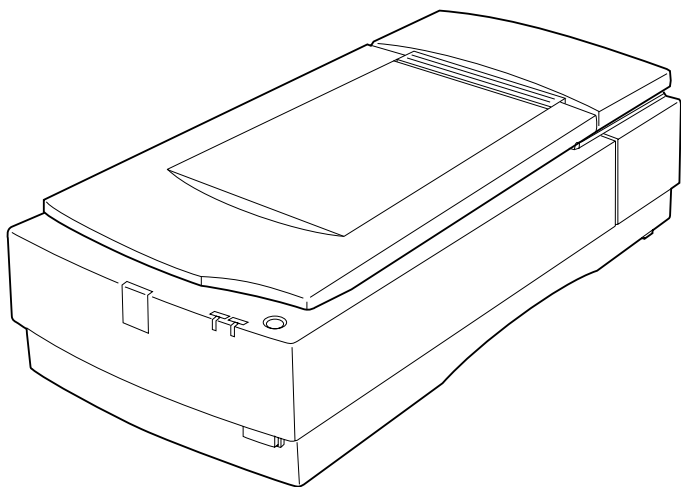


SERVICE MANUAL



Color image scanner

EPSON Expression 1600/1600 Pro



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 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.

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 EPSON Expression 1600/1600 Pro. 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*
- *B109 MAIN Board Component Layout*
- *B109 MAIN Board Circuit Diagram*

Revision Status

Revision	Issued Date	Description
A	October 28, 1999	First Release

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CHAPTER

1

PRODUCT DESCRIPTIONS

1.1 Features

This specifications are applied to the EPSON Color Image Scanner Expression 1600/1600 Pro.

- ☐ The best Color Image Scanner for both graphics and office usage.
 - Maximum document size: 8.5 x 11.7 inches (216 x 297 mm)
 - Scanning speed:
 - Line art =3.1mS/line
 - Gray scale=3.1mS/line
 - Color=9.2mS/line
 - (1600dpi, Draft Mode)
- ☐ High image quality
 - Scanning resolution: 1600dpi(main) x 3200dpi'sub)
 - Pixel depth: In 12bit, Out 1-12bit
 - Max. OD Value: 3.3D
 - Focus control: 2position
- ☐ Many types of IF available
 - SCSI (Standard)
 - USB (Standard)
 - IEEE 1394 Board (Optional)
- ☐ Start bottom
 - Starts scanning (In case of network connection)
 - Wakes up scanner application software (In case of local connection)
- ☐ Command Level
 - ESC/I-B8
 - FS
- ☐ Option
 - ADF (Same as the GT-9600's)
 - TPU (Same as the GT-9600's, but Film holder is added)
 - IEEE 1394 Board

1.2 Specifications

GENERAL SPECIFICATIONS

- ☐ Product type: Flatbed Color Image Scanner
- ☐ Sub-scanning method: Movement of the Scanner-Head
- ☐ Photoelectric device: Alternative 6-line CCD (40800 pixel)
- ☐ Maximum document size: 8.5 x 11.7 inches (216 x 297 mm)
- ☐ Maximum picture element: 13,600(main) x 18,720(sub) pixels (1600dpi)
- ☐ Scanning Resolution:
 - Main: 1600dpi (Optical resolution by 6 line CCD with 40800 pixel)
 - Sub: 3200dpi with micro step
- ☐ Output resolution: 50 ~ 4800dpi (1dpi step)
- ☐ Pixel depth: In 12-bit / pixel, Out 1-12bit/pixel
- ☐ Color separation method: By the color filter of CCD
- ☐ Zoom: 50 ~ 200% (1% step)
- ☐ Scanning speed (1600dpi,Draft Mode):
 - Color: 9.2ms/line
 - Monochrome: 3.1ms/line
- ☐ Command level: ESC/I-B8, FS
- ☐ Image processing functions:
 - Gamma correction: CRT (A, B)
Printer (A, B, C)
User Defined Table
 - Color correction: Impact Dot Printer
Thermal Printer
Ink Jet Printer
CRT Display
User Defined Matrix

Brightness: 7 levels

Line art: Fixed threshold
TET

Halftone: Error diffusion (A, B, C)
Dither (A, B, C, D)
User defined dither (A, B)

Area separation: AAS

- ☐ Interface:
- SCSI (50-contact high-density connector, standard)
- USB (Type-B Receptacle Connector, standard)
- IEEE 1394 Serial Bus Interface (Optional)
- ☐ Light source: Xenon gas fluorescent lamp

ELECTRICAL SPECIFICATIONS

- ☐ Rate voltage: Universal Power Supply
AC100-120V
AC220-240V
- ☐ Input voltage: AC100-120V \pm 10%
AC220-240V \pm 10%
- ☐ Rated current: 0.8 A (Input AC110V)
0.4 A (Input AC220V)
- ☐ Rated frequency range: 50-60Hz
- ☐ Input frequency range: 49.5-60.5Hz
- ☐ Power consumption: Approx.30 W (without optionan unit)
Approx.50 W (without optionan unit)
Approx.10 W (without optionan unit)
- ☐ Insulation resistance: 10MW at 500VDC
(between AC line and chassis)
- ☐ Dielectric strength: AC1.2kV, 1min
(between AC line and chassis)

SAFETY, EMC, EPA

- ☐ Safety: UL1950 (+D3): USA
CSA C22.2 NO.950 (+D3): Canada
EN60950 (VDE)
IEC950 (ROSTEST, PSB)
- ☐ EMC: FCC Part15 Subpart B Class B: USA
CSA C108.8 Class B: Canada
AS/NZS3548 Class B: Australia
CISPR Pub22 Class B: Korea
CNS13438 Class B: Taiwan
- ☐ CE marking:
Low Voltage Directive 73/23/EEC EN60950
MC Directive 89/336/EEC EN55022 Class B
EN61000-3-2
EN61000-3-3
EN 50082-1
IEC 801-2
IEC 801-3
IEC 801-4
- ☐ EPA: Energy Star Program API=On

RESISTANCE TO ELECTRIC NOISE

- ☐ Static electricity: Panel 10kV
Metal 7kV/150pF, 150W

ENVIRONMENTAL CONDITIONS

- ☐ Temperature: Operating 5 ~ 35°C
Storage -25 ~ 60°C
- ☐ Humidity: Operating 10 ~ 80%, no condensation
Storage 10 ~ 85%, no condensation

RELIABILITY

- ☐ Main unit: MCBF 100,000 cycle
clear CSA C108.

OPERATING CONDITIONS

- ☐ Dust:
- Ordinary office or home conditions. Extreme dust should be avoided.
- ☐ Illumination:
- Operation under direct sunlight or near strong light source is not guaranteed and should be avoided.

DOCUMENT

- ☐ Reflective type:
- Documents which has a smooth surface such as a printing and photograph.

1.3 Interfaces

This section includes the specifications for the interfaces equipped with this scanner.

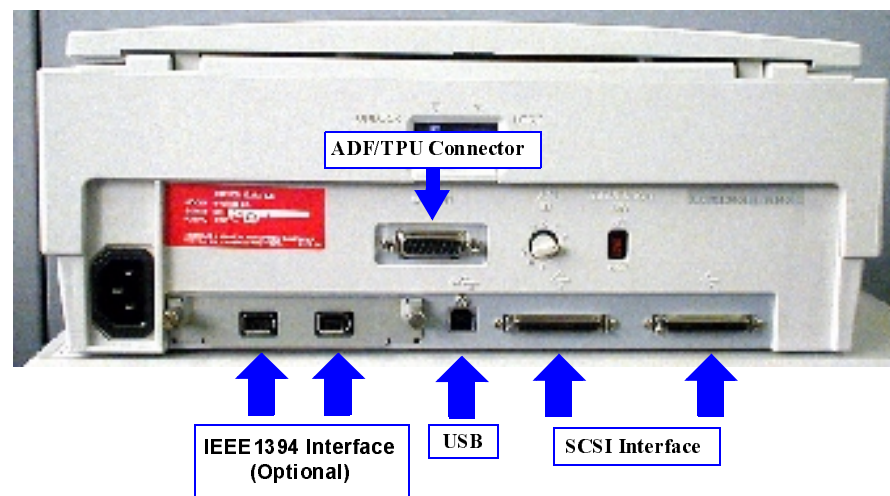


Figure 1-1. Interface Location

1.3.1 SCSI Interface

See the GT-10000 Service Manual / Section 1.3.1 for the specifications and functions of the SCSI Interface equipped with the Expression 1600/1600 Pro.

1.3.2 USB Interface

☐ Basic specifications

- Device:
 - Class: Vender specific
 - Sub class: Vender specific
 - Protocol: Vender specific
 - Maximum packet size for end point 0: 0x04B8
 - Product ID: 0x0107
 - Number of formation: 1
- Configuration:
 - Alternate setting value: None
 - Number of end points: 2
 - Class: Vender specific
 - Sub class: Vender specific
 - Protocol: Vender specific
- End point 1: Bulk IN transmission
 - Maximum packet size: 64 byte
- End point 2: Bulk OUT transmission
 - Maximum packet size: 64 byte
- String descriptor: Manufacturer: EPSON
 - Product name: Expression 1600/1600 Pro

☐ Electrical specifications: Compliant with the high speed mode (12Mbps)

☐ Connector: B receptacle (1)

☐ Pin arrangement, Pin assignment:

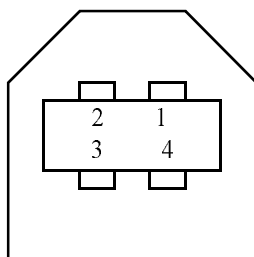


Table 1-1. USB Pin Assignment

Pin No.	Signal
1	VCC
2	-Data
3	-Data
4	GND

1.3.3 IEEE1394 Serial Bus Interface

Refer to the IEEE 1394 optional board service manual.

1.4 Buttons and Lamps

1.4.1 Buttons

The buttons equipped with this scanner and their functions are as shown below:

Table 1-2. Buttons and Functions

Buttons	Functions
Operate switch	<ul style="list-style-type: none"> Turns the scanner ON and OFF. Initializes the scanner when the scanner power is turned on.
Start bottom	<ul style="list-style-type: none"> Starts scanning (In case of network connection) Starts scanner application software (In case of local connection)
SCSI ID switch (Rotary switch)	<ul style="list-style-type: none"> 0 ~ 7: SCSI ID (Factory default ID=2) Others: Reserved
Terminator switch	Sets the SCSI terminator. <ul style="list-style-type: none"> ON: Terminator on (Default) OFF: Terminator off

See the figures below for the locations of the buttons and switches.

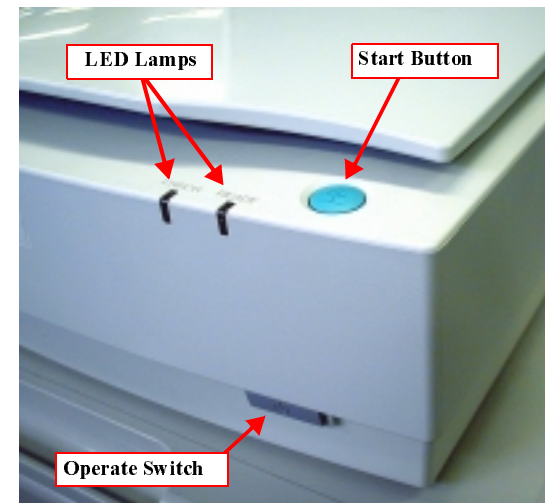


Figure 1-2. Location of the Button and Switches

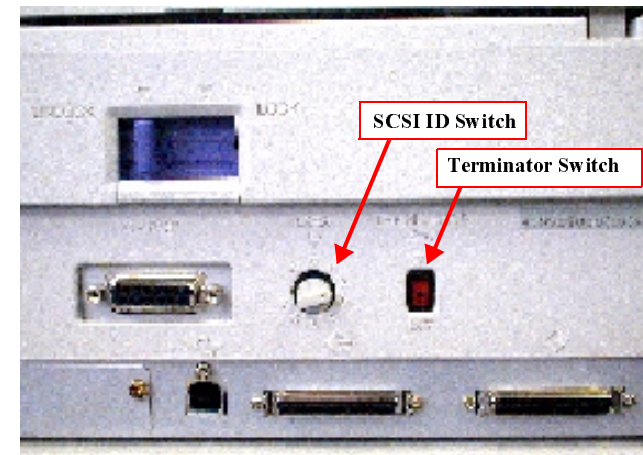




Figure 1-3. Locations of the SCSI/Terminator Switches

1.4.2 Indicators



The table below lists the indicator lamps equipped with this scanner. (See Figure 1-1 for the location.)

