

LBP-EX SERIES

SERVICE MANUAL

REVISION 0

Canon

MAY 1993

RY8-1356-000

COPYRIGHT © 1993 CANON INC.

***Printed in Japan
Imprimé au Japon***

Use of this manual should be strictly supervised to avoid disclosure of confidential information.

Prepared by
INFORMATION SYSTEM & PERIPHERAL PRODUCTS QUALITY PLANNING DIV.
PERIPHERAL PRODUCTS TECHNICAL DOCUMENTATION DEPT.

CANON INC.

30-2 Shimomaruko 3-chome, Ohta-ku, Tokyo 146, Japan

PREFACE

This Service Manual contains basic information required for after-sales service of the LBP-EX series laser beam printer (hereinafter referred to as the "printer"). This information is vital to the service technician in maintaining the high print quality and performance of the printer.

The cassette paper feeder and envelope feeder are prepared for the printer as an optional equipment, which contents are also described in this manual.

"LBP-EX series" is a general reference to LBP-EX, LBP-EX PCB, and LBP-EX PCB II. The following table shows the differences in features between the models.

	LBP-EX	LBP-EX PCB	LBP-EX PCB II
Display PCB	Yes	No	Yes
Control panel	No	Yes	No
Video interface PCB	Yes	No	No
Font card slot	No	Yes	No

In this manual the interface circuit that connects the printer with the external device is named the "Video Controller (PCB)". When descriptions are not applicable to all models, name of the models to which the descriptions refer to are given in parentheses.

This manual consists of the following chapters:

- Chapter 1: General Description
Features, specifications, and operation
- Chapter 2: Operation and Timing
A description of the operating principles and timing sequences of the electrical and mechanical systems.
- Chapter 3: The Mechanical System
Explanation of mechanical operation, disassembly, reassembly, and adjustment procedures
- Chapter 4: Installation
Requirements for a suitable location, installation procedures, plus the storage and handling of EP-E cartridges
- Chapter 5: Maintenance and Servicing
Parts replacement schedule, tools, lubricants, and solvents
- Chapter 6: Troubleshooting
Reference values and adjustments; troubleshooting procedures
- Appendix: General timing chart, general circuit diagram, PCB circuit diagrams, etc.

Information in this manual is subject to change as the product is improved or redesigned.

All relevant information in such cases will be supplied in Service Information Bulletins.

A thorough understanding of this printer, based on information in this Manual and Service Information Bulletins, is required for maintaining its performance and for locating and repairing the cause of malfunctions.

DTP system

This manual was produced on an Apple Macintosh™ IIfx personal computer and output by an Apple LaserWriter™ II NTX-J laser beam printer; final pages were printed on Varityper™ 5300 and 4000-J RIP.


The Canon mo-5001S Magneto-Optical Storage Subsystem with mo-502M Magneto-Optical Storage Disk Cartridge and mo-IF2 interface kit were used for storing large volumes of page layout and graphic data for this manual.

All graphics were produced with Aldus FreeHand™ (J), and all documents and page layouts were created with QuarkXPress™ (J).

The video images were captured with Canon Hi-8 8mm video camcorder and MASS microsystems Quickimage™ 24 video capture board, and modified with Adobe Photoshop™ (J).

CONTENTS

CHAPTER 1 GENERAL DESCRIPTION

I. FEATURES	1-1	IV. PARTS OF THE PRINTER.....	1-6
II. SPECIFICATIONS.....	1-2	V. OPERATION.....	1-10
III.  SAFETY INFORMATION.....	1-5		

CHAPTER 2 OPERATION AND TIMING

I. BASIC OPERATION	2-1	B. Paper Size Detection	2-28
A. Functions.....	2-1	C. Cassette Feed.....	2-29
B. Outline of the Electrical System	2-2	D. Fixing and Delivery Unit....	2-30
C. DC Controller Input Signals	2-3	E. Paper Jam Detection	2-33
D. DC Controller Input/ Output Signals	2-4	V. OVERALL CONTROL SYSTEM .	2-35
E. Basic Sequence of Operations.....	2-6	A. Outline.....	2-35
II. LASER/SCANNER SYSTEM.....	2-7	B. Operation	2-36
A. Outline.....	2-7	VI. POWER SUPPLIES	2-37
B. Scanning Exposure	2-8	A. Outline.....	2-37
C. Laser Control Circuit.....	2-10	B. Protective System	2-37
D. Scanner Drive.....	2-13	VII. ENVELOPE FEEDER	2-38
III. IMAGE FORMATION SYSTEM .	2-15	A. Outline of the Electrical System	2-38
A. Outline.....	2-15	B. Pick-up/Feed System	2-39
B. Printing Process	2-17	C. Paper Jam Detection	2-41
C. High-Voltage Power Supply	2-23	VIII. PAPER FEEDER.....	2-42
IV. PICK-UP/FEED SYSTEM.....	2-27	A. Outline of the Electrical System	2-42
A. Outline.....	2-27	B. Pick-up/Feed System	2-43
		C. Paper Jam Detection	2-43

CHAPTER 3 THE MECHANICAL SYSTEM

I. EXTERNALS	3-1	B. Cassette Pick-up Roller.....	3-9
A. Covers and Panels	3-1	C. MP Tray Pick-up Roller.....	3-9
B. Exhaust Fan	3-4	D. Separation Pad	3-10
C. Display Panel Unit	3-5	E. Paper Delivery Unit	3-10
II. DRIVE SYSTEM	3-6	IV. EXPOSURE SYSTEM.....	3-11
A. Drive Unit.....	3-6	A. Laser/Scanner Unit	3-11
B. Main Motor.....	3-6	V. ELECTROSTATIC IMAGING/ DEVELOPING/CLEANING SYSTEM	3-12
III. PAPER TRANSPORT SYSTEM..	3-7		
A. Paper Pick-up Unit.....	3-7		

A. EP-E Cartridge.....	3-12	C. Pick-up Motor Driver PCB..	3-19
B. Transfer Charging Roller....	3-13	D. Sensor PCB.....	3-20
VI. FIXING SYSTEM.....	3-14	E. Power Supply.....	3-21
A. Fixing Unit.....	3-14	F. High-voltage Power	
VII. ELECTRONIC COMPONENTS ..	3-18	Supply PCB.....	3-21
A. Video interface PCB		VIII. ENVELOPE FEEDER	3-22
(LBP-EX).....	3-18	IX. PAPER FEEDER.....	3-26
B. DC Controller PCB.....	3-18		

CHAPTER 4 INSTALLATION

I. CHOOSING A LOCATION.....	4-1	A. Storage of Sealed	
II. UNPACKING AND		Cartridges	4-6
INSTALLATION	4-2	B. Storage of Unsealed	
III. STORAGE AND HANDLING OF		Cartridges	4-6
CARTRIDGES	4-6	C. Handling Suggestions	4-7

CHAPTER 5 MAINTENANCE AND SERVICING

I. PARTS REPLACEMENT		A. Standard Tools	5-2
SCHEDULE.....	5-1	B. Special Tools	5-3
II. EXPECTED SERVICE LIVES		V. LIST OF LUBRICANTS,	
OF CONSUMABLES.....	5-1	CLEANERS	5-4
III. PERIODIC SERVICE		VI. SERVICE CHECKPOINTS	5-5
SCHEDULE.....	5-1	VII. MAINTENANCE BY	
IV. LISTS OF TOOLS	5-2	CUSTOMER	5-7

CHAPTER 6 TROUBLESHOOTING

I. INTRODUCTION.....	6-1	IV. IMAGE DEFECTS.....	6-14
A. Initial Check	6-1	A. Examples of Image Defects	6-14
B. Basic Procedure.....	6-2	B. Troubleshooting Image	
C. How to Use the		Defects.....	6-15
Troubleshooting Tables.....	6-3	V. TROUBLESHOOTING	
II. EXPLANATION FOR SPECIAL		MALFUNCTIONS	6-28
TOOL	6-4	VI. PAPER TRANSPORT	
A. Printer Driver Tester	6-4	TROUBLESHOOTING	6-40
III. MEASUREMENT AND		A. Print Paper Jams	6-40
ADJUSTMENT	6-8	B. Incomplete Paper Feed	6-43
A. Image Adjustment	6-8	VII. LOCATION OF ELECTRICAL	
B. Mechanical Adjustment	6-8	PARTS/FUNCTION.....	6-44
C. Electrical Adjustment.....	6-10	A. Switches.....	6-44

B. Sensors and Solenoids	6-46
C. Motor and Others	6-48
D. PC Boards.....	6-50
E. Connectors.....	6-52
VIII. VARIABLE RESISTORS, LEDS, TEST PINS, JUMPERS, AND	

SWITCHES ON PC BOARDS.....	6-54
A. DC Controller PCB.....	6-54
B. High-voltage Power Supply PCB.....	6-55
C. Pick-up Motor Driver PCB..	6-56
D. Paper Feeder Driver PCB....	6-56

APPENDIX

I. GENERAL TIMING CHART	A-1
II. LIST OF SIGNALS	A-3
III. GENERAL CIRCUIT.....	A-5
IV. DC CONTROLLER.....	A-6
V. PICK-UP MOTOR DRIVER.....	A-8
VI. SENSOR CIRCUIT	A-10

VII. VIDEO INTERFACE CIRCUIT (LBP-EX).....	A-11
VIII. DISPLAY CIRCUIT (LBP-EX/LBP-EX PCB II).....	A-12
IX. PAPER FEEDER DRIVER	A-13
X. ENVELOPE FEEDER DRIVER..	A-14

CHAPTER 1

GENERAL DESCRIPTION

I. FEATURES	1-1	IV. PARTS OF THE PRINTER.....	1-6
II. SPECIFICATIONS.....	1-2	V. OPERATION.....	1-10
III. ▲ SAFETY INFORMATION.....	1-5		

I. FEATURES

1. Non-impact page printer

This non-impact (low-noise) printer uses electrophotographic, electronic, and laser technology.

2. High print quality through use of fine toner and high resolution (600 dpi)

Toner having a particle size half that of conventional Canon toner and higher resolution (600 dpi) produce clearer images.

3. Easy maintenance

The photosensitive drum, toner, primary charging roller, and drum cleaning unit are combined into one replaceable assembly called the "EP-E Cartridge". By the use of the customer-replaceable cartridge, high printing quality is maintained by replacing the cartridge and simple cleaning in the printer.

4. Roller charging/transfer system

Instead of the conventional corona system, a **charging roller/transfer system** is used for the charging and transfer processes. The charging roller system considerably reduces the ozone produced by the charging system and the roller transfer system makes paper feeding more stable.

5. Space-saving front loading for paper feed

Front loading is used to make it easier to load paper. This, along with the built-in, multi-purpose tray, reduces the size of the printer and the space it takes up.

6. Four paper feed methods with various options

Four-way paper feeding is made possible by installing the optional **cassette paper feeder** (simply called the paper feeder below) and **envelope feeder**, in addition to the multi-purpose tray and cassette. By combining the standard cassette with the paper feeder, **up to about 750 sheets of paper** can be loaded in both the upper and lower cassettes for continuous printing.

II. SPECIFICATIONS

A. Construction

Type	Desktop page printer
Printing method	Electrophotography
Laser scanning system	
Laser	Semiconductor laser
Scanning system	Rotating six-faced prism mirror (Scanning mirror)
Scanning pitch	
Horizontal	600 dots/inch
Vertical	600 raster lines/inch
Photosensitive medium	OPC
Charging	Roller charging
Exposure	Laser scanning
Toner	Single-component dry toner
Development	Toner projection development
Toner supply	Included in replaceable EP-E cartridge (The cartridge can be used to print about 6,000 pages of A4/Letter-size paper. The average print coverage is a 4% image dot ratio with the print density setting in the middle.)
Paper feed	Multi-purpose tray feed Cassette feed (Two cassettes can be used when the paper feeder is installed.)
Transfer	Roller transfer
Separation	Curvature; (small drum radius/paper stiffness)
Cleaning	Blade
Fixing	Heat roller (500 W [115 V] or 500 W [240 V])
Print delivery	Face-down

B. Performance

Printing speed	About 8.1 pages/min (A4) About 8.6 pages/min (Letter)
Time for first print	24 s or less (The amount of time from when the printer receives a /PRNT signal from the video controller when it is ready at an ambient temperature of 20°C until the deliver of an A4/Letter-size paper.)
Warm-up (WAIT) time	60 s or less (115- or 240-V power source) 75 s or less (100- or 220-V power source) (The amount of time after the printer is turedn ON until the completion of the warm-up time at an ambient temperature of 20°C with a rated voltage input.)
Print paper	Plain paper, colored paper, labels, OHP film, envelopes
Paper size of multi-purpose tray	Plain paper from 182 mm X 257 mm to 216 mm X 356 mm (Canon-approved paper, 64 g/m ² to 105 g/m ²), and above type of paper
Paper size of Cassette	Plain paper of A4, B5, Legal, Letter, or Executive (Canon-approved paper, 64 g/m ² to 90 g/m ²)
Multi-purpose tray capacity	Up to 10 mm stack height (about 100 sheets of 80 g/m ² paper)
Cassette type	A4, Letter, Universal (Legal, Letter, A4, Executive, B5)
Cassette specifications	Up to 25 mm stack height (about 250 sheets of 80 g/m ² paper)
Print delivery	Up to 25 mm stack height (about 250 sheets of 80 g/m ² paper)
Option	Envelope feeder and paper feeder

C. Others

Operating environment		
Temperature	10 to 32.5°C (50 to 90.5°F)	
Humidity	20 to 80% RH	
Atmospheric pressure	570 to 760 mmHg	
Power consumption	Max. about 530 W (at ambient temperature of 20°C and rated power source voltage)	
Noise level (DECLARED NOISE EMISSIONS in accordance with ISO 9296)	SOUND POWER LEVEL (1B=10 dB)	6.2 B or less (printing) 4.5 B or less (standby)
	SOUND PRESSURE LEVEL (Bystander positions)	49 dB or less (printing) 33 dB or less (standby)
Dimensions	416 mm X 403 mm X 297 mm (width X depth X height)	
Weight	About 16.8 kg (printer), About 1.5 kg (cartridge), About 1.1kg (cassette)	
Line voltage requirements	100-115 V (50/60 Hz), 220-240 V (50 Hz) (Voltage tolerance ±10%)	

D. Envelope feeder (Envelope Feeder EF-4)

Pick-up speed	About 6 envelopes/min
Envelope type	COM-10, DL, Monarch, C5, B5 (recommended envelope)
Envelope size	Envelopes from 96mm X 189mm to 188mm X 254mm
Capacity	Up to 55 mm stack height (about 75 envelopes)
Power consumption	DC24V (Supplied by the printer)
Dimensions	297 X 293 X 91 mm (width X depth X height)
Weight	About 2 kg

E. Paper feeder (Paper Feeder Unit PF-4S / PF-4L)

Cassette type	EP-E Cassette 500 Universal S (Letter, A4, Executive, B5) EP-E Cassette 500 Universal L (Legal, Letter, A4, Executive, B5)
Cassette specifications	Up to 50 mm stack height (about 500 sheets of 80 g/m ² paper)
Power consumption	DC24V (Supplied by the printer)
Dimensions	416 X 470 X 134 mm (width X depth X height) (including legal cover)
Weight	About 3.9 kg (paper feeder), about 2 kg (universal cassette)

Specifications are subject to change with product improvement.
--

III. SAFETY INFORMATION

A. Handling the Laser/Scanner Unit

The laser/scanner unit emits invisible laser beam. Never disassemble the unit; the reflected beam, although invisible, can possibly damage your eyes. The unit cannot be adjusted in the field. The following label is attached to the cover of the unit:

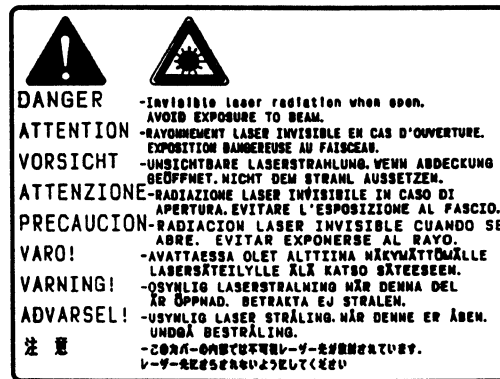


Figure 1-1

IV. PARTS OF THE PRINTER

A. External View

1. Printer

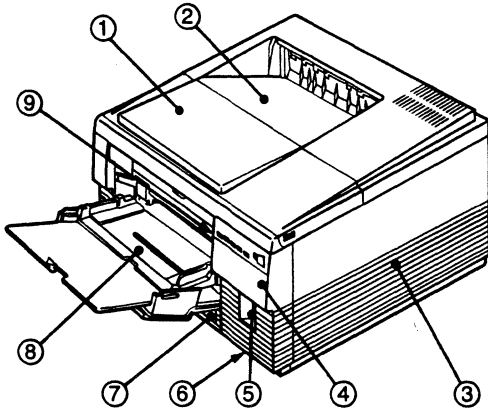


Figure 1-2

- 1: Upper cover
- 2: Face-down tray
- 3: Right cover
- 4: Display panel (LBP-EX/LBP-EX PCB II)
- 5: Font card slot (LBP-EX PCB)
- 6: Power switch
- 7: Cassette
- 8: Multi-purpose tray
- 9: Test print switch
- 10: Delivery cover
- 11: Power receptacle
- 12: Video interface connector (LBP-EX)
- 13: Cleaning brush
- 14: Paper access door

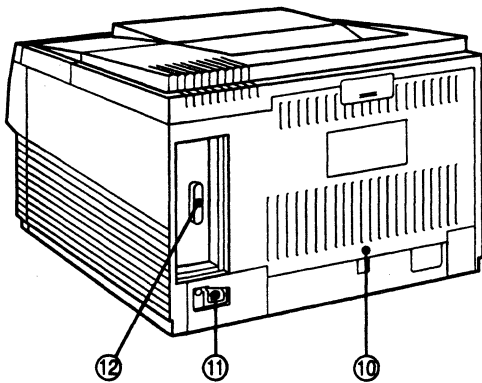


Figure 1-3

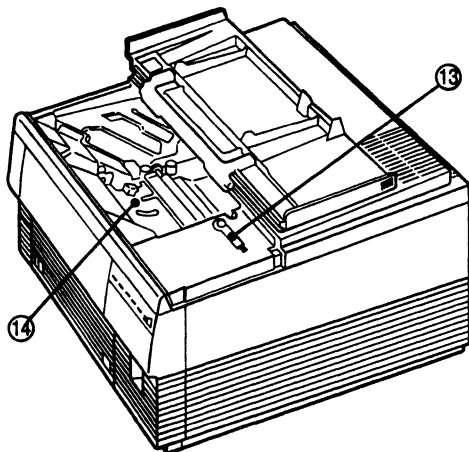
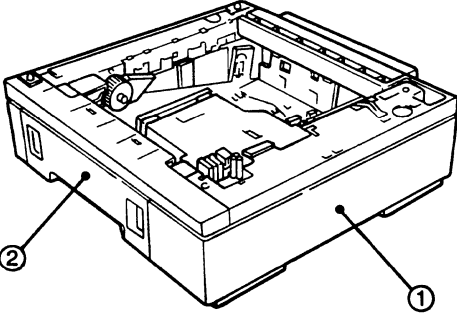


Figure 1-4

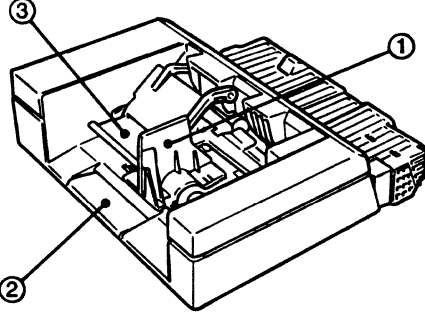
2. Paper feeder



- 1: Paper feeder
- 2: Cassette (500 sheets can be placed)

Figure 1-5

3. Envelope feeder



- 1: Envelope side guide
- 2: Extension tray
- 3: Weight

Figure 1-6

B. Cross Sectional View
1. Printer

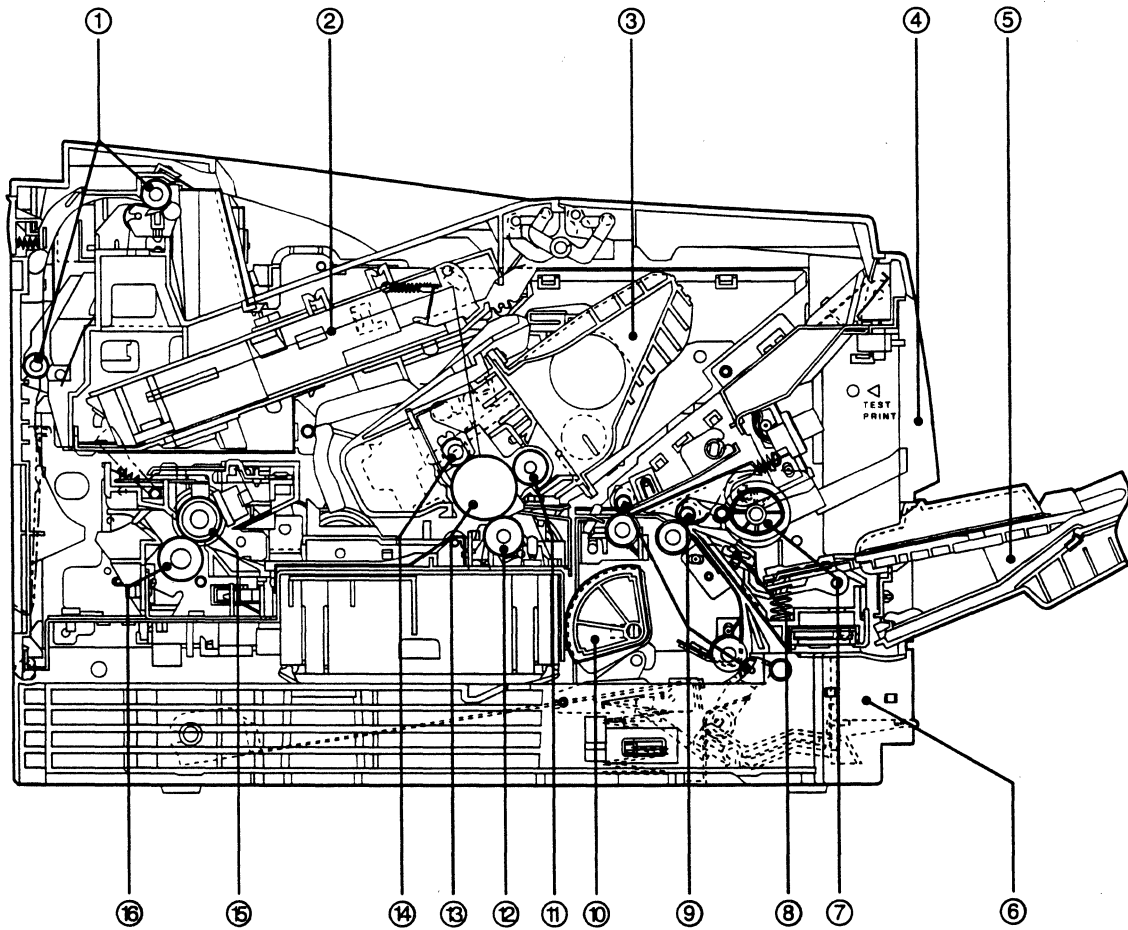


Figure 1-7

- | | |
|---|------------------------------|
| 1: Delivery rollers | 9: Oblique rollers |
| 2: Laser/scanner unit | 10: Cassette pick-up roller |
| 3: EP-E cartridge | 11: Developing cylinder |
| 4: Display panel (LBP-EX/LBP-EX PCB II) | 12: Transfer charging roller |
| 5: Multi-purpose tray | 13: Photosensitive drum |
| 6: Cassette | 14: Primary charging roller |
| 7: Multi-purpose tray pick-up roller | 15: Upper fixing roller |
| 8: Separation pad | 16: Lower fixing roller |

3. Envelope feeder

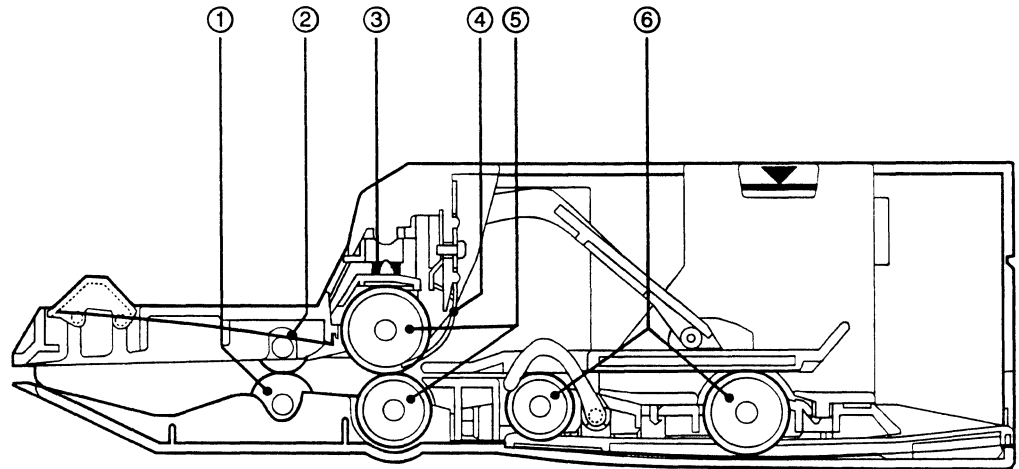


Figure 1-8

- 1: Feed roller
- 2: Oblique roller
- 3: Separation roller pressure spring
- 4: Separation guide
- 5: Separation rollers
- 6: Pick-up rollers

V. OPERATION

A. Display Panel and Test Print button

1. Display panel (LBP-EX/LBP-EX PCB II)

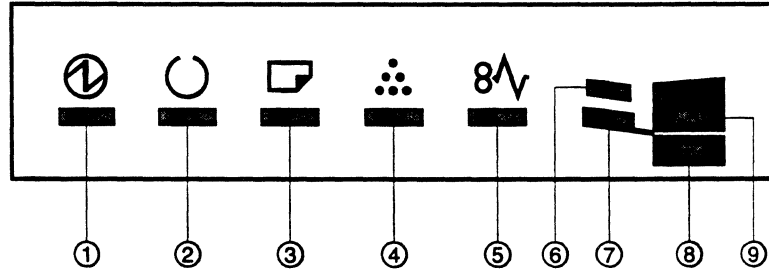


Figure 1-9

- ① **POWER indicator (green)**
ON:
The printer is switched ON.
- ② **READY/WAIT indicator (green)**
ON:
The printer is ready to print.
Flashing:
The printer is in Wait state or conducts test-printing.
OFF:
The printer is not ready (due to a printer fault).
- ③ **PAPER OUT indicator (orange)**
Flashing:
There is no paper at the selected paper source or no cassette is loaded.
OFF:
There is paper at the selected paper source.
- ④ **TONER indicator (green)**
Flashing:
There is no EP-E cartridge in the printer, or the toner remaining in the cartridge is below the required level.
OFF:
There is an EP-E cartridge with sufficient toner in the printer.
- ⑤ **PAPER JAM indicator (orange)**
Flashing:
The paper has jammed.
- ⑥ **ENVELOPE FEED indicator (green)**
ON:
The envelope feeder has been selected.

