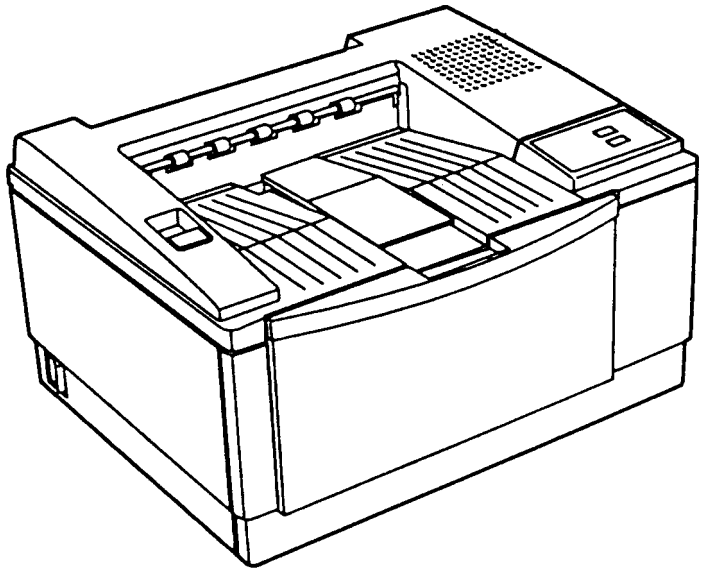
EPSON TERMINAL PRINTER

EPL-3000

ActionLaser 1300

SERVICE MANUAL



EPSON

4003564

NOTICE

The contents of this manual are subjects to change without notice.

All efforts have been made to ensure the accuracy of the contents of this manual. However, should any errors be detected, SEIKO EPSON would greatly appreciate being informed of them.

The above notwithstanding SEIKO EPSON can assume no responsibility for any errors in this manual or the consequence thereof.

Epson is registered trademark of Seiko Epson Corporation.

General Notice: Other product names used herein are for identication purposes only and maybe trademarks of their respective campanies.

SAFETY INFORMATION

This printer is a page printer which operates by means of a laser. There is no possibility of danger from the laser, provided the printer is operated according to the instructions in this manual provided.

Since radiation emitted by the laser is completely confined within protective housings, the laser beam cannot escape from the machine during any phase of user operation.

For United States Users;

[Laser Safety]

This printer is certified as a Class 1 Laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to the Radiation Control for Health and Safety Act of 1968. This means that the printer does not produce hazardous laser radiation.

[CDRH Regulations]

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2,1976. Compliance is mandatory for products marketed in the United States. The label shown below indicates compliance with the CDRH regulations and must be attached to laser products marketed in the United States.

WARNING: Use of controls, adjustments or performance of procedures other thanthosespecified in this manual may result in hazardous radiation exposure.

[Internal Laser Radiation]

Maximum Radiation Power: 3.025 X 10^{-4} (W)
Wave Length: 780 ± 20 nm

This is a Class IIIb Laser Diode Assay that has an invisible laser beam. The print head unit is NOT A FIELD SERVICE ITEM. Therefore, the print head unit should not be opened under any circumstances.

For Other Countries Users;

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

This is a semiconductor laser. The maximum power of the laser diode is 3.025 x 10^{4}W and the wavelength is 780 ± 20 nm.

For Denmark Users;

ADVARSEL Usynlig laserstråling ved åbning, når sikkerhedsafbrydere er ude af funktion. Undgå udsættelse for stråling.

Klasse 1 laser produkt der opfylder IEC825 sikkerheds kravene.

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Undgå udsættelse for stråling.

Klasse 1 laser produkt der opfylder IEC825 sikkerheds kravene.

For Finland, Sweden Users;

VAROITUS
Laitteen käyttäminen muulla kuin tässä käyttöohjeessa mainitulla tavalla saattaa altistaa käyttäjän turvallisuusluokan 1 ylittävälle näkymättömälle lasersateiylle.

VARNING
Om apparaten används på annat satt an i denna bruksanvisning specificerats, kan användaren utsättas for osynlig laserstrålning, som overskrider gränsen for laser klass 1.

For Finland, Sweden Service People

VAROITUS
Avattaessa ja suojalukitus ohitettaessa olet alttiina näkymättömälle lasersäteilylle. Ala katso sateeseen.

VARNING
Osynlig laserstrålning när denna del är oppnad och sparren är urkopplad. Betrakta ej strålen.

For Norway Users;

ADVARSEL
Dersom apparatet brukes på annen måte em spesifisert i denne bruksanvisning, kan brukeren utsettes for unsynlig laserstråling som overskrider grensen for laser klasse 1.

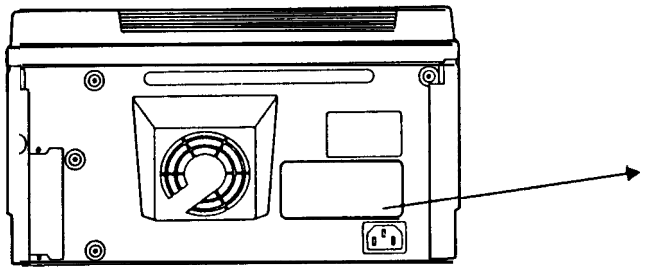
Dette er en halvleder laser. Maksimal effeckt til laserdiode er 3.025 x 10^{-4} W og bølgelengde er 780 ± 20 nm.

Laser Safety Labels

[Label on rear printer case]

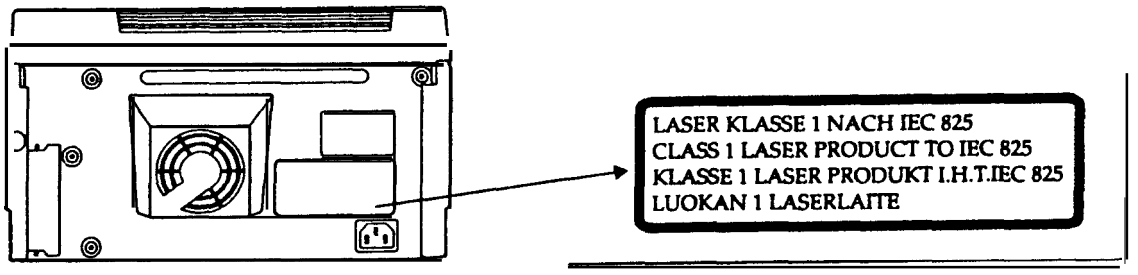
A laser safety labels is attached on the outside of the printer shown below.

For United State



This laser product conferms to the applicable requirement of 21 CFR Chapter 1, subchapter J.
SEIKO EPSON CORP.
Hirooka Office
80 Hirooka, Shiojiri-shi, Nagano-ken, JAPAN
MANUFACTURED:

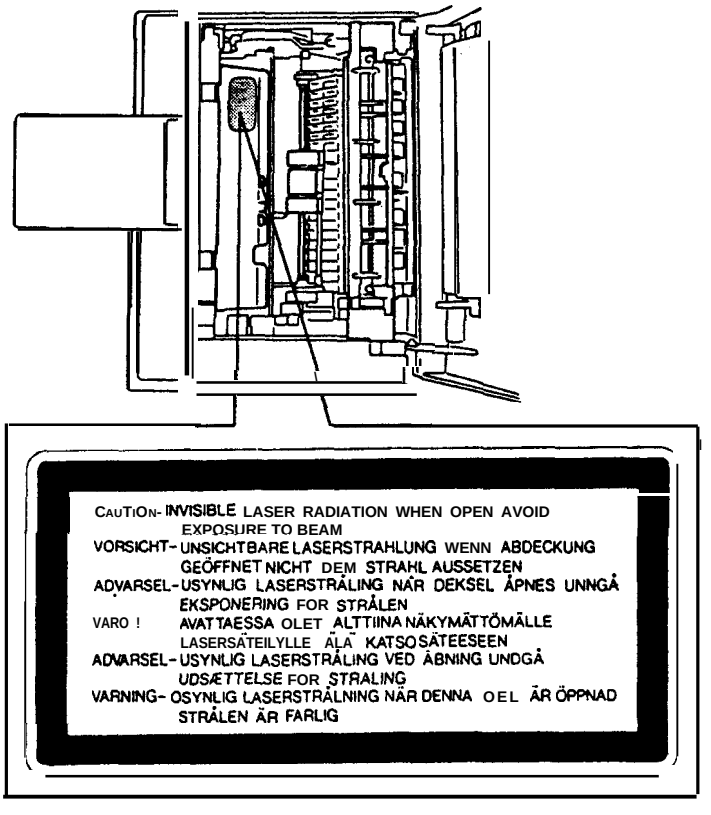
For Europa



[Label inside printer]

The following laser safety label will be attached inside the printer as shown below.

For Denmark, Finland, Swadan, and Norway



PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of EPL-3000/ActionLaser 1300.
The instructions and procedures included herein are intended for the experience repair technician, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. GENERAL DESCRIPTION

Provides a general product overview, lists specifications, and illustrates the main components of the printer.

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of printer operation.

CHAPTER 3. DISASSEMBLY AND ASSEMBLY

Includes a step-by-step guide for product disassembly and assembly.

CHAPTER 4. ADJUSTMENT

Includes a step-by-step guide for adjustment.

CHAPTER 5. TROUBLESHOOTING

Provides Epson-approved techniques for adjustment.

CHAPTER 6. MAINTENANCE

Describes preventive maintenance techniques and lists lubricants and adhesives required to service the equipment.

APPENDIX

Describes connector pin assignments, circuit diagrams, circuit board component layout and exploded diagram.

The contents of this manual are subject to change without notice.

REVISION SHEET

Revision	Issue Date	Revision Page
Rev. A	July 22,1994	let issue

TABLE OF CONTENTS

Chapter 1 General Description

Table of Contents

1.1 FEATURES

The EPSON® EPL-3000 and the ActionLaser™ 1300 are non-impact page printers that combine a semi-conductor laser with electro-photographic technology. These printers are small and light, and feature high-speed, high-resolution printing. Maintenance is very easy because of various built-in diagnostic functions. The main features are:

- ❑ No ozone
- ❑ Printing speed — 4 ppm (pages per minute)
- ❑ Resolution — 300 dpi (dots per inch)
- ❑ Light weight — about 7 kg (15 lb.)
- ❑ Small footprint
- ❑ Easy maintenance
- ❑ HP® LaserJet® 4L emulation mode (PCL® 5e emulation)
- ❑ 22 built-in scalable fonts (8 Agfa® and 14 TrueType fonts)
- ❑ Resolution Improvement Technology (RITech) refines the print quality by eliminating jagged edges from images and characters.
- ❑ Two levels (35% less and 50% less) for Toner Save Mode
- ❑ Optional EPSONScript Level 2 (PostScript® compatible) SIMM module
- ❑ Optional WPS (Windows Printing System) SIMM module
- Q 1 MB standard RAM and up to 5 MB RAM with the addition of optional SIMM
- ❑ Bidirectional parallel interface
- ❑ High-speed parallel communication rate of approximately 125 KB/second
- ❑ A multi-user, multi-emulation mode (EPL-3000)
- ❑ IES (Intelligent Emulation Switch) allows switching between EPSONScript mode and PCL5e emulation mode.
- ❑ SPL (Shared Printer Language) enables switching of the printer mode by command.

Figure 1-1 shows an exterior view of the EPL-3000 and ActionLaser 1300.

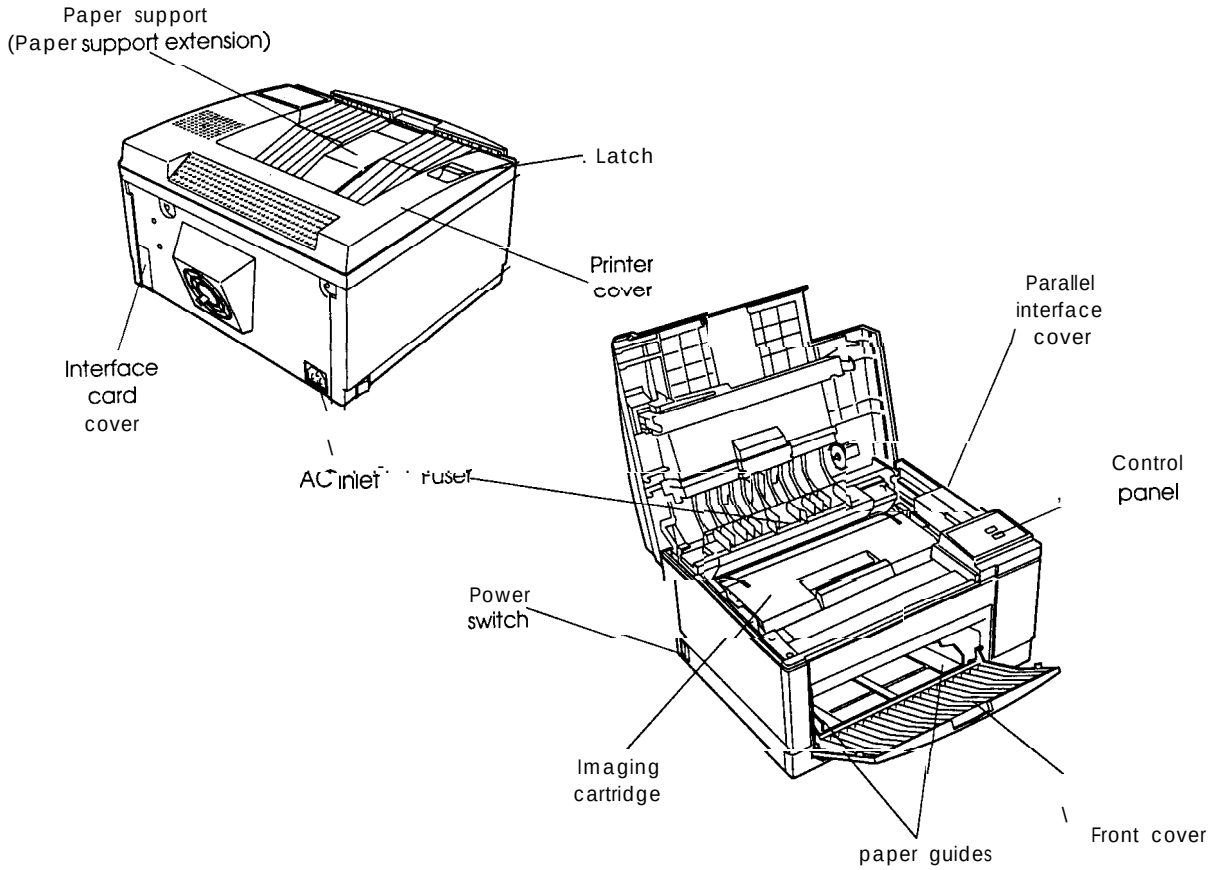


Figure 1-1. Exterior View of the EPL-3000 and ActionLaser 1300

Table 1-1 lists the optional units available for the EPL-3000 and ActionLaser 1300.

Table 1-1. Options for EPL-3000 and ActionLaser 1300

Cat. No.	Description	Note	MachineType	
			EPL-3000	ActionLaser 1300
C83212*	EPSONScript Level 2 SIMM Module	Supports EPSONScript Level 2 mode (PostScript Level 2 compatible) fonts and commands	Yes	Yes
C83213*	AWPS SIMM Module	Supports AtWork Printing System	Yes	Yes
—	Bitmap Local Language Font ROM Chip	Supports bitmap local language fonts	Yes	No
—	Scalable Local Language Font ROM Chip	Supports scalable local language fonts	Yes	No
—	Thai Font ROM Chip	Supports Thai fonts	Yes	No
3051020	Imaging cartridge	Toner cartridge	Yes	Yea
C82305*/ C82306*	Serial interface card	—	Yes	No
C82307*/ 282308X	32 KB serial interface card	—	Yes	No
C82310*/ 28231 1X	32 KB parallel interface card	—	Yes	No
C82312*	LocalTalk card	—	Yes	No
C82314*	COAX interface card	—	Yes	No
C82315*	TWINAX interface card	—	Yes	No

Notes:

1. These printers can use only one optional ROM SIMM module.
2. The EPL-3000 can useonlyoneoptional ROM chip.
3. The ActionLaser 1300 has not optional Type-B interface card slot.

1.2 SPECIFICATIONS

This section provides statistical data for the EPL-3000 and ActionLaser 1300.

1.2.1 Basic Specifications

Printing method: Laser beam scanning and dry electro-photography

Resolution: 300 dpi

Printing speed: 4 ppm (letter/A4)

First printing time (A4/LT): Less than30 seconds

Warm-up time: Less than 40 seconds
(at rated current and 23'C (73 °F) temperature)

Paper supply: See Table 1-2.

Table 1-2. Paper Feed Methods

Paper Supply		Capacity (20 lb. (70g/m2) paper)	Paper Size	Usage Thickness (Ream Weight)
Standard built-in paper tray	Auto feed	150	A5, B5, A4, LT, GLT, EXE, LG, GLG, F4, HLT	16 to 24 lb. (60 to 90 g/m^2)
		5 to 10	Monarch, DL, C5, C6, IB5 Commercial-10	Envelopes made of 16 to 24 lb. (60 to 90 g/m^2) paper
	Manual feed	1	Any size feedable (Note 2)	16 to 42 lb. (60 to 157 g/m^2)

Notes:

1. The weight in pounds (lb.) is determined by how much 500 sheets cut to 17 x 22 inches would weigh; 1 g/m^2 = 0.2659763 lb.
2. Paper size range: width 3.0 to 8.5 inches (76.2 to 216 mm)
   length 5.0 to 14.0 inches (127 to 356 mm)

Paper types: See Table 1-3.

Table 1-3. Paper Types

Standard paper	Xerox® 4024 DP paper 20 lb. (75 g/m^2)
Normal paper	Regular photocopier paper Bond paper Recycled paper 16 to 24 lb. (60 to 90 g/m^2)
Special paper	Card stock (90 to 157 g/m^2) Envelopes Labels Letterhead Transparency (OHP) sheets Colored paper

Usability of special paper: See Table 1-4.

Table 1-4. Usability of Special Paper

Input	output	OHP	Envelopes	Labels	Card Stock	Letterhead
Standard built-in paper tray	Face down	P	P	P	P	R

R: Reliable feeding and good image quality.
P: Possible, but better avoided.
N: Not supported.

Paper feed alignment and direction: Center alignment for all sizes
Paper ejection: Face down
Output tray capacity: 50 sheets (standard paper)
Printable area (standard paper): See Figure 1-2.

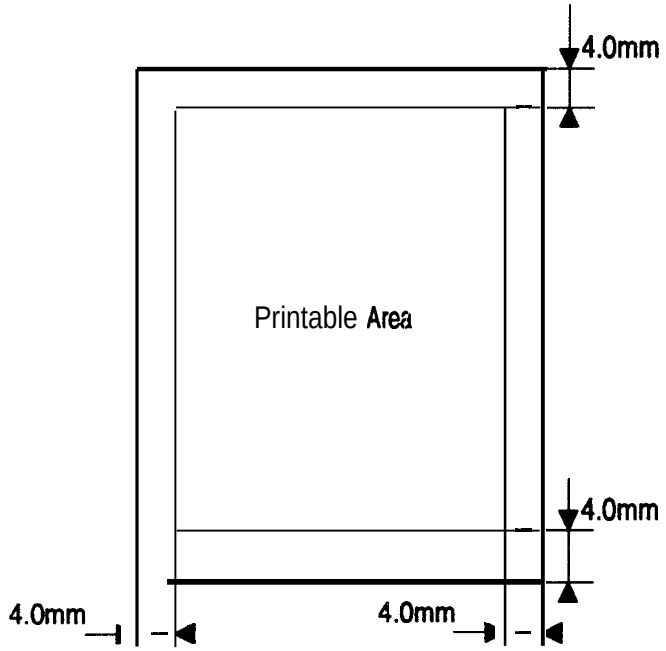


Figure 1-2. Printable Area

Note: The actual printable area depends on the printer mode.

Noise: Less than 30 dB(A) (standby)
Less than 47 dB(A) (operating)
Ozone density: Less than 0.01 ppm
Toxicity: No toxicity exists in organic photo conductor (OPC), toner, or plastic materials

1.2.2 Electrical Specifications

Table 1-5. Electrical Specifications

Description	100 V Version	200 V Version
Rated voltage	100-120 VAC	220-240 VAC
Input voltage range	90-132 VAC	198-264 VAC
Rated frequency range	50-60 Hz	
Input frequency range	47-63 Hz	
Power consumption	Less than 350 W	Less than 450 W
Power consumption while in standby mode	Less than 15 W	

1.2.3 Reliability Specifications

MPBF (Mean Prints Between Failures): Over 17,000 sheets

Note: MPBF indicates the average number of pages printed before the occurrence of a problem requiring replacement or service.

MTBF (Mean Time Between Failures):	3000 power-on hours (POH)
Jam rate:	1 out of 2,000 sheets or less (excluding multiple-sheet feeding)
Feed failure:	1 out of 2,000 sheets or less (excluding multiple-sheet feeding)
Multiple paper feeds:	1 out of 500 sheets or less
Paper curl height:	30 mm (1.2 inches) or less
Leading edge bending (1 cm or more):	1 out of 1,000 sheets
MTTR (Mean Time To Repair):	30 minutes or less
Durability:	5 years or 100,0000 sheets

1.2.4 Environmental Conditions for Operation (Including Imaging Cartridge)

Temperature:	10 to 35° c (50 to 95° F)
Humidity:	15 to 85% RH
Altitude:	2,500 m (8,200 feet) or lower
Horizontal placement:	The printer should be installed on a level plane.
Illuminance:	3,000 IUX or less (must not be exposed to direct sunlight)
Surrounding space:	The printer should have at least 100 mm of clearance on its sides and rear.

1.2.5 Environmental Conditions for Storage and Transportation (Excluding Imaging Cartridge)

Temperature:	O to 35° C (32 to 95° F) over full storage term -20 to 55° C (-4 to 131° F) under extreme conditions (Extremes are allowable for up to 1/30 of full storage term) Temperature variation must be 10″ C (18° F)/hour or less
Humidity:	30 to 85% RH over full storage term 10 to 95% RH under extreme conditions (Extremes are allowable for up to 1/30 of full storage term)
Drop test:	Clear to JIS Z0200-1987 Level 1
Vibration:	Vibration frequency 5 to 100 Hz and 100 to 5 Hz Acceleration 1 G Acceleration direction 3 direction
Resistance to atmospheric pressure:	More than 613 hPa
Storage term:	24 months (following date of manufacture)

1.2.6 Applicable Standards

Safety Standards

120 VAC model:	UL 1950, CSA 22.2 No.950 Deviation 3
220/240 VAC model:	EN 60950 (IEC950), NEMKO (IEC950), SETI (IEC950), SEMKO (IEC950), DEMKO (IEC950)

Safety Regulations (Laser radiation)

120 VAC model:	FDA (NCDRH) Class 1
220/240 VAC model:	VDE 0837 (Laser Class 1)(IEC825), SETI (IEC825), SEMKO (IEC825), DEMKO (IEC825)

EMI

120 VAC model:	FCC Part 15 Subpart B Class B
220/240 VAC model:	Vfg 243 (VDE 0878 Part 3,30) EN55022 class B (CISPR Pub.22 class B)

Others

Toner:	No effect on human health (OSHA-TSCA, EINECS)
OPC:	No effect on human health (OSHA)
Ozone:	Less than 0.01 mmp other UL478 (5th edition)
Materials:	SWISS Environmental Law (No CdS must be contained)

1.2.7 Consumable (Imaging Cartridge) Specifications

Life:	3,000 pages (unit included with printer) 4,500 pages (optional consumable)

Note: Consumable life is based on continuous printing mode with A4/letter paper at a 5% image ratio (black/white ratio). The life varies, depending on the printing mode (continuous or intermittent) and/or the image ratio.

Environmental Conditions for Storage and Transportation

Temperature:	Oto300 C (32to860 F) over full storage term –20 to40'C (-4 to 104 "F) under extreme conditions (Extremes are allowable for up to 1/.30 of full storage term) Temperature variations must be10"C (18 °F)/hour or less.
Humidity:	30 to 85% RH over full storage term 10 to 95% RH under extreme conditions (Extremes are allowable for up to 1/30 of full storage term)
Drop test:	Height 76 cm (30.4 inches)
Vibration:	Same as printer
Resistance to atmospheric pressure:	More than 740 hPa
Storage term:	18 months (following date of manufacture)

1.2.8 Physical Specifications

Dimensions (W x D x H):	376 x 311 x 216 mm (14.8 x 12.3x 8.5 inches) 376 x 444 x 218 mm (14.8 x 17.5x 8.9 inches) (paper tray set)
Weight:	Approximately 7 Kg (15.5 lb.) (including consumable, excluding all options)

1.2.9 Software Specifications

Built-in modes: HP LaserJet 4L emulation (PCL5e)

Optional modes: EPSONScript Level 2 (PostScript Level 2 emulation) mode
AWPS (AtWork Printing System) mode

Auxiliary software: Hex dump
Status sheet
Font sample
Fact sheet
RITech test sheet

Built-in fonts: See Table 1-6

Table 1-6. Built-in Fonts

Resident Fonts		Applicable Mode
		HP LJ4L
Bitmap fonts		
Line Printer	16.66 cpi (Portrait)	S
Courier	10 cpi (Portrait)	S
Courier Bold	10 cpi (Portrait)	S
Courier	12 cpi (Portrait)	S
Courier Bold	12 cpi (Portrait)	S
Scalable fonts		
Dutch™ 801	Roman SWC	S
Dutch 801	Bold SWC	S
Dutch 801	Italic SWC	S
Dutch 801	Bold Italic SWC	S
Swiss™ 742	SWC	S
Swiss 742	Bold SWC	S
Swiss 742	Medium Italic SWC	S
Swiss 742	Bold Italic SWC	S
Swiss 721	Roman SWM	S
Swiss 721	Bold SWM	S
Swiss 721	Oblique SWM	S
Swiss 721	Bold Oblique SWM	S
Dutch 801	Roman SWM	S
Dutch 801	Bold SWM	S
Dutch 801	Italic SWM	S
Dutch 801	Bold Italic SWM	S
Symbol Set	SWA	S
More WingBats	SWM	S
Courier	SWC	S
Courier	Bold SWC	S
Courier	Italic SWC	S
Courier	Bold Italic SWC	S

S: Supported, NS: Not Supported

Note: The built-in fonts for this printer are not same as the fonts for the HP LaserJet 4L.

Font Symbol Sets

HP LaserJet 4L Mode (bitmap fonts): 26 **symbol sets**

Roman-8	**Norweg1**	Roman Extension
French	HP German	Italian
JIS ASCII	ECM941	**Swedis2**
ANSI ASCII	**Norweg2**	UK
French2	German	HP Spanish
Legal	Chinese	Spanish
IRV	Swedish	Portuguese
IBM® Portuguese	IBM Spanish	IBM- US
IBM-DN	**PcMultilingual**	

HP LaserJet 4L Mode (scalable fonts): 34 symbol sets

Roman-8	**Norweg1**	Italian
ECM94-1	**Swedis2**	ANSI ASCII
UK	**French2**	German
Legal	8859-2 **ISO**	Spanish
PsMath	8859-9 **ISO**	WiTurkish
MsPublishing	VeMath	DeskTop
Math-8	**WiE.Europe**	**PcTk437**
Windows	**PsText**	IBM-US
IBM-DN	McText T	**PcMultilingual**
VeInternational	VeUS	PiFont
PcE.Europe	**SymbolT**	WiAnsi
Wingdings		

1.3 INTERFACE SPECIFICATIONS

The EPL-3000 is equipped with the following external interfaces:

- Parallel interface
- Optional Type-B interface

The ActionLaser 1300 is equipped with the following external interface:

- Parallel interface

1.3.1 Parallel Interface

The parallel interface has two modes as follows:

- Compatibility mode (same as parallel interface of Epson's current page printer)
- Reverse mode

1.3.1.1 Compatibility Mode of Parallel Interface

System:	$\overline{\text{STROBE}}$ synchronization, 8-bit parallel data transfer
Handshaking:	BUSY and $\overline{\text{ACKNLG}}$ signals
Connector type:	P90-25027-1 (Amphenol) receptacle
Applicable plug:	57-30360 (Amphenol or equivalent)
Transfer speed:	Approximately 125,(XN bytes/second (maximum)
Signal timing:	See Figure 1-3.
Signal description:	See Table 1-7.

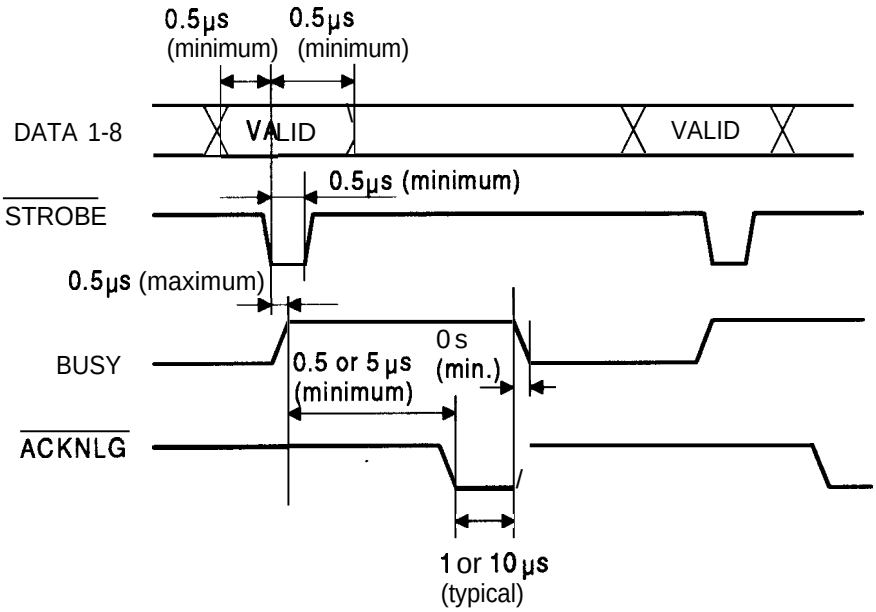


Figure 1-3. Compatibility Mode Signal Timing

Table 1-7. Parallel Interface Pin Assignment

Pin No.	Signal Name	I/O	Description
1	STROBE	IN	STROBE is a strobe pulse used to read data from the host computer. The pulse width must be more than 0.5 µsec. Normally it is HIGH, and data is latched at the trailing edge of this signal.
2-9	DATA 1-8	IN	DATA 1 to 8 are parallel data bits. When the signal is HIGH, the data bit is 1, and when it is LOW, the data bit is O. The most significant bit (MSB) is DATA8. The signal state must be maintained for 0.5 @cc. on either side of the STROBE signal active edge.
10	ACKNLG	OUT	ACKNLG is an acknowledge pulse with an approximate width of 1 or 10P. This signal goes LOW when the data reception is completed, which indicates that the printer can accept new data. Timing with the BUSY signal is specified through SelecType.
11	BUSY	OUT	The BUSY signal informs the host computer of the printer state. When the signal is HIGH, the printer cannot accept data.
12	PE	OUT	The PE signal indicates paper empty for the standard tray selected through SelecType or command, or for the optional paper cassette. Paper empty is indicated by HIGH.
13	SLCT	OUT	Use in reverse mode.
14	AUTO-FEED	IN	Not used.
15	NC	·	Not used.
16	GND		Logic ground level.
17	CHASSIS GND	-	Connected to the printer chassis. The printer chassis GND and the signal GND are connected to each other.
18	NC	·	Not connected.
19"30	GND	·	Ground level for the twisted pair return signal.
31	INIT	IN	The STROBE signal is ignored when this signal is LOW.
32	ERROR	OUT	This level goes LOW when the printer is: . out of paper . in paper jam state . in error state • off line
33	GND	·	Same as for pins19 to 30.
34	NC	·	Not used.
35	+5		Pulled up to +5V through 1.0 KΩ resistance.
36	SLCT IN	·	Use the reverse mode.

1.3.1.2 Reverse Mode

The reverse mode for the EPL-3000/ActionLaser 1300 supports IEEE-P1284 nibble mode and WPS reverse mode. This section describes the nibble mode. This printer can run in reverse mode, in which the printer can inform the computer of its status by EJL and PJL commands.

System: IEEE-P1284 nibble mode

Connector type: P90-25027-1 (Amphenol) receptacle

Applicable plug: 57-30360 (Amphenol or equivalent)

Signal description: See Table 1-8.