Table 1-3. Lamps and their Functions

Lamps	Functions
 READY (Green LED)	<ul style="list-style-type: none"> Lights up when the scanner is ready to send and receive data. During scanning, goes on and off in accordance with data transmission. Blinks in combination with the ERROR LED when an error occurs.
 ERROR (Red LED)	Indicates an error condition.

The scanner shows several error conditions by turning on/off each lamp as shown in the table below:

Table 1-4. Error Indication by LEDs

 READY (Green LED)	 ERROR (Red LED)	Error Type
Lights up	Lights up	Command Error
Off	Blinks	Interface Error
Blinks	Blinks	Fatal Error
Off	Off	Option Error

1.4.3 Physical Specifications

☐ External view

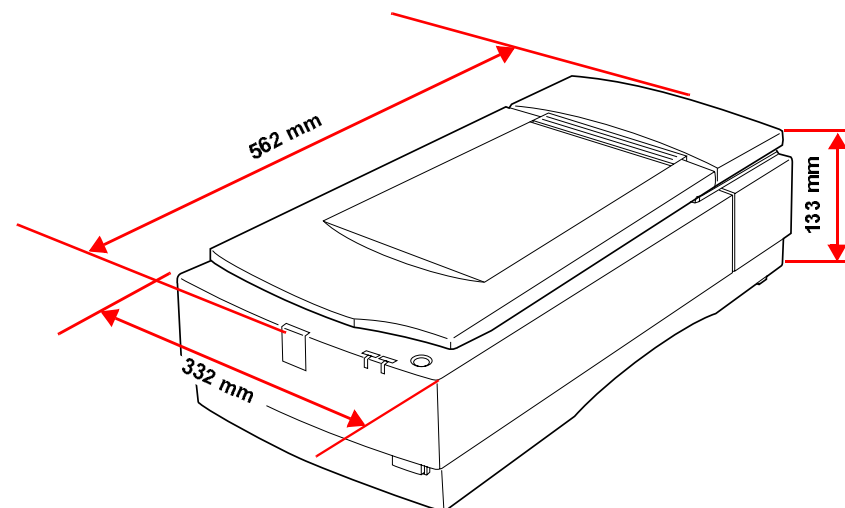


Figure 1-4. External View of the Expression 1600/1600 Pro

☐ Dimensions: 332 x 562 x 133 mm (W x D x H)
☐ Weight: Approximately 8.5kg

1.4.4 Scanning Area

The effective scanning area of the scanner is 216 x 297 mm (main scan x sub scan). See the figure below:

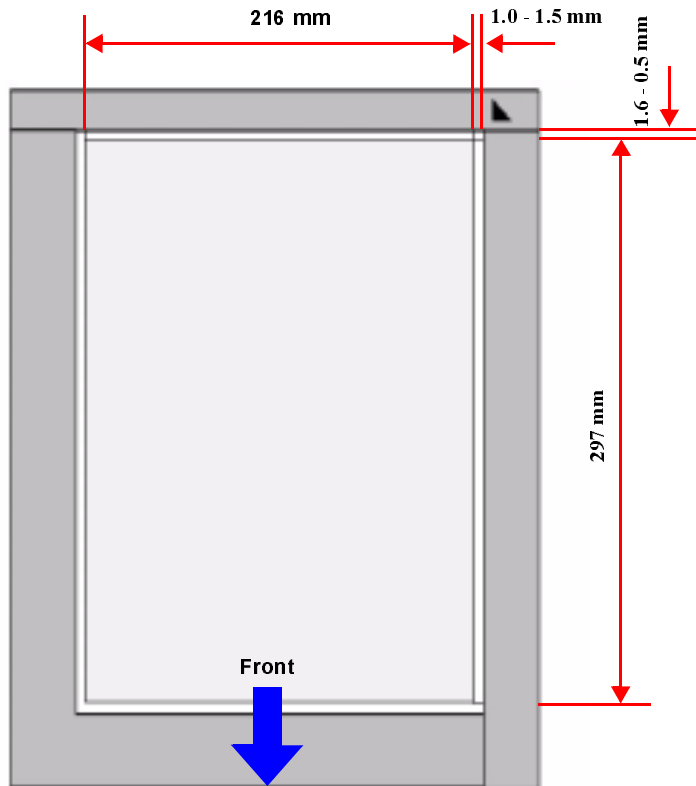


Figure 1-5. Maximum Scanning Area

1.5 Control Codes and Commands

The control codes and commands of the scanner are as listed in the following table:

Table 1-5. Control Code Commands

Classification	Name	Code
Command	ID request	ESC I
	status request	ESC F
	extended status request	ESC f
	request command parameters	ESC S
	start scanning	ESC G
	Push Button status request	ESC !
	extended ID request	FS I
	scanner status request	FS F
	scanning parameter request	FS S
	start new scanning	FS G
Set data form	set data format	ESC D i
	set resolution	ESC R n1 n2
	set zooming	ESC H i1 i2
	set scanning area	ESC A n1 n2 n3 n4
	set color	ESC C i
	set mirroring	ESC K i
	set scanning parameter	FS W
Correction	set brightness	ESC L i
	set gamma correction	ESC Z i
	down load gamma table	ESC z i d[256]
	set sharpness control	ESC Q i

Table 1-5. Control Code Commands (continued)

Classification	Name	Code
Image disposition	set half-tone processing	ESC B i
	set auto area segmentation	ESC s i
	down load dither pattern	ESC b i j d[j^2]
	set color correction	ESC M i
	down load color correction	ESC m d[9]
Support, and others	set threshold	ESC t i
	set scanning mode	ESC g i
	initialize	ESC @
	set line counter	ESC d i
	option control	ESC e i
	set film type	ESC N i
	set focus position	ESC p i
	request focus position	ESC q
	eject paper	FF
Control	normal response	ACK
	abnormal response	NACK
	stop scanning	CAN
	header	STX

1.6 Errors

COMMAND ERROR

[Cause] Unidentified command is detected.

[Disposition] The scanner sends NACK and waits for the next command. When the scanner receives a wrong command or parameter, it disregards a value and maintains the former value.

[Indicator] READY LED lights up.
ERROR LED lights up.

[Remedy] The error condition is cleared when the scanner receives a correct command.

INTERFACE ERROR

[Cause] Wrong operation in the communication procedure is detected.
In case of SCSI, a time-out error occurred.

[Disposition] The lamp goes off and the operation stops.

[Indicator] READY LED goes off.
ERROR LED blinks.

[Remedy] Turn the scanner off and then back on.
The RESET signal of SCSI is asserted.

[Acceptable commands] None

FATAL ERROR

[Cause] The lamp is broken.
Power is turned on before removing the transportation lever.
System breakdown.

[Disposition] The lamp goes off and the operation stops.
The bit 7 of the status byte is set.

[Indicator] READY LED blinks.
ERROR LED blinks.

[Remedy] Turn the scanner off and then back on.
Send Initialize command code (ESC @) to the scanner.
Complete BUS DEVICE RESET message in SCSI.
The RESET signal of SCSI is asserted.

[Acceptable commands] ESC F, ESC f, ESC @, FS F

OPTION ERROR (In Case Option Unit is Installed)

[Cause] Unit cover is open.
Paper empty condition

[Disposition] The bit7 of the status byte is set.

[Indicator] READY LED goes off.
ERROR LED goes off.

[Remedy] Remove the cause of the error condition.

CHAPTER

2

OPERATING PRINCIPLES

2.1 Mechanism Operating Principles

The mechanism operating principles of the EPSON Expression 1600/1600 Pro are basically the same as for the GT-9500 and GT-9600. This section, therefore, only includes the items that are specific to this scanner. For the rest of the chapter, please see the GT-9600/9500 Service Manual.

2.1.1 Fixed Type Two Focuses Mechanism

As shown in Figure 2-1, this scanner uses the fixed type two focuses mechanism when used with an optional transparency unit. Instead of the automatic focusing mechanism, as used in other scanners, this scanner has the focusing mechanism that consists of the rotating focus glass, drive motor, and so on.

During normal scanning that uses the document glass, the focus glass is held up to enable the incident light to focus on the document glass. When “TPU” is selected on the user’s application, however, the focus glass lowers 90°, driven by the specified motor, to be set between the first glass and second glass. This operation shifts the light path to raise the focusing point 2.5 mm from the document glass, which allows the scanner to focus on the TPU’s film scanning surface.

Figure 2-1 illustrates the focusing mechanism of the Expression 1600/1600 Pro.

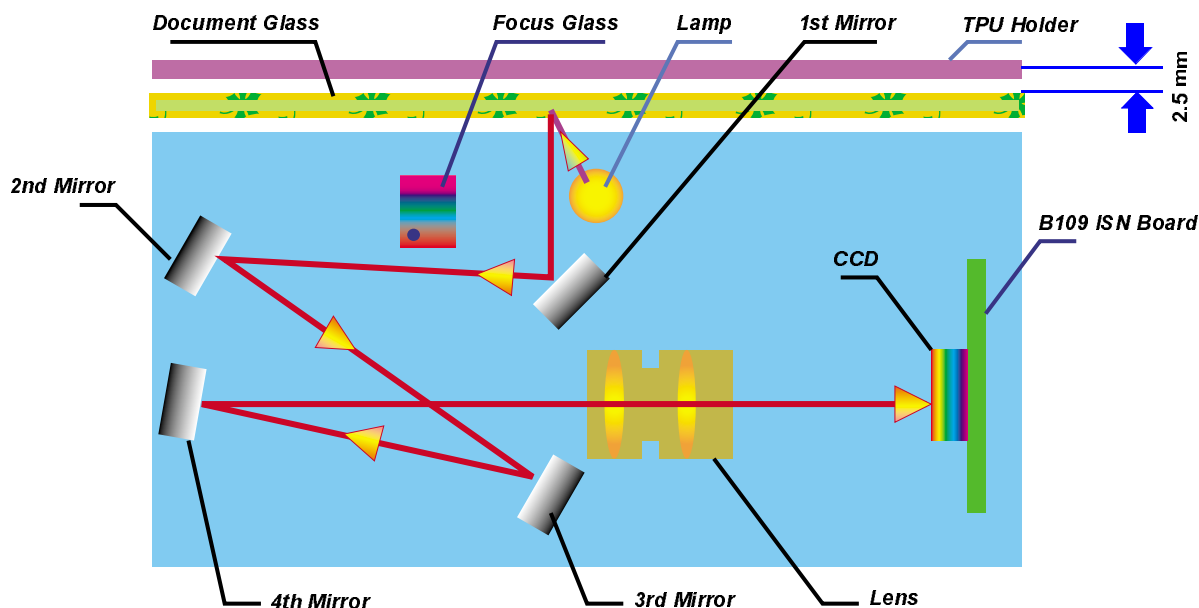


Figure 2-1. Focusing Mechanism of the Expression 1600/1600 Pro

2.2 Control Circuit Operation

The control circuit of the scanner is composed of the following electrical circuit boards:

- B109 ISN Board (CCD sensor control board / Attached on the CR)
- B109 MAIN Board (main control circuit board)
- B109 PSH Board (power supply control board)
- B109 SUB Board
- B109 SUB-B Board (Push switch and LED control circuit board)
- B109 SUB-C Board (Operate switch board)
- B109 SUB-D Board (Relay board)
- B80834* I/F Board (IEEE1394 I/F control board)

See Figure 2-2 for the block diagram of these control circuits.

The following tables show the major elements of each circuit board.