⑦ **MP-TRAY FEED indicator (green)**

ON:

The multi-purpose tray has been selected.

⑧ **LOWER CASSETTE indicator (green)**

ON:

The lower cassette has been selected when the paper feeder is installed.

⑨ **UPPER CASSETTE indicator (green)**

ON:

The upper cassette has been selected.

Flashing:

The upper cassette is not installed when the lower cassette has been selected.

Note: When shipped from factory, the upper cassette is selected as the paper feed source. However, selection may be changed by the command from the external device.




2. Test print switch

The test print switch is on the right-hand side when the multi-purpose tray is opened (Fig. 1-2.). This switch is used to print test patterns (vertical lines) generated by the DC controller. When the photosensitive drum is stationary and the READY/WAIT indicator is ON, pressing the switch will make the printer print a page of the test pattern. If the switch is held down, the printer prints the test pattern continuously.

Because paper is fed from the upper cassette, make sure there is paper in the upper cassette, before pressing the test switch.

CHAPTER 2

OPERATION AND TIMING

1. This chapter describes the printer functions, the relationships between mechanisms and circuits, and the timing of operations. Mechanical linkages are indicated by black and white lines (), the flow of control signals by solid arrows (), and the flow of groups of signals by outline arrows ().

2. An active-high signal is indicated by "H" or by a signal name without a slash in front of it, such as "PSNS". An active-low signal is indicated by "L" or by a signal name with a slash in front of, such as "/SCNON".

A signal that is "H" or has a name without a slash is active at the supply voltage level (indicating that the signal is being output), and inactive at ground level (indicating that the signal is not being output).

A signal that is "L" or has a slash in front of its name is active at ground level, and inactive at the supply voltage level.

There is a microcomputer in this printer. But as the internal operation of the microcomputer cannot be checked, an explanation of the operation of the microcomputer has been left out.

As it is assumed that no repair will be made to customer circuit boards, the explanation of board circuits is limited to an outline using block diagrams. So there are two types of circuit explanation; (1) everything from the sensor to the input sections of the major circuit boards, (2) everything from the output sections of the major circuit boards to the loads. These are explained with block diagrams according to the function.

I. BASIC OPERATION	2-1	V. OVERALL CONTROL SYSTEM ..	2-35
II. LASER/SCANNER SYSTEM	2-7	VI. POWER SUPPLIES	2-37
III. IMAGE FORMATION SYSTEM...	2-15	VII. ENVELOPE FEEDER	2-38
IV. PICK-UP/FEED SYSTEM	2-27	VIII. PAPER FEEDER	2-42

I. BASIC OPERATION

A. Functions

Printer functions can be divided into four groups: the overall control system, the image-formation system, the laser/scanner unit, and the paper pick-up/feed system.

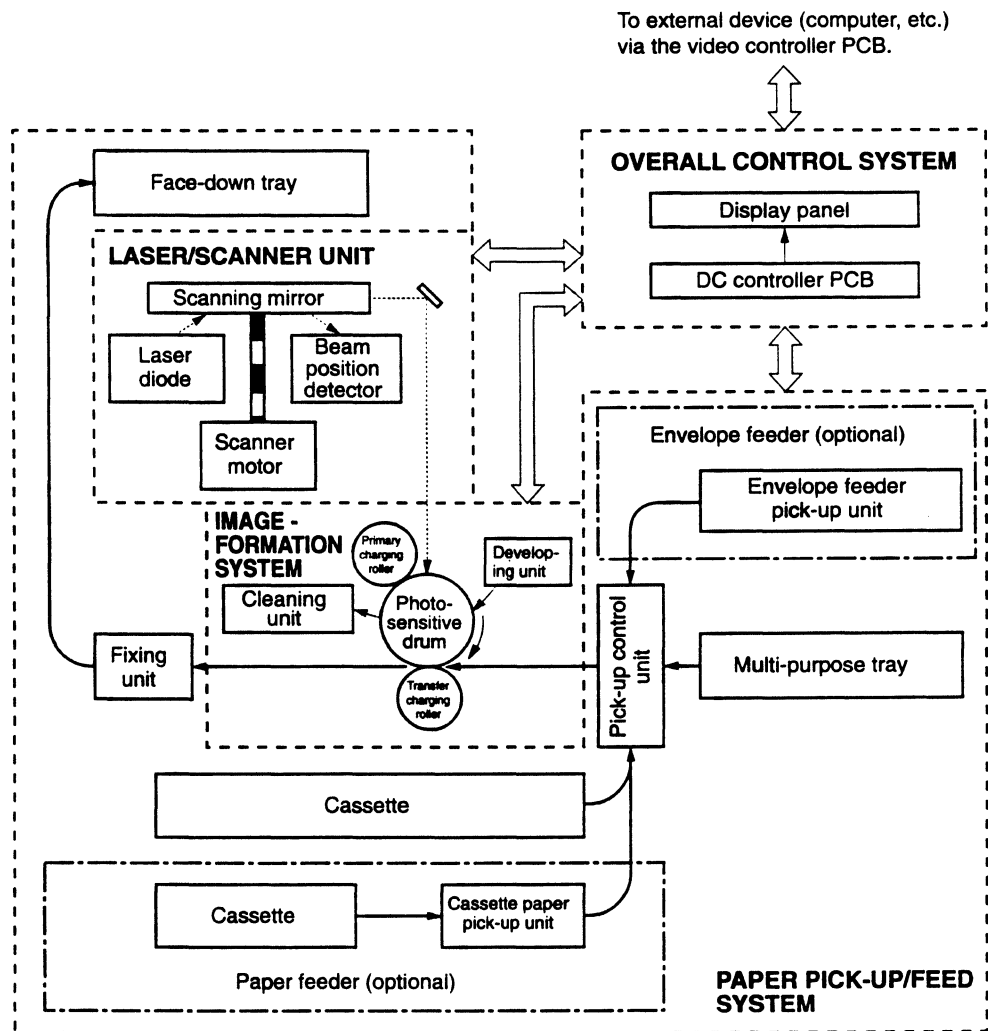


Figure 2-1

B. Outline of the Electrical System

The operations of this printer are controlled by the microprocessor located on the DC controller PCB. When the power is turned on and the printer goes into standby, the microprocessor outputs signals to drive the laser diode, motors, and solenoids in response to print commands and image data from the external device.

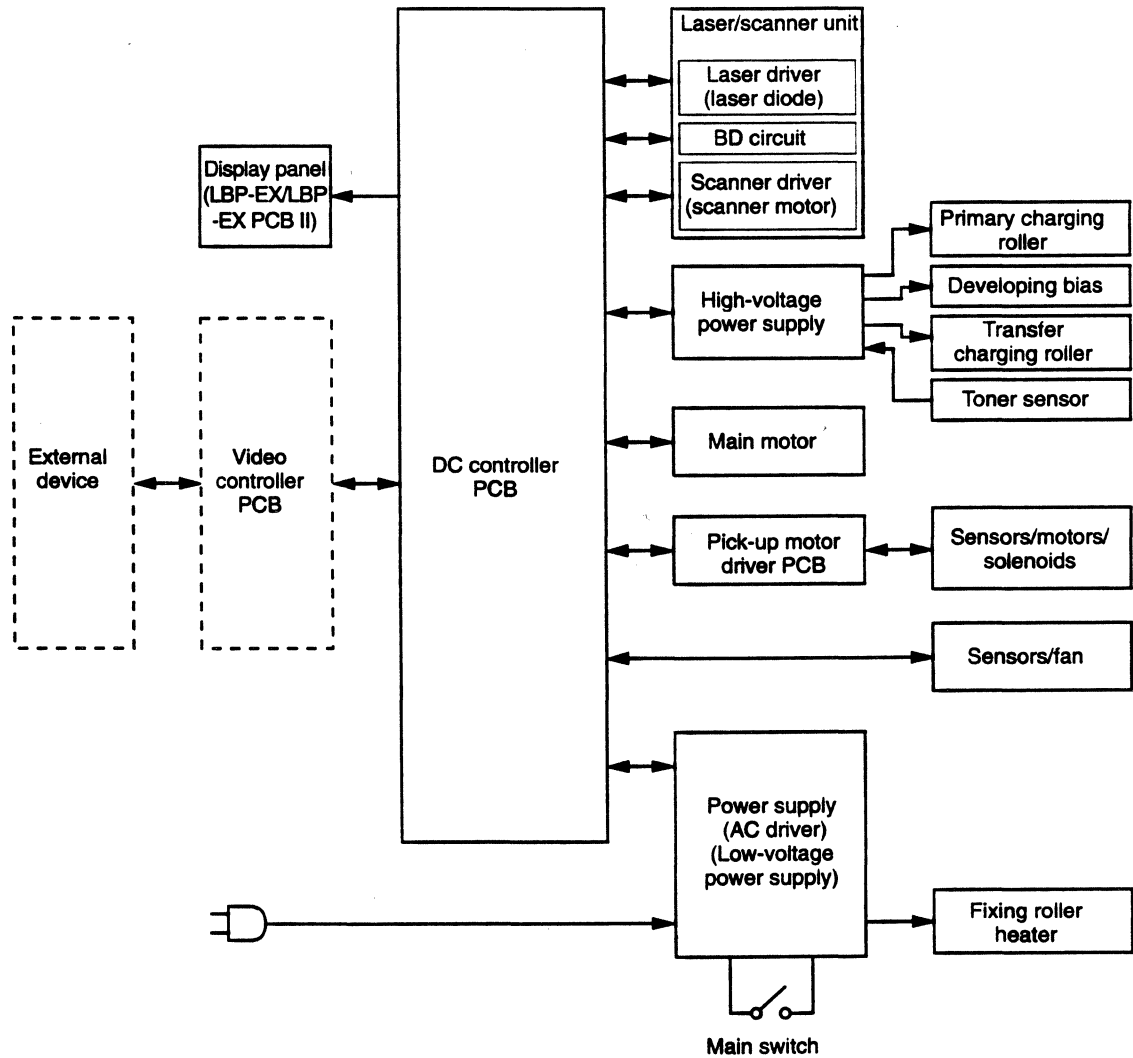


Figure 2-2

C. DC Controller Input Signals

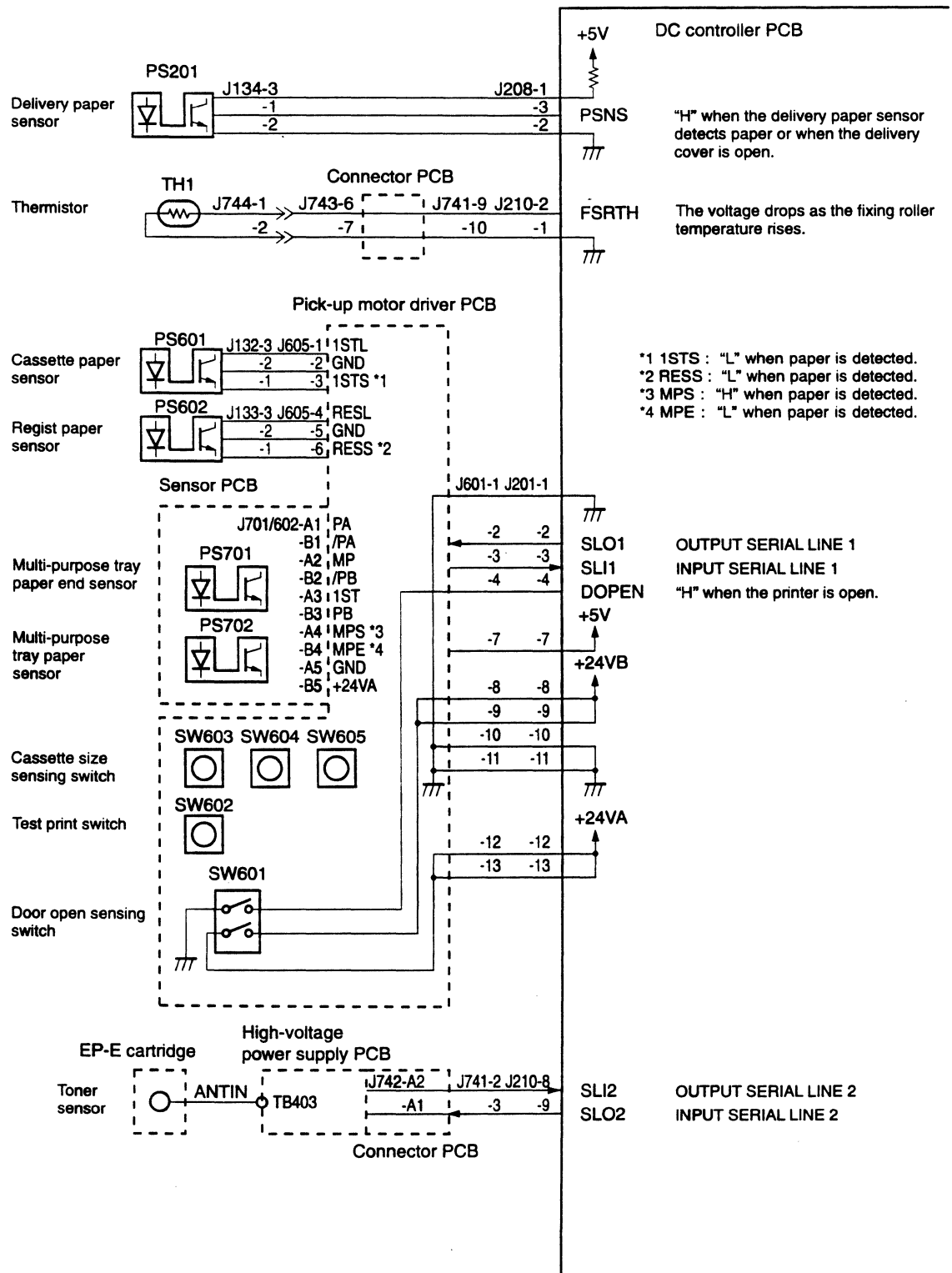


Figure 2-3

D. DC Controller Input/Output Signals (1/2)

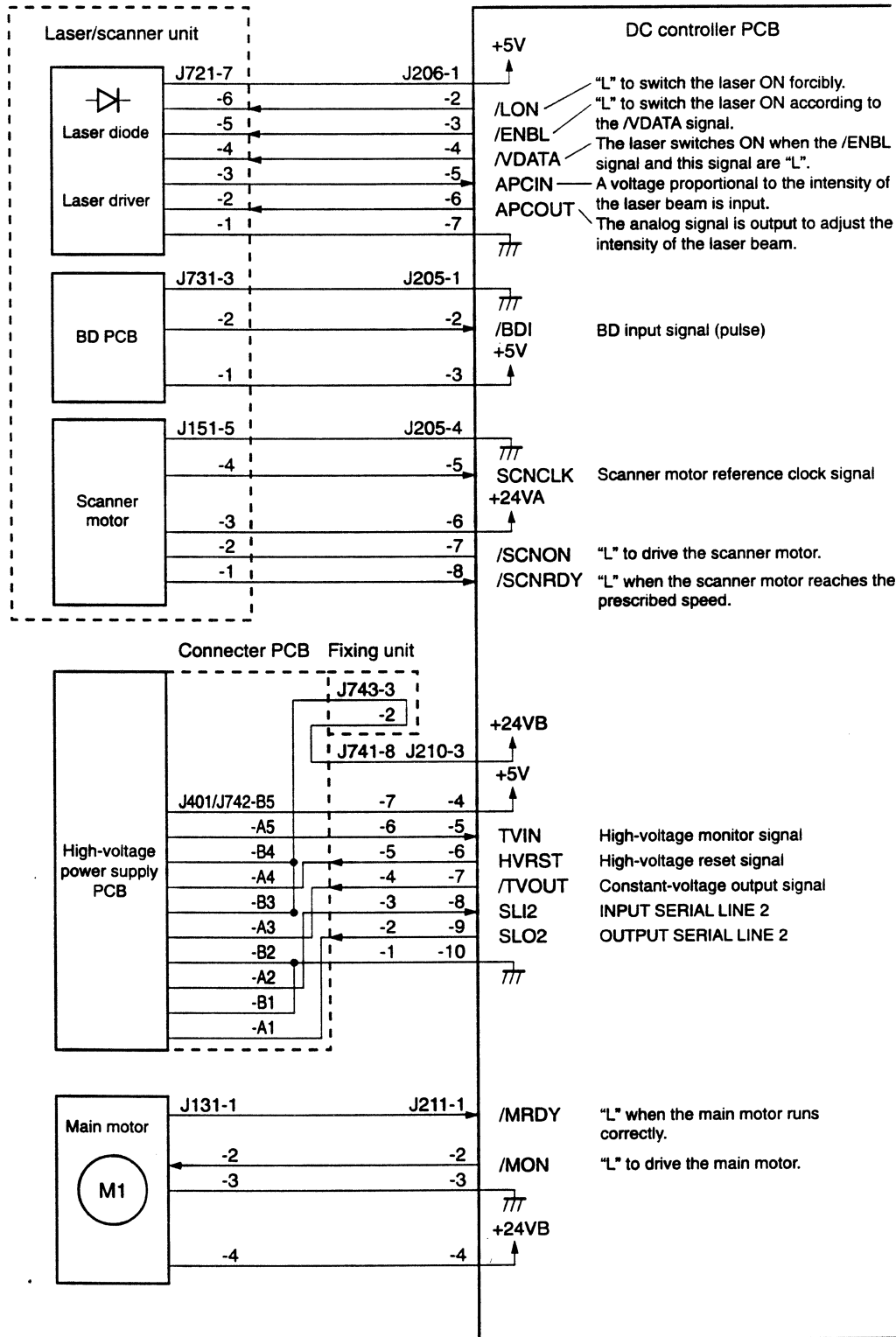


Figure 2-4

DC Controller Input/Output Signals (2/2)

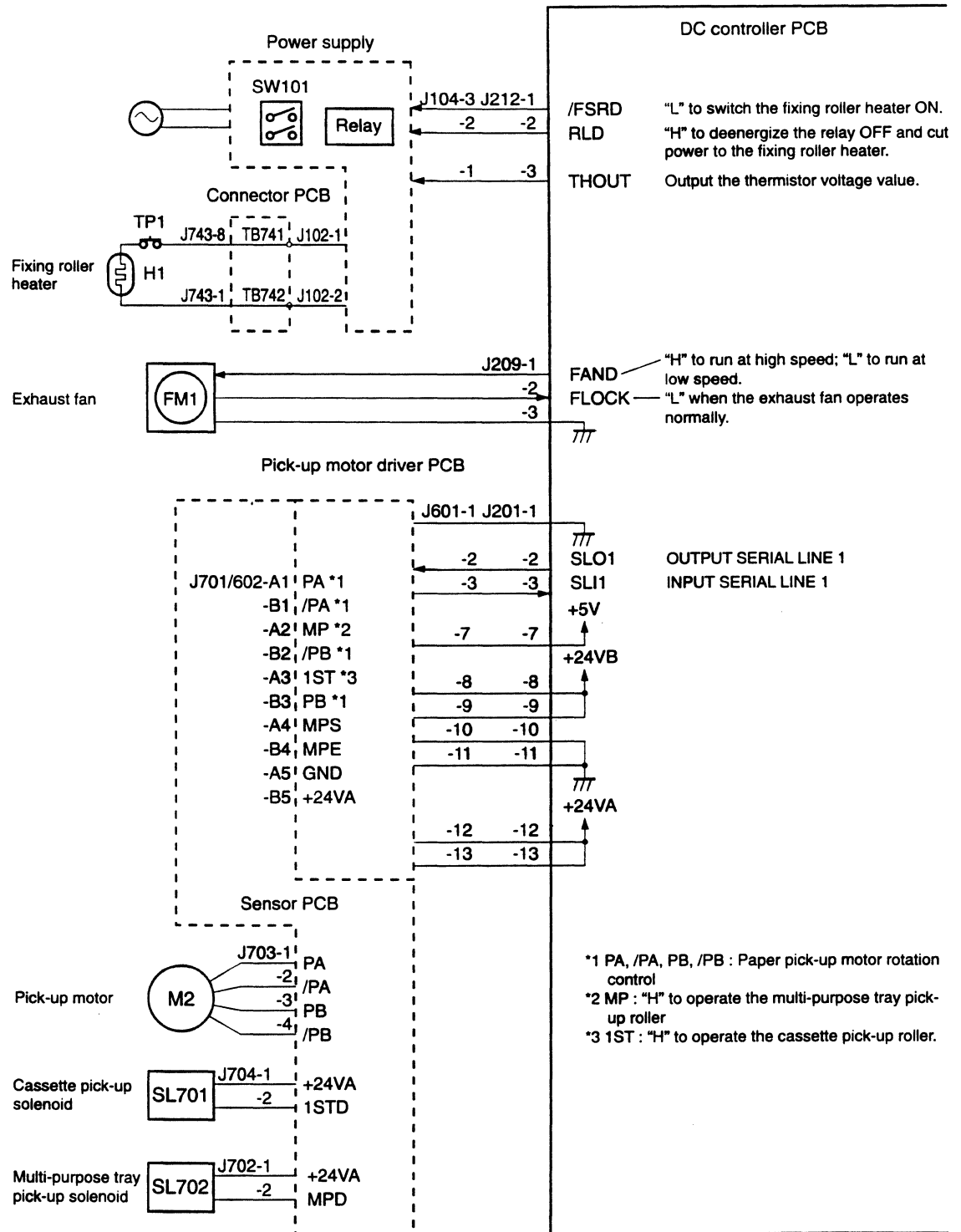


Figure 2-5

E. Basic Sequence of Operations

Two consecutive prints on A4 paper (Cassette feed)

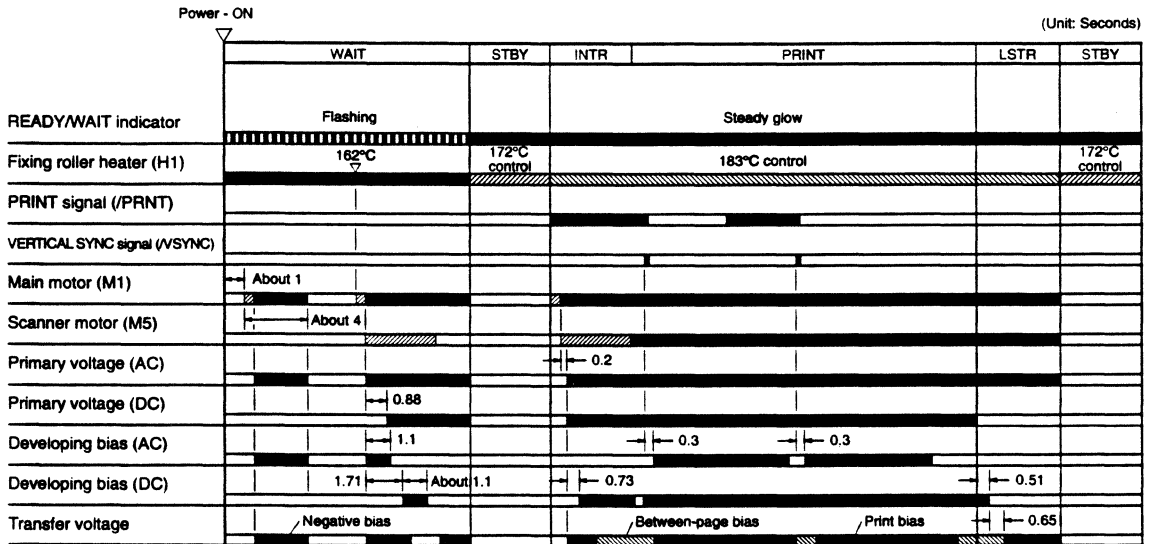


Figure 2-6

Table 2-1

Period		Purpose	Remark
WAIT (WAIT period)	From power-ON until the fixing roller temperature reaches 172°C	To warm up the fixing roller to put the printer in the standby state and clean the transfer charging roller.	During this period, the printer checks the cartridge is installed and there is toner in it.
STBY (STANDBY)	From the end of the WAIT period until a /PRNT signal is input from the video controller, or from the end of the LSTR period until a /PRNT signal is input from the video controller or the power is switched OFF	To hold the fixing roller at 172°C to keep the printer ready to print.	If the printer stays in the standby state for five hours or more, it drives the main motor for one second to rotate the fixing roller, so that the fixing roller will not be deformed.
INTR (INITIAL ROTATIONS period)	After the /PRNT signal has been input from the video controller until the scanner motor becomes ready (about 6 seconds)	To stabilize the sensitivity of the drum in preparation for printing and to clean the transfer charging roller.	
PRINT (Print)	From the end of the INTR period until the primary voltage (DC) switches OFF	To form an image on the photosensitive drum according to the /VDO signal input from the video controller and to transfer the image the paper.	During this period, the printer holds the fixing roller at 183°C.
LSTR (LAST ROTATIONS period)	After the primary voltage (DC) turns OFF until the main motor stops	To deliver the final page of the job and to clean the transfer charging roller.	If a /PRNT signal is input from the video controller, the INITIAL ROTATIONS period begins immediately.

