ HP sensor	Page 7-2
CN4	⇒ CR (Inverter Board, Lamp)	Page 7-2
CN5	⇒ Scanner	Page 7-2
CN6	⇒ Scanner	Page 7-2

B81310*MAIN – CN2

No.	Signal Name	Function
1	A	Motor Drive (Phase A)
2	A/	Motor Drive (Phase A/)
3	B	Motor Drive (Phase B)
4	B/	Motor Drive (Phase B/)

B81310*MAIN – CN3

No.	Signal Name	Function
1	HOME	Home position detection signal
2	GND	GND
3	+5V	Power supply voltage (+5V)

B81310*MAIN – CN4

No.	Signal Name	Function
1 – 4	GND	GND
5	Lamp	Lamp drive signal
6 – 9	+24V	Power supply voltage (+24V)

B81310*MAIN – CN5

No.	Signal Name	Function
1	DSW1(HOME)	Home position detection signal
2	DSW2(COVE)	Cover open detection signal
3	+5V	Power supply voltage (+5V)
4	LAMP	Lamp drive signal
5	+5V	Power supply voltage (+5V)
6	TXD	TXD signal (Serial communication)
7	SCK	SCK signal (Serial communication)
8	LOD	Motor drive data set signal
9	SEL	Option detection signal
10	GND	GND

B81310*MAIN – CN6

No.	Signal Name	Function
1	+24V	Power supply voltage (+24V)
2	GND	GND
3	+5V	Power supply voltage (+5V)