Table 1-8. Parallel Interface Pin Assignment

Pin No.	Signal Name	I/o	Description
1	$\overline{\text{STROBE}}$	IN	HostClk: This signal is a strobe pulse used to read extension request values from the host computer during negotiation.
2-9	DATA 1-8	IN	The signals are data bits of extension request values during negotiation. This printer supports the following values: 0000 0100: Request Device ID (by nibble mode transmission) 0000 0000: Request nibble mode
10	$\overline{\text{ACKNLG}}$	OUT	PtrClk: Printer data sending clock.
11	BUSY	OUT	PtrBusy: Printer sending data bits 3 and 7 during data transfer to host computer.
12	PE	OUT	AckDataReq: Printer sending data bits 2 and 6 during data transfer to host computer.
13	SLCT	OUT	Xflag: Printer sending data bits 2 and 6 during data transfer to host computer.
14	$\overline{\text{AUTO-FEED}}$	IN	HostBusy: This signal informs the printer of the host computer state. When the signal is HIGH, the host computer cannot accept data.
15	NC		Not used.
16	GND		Logic ground level.
17	CHASSIS GND	-	Connected to the printer chassis. The printer chassis GND and the signal GND are connected to each other.
18	NC		Not connected.
19-30	GND		Ground level for the twisted pair return signal.
31	INIT	IN	nInit: High level fixed
32	$\overline{\text{ERROR}}$	OUT	nDataAvail: Printer sending data bits O and 4 during data transfer to host computer.
33	GND		Same as for pins19 to 30.
34	NC		Not used.
35	+5		Pulled up to +5V through 1.0 KΩ resistance.
36	$\overline{\text{SLCT IN}}$	IN	1284Active: If this signal is set to HIGH, this printer active P1284 (reverse mode).

Figure 1-4 shows the parallel interface state switch diagram.

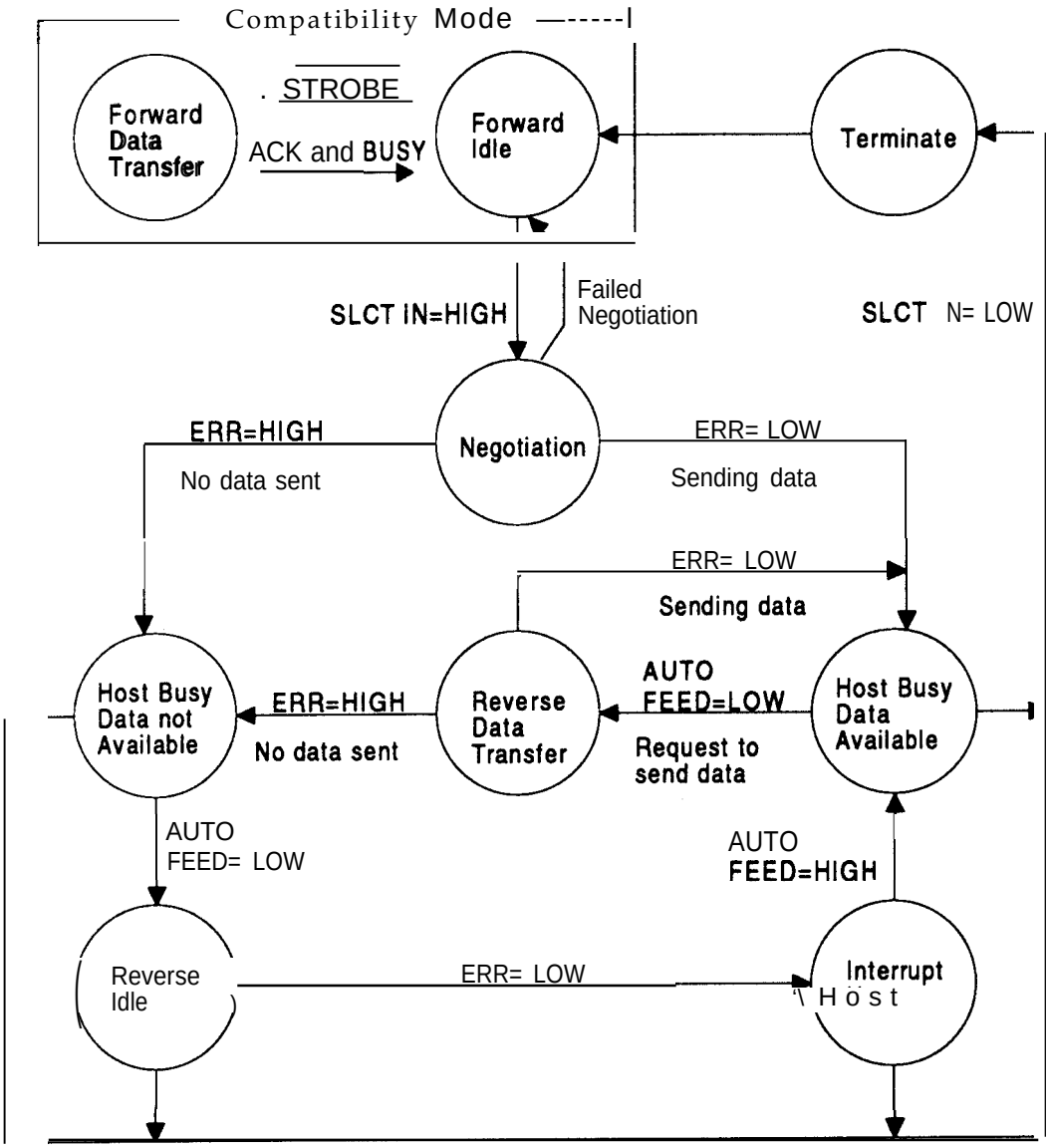


Figure 1-4. Parallel Interface State Switch Diagram

Figure 1-5 shows the negotiation timing chart.

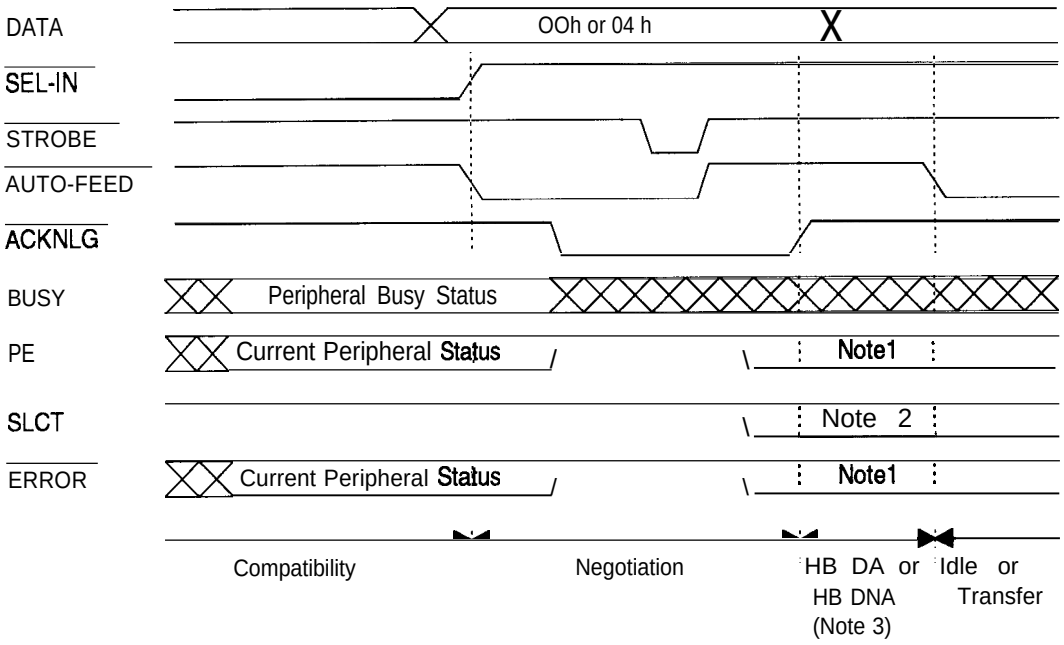


Figure 1-5. Negotiation Timing Chart

Note 1: The signal is set to HIGH when not sending data.
The signal is set to LOW when sending data.

Note 2: The signal is set to HIGH if the extension request value is 04h.

Note 3: HB DA: Host Busy Data Available
HB DNA: Host Busy Data Not Available

Figure 1-6 shows the data transfer timing chart.

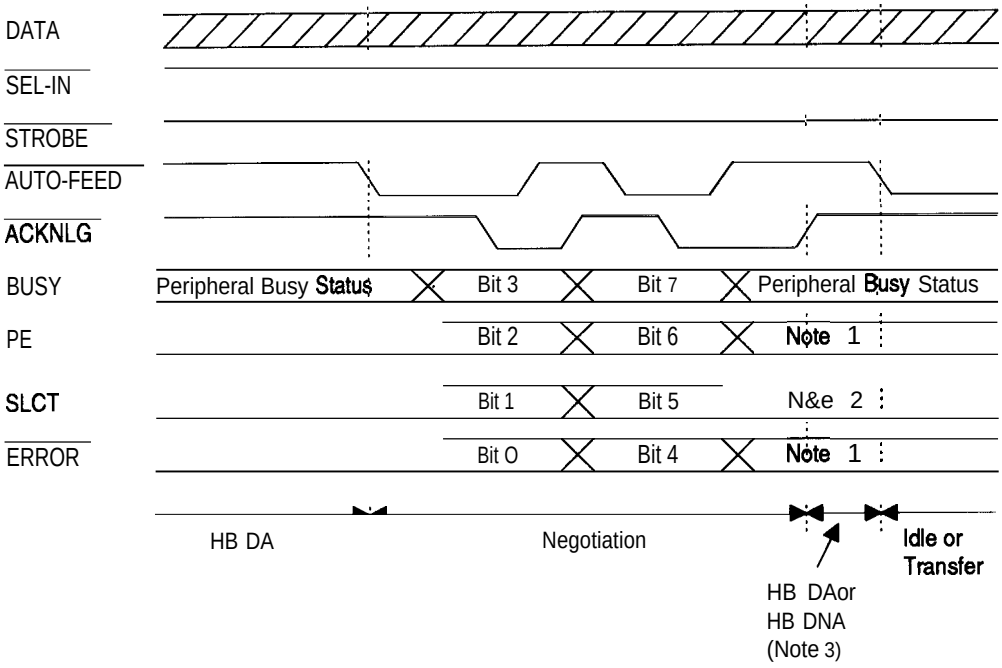


Figure 1-6. Data Transfer Timing Chart

Note 1: The signal is set to HIGH when not sending data.
The signal is set to LOW when sending data.

Note2: The signal is set to HIGH if the extension request value is 04h.

Note3: HB DA: Host Busy Data Available
HB DNA: Host Busy Data Not Available

Figure 1-7 shows the termination timing chart.

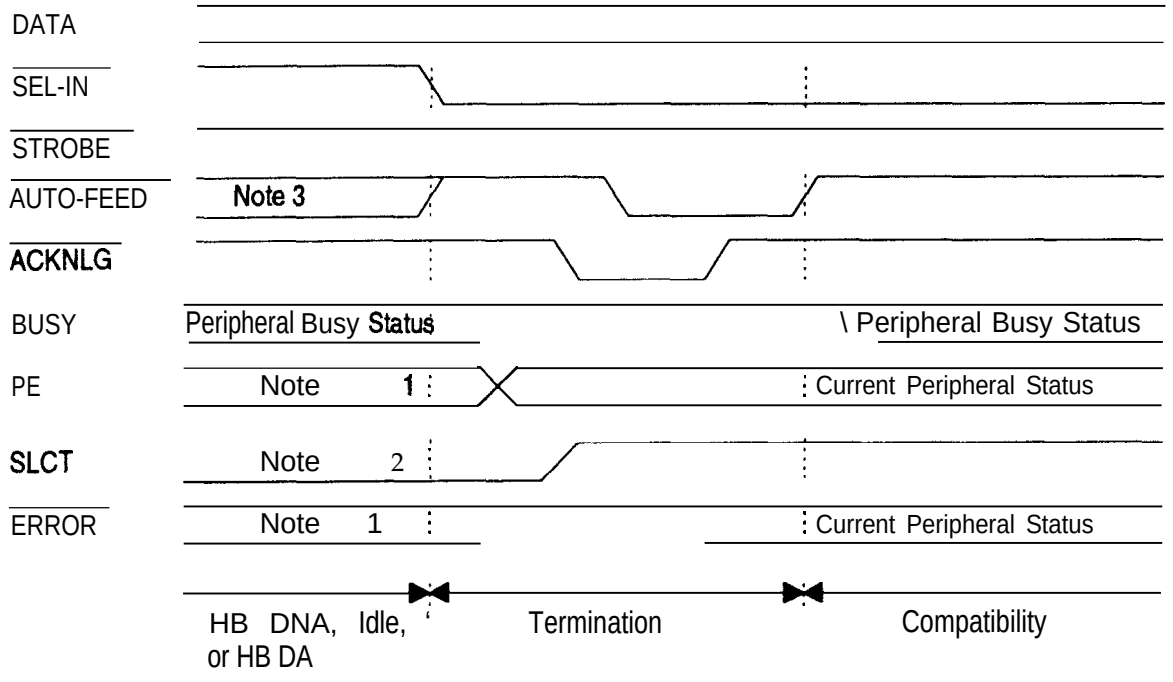


Figure 1-7. Termination Timing Chart

Note 1: The signal is HIGH when HB DNA.
The signal is LOW when HB DA.

Note 2: The signal is set to HIGH if the extension request value is 04h.

Note3: Idle= LOW

Figure 1-8 shows the interrupt timing chart.

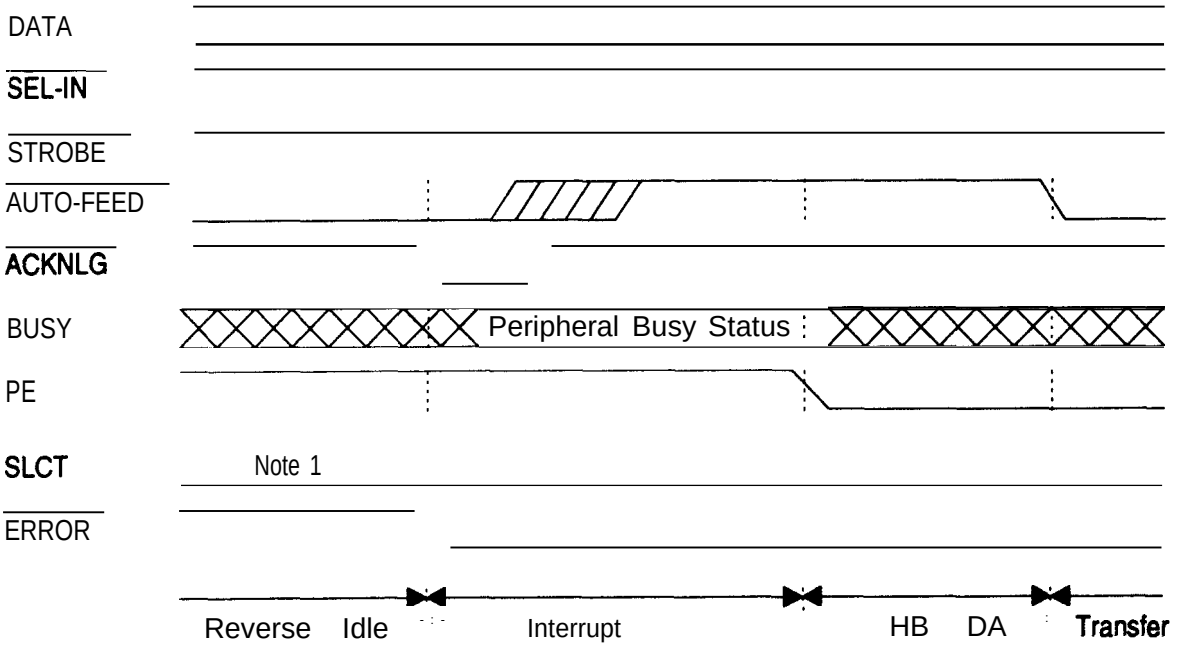


Figure 1-8. Interrupt Timing Chart

Note 1: The signal is set to HIGH if the extension request value is 04h.

1.3.2 Optional Interface C82305*/C82306* (EPL-3000 only)

Type:	RS-232C or current loop	
Synchronization:	Asynchronous start-stop system	
	Start bit:	1 bit
	Stop bit:	1 bit
	Data length:	7 or 8 bits
	Parity:	Odd, even, or none
Protocol:	X-ON/X-OFF (cannot be combined with DTR control)	
	DTR control (cannot be combined with X-ON/X-OFF)	
Transfer speed:	300,600,1200,1800,2400, 4800,9600, or 19200 bps	
Error handling:	Overrun error:	Processed as missing data and replaced by "*"
	Parity error:	Replaced by "*"
	Framing error:	Replaced by "*"
	Breaking character:	Ignored

Handshaking

When the vacant area for data in the input buffer drops to 256 bytes, the printer outputs an X-OFF code or sets the DTR signal level to LOW, indicating that the printer cannot receive more data. Once the vacant area for data in the buffer recovers to 512 bytes, the printer outputs an X-ON code or sets the DTR signal level to HIGH, indicating that the printer is again ready to receive data.

1.4 OPERATING INSTRUCTIONS

This section describes the functions performed through the control panel, *such* as test print, hexadecimal dump, and panel setting functions.

1.4.1 Control Panel

The printer control panel gives you easy control over most common printer operations. The panel consists of indicator lights and buttons.

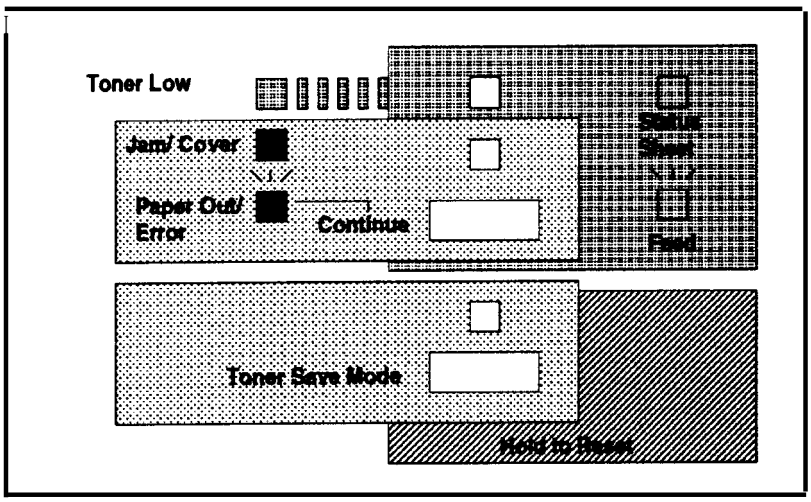


Figure 1-9. Control Panel

Indicator lights

■ Data

Off:	Power off
Slow flashing:	Received data is stored in the printer but has not been printed.
Quick flashing:	The printer is receiving or processing data.
on:	There is no printable data remaining in the printer.
Orange color:	Toner low

■ Jam/Cover

on:	Paper jam or cover open
Slow flashing:	Paper out or feed jam
Quick flashing:	Warning (Refer to "Message Display" section)

■ Toner Save Mode

on:	Toner Save Mode selected
Off:	Toner Save Mode not selected
Flashing	The panel is being reset

Buttons

■ Status Sheet

Warning Measures	When the Jam/Cover light is quickly flashing, press this button to clear a warning.
Feed	When the Data light is slowly flashing, press this button to print out data in the printer's memory.
Continue	When the Jam/Cover light is slowly flashing, press this button to starts printing.
Status Sheet Printing	When the Data light is on, press and hold this button until the Data light begins quickly flashing. A status sheet will them print.

■ Toner Save Mode

Toner Save Mode	Press this button to turn the Toner Save Mode light on (Toner Save Mode selected) or off (Toner Save Mode not selected), or to reset Toner Save Mode.
Reset	Press and hold down this button until the Toner Save Mode light begins flashing.

■ Toner Counter Reset (Toner Save Mode+ Status Sheet)

Toner Counter Reset	To reset the toner counter, press and hold down the Toner Save Mode and Status Sheet buttons until the Data light turns green and then flashes orange.

1.4.2 Service Mode

This printer has three service modes as follows:

■ Hexadecimal Dump
■ Factory Reset
■ EEPROM Format (EEPROM reset)

1.4.2.1 Hexadecimal Dump Mode

The hexadecimal dump mode is a useful tool for troubleshooting data control problems. To enter hexadecimal dump mode, turn on the printer while holding down the Toner Save Mode button until Data light comes on.

1.4.2.2 Factory Reset Mode

This mode resets all settings except the printer name and total printing counter. To enter factory reset mode, turn on the printer while holding down the Toner Save Mode button until only the Toner Save Mode light is on.

1.4.2.3 EEPROM Format Mode

EEPROM format operations are required only when the main controller board or EEPROM is replaced. These operations are specified in the documentation accompanying these components.

EEPROM format functions (printer name, default paper size (A4 or letter), toner counter, total printing counter, and other settings) are all stored in memory.

Defaults for the EEPROM format functions can be written to EEPROM as follows:

Turn on the printer while holding down the Status Sheet and Toner Save Mode buttons until only the Data light is flashing.

Note: The printer name (EPL-3000 or ActionLaser 1300) and default paper size (A4 or letter) are selected by jumper J3 for the main controller board when this operation is performed.

1.4.3 Message Display

This printer displays two types of messages on the indicator lights: status and error, and service call error.

1.4.3.1 Status and Error Messages

If any of the following status and errors conditions occur, they will be displayed on the indicator lights. The error must be cleared immediately using the measures shown in the following table.

Table 1-9. Status and Error Messages

Indicator Light Display			Status	Measures
Data	Jam/ Cover	Toner Save Mode		
—	—	F.	Resetting	—
—	ON	—	Paper jam or cover open	If paper jams, open the cover and remove the jammed paper. Then close the cover.
—	Q.F.	—	Warning **An error follows.**	Press the Status Sheet **button. If you need an error statement, print a status sheet. The status sheet is the printed error statement.**
			Insufficient Memory There is not enough memory to print or download data.	**Erase** downloaded data or add optional memory.
			Print Overrun Engine speed faster than print image processing. If the printer has unused memory, it automatically recovers.	If the printer cannot **automatically** recover, change the PAGE PROTECT setting by with the PJL **command** (utility software).
			Image Optimum **The printer** uses a lower print quality.	**Erase downloaded data or add optional memory.**
			Paper Size Mismatch The printing paper size is different from the paper size chosen.	Change the paper and print again.
			EEPROM Error The **EEPROM** cannot memorize the new settings.	Try again
			Soft Error/CPU Error Controller error	**Service** call
—	S.F.	—	Paper empty or feed jam	**Insert** or clear the paper **and** then press the Status Sheet button.

Table 1-9. Status and Error Messages (Continued)

Indicator Light Display			Status	Measures
Data	Jam/ Cover	Toner Save Mode		
OR	—	—	Toner low	Prepare the new imaging cartridge
Q.F.	OFF	—	Data received or data processing	—
S.F.	—	—	Data held	—
ON	—	—	Data not held	—
—	—	ON	Toner Save Mode	—
—	—	OFF	No Toner Save Mode	—
OFF	OFF	OFF	No power	—

F.: Flashing, S.F.: Slow Flashing, Q.F.: Quick Flashing, OR.: Orange light

1.4.3.2 Service Call Error

This printer automatically checks the operating conditions of each component. If any abnormality is detected, the printer displays an error message on the control panel.

While the printer detects a service call error, it continuously repeats the following display:

All lights on → All lights off → Error code display → All lights off

Table 1-10. Service Call Error

Indicator Light Display			Error
Data	Jam/ Cover	Toner Save Mode	
ON	OFF	OFF	Fusing unit error
OFF	ON	OFF	Laser light error
OFF	OFF	ON	Scanner motor error
ON	ON	OFF	Fan motor error
ON	OFF	ON	EEPROM format error
OFF	ON	ON	RAM error
OFF	OFF	OFF	ROM error

1.4.4 Printer Sharing

This section describes printer sharing- It is possible to allocate each mode to parallel and optional interfaces. The entire memory will be allocated to the channels that are used. The interface that receives the data first will print first.

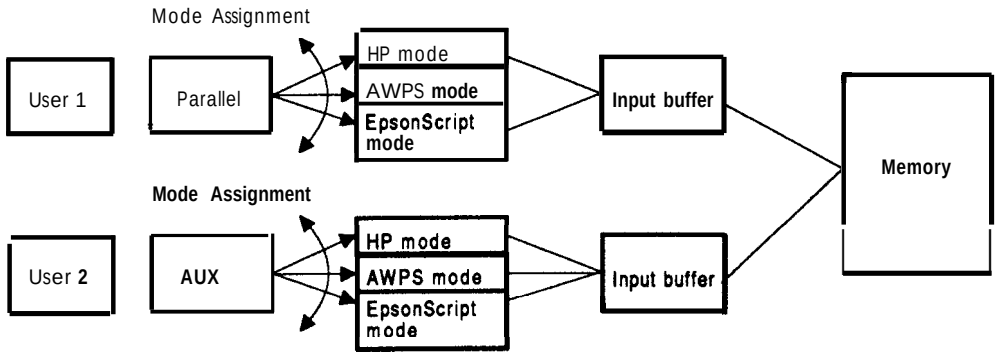


Figure 1-10. Auto Sense Mode

Input Buffer

The input buffer size is automatically adjustable from a minimum of 1/1000 of all memory to a maximum of 1/5 of all memory. If the input buffer is full, this printer expands the input buffer by 1/1000 of all memory per one step.

When the user connects the host computers parallel interface and optional interface, the input buffer size for the interface not processing data is a maximum of 1/100 of all memory.

Note: While EPSONScript Level 2 is used, this printer sets the input buffer.

1.4.5 Emulation Mode Switch Function

This section describes the emulation mode switch function.

1.4.5.1 Emulation Switch by SPL

The two types of emulation switch functions described below are available on this printer. Together they are referred to as SPL (Shared Printer Language).

EJL: EPSON Job Language

This is EPSON's original language system. It is able to skip among various destinations, as shown in Figure 1-11.

PJL: Printer Job Language

This is HP's original language, which is available with the LaserJet III Si printer.
It is able to skip among various destinations, as shown in Figure 1-11. The precise specifications for this language are based on the HP LaserJet III Si.

The figure below shows three types of mode switching.

Neither EJL nor PJL switches the mode directly. They first exit the current mode and return to EJL or PJL. Then they enter another mode.

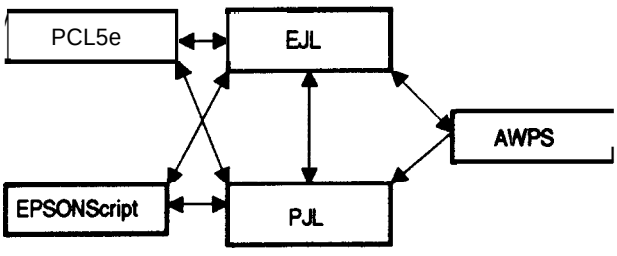


Figure 1-11. Emulation Switch by SPL

1.4.5.2 Intelligent Emulation Switch

The Intelligent Emulation Switch (IES) automatically switches the emulation switch mode, depending on the data sent from the host computer through one of the interface channels. It is able to switch between EPSONScript and other modes as shown in the figure below.

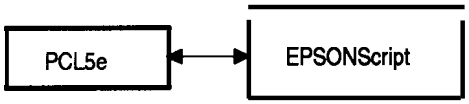


Figure 1-12. Intelligent Emulation Switch

1.4.6 Resolution Improvement Technology

The EPL-3000/ActionLaser 1300 printers have RITech (Resolution Improvement Technology), which is designed to improve print quality at 300 dpi. With this method, the dot-map data extracted from the image data is reassembled to improve the print data.

The main improvement from this technique is in eliminating "jaggies" in diagonal lines. It is most effective when the dot-map data fits the development characteristics of the printer mechanism. It is therefore necessary to set appropriate values in PJL commands.

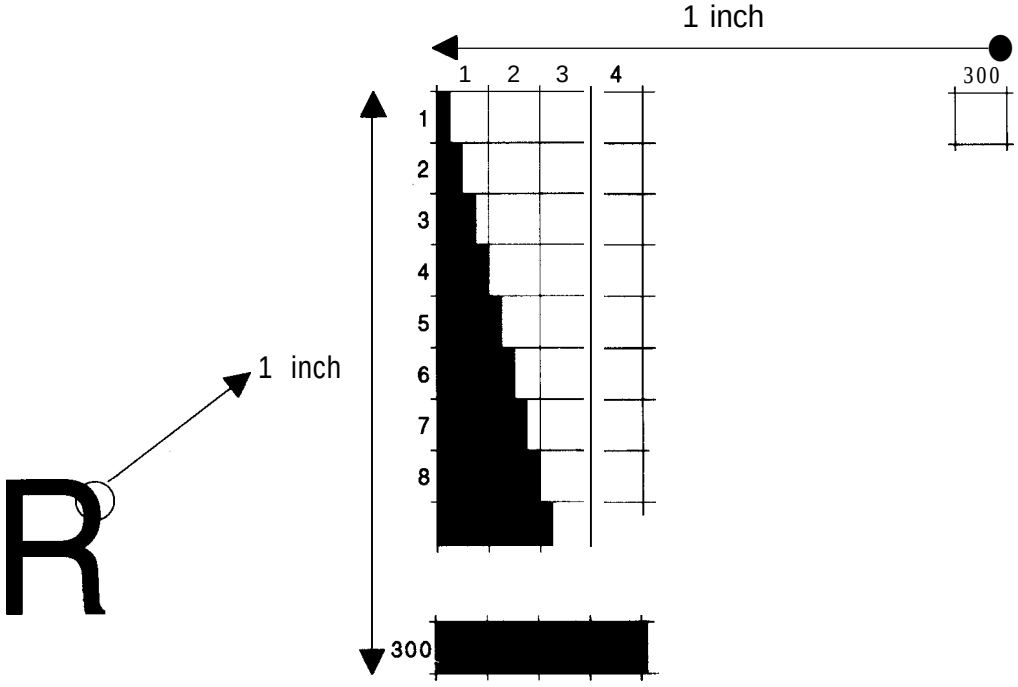


Figure 1-13. Effect of RITech

Note: RITech is not effective for printing a screen pattern or gray scale. In such cases, RITech must be set to OFF. (The default setting is MEDIUM.) Since the RITech effect depends on the toner condition, it should be adjusted when the imaging cartridge is replaced or after the imaging cartridge is used for a long time.

The following settings are available in PJL commands for RITech: DARK, MEDIUM, LIGHT, and OFF. When the toner density of area A is almost the same as that of area B (as shown in the figure below), the RITech setting is optimum. In other words, the optimum setting is achieved when it is difficult to distinguish the shape of area A from that of area B.

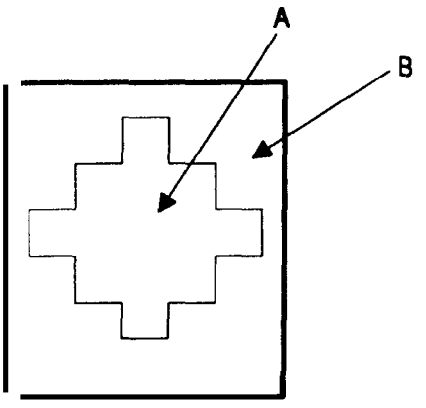


Figure 1-14. RITech Adjustment

1.4.7 Toner Save Mode

The Toner Save Mode uses about 50% less toner than normal. The printer saves toner by substituting a gray shade for the black inside of characters. The outlines of the characters are still printed in full black.

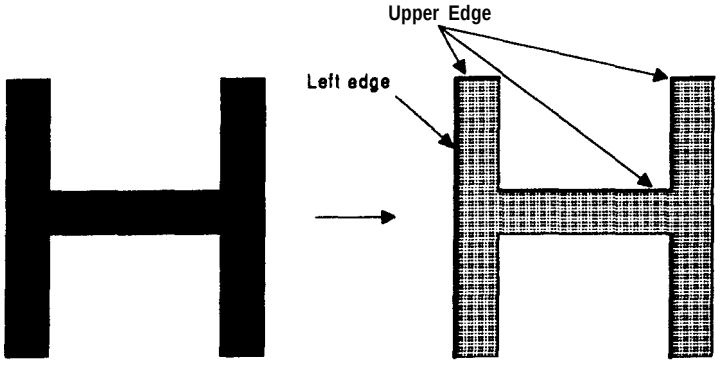


Figure 1-15. Toner Save Mode

1.4.8 Optional Memory

If you have difficulty printing complex, graphics-intensive pages or if you regularly use downloaded fonts, you may need to install the optional SIMM sets on this printer's controller board. The printer's controller board comes with 1.0 MB of RAM installed.