B109 ISN BOARD

Table 2-1. Major Elements - B109 ISN Board

Name	Location	Description
CCD Sensor (T8D38)	IC1	Color CCD Linear Sensor <ul style="list-style-type: none"> • 24-pin DIP/2.5-mm pitch • Power supply voltage: 12.0 V \pm 5% • 7500 pixels x 6 lines
AFE (VSP3010Y)	IC2	Manages the following: 12bit 6MHz A/D convertor, 3CH CDS, 5bit PGA, and 8bit offset correction DAC. <ul style="list-style-type: none"> • 48-pin QFP/0.5-mm pitch • Power supply voltage: 5.0 V \pm 6% • Gain = 1 - 13dB • DAC = 150mV - +50mV

B109 MAIN BOARD

Table 2-2. Major Elements - B109 MAIN Board

Name	Location	Description
CPU (HD6412350F20)	IC1	Manages the following: Interruption controller, DMA controller, Serial I/O, Timer unit controller, General I/O port control, DA convertor, and Data transfer controller. <ul style="list-style-type: none"> • Operates at 20MHz. • Operation mode: Mode 5 • 128-pin QFP/0.5-mm pitch • Power supply voltage: 5.0 V \pm 10% • Maximum consumption current: 95mA
ROM for CPU (M27C1001-10F)	IC2	Program area of the firmware. <ul style="list-style-type: none"> • 128K*8Bit • 32-pin 600mil DIP/2.54-mm pitch • Power supply voltage: 5.0 V \pm 10% • Maximum consumption current: 30mA • Maximum access time: 100ns
SRAM for CPU (IS61C256AH-15J)	IC3	Work area of the firmware. <ul style="list-style-type: none"> • 32K*8Bit • 32-pin 300mil SOJ/1.27-mm pitch • Power supply voltage: 5.0 V \pm 10% • Maximum consumption current: 1.5W • Maximum access time: 15ns
T-Rex (E02A31EA)	IC5	ASIC managing CCD control, line correction, image processing, buffer control, and so on. <ul style="list-style-type: none"> • Operates at 40MHz. (SDRAM control area: 80MHz) • 208-pin HQFP/0.5-mm pitch • Power supply voltage: 3.3 V \pm 0.3V

Table 2-2. Major Elements - B109 MAIN Board (continued)

Name	Location	Description
SRAM for image processing (IS61C256AH-15J)	IC6/7	Work area of the firmware. <ul style="list-style-type: none"> • 32K*8Bit*2 • 28-pin 300mil SOJ/1.27-mm pitch • Power supply voltage: 5.0 V \pm 10% • Maximum consumption current: 1.5W • Maximum access time: 15ns
SDRAM for image processing (MB81F64B42C-103FN-C)	IC8/9	Data area for the T-Rex image processing and output buffer for the T-Rex. <ul style="list-style-type: none"> • Operates at 95MHz. • 2M*8Bit*2 • 54-pin TSOP/0.5-mm pitch • Power supply voltage: 3.3 V \pm 0.3V • Maximum consumption current: 1.0W • Maximum access time: 6ns
CR motor driver (A3957SLBTR)	IC10/11	Scanner carriage motor driver <ul style="list-style-type: none"> • 24-pin SOP/1.27-mm pitch • Power supply voltage: <ul style="list-style-type: none"> Logic: 5.0 V \pm 10% Motor: 24V (5V - 50V)
SCSI controller (SPC7211F0B)	IC12	SCSI-2 I/F controller <ul style="list-style-type: none"> • Operates at 40Mhz • 80-pin QFP/0.5-mm pitch • Power supply voltage: <ul style="list-style-type: none"> I/O area = 5.0 V \pm 10% Internal area = 3.3 V \pm 0.3V
SCSI terminator (BH9596FP-YE2)	IC13	Active terminator of SCSI-2 I/F controller <ul style="list-style-type: none"> • 25-pin SOP/0.8-mm pitch • Power supply voltage: 5.0 V \pm 10%
USB controller (E02A29BB)	IC14	USB interface controller <ul style="list-style-type: none"> • Operates at 24MHz • 100-pin QFP/0.5-mm pitch • Power supply voltage: 3.3 V \pm 0.3V • Input voltage: 5.0 V \pm 10%

B109 PSH BOARD

Power supply specifications of B109 PSH Board are as shown in the table below:

Table 2-3. B109 PSH Board Power Supply Specifications

Destination	DC Output Voltage	Standby Current	Rated Current
<ul style="list-style-type: none"> • Logic line • Carriage HP sensor • LED power 	5 \pm 0.2 V	0.8A	1.5A
CCD drive/amplifier	15 \pm 0.8 V (12V)	0.2A	0.3A
<ul style="list-style-type: none"> • Carriage motor drive • Lamp drive 	24 \pm 2.4 V	0.05A	1.5A

B109 USB BOARD

- ☐ Supports connectors for optional device interfaces.
- ☐ Supports SCSI ID switch.
- ☐ Supports the SCSI terminator switch

B109 SUB-B BOARD

- ☐ Supports the push switch.
- ☐ Supports the READY LED (green) and ERROR LED (red).

B109 SUB-C BOARD

- ☐ Controls on/off operation of the operate switch.

B109 SUB-D BOARD

- ☐ A relay board that connects B80834* I/F Board to B109 MAIN Board.

B80834* I/F BOARD (OPTIONAL)

- ☐ CPU (IC8): HD6412350F20

- ☐ IEEE-1394 LINK (IC9): MN864400
- ☐ IEEE-1394 PHY (IC12): TSB41LV03

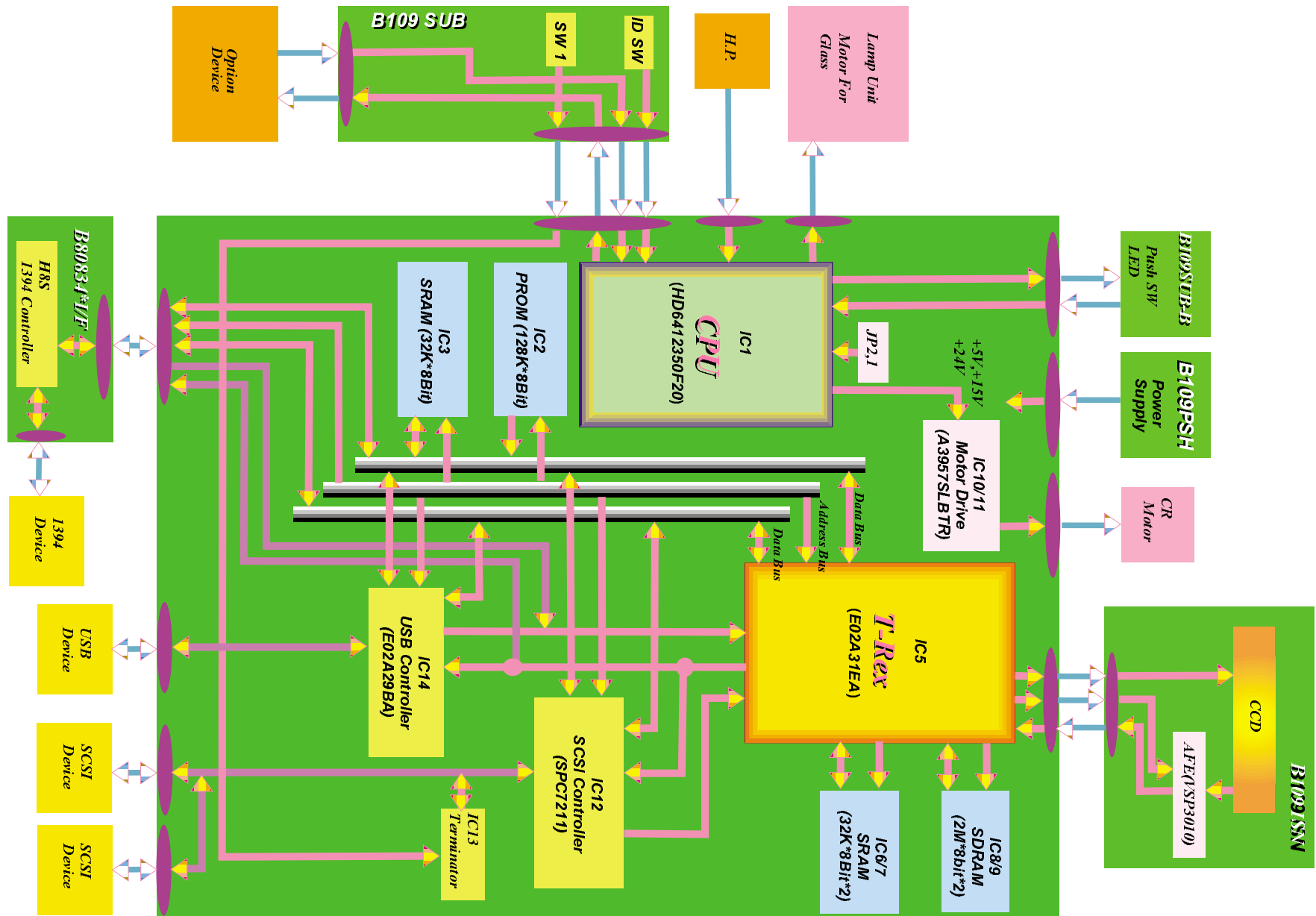


Figure 2-2. Control Circuit Block Diagram

CHAPTER

3

TROUBLESHOOTING

3.1 Overview

Since the scanner mechanism and the electrical circuits of this scanner are similar to the GT-9500's, you can solve most problems by referring to the GT-9500 Service Manual. Therefore, this chapter only provides causes and remedies for fatal errors.

In order to find out any wrong status of the motor or sensor by measuring, the signal specifications of CR Moto and HP Sensor are shown as follows.

Table 3-1. Resistance of CR Motor

Name of Motor	Resistance
CR Motor	• $3.6 \Omega \pm 10\%$ (25 °C)

Table 3-2. Sensor's Status

Name of Sensor	Test Point	Signal Level	Status
HP Sensor	• CN3 / Pin 1	• High (5V)	• Inside Home Position
		• Low (GND Level)	• Inside Home Position

The following tables separately provides the error conditions and remedies for the scanner, ADF, and TPU.

ERROR CONDITIONS - SCANNER BODY

Table 3-3. Error Conditions - Scanner Body

Occurs when:	Conditions	Causes	Remedies
Carriage is reset.	HP is not detected.	<ul style="list-style-type: none"> • HP sensor is defective or not connected properly. • Carriage lock lever is still locked. • Motor cable is not connected properly. • Motor is defective. 	<ul style="list-style-type: none"> • Connect the HP sensor cable properly or replace the HP sensor. • Release the carriage lock lever. • Connect the motor cable properly. • Replace the motor.
Lamp check at power on	Lamp check is not completed after 30 seconds.	<ul style="list-style-type: none"> • Lamp has blown out or is defective. • FFC is not connected properly. 	<ul style="list-style-type: none"> • Replace the lamp. • Connect the FFC properly.
Automatic light level correction	<ul style="list-style-type: none"> • Maximum outputs of all sensors are lower than 20LSB. • CCD's accumulated time is 100 microseconds or less. • CCD's accumulated time is 20 milliseconds or more. • Automatic light level correction is not completed after 30 seconds. 	<ul style="list-style-type: none"> • Lamp is defective. • Life end of the lamp • Carriage adjustment is not correctly done. 	<ul style="list-style-type: none"> • Replace the lamp. • Replace the carriage.
Image reading is completed.	HP is not detected.	<ul style="list-style-type: none"> • HP sensor is defective. • HP sensor cable is not connected properly. 	<ul style="list-style-type: none"> • Replace the HP sensor. • Connect the HP sensor cable properly.

ERROR CONDITIONS - ADF (OPTION)

Table 3-4. Error Conditions - ADF

Occurs when:	Conditions	Causes	Remedies
Scanner is being initialized.	<ul style="list-style-type: none"> Registration sensor is turned on. Paper eject sensor is turned on. 	<ul style="list-style-type: none"> Paper is jamming. Registration sensor / Paper eject sensor is defective or its cable is not connected properly. Switch lever is damaged. Motor cable is not connected properly. 	<ul style="list-style-type: none"> Remove the jammed paper. Connect the sensor cable properly or replace the sensor. Replace the sensor lever. Connect the motor cable properly.
Scanner is reading image or ejecting paper.	Small cover open sensor is off.	<ul style="list-style-type: none"> Top cover of the ADF is open. Small cover sensor is defective. 	<ul style="list-style-type: none"> Close the small cover. Replace the sensor.
	Cover open sensor is off.	<ul style="list-style-type: none"> ADF is open. Cover open sensor is defective. 	<ul style="list-style-type: none"> Close the ADF. Replace the sensor.
	<ul style="list-style-type: none"> Registration sensor does not turn on or off. Paper eject sensor does not turn on or off. 	<ul style="list-style-type: none"> Paper is jamming. Registration sensor / Paper eject sensor is defective. Switch lever is damaged. 	<ul style="list-style-type: none"> Remove the jammed paper. Replace the sensor. Replace the switch lever.