II. LASER/SCANNER SYSTEM

A. Outline

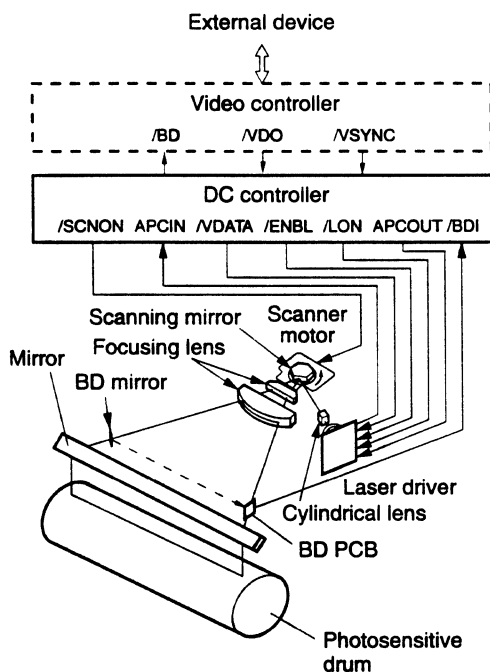


Figure 2-7

The DC controller receives the VIDEO signal (/VDO) from the video controller and sends it to the laser driver in the laser/scanner unit as the /VDATA signal. The laser driver turns the laser diode on and off according to the /VDATA signal and generates the modulated laser beam only when the VIDEO DATA ENABLE signal (/ENBL) from the DC controller is "L"

The laser activates the laser diode in response to the AUTOMATIC POWER CONTROL OUTPUT signal (APCOUT) when the FORCIBLE LASER ON signal (/LON) from the DC controller goes "L", detects the laser beam with the photodiode adjoining the laser diode, and sends an output proportional to the intensity of the laser beam to the DC controller as the AUTOMATIC POWER CONTROL INPUT (APCIN) signal.

The DC controller controls the APCOUT signal to set the APCIN signal to the

specified value to stabilize the intensity of the laser beam. (Control of laser beam intensity: APC control)

The modulated laser beam is formed by a collimator lens and a cylindrical lens into a parallel beam that strikes the scanning mirror, which is rotating at constant speed.

The beam is reflected from this mirror, then brought to a focus on the photosensitive drum by the focusing lens in front of the scanning mirror. The path of the beam passing through the focusing lens is changed by a mirror.

As the scanning mirror rotates at constant speed, the beam is scanned across the photosensitive drum, which also rotates at constant speed. As the photosensitive drum rotates, the laser beam successively scans across its surface. Thus the laser beam builds up the latent image on the surface of the photosensitive drum.

B. Scanning Exposure

The simplest example of exposure of the photosensitive drum by the laser beam is to imagine that both the drum and beam are stationary. In this case the laser beam illuminates a single point on the drum.

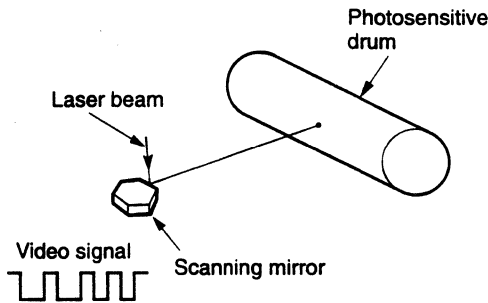


Figure 2-8

When the scanning mirror is rotating and the laser beam strikes one of its faces, the reflected laser beam scans from one end of the photosensitive drum to the other (horizontal scan).

A broken line is produced by switching the laser beam on and off during the horizontal scan according to the VIDEO signal (/VDO).

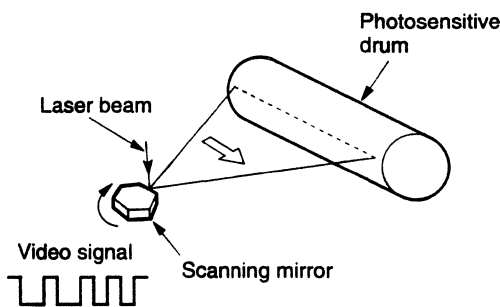


Figure 2-9

When the photosensitive drum is also rotating, in addition to the horizontal scan, the laser beam also advances around the photosensitive drum (vertical scan). The photosensitive drum rotates at constant speed while the laser beam scans across it. In the time that the beam takes to sweep across the drum and return to its original position, the drum surface rotates about

43 μm (600 raster lines/inch). Successive horizontal scans are therefore separated by this interval.

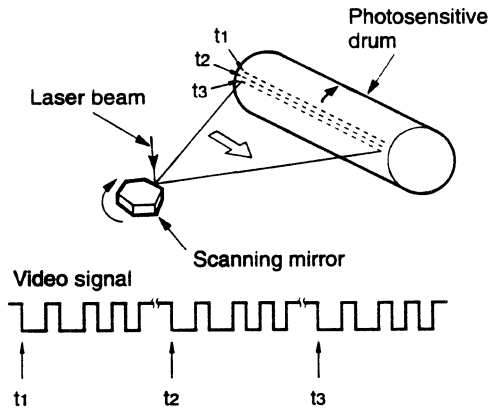


Figure 2-10

The surface of the photosensitive drum is charged to a negative potential by the primary charging roller before printing starts. When laser light strikes the photosensitive drum during the horizontal and vertical scans described above, the electrostatic charge at that location is neutralized, producing an electrostatic latent image on the photosensitive drum surface.

There is a small fixed beam-detect (BD) mirror in the laser beam path. As the laser beam is swept horizontally toward the starting point for printing a line of data (the scanning start position), the beam strikes the BD mirror and is reflected to the sensor on the BD PCB. The laser beam is converted to an electrical signal by the sensor and the signal is sent to the DC controller as the BD INPUT signal (/BDI).

The DC controller produces the BEAM DETECT signal (/BD) in response to the /BDI signal. The /BD signal is sent to the video controller as a differential signal (BD, /BD).

The laser is ON whenever the laser beam is not scanning the drum surface to allow detection of the /BD signal. This signal is called the UNBLANKING signal (UBL) and is produced by the DC controller. The UBL signal is sent to the laser driver as the FORCIBLE LASER ON signal (/LON) to

cause it to switch the laser diode ON when the /LON signal is "L".

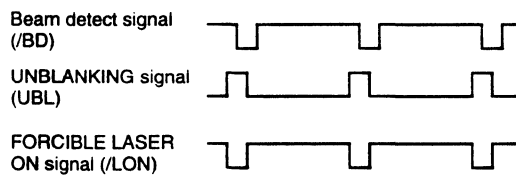


Figure 2-11

C. Laser Control Circuit

1. Outline

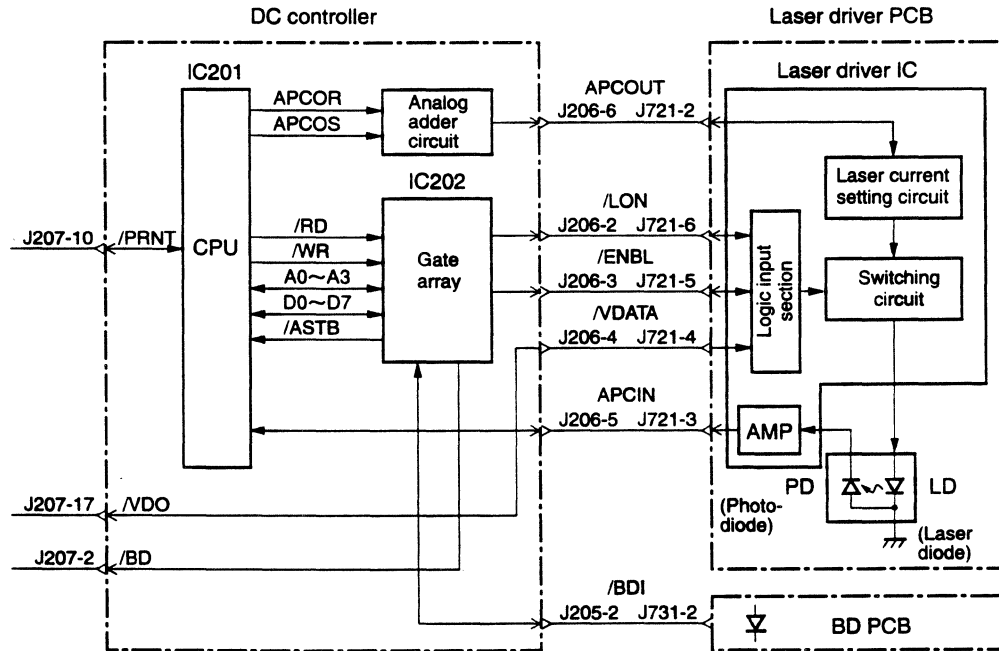


Figure 2-12

This circuit switches the laser diode (LD) ON and OFF at a constant intensity in response to the /VDO signal from the video controller. The /VDO signal, sent from the video controller to the DC controller, goes to the switching circuit in the laser driver circuit as it is as the /VDATA signal.

The microprocessor (CPU:IC201) outputs the INTENSITY CONTROL signals (APCOR, APCOS) from the DA output ports to the analog adder circuit according to the internal data. The APCOR and APCOS signals are added to this circuit at a ratio of approximately 8 to 1, and then sent to the laser current setting circuit located in the laser driver as the AUTOMATIC POWER CONTROL OUTPUT signal (APCOUT).

The CPU adjusts the value of the APCOUT signal by changing the APCOR signal for coarse adjustment, and the APCOS signal for fine adjustment.

The output current of the laser current setting circuit is sent to the switching circuit and the laser diode is switched ON and OFF in response to the /VDATA signal when the VIDEO DATA ENABLE signal (/ENBL, described later) is "L".

2. Control of laser beam intensity (APC control)

The CPU performs automatic power control (APC) of the laser diode to make the laser diode emit constant light. This control can be classified into two types: initial APC and between-page APC.

a. Initial APC

Initial APC is performed to increase the intensity of the laser beam from zero to the target value during initial rotation. The CPU sets the FORCIBLE LASER ON signal (/LON) to "L", and at the same time the CPU changes the APCOR signal (coarse adjustment) and lets the APCOUT signal gradually rise from the low value. As the laser current increases, the laser diode (LD) begins emitting light.

The intensity of the laser diode (LD) output is detected by the photodiode (PD). After amplification, the output voltage is fed back to the CPU as the AUTOMATIC POWER CONTROL INPUT signal (APCIN).

The CPU continues coarse adjustment until the input value of the APCIN signal reaches 70% of the target value stored in the CPU. The CPU then does fine adjustment with the APCOS signal, and ends the initial APC when the input value of the APCIN signal has become almost equal to the target value.

b. Between-page APC

Between-page APC is performed after initial APC, and when printing is not being performed while waiting for the next page to proceed to the printing area, to correct variations in the intensity of the laser printing.

Between-page APC is also performed during the unblinking period, described later, to prevent the laser beam from writing on the image area of the photosensitive drum.

The CPU sets the UNBLANKING signal (UBL, used by IC202 and not output externally) to "H" and sets the FORCIBLE LASER ON signal (/LON) to "L".

The CPU then changes the APCOS signal (fine adjustment), compares the input value of the APCIN signal with the target value, and optimizes the intensity of the laser beam.

3. Laser diode emission control

Laser diode emission is controlled by VIDEO signal (/VDO), which is sent from the video controller and processes the paper size data.

The paper size data is input to the CPU from the cassette size sensing switches for cassette feed and by the paper size command from the video controller for multi-purpose tray feed.

The CPU (IC201) transfers the /VDO signal from the video controller to the laser driver as it is as the /VDATA signal .

The CPU sends data to the gate array (IC202) to generate the IMAGE TOP ERASE AND BOTTOM ERASE signal (TOPE) and HORIZONTAL MASK signal (MSK) according to the paper size data from IC202. (TOPE and MSK are used by IC202 and not output externally.)

To prevent the laser beam from writing on the non-image area during the non-unblinking period, IC202 makes the VIDEO DATA ENABLE signal (/ENBL) "L" only when the TOPE and MSK signals are "L". The laser driver switches the laser ON when the /ENBL signal is "L" and the /VDATA signal is "L".

The gate array (IC202) generates the UNBLINKING signal (UBL) according to the BD INPUT signal (/BDI) sent from the BD PCB in the laser/scanner unit. IC202 sets the UBL signal to "H" during the unblinking period and sets the FORCIBLE LASER ON signal (/LON). The laser driver switches the laser diode ON when the /LON signal is "L".

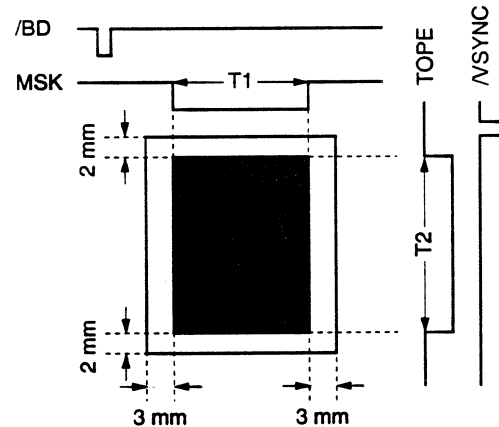


Figure 2-13

- Notes:**
1. ■ Indicates the area where the laser beam writes on the drum.
 2. The duration of T1 & T2 vary according to paper size. When using the multi-purpose tray the printer cannot comprehend the width of the paper when the paper size has not been specified by a paper size command from the video controller. T1 is therefore specified as legal size paper (maximum printable width).

D. Scanner Drive

1. Outline

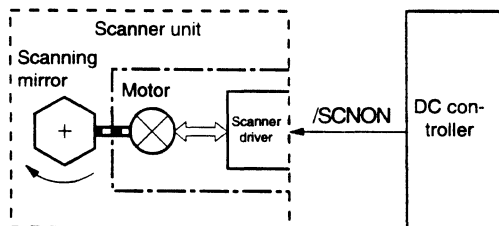


Figure 2-14

The key part of the scanner motor unit is the scanning mirror, which is a hexagonal prism with mirror faces. It is mounted on the scanner motor shaft and turned by the motor.

The scanner motor is controlled by the scanner driver to make the laser beam reflected from the scanning mirror scan across the photosensitive drum at constant

speed.

The scanner driver drives the scanner motor when it is receiving the SCANNER MOTOR DRIVE signal (/SCNON) from the DC controller.

2. Scanner motor rotation control

Figure 2-15 shows the scanner motor control circuit.

The scanner motor is a 3-phase, 8-pole DC brushless motor containing a Hall element, and forms a unit along with the scanner driver, which controls scanner motor rotation at constant speed.

When the printer power is switched ON, the oscillation frequency of the crystal (X202) is divided by the gate array (IC202), and the SCNCLK signal is sent to the scanner driver.

When the /PRNT signal that is sent to the CPU (IC201) on the DC controller becomes "L", the CPU sets the /SCNON signal to "L" to turn the scanner motor.

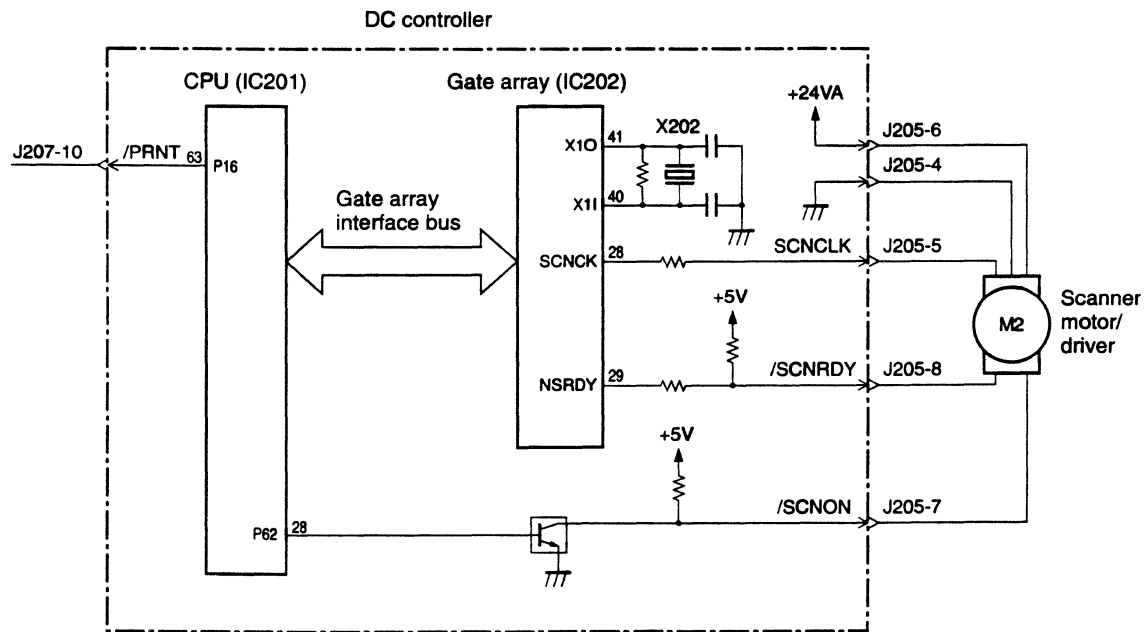


Figure 2-15

When the scanner motor turns and reaches the prescribed speed, the CPU sets the SCANNER MOTOR READY signal (/SCNRDY) to "L".

The CPU notifies a scanner error to the video controller in the following cases:

- a. When the /SCNRDY signal does not go "L" within 20 seconds after the scanner motor starting rotation.
- b. When the /SCNRDY signal goes "H" for 2.5 seconds after it goes "L".

II. IMAGE FORMATION SYSTEM

A. Outline

The image formation system is the main part of the printer, and it consists of the photosensitive drum, developing unit, charging roller, etc.

When the PRINT signal (/PRNT) is sent from the video controller to the DC controller, the DC controller drives the main motor to turn the photosensitive drum, developing cylinder, primary charging roller, and transfer charging roller.

The primary charging roller uniformly applies a negative charge to the surface of the photosensitive drum. To form the latent image on the photosensitive drum, the laser beam modulated by the /VDO signal illuminates the photosensitive drum surface.

The latent image formed on the photosensitive drum is changed to a visible image by the toner on the developing cylinder, then transferred to the paper by the transfer charging roller. The residual toner on the photosensitive drum surface is scraped off by the cleaning blade. The potential on the drum is made uniform by

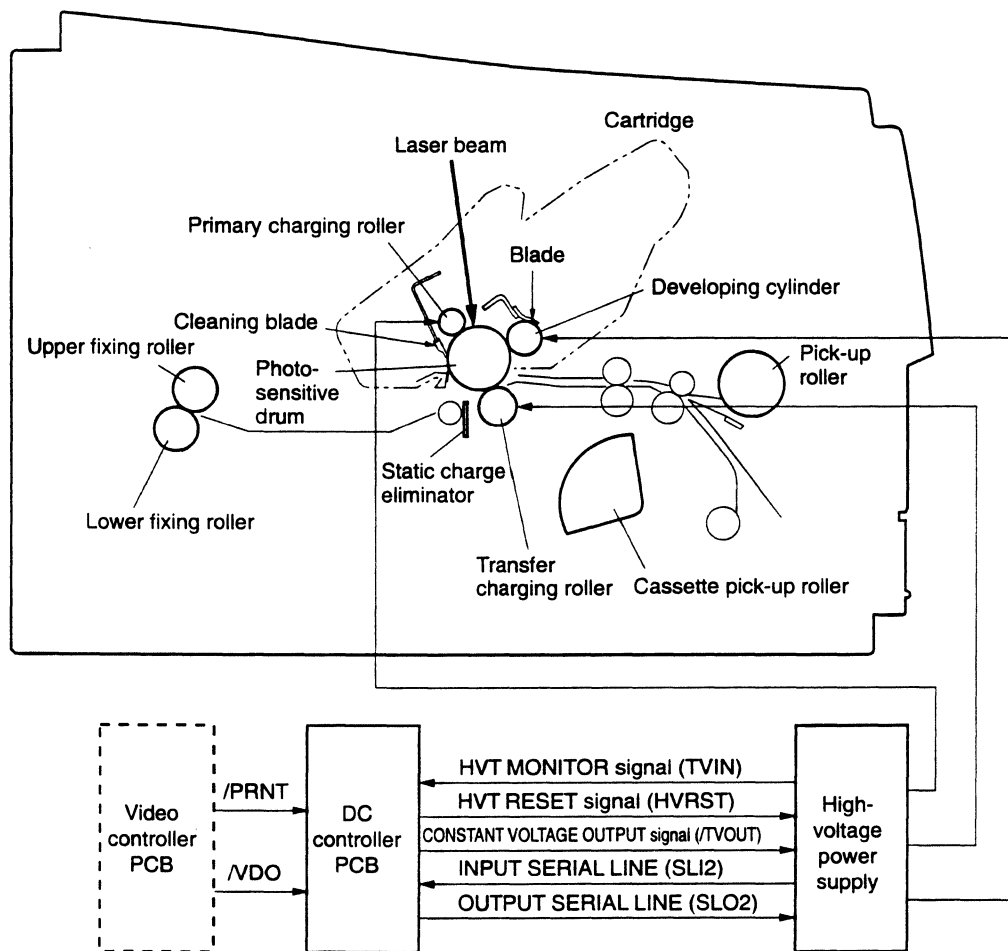


Figure 2-16

the primary charging roller prior to generation of a new latent image.