By installing additional SWIMS, you can increase the printer's memory to a total of 5 MB, including the resident memory.

Epson supplies several types of SIMM memory options. Other SIMMs can be purchased from other vendors. Be sure that the SIMM meets the requirements listed below.

- 72-pin type
- Capacity is one of the following: 1, 2, 4 MB
- Access speed is less than 70 ns.
- Size is within the following dimensions:
  36 mm (1.42 in.) × 108 mm (4.25 in.) × IOmm (.39 in.) (Hx W x D)

1.5 MAIN COMPONENTS

To simplify maintenance and repair, the main components of the EPL-3000 / ActionLaser 1300 have been designed for easy removal and replacement. The main components are:

❑ C144 MAIN Board	Video controller circuit and engine controller circuit board
❑ ROM SIMM board	Optional ROM module
❑ PWB-E Board	Power supply circuit board
❑ PWB-F Board	High-voltage supply circuit board
❑ Optical Unit	
❑ Fusing Unit	
❑ Drive Unit	
❑ Imaging Cartridge	
❑ Housing	

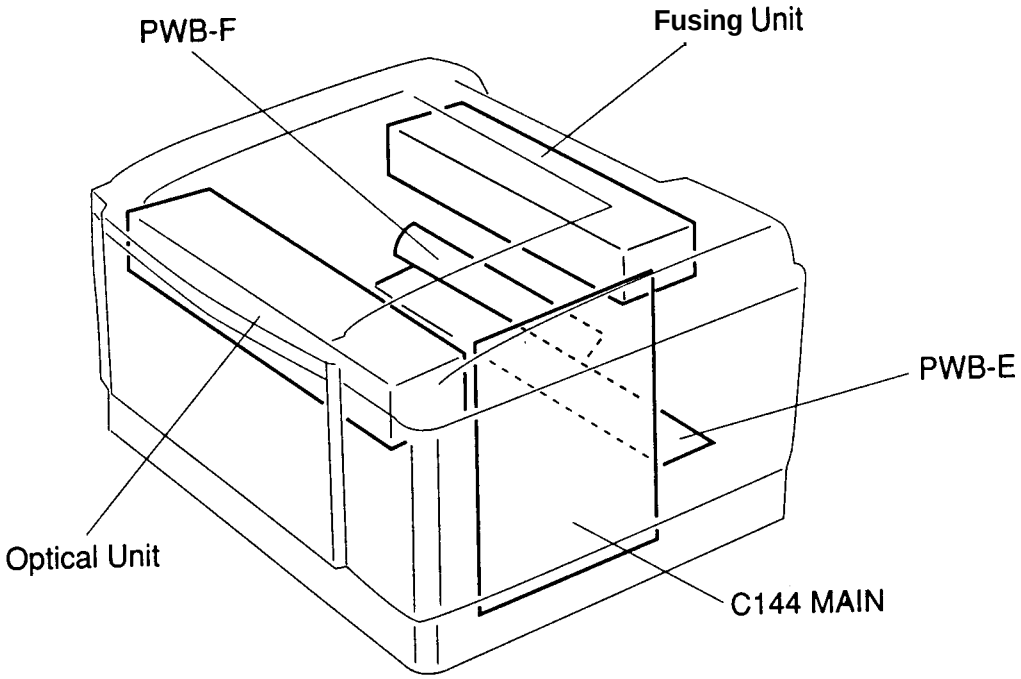


Figure 1-16". Component Layout

1.5.1 C144 MAIN Board

The C144 MAIN board is a video controller circuit and engine controller circuit board. The primary functions of the video controller circuit are receiving print data from the host, generating the print image (video), and sending the print image to the engine controller circuit via the video interface. A Motorola 68EC000, 16-bit, 16.7 MHz CPU (location: IC6) is used, and the following memory chips and custom ICs are assigned to the 16 MB memory space.

■ Memory chips

Code ROM: two 4Mbit EEPROM (IC17, 18) or one 8Mbit mask ROM (IC19)
Font ROM: one 8Mbit mask ROM (M80ATBD: IC8)
Code and font ROM: one 16Mbit mask ROM (IC8)
4Mbit DRAM (IC1O, 11)
16Kbit EEPROM (IC8)

Note: This printer can select one included code and font ROM or a separate type.

Table 1-11. ROM and Jumper Settings

Jumper Settings		ROM Locations			
J2	J4	IC17	IC18	IC19	IC8
1-2	1-2	4Mbit EEPROM Code U	4Mbit EEPROM Code L	—	8Mbit Mask Font ROM
1-2	1-2	—	·	8Mbit Mask Code ROM	8Mbit Mask Font ROM
1-2	2-3	·	—	—	16Mbit Mask Code & Font ROM

■ Custom ICs

ASIC E05A83 (IC5)
ASIC E05B01 (IC9)
ASIC E05B04 (IC13)
PAL E06A01 (IC22)

The engine controller circuit consists of an M37451M4 8-bit CPU (including a MASK ROM) and a gate array. The circuit controls laser scanning (the polygon mirror drive motor), image synchronization, laser beam pulse width, and power.

There are two types of C144 MAIN boards used as after-service parts. The following table shows differences between them.

Table 1-12. Differences in Components for the C144 MAIN Boards

	EPL-3000	ActionLaser 1300
Optional interface connector (CN5)	Connector used	None
IC2, 3	IC socket used	None
Jumper J3	short	Open

Note: The first release C144 MAIN board also has a small board (C144 SUB board).

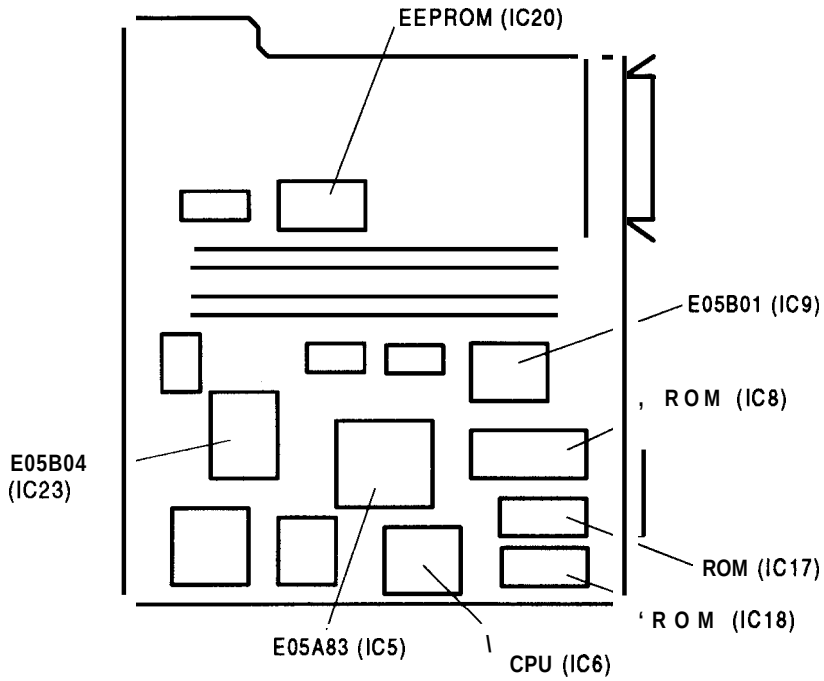


Figure 1-17. C144 MAIN Board

1.5.2 ROM SIMM Board

This printer can use an optional ROM SIMM board. It is a code ROM for other software modes.

1.5.3 PWB-E Board

The PWB-E is the power supply board, which consists of a switching regulator circuit. It converts the AC line voltage into +12 V and +5 VDC voltages. There are two types of power supply board, the 120V and 220/240V type. The difference between the two circuits is only in the input section.

CAUTION

Do not touch VRIE on PWB-E board, as it is set at the factory and should not be changed.

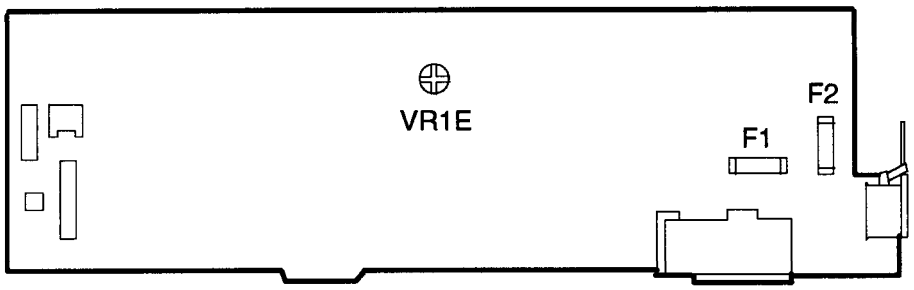


Figure 1-18. PWB-E Board

1.5.4 PWB-F Board

The PWB-F is the high-voltage supply circuit board. It converts the development bias, OPC drum charge bias, and image transfer bias.

CAUTION

Do not touch VR2F on PWB-F board, as it is set at the factory and should not be changed.

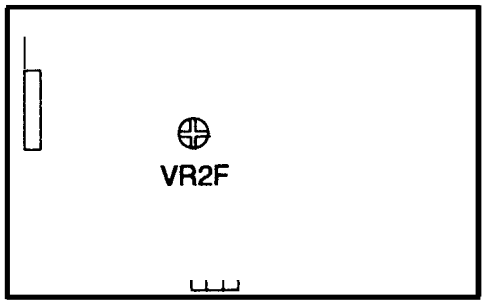


Figure 1-19. PWB-F Board

1.5.5 Optical Unit

The optical unit consists of the laser diode (semi-conductor laser), the mirror motor (scanner motor) which drives the polygon mirror for laser scanning, and several mirrors and lenses. The laser beam generated by the laser diode is conducted to the OPC drum surface by way of the polygon mirror, as well as several mirrors and lenses, to create a latent electro-photographic image on the drum.

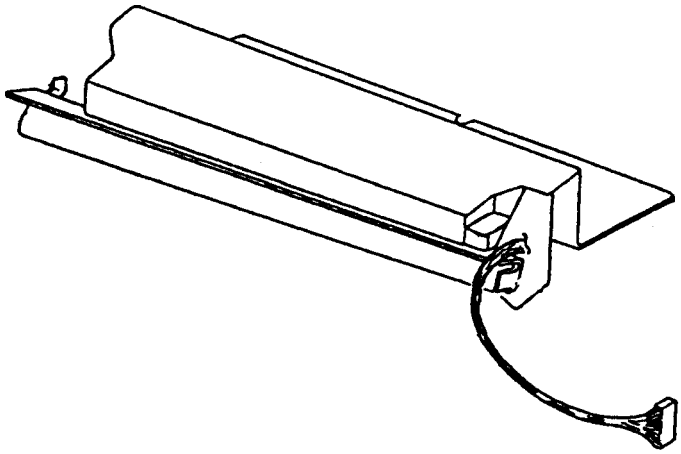


Figure 1-20. Optical Unit

1.5.6 Fusing Unit

The fusing unit fixes the toner to the paper using heat and pressure. This unit has a heater lamp, thermistor, and thermal fuse. There are two types of fusing units, the 120 V type and the 220/240 V type. The only difference between them is the heater lamp.

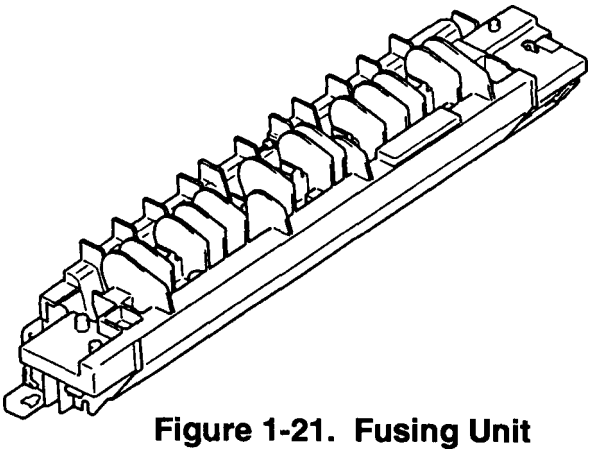


Figure 1-21. Fusing Unit

1.5.7 Drive Unit

The drive unit consists of the main motor and a series of gears and clutches. It drives the paper transport rollers, OPC drum, sleeve roller, fusing roller, and some other mechanisms.

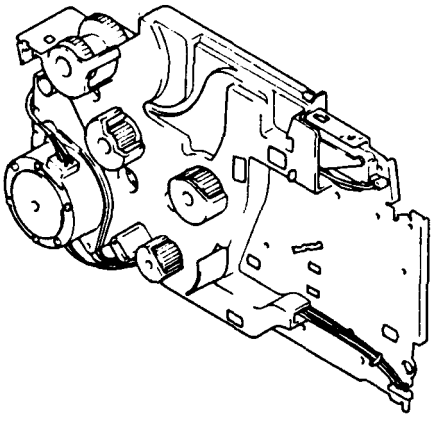


Figure 1-22. Drive Unit

1.5.8 Imaging Cartridge

The core mechanisms of the printing process, such as charging, developing, and cleaning, are integrated into this imaging cartridge.

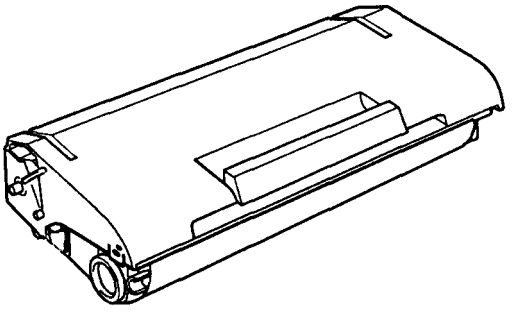


Figure 1-23. Imaging Cartridge

Chapter 2 Operating Principles

Table of Contents

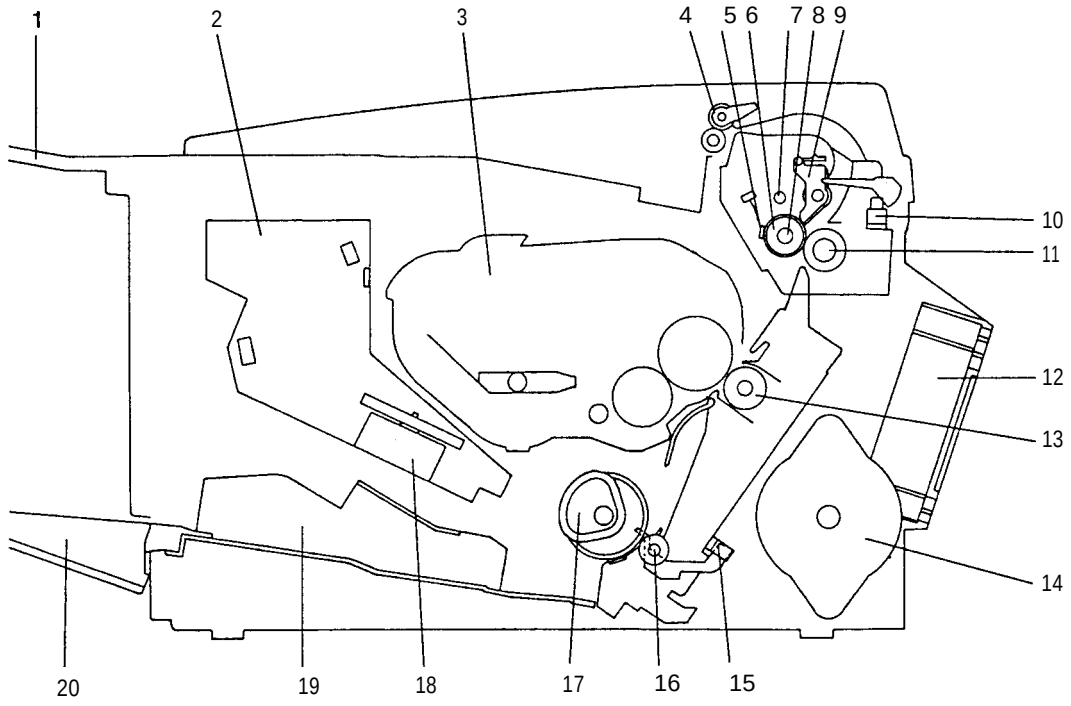
List of Figures

List of Tables

2.1 ENGINE OPERATION

This section describes the functions and operating principles of the EPL-3000/ActionLaser 1300 engine.

Figure 2-1 shows the locations and names of the main engine components.



1. Paper exit tray
2. Optical unit
3. Imaging cartridge
4. Exit roller
5. Thermistor (TH1)
6. Upper fusing roller
7. Thermal fuse (TF1)
8. Heater lamp (Hi)
9. Fusing separator
10. Paper exit sensor (PC2)
11. Lower fusing roller
12. cooling fan
13. Image transfer roller
14. Main motor (Ml)
15. Paper Take-up sensor (PC1)
16. Transport roller
17. Paper take-up roller
18. Polygon motor (M2)
19. Paper Guide
20. Paper tray

Figure 2-1. Main Components

2.1.1 Print Process

This section describes the print process from paper feeding to paper exit.

Figure 2-2 shows a diagram of the print process.

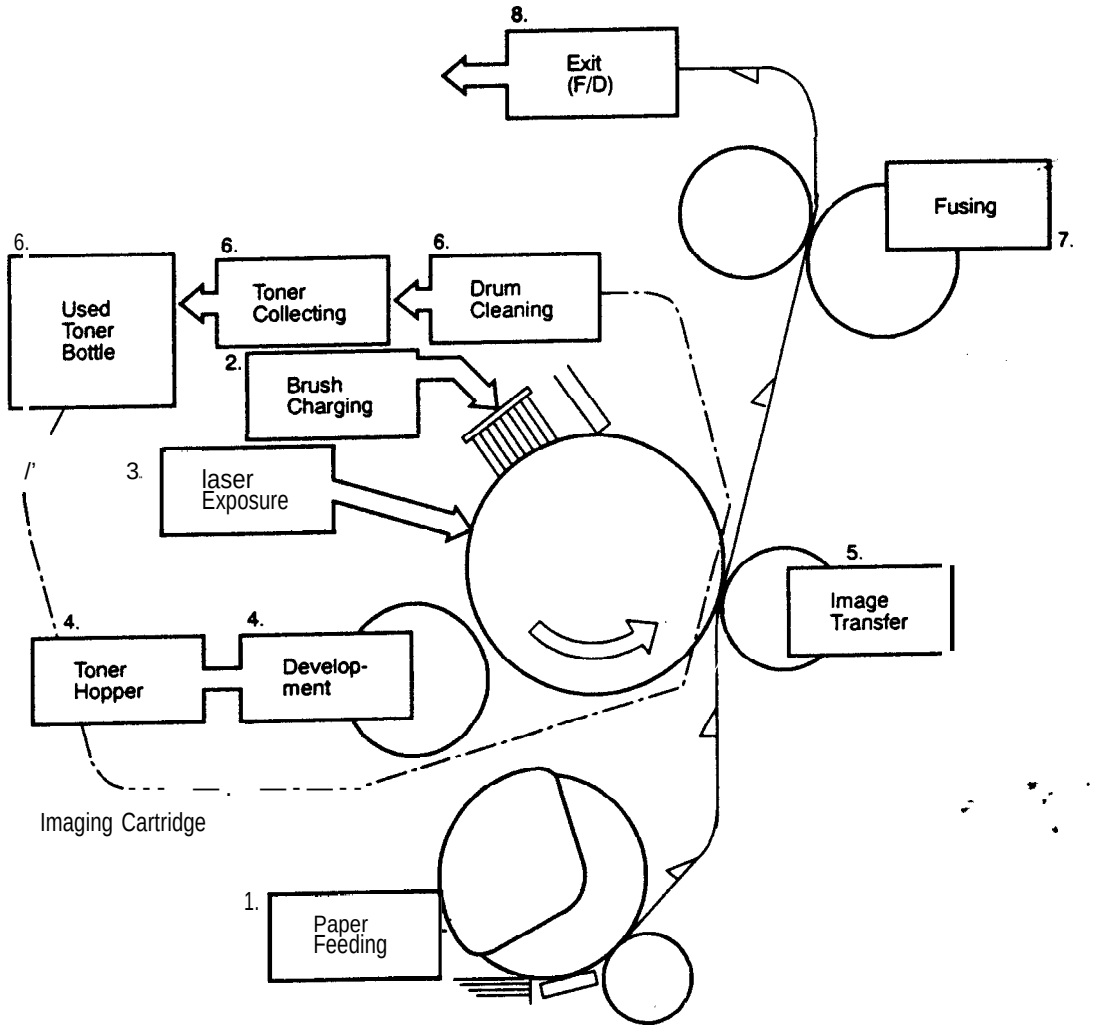


Figure 2-2. Print Process Diagram

2.1.1.1 Paper Feeding

On the multi-purpose tray (standard tray), various sizes of paper can be fed by fitting the paper guide against the sides of the paper.

The depressing cam is fixed to the shaft of the paper take-up roller, but the transport rollers are free. The transport rolls are rotated by the rotation of the transport roller. The depressing cam presses the paper lifting-up plate.
When the paper take-up solenoid (SL1) is actuated, the paper take-up roller rotates and the depressing cam releases to feed the first sheet of paper.
The timing to align the leading edge of paper with the image is determined by the paper take-up sensor (PC1).
Both of the sensors are comprised of a photo interrupter and an actuator. When the paper turns the actuator on, output from the paper take-up sensor (PC1) switches to "L" and output from the paper exit sensor (PC2) switches to "H".

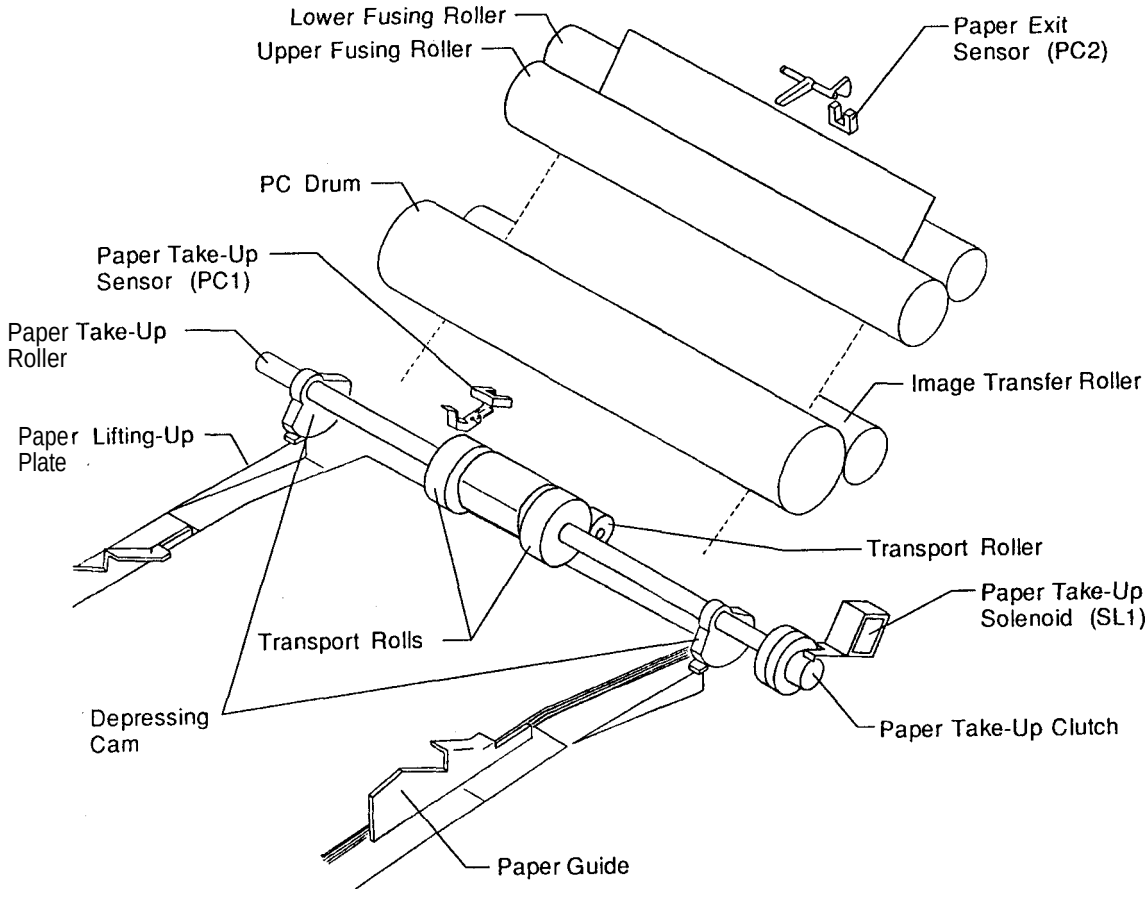


Figure 2-3. Paper Feeding

2.1.1.2 Imaging Cartridge

The imaging cartridge consists of the drum charging, developing and cleaning sections; the cleaning unit, the toner bottle, and the used toner bottle, all combined in a single unit.

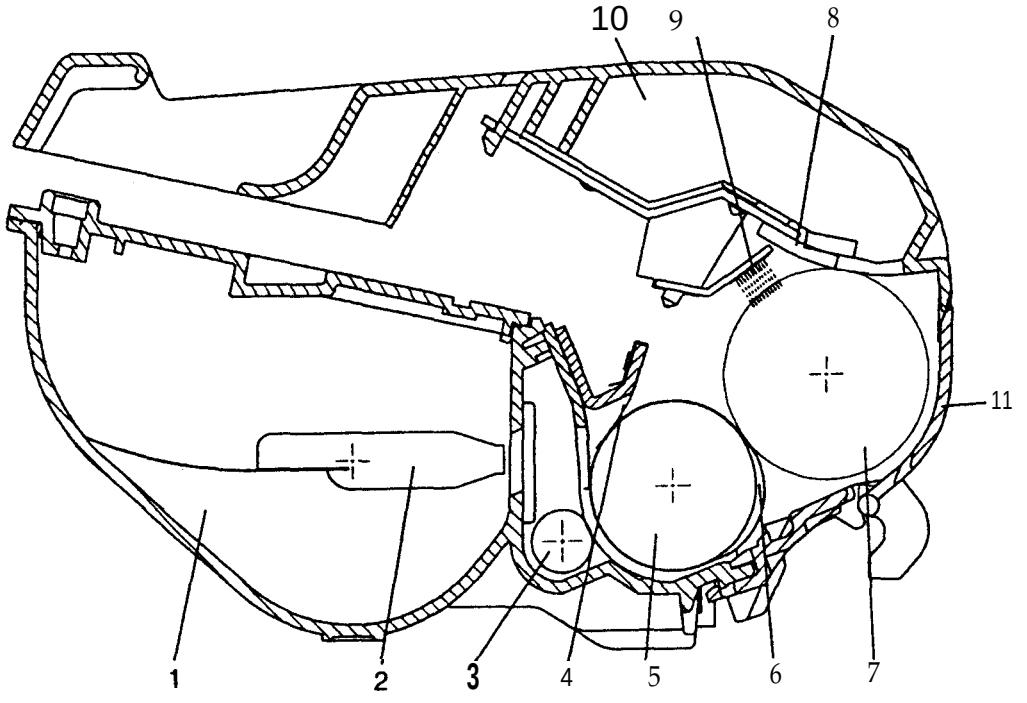


Figure 2-4. Imaging Cartridge

1. Toner Hopper	This contains the toner.
2. Toner Agitating Screw	This mixes the toner in the toner hopper and feeds it to the toner transport rollers.
3. Toner Transport Rollers	These transport toner to the sleeve roller.
4. Doctor Blade	This spreads a thin, even coat of toner over the flexible sleeve. As toner passes between the doctor blade and the flexible sleeve, it becomes negatively charged though friction.
5. *Sleeve* Roller	These are used to rotate the flexible sleeve.
6. Flexible Sleeve	This transports toner to the surface of the PC drum and controls developing.
7. PC Drum	'l'he latent image is formed by laser beams on the surface of the PC drum, and development is carried out by the flexible sleeve. The developed image is then conveyed to the surface of the paper.
8. Cleaning Blade	After the image is transferred, toner left on the surface of the PC drum (used toner) is wiped away by this blade.
9. Drum Charge Brush	This negatively *charges the PC* drum.
10. Used Toner Box	Used toner is collected here.
11. PC Drum Protecting Cover	This protects the surface of the PC drum when it is removed from the printer unit.

2.1.1.3 Drum Charge

Drum charge is the process of charging the PC drum with static electricity before laser exposure. This printer uses the brush charge method, rather than corona charge, to charge the drum. In brush charge, there is no generation of ozone as a result of corona discharge. This method also allows the drum to be charged at a low voltage, because a direct electric load is applied to the PC drum.

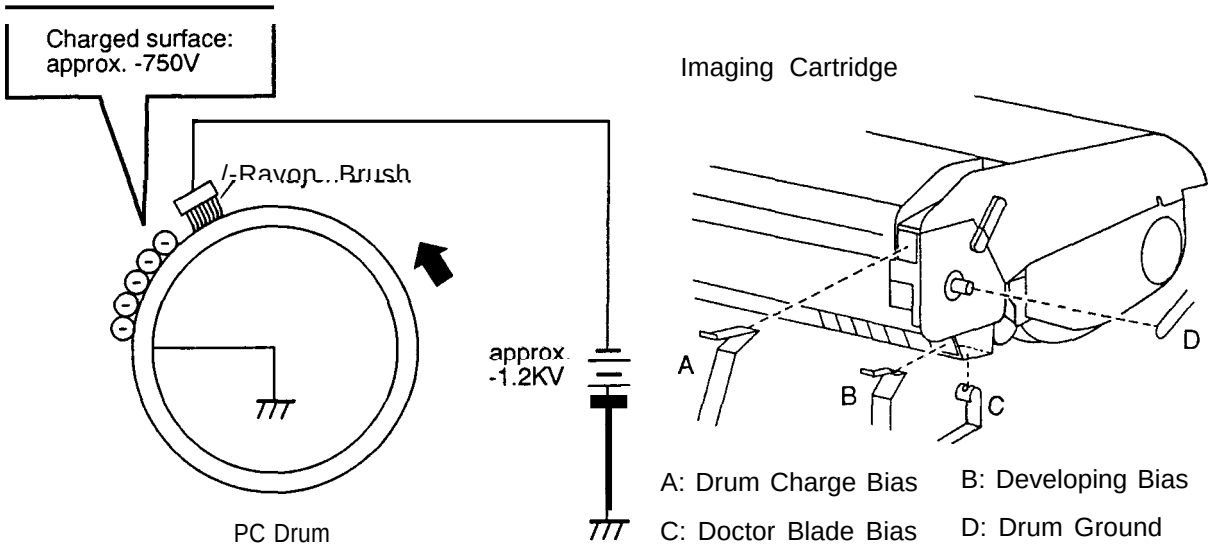


Figure 2-5. Drum Charge

2.1.1.4 Laser Exposure

Laser exposure is the process of creating an invisible static electric image on the PC drum with laser beams emitted from the optical unit. The mirror motor (scanner motor) rotates the four-sided mirror counterclockwise to produce a laser light scan. (One side of the mirror produces one scan.) The SOS (start of scan) sensor detects the laser rays from the SOS mirror and outputs the SOS signals to make the starting position of each line of the image uniform.