ERROR CONDITIONS - TPU (OPTION)

Table 3-5. Error Conditions - TPU

Occurs when:	Conditions	Causes	Remedies
Resetting the lamp unit.	<ul style="list-style-type: none"> HP is not detected. 	<ul style="list-style-type: none"> HP sensor is defective. Lamp unit is still secured with the fixing screw. 	<ul style="list-style-type: none"> Replace the HP sensor. Remove the screw and mount it to the storage position.
Lamp check at power on	Lamp check is not completed after 30 seconds.	<ul style="list-style-type: none"> TPU lamp has blown out. Foreign matter is lodged on the smaller glass of the scanner. 	<ul style="list-style-type: none"> Replace the TPU lamp. Remove the foreign matter from the glass.
Automatic light level correction	<ul style="list-style-type: none"> Maximum outputs of all sensors are lower than 20LSB. CCD's accumulated time is 100 microseconds or less. CCD's accumulated time is 20 milliseconds or more. Automatic light level correction is not completed after 30 seconds. 	<ul style="list-style-type: none"> TPU lamp is defective. Life end of the TPU lamp Ferris matter is lodged on the small glass. 	<ul style="list-style-type: none"> Replace the TPU lamp. Remove the foreign matter from the glass.
Image reading begins.	<ul style="list-style-type: none"> Cover open sensor is off. 	<ul style="list-style-type: none"> TPU is open. Cover open sensor is defective or its cable is not connected properly. 	<ul style="list-style-type: none"> Close the TPU. Replace the sensor or connect the cable properly.
Image reading is over.	Carriage does not return to the home position.	<ul style="list-style-type: none"> HP sensor in the scanner is defective. 	<ul style="list-style-type: none"> Replace the HP sensor.
Before scanning image	Scanned image is senile.	<ul style="list-style-type: none"> Motor for controlling Focus Glass is out of order. 	<ul style="list-style-type: none"> Replace the Motor.

CHAPTER

4

DISASSEMBLY AND ASSEMBLY

4.1 Overview

This chapter explains how to disassemble the major units and components of the Expression 1600/1600 Pro. Since the scanner's components and units are basically the same as for the GT-9500 and GT-9600, items that are specific to this scanner are only provided here. Unless otherwise specified, assembly can be performed by reversing the disassembly procedures.



Never disassemble/assemble the scanner before disconnecting the AC power cable.



- Make sure the carriage lock lever is set to “UNLOCK” side (=carriage is released) when disassembling the scanner or performing operation check.
- When returning the scanner to the customer after disassembly/assembly, be sure to set the carriage lock lever to “LOCK” side (=carriage is fixed).



4.1.1 Tools

The tools used to service on this scanner are as listed in the table below:

Table 4-1. Tool List

Description	Availability	Code
Phillips screw driver (No.2)	Commercial	B743800200
Tweezers	Commercial	B641000100
Box screw driver (5mm)	Commercial	
Pliers	Commercial	B740400100

4.2 Disassembly Procedures

This section only provides disassembly procedures specific to the Expression 1600/1600 Pro.

4.2.1 LED Board Removal

1. Remove "DOCUMENT COVER".
2. Remove "HOUSING, UPPER". (See the GT-9500 Service Manual / Section 3.2.1.)
3. Disconnect the harness from CN1 and remove the one screw (CBS, 3x12). Then remove the LED Board from "HOUSING, LOWER". (See Figure 4-1.)

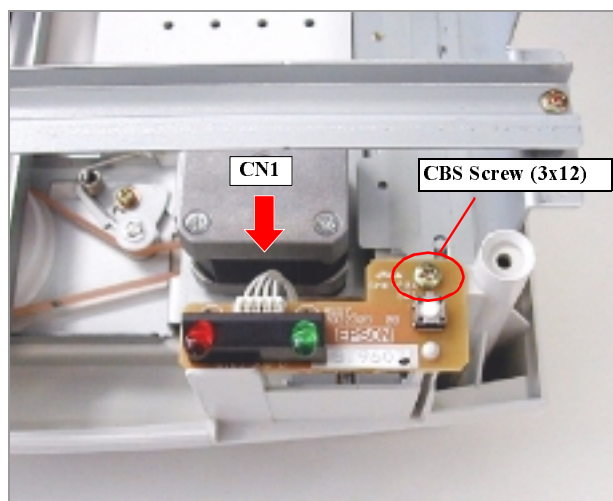


Figure 4-1. LED Board Removal

4.2.2 Operate Switch Board Removal

1. Remove "DOCUMENT COVER".
2. Remove "HOUSING, UPPER". (See the GT-9500 Service Manual / Section 3.2.1.)
3. Remove the LED Board. (Refer to Section 4.2.1.)
4. Remove the "KEY TOP, POWER SWITCH". (See Figure 4-2.)
5. Disconnect the harness from CN1, remove the one screw (CBS, 3x12), and then remove the Operate Switch Board from "HOUSING, LOWER".

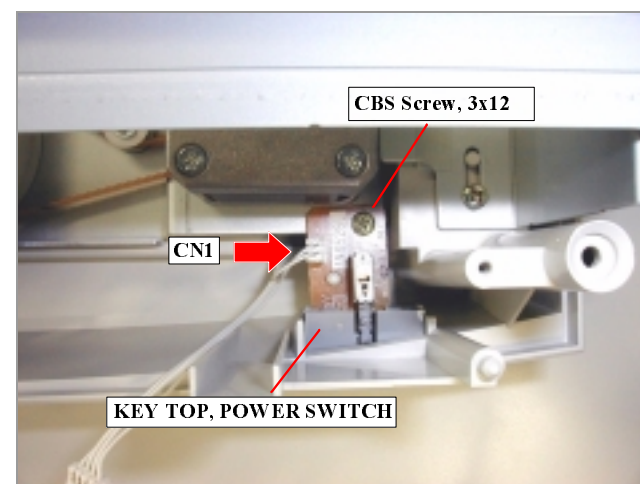


Figure 4-2. Operate Switch Board Removal

4.2.3 “GLASS ASSEMBLY, FOCUS” Removal

1. Remove “HOUSING, UPPER”. (See the GT-9500 Service Manual / Section 3.2.1.)
2. Remove the Lamp Assembly. (See the GT-9500 Service Manual / Section 3.2.5.)
3. Remove “COVER, LAMP”. (See Figure 4-3.)

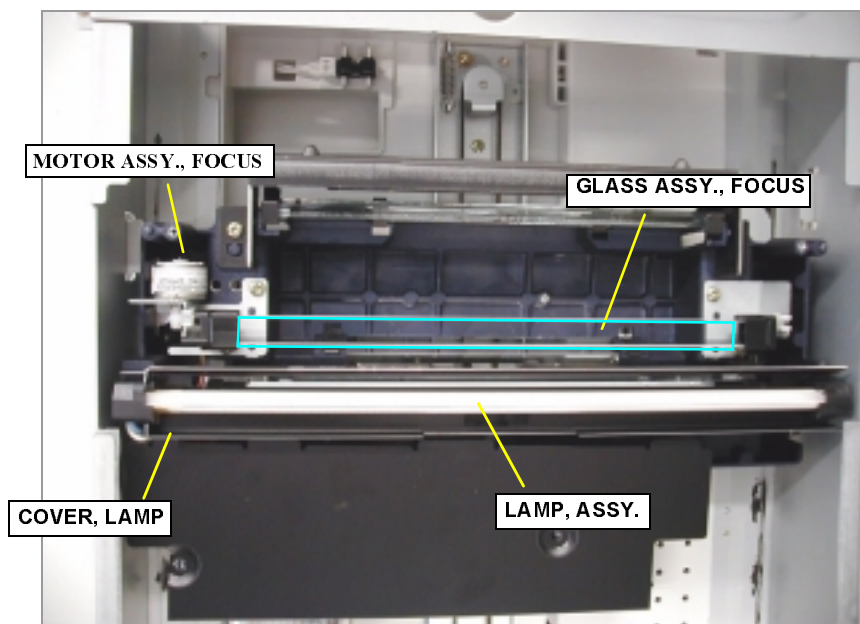


Figure 4-3. “GLASS ASSEMBLY, FOCUS” Removal (1)

4. Using pliers, lift up “GLASS ASSEMBLY, FOCUS” by pushing “HOLDER, FOCUS” attached to the both ends of “GLASS ASSEMBLY, FOCUS” inward. (See Figure 4-4.)

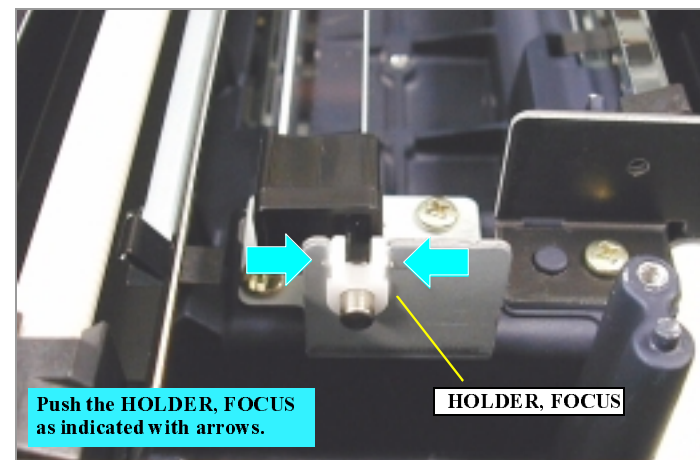


Figure 4-4. “GLASS ASSEMBLY, FOCUS” Removal (2)



- Since “GLASS ASSEMBLY, FOCUS” serves as a lens, handle it with care.
- If the glass is dirty, wipe it carefully using exclusive cleaning paper for lens.

4.2.4 “MOTOR ASSEMBLY, FOCUS” Removal

1. Remove “GLASS ASSEMBLY, FOCUS”. (See Section 4.2.3.)
2. Remove the Lamp Assembly. (See the GT-9600 Service Manual / Section 3.2.5.)
3. Remove the two screws (CB, 3x6) for “FRAME, FOCUS”, and disconnect the harnesses from CN1 and CN3 on the Inverter Board.

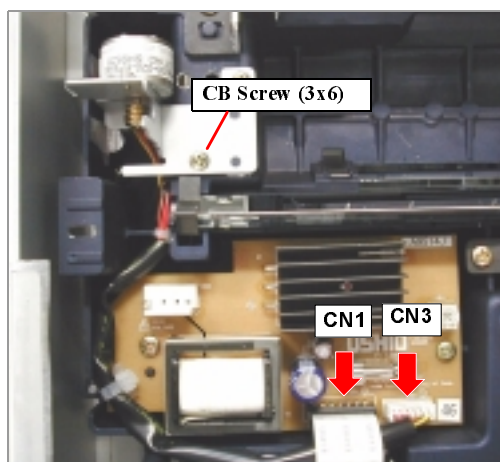


Figure 4-5. “MOTOR ASSEMBLY, FOCUS” Removal (1)

4. Remove the two screws (CB, 2x3) securing “MOTOR ASSEMBLY, FOCUS” Assembly to “FRAME, FOCUS”, and remove “MOTOR ASSEMBLY, FOCUS”.

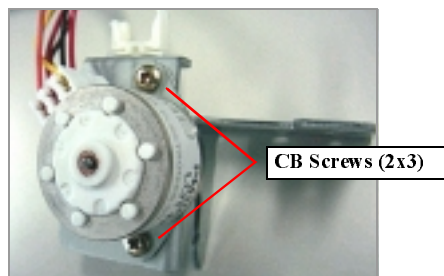


Figure 4-6. “MOTOR ASSEMBLY, FOCUS” Removal (2)

4.2.5 Bottom Plate Removal

1. Remove “DOCUMENT COVER”.
2. Turn the scanner over and remove the sixteen screws (CBS, 3x12) and the other one (CB, 3x6), and then remove the Bottom Plate. (See Figure 4-7.)