The cartridge has a toner sensor that detects whether there is enough toner or whether a cartridge is installed. If the level of toner in the cartridge becomes lower than the prescribed level, or if there is no cartridge in the printer, the high-voltage power supply PCB notifies the DC controller via the serial line.

B. Printing Process

The major part of the image formation system is contained in the cartridge, as shown in Figure 2-17.

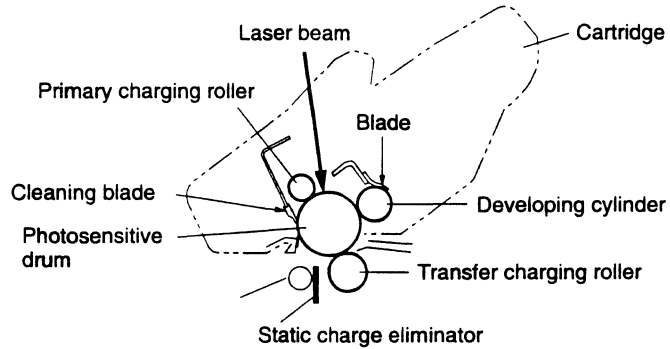


Figure 2-17

The cartridge used by the printer has a seamless photosensitive drum with the structure shown in Figure 2-18. The outer layer of the drum consists of an organic photoconductor (OPC); the base is aluminum.

The printing process can be divided into five major stages:

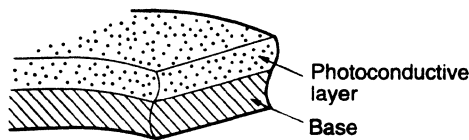


Figure 2-18

1. Electrostatic latent image formation stage
 - Step 1 Primary charge (-)
 - Step 2 Scanning exposure
2. Developing stage
 - Step 3 Development
3. Transfer stage
 - Step 4 Transfer (+)
 - Step 5 Separation
4. Fixing stage
 - Step 6 Fixing
5. Drum cleaning stage
 - Step 7 Drum cleaning

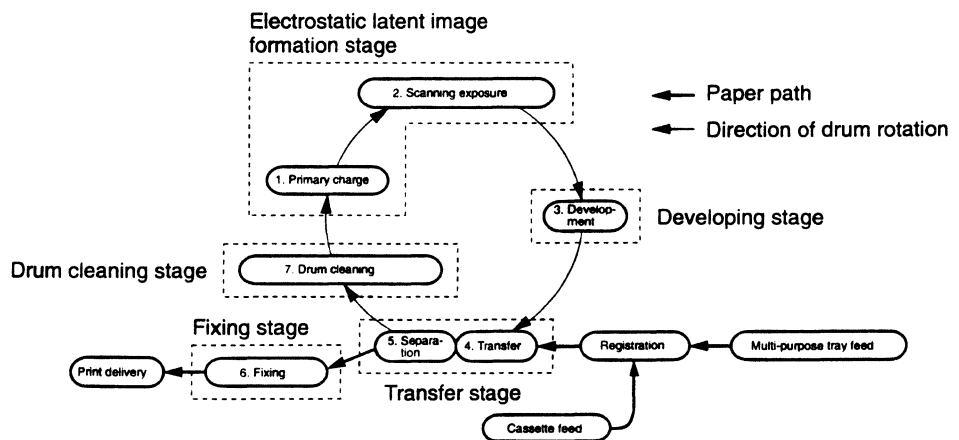


Figure 2-19

1. Electrostatic latent image formation stage

This stage has two steps, which together produce a pattern of electrical charges on the photosensitive drum.

At the end of the stage, negative charges remain in the unexposed "dark" areas. Charges are absent from the "light" areas, where the laser beam struck (exposed) the drum surface.

Since this image of negative charges on the drum is invisible to the eye, it is called an "electrostatic latent image".

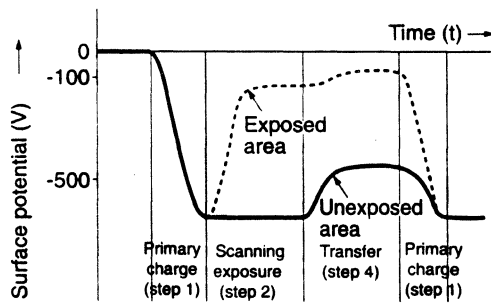


Figure 2-20

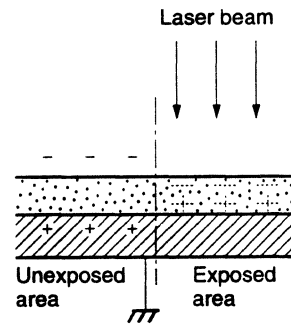


Figure 2-22

Step 1 Primary charge

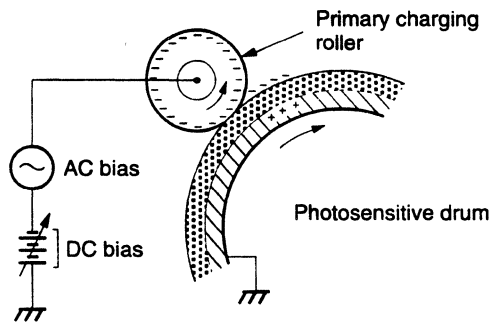


Figure 2-21

The primary charging roller consists of conductive rubber. In addition to DC bias, AC bias is applied to the primary charging roller to keep the potential on the drum surface uniform. This DC bias is changed with the developing DC bias.

This charging method has advantages such as lower applied voltage, less ozone generation, etc., compared with the corona charge system.

Step 2 Scanning exposure

When the laser beam scans the drum surface, it causes the charge to be neutralized in the areas struck by the beam. Areas on the drum with no charge form the electrostatic latent image.

2. Development stage

Development places particles of toner onto the areas of the drum that have been cleared of charge by the laser beam. This makes a visible image. This printer uses the toner projection development method with a single-component toner.

Step 3 Development

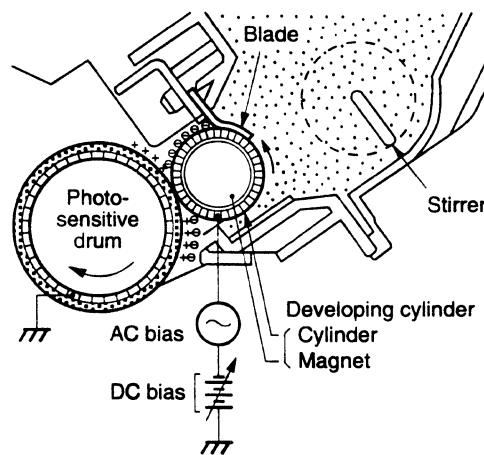


Figure 2-23

Note: The charges on the light areas on the photosensitive drum are shown as positive in this figure. Actually they are negative, but they are more positive than the developing cylinder and explanation is simplified by regarding them as positive.

As shown in Figure 2-23, the developing unit consists of a developing cylinder and rubber blade. The developing cylinder rotates around a fixed internal magnet.

The single-component toner consists of magnetite and a resin binder, and is held to the cylinder by magnetic attraction. The toner is an insulator, and acquires a negative charge by friction due to the rotation of the cylinder.

The areas on the drum that were exposed to the laser beam have a higher potential (are less negative) than the

negatively charged toner particles on the developing cylinder. When these areas approach the cylinder, the potential difference projects the toner particles onto them. This is called toner projection, and the latent image on the drum becomes visible.

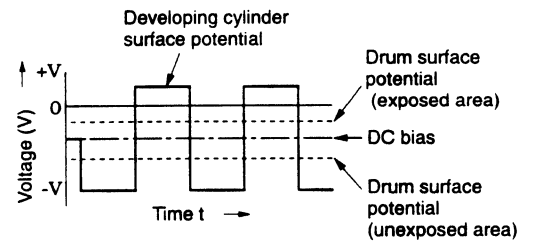


Figure 2-24

An AC bias is applied to the developing cylinder to help project the toner particles to the drum surface and improve the contrast of the printed image. The center voltage of the AC bias (1600 Vp-p) varies with the DC bias voltage.

The IMAGE DENSITY ADJUSTMENT signal (sent from the DC controller to the high-voltage power supply via the serial line) changes the DC bias, and thus the potential difference between the cylinder and drum. This changes the density of the print.

This printer has a stirring mechanism to supply toner in the cartridge smoothly to the cylinder.

3. Transfer stage

In the transfer stage, the toner image is transferred from the drum surface to the paper.

Step 4 Transfer

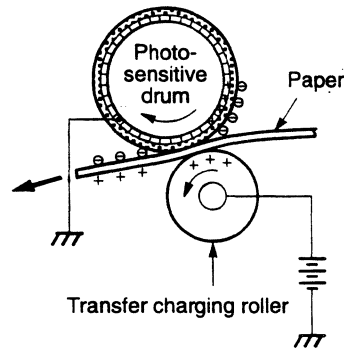


Figure 2-25

A positive charge applied to the back of the paper attracts the negatively charged toner particles to the paper. The printer accomplishes transfer by using the charging roller method. Advantages compared with the corona transfer method are as follows:

- Low transfer voltage that is less than half that for corona transfer
- Less ozone generation
- The paper is supported by the transfer charging roller and photosensitive drum, so feed is more stable.

Reference:

If the image on the photosensitive drum is not completely transferred to the paper due to jamming, etc., the toner may adhere to the transfer charging roller. The printer removes the toner from the transfer charging roller by switching the transfer voltage between positive and negative in sequence. During wait, initial rotation, and last rotation, the printer sets the primary DC voltage to zero, and sets the charge on the drum to zero. In this case, the transfer voltage is made negative to remove the negatively-

charged toner on the transfer charging roller to the drum. The transfer charging roller is thus cleaned.

Step 5 Separation

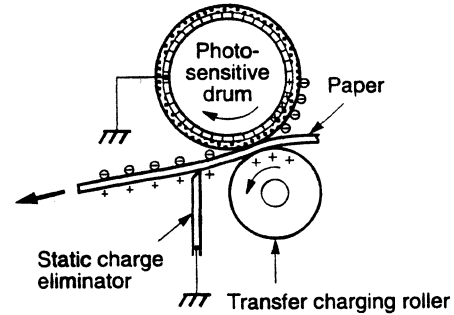


Figure 2-26

The stiffness of the paper causes it to separate from the drum. (Curvature separation)

To stabilize the paper feed and prevent small white circles from appearing in the printed image at low temperature and humidity, the charge on the back of the paper is reduced by the static charge eliminator after transfer.

4. Fixing stage

The toner image transferred to the paper in the transfer stage is held only by electrostatic attraction and slight physical adhesion, so even a light touch will smear the image.

In the fixing stage, the toner image is fixed by heating the paper and applying pressure. This fuses the toner particles to the paper to make a permanent image.

Step 6 Fixing

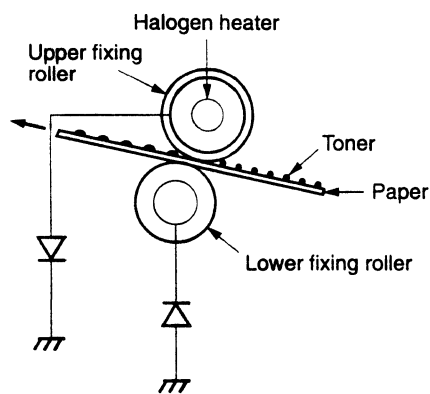


Figure 2-27

The upper roller surface is covered with a non-stick teflon tube. The upper and lower roller surfaces are grounded via a diode to prevent the negative potential of the upper roller becoming higher than that of the lower roller, resulting in the toner being drawn to the lower roller, and adhering to the lower roller surface.

5. Drum cleaning stage

In the transfer stage, not all the toner is transferred to the paper. Some remains on the photosensitive drum. This residual toner is cleaned off in the drum cleaning stage so that the next print image will be clear.

Step 7 Drum cleaning

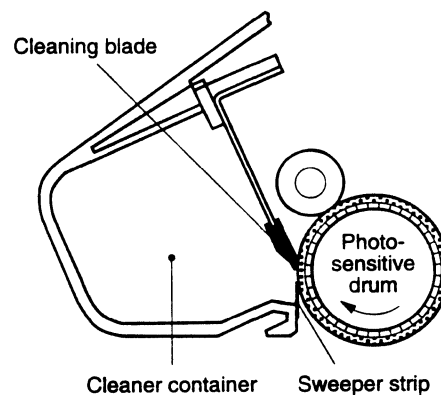


Figure 2-28

Prior to the next printing, the residual toner on the drum surface is scraped away by the cleaning blade to clean the drum surface. The removed toner is collected in the cleaner container.

Reference: Toner projection development

Actually, both unexposed and exposed areas of the drum surface have a negative potential, but to simplify the explanation, the drum potential is shown as positive when it is higher (less negative) than the developing cylinder potential, and negative when it is lower (more negative) than the developing cylinder potential.

Table 2-2

Latent image	Development bias	Toner movement and electric potentials	Description
Exposed area	Negative bias		The electrostatic attraction caused by the difference in potential between the drum surface and the cylinder is sufficient to overcome the attraction of the magnet, so the toner particles are projected from the cylinder onto the drum. The amount of toner projected depends on the DC bias voltage on the cylinder.
	Positive bias		When the potential difference between the drum surface and the developing cylinder is reduced, the resulting weak electric field combines with the magnetic field to attract toner back from the drum to the cylinder. This removes any excessive toner adhering to the drum, and improves the contrast of the finished print.
Unexposed area	Negative bias		The drum surface potential is only slightly higher than the cylinder potential, so the magnetic attraction to the cylinder is greater than the electrostatic attraction to the drum. Therefore, only a small amount of toner is projected toward the drum.
	Positive bias		The cylinder bias and the magnetic force now combine to strongly attract the toner to the cylinder, removing the excessive toner from the unexposed areas of the drum and preventing fogging.

C. High-Voltage Power Supply

1. Outline

In response to an instruction from the microprocessor (MPU) on the DC controller PCB, the high-voltage power supply applies a voltage comprising the DC voltage and the AC voltage to the primary charging roller and developing cylinder and applies the positive or negative DC voltage to the transfer charging roller.

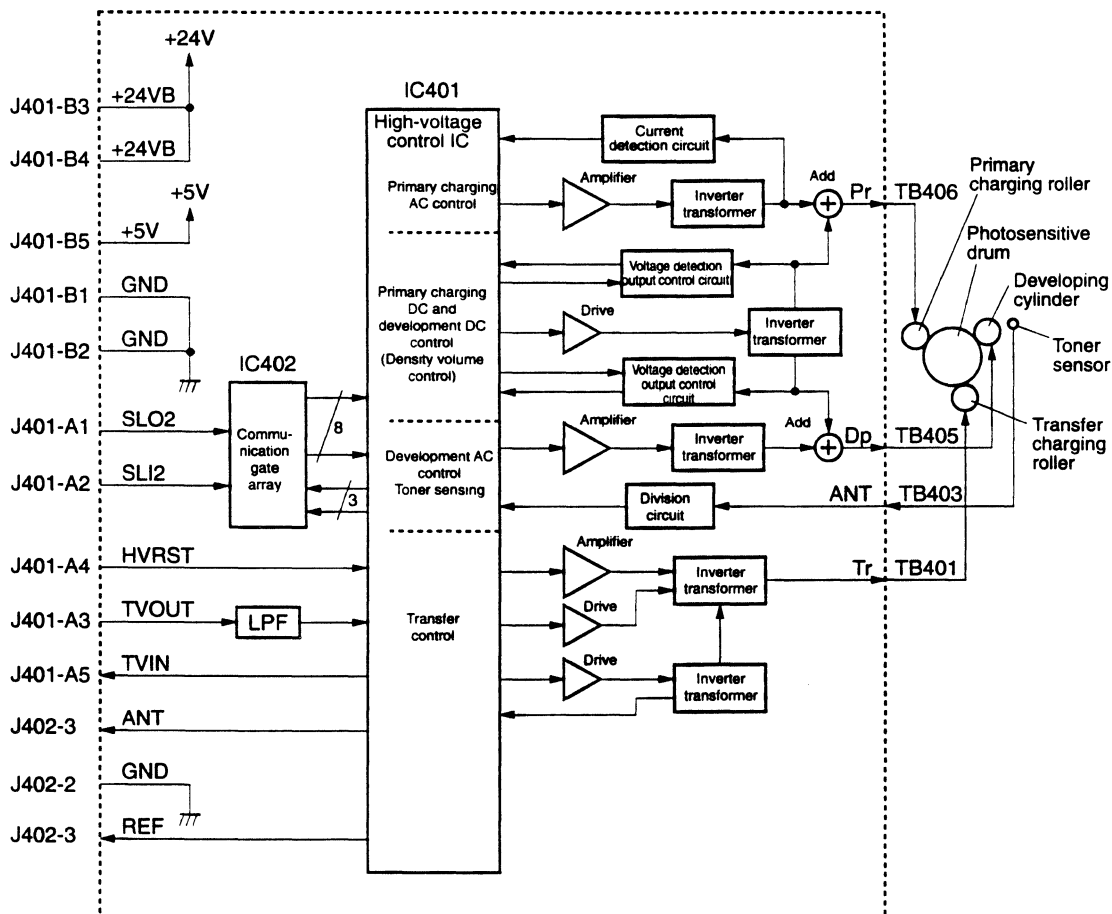


Figure 2-29

2. Principle of operation

a. Primary charging roller voltage generation

When the /PRNT signal from the video controller becomes "L", initial rotation starts, the HVT RESET signal (HVRST) becomes "H", and the circuit outputs the primary AC voltage to the primary charging roller. When the PRIMARY DC VOLTAGE ON signal is output to this circuit via the serial line, the high-voltage power supply outputs the

primary DC voltage, and the primary voltage comprising the AC bias and DC bias is applied to the primary charging roller.

The primary DC bias changes with the development DC bias according to the image density data sent from the DC controller via the serial line.

b. Developing bias generation

When the DEVELOPING BIAS DC ON signal is sent from the DC controller via

the serial line, a developing DC bias is applied to the developing cylinder.

When the VERTICAL SYNC signal (/VSYNC) is sent from the video controller, the DEVELOPING BIAS AC ON signal is sent from the DC controller via the serial line, and the voltage comprising the developing DC bias and developing AC bias is applied to the developing cylinder.

The developing DC bias changes with the image density data sent from the DC controller via the serial line, and the image density can be adjusted.

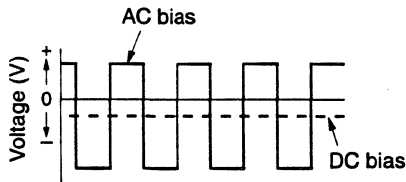


Figure 2-30

c. Transfer charging roller voltage generation

A negative or between-page or print bias is applied to the transfer charging roller according to the print sequence.

A negative bias voltage is applied to the transfer charging roller during appropriate time to move the toner attached to the transfer charging roller to the photosensitive drum, and so clean the roller.

A print bias voltage is applied to the transfer charging roller to transfer the toner on the photosensitive drum to the paper.

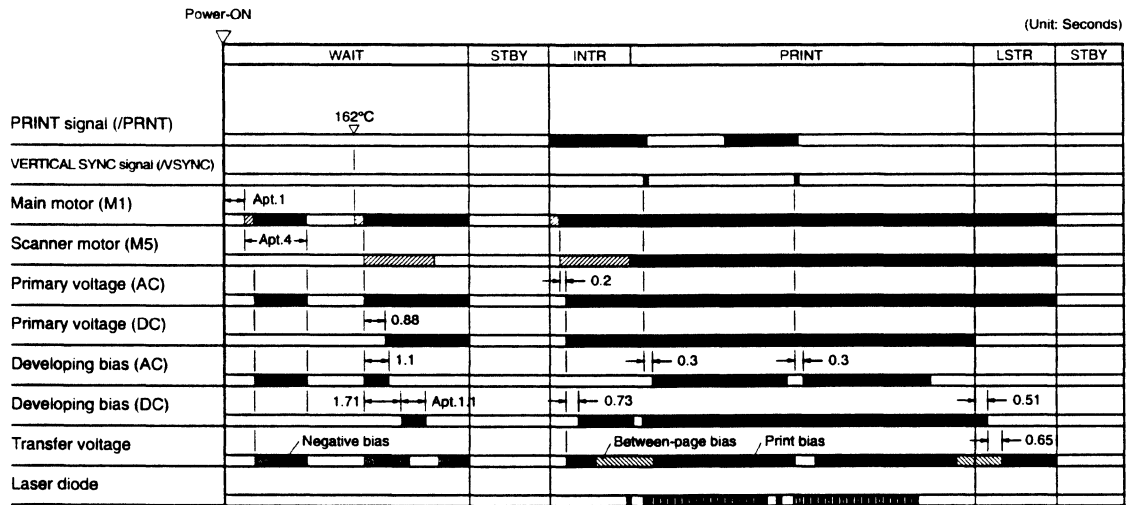
When the /PRNT signal from the video controller becomes "L", initial rotation starts and a negative bias is applied to the transfer charging roller for a certain time to clean the roller. A print bias is also applied during the print sequence to transfer toner to the paper.

After completion of printing, a between-page and a negative biases are applied again to clean the transfer charging roller.

d. Toner sensing/cartridge sensing

The EP-E cartridge has a toner sensor that detects the toner level and whether there is a cartridge when the developing AC bias is applied to the developing cylinder by the DEVELOPING BIAS AC ON signal.

The detection result is sent to the DC controller via the serial line.



Note: The transfer high voltage is switched according to the printing sequence, as shown below.

- : 0V
- : Negative bias (A negative voltage is applied to the transfer charging roller to clean it.)
- : Print bias (A positive voltage is applied to the transfer charging roller to transfer toner from the surface of the drum to the paper.)
- : Between-page bias (A weak positive charge is applied to the transfer charging roller to prevent excessive toner from collecting on the drum.)

Figure 2-31

This page intentionally left blank

IV. PICK-UP/FEEED SYSTEM

A. Outline

The presence of paper on the multi-purpose tray is sensed by photointerrupter PS702, and the presence of paper in the cassette is sensed by photointerrupter PS601.

The presence and size of the cassette installed in the printer are sensed by three switches (SW603, 604, 605) mounted on the pick-up motor driver PCB.

If the pick-up roller clutch solenoid

(SL701, SL702) energizes when the pick-up motor is running, the pick-up roller turns and feeds a sheet of paper into the printer. The paper stops at the resist paper sensor (PS602). The video controller sends the VERTICAL SYNC signal after the paper reaches the sensor, and the leading edge of the toner image on the photosensitive drum is matched with the leading edge of the paper. The image is transferred, then the paper is separated from the drum, fed to the fixing unit, and delivered onto the face-down tray.