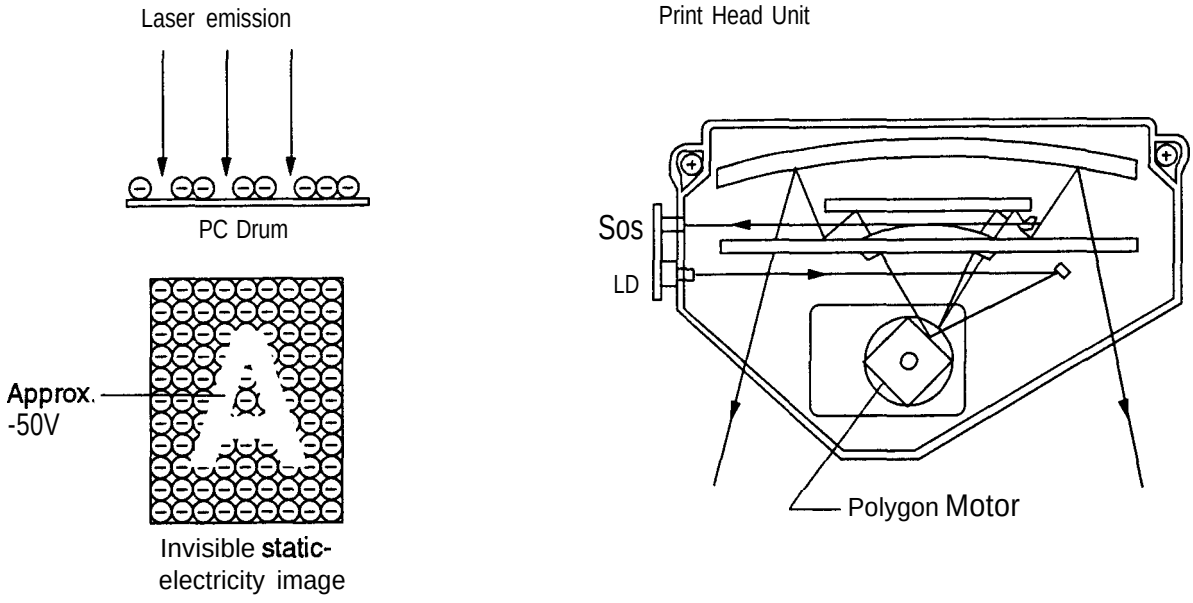


Figure 2-6. Laser Exposure

2.1.1.5 Development

Development is the process of creating a toner image on the PC drum by applying toner to the invisible static electric image. The doctor blade spreads a thin, even coat of toner over the flexible sleeve. When the toner passes between the doctor blade and the flexible sleeve, it becomes negatively charged. The flexible sleeve transports toner to the surface of the PC drum and controls the development with the developing bias voltage.

No positive toner is transported, and the doctor blade is charged to prevent the printing from having a foggy background.

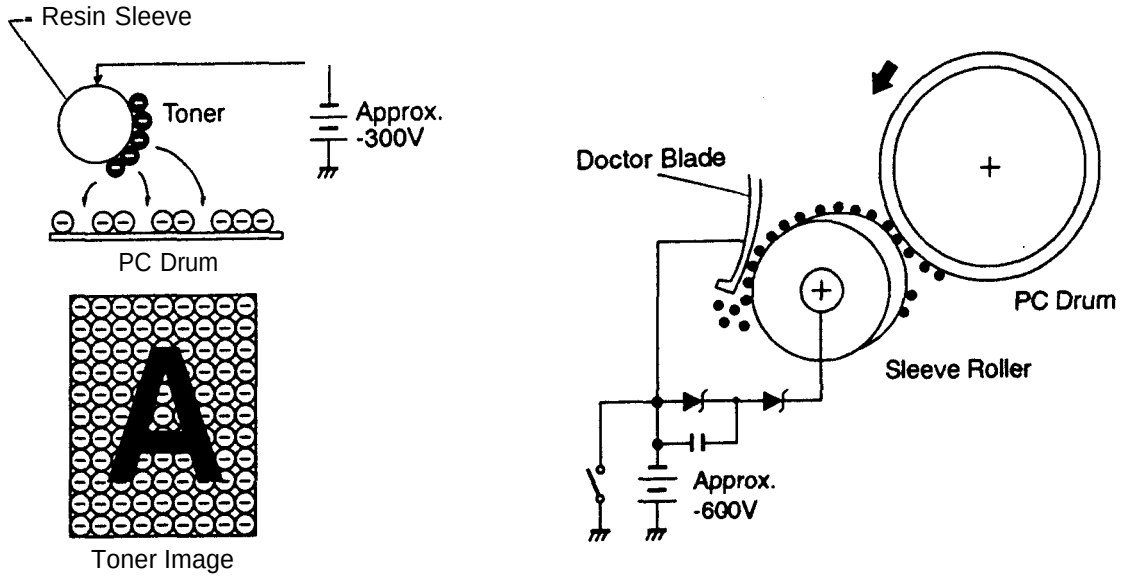


Figure 2-7. Development

2.1.1.6 Drum Cleaning

After the image is transferred onto paper, any remaining toner on the PC drum is scraped off by the cleaning blade and collected in the used toner bottle.

2.1.1.7 Image Transfer

Image transfer is the process of transferring to the paper the toner image created on the PC drum during development. This printer uses the roller image transfer method, instead of *corona* image transfer, as the image transfer process. In roller image transfer, there is no generation of ozone as there is with corona discharge. Also, there is no blurring caused by motion in the image transfer, because the image transfer roller pressure bonds the paper with the PC drum.

A reverse bias voltage is applied so that the positive toner is not transferred onto the image transfer roller. (The drum charge bias voltage is used.)

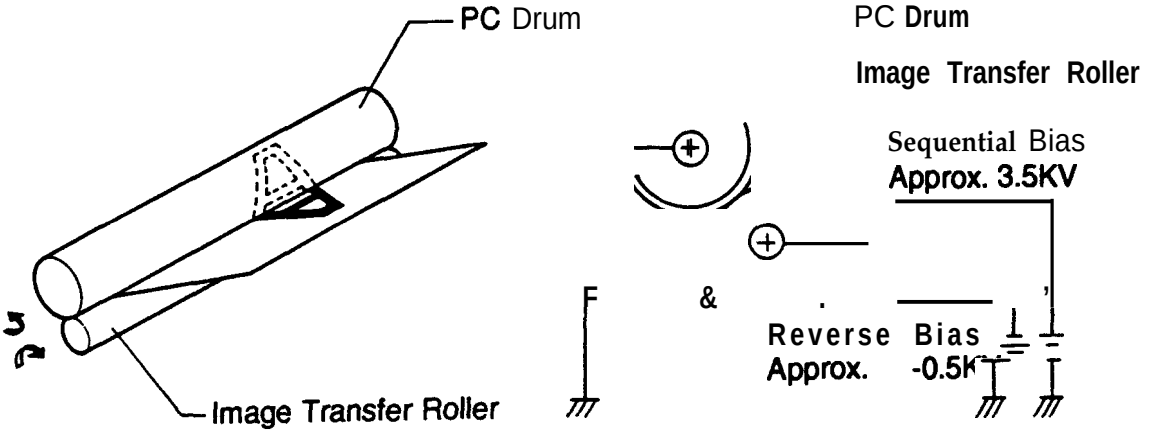


Figure 2-8. Image Transfer

2.1.1.8 Fusing

Fusing is the process of fixing the transferred toner image onto the paper. This printer uses the heating roller method for fusing. The heating roller method fixes the toner image with an upper fusing roller that is heated by the heater lamp. The printer uses the cleaning roller to clean that roller if it becomes dirty.

After the power is turned on, the heater lamp lights until the temperature of the upper fusing roller reaches 168°C (334°F). After warm up, the mechanical control board controls the on/off operation of the heater lamp, based on the TH1 signals from the thermistor.

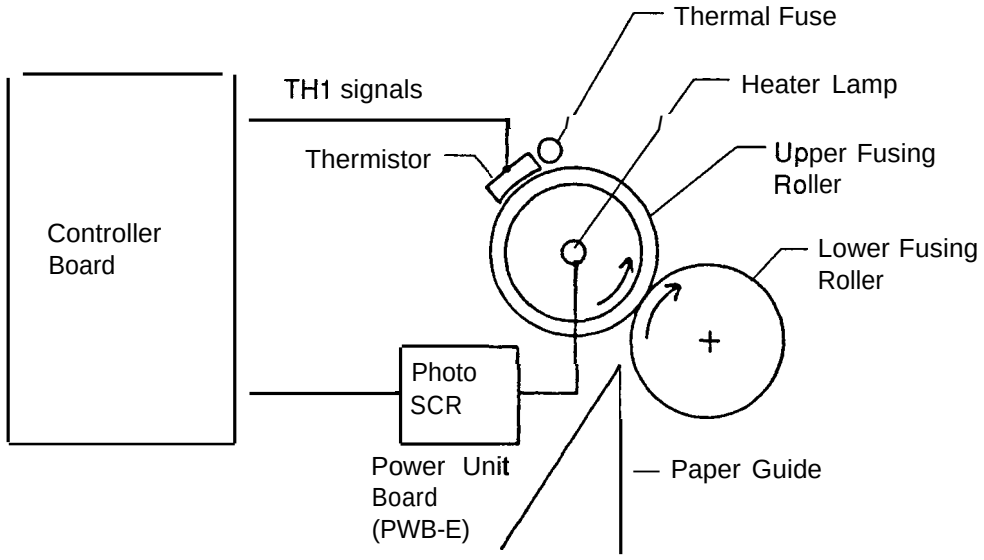


Figure 2-9. Fusing

2.1.1.9 Paper Exit

The paper on which the toner image has been fused is fed to the face-down or face-up tray.

2.1.2 Engine Control

This section describes engine control, the power supply board, and the high voltage supply board. The engine is controlled by the main controller board (C144 MAIN). Figure 2-10 shows the engine controller connections.

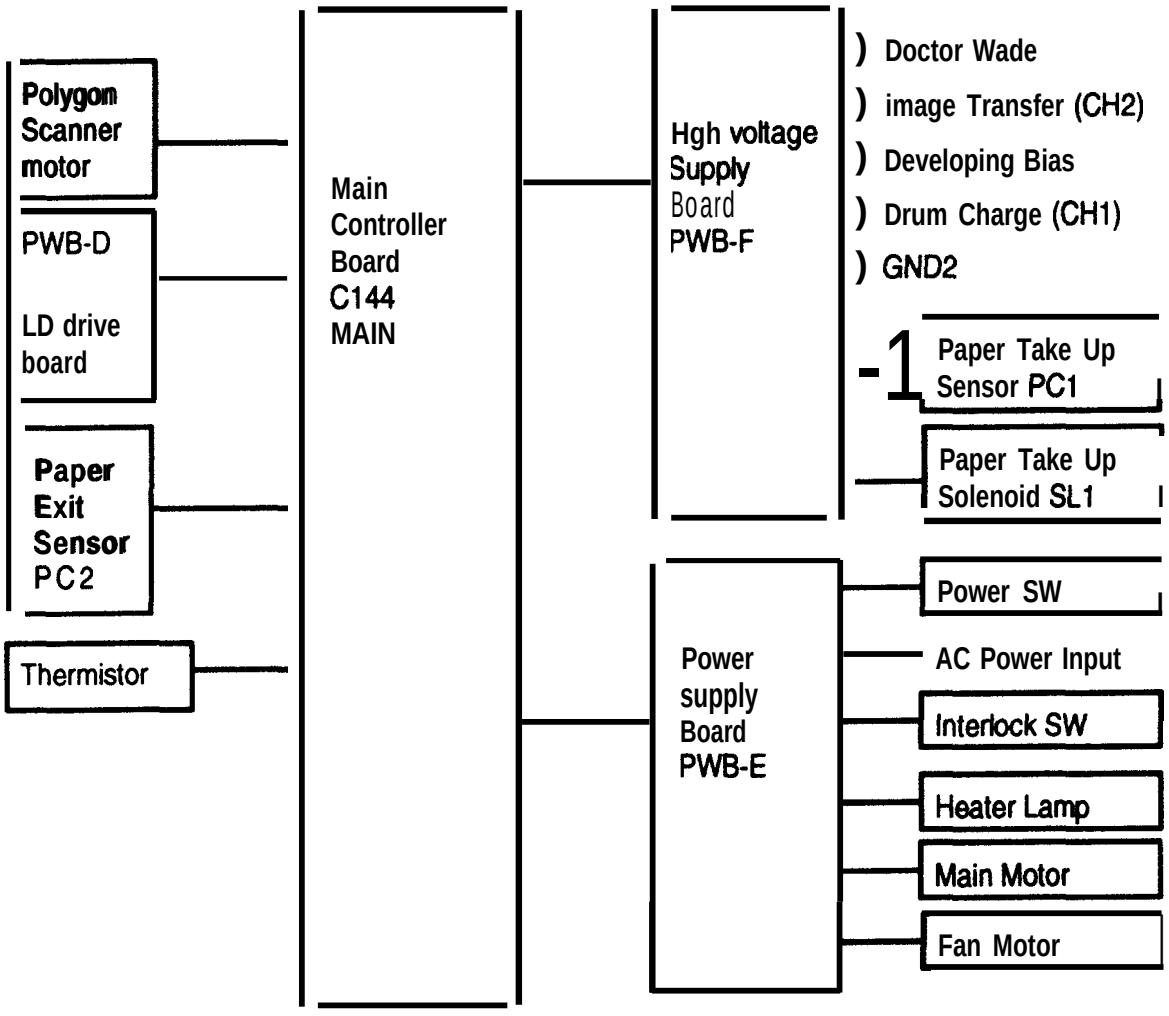


Figure 2-10. Engine Controller Connecting Diagram

2.1.2.1 Main Motor Functions and Control

Power from the main motor (Ml) drive is used for the PC (photoconductor) drive, developing drive, fusing drive, standard paper slot feeding drive, and lower paper cassette (optional) feeding drive. Figures 2-11 through 2-16 show the positions of the gears and rollers.

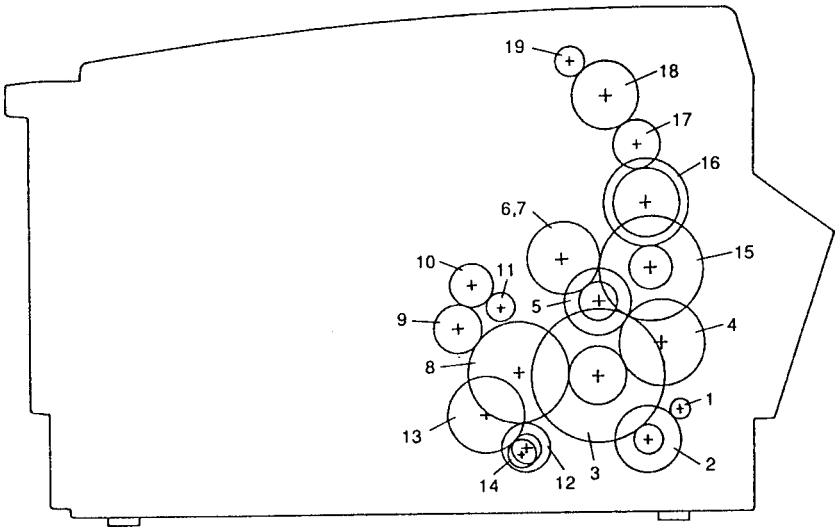


Figure 2-11. Gear Position

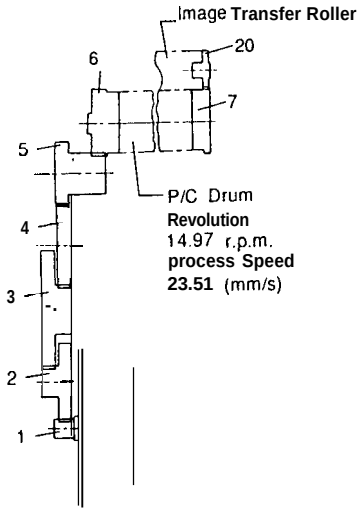


Figure 2-12. P/C Drive

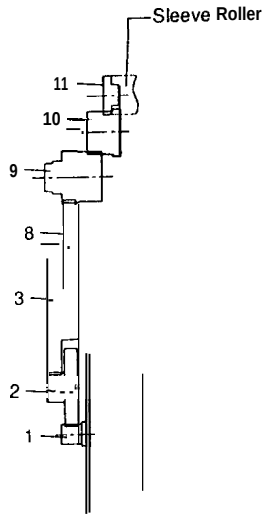


Figure 2-13. Developing Drive

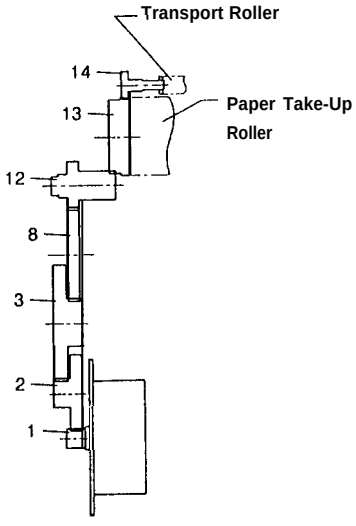


Figure 2-14. Feeding Drive

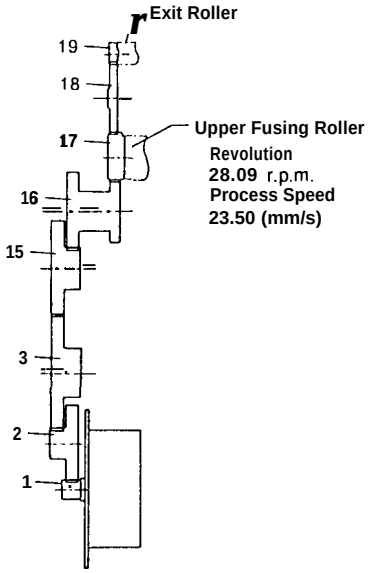


Figure 2-15. Fusing Drive

Table 2-1. Gears and Rollers

No.	No. of Gear Teeth	Roller Neme	No.	No. of Gear Teeth	Roller Name
1	16		11	20	Sleeve roller
2	1 7/56		12	1 6/29	
3	29/72		13	4Y48	Paper take-up roller
4	51		14	16	Transport roller
5	24/38		15	24/59	
6	43	P/C Drum	16	38/48	
7	30		17	29	Upper fusing roller
8	57		18	50	
9	29/30		19	15	Exit roller
10	26/27		20	16	image transfer roller

Figure 2-16 shows the main motor drive circuit. The main motor (Ml) is a four-phase stepping motor. This motor is controlled by the CPU (IC201) on the main controller board (C144 MAIN). The power supply board (PWB-E) has a stepping motor driver IC. This IC drives the main motor (Ml) with a constant current.

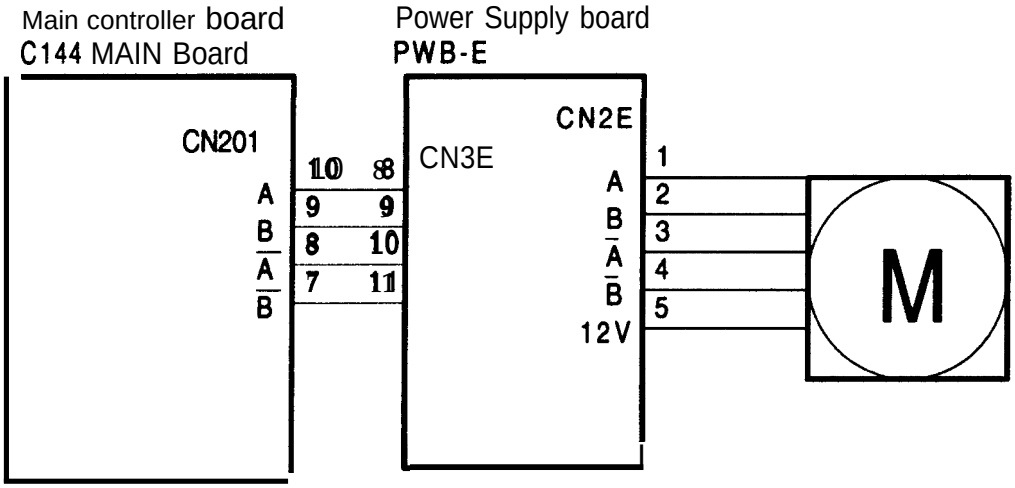


Figure 2-16. Main Motor Drive Circuit

2.1.2.2 Paper Take-Up and Paper Exit Sensors

The paper take-up sensor has three functions:

1) To detect' the top edge of the paper. The engine starts printing when the detection signal is received.
2) To detect paper size. The printer detects the time it takes for paper to pass the take-up sensor during paper feeding. A longer amount of time means that long paper is feeding; a shorter amount of tome means that short paper is feeding.
3) To detect paper jams and feed jams.

If one of the following conditions is detected, the printer assumes that a paper miss feed has occurred. On detection of a jam, all elements except the fan motor (M3) are deactivated, with the following exceptions:

- If a paper is being transferred in the printer on detection of condition 1 below, the paper is ejected and all elements are then deactivated.
- if only the condition 1 below is detected, elements other than the heater lamp (Hi) are deactivated since there is no paper in the fusing unit.

1. The paper take-up sensor (PC1) is not turned on within the specified time after the paper take-up roller starts to rotate.
2. The paper take-up sensor (PC1) is on when the power is on or the upper unit is closed.
3. The paper exit sensor (PC2) is on when the power is on or the upper unit is closed.
4. The paper take-up sensor (PC1) is not turned off within 16.43 seconds after the leading edge of the paper reaches the sensor.
5. The paper exit sensor (PC2) is not turned on within 5.89 to 7.89 seconds after the leading edge of the paper reaches the paper take-up sensor (PC1).
6. The paper exit sensor (PC2) is not turned off within 6.48 to 8.48 seconds after the trailing edge of the paper passes the paper take-up sensor (PC1).

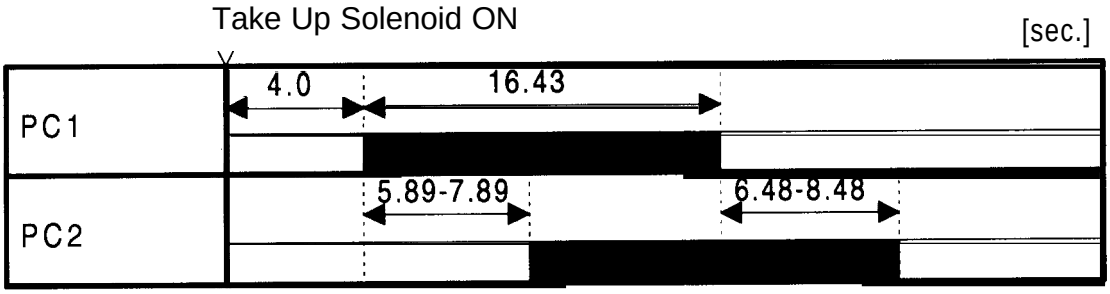


Figure 2-17. Sensor On/Off Timing

2.1.2.3 Fuser Control

The surface temperature of the upper fusing roller is detected by thermistor TH1 and the corresponding analog voltage is applied to IC201 pin 62.

Heater lamp HI is turned on or off to provide fusing temperature control by the heater lamp on/off signal output from IC201 pin%.

If HI is not turned off when TH1 detects an abnormally high fusing temperature, H1 is automatically turned off as follows.

When the surface temperature of the upper fusing roller detected by TH1 exceeds 200 °C (392 "F), the voltage applied to 1(202 pin 42 becomes higher than the reference voltage at IC202 pin 41. Then the outout from comparator goes from HIGH to LOW. When this occurs, the output from the NAND circuit goes from LOW to HIGH, thus turning off H1.

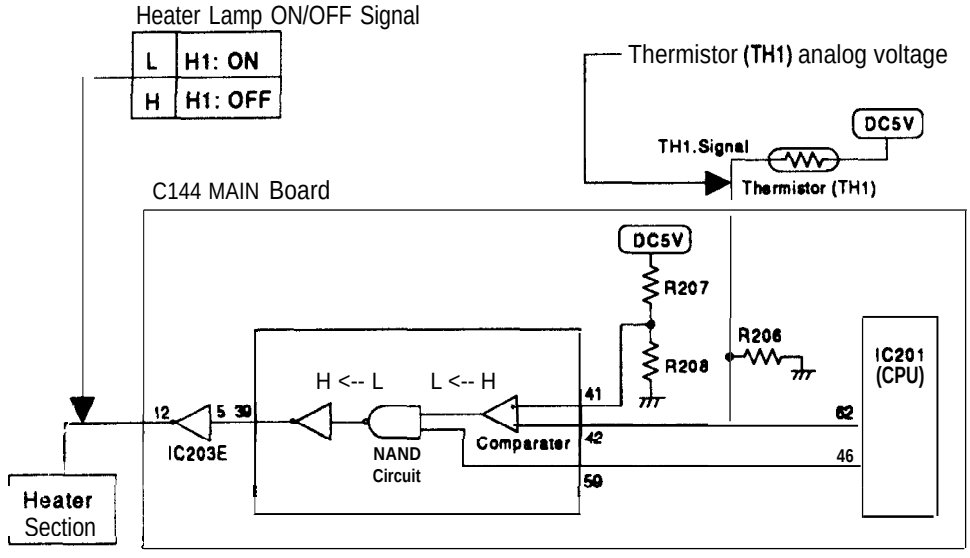


Figure 2-18. Fuser Control Circuit

The diagram below shows fluctuations in the temperature after the *power* supply has been turned on.

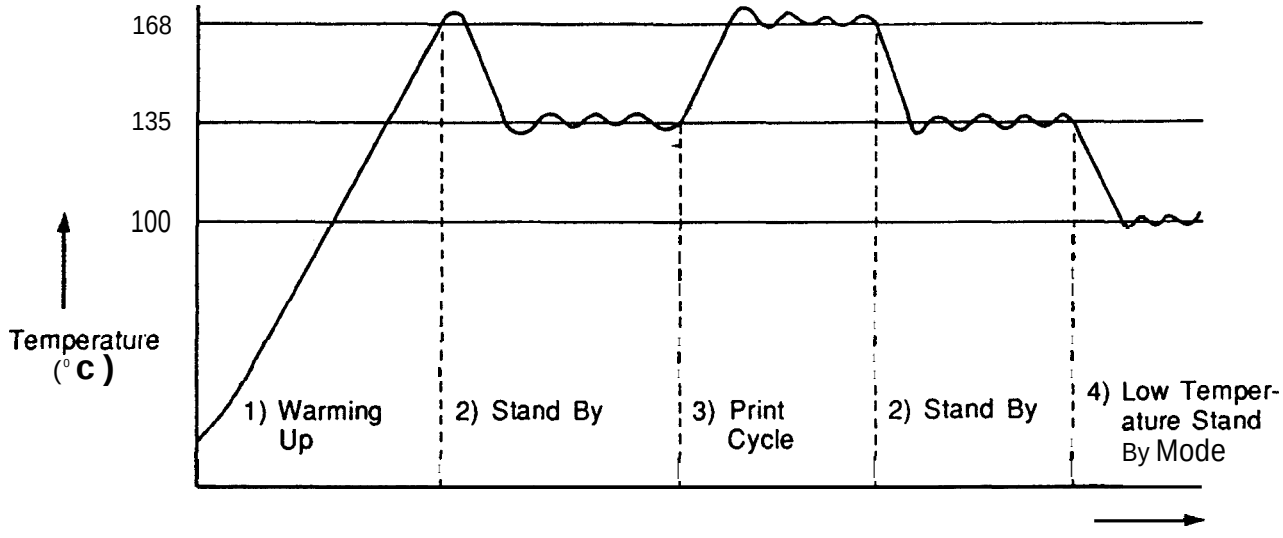


Figure 2-19. Temparature Control

1. Warming Up	When the power on/off switch is set to on and the printer is initialized, warming-up starts and the heater lamp is lit. The heater lamp remains lit until the temperature of the fusing section reaches 168 "C (337 "F).
2. During Standby	The temperature of fusing section is controlled to keep it at about 135 "C (275 "F). If the standby state persists for 5 consecutive minutes, the printer enters the low temperature standby mode.
3. During Printing	When the controller gives the print instruction, the temperature is controlled to keep the fusing section at about 168'C (334 "F).
4. Low Temperature Standby Mode	The temperature is controlled to keep the fusing section at about 100 °C (212 "F).

If the following conditions occur, the printer detects a fuser error.

1. The thermistor temperature is checked 12 seconds after warm-up starts and continues for the next 18 seconds.
   If during that time the temperature of the thermistor falls to within 20'C (68 "F) of the ambient room temperature, a fuser error is detected.
2. If the thermistor temperature does not reach 168 "C (334 "F) within 80 seconds after the warm-up starts, a fuser error is detected.
3. If the thermistor temperature falls below 70 "C (158 "F) during standby after the end of detection in the non-pause mode of falls below 120 'C (248 °F) during printing, fuser error is detected.
4. If the thermistor temperature exceeds 200 "C (392 "F) during temperature control, a fuser error is detected.

Note: During pause mode, the control temperature is decreased to save power in the standby state, heater lamp (Hi) being turned off.

The thermofuse (TF1) cuts the power if the temperature of the fusing section rises to an abnormally high level (over 200 "C (392 "F)).

2.1.2.4 Polygon Motor Control

Figure 2-20 shows the polygon motor (M2) control circuit. The polygon motor is driven while it receives the POLGNM (M2:ON) signal.

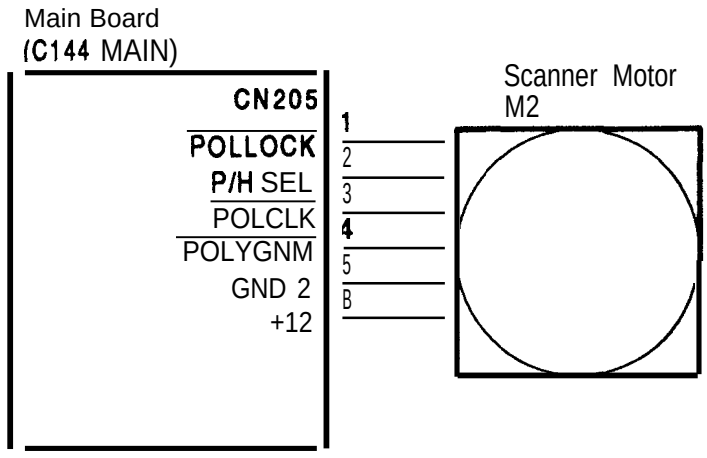


Figure 2-20. Polygon Motor Control Circuit

The rotation of the polygon motor (M2) is detected within 5 seconds after starting the motor. If the SSCAN signal is not detected properly during this period, the printer assumes that the polygon motor (M2) is malfunctioning and stops the motor.

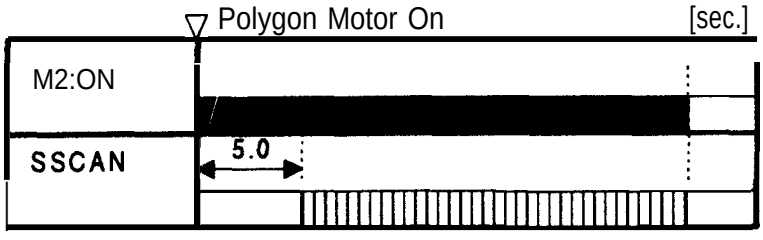


Figure 2-21. Polygon Motor Driving Start Timing

2.1.2.5 Laser Diode Drive

Laser diode emission is controlled by three signals (LDATA, LDVR1 and LDVR2) sent from the main board a 1 signal (LDLVL) from the laser diode drive board (PWB-D). The photo diode (sensor) is located inside the laser diode. This sensor measures the laser power.