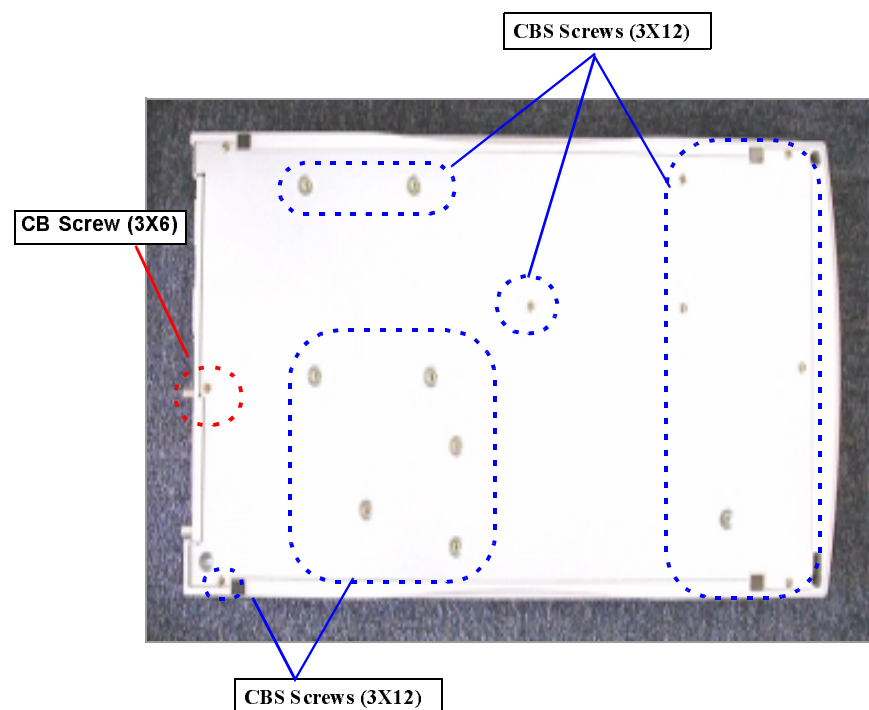


Figure 4-7. Bottom Plate Removal

4.2.6 B109 PSH Board Removal

1. Remove the Bottom Plate. (See Section 4.2.5.)
2. Remove the two screws (CBB, 3x12) and disconnect the harnesses from CN1, CN2, and CN3. Then remove the B109 PSH Board from “HOUSING, LOWER”. (See Figure 4-8.)

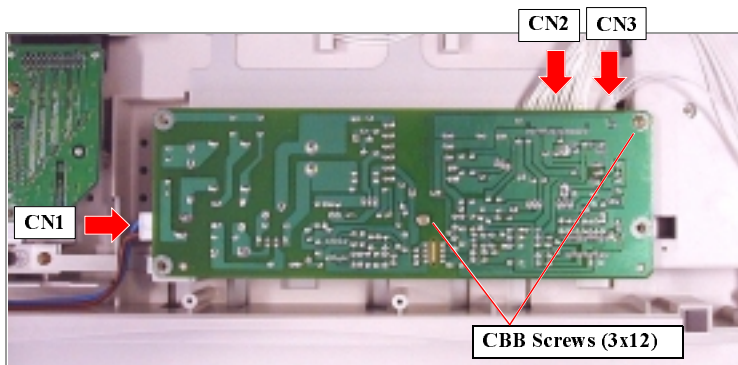


Figure 4-8. B109 PSH Board Removal

4.2.7 B109 SUB-B Board Removal

1. Remove the Bottom Plate. (See Section 4.2.5.)
2. Remove the one screw (CBS, 3x12), and then remove the B109 SUB-B Board from CN11 of the B109 MAIN Board. (See Figure 4-9.)

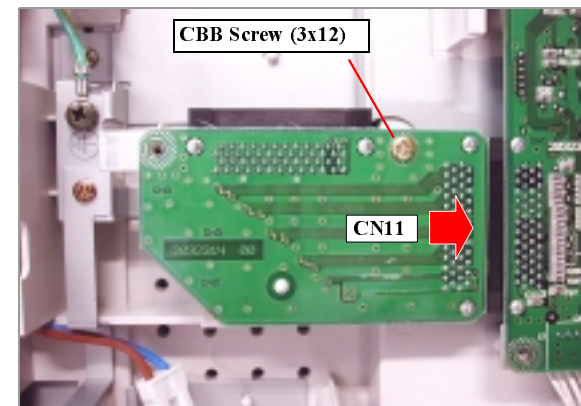


Figure 4-9. B109 SUB-B Board Removal

4.2.8 B109 MAIN Board Removal

1. Remove "DOCUMENT COVER".
2. Remove "HOUSING, UPPER". (See the GT-9500 Service Manual / Section 3.2.1.)
3. Slide the CR forward, remove the one screw (CB, 3x3), remove "GROUNDING PLATE", and then disconnect the FFCs from CN1 and CN2 on the B109 MAIN Board. (See Figure 4-10.)

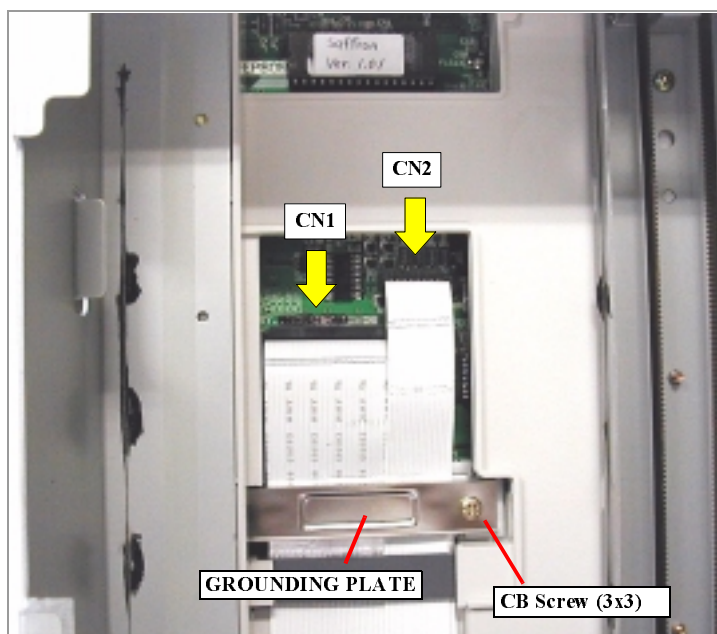


Figure 4-10. B109 MAIN Board Removal (1)

5. Remove the three screws (CBS, 3x6) and remove "GROUNDING PLATE".
6. Disconnect the harnesses from CN3, CN4, CN5, and CN6 on the B109 MAIN Board, and then remove the B109 MAIN Board from "HOUSING, LOWER". (See Figure 4-11.)

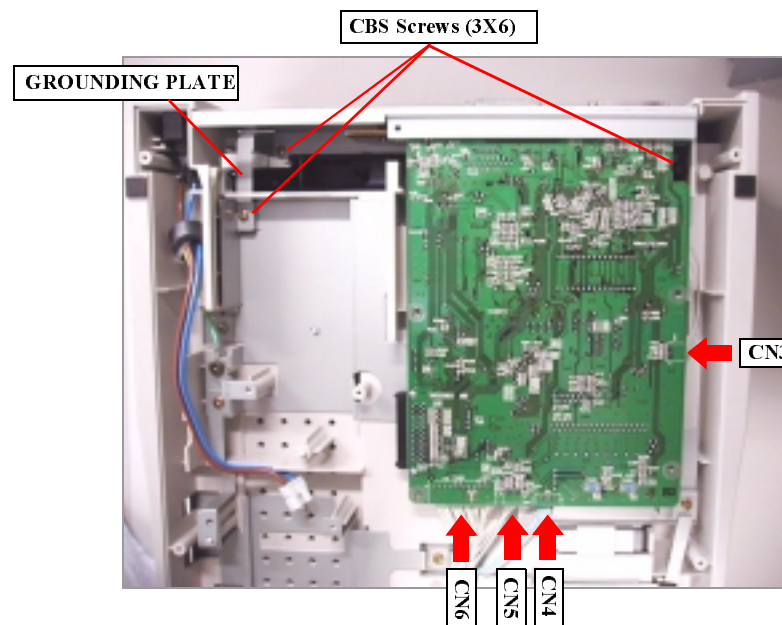


Figure 4-11. B109 MAIN Board Removal (2)

4. Remove the Bottom Plate. (See Section 4.2.5.)

4.2.9 B109 SUB Board Removal

1. Remove the B109 MAIN Board. (See Section 4.2.8.)
2. Remove the two screws (boxed, 3x7, paired side: 5mm) securing the optional I/F to “COVER, I/F, PLATE”, and then remove the optional I/F from “COVER, I/F, PLATE”. (See Figure 4-13.)

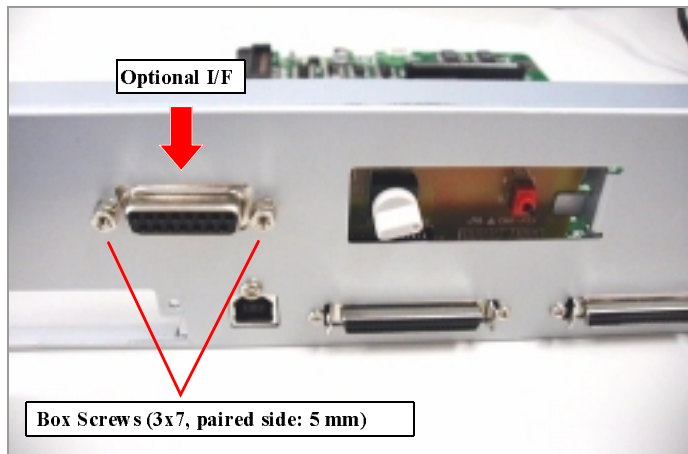


Figure 4-12. B109 SUB-B Board Removal (1)

3. Disconnect the harness from CN7 on the B109 MAIN Board. (See Figure 4-13.)

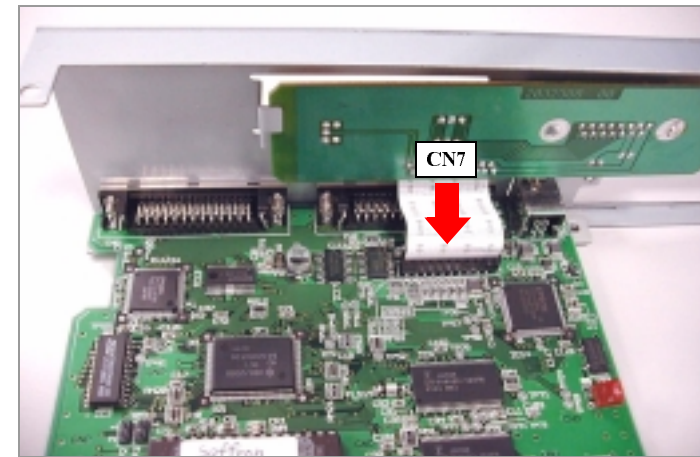


Figure 4-13. B109 SUB-B Board Removal (2)

CHAPTER

5

ADJUSTMENT

5.1 Overview

This scanner does not require any adjustment for specified services such as disassembling and assembling the scanner, including parts replacement.

CHAPTER

6

MAINTENANCE

6.1 Overview

For information on how to maintain the EPSON Expression 1600/1600 Pro, please refer to the GT-9500 Service Manual.

CHAPTER

7

APPENDIX

7.1 Overview

This chapter provides information necessary for servicing.