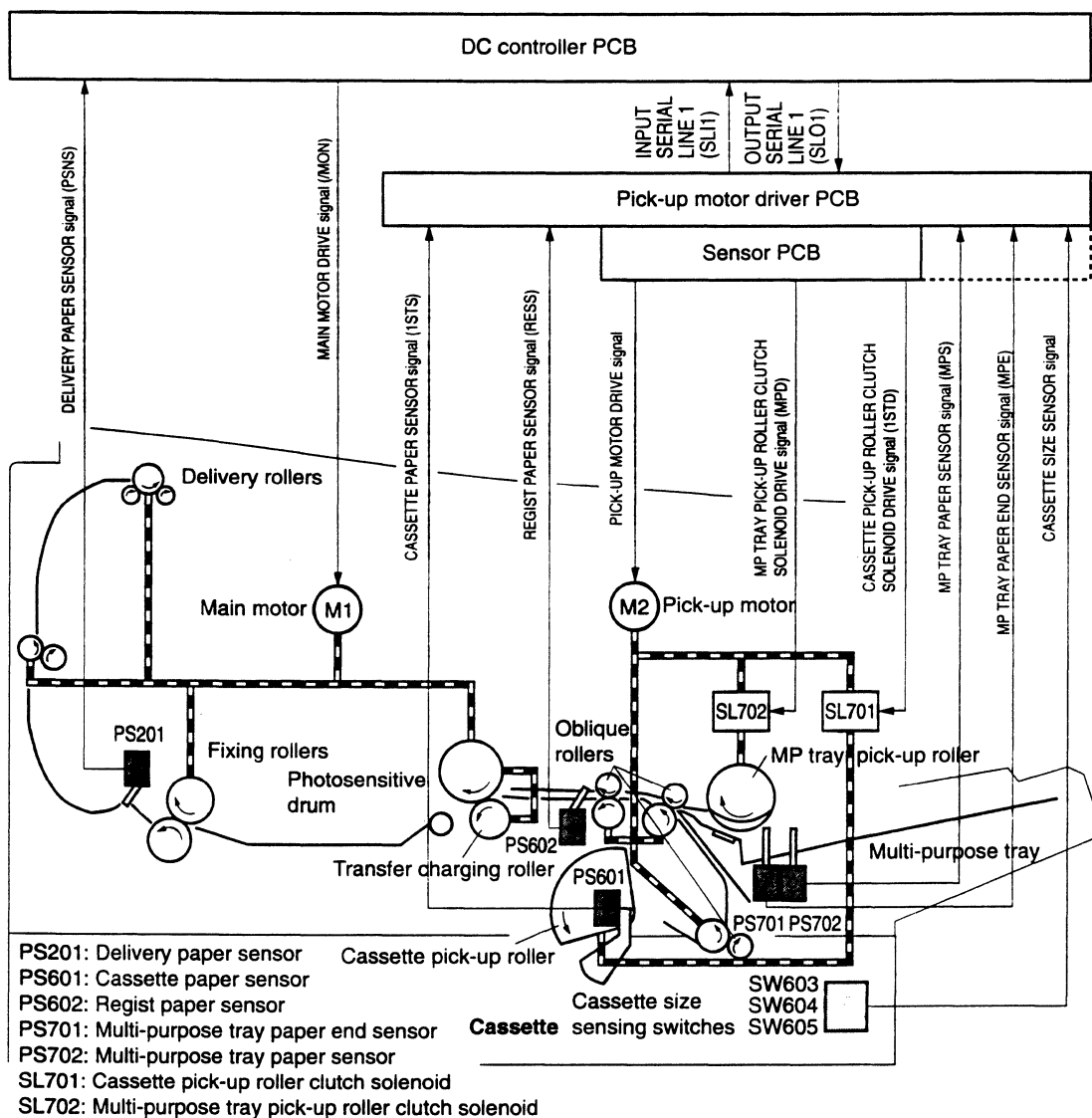


Figure 2-32

The pick-up and delivery units have photointerrupters (PS602, PS201) to detect paper. If the print does not reach or clear each sensor within a preset time, the microprocessor on the DC controller assumes a paper jam has occurred. The DC controller notifies the video controller of the jam.

B. Paper Size Detection

Loading the cassette in the printer feeder actuates specific switches. From the combination of actuated switches (Table 2-3), the microprocessor on the DC controller detects the cassette size and the presence of a cassette.

Table 2-3

Cassette	Cassette size sensing switch		
	SW603	SW604	SW605
Legal	ON	ON	OFF
Letter	ON	OFF	ON
A4	OFF	OFF	ON
Executive	OFF	ON	ON
B5	OFF	ON	OFF
No cassette	OFF	OFF	OFF

This printer cannot detect the paper size on the multi-purpose tray until the first page has been printed. When the universal cassette is used, the user sets the cassette size, so there may be a setting error.

The paper size is detected by the multi-purpose tray paper end sensor (PS701) if paper is fed from the multi-purpose tray, and by the resist paper sensor (PS602) if paper is fed from the cassette. If the paper size is different from that specified by the video controller, the microprocessor reports a paper size error to the video controller.

C. Cassette Feed

Each pick-up roller and the oblique rollers of the pick-up unit are driven by the pick-up motor (M2). When the video controller sends the /PRNT signal to the printer, the pick-up motor starts rotating.

After the pick-up motor rotates for 0.1 seconds, the pick-up roller clutch solenoid (SL701) or the multi-purpose tray pick-up roller clutch solenoid (SL702) activates for 0.3 seconds to rotate each pick-up roller.

The paper is fed by the oblique rollers so that the edge of the paper touches the left side plate to correct skew. The paper stops at the resist paper sensor (PS602). The VERTICAL SYNC signal (/VSYNC) is received about 0.2 seconds after the pick-up motor turns the oblique rollers.

The print paper is fed again.

- Paper path from multi-purpose tray

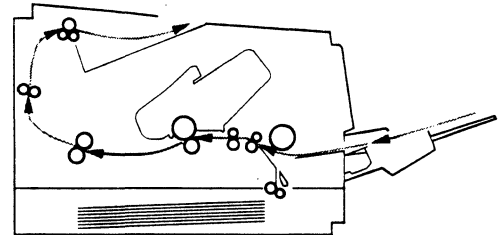


Figure 2-33

- Paper path from cassette

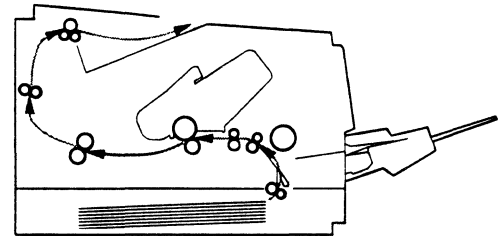


Figure 2-34

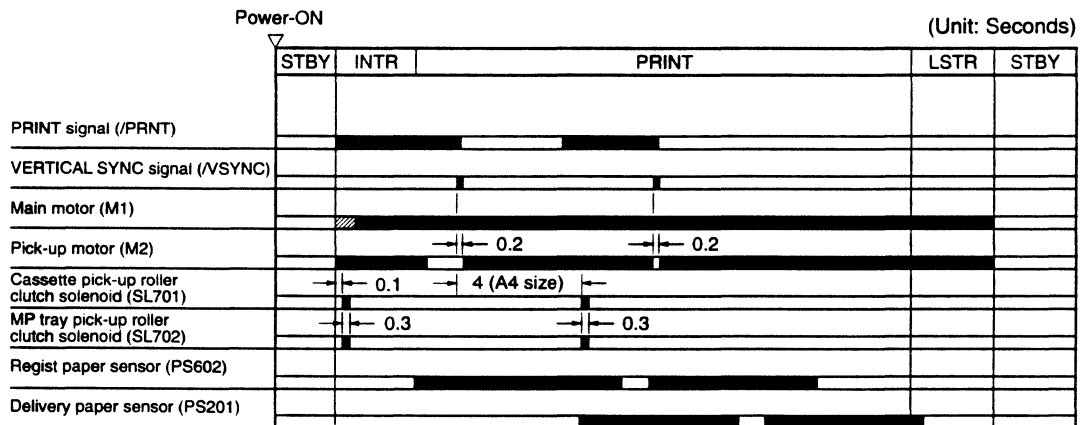


Figure 2-35

D. Fixing and Delivery Unit

1. Outline

The upper/lower rollers of the fixing unit and the delivery rollers are driven by the main motor (M1). The upper roller is heated by a fixing roller heater (H1: 500 W).

The upper roller surface temperature is detected by a thermistor (TH1). As the surface temperature increases, the resistance of the thermistor (TH1) decreases, and the voltage of the FIXING

ROLLER SURFACE TEMPERATURE signal (FSRTH) decreases.

According to the voltage of the FSRTH signal, the microprocessor (CPU) on the DC controller makes the FIXING ROLLER HEATER DRIVE signal (/FSRD) "H" or "L" to set the upper roller surface temperature to the appropriate value.

The target temperatures of the upper fixing roller during WAIT, STANDBY, and PRINT state are listed in Table 2-4.

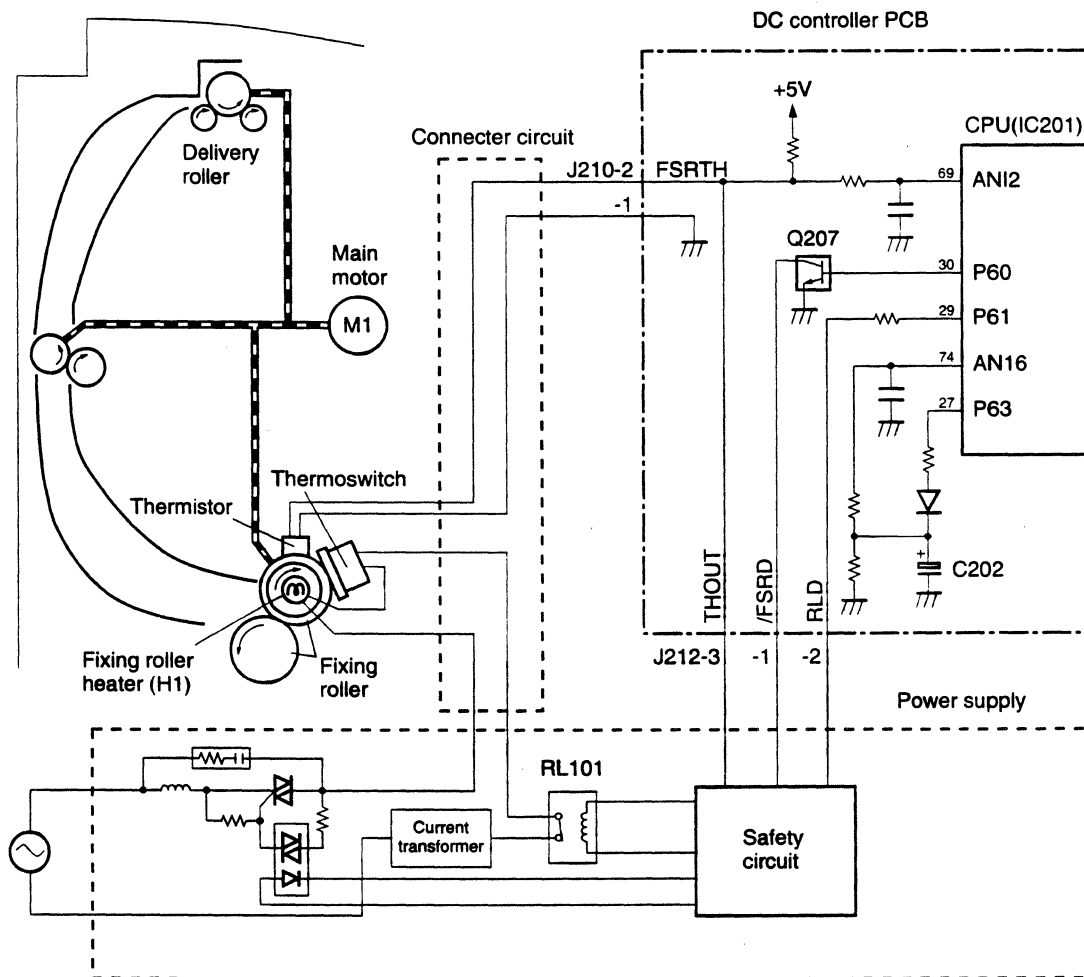


Figure 2-36

Table 2-4

	Target temperature				
	Normal temperature control		Initial warm-up temperature control (Note2)		
	Non-envelope	Envelope	Non-envelope		Envelope
			0-5 min.	5-15 min.	0-15 min.
WAIT	172	172	187	187	187
STANDBY	172	172	187	187	187
PRINT	183	183 (Note1) -178	203	193	198

- Notes:**
1. If you print up to 25 envelopes continuously during normal temperature control, the target temperature is held at 183°C. If you print more than 25 envelopes continuously, the temperature is held at 178°C.
 2. If the thermistor-detected temperature is 50°C or less when the power is switched ON, this temperature control is performed for 15 minutes to improve fixing.

The printer has the following three protection functions to prevent incorrect activation of the fixing roller:

- The CPU monitors the thermistor voltage. If it is abnormal, the CPU detects the fixing unit error, interrupts the power to the fixing roller heater, and reports it to the video controller.
- If the upper roller surface temperature rises abnormally and the thermistor voltage falls below about 1.0 V (230°C), the safety circuit in the power supply interrupts the power to the fixing roller heater regardless of the CPU output.
- If the upper roller surface temperature rises abnormally and the thermoswitch temperature exceeds 210°C, the thermoswitch turns off, interrupting the power to the fixing roller heater.

2. Fixing unit error detection

The CPU assumes a fixing unit error in the following cases, and informs the video controller:

- a. Error memory capacitor (C202) charging detection
If the voltage at pin 74 (ANI6) of the CPU is 1.62 V or more (C202 is charged) when the power is switched ON
- b. Thermistor broken-wire detection
If the upper roller temperature does not reach 33°C within 22 seconds of the fixing roller heater being turned ON
- c. Fixing roller heater broken-wire detection
If the upper roller temperature does not reach the standby temperature within 200 seconds of the fixing roller heater being turned ON
- d. Broken-wire detection after the fixing unit becomes ready
If the upper roller temperature reaches 140°C in the standby state or during printing
- e. Thermistor short detection
If the voltage of the FIXING ROLLER SURFACE TEMPERATURE signal (FSRTH) is 0.94 V (230°C) or less

When the CPU detects a fixing error, the following are performed:

- 1) Switches the fixing roller heater OFF.
- 2) Sets the output from pin 27 (P63) to "H" and charges the error memory capacitor (C202).
- 3) Sets the RELAY DRIVE signal (RLD) to "L", switches the relay OFF in the power supply, and interrupts the power to the fixing roller heater.

When the power is switched ON, the CPU reads the voltage of pin 74 (ANI6). If the voltage is higher than the specified value, the CPU assumes a fixing unit error before power-ON and cuts the current to the fixing roller heater.

Note: If a fixing unit error occurs, do not switch the power on for about 10 minutes. As a safety measure, the roller heater will not operate even if you switch the power on during this time.

3. Fixing roller heater start sequence

The sequence of operations from power-on to standby is as follows:

- 1) The CPU turns the fixing roller heater ON a preset time after power-ON (after CPU initialization).
- 2) The CPU assumes a fixing unit error when the upper fixing roller does not reach 172°C (187°C for initial warm-up) within 200 seconds after the fixing heater is turned ON.
- 3) When the upper fixing roller temperature reaches 172°C (187°C for initial warm-up temperature control), the READY signal (/RDY) is output to the video controller.
- 4) After the /RDY signal is output, 172°C (187°C for temperature control in the morning) is maintained until the PRINT signal (/PRNT) is sent from the video controller.

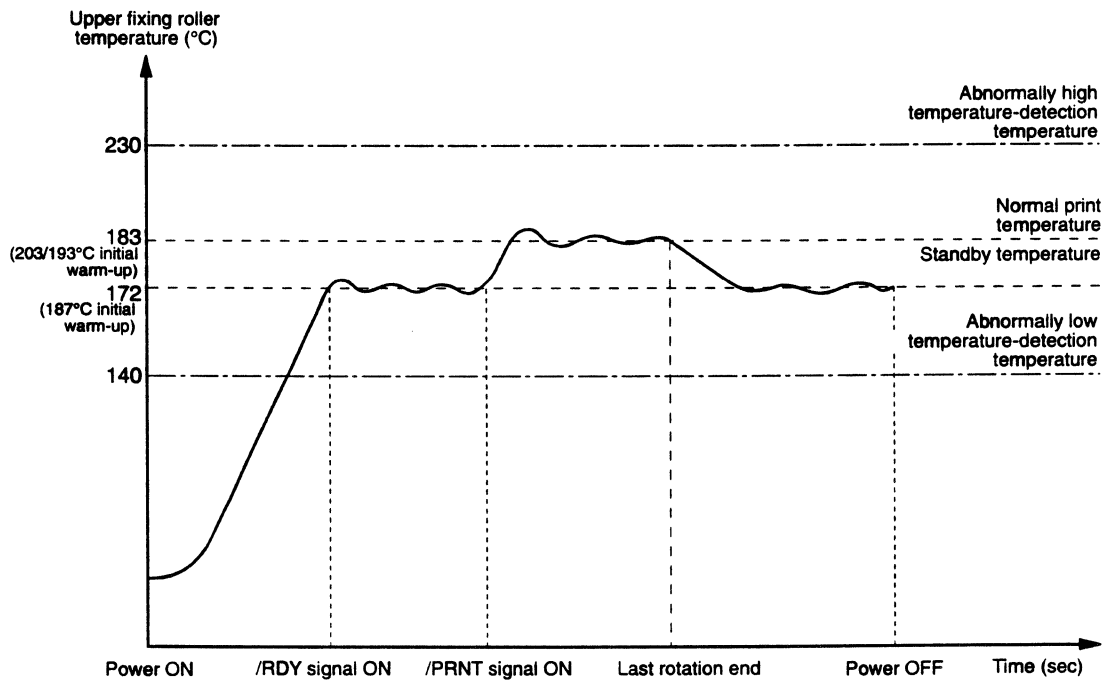


Figure 2-37

E Paper Jam Detection

To detect the presence of paper and whether or not the paper has been fed correctly, the following paper sensors are provided:

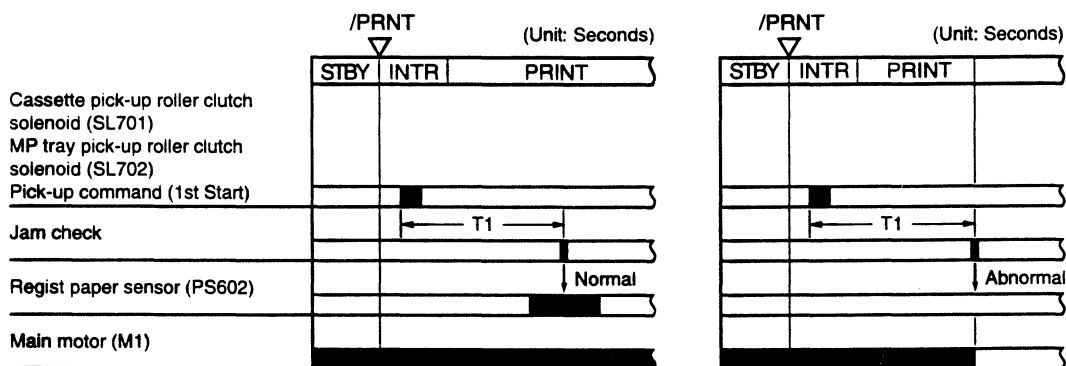
- Resist paper sensor (PS602)
- Delivery paper sensor (PS201)

The microprocessor (CPU) determines if a paper jam has occurred by checking whether paper is present at the sensor within the amount of time specified in the memory.

If it detects a jam, the microprocessor immediately stops printing, and sends a signal to the video controller to notify it.

1. Pick-up unit delay jam

The microprocessor detects a pick-up unit delay jam if the paper does not reach the resist paper sensor (PS602) within the required time after the paper is picked up.

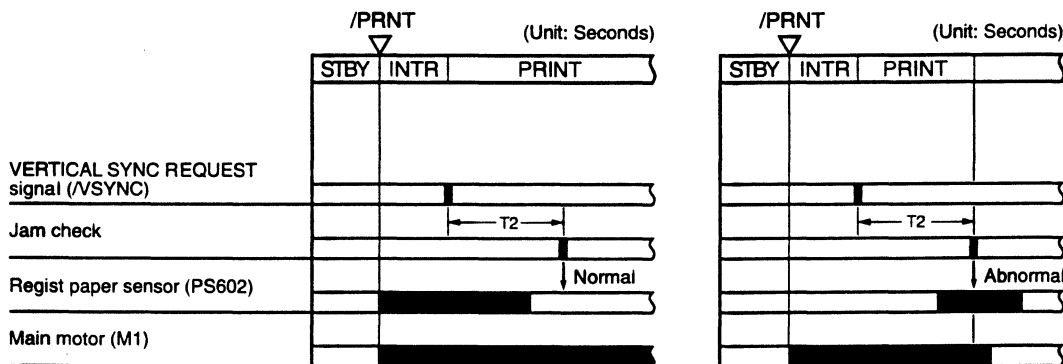


T1: 3.76 seconds (upper cassette), 2.85 seconds (multi-purpose tray), 3.83 seconds (lower cassette), 12.00 seconds (envelope feeder)

Figure 2-38

2. Pick-up unit stationary jam

The microprocessor detects a pick-up unit stationary jam when the resist paper sensor (PS602) detects the sheet of paper within the required time after the VERTICAL SYNC signal (/VSYNC) has been received.



T2: 7.24 seconds (A4), 6.39 seconds (B5), 6.87 seconds (Letter), 8.49 seconds (Legal), 6.6 seconds (Executive), 8.49 seconds (Universal), 6.39 seconds (Envelope feeder)

Figure 2-39

3. Delivery unit delay jam

The microprocessor detects a delivery unit delay jam if the paper does not reach the delivery paper sensor (PS201) within the required time after the VERTICAL SYNC signal (/VSYNC) is received.

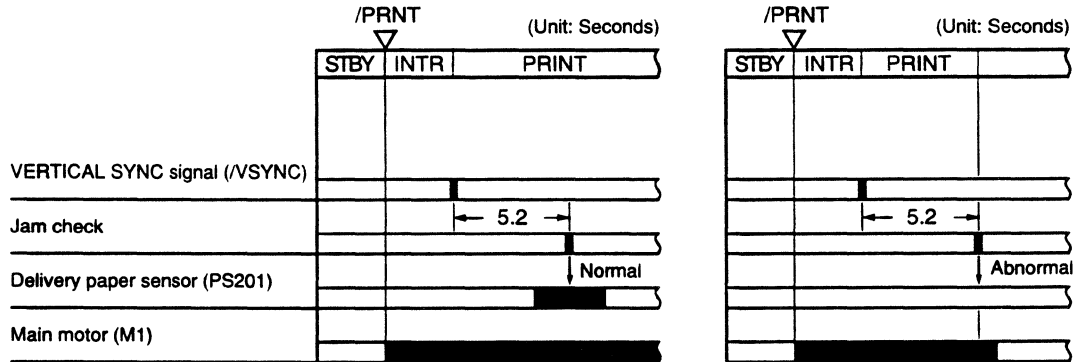


Figure 2-40

4. Delivery unit stationary jam

The microprocessor detects a delivery unit stationary jam when the delivery paper sensor (PS201) detects the sheet of paper within the required time when the paper passes through the resist paper sensor (PS602).

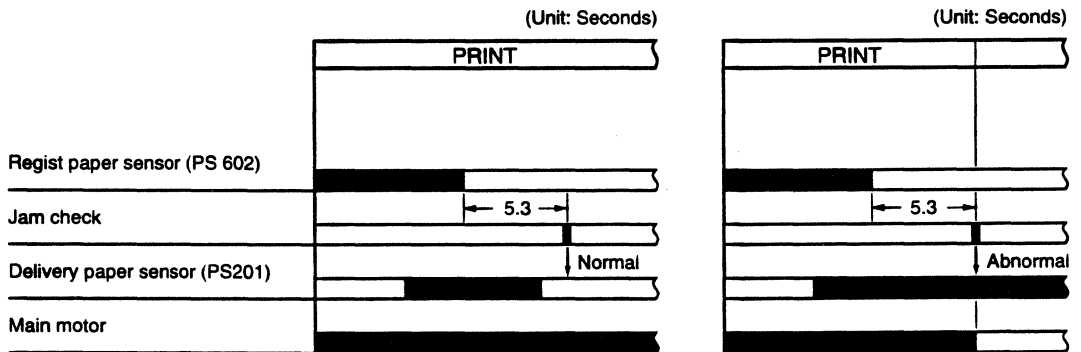


Figure 2-41

5. Pick-up unit or delivery unit stationary jam

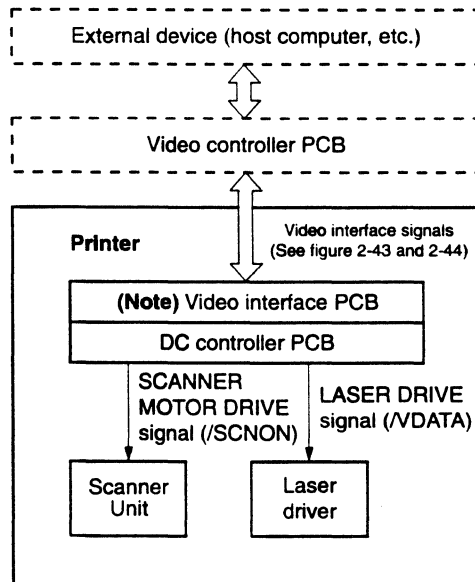
The microprocessor detects a pick-up unit or delivery unit stationary jam if the paper is at the resist paper sensor (PS602) or delivery paper sensor (PS201) when the power is switched ON.

V. OVERALL CONTROL SYSTEM

A. Outline

To connect the printer to external device, such as a computer, the video controller PCB (interface PCB) must be used between the printer and the external device. This section explains the kinds of interface signal exchanged between the printer and the video controller PCB, and gives information about the sequence of printer operations making use of interface signals.

1. System block diagram



Note: The video interface PCB is used only in the LBP-P270.