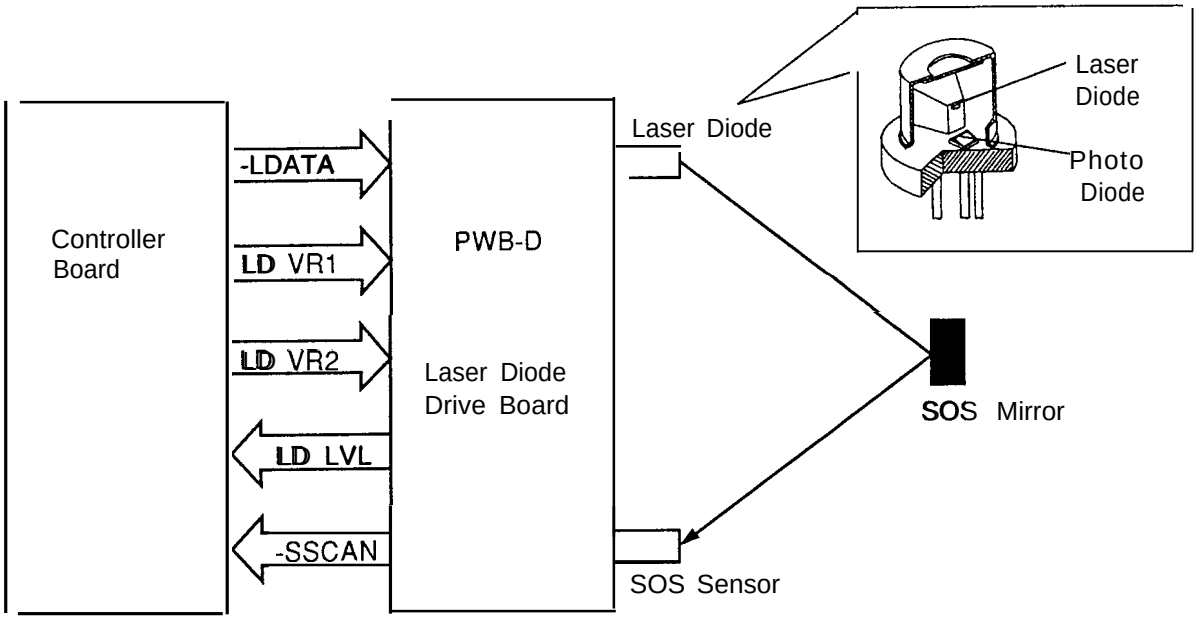


Figure 2-22. Laser Diode Drive Circuit

Table 2-2. Laser Diode Control Circuit

Signal	Description
LDATA	This signal is the laser on/off signal. When it is "L", the laser is allowed to emit; and when it is "H", the laser is stopped emitting.
LDVR1	This signal adjusts the laser drive current so that the laser emission becomes the regulated value (rough adjustment).
LDVR2	This signal adjusts the laser drive current so that the laser emission becomes the regulated value (fine adjustment).
LDLVL	This signal indicates whether the laser drive current has reached the regulated value. The signal "H" shows that the current has reached the regulated value and the signal "L" shows that the current has not yet.
SSCAN	This signal is returned from the PWB-D to the main board. This is the signal to the SOS sensor and is the main scanning direction synchronization signal. The main board is timed with this signal and sends the LDATA signal to the PWB-D.

After the main motor has been activated for 0.06 seconds, the laser diode is forcibly activated for 0.74 seconds. At the same time, the laser emission power is adjusted.

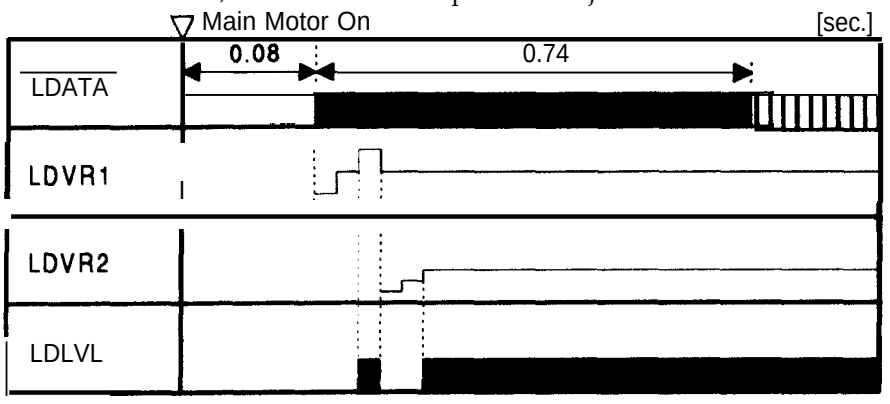


Figure 2-23. Laser Emission Power Adjustment Timing

After the main motor (Ml) has been driven for 0.0S seconds, the laser diode is forcibly activated for 0.74 seconds, during which time the laser diode emission is detected. If the LDVR1 signal deviates from the specified value during this period, the laser diode is assumed to be judged as malfunctioning.

2.1.2.6 Bias Voltages and Laser Drive Timing

Figure 2-24 is a diagram of the drum charge, image transfer, and doctor blade bias voltages. This figure also shows the developing bias voltage control circuit. These bias voltages are generated from the +12 VDC on the high voltage supply board (PWB-F). If the printer detects a case open condition, the interlock switch is set to off, which cuts the +12 VDC and in turn cuts the bias voltages.

These bias voltages are controlled by the main board (C144 MAIN). The CH2:ON signal is the image transfer (roller) bias voltage control. While this signal is LOW, the image transfer roller is charged to 3.5K VDC by the high voltage supply circuit. While this signal is HIGH, the image transfer roller is charged to -0.5K VDC. The CH1:ON signal controls the dmm charge. While this signal is LOW, the PC drum is charged to -1.2K VDC.

DB:CNT is an analog signal for developing bias voltage control. This signal controls the bias voltage level (about -300 VDC) using analog data. The image density is controlled by the developing bias voltage level.

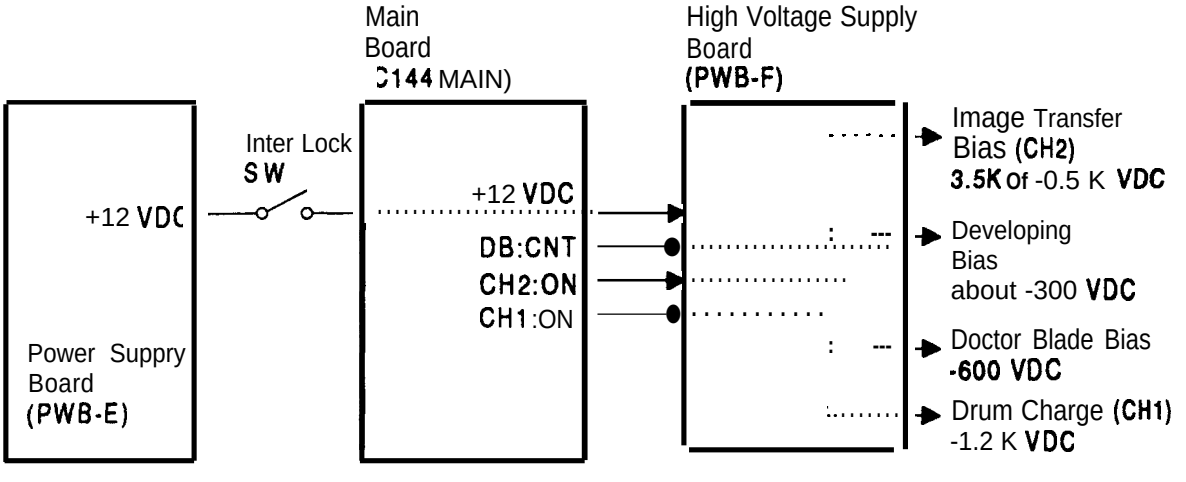


Figure 2-24. High Voltage Supply Block Diagram

Figure 2-25 shows the print process, and Figure 2-26 shows the start print sequence. The printer's engine starts printing when the PRINT signal is received from the video controller board.

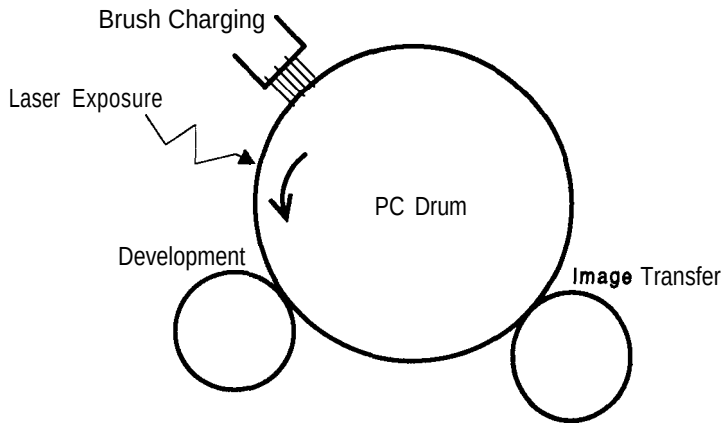


Figure 2-25. Print Process

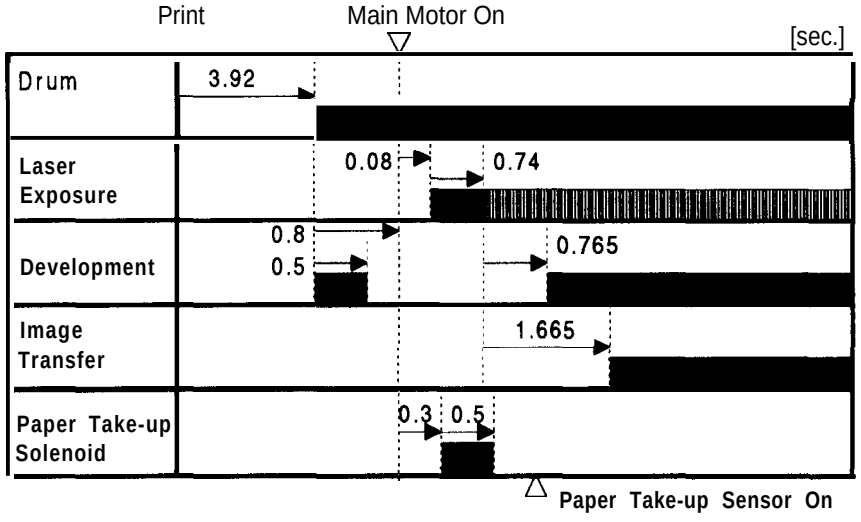


Figure 2-26. Print Sequence (Start)

Figure 2-27 shows the end of the print sequence. The printer stops the main motor (Ml) from rotating when the paper exit sensor turns off after 4.72 seconds.

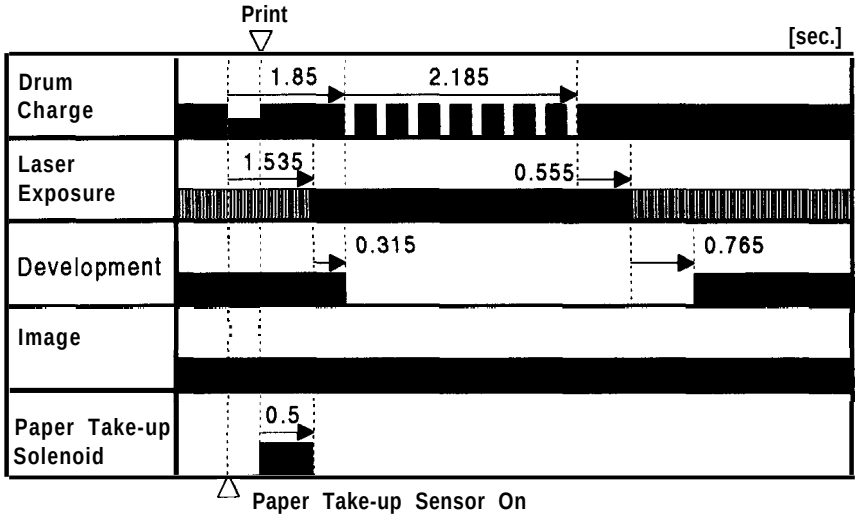


Figure 2-27. Print Sequence (End)

Figure 2-28 shows the multiple page printing sequence.

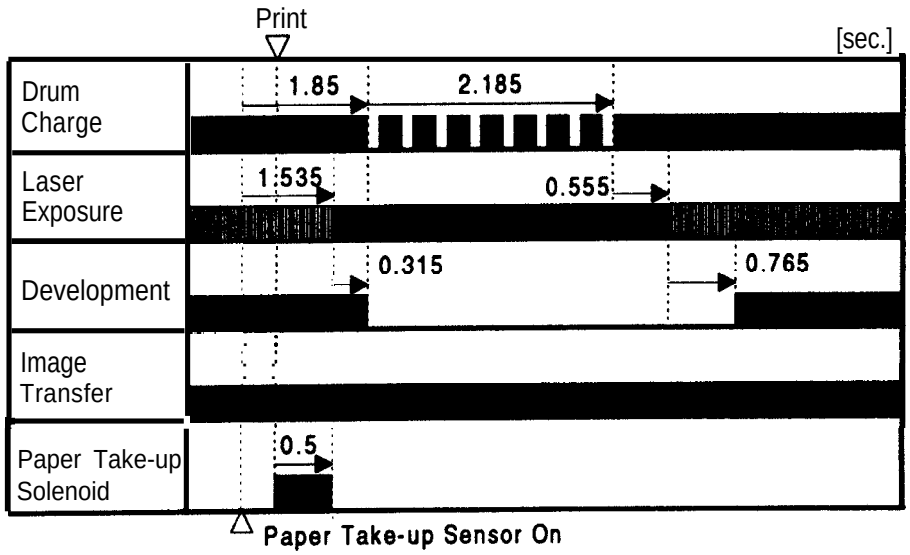


Figure 2-28. Printing Multiple Pages

2.1.2.7 Fan Motor Control

The **fan** motor (M3) rotates for the following periods and remains stopped for other than the following periods:

- **For 2 seconds after power-on.**
- **Between 20 seconds after the start of printing and 20 seconds after the end of printing.**
- **For 20 seconds after all elements are stopped** for detecting trouble, with the exception of a except paper jam.

If the fan motor's current detecting potential remains at 150 **mV** or less for 2 **seconds, the fan motor is assumed to be malfunctioning.**

Note: Current detecting potential means that the fan motor current is converted to the **corresponding voltage for detection purposes.**

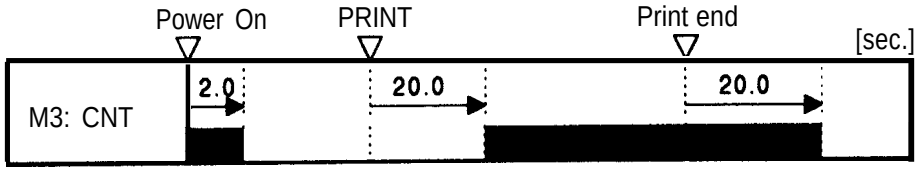


Figure 2-29. Fan Motor Control Timing

2.1.2.8 Power Supply Circuit Functions and Safety Protection

The printer's power supply board (PWB-E) supplies +5 VDC and +12 VDC. The +12 VDC is used as the bias voltage supply, main motor (Ml) drive, scanner mirror motor (M2) drive, fan motor (M3) drive, and solenoid drive. For safety protection, the +12 VDC line is cut when the interlock switch (case-open switch) is off.

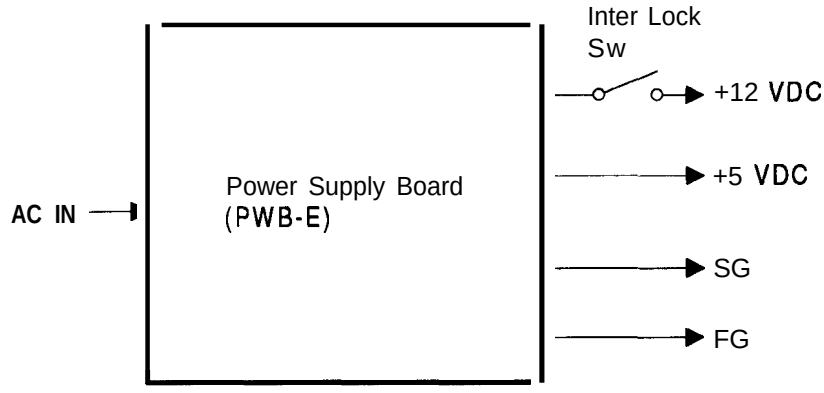


Figure 2-30. Power Supply Circuit Block Diagram

2.2 VIDEO CONTROLLER OPERATION

The video controller section generates the video signals for the received data. The video controller is a separate section of the C144 MAIN board.

2.2.1 C144 MAIN Board Operation

Figure 2-31 shows a block diagram of the video controller circuit *section* of the C144 MAIN bed. The C144 MAIN board contains the video controller, which consists of a 16-bit 68000 (16.67 MHz) CPU, the standard cells developed for this printer, DRAMs, ROM, and a 16Kbit EEPROM.

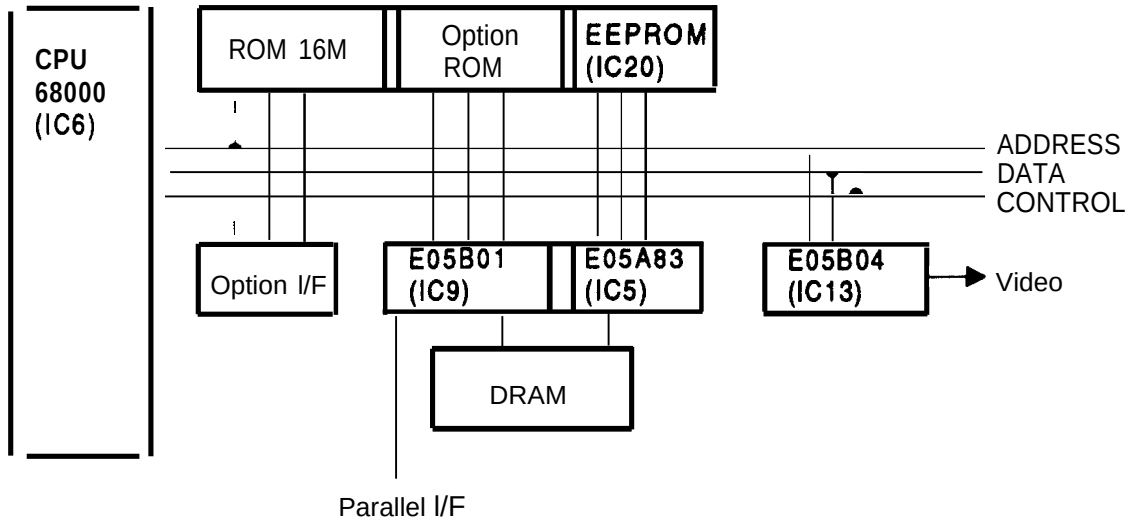


Figure 2-31. C144 MAIN Board Block Diagram

Table 2-3 lists the functions of the C144 MAIN board elements.

Table 2-3. Functions of C144 MAIN Board Elements

Element	Location	Function
66000 CPU	IC6	The CPU, which operates at 16.67 MHz, manages the video controller circuit operation.
ASIC E05A83	IC5	This ASIC contains the following functions: . Interrupt control . Address decoding • Cbck control • DRAM management (refresh control, RAS/CAS control) • Image processing • Video interface
ASIC E05B01	IC9	This ASIC contains the following functions: • Parallel interface • DRAM management with the E05A83
ASIC E05B04	IC13	This ASIC contains following functions: • RITech function • Toner Save Mode function
EEPROM	IC20	This EEPROM stores the following: • Model type • Printed page counter value . Toner life counter value • Printer setting
DRAM	IC1O, 11,23	These DRAMs are used as the working area of the CPU: input buffer. image buffer. etc.

Print data and commands transmitted from the host computer via parallel or optional interfaces are read using the interrupt process of the CPU and are stored in the DRAM input buffer.

Data and commands in the input buffer are processed by the CPU, which then stores the printing bit-map data (image data) in the V-RAM (Video RAM) (image buffer) in the DRAM. The size of the V-RAM depends on the available DRAM size and can be specified using printer settings. A page error occurs when the V-RAM is so small that the CPU cannot process data faster than it is transmitted to the engine controller board. If such an error occurs, increase the V-RAM using printer settings.

The CPU transmits image data stored in the V-RAM to a temporary buffer in the SRAM, which is located in an address space different from the CPU. The temporary buffer has a capacity equivalent to several lines. This is controlled by the ASIC, which synchronizes and transmits the temporary buffer's data to ASIC E05B04.

ASIC E05B04 has RITech and toner save functions.

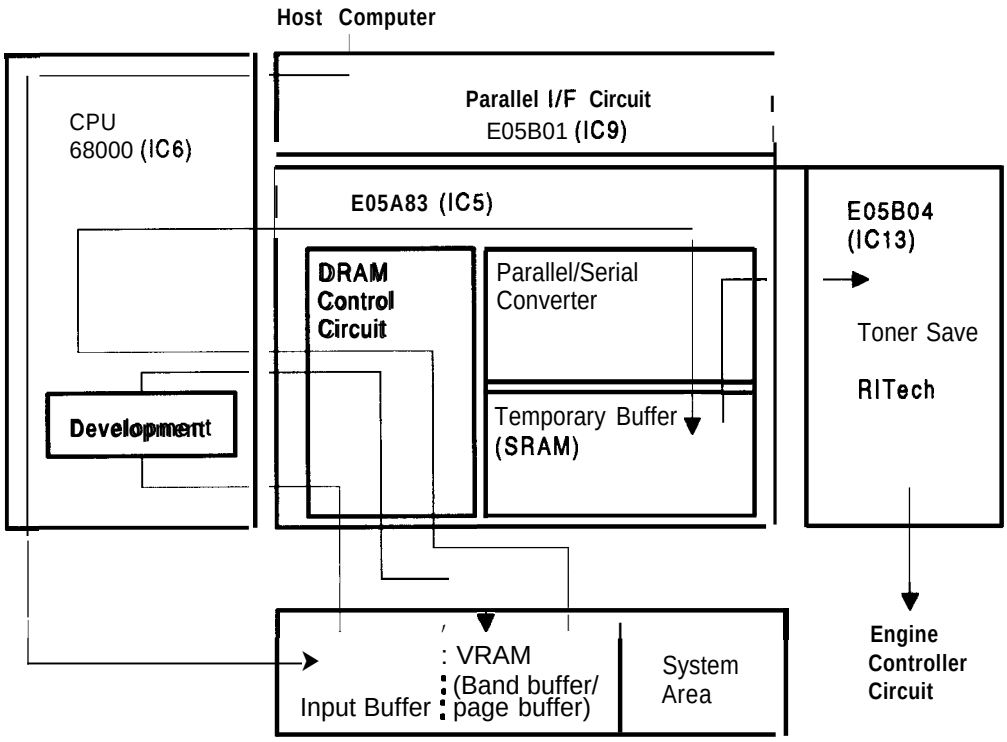


Figure 2-32. Data Flow Diagram

2.2.1.1 Reset Circuit

The 68000 CPU contains the reset terminal, which is bidirectional and can initialize the system either from inside or outside the CPU. The entire system (the CPU and the external devices) can be initialized if both the HALT (CPU pin 20) and RESET (CPU pin 21) signals are active simultaneously. By executing a RESET instruction, a RESET pulse from inside the CPU can also be issued to reset all the devices connected to the RESET line. This circuit uses an M51953B IC to monitor the supply voltage and reset the CPU if a voltage level less than 4.25 V is detected. The reset time is approximately 840 ms.

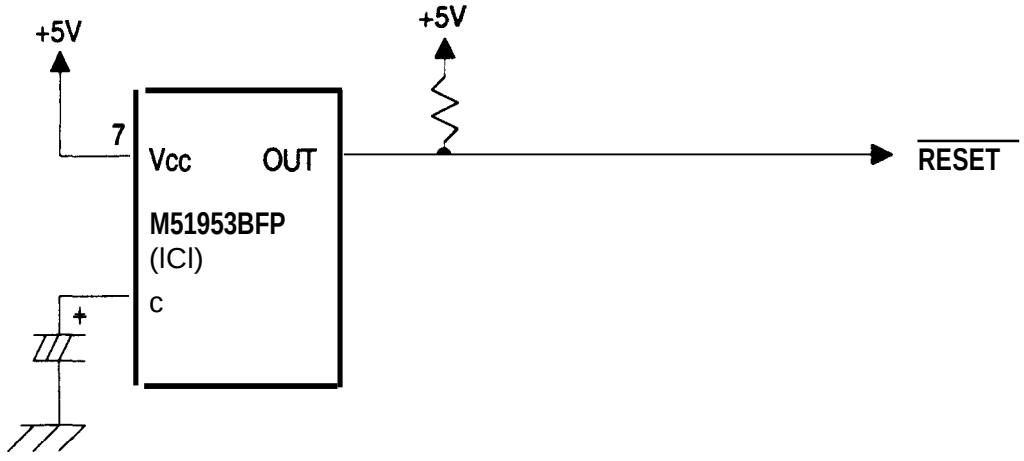


Figure 2-33. Reset Circuit

2.2.1.2 Bus Control Circuit

The 68(111 CPU outputs the R/W (read/write), AS (address strobe); and FC0, FC1, and FC2 (processor status) signals to ASIC E05A83. ASIC E05A83 uses these signals to generate the RD (read strobe), DTACK (wait control), VPA (interrupt control), and BERR (bus error) signals.

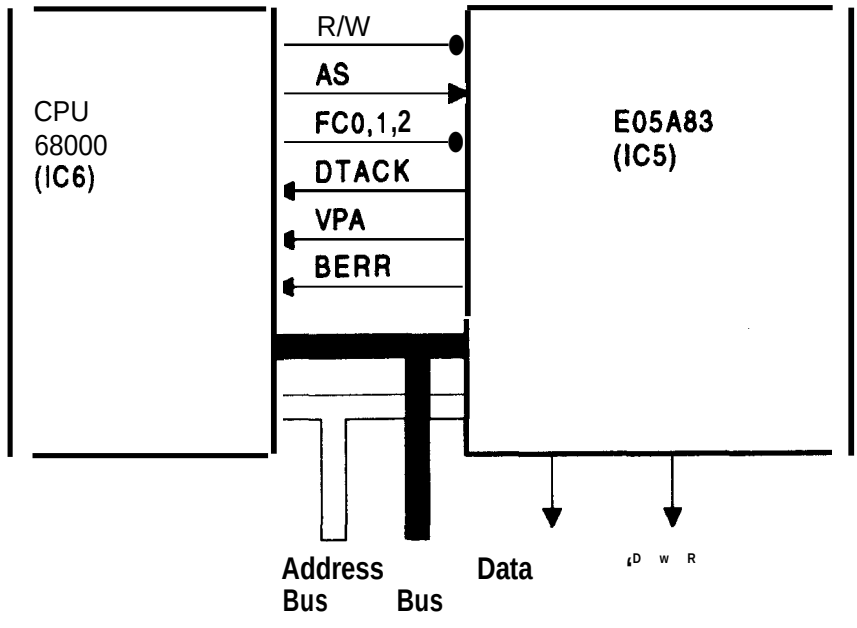


Figure 2-34. Bus Control Circuit

2.2.1.3 Interrupt Control

ASIC E05A83 determines the priority level of the interrupt and outputs it to terminals IPL0 through IPL2. An interrupt is then sent to the CPU. If the CPU accepts the interrupt, terminals FC0 through FC2 all go HIGH to indicate the interrupt acceptance to ASIC E05A83. ASIC E05A83 confirms that terminals FC0 through FC2 are HIGH (interrupt acknowledge), then sets the VPA terminal to LOW and informs the CPU that this is an automatic vector interrupt. This initializes the interrupt process. ASIC E05A83 has a controller for the automatic vector interrupt.

2.2.1.4 DRAM Management

The video controller circuit uses DRAMs for the system RAM and for the V-RAM.

The DRAMs (including optional SIMMs) are managed by ASIC E05A83 and E05B01. ASIC E05A83 handles the main management. The E05A83 outputs RAS/CAS, WE, and OE signals. The DRAMs (including optional SIMMs) are controlled by the CAS, WE, and OE signals from the E05A83, and are also controlled by the RAS signal from the E05B01.

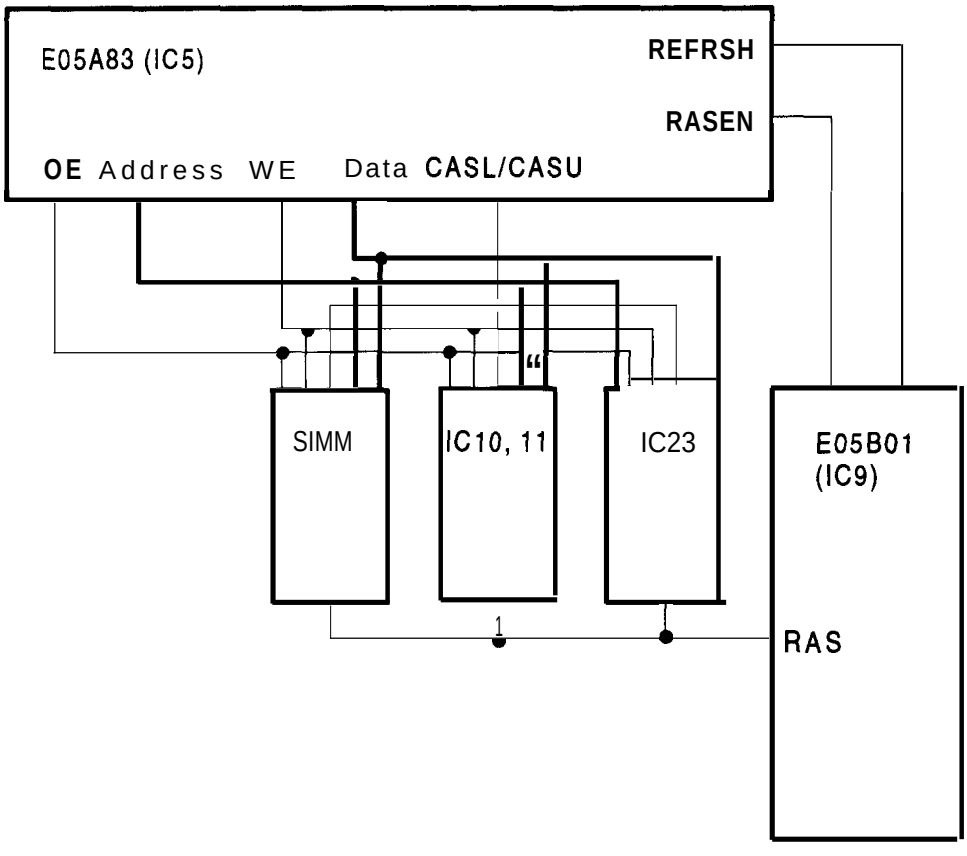


Figure 2-35. DRAM Management

2.2.1.5 Parallel Interface Circuit

Figure 2-36 shows the parallel interface circuit block diagram. Data sent from the host computer is latched within the E05B01 by the STROBE signaL The E05B01 outputs the BUSY signal automatically to stop the host computer from sending additional data. The CPU resets the BUSY signal after reading the data from the E05B01, so that the printer is ready to receive more data from the host computer.

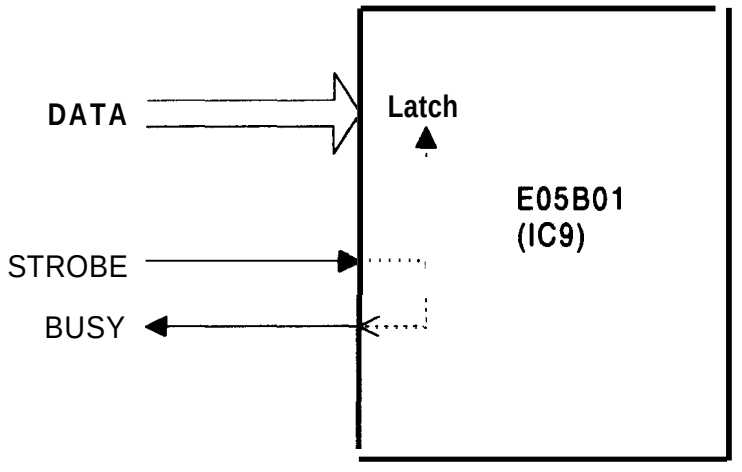


Figure 2-36. Parallel Interface Circuit

2.2.1.6 Optional Type-B Interface

This printer supports an Epson Type-B optional interface, which is controlled by the INH and BIF signals from ASIC E05A83.

2.2.1.7 Video Interface

ASIC E05A83 maps the SRAM into a memory space different from the system memory. The CPU transmits data from the V-RAM (in the system RAM) to the SRAM using ASIC E05A83. The ASIC converts the image data in the SRAM from parallel to serial, synchronizes it, and then transmits it to the engine controller circuit. In other words, the SRAM is a temporary buffer used to transmit the image data to the engine controller circuit. This serial image data is the VIDEO signal of the video interface.

The signal line of the internal video interface circuit can be divided into four groups. The first group (PRINT, CPRDY, EPRDY, and PRDY) gives the status of either the video or engine controller and indicates whether they are ready to communicate with each other *or* ready to start printing. The second group (VSYNC) is the synchronizing signal for printing. The third group (VIDEO) is the serial video data signal. The fourth group (CMD, SRCLK, CTBSY, and ETBSY) is used to transfer the commands (from the video controller) or the status (from the engine controller) for printer mechanism control.

This printer has a standard RITech function. This function modifies the $\overline{\text{VIDEO}}$ signal with ASIC E05B04 on the main board.