7.1.1 Interconnection of the Major Components

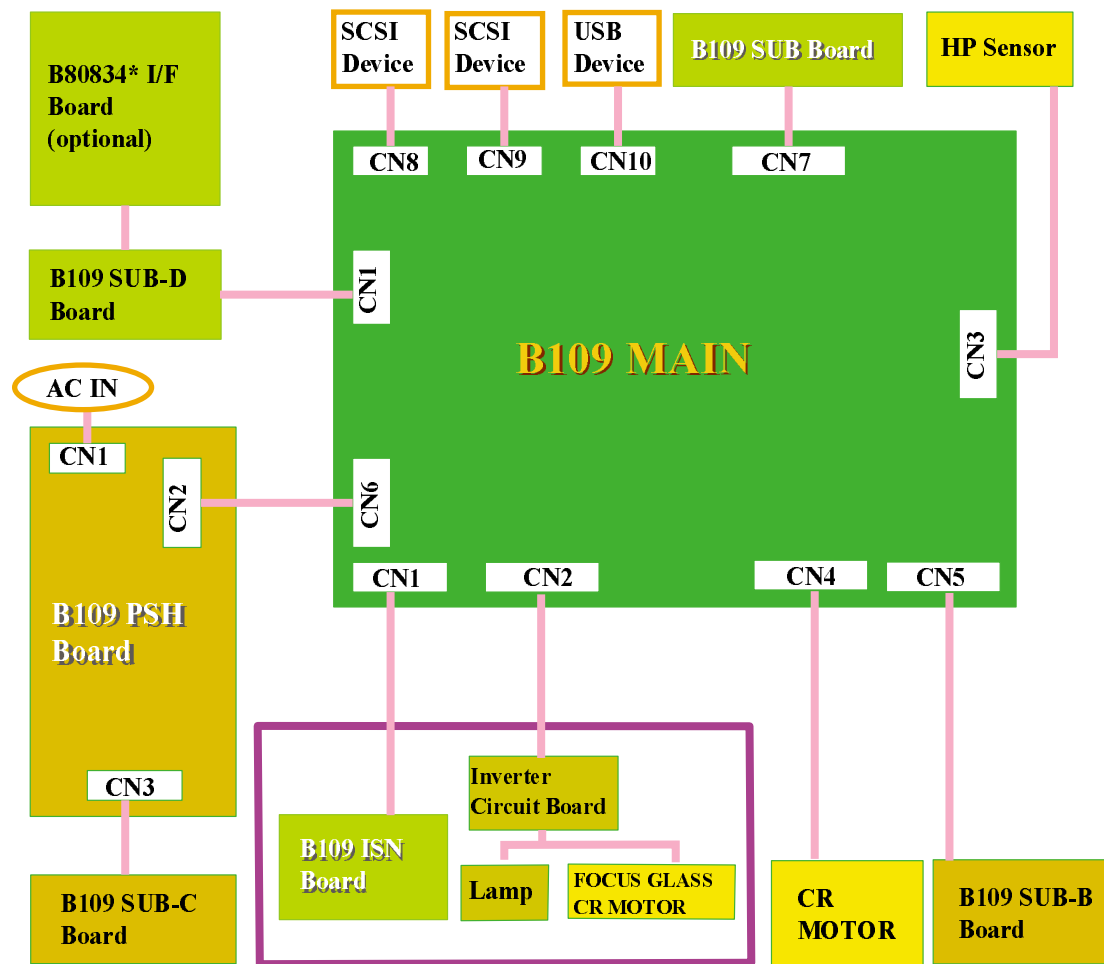


Figure 7-1. Interconnection of the Major Components

7.1.2 Connector Summary

Connectors used on the electrical circuit boards are summarized in the table below.

Table 7-1. Connector Summary

Board	CN No.	Function	Refer to:
B109 MAIN Board	CN1	For connection with B109 ISN Board	Table 7-2
	CN2	For connection with Inverter Board	Table 7-3
	CN3	For connection with HP Sensor	Table 7-4
	CN4	For connection with CR Motor	Table 7-5
	CN5	For connection with B109 SUB-B Board	Table 7-6
	CN6	Power supply line from B109 PSH Board	Table 7-7
	CN7	For connection with B109 SUB Board	Table 7-9
	CN8, 9	For connection with SCSI device	Table 7-10
	CN10	For connection with USB device	Table 7-8
	CN11	For connection with B109 SUB-D	Table 7-11
B109 PSH Board	CN1	Power supply line from the AC inlet	-
	CN2	Power supply line for the B109 MAIN Board	Table 7-7
	CN3	For connection with B109 SUB-C Board (Operate SW)	-

7.1.3 B109 MAIN Board Connector Pin Assignment

CN1: B109 MAIN BOARD — B109 ISN BOARD (CCD CONTROL)

Table 7-2. Connector Pin Assignment - CN1

Pin	Signal Name	I/O	Function	Pin	Signal Name	I/O	Function
1	AGND		Analog GND	21	SNCK4	O	AFE: Data clamp (CDS2)
2	+12V		Power supply (+12V)	22	SNCK3	O	AFE: Reference clamp (CDS1)
3	+12V		Power supply (+12V)	23	WR	O	AFE: Serial write
4	AGND		Analog GND	24	SD	O	AFE: Serial data
5	DGND		Digital GND	25	SCK	O	AFE: Serial clock
6	DGND		Digital GND	26	DGND		Digital GND
7	+5V		Power supply (+5V)	27	D0	I	AEF: Image digital data 0
8	+5V		Power supply (+5V)	28	D1	I	AEF: Image digital data 1
9	DGND		Digital GND	29	D2	I	AEF: Image digital data 2
10	SHB	O	CCD: Output shutter for Blue (ICG1)	30	D3	I	AEF: Image digital data 3
11	SHG	O	CCD: Output shutter for Green (ICG2)	31	D4	I	AEF: Image digital data 4
12	SHR	O	CCD: Output shutter for Red (ICG3)	32	D5	I	AEF: Image digital data 5
13	SNCK2	O	CCD: Reset (RS)	33	D6	I	AEF: Image digital data 6
14	CSL0	O	CCD: Clamp (CP)	34	D7	I	AEF: Image digital data 7
15	LCMP	O	AFE: Line clamp (START, CLP)	35	D8	I	AEF: Image digital data 8
16	SNCK1X	O	CCD: Clock 2 ($\Phi 1B$)	36	D9	I	AEF: Image digital data 9
17	SNCK1	O	CCD: Clock 1 ($\Phi 1A$, $\Phi 2A$)	37	D10	I	AEF: Image digital data 10
18	TG	O	CCD: Shift pulse (SH)	38	D11	I	AEF: Image digital data 11
19	CSL1	O	CCD: Clock 3 ($\Phi 2B$)	39	DGND		Digital GND
20	ADCK	O	AFE: Clock (ADCK)	–	–	–	–

CN2: B109 MAIN BOARD — INVERTER BOARD**Table 7-3. Connector Pin Assignment - CN2**

Pin	Signal Name	I/O	Function
1	COM		Power Supply (+24V)
2	COM		Power Supply (+24V)
3	AN	O	Glass drive motor (Phase /A control signal)
4	BN	O	Glass drive motor (Phase /B control signal)
5	A	O	Glass drive motor (Phase A control signal)
6	B	O	Glass drive motor (Phase B control signal)
7	+24V		Power Supply (+24V)
8	+24V		Power Supply (+24V)
9	+24V		Power Supply (+24V)
10	LMPCNT	O	CCD lamp control (L: on, H: off)
11	GND		GND
12	GND		GND
13	GND		GND

CN3: B109 MAIN BOARD — HP SENSOR**Table 7-4. Connector Pin Assignment - CN3**

Pin	Signal Name	I/O	Function
1	HP	I	Home position detection (H: Home position)
2	GND		GND
3	+5V		Power Supply (+5V)

CN4: B109 MAIN BOARD — CR MOTOR**Table 7-5. Connector Pin Assignment - CN4**

Pin	Signal Name	I/O	Function
1	B	O	Carriage motor (Phase B control signal)
2	A	O	Carriage motor (Phase A control signal)
3	BX	O	Carriage motor (Phase /B control signal)
4	AX	O	Carriage motor (Phase /A control signal)

CN5: TO B109 SUB-B BOARD**Table 7-6. Connector Pin Assignment - CN5**

Pin	Signal Name	I/O	Function
1	+5V		Power Supply (+5V)
2	LEDR	O	Red LED control (L: on, H: off)
3	LEDG	O	Green LED control (L: on, H: off)
4	P_SW	I	Push button condition (H: pressed)

CN6: B109 MAIN BOARD — B109 PSH BOARD**Table 7-7. Connector Pin Assignment - CN6**

Pin	Signal Name	I/O	Function
1	+24V		Power Supply (+24V)
2	+24V		Power Supply (+24V)
3	GND		GND
4	GND		GND
5	+5V		Power Supply (+5V)
6	+5V		Power Supply (+5V)
7	+15V		Power Supply (+15V)
8	GND		GND
9	GND		GND
10	GND		GND
11	GND		GND
12	GND		GND

CN10: USB I/F BOARD CONNECTOR**Table 7-8. Connector Pin Assignment - CN10**

Pin	Signal Name	I/O	Function
1	Vcc	I	Power for USB (VBUS) (used only for connection/disconnection of the USB bus)
2	-Data	I/O	USB -Data
3	+Data	I/O	USB + Data (with pull-up control function)
4	GND		GND

CN7: B109 MAIN BOARD — B109 SUB BOARD**Table 7-9. Connector Pin Assignment - CN7**

Pin	Signal Name	I/O	Function
1	+24V		Power supply (+24 V)
2	+24V		Power supply (+24 V)
3	GND		GND
4	+5V		Power supply (+5V)
5	GND		GND
6	OP5	I/O	Option (ADF, TPU) status 5, LED control
7	OP_SEL	O	Option (ADF, TPU) select signal
8	OP4	I	Option (ADF, TPU) status 4
9	SLOAD	O	Option (ADF, TPU) serial load
10	OP3	I	Option (ADF, TPU) status 3
11	SCK	O	Option (ADF, TPU) serial clock
12	OP2	I	Option (ADF, TPU) status 2
13	SDATA	O	Option (ADF, TPU) serial data
14	OP1	I	Option (ADF, TPU) status 1
15	GND		GND
16	ID_8	I	SCSI - ID bus bit 3
17	ID_1	I	SCSI - ID bus bit 0
18	ID_4	I	SCSI - ID bus bit 2
19	ID_2	I	SCSI - ID bus bit 1
20	T_SW	I	SCSI terminator power control (L: on, H: off)

CN8, CN9: B109 MAIN BOARD — SCSI I/F

Table 7-10. Connector Pin Assignment - CN8, CN9

Pin	Signal Name	I/O	Function	Pin	Signal Name	I/O	Function
1	GND		GND	26	DB0	I/O	SCSI data 0
2	GND		GND	27	DB1	I/O	SCSI data 1
3	GND		GND	28	DB2	I/O	SCSI data 2
4	GND		GND	29	DB3	I/O	SCSI data 3
5	GND		GND	30	DB4	I/O	SCSI data 4
6	GND		GND	31	DB5	I/O	SCSI data 5
7	GND		GND	32	DB6	I/O	SCSI data 6
8	GND		GND	33	DB7	I/O	SCSI data 7
9	GND		GND	34	DBP	I/O	SCSI data parity
10	GND		GND	35	GND		GND
11	GND		GND	36	GND		GND
12	GND		GND	37	GND		GND
13	GND		GND	38	TRMPW	O	TERMINATOR POWER
14	GND		GND	39	GND		GND
15	GND		GND	40	GND		GND
16	GND		GND	41	ATN	I/O	SCSI ATN
17	GND		GND	42	GND		GND
18	GND		GND	43	BSY	I/O	SCSI BSY
19	GND		GND	44	ACK	I/O	SCSI ACK
20	GND		GND	45	RST	I/O	SCSI RST
21	GND		GND	46	MSG	I/O	SCSI MSG
22	GND		GND	47	SEL	I/O	SCSI SEL
23	GND		GND	48	C/D	I/O	SCSI C/D
24	GND		GND	49	REQ	I/O	SCSI REQ
25	GND		GND	50	I/O	I/O	SCSI I/O

CN11: B109 MAIN BOARD — OPTIONAL IEEE1394 I/F**Table 7-11. Connector Pin Assignment - CN11**