Figure 2-42

2. Video interface signal

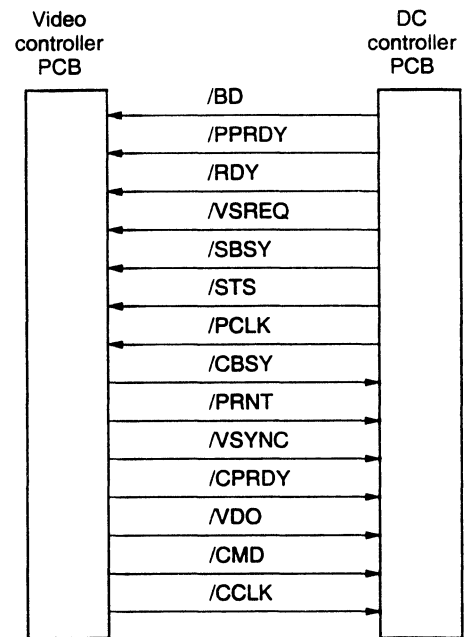


Figure 2-43 (LBP-EX PCB)

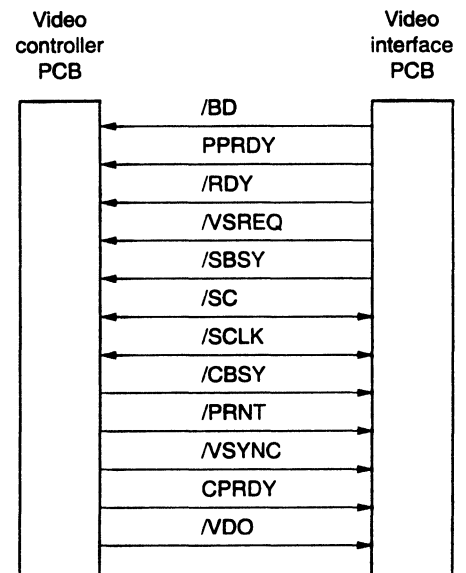


Figure 2-44 (LBP-EX)

B. Operation

When the power is switched ON, the printer enters the WAIT state. When the printer is ready for operation, the READY signal (/RDY) is sent from the DC controller to notify the video controller that the printer is ready. When the /RDY signal is "L" and data for a page is ready, the video controller sends the PRINT signal (/PRNT) to the DC controller.

When the DC controller receives the /PRNT signal, it starts the INITIAL ROTATIONS (INTR) operations. A certain time after the INTR period, the DC controller sends the VERTICAL SYNC REQUEST signal (/VSREQ) to the video controller. After video controller receives the /VSREQ signal, it sends the VERTICAL SYNC signal (/VSYNC) to the DC controller. When the DC controller receives the /VSYNC signal, it starts the print (PRINT) sequence.

The video controller synchronizes the VIDEO signal (VDO) with the HORIZONTAL SYNC signal (BD) and the VERTICAL SYNC signal (VSYNC) sent from the DC controller, and sends it to the DC controller. In response to the /VDO signal, the DC controller generates the LASER DRIVE signal (/VDATA) that switches the laser diode ON and OFF, and sends it to the laser driver.

The resulting laser beam is scanned repeatedly across the photosensitive drum by the mirror drum to form a latent electrostatic image of the original data, as described earlier.

When a page is being printed, the DC controller checks for another /PRNT signal from the video controller. If none has arrived by the end of the PRINT period, the DC controller begins the LAST ROTATION (LSTR) operations. At the end of this period, the printer enters the STANDBY (STBY) state.

If another /PRNT signal arrives during printing, however, the print sequence continues. The LAST ROTATIONS operations are performed, and the printer enters the standby state.

VI. POWER SUPPLIES

A. Outline

The AC line voltage is supplied to the low-voltage power supply circuit in the power supply by turning the power switch (SW101) ON.

The low-voltage power supply circuit generates +24 VDC and +5 VDC. The +24 VDC is supplied to the main motor, scanner motor, and exhaust fan to drive them, and to the high-voltage power supply PCB. The +5 VDC is supplied to the sensors and ICs on the DC controller PCB.

The +24 VDC consists of two types of voltage; +24VA, which is normally supplied from the power supply, and +24VB, which is cut when the upper cover is opened and the door switch (SW601) is turned OFF.

The block diagram is shown below.

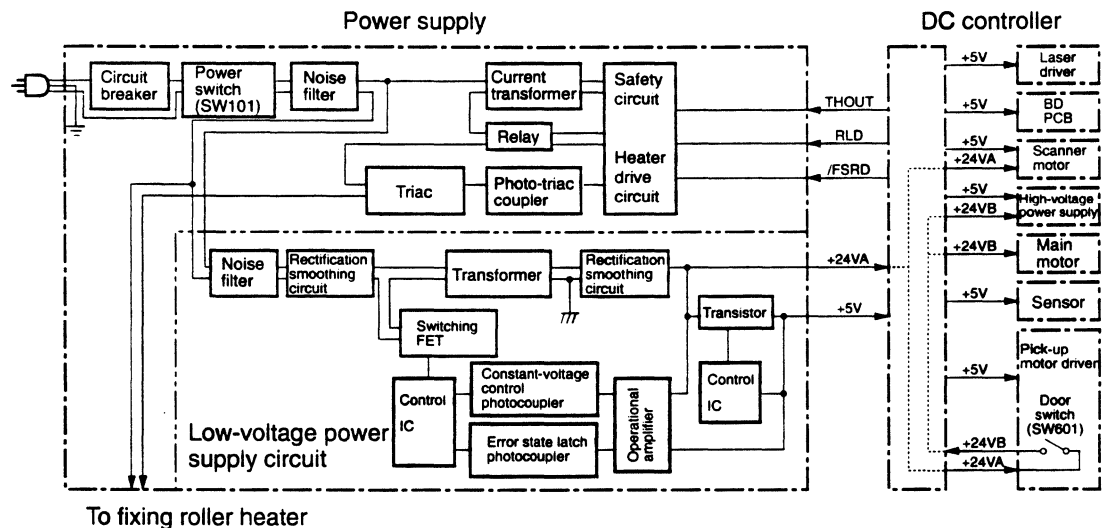


Figure 2-45

B. Protective System

If a short circuit or other fault causes excessive current from the +24 VDC and +5 VDC power supplies, the overcurrent protection system automatically shuts off the output voltage to protect the power supply. To reset the power supply after such a shutdown, switch the power OFF, correct the fault, then switch the power back ON again. If overcurrent flows through the AC line, the circuit breaker in the power supply trips and the output voltage is shut off.

VII. ENVELOPE FEEDER

A. Outline of the Electrical System

The DC controller regulates the envelope feeder driver, outputting pick-up commands (1st Start and 2nd Start) at the appropriate timing to the envelope feeder driver via the serial line. The envelope feeder driver runs the motor according to the commands. Figure 2-46 shows the flow of signals between the feeder and the printer. The envelope feeder is supplied with +24 VDC power from the printer.

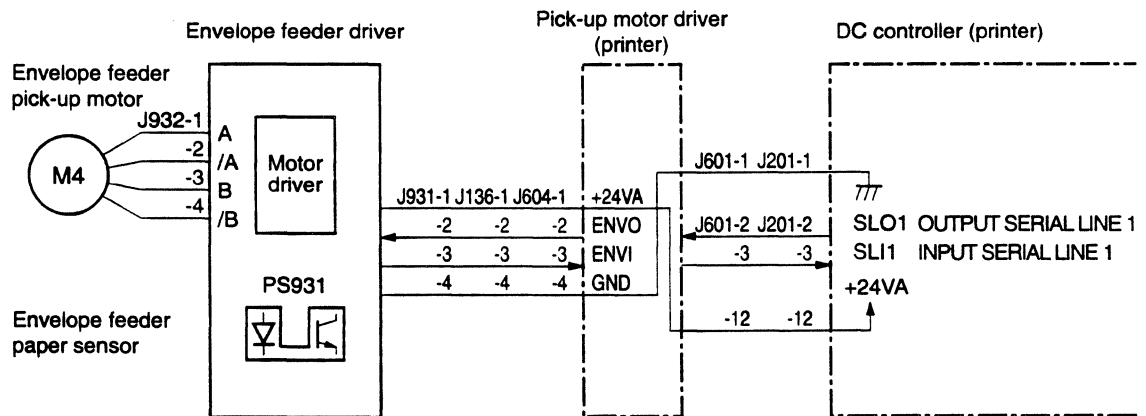


Figure 2-46

B. Pick-up/Feed System

The envelope feeder pick-up motor (M4) is a stepping motor that rotates forward or backward and is controlled by the envelope feeder driver PCB. When the motor rotates forward, all of the envelope rollers rotate, while only the upper separation roller and the feed roller rotate when the motor rotates backward.

When the envelope feeder driver PCB receives a 1st Start command from the DC controller, it runs the pick-up motor

forward for about 1.8 second, pauses for 0.1 seconds, then runs the motor backward for about 2.3 seconds. One envelope is picked up and fed into the printer by the oblique rollers so that its end touches the left side plate to correct skew. The envelope stops when it reaches the resist paper sensor (PS602).

When it receives a 2nd Start command, the envelope feeder driver PCB runs the motor backward for about 2.8 seconds to feed the envelope again.

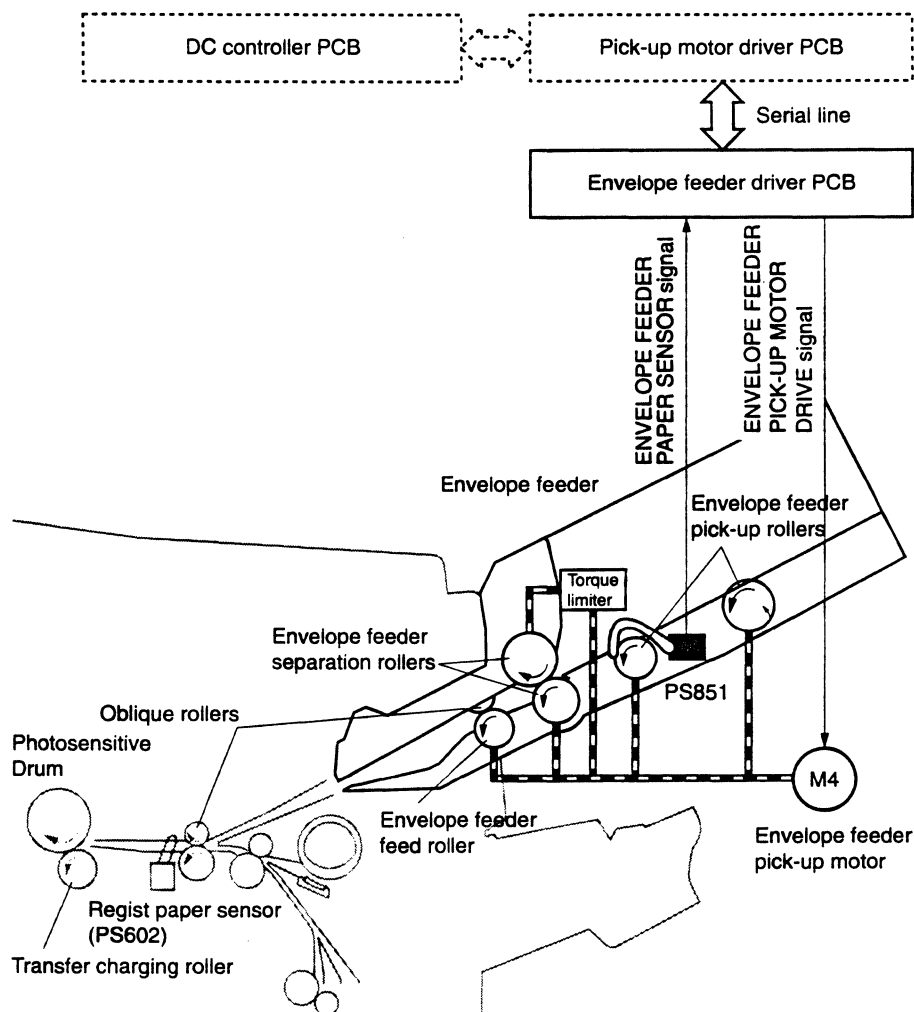


Figure 2-47

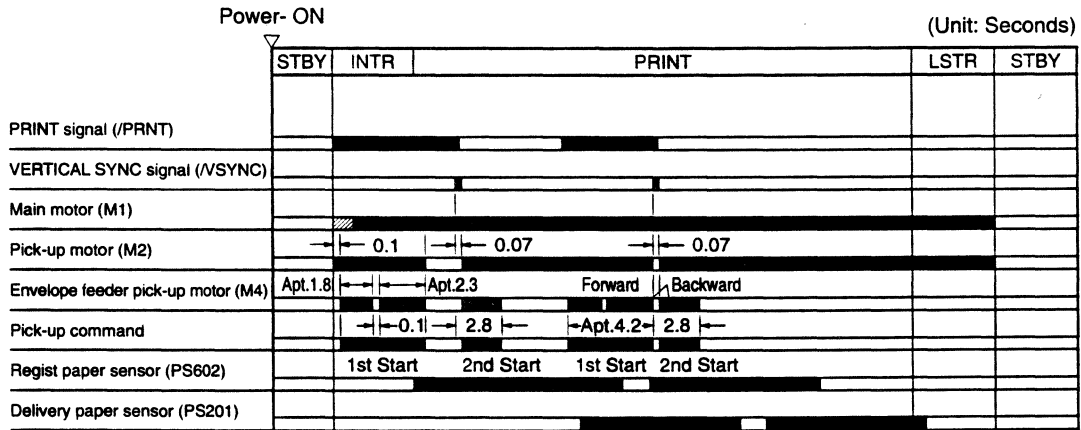


Figure 2-48

The upper separation roller is driven via a torque limiter by the motor, which imparts a turning moment in the direction of rotation of the pick-up and lower separation rollers (in the direction of the white arrow in Figure 2-49).

When a single envelope is fed, however, the upper separation roller is forced to rotate in the opposite direction (in the direction of the black arrow in Figure 2-49) by the movement of the envelope, which is driven by the lower separation roller.

Since the friction between the envelopes is weak when two or more envelopes are fed simultaneously (multi-feed), the rotating force of the lower roller is not strong enough to cause the upper roller to rotate in the same direction as it is rotating. The upper roller rotates in the direction of the white arrow in Figure 2-49, and the envelope on the bottom of the feeder passes through while the others are returned to the feeder.

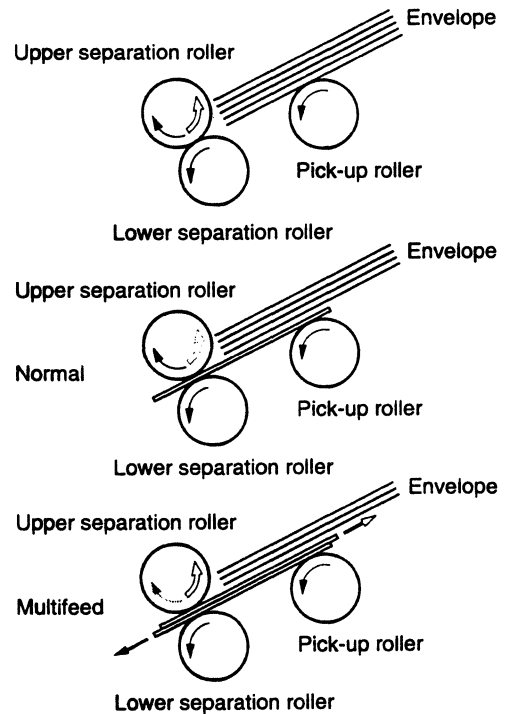


Figure 2-49

C. Paper Jam Detection

Paper jam during pick-up or feeding from the envelope feeder is detected in the same way as for a printer paper jam detection. See page 2-33 for details.

VIII. PAPER FEEDER

A. Outline of the Electrical System

The DC controller controls the paper feeder driver, outputting paper pick-up commands (1st Start and 2nd Start) at the appropriate timing to the paper feeder driver via the serial line. The paper feeder driver drives the solenoid and motor according to these commands. Figure 2-50 shows the flow of signals between the feeder and the printer. The paper feeder is supplied with +24 VDC from the printer.

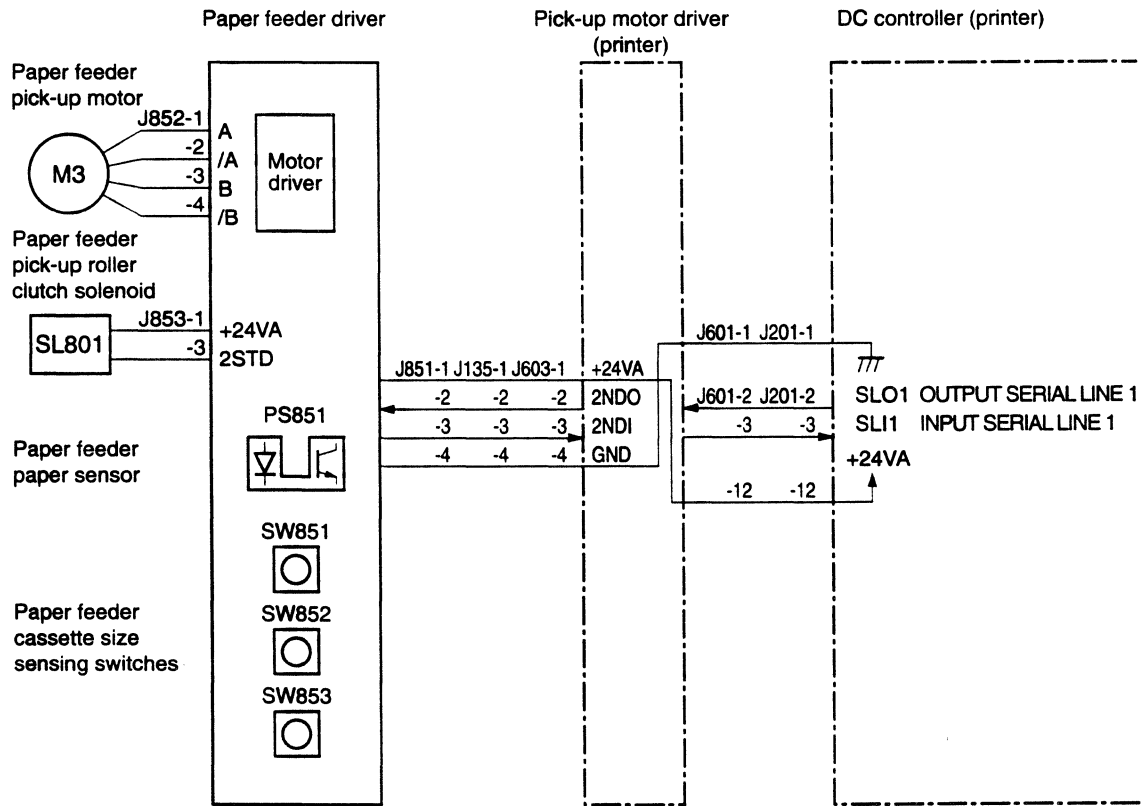


Figure 2-50

B. Pick-up/Feed System

The paper feeder pick-up motor (M3) is a stepping motor that rotates forward or backward and is controlled by the paper feeder driver PCB.

When the paper feeder driver PCB receives a 1st Start command from the DC controller, it energize the paper feeder pick-up roller clutch solenoid (SL851) for 0.25 seconds, then after 0.1 seconds, runs the motor forward for about 1.4 seconds.

The pick-up roller runs through one turn, and the feed roller is turned at high speed. The motor is then run backward for about 1.2 seconds to turn the feed roller, and paper is fed into the printer.

The paper is fed by the oblique rollers so that its end touches the left side plate to correct skew. The paper stops when it reaches the regist paper sensor (PS602).

When it receives a 2nd Start command, the paper feeder driver PCB runs the motor backward for about 2.8 seconds to feed the paper again.

C. Paper Jam Detection

Paper jam during pick-up or feeding from the paper feeder is detected in the same way as for printer paper jam detection. See page 2-33 for details.

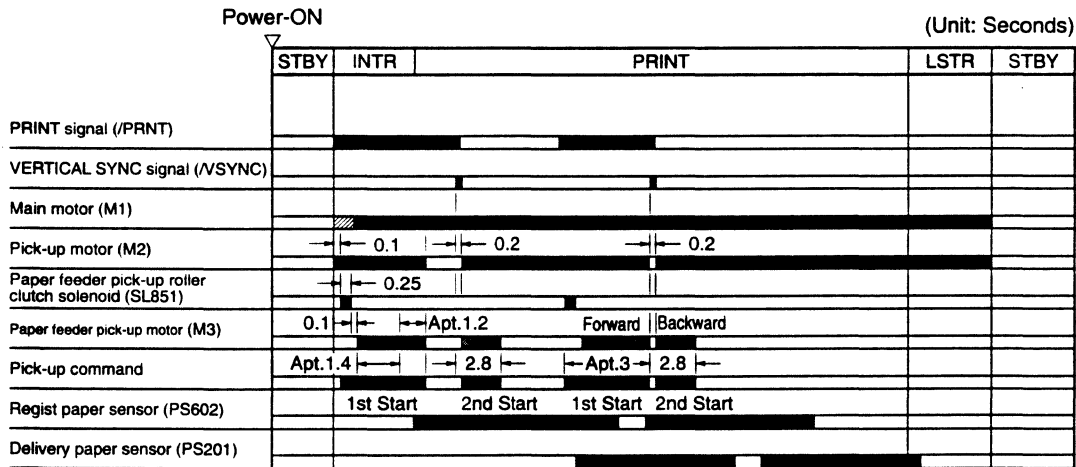


Figure 2-51

CHAPTER 3

THE MECHANICAL SYSTEM

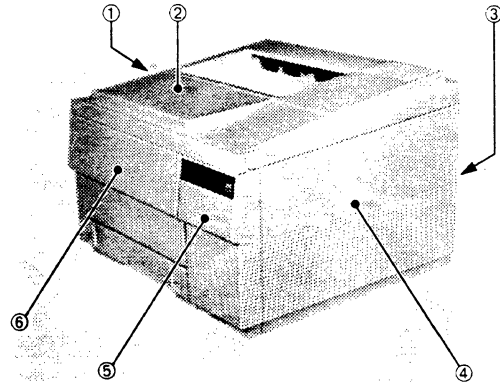
This chapter describes mechanical operation as well as disassembly and reassembly procedures of the printer. Note the following precautions during disassembly or reassembly.

1. When you remove the EP-E cartridge, cover the cartridge with a cloth or put it in a dark place to prevent light from affecting the drum inside the cartridge.
2. Remove the EP-E cartridge from the printer before disassembling or transporting the printer.
3. **▲ CAUTION:** Before servicing the printer, disconnect its power cord from the electrical outlet.
4. Assembly is the reverse of disassembly unless otherwise specified.
5. Note the lengths, diameters, and locations of screws as you remove them. When reassembling the printer, be sure to use them in their original locations.
6. Do not operate the printer with any parts removed.

I. EXTERNALS	3-1	VI. FIXING SYSTEM	3-14
II. DRIVE SYSTEM	3-6	VII. ELECTRONIC COMPONENTS ..	3-18
III. PAPER TRANSPORT SYSTEM..	3-7	VIII. ENVELOPE FEEDER	3-22
IV. EXPOSURE SYSTEM	3-11	IX. PAPER FEEDER	3-26
V. ELECTROSTATIC IMAGING/ DEVELOPING/CLEANING SYSTEM	3-12		

I. EXTERNALS

A. Covers and Panels

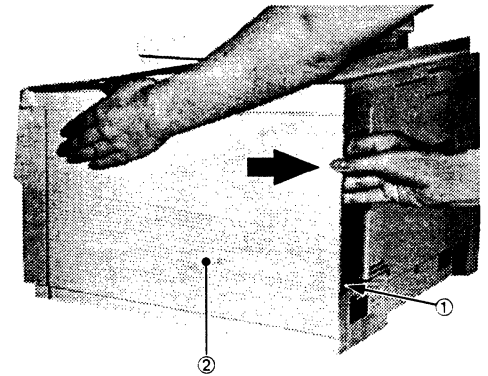


- | | |
|--------------------|----------------------|
| ① Left cover | ④ Right cover |
| ② Upper cover unit | ⑤ Display panel unit |
| ③ Delivery cover | ⑥ Front cover |

Figure 3-1

1. Right cover

- 1) Open the printer.
- 2) Remove the screw.
- 3) Move the right cover in holding the rear side of the cover, and remove it.