Chapter 3 Disassembly and Assembly

Table of Contents

List of Figures

List of Tables

3.1 GENERAL INFORMATION

This chapter describes the disassembly/assembly procedures to be used for replacing the main assemblies of the EPL-3000 and ActionLaser 1300.

3.1.1 Precautions for Disassembly/Assembly

Follow the precautions below when disassembling/assembling the printer.

WARNING

- *Disconnect the power cord before disassembly/assembly.*
- *Be sure to handle the fusing unit carefully, because the unit is still hot for awhile after the printer stops printing.*
- *If it is necessary to plug in the power cord and operate the printer after disassembling it, please be careful of the following:*

  1) Keep your hands and clothing well away from operating or rotating parts (such as rollers, fan motors, etc.).

  2) Never touch electric terminals or high-voltage components (such as the charger and the high-voltage unit).

CAUTION

- *Do not disassemble the imaging cartridge.*
- *If the imaging cartridge is removed from the printer, do not place it in the direct sunlight.*
- *Do not disassemble the optical unit.*
- *Never turn power on if the optical unit is not installed.*
- *To prevent damage to ICs from static electricity, do not touch the ICs on the circuit board or the terminals of peripheral electrical components with your hands.*
- *Use only the recommended tools to ensure safe and efficient maintenance work. Inappropriate tools may damage the machine.*
- *Never open the upper unit until the main motor stops completely. Otherwise, the gears may be damaged.*
- *When transporting the printer, remove the imaging cartridge from the printer.*
- *When transporting the printer a long distance, box the printer using the original packing material.*

3.1.2 Tools

Use the tools listed in Table 3-1 for disassernbly/assembly and troubleshooting.

Table 3-1. Tools

Name	Commercially Available?	Part No.
Phillips screwdriver No. 2	Yes	B743800200
Regular screwdriver	Yes	B743OOO1OO
Tweezers	Yes	B841 000100
Soldering iron	Yes	B740200100
Round-nose pliers	Yes	6740400100

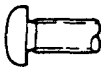
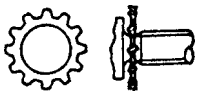
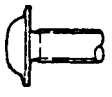
3.1.3 Small Parts

In the following sections, abbreviations are used for small parts, such as screws and washers. Tables 3-2 and 3-3 list these abbreviations.

Table 3-2. Abbreviations Used for Screws

Abbreviation	Part Name
CC screw	Cross-recessed Cup head
CP(O) screw	Cross-recessed Pan haad with Outside toothed lock *washer*
CPB screw	Cross-recessed Pan head B-tight

Table 3-3. Screw Types and Abbreviations

Head		Body	washer (assembled)
Top	Side		
1 Gross-recessed head 	1 Pan 	1. Normal 	1. Outside toothed lock washer 
	2. Cup 	2. B-tight 	

3.1.4 Service Checks after Repair

Check the repaired unit using the following list on completion of servicing.

Table 3-4. Checks after Repair

Item	Location	Check Point	Check
Operation	Control panel	Do all LEDs and buttons function normally?	
	Heater lamp	Does the heater lamp turn ON normally?	
	Test status sheet	Is the status sheet print performed normally?	
	Data print	Does data print in all modes?	
Adjustment	Print position	Is the gap between the top edge of the paper and the horizontal line in the feature print exactly 14.6 mm (0.57 inch)?	
ROM version		Is it the latest version?	
Cleaning		Is toner and dust removed from the paper path? Is the paper take up roller cleaned? Is the roller in the fusing unit cleaned? Is the outer surface of the printer clean?	
Packing		Is the imaging cartridge removed from the printer? Is the unit packed securely? Are accessories packed also?	

3.2 DISASSEMBLY AND ASSEMBLY

This section describes and illustrates the procedures for removing and disassembling the components of the EPL-3000 and ActionLaser 1300. Cleaning is described in Chapter 6. The assembly procedures are not described, except for special notes where necessary, because assembly can be accomplished by performing disassembly in reverse.

3.2.1 Housing Removal

This section describes how to remove the cases and the rear frame.

3.2.1.1 Case Removal

1. Open the top cover. Remove the imaging cartridge. Cover the imaging cartridge to protect it from the light or place it in a dark area.
2. Remove the CC screw (M3 x 8) and panel cover.
3. Remove the paper tray.
4. Remove 2 CC screws (M3 x 8) and the front cover.
5. Remove interface cover.
6. Remove 2 CC screws (M3 x 8) and right cover.
7. Remove 2 CC screws (M3 x 8) and left cover.
8. Remove the top cover.

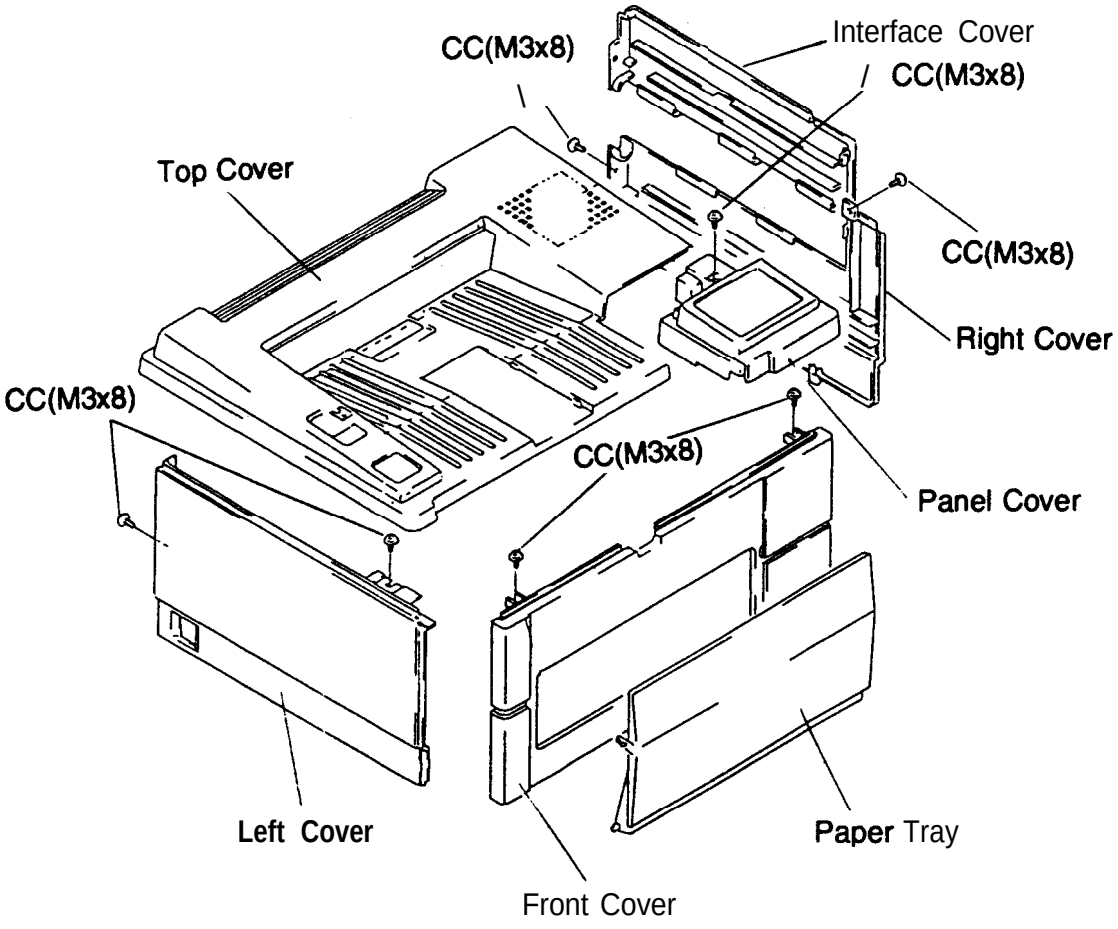


Figure 3-1. Removing the Housing

3.2.1.2 Rear Frame Removal

1. Open the top cover. Remove the imaging cartridge. Cover the imaging cartridge to protect it from the light or place it in a dark area.
2. Remove the housing. (Refer to Section 3.2.1.1.)
3. Remove 7 CP(O) screws (M3 x 6) and CC screw (M3 x 6), and lift the rear frame.
4. Disconnect connector CN1 on thepowersupply board (PWB-E).

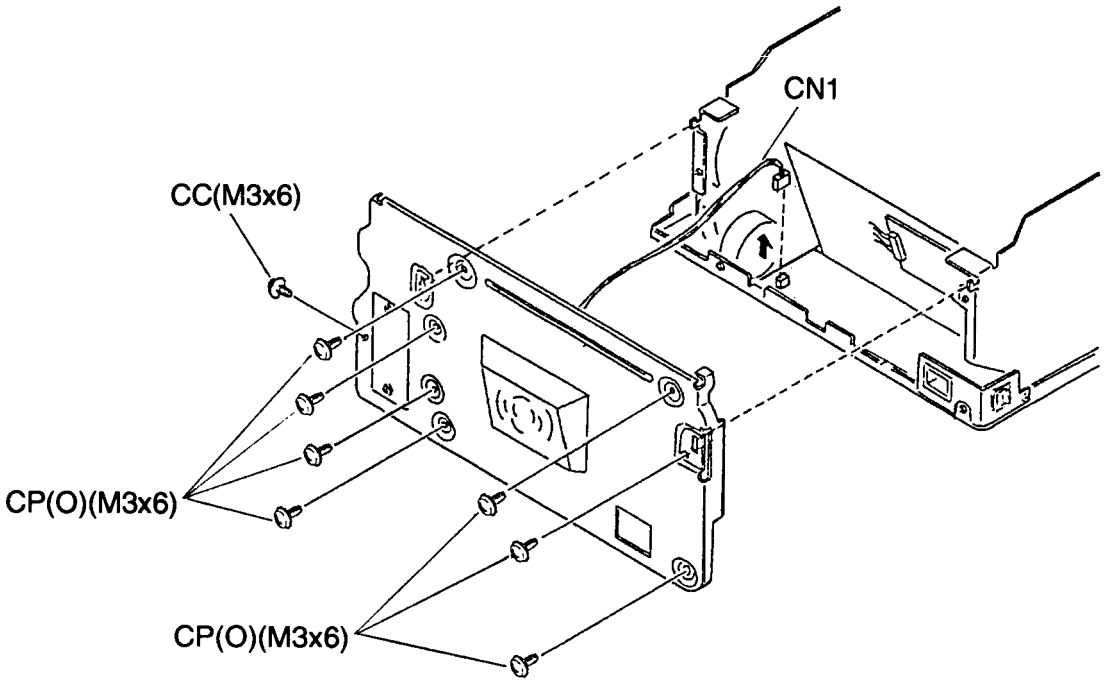


Figure 3-2. Removing the Rear Frame

3.2.2 Removal of the Controller Section

The control section is comprised of the main board (C144 MAIN).

3.2.2.1 Main Board (C144 MAIN Board) Removal

1. Remove the panel cover, paper tray, front cover interface cover, and right cover. (Refer to Section 3.2.1.1)
2. Disconnect all 5 connectors on the main board.
3. Remove the 8 CC screws (M3 x 6) that secure the shield case on the right side of the printer.
4. Remove the shield case with main board.

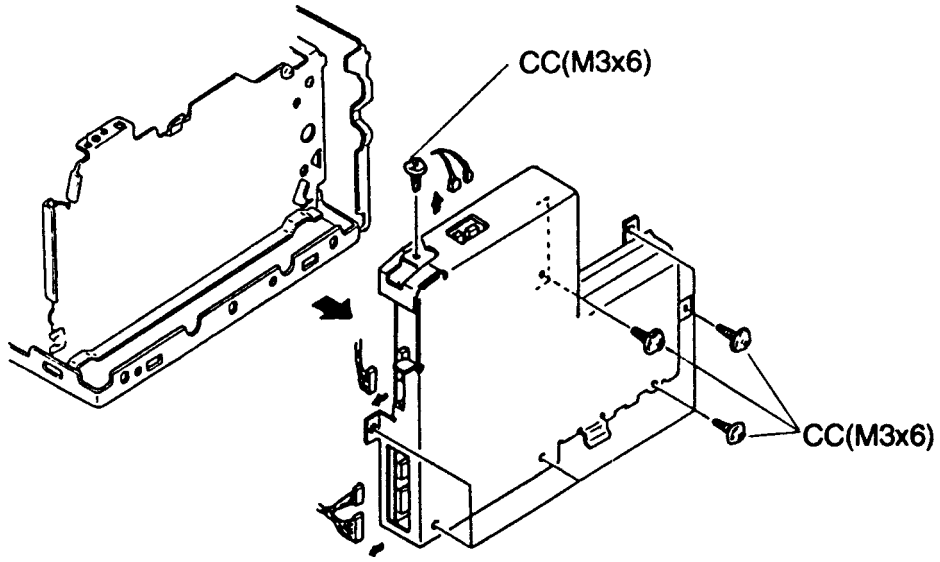


Figure 3-3. Removing the Shield Case

5. Remove the 3 CP screws (M3 x 6) that secure the interface shield plate on the shield case.
6. Remove the 3 CP screws (M3 x 6), and main board with interface shield plate.
7. Remove the 2 screws, and interface shield plate.

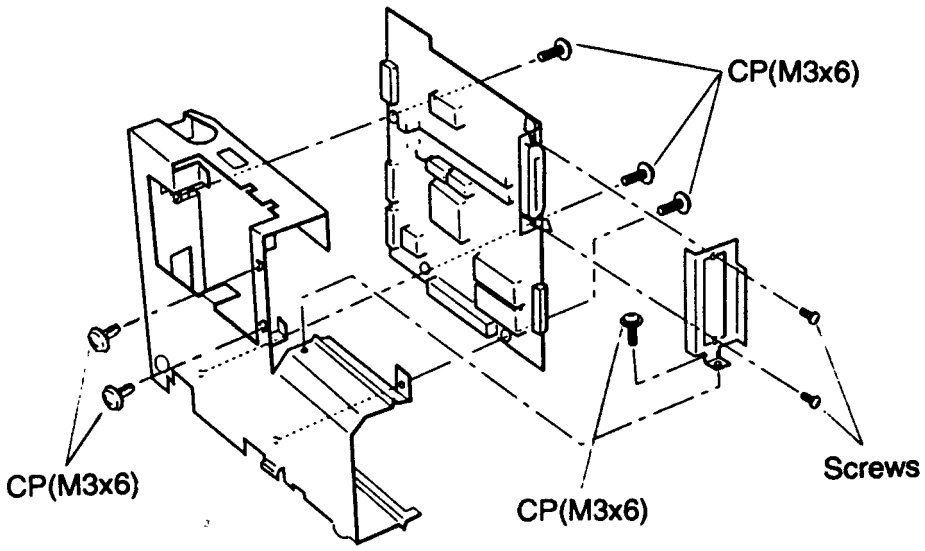


Figure 3-4. Removing the Main Board

3.2.3 Disassembling the Engine

This section describes disassembling the engine, including the power supply board (PWB-E).

3.2.3.1 Optical Unit Removal

CAUTION

- *Do not touch the optical unit except at the time of replacement.*
- *Do not open the unit under any conditions.*
- *Do not remove the circuit board from the optical unit under any condition.*

1. Remove the housing. (Refer to Section 3.2.1.1.)
2. Disconnect connector CN205 on the main board.
3. Remove 2 CC screws (M3 x 6) and CC screw (M3 x 12), and remove optical unit.

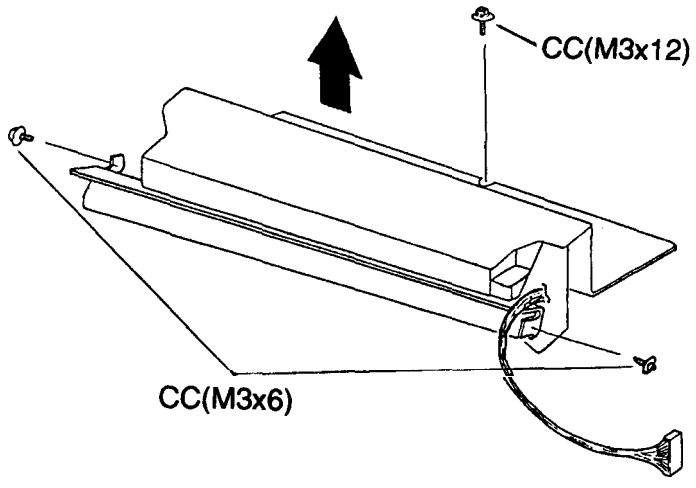


Figure 3-5. Removing the Optical Unit

3.2.3.2 Fusing Unit Removal

1. Remove the housing. (Refer to Section 3.2.1.1.)
2. Remove the main board. (Refer to Section 3.2.2.1.)
3. Remove 4 CP(O) screws (M3 x 6) on the fusing unit, and remove the fusing unit.

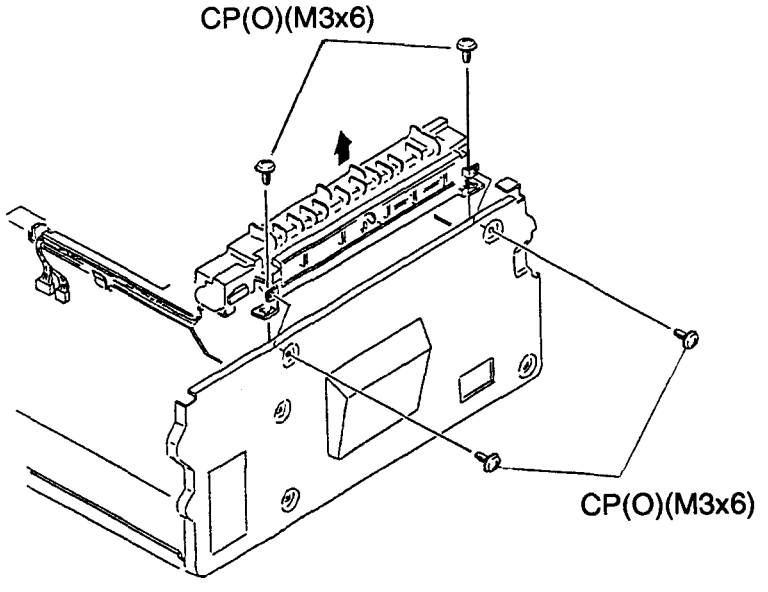


Figure 3-6. Removing the Fusing Unit

3.2.3.3 Heater Lamp Removal

CAUTION

- *Do not touch the glass surface of the lamp with your bare hands.*
- *When replace the heater lamp, terminal of the heater lamp that indicated the voltage side set to the support plate side.*

1. Remove the fusing unit. (Refer to Section 3.23.2.)
2. Remove the CC screw (M3 x 8) for the heater lamp support plate, and remove it.
3. Remove the heater lamp.

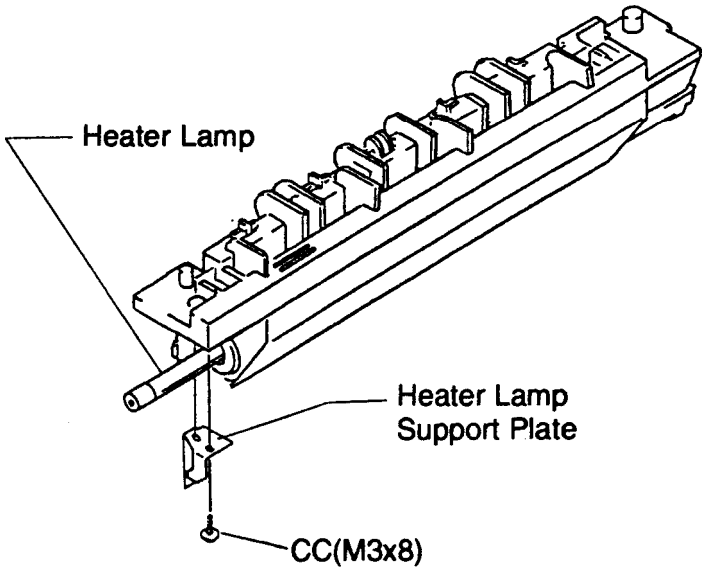


Figure 3-7. Removing the Heater Lamp

3.2.3.4 Power Supply Unit (PWB-E) Removal

1. Remove the housing. (Refer to Section 3.2.1.1.)
2. Remove the rear frame. (Refer to Section 3.2.1.2.)
3. Disconnect connectors CN2, CN3, and CN4 on the power supply board (PWB-E).
4. Remove 2 CC screws (M3 x 6) and 3 CP(O) screws (M3 x 6), and remove the power supply unit.

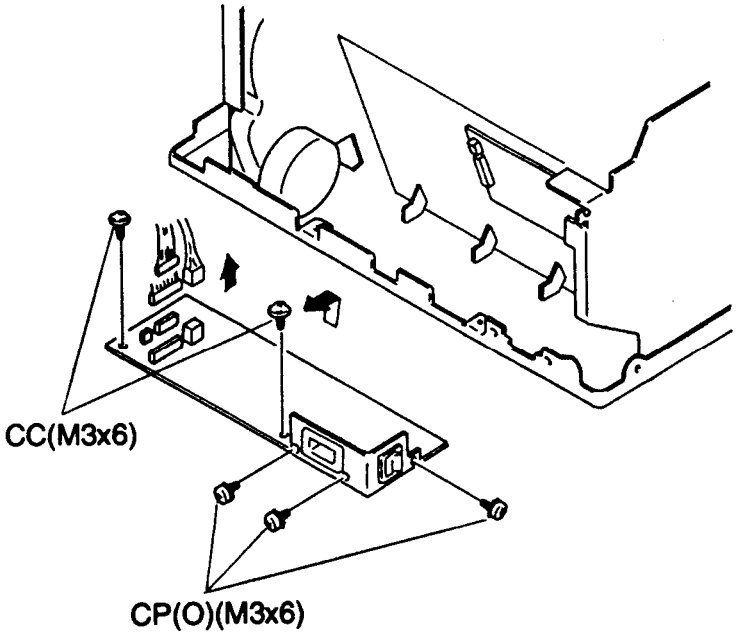


Figure 3-8. Removing the Power Supply Unit

3.2.3.5 High Voltage Supply Board (PWB-F) Removal

1. Remove the housing. (Refer to Section 3.2.1.1.)
2. Remove the rear frame. (Refer to Section 3.2.1.2.)
3. Disconnect connectors CN1 and CN2 on the high voltage supply board (PWB-F).
4. Remove 3 CPB screws (M3 x 8), and remove the high voltage supply board.

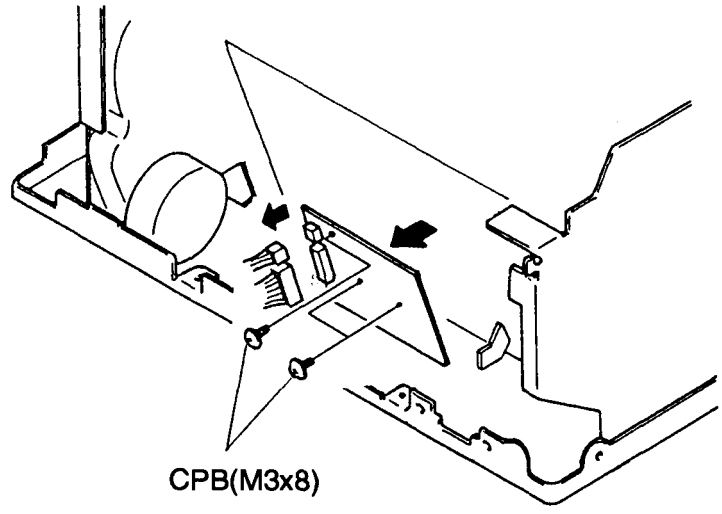


Figure 3-9. Removing the High Voltage Supply Board

Chapter 4 Adjustment

Table of Contents

List of Figures

4.1 ADJUSTMENT

This section describes the adjustment procedure for the EPL-3000 and ActionLaser 1300. This adjustment must be performed after every servicing operation, especially when any component or part is replaced.

4.1.1 Print Position Adjustment

You can adjust the vertical print position on a sheet of paper by turning the image synchronizing volume control on the main board (C144 MAIN). After the main board is replaced, be sure to adjust the print position following the procedure below.

1. Print a STATUS SHEET using the control panel switch.
2. Check that the registration gap between the leading edge of paper and the printing of a "Status Sheet" is the correct value as follows.
   STATUS SHEET page: 14.6 mm (0.57 inch)
   If not, adjust the print position as described in the next few steps.

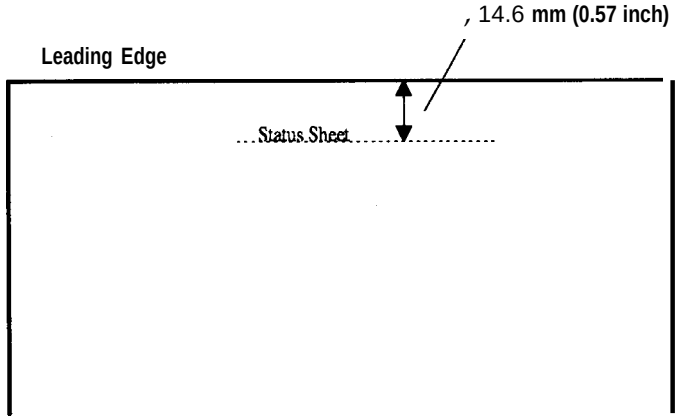


Figure 4-1. Print Position Adjustment

3. Turn the printer power off.
4. Remove the right case. (Refer to section 3.2.1.1.)
5. While holding the control panel, adjust the image synchronizing adjustment volume (VR201) on the main board so that the gap for the print position of "Status Sheet) (vertical print position) becomes 14.6 mm (0.57 inch).
   - Turn VR201 clockwise to decrease the gap for the print position of the horizontal line.
   - Turn VR201 counterclockwise to increase the gap.
6. Turn on the printer.

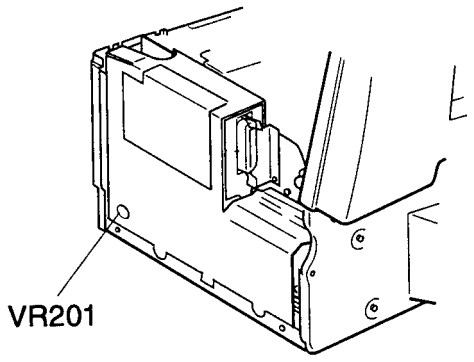


Figure 4-2. Postiton of VR201

7. Print a STATUS SHEET to again check the print position.
8. Repeat steps3 to 7 until the print position is 14.6 mm (0.57 inch).
9. Reattach the right case.

Chapter 5 Troubleshooting

Table of Contents

List of Tables

5.1 OVERVIEW

The EPL-3000 and ActionLaser 1300 have a sophisticated, built-in, self-diagnostic function that reduces troubleshooting time by identifying failed parts or components. This self-diagnostic test overcomes the troubleshooting problems for page printers, in which even a trivial failure can result in a serious print quality problem.

5.2 SELF-DIAGNOSTIC FUNCTION

This section describes the self-diagnostic function in which the controller automatically checks the operating conditions of each component. If any abnormality is detected, the printer displays an e&or message on the LED. It enables repeat displays as follows.

All LED ON+ ALL LED OFF → Error code display+ ALL LED OFF

Table 5-1 lists the error code messages.

Table 5-1. Error Code

LED Display			Error
Data	Jam/ Cover	Toner Save Mode	
ON	OFF	OFF	Fusing unit error
OFF	ON	OFF	Laser light error
OFF	OFF	ON	Scanner motor error
ON	ON	OFF	Fan motor error
ON	OFF	ON	EEPROM format error
OFF	ON	ON	RAM error
OFF	OFF	OFF	ROM error

5.3 TROUBLESHOOTING

This section describes the troubleshooting of abnormal operations and print quality problems.

5.3.1 Troubleshooting of Abnormal Operation

This section describes how to detect and determine the cause of malfunctions and suggests what actions to take. Each paragraph refers you to a detailed troubleshooting table.

Table 5-2. Symptoms and Reference Tables

Symptom	Printer Condition	Reference Table
The printer does not operate at all.	The heater tamp in fusing unit does not come on.	5-3
LEDs do not on.	The heater lamp in fusing unit comes on, but LED does not operate.	5-4
Paper jam or cover open displayed	The cover is closed, but the LCD displayed paper iam or oover open.	5-5
Paper empty or feed jam displayed	The paper is loaded in the paper tray, but the LED displays paper empty or feed jam.	5-6
Fusing unit error displayed	The LCD displays fusing unit.	5-7
Laser light error displayed	The LCD displays laser light error.	5-8
Scanner motor error displayed	The LCD displays scanner motor error.	5-9
Fan motor error displayed	The LCD displays fan motor error.	5-1o
EEPROM format error displayed	The LCD displays EEPROM format error.	5-11
RAM error displayed	The LCD displays RAM error.	5-12
ROM error displayed	The LCD displays ROM error.	5-13
Other error	Other error	5-14

Table 5-3. The Printer Does Not Operate at All

Cause	Step	Checkpoint	Finding	Solution
The fuse on the PWB-E board mav be blown.	1	Is fuse blown on the PWB-E board?	Yes	Replace the fuse.
Connector CN3 on PWB-A board or connector CN201 on C144 MAIN board may be disconnected.	2	Is connector CN3 on the PWB-A board or connector CN201 on C144 MAIN board disconnected?	Yes	Connect CN3 on PWB-A board or CN201 on C144 MAIN board.
PWB-E board maybe dead.	3	With the power on, is there an output of +5 VDC between pin 2 (+) and pin 1 (-) for CN3 on PWB-E board?	No	Replace the PWB-E board.
C144 MAIN board maybe dead.	4	—	—	Replace the C144 MAIN board.

Table 5-4. The LEDs Do Not On

cause	Step	Checkpoint	Finding	Solution
The C144 MAIN board may be dead.	1	—	—	Replace the C144 MAIN board.

Table 5-5. The LCD Displays Paper Jam or Cover Open

Cause	Step	Checkpoint	Finding	Solution
The interlock switch terminal connector may be disconnected.	1	Is interlock switch terminal connector disconnected?	Yes	Connect the terminal connector on the interlock switch.
The interlock switch position may be incorrect.	2	Does the switch turn on when the case is closed?	No	Reseat the interlock switch.
The interlock switch may be dead.	3	Does the switch toggle? (Check with multimeter.)	No	Replace the interlock switch.
The PWB-E board maybe dead.	4	With the power on, is there an outputof+12 VDC between pin 4 (+) and pin 3 (-) for CN3 on PWB-E board?	No	Replace the PWB-E board.
Sensor may be bad.	5	Does the LEDs display cover open error at power on?	No	Skip to step 8.
Paper take up sensor may be dead.	6	—	—	Replace the paper take up sensor.
Paper exit sensor may be dead.	7	—	—	Replace the exit sensor.
The imaging cartridge may not be installed.	8	Is the imaging cartridge installed?	No	Install the imaging cartridge.
The paper take up roller may be bad.	9	Does paper always jam in paper take up roller area?	Yes	Replace the paper take up roller.
The image transfer roller may be bad.	10	Does paper always jam in the image transfer roller area?	Yes	Replace the image transfer roller area.
The fusing unit may be bad.	11	—	—	Replace the fusing unit.

Table 5-6. The LCD Displays Paper Empty or Feed Jam

Cause	Step	Checkpoint	Finding	Solution
Connector for paper take-up solenoid maybe disconnected.	1	Is connector disconnected?	Yes	Connect it.
The paper take-up solenoid coil may be open or shorted.	2	Disconnect connector CN2 on the PWB-F board and check coil resistance between pin 1 and pin 2 on the disconnected cable side of the connector using a multimeter. Is the resistance approximately 31 ohms?	No	Replace the paper take-up solenoid.
		If the coil is shorted, check the solenoid drive circuit using the procedure below: 1. Set the multimeter for resistance check mode. 2. Place the (-) terminal of the multimeter on pin 2 of connector CN2 on the PWB-F board. 3. Place the (+) terminal of the multimeter on (GND). With power on, does the multimeter detect any current?	Yes	Replace the paper take-up solenoid and the PWB-F board.
The main motor coil may be open or shoaled.	3	Disconnect connector CN2 on the PWB-E board and check the coil resistance between: pin 1 and pin 5; pin 2 and pin 5; pin 3 and pin 5; and pin 4 and pin 5(4 points total) on the disconnected cable side of the connector using a multimeter. Pin 1 — Pin 5 Pin 2- Pin 5 Pin 3 — Pin 5 Pin 4 — Pin 5 Are the resistances of all four points approximately 5 ohms?	No	Replace the main motor.
		If any coil is shorted, check the main motor drive circuit using the following procedure: 1. Set the multimeter to resistance check mode. 2. Place the (-) terminal of the multimeter on pins 1,2, 3, or 4 of connector CN2 on the PWB-E board. 3. Place the (+) terminal on pin 1 of connector CN3 of the PWB-E board (GND). With power on, does the multimeter detect current?	Yes	Replace the PWB-E board.
Paper take-up sensor flag position maybe incorrect.	4	Is paper take-up sensor flag position incorrect?	Yes	Reseat the paper take-up sensor flag.
Paper take-up roller may be bad.	5	—	—	Replace the paper take-up roller.