7.2 COMPOONENT LAYOUT

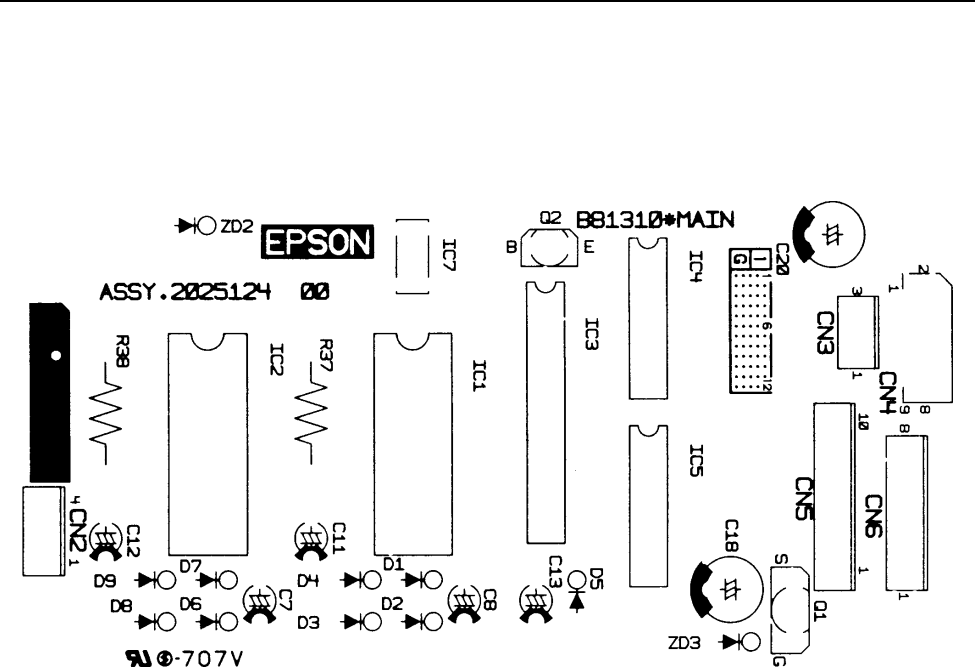


Figure 7-2. Component Layout - B81310*MAIN

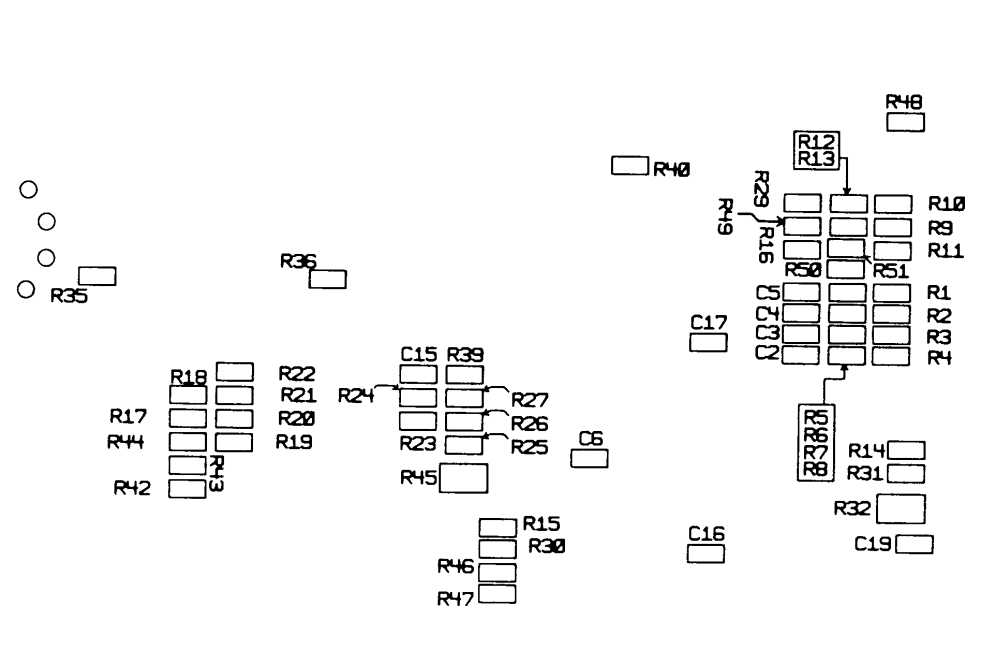


Figure 7-3. Component Layout - B81310*MAIN (Soldered Side)