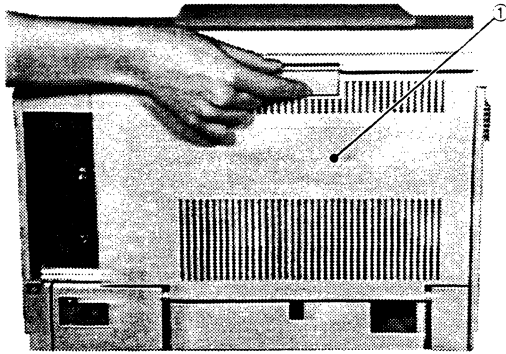
- | | |
|---------|---------------|
| ① Screw | ② Right cover |
|---------|---------------|

Figure 3-2

When cleaning inside the printer, or inspecting or repairing it, remove the appropriate covers and/or panels as described below.

2. Upper cover unit

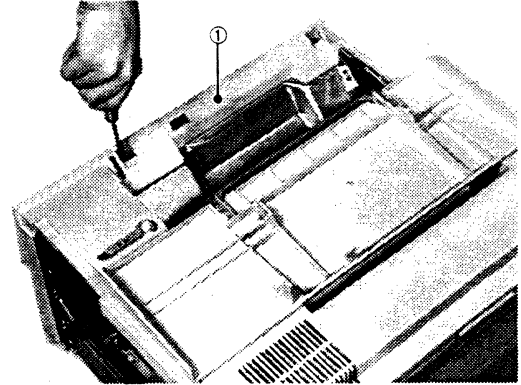
- 1) Remove the right cover.
- 2) Open the delivery cover.



① Delivery cover

Figure 3-3

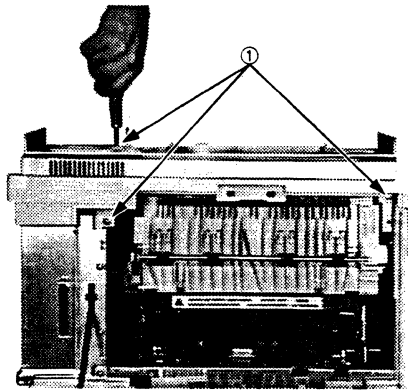
- 4) Release the hook holding the upper cover with a flat-blade screwdriver and remove the upper cover unit.



① Upper cover unit

Figure 3-5

- 3) Remove the three screws.

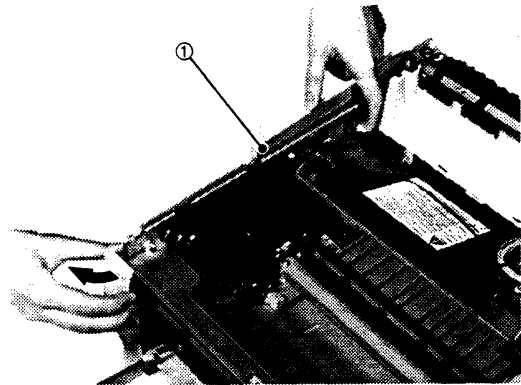


① Screws

Figure 3-4

3. Left cover

- 1) Open the multi-purpose tray.
- 2) Remove the right cover, and then the upper cover unit.
- 3) Release the left cover hook holding the left side plate, then open the left cover to the front and remove it.

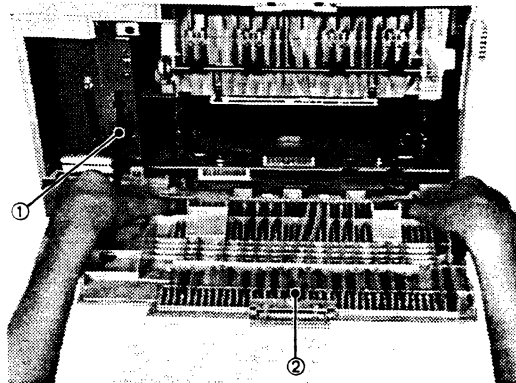


① Left cover

Figure 3-6

4. Delivery cover

- 1) Remove the cassette.
- 2) Open the delivery cover.
- 3) Remove the hinge from the delivery cover.
- 4) Remove the delivery cover by pushing both its ends so the cover flexes.

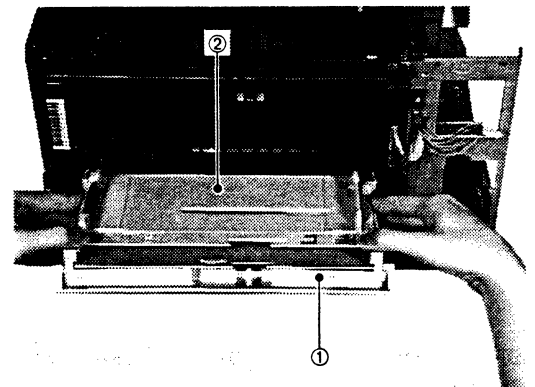


① Hinge ② Delivery cover

Figure 3-7

5. Multi-purpose tray

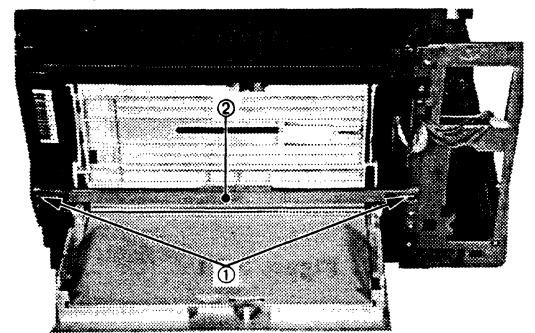
- 1) Remove the cassette.
- 2) Remove the right cover, and then the upper cover unit.
- 3) Remove the left cover.
- 4) Remove the display panel unit.
- 5) Open the multi-purpose tray.
- 6) Pull the side of the front cover slightly outward, and remove the multi-purpose tray from the front cover.



① Front cover ② Multi-purpose tray

Figure 3-8

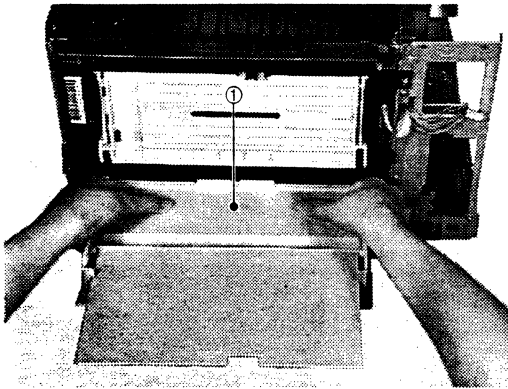
- 7) Remove the two screws, and then the stay.



① Screws ② Stay

Figure 3-9

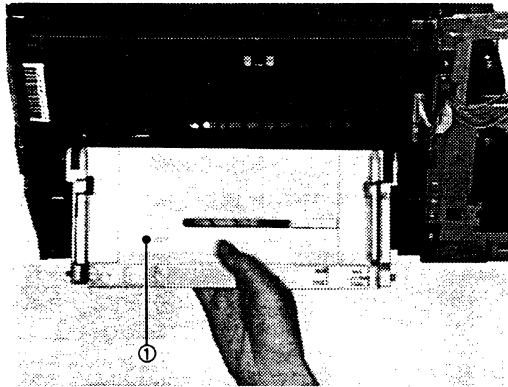
- 8) Press both ends of the front cover and remove the front cover.



① Front cover

Figure 3-10

- 9) Pull the multi-purpose tray down and out .



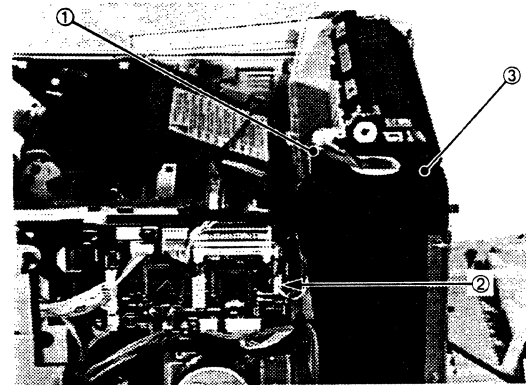
① Multi-purpose tray

Figure 3-11

B. Exhaust Fan

1. Exhaust fan

- 1) Remove the right cover, and then the upper cover unit.
- 2) Perform step 1 to 2 on page 3-18, and remove the video interface unit with the I/O plate.
- 3) Remove the fan cover hook, and then fan cover.
- 4) Disconnect the connector and remove the exhaust fan.



① Fan cover ② Connector
③ Exhaust fan

Figure 3-12

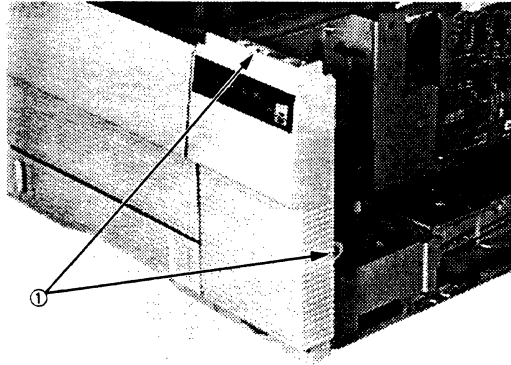
Note on reassembly

When installing the exhaust fan, attach the fan cover hook to the fan.

C. Display Panel Unit

1. Removing the display panel unit from the printer

- 1) Remove the upper cover unit.
- 2) Remove the two screws.

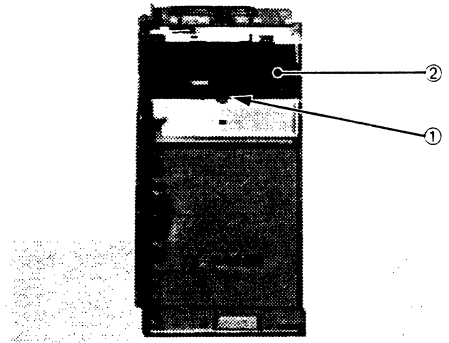


① Screws

Figure 3-13

2. Disassembly and reassembly

- 1) Remove the screw, and then the display panel PCB.

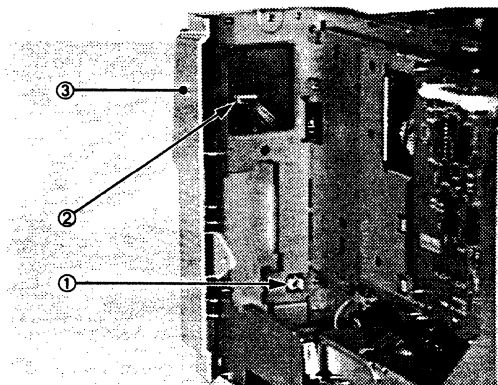


① Screw

② Display panel PCB

Figure 3-15

- 3) Release the hook holding the display panel unit.
- 4) Disconnect the connector from the display panel, and remove the display panel.



① Hook

② Connector

③ Display panel unit

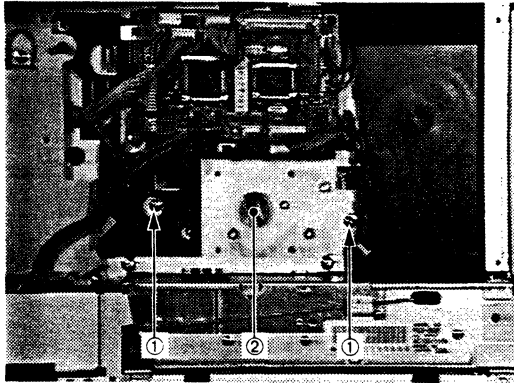
Figure 3-14

II. DRIVE SYSTEM

A. Drive Unit

1. Removing the drive unit from the printer

- 1) Perform steps 1 and 2 on page 3-14, and remove the fixing unit.
- 2) Remove the main motor by performing steps 1 to 3 on this page.
- 3) Remove the two screws, and remove the drive unit from the back.



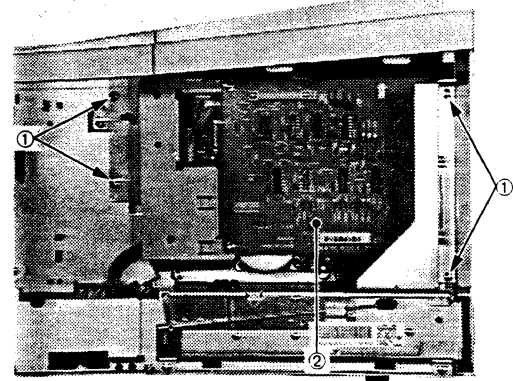
① Screws ② Drive unit

Figure 3-16

B. Main Motor

1. Removing the main motor from the printer

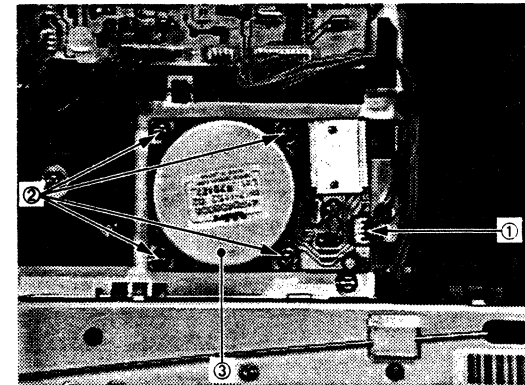
- 1) Remove the right cover.
- 2) Remove the four screws, and then the video interface PCB with the I/O plate carefully.



① Screws
② Video interface PCB

Figure 3-17

- 3) Disconnect the connector, remove the four screws, and remove the main motor.



① Connector ② Screws
③ Main motor

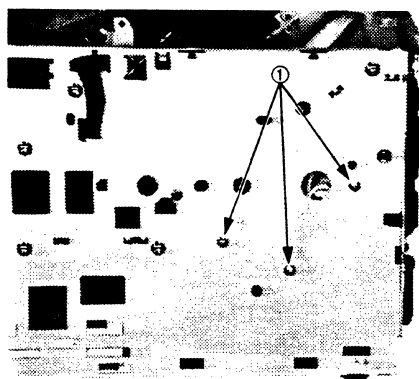
Figure 3-18

III. PAPER TRANSPORT SYSTEM

A. Paper Pick-up Unit

1. Removing the paper pick-up unit

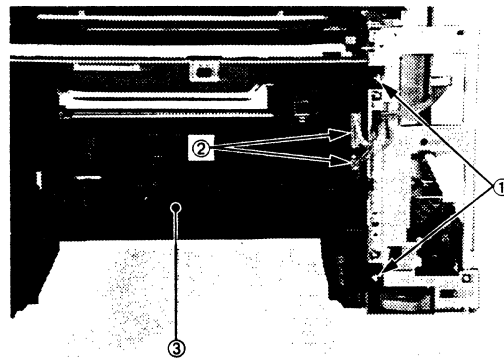
- 1) Remove the cassette.
- 2) Remove the inner cover.
- 3) Remove the upper cover unit.
- 4) Remove the left cover.
- 5) Remove the multi-purpose tray.
- 6) Remove the display panel unit.
- 7) Remove the three screws from the left side of the printer.



① Screws

Figure 3-19

- 8) Remove the two screws, disconnect the two connectors, and pull the paper pick-up unit forward and out.



① Screws ② Connectors
③ Paper pick-up unit

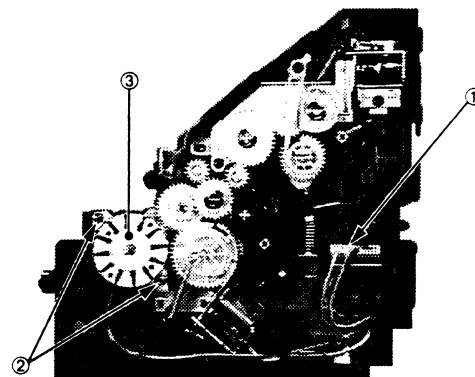
Figure 3-20

Note: If you replace the paper pick-up unit, make several test prints and check the leading edge registration is 2.0 mm. If it is not, adjust it. (See page 6-10)

2. Disassembly and reassembly

a. Pick-up motor

- 1) Disconnect the connector, remove the two screws, and remove the pick-up motor.

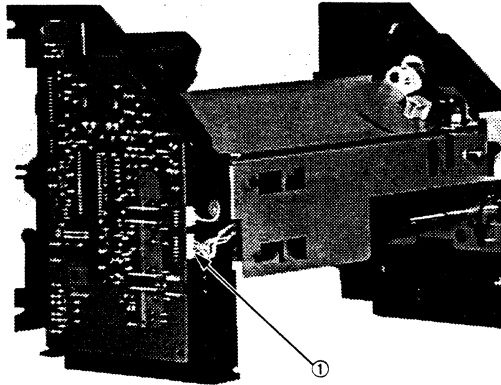


① Connector ② Screws
③ Pick-up motor

Figure 3-21

b. Regist Paper Sensor and Cassette Paper Sensor

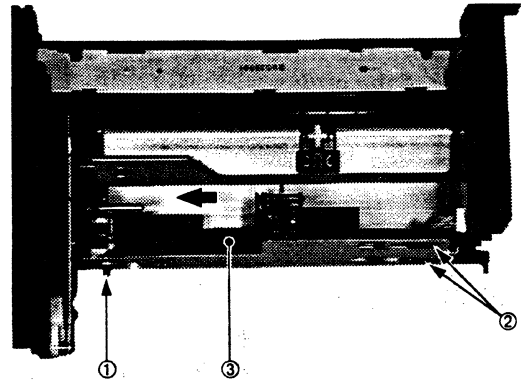
- 1) Remove the cassette pick-up roller.
- 2) Disconnect the connector.



① Connector

Figure 3-22

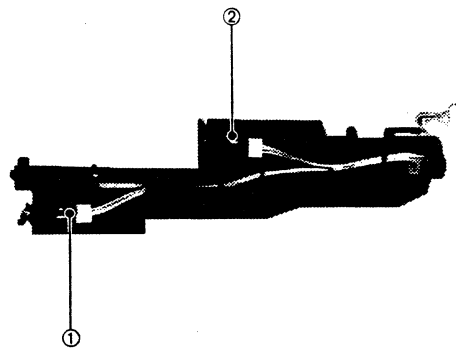
- 3) Remove the pin in the projection on the left end of the regist sensor holder and push the projection. Then, take off two claws on the right side, and slide off the regist sensor holder unit to the left. Slide the left end of the regist sensor holder toward the cassette feed roller shaft (front in the figure) so that it does not touch the oblique roller.



① Projection ② Claws
③ Regist sensor holder unit

Figure 3-23

- 4) Remove the sensors from regist sensor holder unit.



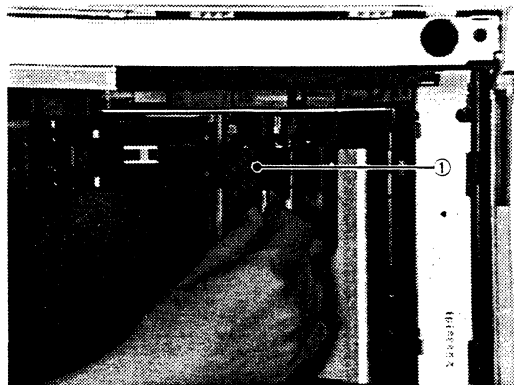
① Regist paper sensor
② Cassette paper sensor

Figure 3-24

B. Cassette Pick-up Roller

1. Removing the cassette pick-up roller

- 1) Remove the cassette.
- 2) Stand the printer on its right side.
- 3) Pull out the cassette pick-up roller by its knob.



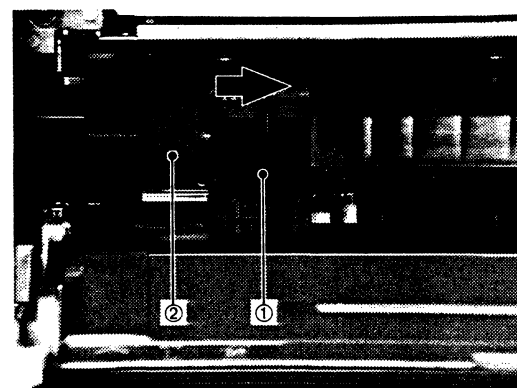
① Cassette pick-up roller

Figure 3-25

C. Multi-purpose Tray Pick-up Roller

1. Removing the multi-purpose tray

- 1) Open the multi-purpose tray.
- 2) Remove the inner cover.
- 3) Push the sub-pad, hold the knob of the multi-purpose tray pick-up roller, and pull out the roller.



① Sub-pad

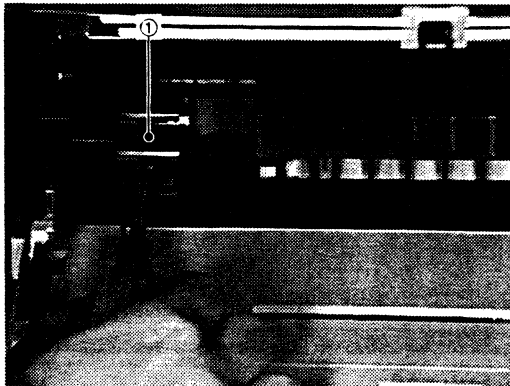
② Multi-purpose tray pick-up roller

Figure 3-26

D. Separation Pad

1. Removing the separation pad

- 1) Open the multi-purpose tray.
- 2) Remove the inner cover.
- 3) Remove the multi-purpose tray pick-up roller.
- 4) Remove the separation pad with a flat-blade screwdriver.



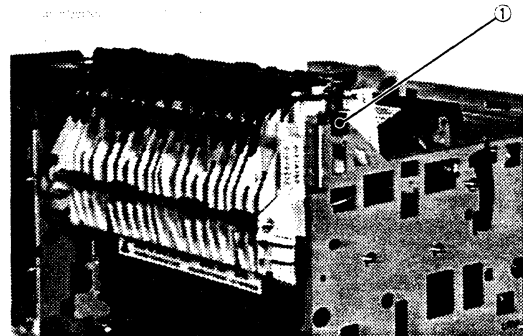
① Separation pad

Figure 3-27

E. Paper Delivery Unit

1. Removing the paper delivery unit

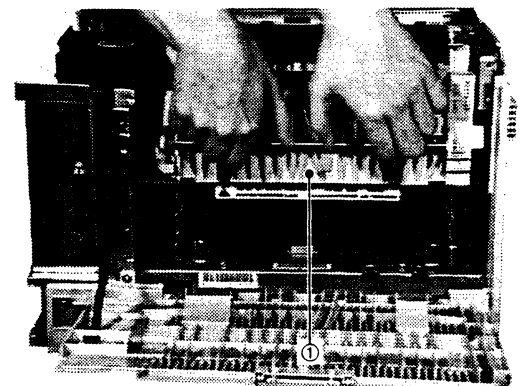
- 1) Remove the upper cover unit.
- 2) Remove the left cover.
- 3) Remove the leaf spring.



① Leaf spring

Figure 3-28

- 4) Release the two hooks holding the delivery unit, and remove the delivery unit by pulling it forward.



① Paper delivery unit

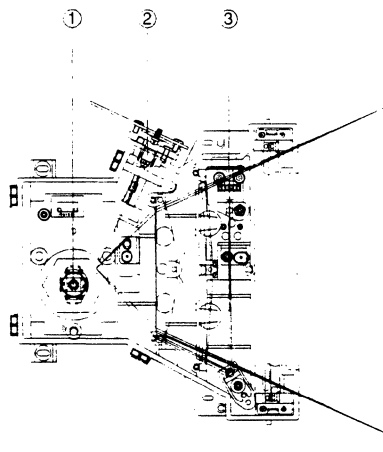
Figure 3-29

IV. EXPOSURE SYSTEM

A. Laser/Scanner Unit

1. Configuration

The laser/scanner unit sweeps a laser beam across the photosensitive drum. It is configured as shown below.

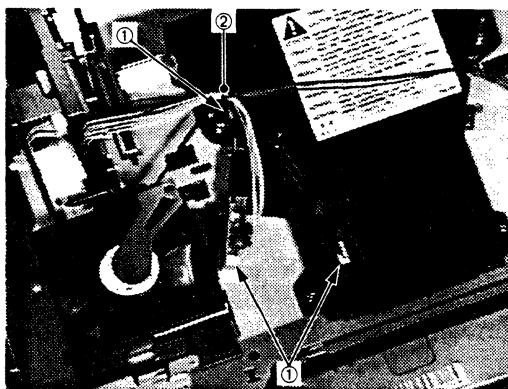


① Scanner unit ② Laser unit
③ BD PCB

Figure 3-30

2. Removing the laser/scanner unit

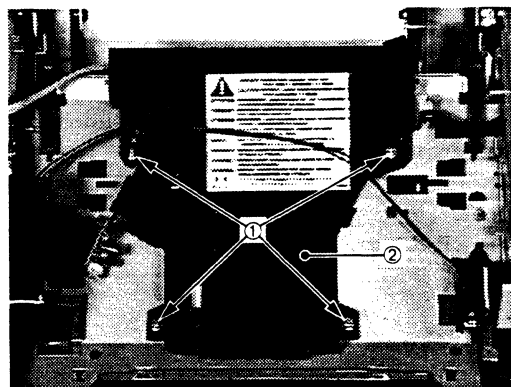
- 1) Perform steps 1 and 4 on page 3-10, and remove the paper delivery unit.
- 2) Disconnect the three connectors and remove the wire harness from the laser/scanner unit.