Table 5-7. The LCD Displays Fusing Unit Error

Cause	Step	Checkpoint	Finding	Solution
The connector for the thermistor may be disconnected.	1	Is the connector CN202 on the C144 MAIN board for the thermistor disconnected?	Yes	Connect it.
The C144 MAIN board may be dead.	2	Does the heater lamp remain lit up until an error occurs?	Yes	Replace the C144 MAIN board.
The heater lamp or thermal fuse in fusing unit maybe bad.	3	Does the heater lamp come on at power on?	No	Replace the heater lamp or thermal fuse infusing unit.
The PWB-E board maybe dead.	4	—	—	Replace the PWB-E board.

Table 5-8. The LCD Displays Laser Light Error

Cause	Step	Checkpoint	Finding	Solution
The optical unit may be bad.	1	—	—	Replace the optical unit.
The C144 MAIN board may be bad.	2	—	—	Replace the C144 MAIN board.

Table 5-9. The LCD Displays Scanner Motor Error

Cause	Step	Checkpoint	Finding	Solution
The optical unit may be dead.	1	—	—	Replace the optical unit.
The C144 MAIN board may be dead.	2	—	—	Replace the C144 MAIN board.

Table 5-10. LCD Displays Fan Motor

Cause	Step	Checkpoint	Finding	Solution
Connector CN1 on PWB-F board may be disconnected.	1	Is connector CN1 on the PWB-F board disconnected?	Yes	Connect it.
The fan motor may be dead.	2	—	—	Replace it.

Table 5-11. LCD Displays EEPROM Format Error

Cause	Step	Checkpoint	Finding	Solution
EEPROM data maybe bad.	1	—	—	Operate the EEPROM clear.
The EEPROM (IC20) on the C144 MAIN board maybe bad.	2	—	—	Replace the EEPROM (IC20) on the C144 MAIN board.
The C144 MAIN board may be bad.	3	—	—	Replace the C144 MAIN board.

Table 5-12. LCD Displays RAM Error

Cause	Step	Checkpoint	Finding	Solution
The optional SIMM may be bad.	,	Is the operation OK after you remove the optional SIMM?	Yes	Replace the SIMM.
The C144 MAIN board may be bad.	2	—	—	Replace the C144 MAIN board.

Table 5-13. LCD Displays ROM Error

Cause	Step	Checkpoint	Finding	Solution
The ROMs on the C144 MAIN board may be bad.	1	Is the operation OK after you replace the ROM?	–	Replace the ROMs on the C144 MAIN board.
The C144 MAIN board may be bad.	2	—	—	Replace the C144 MAIN board.

Table 5-14. The LCD Displays SERVICE REQ. C111O

Cause	Step	Checkpoint	Finding	Solution
The C144 MAIN board may be bad.	1	—	—	Replace the C144 MAIN board.

5.3.2 Print Quality Anomaly

This section describes how to isolate a print quality problem from the possible causes.

Table 5-15. Print Quality Anomaly

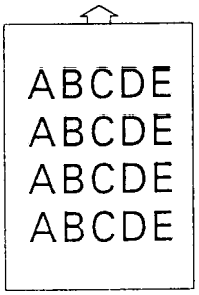
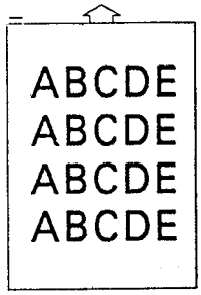
Symptom	Possible Cause	Part Name	Check Item	Remedy
Low image density 	Poor development	Imaging cartridge	Check the toner level in the imaging cartridge.	Shake the imaging cartridge.
				Replace the imaging cartridge.
		PWB-F board	—	Replace the PWB-F board.
	Improper charging	Imaging cartridge	–	Replace the imaging cartridge.
		PWB-F board	—	Replace the PWB-F board.
	Image transfer problem	Image transfer roller	Check to see if the surface of image transfer roller is damaged.	Replace the image transfer roller.
		PWB-F board	—	Replace the PWB-F board.
	Paper problem	Paper	Check to see if paper is moist.	Replace paper.
	Defective optical unit	Optical unit	—	Replace the optical unit.
	Improper print density setting	–	—	Adjust the print density
Foggy background 	Poor development	Imaging cartridge	–	Replace the imaging cartridge.
			Check the wiring of developing bias line.	Replace the PWB-F board.
	Improper charging	Drum charge	—	Replace the PWB-F board.
			Check the wiring of PC drum charging bias line.	Replace the imaging cartridge.
	Improper print density setting	–	—	Adjust the print density
	Defective optical unit	Optical unit	—	Replace the optical unit.

Table 5-15. Print Quality Anomaly (Continued)

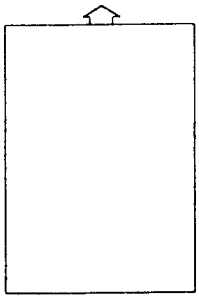
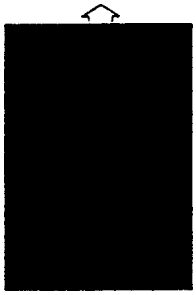
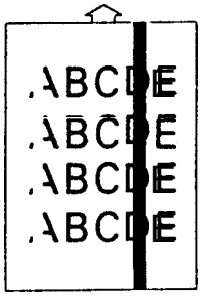
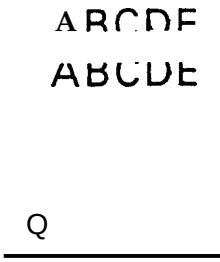
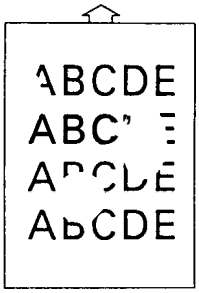
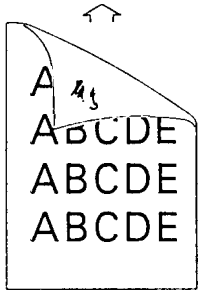
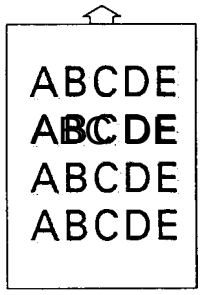
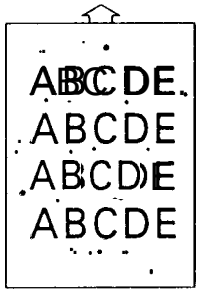
Symptom	Possible Cause	Part Name	Check Item	Remedy
Blank print 	Poor development	Imaging cartridge	Check whether the imaging cartridge is installed properly.	Reinstall the imaging cartridge.
		PWB-F board	—	Replace the PWB-F board.
	Improper charging	PWB-F beam	–	Replace the PWB-F board.
	Poor image transfer	Image transfer roller	Check the surface of the image transfer roller.	Replace the image transfer roller.
		PWB-F board	—	Replace the PWB-F board.
	Improper print density setting	–	—	Adjust the print density.
	Defective optical unit	Optical unit	–	Replace the optical unit.
Black print 	Improper charging	Imaging cartridge	–	Replace the imaging cartridge.
		PWB-F board	—	Replace the PWB-F board.
	Poor development	Imaging cartridge	–	Replace the imaging cartridge.
		PWB-F board		Replace the PWB-F board.
	improper print density setting	–	—	Adjust the print density
	Defective optical unit	Optical unit	–	Replace the optical unit.
White/black lines and bands 	Improper charging	Imaging cartridge	—	Shake the imaging cartridge.
				Replace the imaging cartridge.
	Poor development	PWB-F board	–	Replace the PWB-F board.
		Imaging cartridge	–	Replace the imaging cartridge.
	Improper drum cleaning	Imaging cartridge	–	Replace the imaging cartridge.
	Dirt on the fusing roller	Fusing roller	—	Clean the fusing roller.
White/black lines and bands 	Improper fusing	Fusing roller	—	Clean the fusing roller.
		Thermistor	—	Replace the thermistor
	Defective optical unit	Optical unit	–	Replace the optical unit.
	Poor image transfer	Image transfer roller	Check the surface of the image transfer roller.	Replace the image transfer roller.

Table 5-15. Print Quality Anomaly (Continued)

Symptom	Possible Cause	Part Name	Check Item	Remedy
Areas of missing print 	Poor image transfer	Image transfer roller	Check the surface of the image transfer roller.	Replace the image transfer roller.
		PWB-F board	—	Replace the PWB-F board.
	Poor development	Imaging cartridge	–	Shake the imaging cartridge.
			—	Replace the imaging cartridge.
		PWB-F board	—	Replace the PWB-F board.
	Paper problem	Paper	Check to see if paper is moist.	Replace the paper.
Toner smudges on back side of pages 	Smears on paper path.	Image transfer roller	Check the surface of image transfer roller.	Clean the image transfer roller.
		Fusing roller	—	Clean the fusing roller.
		Other paper paths	Check the paper path.	Clean the paper path.
Print offset 	Improper fusing	Fusing roller	Check if there is any dust or damage on the fusing roller surface.	Clean or replace fusing roller.
	Dirty drum	Imaging cartridge		Replace the imaging cartridge.
Black specks or lots 	Poor development	Imaging cartridge		Shake the imaging cartridge. Replace the imaging cartridge.
		PWB-F board		Replace the PWB-F board.
	Defective PCdrum	Imaging cartridge		Replace the imaging cartridge.

Chapter 6 Maintenance

Table of Contents

List of Figures

List of Tables

6.1 MAINTENANCE

The EPL-3000 and ActionLaser 1300 are page printers that use an electrophotographic printing method. Unlike most impact or ink-jet printers, the key components in the electrographic process are integrated into an expendable cartridge (the imaging cartridge). Therefore, periodic replacement of the imaging cartridge is essential to ensure high-quality output. Other maintenance items are also described in this section, which is divided into two sections: user maintenance (preventive maintenance) and service maintenance (repair).

6.1.1 User Maintenance

Users can achieve maximum print quality from the printer by following the procedures below:

6.1.1.1 Cleaning

This section describes the cleaning required for optimal print quality.

● External Cleaning

Be sure to disconnect the printer from the power outlet before cleaning it. Wipe the cover and external parts of the printer with a damp cloth that has been soaked in a neutral cleaning solution.

. Internal Cleaning

Be sure the printer has been disconnected from the power supply and that the fusing unit has cooled down. Clean printer inside using a soft cloth.

6.1.1.2 Consumable Replacement

This printer uses consumable imaging cartridge SO51O2O. The life of this cartridge is 4500 pages when printing on A4 or letter size pages with a 5% print ratio.

If printed images become faint, remove the cartridge and gently shake it. This will distribute the toner and may make the images darker. If the image is still too light, replace the imaging cartridge. The procedure for changing the imaging cartridge is described below.

● Imaging Cartridge Replacement

1. Gently open the upper unit and remove the imaging cartridge by pulling it out.
2. Dispose of the used imaging cartridge.
3. While holding the new imaging cartridge horizontally, gently shake it a few times to distribute the toner evenly.

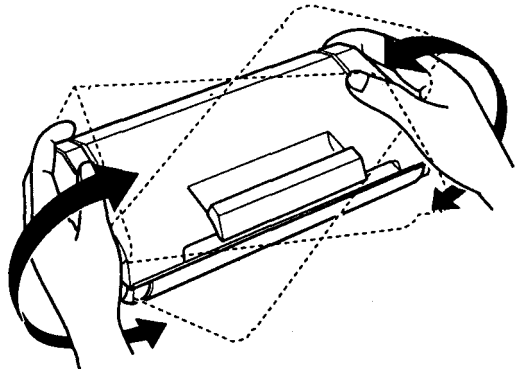


Figure 6-1. Shaking the Imaging Cartridge

4. Set the imaging cartridge on a clean, flat surface. Firmly grip the tab on the left side of the cartridge. Pull the clear seal all the way out with firm, even pressure, as shown.

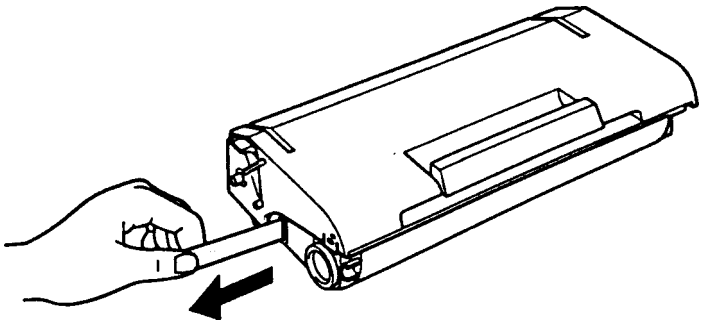


Figure 6-2. Removing the Clear Seal

5. Shake the imaging cartridge again.
6. Insert the imaging cartridge into the printer by placing the pins on each side of the cartridge into the grooves inside the printer. Slide it gently into the opening until it stops.
7. Push down on the front of the cartridge until it locks in place

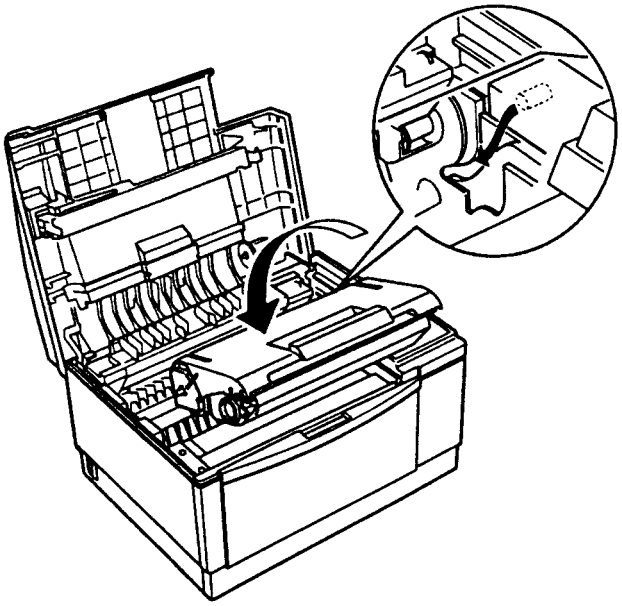


Figure 6-3. Imaging Cartridge Settings -1

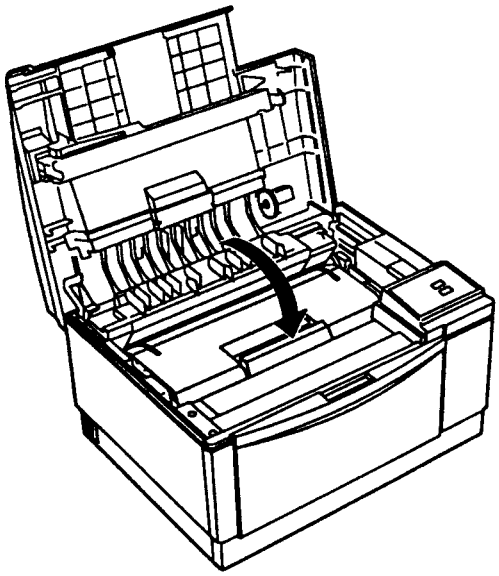


Figure 6-4. Imagig Cartridge Settings -2

8. Close the upper unit.
9. If the printer displays toner low message, hold down the Continue button together with the Toner Save Mode button until the Status Sheet light begins blinking green and orange.

6.1.2 Service Maintenance

This section describes the periodic service maintenance.

6.1.2.1 Periodic Service Maintenance

The following units require periodic service rnaintemnce because they are subject to functional deterioration as the total number of printed pages increase, resulting in bad print quality.

Table 6-1. Periodic Service Maintenance

Unit	Service Interval
Optical unit	Approx. 50,000 pages
Fusing Unit	Approx. 50,000 pages

The service interval listed above is only a reference value. You do not need to perform service maintenance exactly at this time.

Appendix

Table of Contents

List of Figures

List of Tables

A.1 CONNECTOR PIN ASSIGNMENTS

Figures A-1 and A-2 illustrate the intercomection of the primary components. Table A-1 gives the size and a description of each connector.

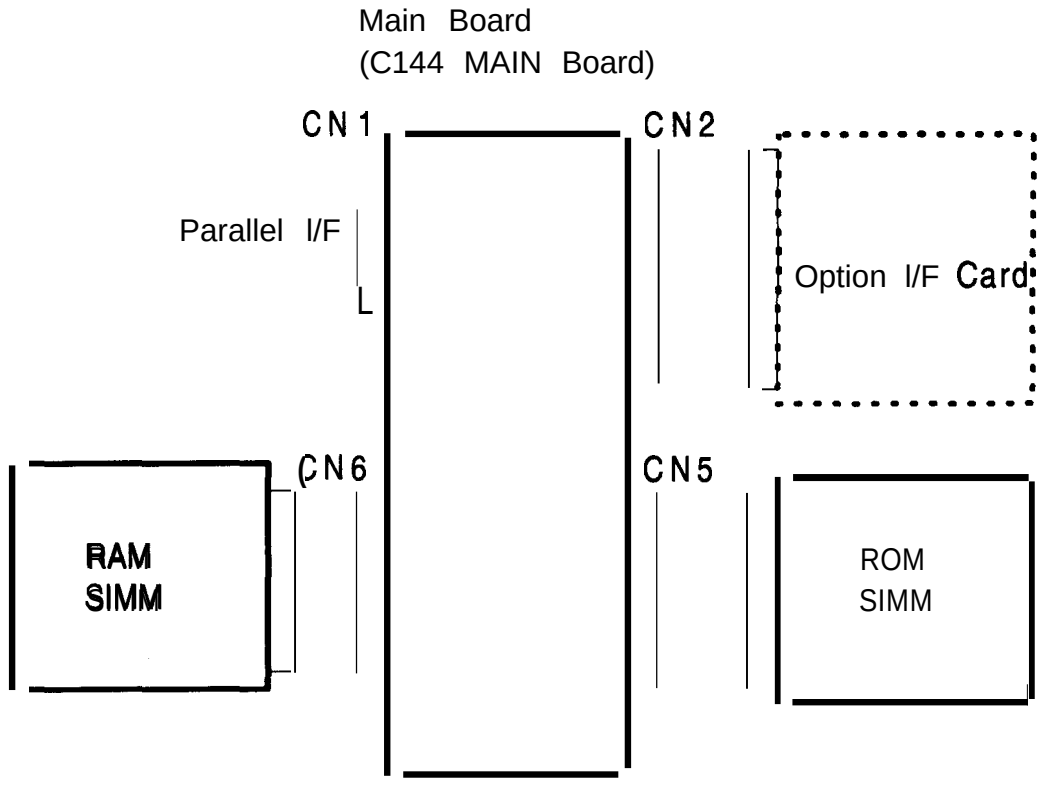


Figure A-1. Cable Connections for the Video Controller Section

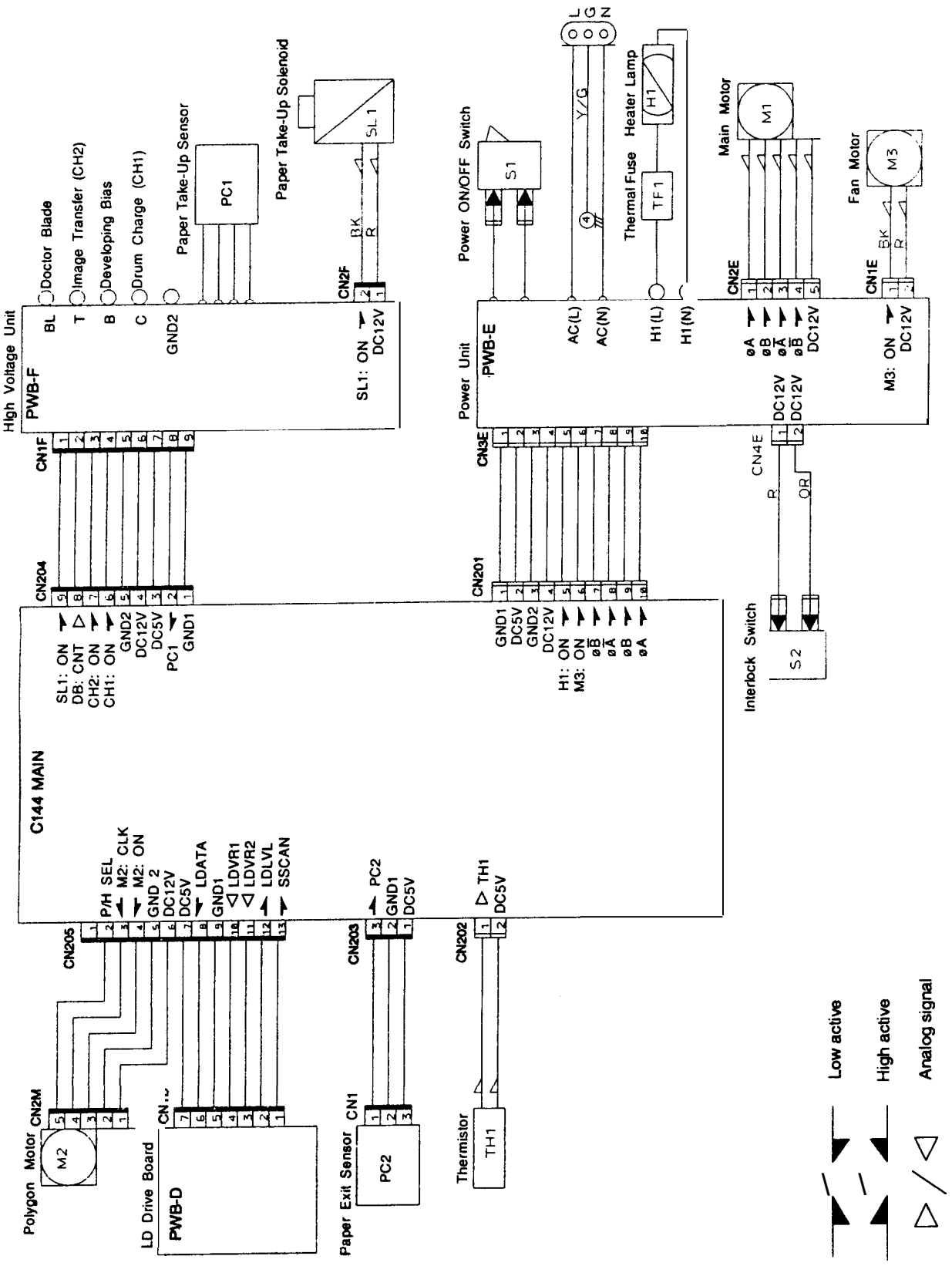


Figure A-2. Cable Connections for the Engine Section

Table A-1. Board Connector Summary

Connector	Description	Pins	Reference
Main Board (C144 MAIN Board)			
CN1	Centronics parallel interface	36 pins	Table 1-8
CN2	Connector for optional I/F (Type-B) card	36 pins	Table A-2
CN3	RIT I/F (Not used)	16 pins	—
CN4	Not used	84 pins	—
CN5	Connector for ROM SIMM	72 pins	Table A-3
CN6	Connector for RAM SIMM	72 pins	Table A-4
CN7	Video I/F (not used)	20 pins	—
CN201	Connector for power supply board (PWB-E board)	10 pins	Table A-5
CN202	Connector for thermistor	2 pins	Table A-6
CN203	Connector for paper exit sensor	3 pins	Table A-7
CN204	Connector for high-voltage supply board (PWB-F board)	9 pins	Table A-8
CN205	Connector for optical unit	13 pins	Table A-9
CN207	Not used	2 pins	—
Power Supply Board (PWB-E Board)			
CN1	Connector for fan motor	2 pins	Table A-1 O
CN2	Connector for main motor	5 pins	Table A-1 1
CN3	Connector for main board (C144 MAIN board)	10 pin	Table A-5
CN4	Connector for interlock switch	2 pins	Table A-1 2
High-Voltage Supply Board (PWB-F Board)			
CN1	Connector for paper take-up solenoid	2 pins	Table A-1 3

A.1.1 Main Board (C144 MAIN Board) Pin Assignments

Table A-2. CN2 Pin Assignments

Pin No.	Signal Name	I/o	Description
1-6	+5V	—	+5 VDC
7	TXD	O	Transmitted data
8	READY	O	Ready signal
9	RXD	I	Received data
10	NC	—	Not connected
11	RESET	O	Reset signal
12	INH	O	I/F disabled
13	CMREQ	I	Request command
14	WRRDY	I	I/F ready
15	RDREQ	I	Data read request
16	WR	O	Write enable
17	RD	O	Read enable
18	CS	O	Chip select
19-24	GND	—	Ground
25-28	A3-AO	O	Address bus bit 3-O
29-36	D7-DO	I/O	Data bus bit 7-O

Table A-3. CN5 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	Vss	—	Ground
2	DQ0	I/O	Data bus bit 0
3	DTACK	I	DTACK for CPU
4	DQ1	I/o	Data bus bit 1
5	NC	—	Not connected
6	DQ2	I/o	Data bus bit 2
7	NC	—	Not connected
8	DQ3	I/o	Data bus bit 3
9	MCLK	o	Clock
10	Vcc	—	+5 VDC
11	RD	o	Read strobe
12	AO	0	Address bit 0
13	A1	0	Address bit 1
14	A2	0	Address bit 2
15	A3	0	Address bit 3
16	A4	0	Address bit 4
17	A5	0	Address bit 5
18	A6	0	Address bit 6
19	AIO	0	Address bit 10
20	DQ4	I/O	Data bus bit 4
21	NC	—	Not connected
22	DQ5	I/o	Data bus bit 5
23	A22	o	Address bit 22
24	DQ6	I/o	Data bus bit 6
25	A21	o	Address bit 21
26	DQ7	I/O	Data bus bit 7
27	A20	o	Address bit 20
28	A7	0	Address bit 7
29	NC	—	Not connected
30	Vcc	—	+5 VDC
31	A8	o	Address bit 8
32	A9	0	Address bit 9
33	$\overline{CS3}$	0	CS3
34	$\overline{CS2}$	0	CS2
35	WR	0	Write strobe
36	$\overline{AS}$	0	Address strobe
37	WR	0	Read/Write
38	CS4	0	CS4
39	Vss	—	Ground
40	A11	o	Address bit 11
41	A13	0	Address bit 13
42	A14	0	Address bit 14
43	A12	0	Address bit 12
44	$\overline{CS0}$	0	CS0
45	$\overline{CS1}$	0	CS1
46	A18	0	Address bit 18
47	$\overline{INH}$	0	INH
48	A17	0	Address bit 17
49	DQ8	I/O	Data bus bit 8

Table A-3. CN5 Pin Assignments (Continued)

P ı No.	Signal Name	I/O	Description
50	NC	—	Not connected
51	DQ9	I/O	Data bus bit 9
52	NC	—	Not connected
53	DQ10	I/O	Data bus bit 10
54	NC	—	Not connected
55	DQ11	I/O	Data bus bit 11
56	NC	—	Not connected
57	DQ12	I/O	Data bus bit 12
58	NC	—	Not connected
59	Vcc	—	+5 VDC
60	NC	—	Not connected
61	DQ13	I/O	Data bus bit 13
62	NC	—	Not connected
63	DQ14	I/O	Data bus bit 14
64	NC	—	Not connected
65	DQ15	I/O	Data bus bit 15
66	NC	—	Not connected
67	Pol	—	Not used
68	PO2	—	Not used
69	PO3	—	Not used
70	PO4	—	Not used
71	A15	o	Address bus bit 15
72	Vss	—	Ground

Table A-4. CN6 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	Vss	—	Ground
2	DQ0	I/O	Data bus bit O
3	DQ16	I/O	Data bus bit 16
4	DQ1	I/O	Data bus bit 1
5	DQ17	I/O	Data bus bit 17
6	DQ2	I/O	Data bus bit 2
7	DQ18	I/O	Data bus bit 18
8	DQ3	I/O	Data bus bit 3
9	DQ19	I/O	Data bus bit 19
10	Vcc	—	+5 VDC
11	NC	—	Not connected
12	MAO	o	Memory address bit O
13	MA1	0	Memory address bit 1
14	MA2	0	Memory address bit 2
15	MA3	0	Memory address bit 3
16	MA4	0	Memory address bit 4
17	MA5	0	Memory address bit 5
18	MA6	0	Memory address bit 6
19	MA1O	0	Memory address bit 10
20	DQ4	I/O	Data bus bit 4
21	DQ20	I/O	Data bus bit 20
22	DQ5	I/O	Data bus bit 5
23	DQ21	I/O	Data bus bit 21
24	DQ6	I/O	Data bus bit 6

Table A-4. CN6 Pin Assignments (Continued)

Pin No.	Signal Name	I/o	Description
25	DQ22	I/O	Data bus bit 22
26	DQ7	I/O	Data bus bit 7
27	DQ23	I/O	Data bus bit 23
28	MA7	o	Memory address bit 7
29	NC	·	Not connected
30	V(X	—	+5 VDC
31	MA8	o	Memory address bit 8
32	MA9	o	Memory address bit 9
33	$\overline{\text{RAS3}}$	o	RAS 3
34	$\overline{\text{RAS2}}$	o	RAS 2
35	MP2	—	Not used
36	MP0	—	Not used
37	MP1	—	Not used
38	MP3	—	Not used
39	Vss	—	Ground
40	$\overline{\text{CAS0}}$	o	CAS O
41	$\overline{\text{CAS2}}$	o	CAS 2
42	$\overline{\text{CAS3}}$	o	CAS 3
43	$\overline{\text{CAS1}}$	o	CAS 1
44	$\overline{\text{RAS0}}$	o	RAS O
45	$\overline{\text{RAS1}}$	o	RAS 1
46	NC	—	Not connected
47	$\overline{\text{WE}}$	o	Write enable
48	NC	—	Not connected
49	DQ8	I/O	Data bus bit 8
50	DQ24	I/O	Data bus bit 24
51	DQ9	1/0	Data bus bit 9
52	DQ25	I/O	Data bus bit 25
53	DQ10	I/o	Data bus bit 10
54	DQ26	I/O	Data bus bit 26
55	DQ11	I/O	Data bus bit 11
56	DQ27	I/O	Data bus bit 27
57	DQ12	I/O	Data bus bit 12
58	DQ28	I/O	Data bus bit 28
59	Vcc	—	+5 VDC
60	DQ29	I/O	Data bus bit 29
61	DQ13	I/O	Data bus bit 13
62	DQ30	I/O	Data bus bit 30
63	DQ14	I/O	Data bus bit 14
64	DQ31	I/O	Data bus bit 31
65	DQ15	I/O	Data bus bit 15
66	NC	—	Not connected
67	Pol	—	Not used
68	P02	—	Not used
69	P03	—	Not used
70	P04	—	Not used
71	Nc	—	Not connected
72	VSs	—	Ground

Table A-5. CN201 Pin Assignments

Pin No.	Signal Name	I/o	Description
1	GND1	—	Ground
2	DC5V	—	+5 VDC
3	GND2	—	Ground
4	DC12	—	+12 VDC
5	HI :ON	—	Heater lamp on
6	M3:ON	—	Fan motor on
7	φB̄	o	Main motor phase B̄
8	φĀ	0	Main motor phase Ā
9	φB	0	Main motor phase B
10	(RA	0	Main motor phase A

Table A-6. CN202 Pin Assignments

Pin No.	Signal Name	I/o	Description
1	TH1	I	Thermistor data
2	DC5V	—	+5 VDC

Table A-7. CN203 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	DC5V	—	+5 VDC
2	GND1	—	Ground
3	PC2	I	Paper exit sensor signal

Table A-8. CN204 Pin Assignments

Pin No.	Signal Name	I/o	Description
1	GND1	—	Ground
2	PC1	I	Paper take-up
3	DC5V	—	+5 VDC
4	DC12V	—	+12 VDC
5	GND2	—	Ground
6	CH1 :ON	o	Drum charge on
7	CH2:ON	o	Image transfer on
8	DB:CNT	o	Developing bias control
9	SL1:ON	" o	Paper take up solenoid on