Pin	Signal Name	I/O	Function	Pin	Signal Name	I/O	Function
1	GND		GND	26	GND		GND
2	DM[0]	O	Image Data 0	27	DM[1]	O	Image Data 1
3	DM[2]	O	Image Data 2	28	DM[3]	O	Image Data 3
4	DM[4]	O	Image Data 4	29	DM[5]	O	Image Data 5
5	DM[6]	O	Image Data 6	30	DM[7]	O	Image Data 7
6	GND		GND	31	GND		GND
7	DM[8]	O	Image Data 8	32	DM[9]	O	Image Data 9
8	DM[10]	O	Image Data 10	33	DM[11]	O	Image Data 11
9	DM[12]	O	Image Data 12	34	DM[13]	O	Image Data 13
10	DM[14]	O	Image Data 14	35	DM[15]	O	Image Data 15
11	GND		GND	36	GND		GND
12	IMG	O	Not used	37	WREXT	O	DMA write
13	CS	O	Resister select	38	RD	O	Resister read
14	WR	O	Resister write	39	ADR	O	Resister address
15	SYSRS	O	Power on reset	40	NC		Not connected
16	GND		GND	41	GND		GND
17	D[0]	I/O	Resister data 0	42	D[1]	I/O	Resister data 1
18	D[2]	I/O	Resister data 2	43	D[3]	I/O	Resister data 3
19	D[4]	I/O	Resister data 4	44	D[5]	I/O	Resister data 5
20	D[6]	I/O	Resister data 6	45	D[7]	I/O	Resister data 7
21	GND		GND	46	GND		GND
22	DREXT	I	DMA request	47	INTEXT	I	Interruption
23	RDREQ	O	Ready (= L)	48	+24V		Power Supply (+24V)
24	+5V		Power Supply (+5V)	49	+5V		Power Supply (+5V)
25	+5V		Power Supply (+5V)	50	+5V		Power Supply (+5V)

7.2 Component Layout

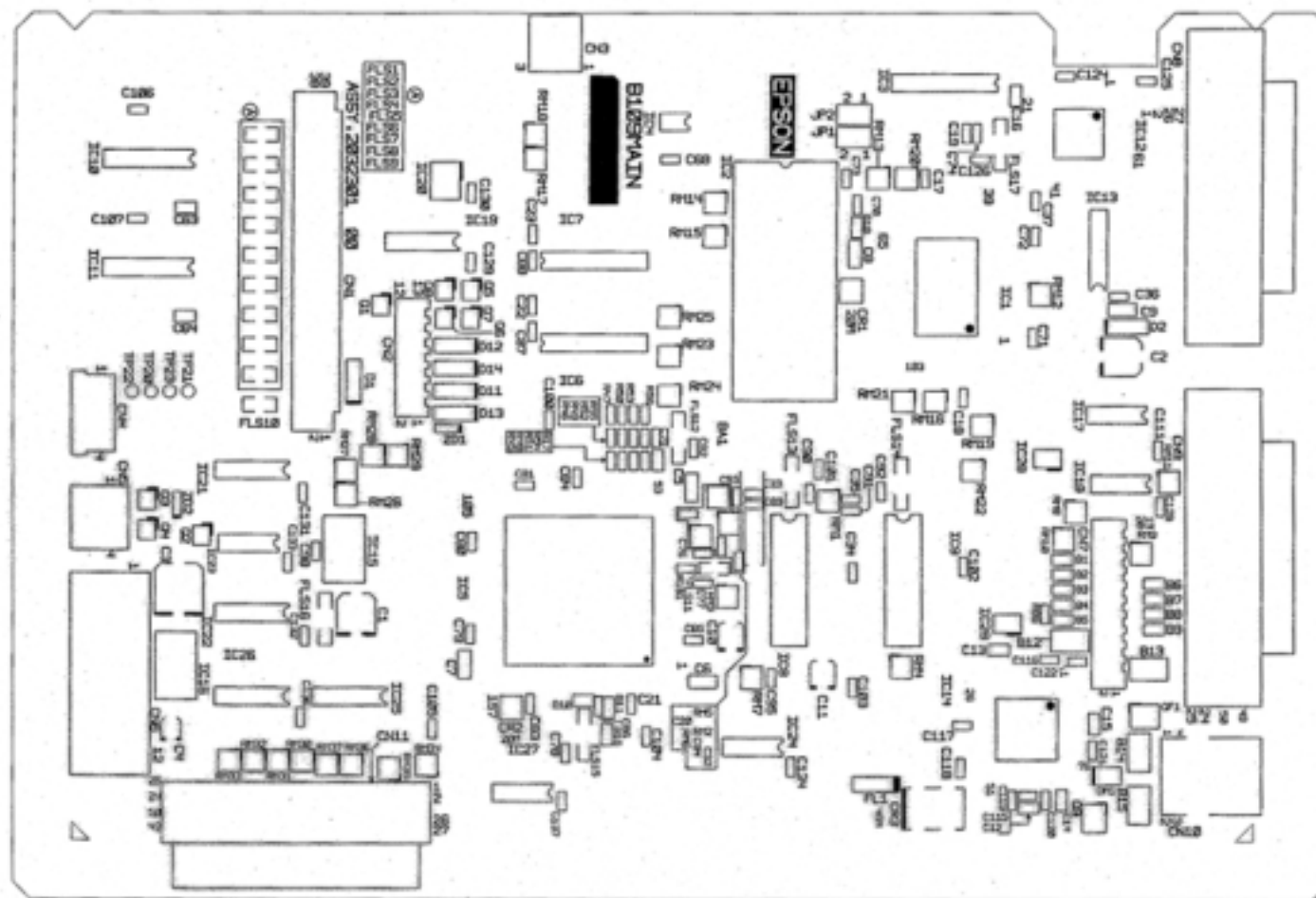
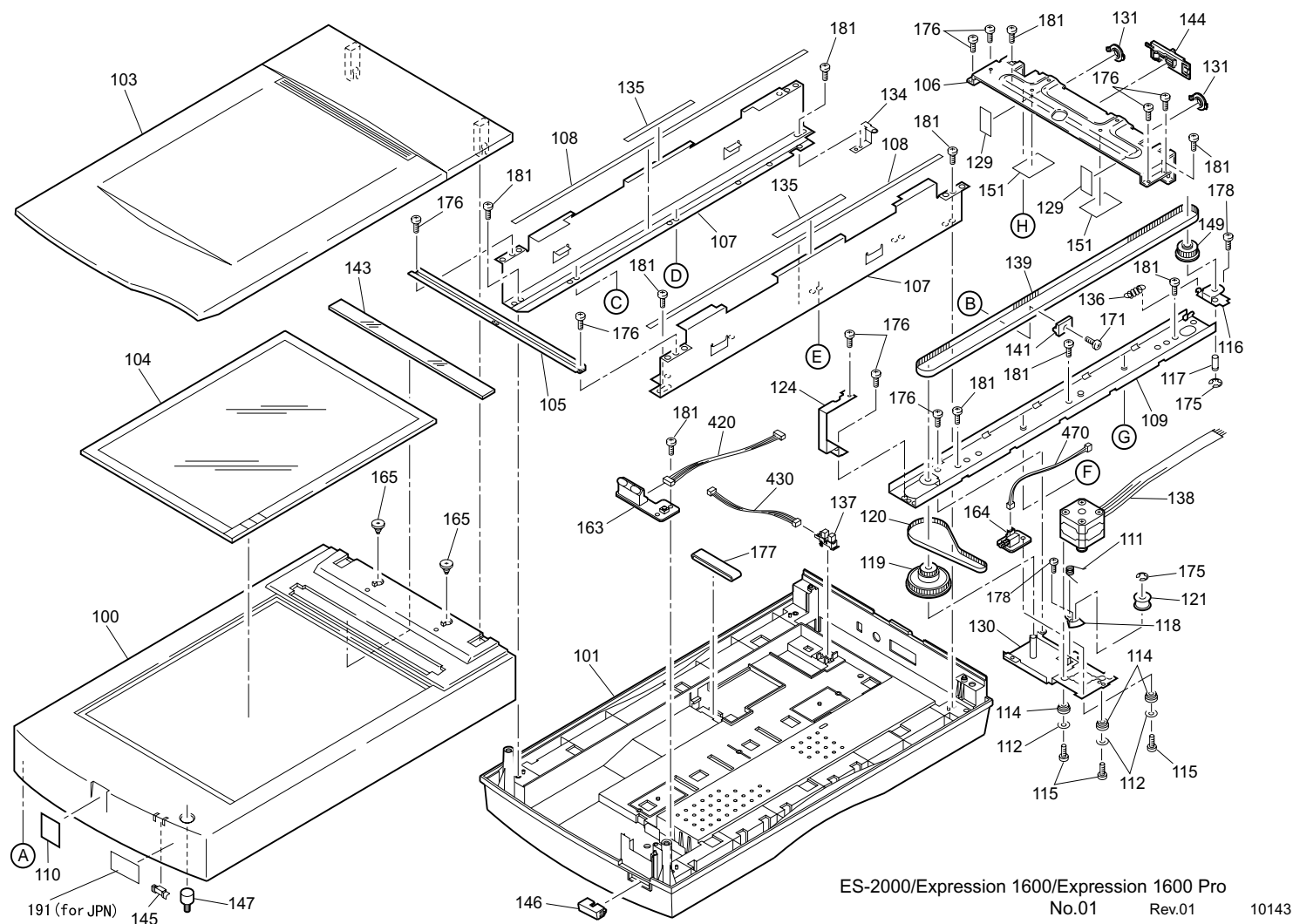