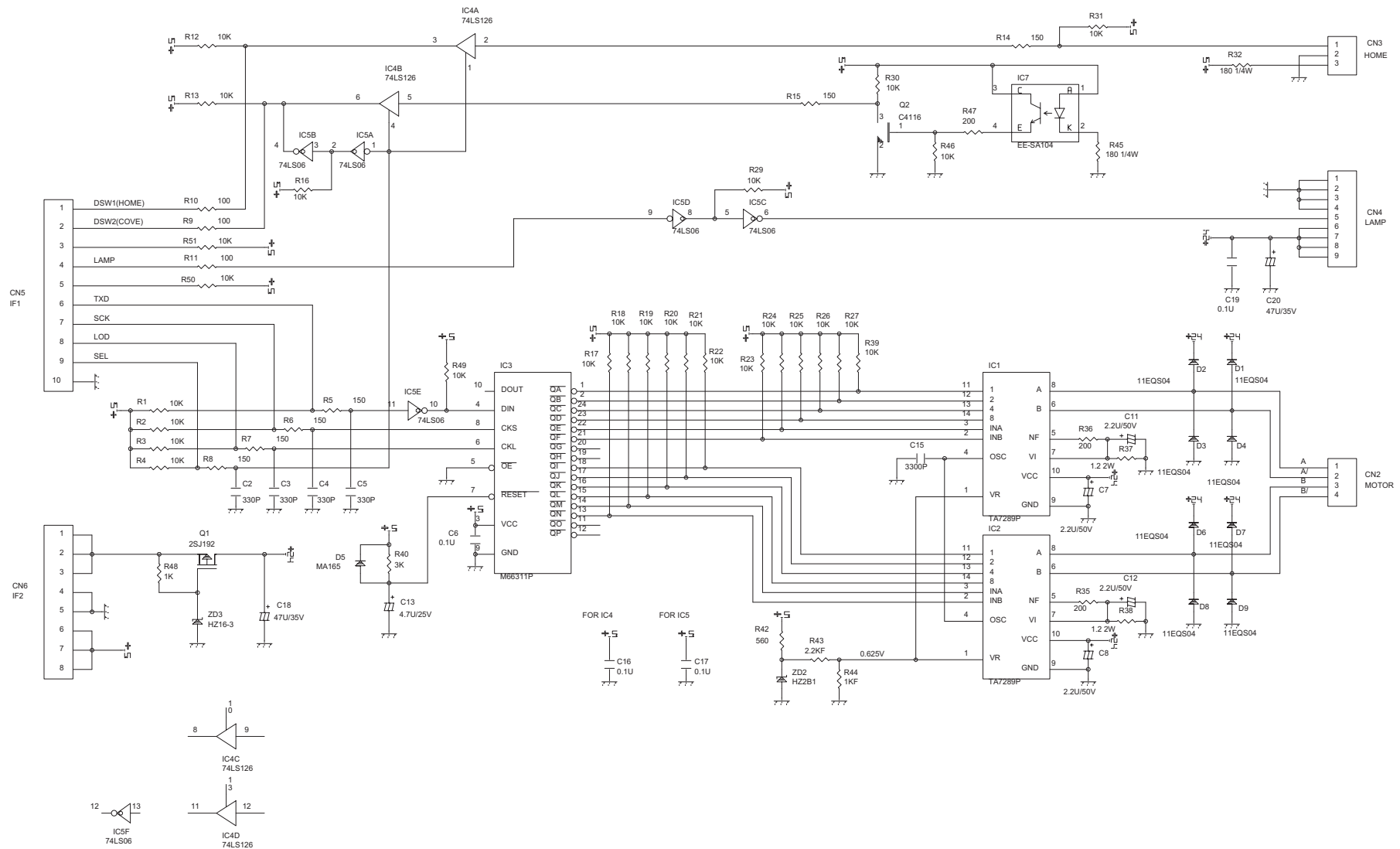
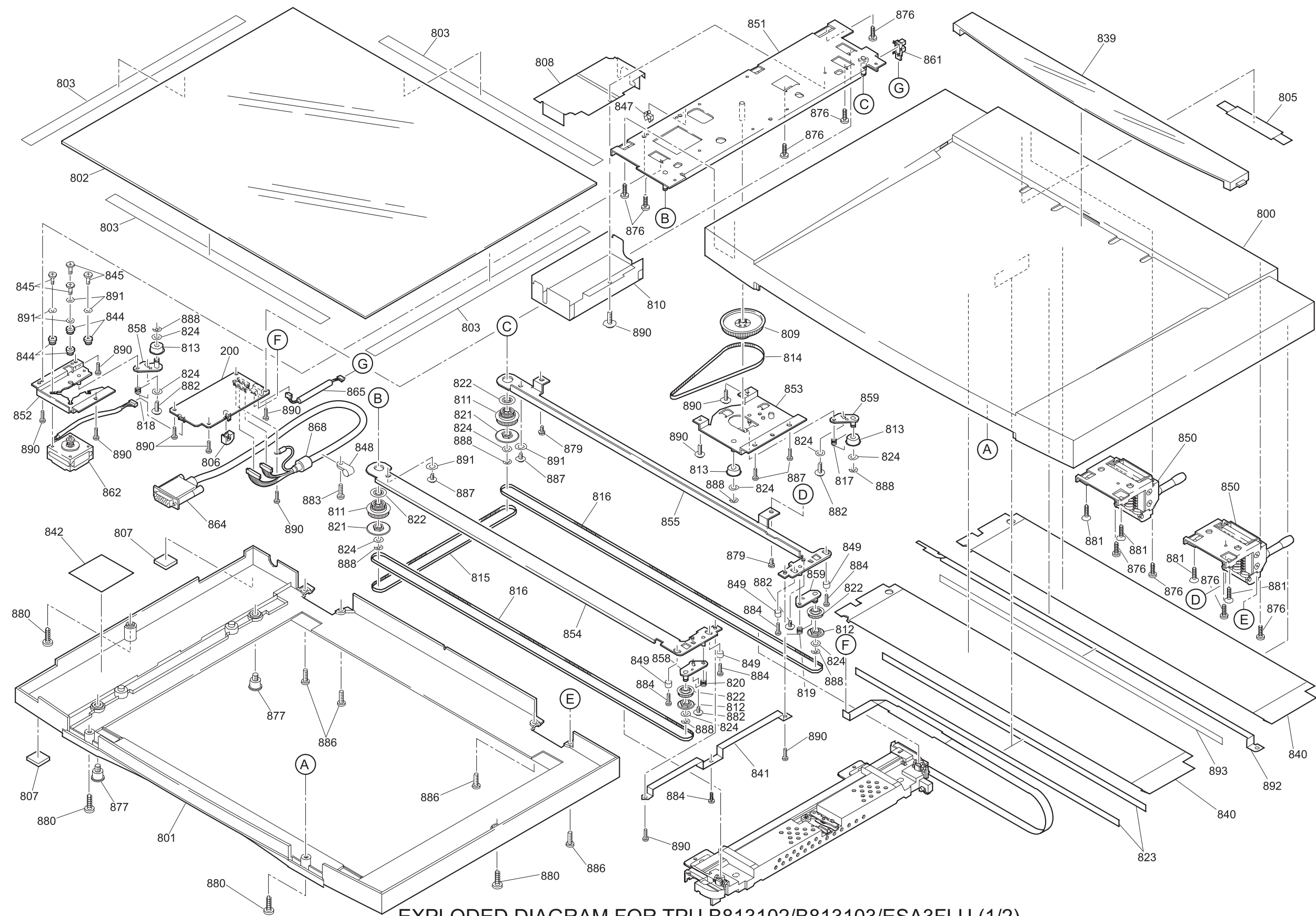