Table A-9. CN205 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	NC	—	Not connected
2	P/H SEL	o	M2 phase select
3	M2:CLK	0	M2 clock
4	M2:ON	0	M2 drive
5	GND2	—	Ground
6	DC12V	—	+12 VDC
7	DC5V	—	+5 VDC
8	LDATA	o	Laser on/off
9	GND1	—	Ground
10	LDVR1	o	Laser power adjust 1
11	LDVR2	0	Laser power adjust 2
12	LDLVL	I	Laser power signal
13	SSCAN	I	Horizontal synchronous signal

A.1.2 Power Supply Board (PWB-E Board) Pin Assignments

Table A-10. CN1 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	DC12V	—	+12 VDC
2	M3: ON	o	Fan motor control signal

Table A-n. CN2 Pin Assignments

Pin No.	Signal Nama	I/O	Description
1	φA	o	MI phase A
2	φB	o	MI phase B
3	$\overline{\varphi A}$	o	MI phase $\overline{A}$
4	$\overline{\varphi B}$	o	MI phase $\overline{B}$
5	DC12V	—	+12 VDC

Table A-12. CN4 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	DC12V	—	+12 VDC
2	DC12V	–	+12 VDC

A.1.3 High-Voltage Supply Board (PWB-F Board) Pin Assignments

Table A-13. CN1 Pin Assignments

Pin No.	Signal Name	I/O	Description
1	DC12V	—	+12 VDC
2	SL1:ON	o	Paper take-up solenoid on

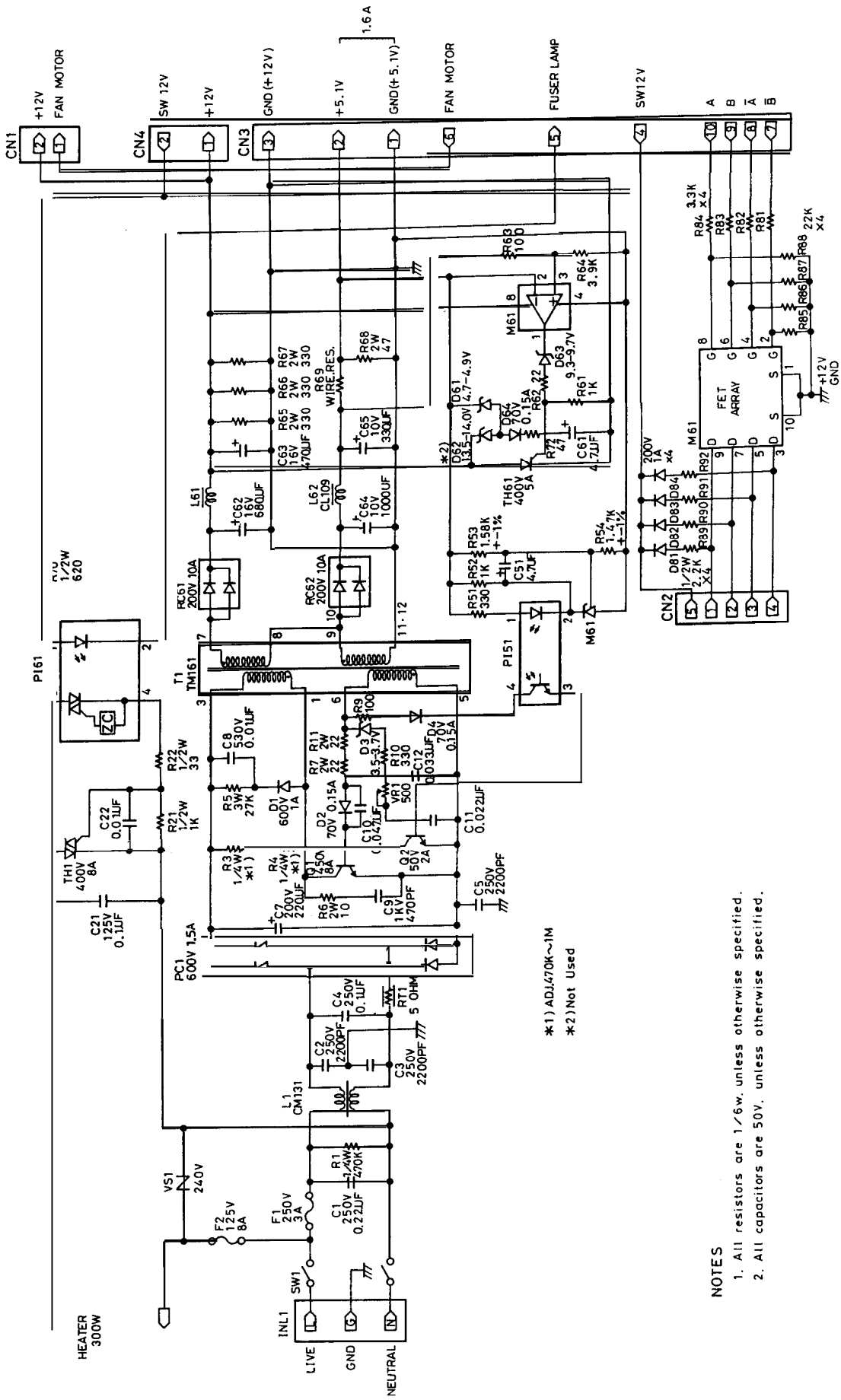


Figure A-6. PWB-E (120V) Board Circuit Diagram

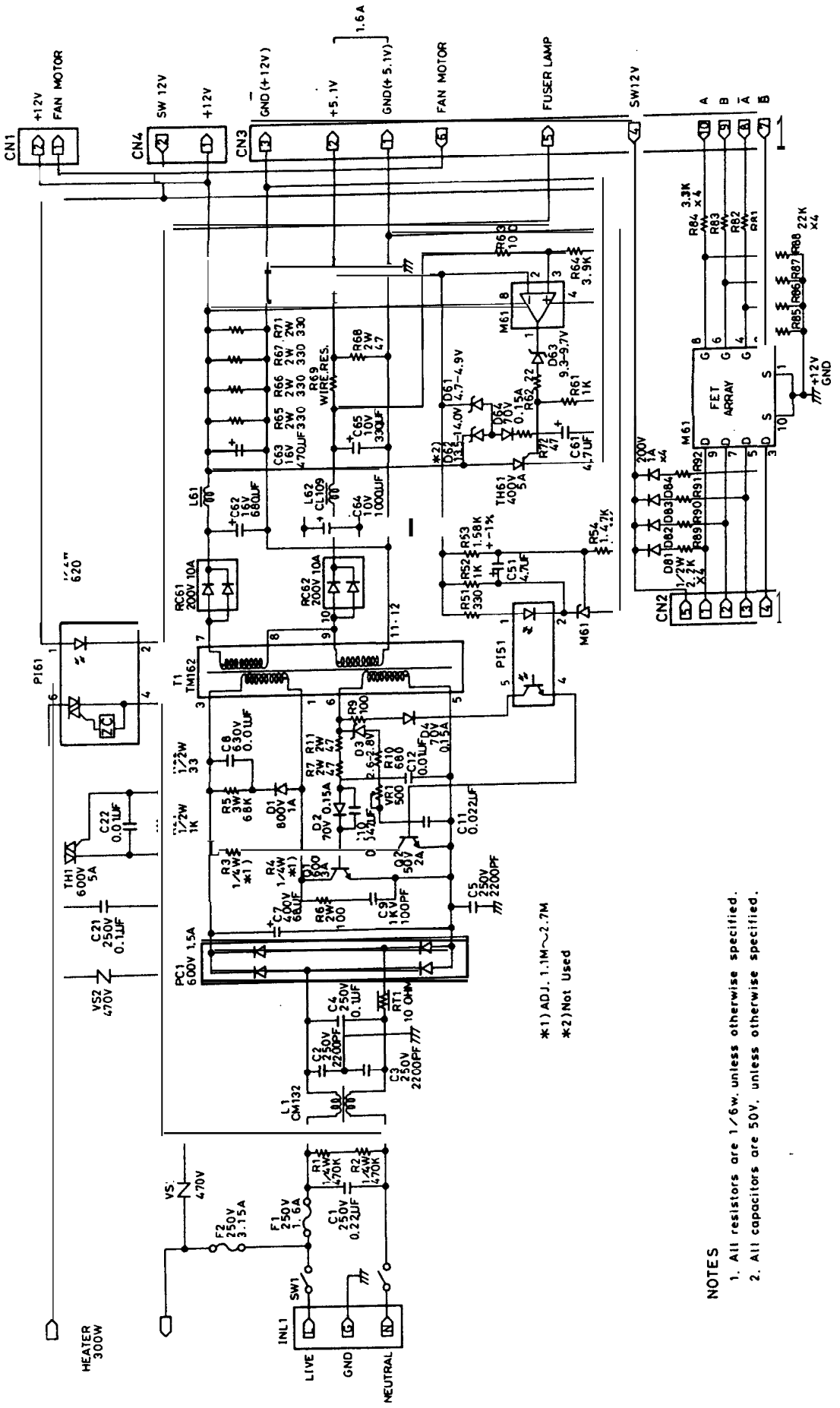


Figure A-7. PWB-E (220/240V) Board Circuit Diagram

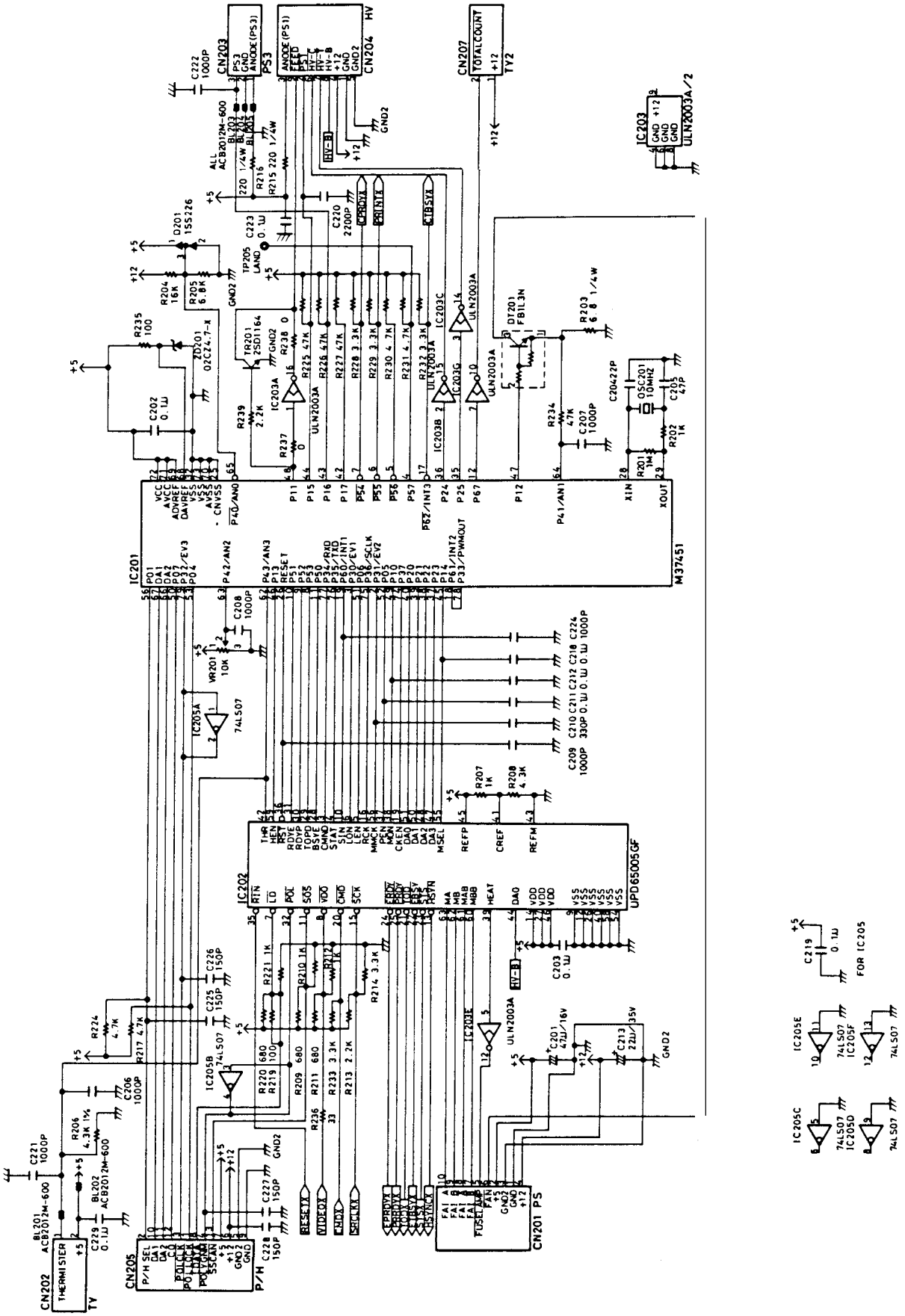


Figure A-4. C144 MAIN Board Circuit Diagram (2/2)

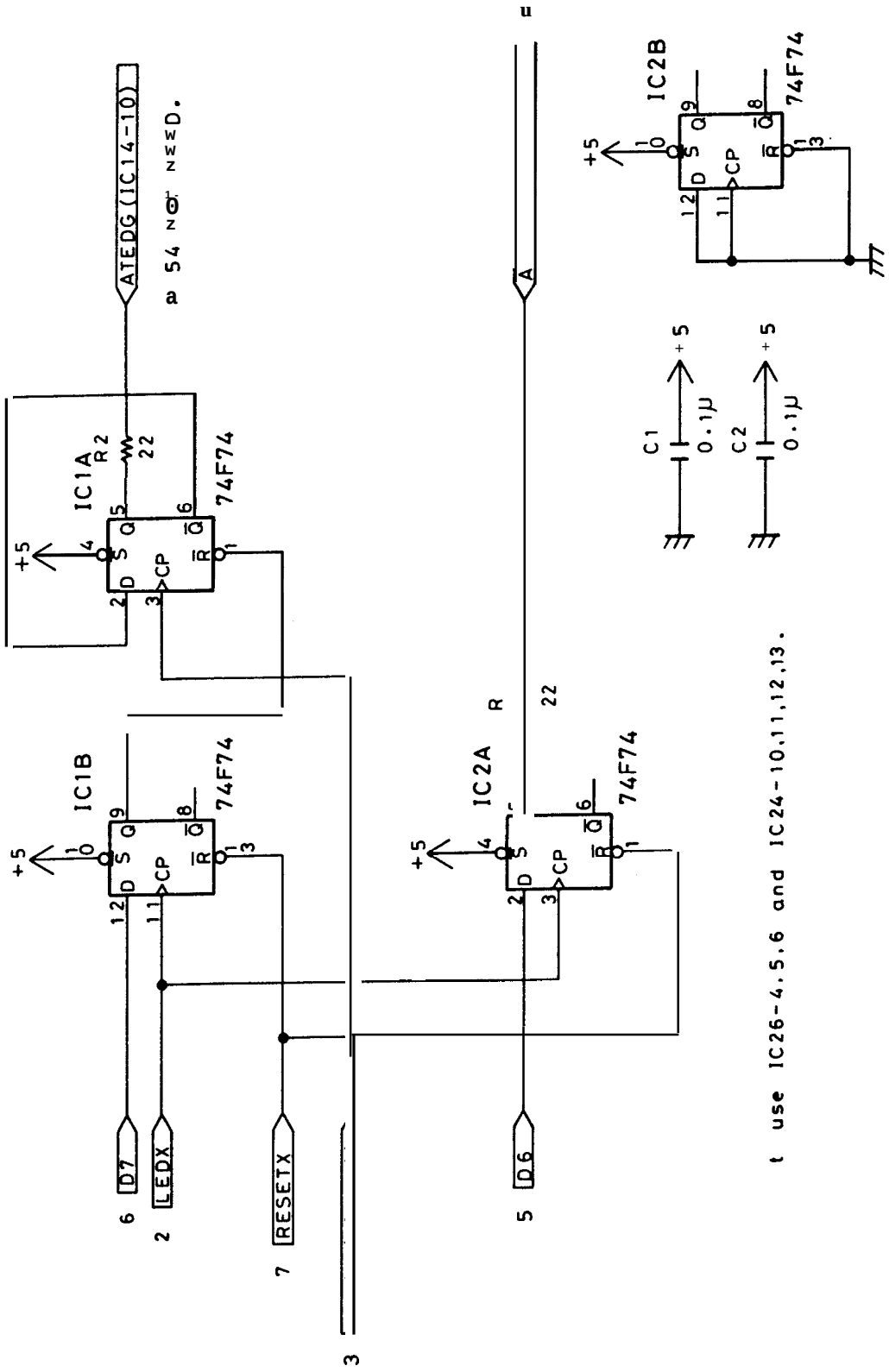


Figure A-5. C144 SUB Board Circuit Diagram

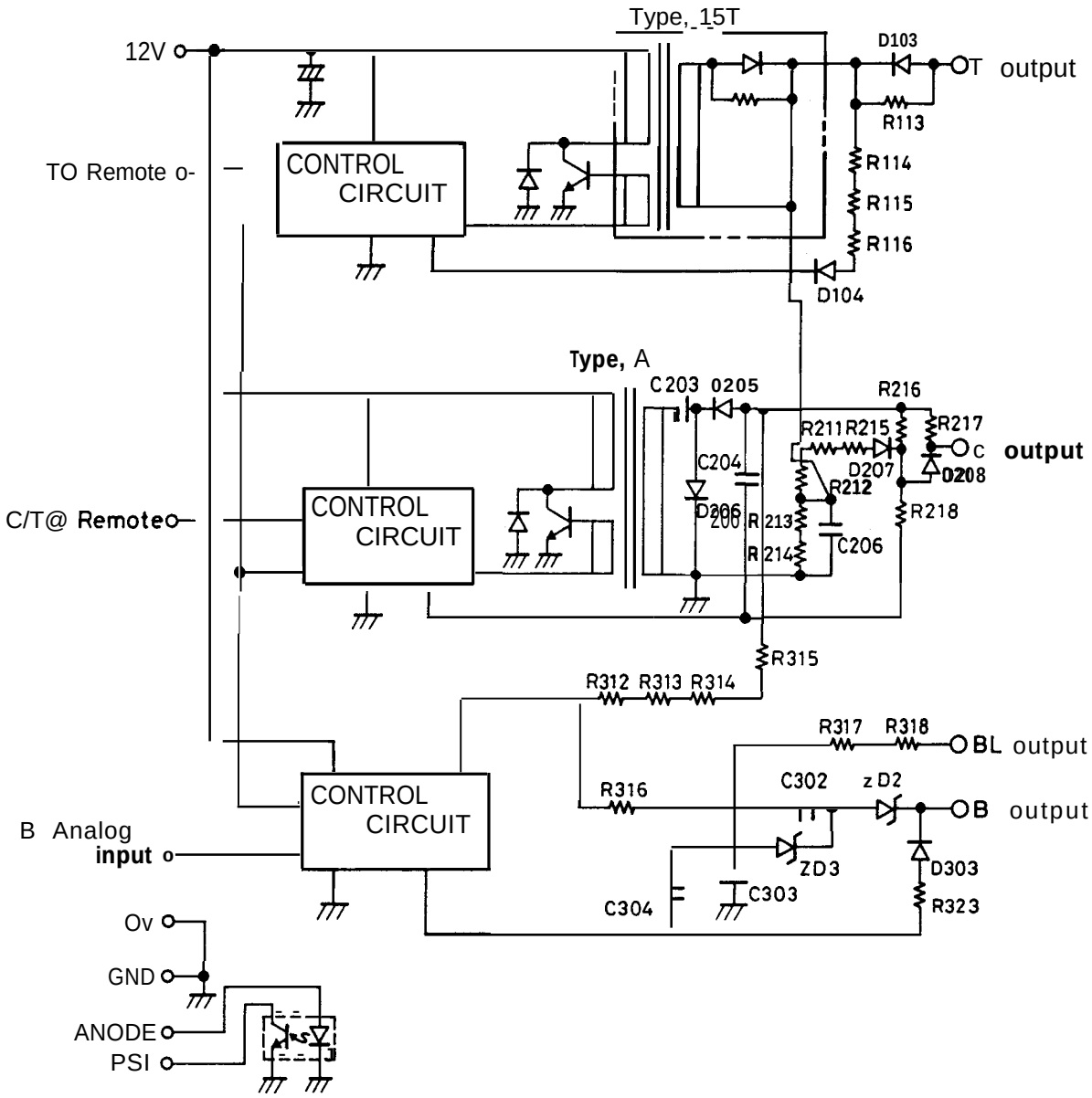


Figure A-8. PWB-F (120V) Board Circuit Diagram

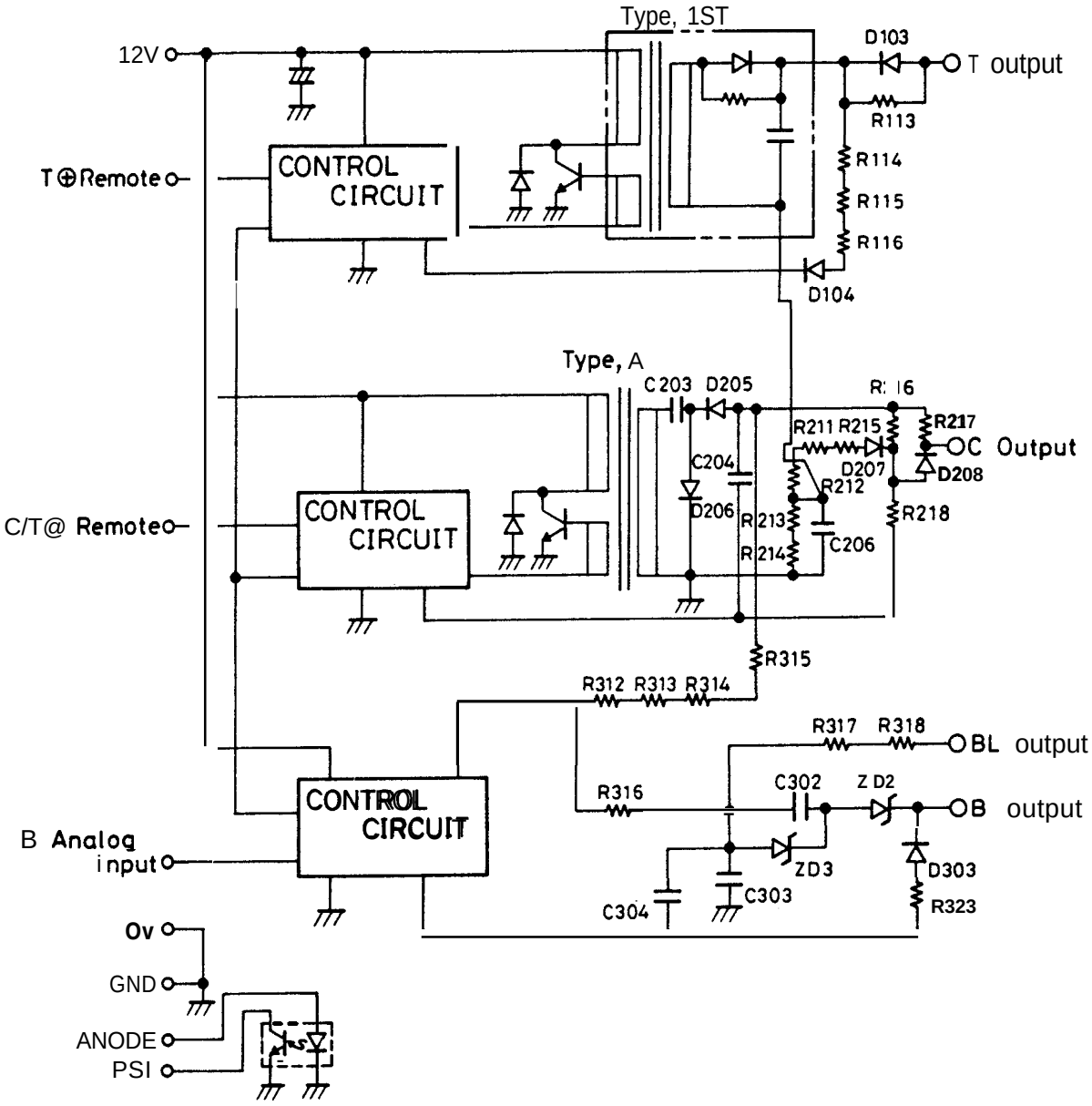


Figure A-9. PWB-F (220/240V) Board Circuit Diagram

A.3 CIRCUIT BOARD COMPONENT LAYOUT

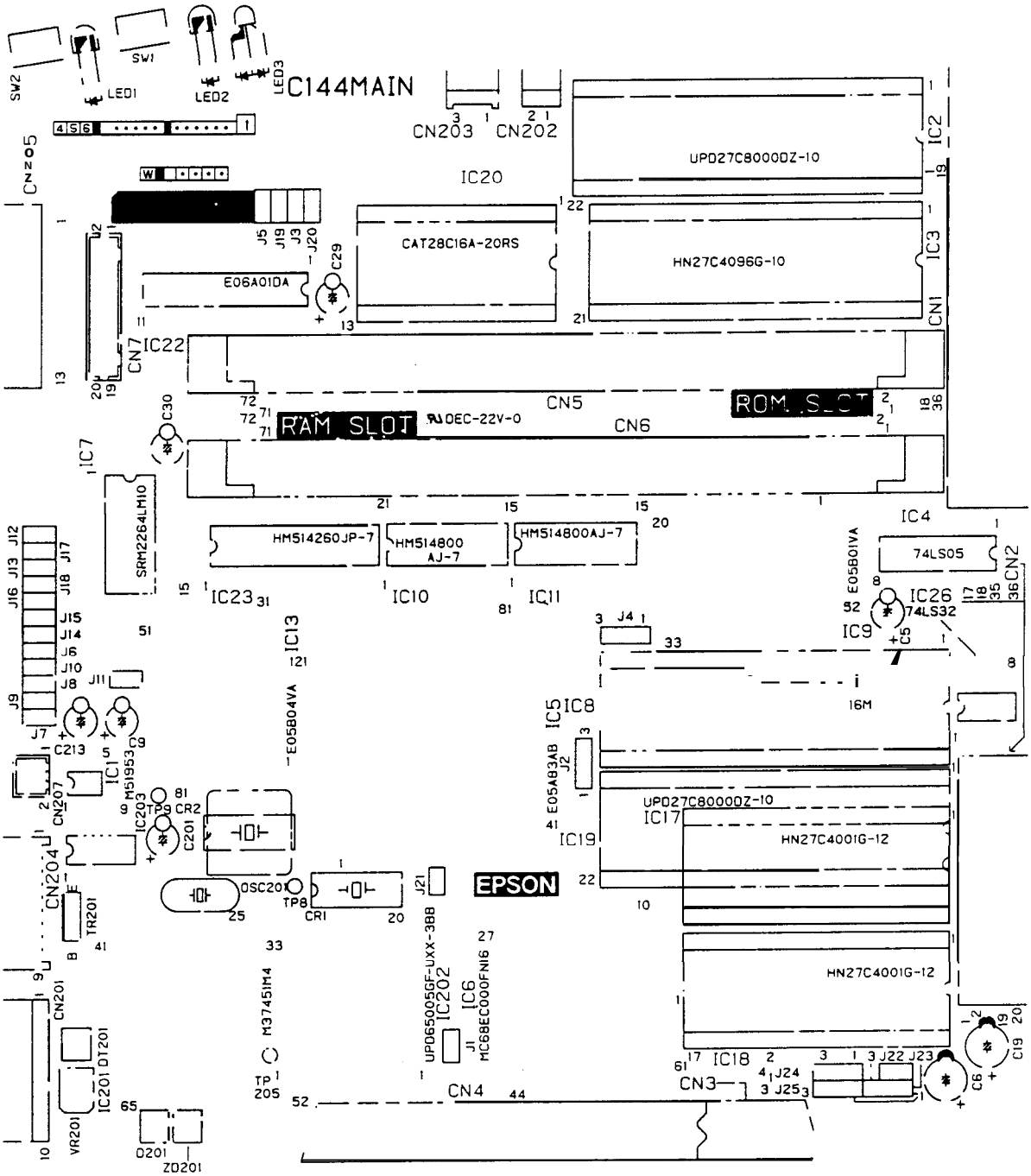


Figure A-10. C144 MAIN Board Component Layout (Front)

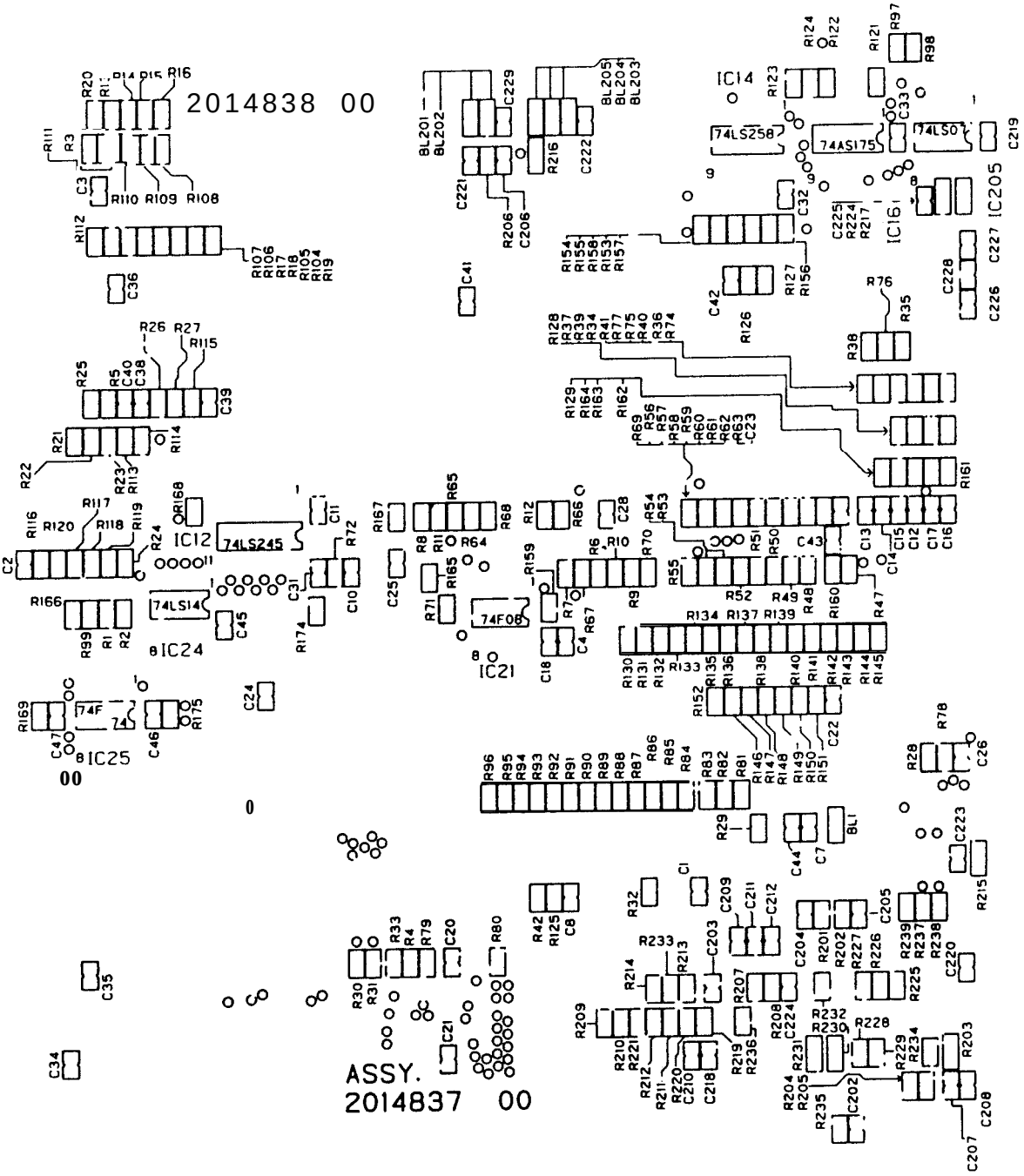


Figure A-II. C144 MAIN Board Component Layout (Rear)