Figure 7-2. B109 MAIN Board

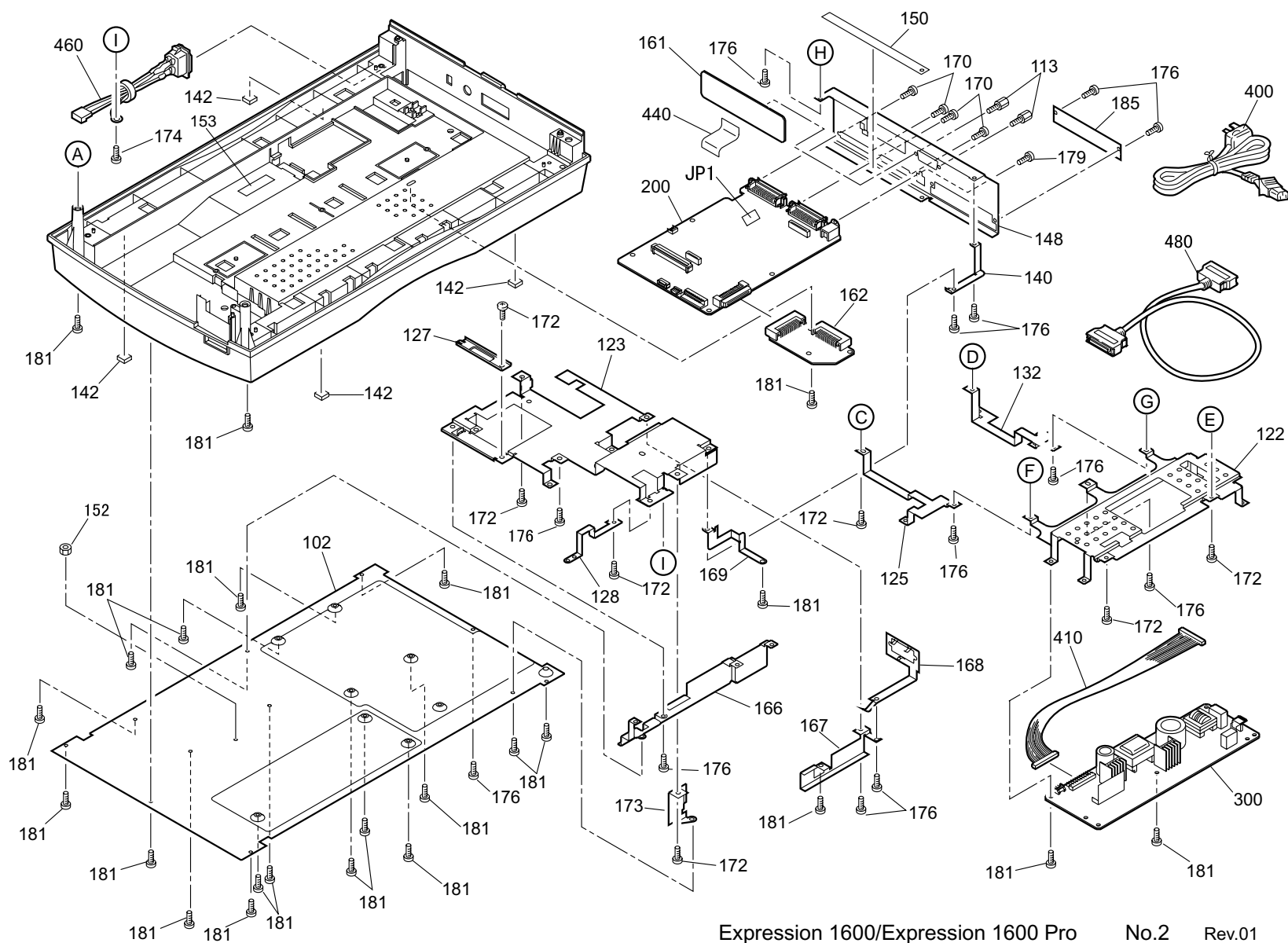
7.3 Exploded Diagrams and Parts List

7.3.1 Exploded Diagrams

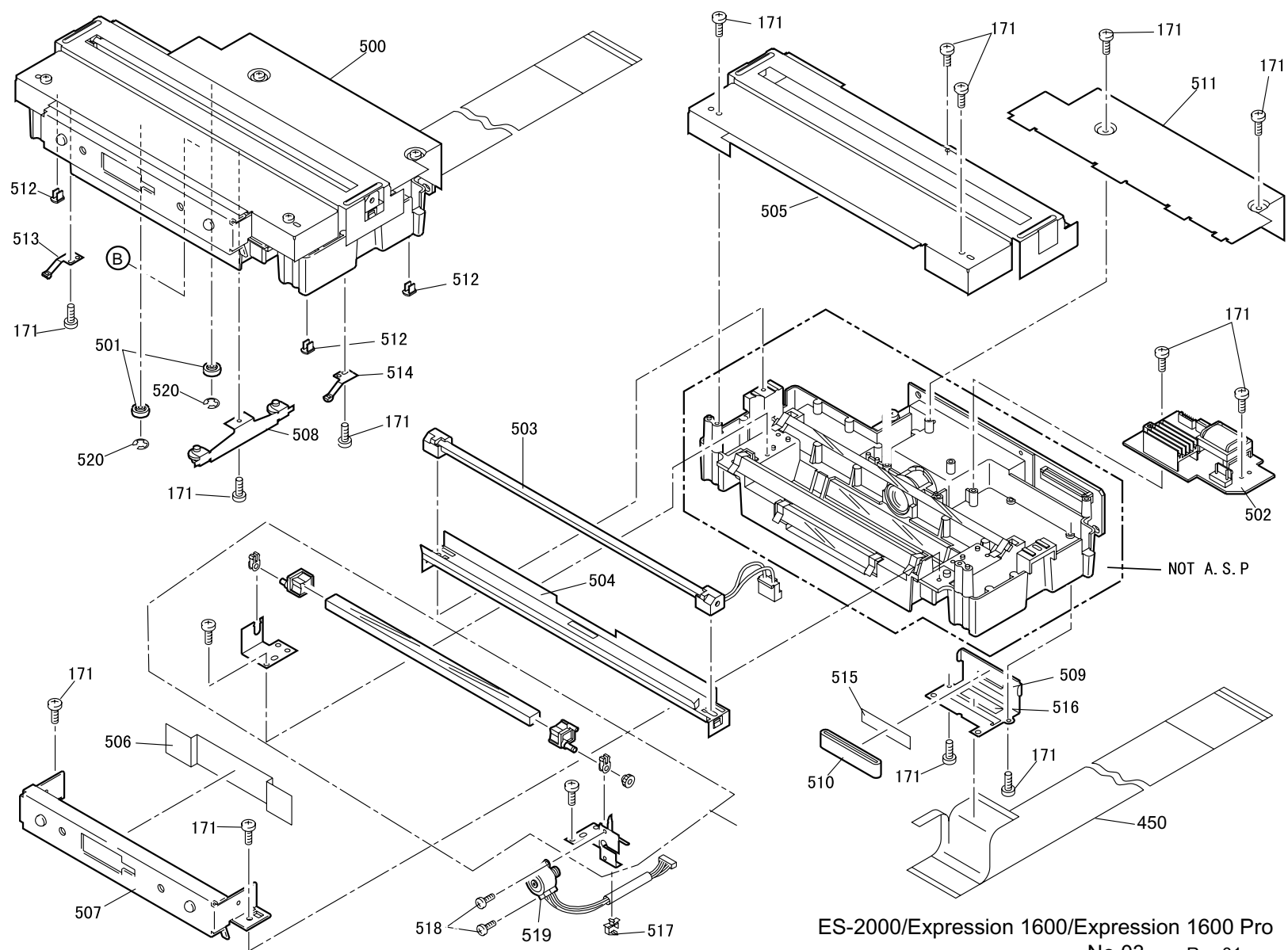
□ Expression 1600 / 1600 Pro No.01



□ Expression 1600 / 1600 Pro No.02



□ Expression 1600 / 1600 Pro No.03



ES-2000/Expression 1600/Expression 1600 Pro
No.03 Rev.01

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7.3.2 Parts List

Drawing No.	Part No.	Part Name
• 100	• 1049816	• HOUSING ASSY., UPPER
• 101	• 1049101	• HOUSING, LOWER
• 102	• 1050474	• PLATE, ASSY., BOTTOM
• 103	• 1049817	• COVER ASSY., DOCUMENT
• 104	• 1042703	• GLASS ASSY., LARGE
• 105	• 1029438	• FRAME, FRONT
• 106	• 1029441	• FRAME, REAR
• 107	• 1052016	• FRAME, SIDE, L
• 108	• 1029442	• SHEET, FRAME, SIDE
• 109	• 1052020	• RAIL, CENTER
• 110	• 1051432	• LOGO PLATE, B
• 111	• 1007525	• TORSION SPRING, 17100
• 112	• 1008492	• PLAIN WASHER 3*0.5*8 F/ZN
• 113	• 1009569	• SCREW, CONNECTOR, ADF
• 114	• 1012618	• DAMPER, CR
• 115	• 1017596	• SHAFT, DAMPER, CR, B
• 116	• 1022304	• HOLDER, PULLEY, DRIVEN
• 117	• 1022306	• SHAFT, PULLEY, DRIVEN
• 118	• 1050012	• LEVER ASSY., TENSION
• 119	• 1042614	• PULLEY, DRIVE
• 120	• 1025472	• TIMING BELT, B
• 121	• 1025473	• ROLLER, TENSION
• 122	• 1049110	• SHIELD PLATE, POWER SUPPLY
• 123	• 1049111	• SHIELD PLATE, REAR
• 124	• 1029431	• GROUNDING PLATE, FRONT
• 125	• 1042632	• GROUNDING PLATE, POWER SUPPLY
• 127	• 1049112	• GROUNDING PLATE, FFC
• 128	• 1049362	• GROUNDING PLATE, SHIELD, B
• 129	• 1029443	• SHEET, FRAME, REAR
• 130	• 1050013	• FRAME ASSY., MOTOR

Drawing No.	Part No.	Part Name
• 131	• 1030479	• SLEEVE, FRAME, REAR
• 132	• 1042634	• GROUNDING PLATE, POWER SUPPLY, B
• 134	• 1033384	• GROUNDING PLATE, FRAME
• 135	• 1032131	• SHEET, FRAME, PROTECT
• 136	• 1032407	• EXTENSION SPRING, 600
• 137	• 2032842	• DETECTOR, HP, E
• 138	• 2028613	• MOTOR ASSY., CR
• 139	• 1042613	• TIMING BELT
• 140	• 1049361	• GROUNDING PLATE, SHIELD
• 141	• 1042599	• CLAMP, BELT
• 142	• 1025491	• FOOT
• 143	• 1022255	• GLASS, SMALL
• 144	• 1042629	• LEVER, LOCK
• 145	• 1049107	• OPTICAL PLATE
• 146	• 1049105	• KEYTOP, POWER SWITCH
• 147	• 1049106	• KEYTOP, START SWITCH
• 148	• 1049108	• COVER, I/F, PLATE
• 149	• 1042615	• PULLEY, DRIVEN
• 150	• 1049118	• SHEET, SHIELD, MAIN, B
• 151	• 1042624	• SHEET, FRAME, REAR, B
• 152	• 1030684	• HEXAGON NUT, GROUND
• 153	• 1031846	• DOUBLE SIDE TAPE, 75X20
• 165	• 1022274	• METAL FITTING COVER DOCUMENT
• 166	• 1051576	• GROUNDING PLATE, SHIELD, D
• 167	• 1051577	• GROUNDING PLATE, SHIELD, E
• 168	• 1051578	• GROUNDING PLATE, SHIELD, F
• 169	• 1051579	• GROUNDING PLATE, SHIELD, G
• 170	• B010102412	• C.P. SCREW, 2.5X8, F/NI
• 171	• B010303311	• C.B. SCREW
• 172	• B010350511	• C.B. SCREW
• 173	• 1051580	• GROUNDING PLATE, SHIELD, H
• 174	• B045800115	• C.B.(O) SCREW 4X8 F/ZG
• 175	• B150300611	• RETAINING RING

Drawing No.	Part No.	Part Name
• 176	• B300204211	• C.B.S. SCREW
• 177	• 2025174	• FERRITE CORE
• 178	• 1049800	• C.P.S-TITE(S-P4)SCREW,3X6,F/ZN
• 179	• B010103212	• C.P.SCREW
• 181	• B310204511	• C.B.B. SCREW
• 185	• 1049109	• COVER,OPTION
• 200	• 2032301	• BOARD ASSY., MAIN
• 161	• 2032307	• BOARD ASSY., SUB
• 162	• 2032313	• BOARD ASSY., SUB
• 163	• 2032309	• BOARD ASSY., SUB
• 164	• 2032311	• BOARD ASSY., SUB
• 300	• 2032305	• BOARD ASSY., POWER SUPPLY
• 400	• Y901300600	• POWER CABLE
• 410	• 2032448	• WIRE-HARNESS
• 420	• 2032447	• WIRE-HARNESS
• 430	• 2032449	• WIRE-HARNESS
• 440	• 2032445	• WIRE-HARNESS
• 450	• 2032444	• WIRE-HARNESS
• 460	• 2032450	• WIRE-HARNESS
• 470	• 2032446	• WIRE-HARNESS
• 480	• 2028921	• I/F CABLE
• 500	• 2032549	• CARRIAGE ASSY.
• 501	• 1030337	• ROLLER,CARRIAGE,C
• 502	• 2032412	• BOARD ASSY.,INVERTER
• 503	• 2032413	• LAMP,ASSY.
• 504	• 1042598	• COVER,LAMP
• 505	• 1042605	• COVER,CR
• 506	• 1029462	• COVER,MOUNT PLATE
• 507	• 1029448	• MOUNT PLATE,MAIN
• 508	• 1022332	• HOLDER ASSY.,ROLLER
• 509	• 1042601	• CLAMP.FERRITE CORE
• 510	• 2025174	• FERRITE CORE
• 511	• 1049446	• COVER,REAR,CR

Drawing No.	Part No.	Part Name
• 512	• 1000639	• SLIDER,CARRIAGE
• 513	• 1042602	• BURSH,CR
• 514	• 1044031	• BRUSH,CR;B
• 515	• 1043166	• DOUBLE SIDE TAPE,8X17
• 516	• 1044030	• BLOCK,HOLD,FFC
• 517	• 2032510	• REUSE CLAMP,RLMC-05T V-0
• 518	• B010309411	• C.B.SCREW,2X3,F/ZN
• 519	• 2032524	• MOTOR ASSY.,FOCUS
• 520	• B150350111	• RETAINING RING

7.4 Circuit Diagrams

See the following pages for the circuit diagrams below:

- B109 MAIN Board
- B109 PSH Board
- B109 SUB Board