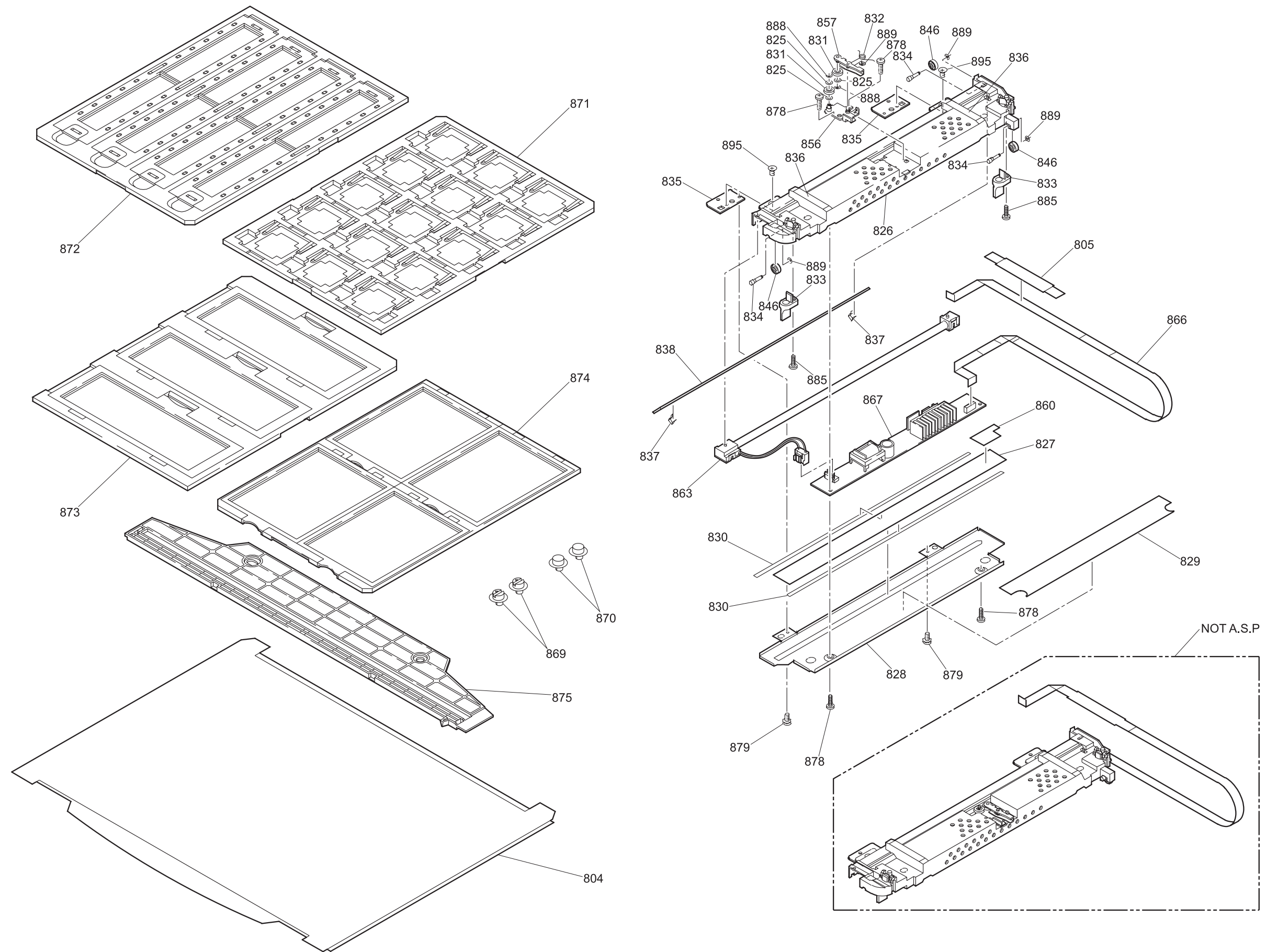
Figure 7-4. Circuit Diagram - B81310*MAIN

7.4 EXPLODED DIAGRAMS



EXPLODED DIAGRAM FOR TPU B813102/B813103/ESA3FLU (1/2)

Figure 7-5. Exploded Diagram (1)



EXPLODED DIAGRAM FOR TPU B813102/B813103/ESA3FLU (2/2)

Figure 7-6. Exploded Diagram (2)