① Connectors ② Wire harness

Figure 3-31

- 3) Remove the four screws, and then the laser/scanner unit.



① Screws ② Laser/scanner unit

Figure 3-32

-
- Notes:**
1. Never disassemble the laser/scanner unit; it cannot be adjusted in the field.
 2. When installing the laser/scanner unit, engage the laser shutter with the shutter arm.
 3. If you replace the laser/scanner unit, make several test prints and check the leading edge registration is 2.0 mm. If it is not, adjust it. (See page 6-10)
-

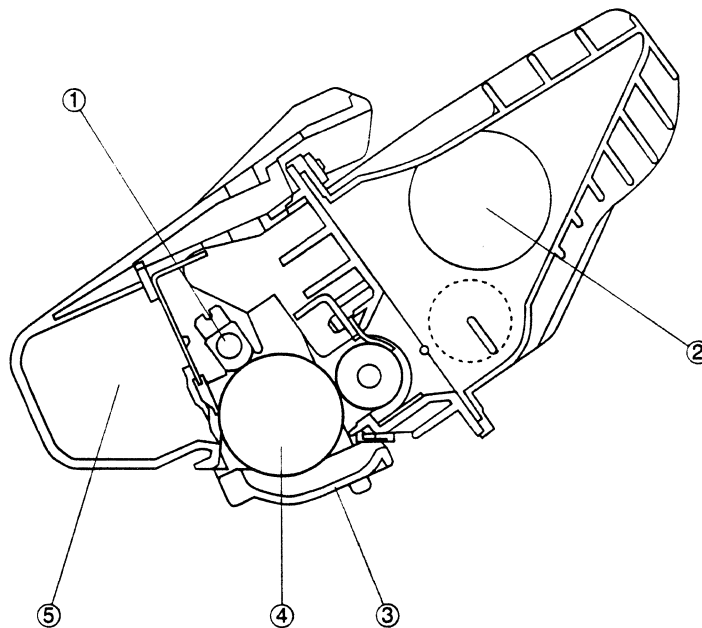
V. ELECTROSTATIC IMAGING/DEVELOPING/CLEANING SYSTEM

A. EP-E Cartridge

1. Configuration

The EP-E cartridge combines a photosensitive drum, primary charging roller, developing unit, and drum cleaning unit in a single housing. During printing the drum rotates and an invisible electrostatic latent image is formed on its surface and then developed into a visible image by toner.

The EP-E cartridge cannot be disassembled.



- ① Primary charging roller
- ② Developing unit
- ③ Protective shield
- ④ Photosensitive drum
- ⑤ Drum cleaning unit

Figure 3-33

a. Protective shield

The photosensitive drum is protected by a protective shield that prevents exposure to strong light. If the drum is exposed to strong light, blank areas or black streaks may appear on prints, so do not open the protective shield unless necessary. (The protective shield is automatically opened when the EP-E cartridge is inserted into the printer.)

2. Cleaning the photosensitive drum

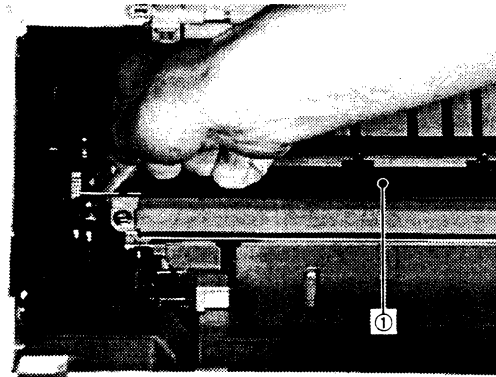
- 1) Open the printer and remove the cartridge.
- 2) Open the protective shield.
- 3) Liberally sprinkle toner on a piece of flannel or other soft cloth and clean the drum surface with it.

Notes: 1. Only turn the drum in the direction that it turns during printing. If you turn it backward, the spring-loaded contact that conducts the developing bias to the inside rim of the developing cylinder will be bent. Do not touch the photosensitive part of the drum while rotating the drum.

2. Use flannel or some other soft cloth to clean the drum surface. Do not use lint-free paper because it is too hard and will scratch the surface. Never use the solvents to clean the drum.
 3. Finish cleaning as quickly as possible to avoid exposing the drum to light for a long time, as this can cause abnormal images.
-

B. Transfer Charging Roller

- 1) Open the printer.
- 2) Hook the left side of the transfer charging roller shaft with the supplied green cleaning brush, and remove the transfer charging roller.



① Transfer charging roller

Figure 3-34

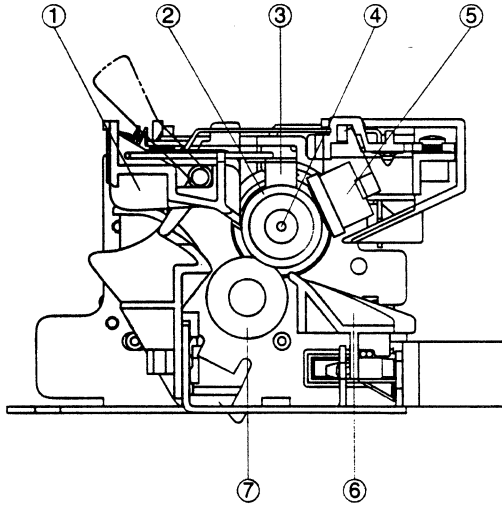
-
- Notes:** 1. Use dry lint-free paper (producing little paper dust) to clean the transfer charging roller. Never use solvents.
2. If paper dust or toner cannot be removed from the transfer roller with the lint-free paper, or if the roller is deformed, change the roller for a new one.
-

VI. FIXING SYSTEM

A. Fixing Unit

1. Configuration

The fixing unit fixes the toner image onto the paper. It is configured as shown below.

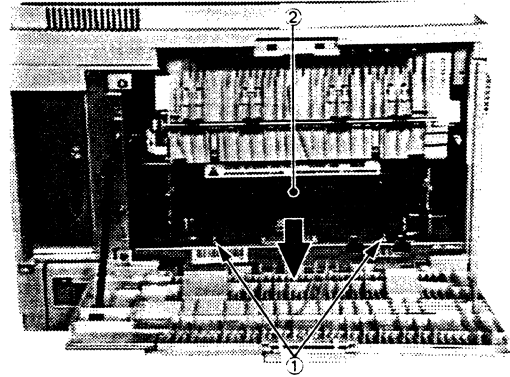


- ① Separation guide
- ② Upper fixing roller
- ③ Thermistor
- ④ Fixing roller heater
- ⑤ Thermoswitch
- ⑥ Fixing unit entrance guide
- ⑦ Lower fixing roller

Figure 3-35

2. Removing the fixing roller

- 1) Open the delivery cover.
- 2) Remove the two screws, lift the fixing unit slightly, and pull it forward and out.



- ① Screws
- ② Fixing unit

Figure 3-36

Note: When you replaced the fixing unit, push the metal levers on both sides of the new fixing unit down.

3. Disassembly and reassembly

a. Fixing roller heater

- 1) Release the two hooks holding the contact cover, and remove the contact cover.

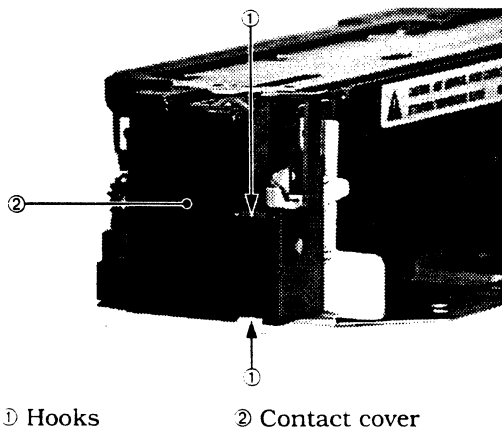


Figure 3-37

- 2) Release the seven hooks holding the wire cover to the fixing unit with a flat-blade screwdriver. Remove the wire cover.

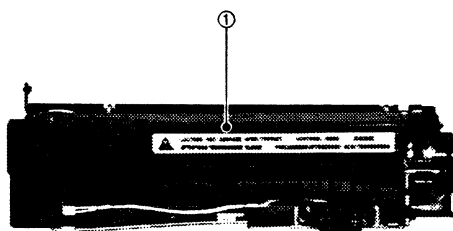


Figure 3-38

- 3) Remove the two screws, disconnect the connector, and remove the left fixing cover.

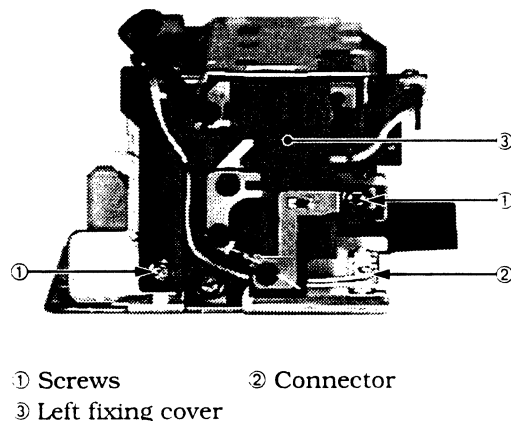


Figure 3-39

- 4) Remove the screw, and then the fixing roller heater lead from the heater wire cover.
- 5) Remove the fixing roller heater lead from the connector.

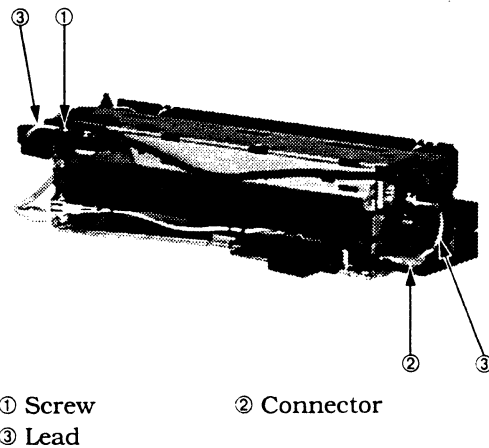
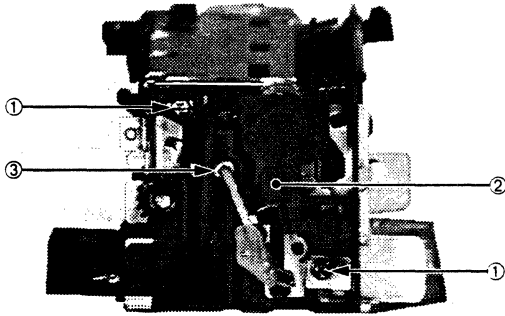


Figure 3-40

- 6) Remove the two screws, and then the right fixing cover. Pull the fixing roller heater carefully out of the upper roller.

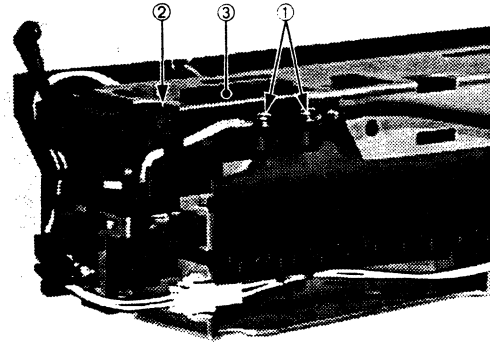


- ① Screws
- ② Right fixing cover
- ③ Fixing roller heater

Figure 3-41

b. Thermoswitch

- 1) Remove the wire cover.
- 2) Remove the two screws. Release the hook holding the thermoswitch, and remove the thermoswitch unit.



- ① Screws
- ② Hook
- ③ Thermoswitch unit

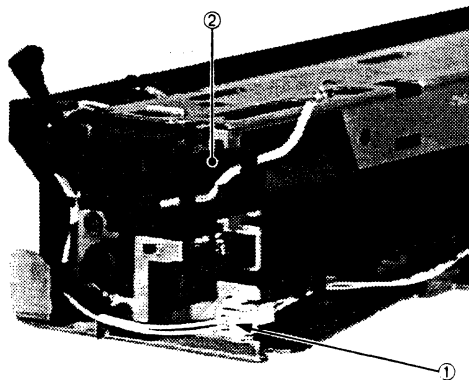
Figure 3-42

Note on reassembly:

When installing the thermoswitch unit, make sure that the sensing surface of the thermoswitch contacts the surface of the upper fixing roller uniformly. If it does not, check whether the leaf spring is bent.

c. Thermistor

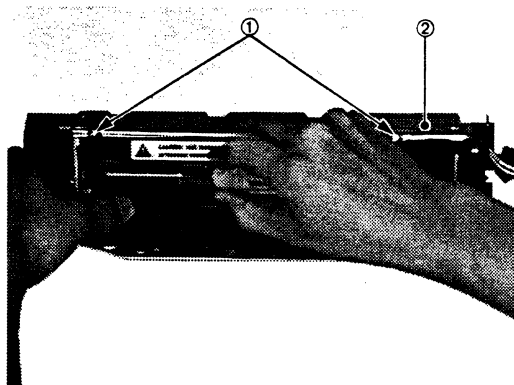
- 1) Remove the thermoswitch by performing steps 1 and 2 on page 3-16.
- 2) Disconnect the connector and remove the cable from left fixing cover.
- 3) Remove the heater wire cover.



① Connector ② Heater wire cover

Figure 3-43

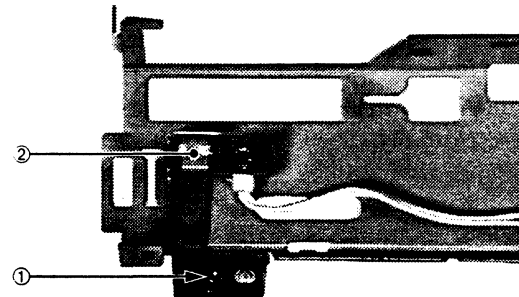
- 4) Remove the two springs and open the lower separation guide. Release the hook holding the upper fixing frame with a flat-blade screwdriver and remove the upper fixing frame.



① Springs ② Upper fixing frame

Figure 3-44

- 5) Remove the screw and then the thermistor.



① Screw ② Thermistor

Figure 3-45

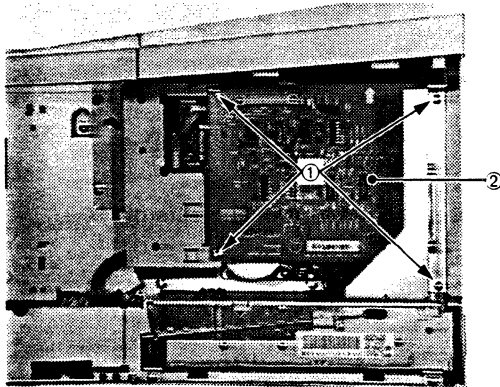
Note for reassembly:

When installing the thermistor, make sure that the sensing surface of the thermistor contacts the surface of the upper fixing roller uniformly. If it does not, check whether the leaf spring is bent.

VII. ELECTRONIC COMPONENTS

A. Video Interface PCB (LBP-EX)

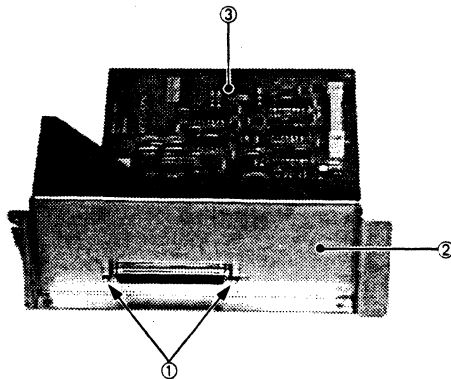
- 1) Remove the right cover.
- 2) Remove the four screws, and then the video interface PCB with the I/O plate carefully.



① Screw ② Video interface PCB

Figure 3-46

- 3) Remove the two nuts, and then the I/O plate from the video interface PCB.

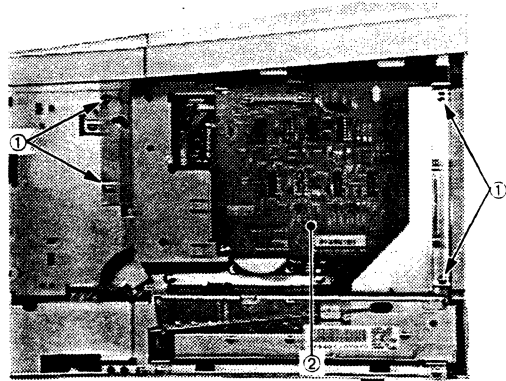


① Nuts
② I/O plate
③ Video interface PCB

Figure 3-47

B. DC Controller PCB

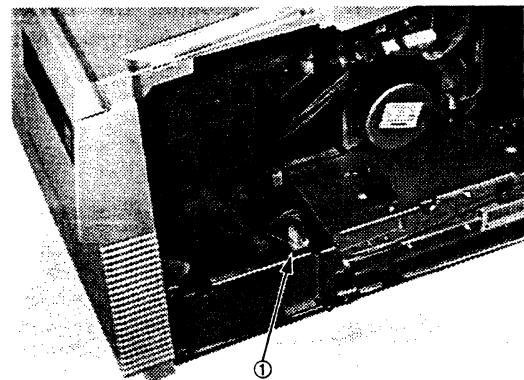
- 1) Remove the right cover.
- 2) Remove the four screws, and then the video interface PCB with the I/O plate carefully.



① Screws
② Video interface PCB

Figure 3-48

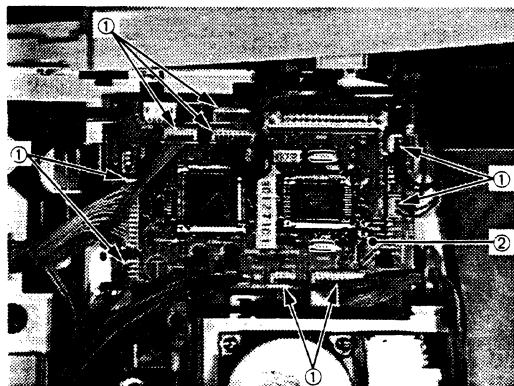
- 3) Disconnect the connector from the power supply.



① Connector

Figure 3-49

- 4) Disconnect the nine connectors from the DC controller PCB.
- 5) Release the two hooks securing the DC controller PCB to the PCB holder, and remove the DC controller PCB.



- ① Connectors
- ② DC controller PCB

Figure 3-50

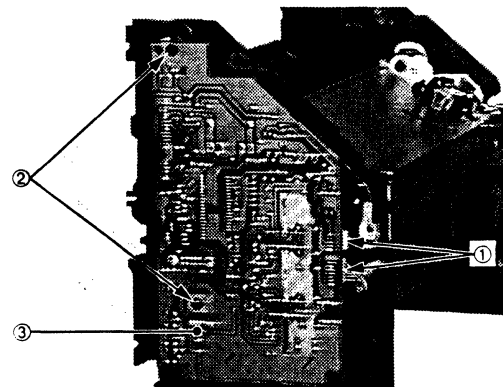
Note on reassembly:

When installing the DC controller PCB, put the bottom of the PCB into the PCB holder, then align the PCB with the positioning pin.

Note: When you replace the DC controller PCB, make sure you adjust the leading edge registration. (See page 6-10)

C. Pick-up Motor Driver PCB

- 1) Perform steps 1 to 8 on page 3-7, and remove the paper pick-up unit.
- 2) Disconnect the two connectors, remove the two screws, release the five hooks, and remove the pick-up motor driver PCB.

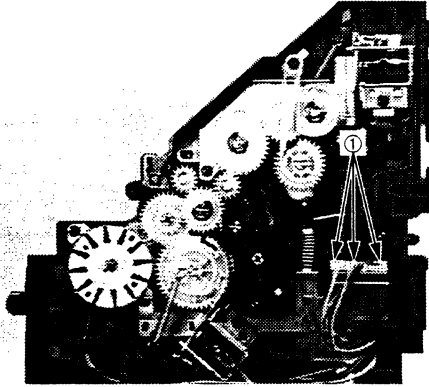


- ① Connectors
- ② Screws
- ③ Pick-up motor driver PCB

Figure 3-51

D. Sensor PCB

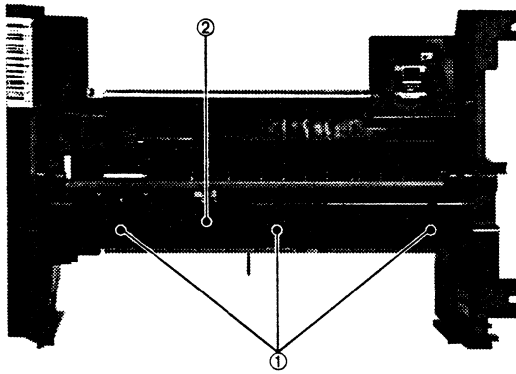
- 1) Remove the pick-up motor driver PCB by performing steps 1 and 2 on page 3-19.
- 2) Disconnect the three connectors.



① Connectors

Figure 3-52

- 3) Release the three hooks, and remove the cover.

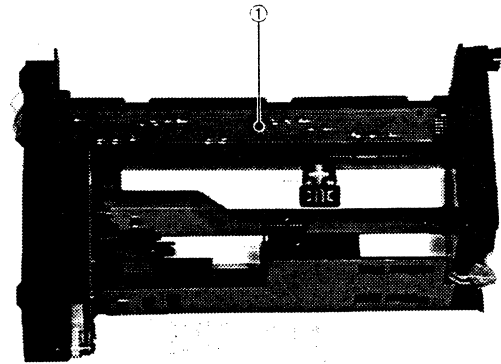


① Hooks

② Cover

Figure 3-53

- 4) Remove the sensor PCB.

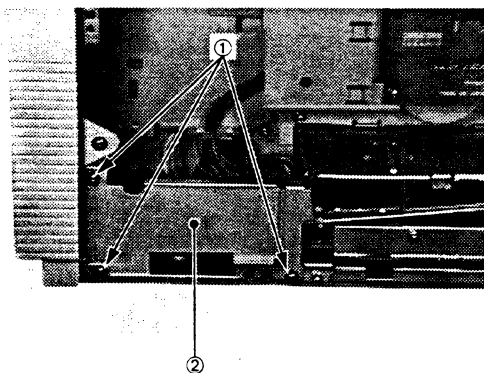


① Sensor PCB

Figure 3-54

E. Power Supply

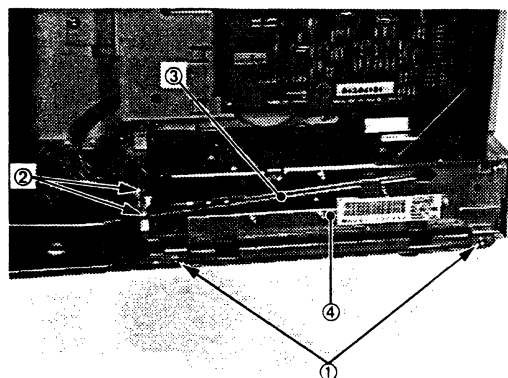
- 1) Remove the right cover.
- 2) Remove the three screws, and then the connector cover.



① Screws ② Connector cover

Figure 3-55

- 3) Remove the two screws, disconnect the two connectors, remove the rod, and pull the power supply forward and out.

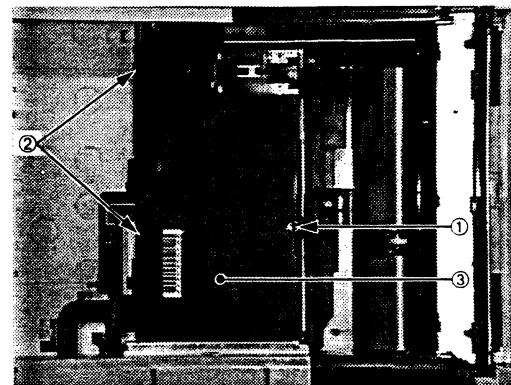


① Screws ② Connectors
③ Rod ④ Power supply

Figure 3-56

F. High-voltage Power Supply PCB

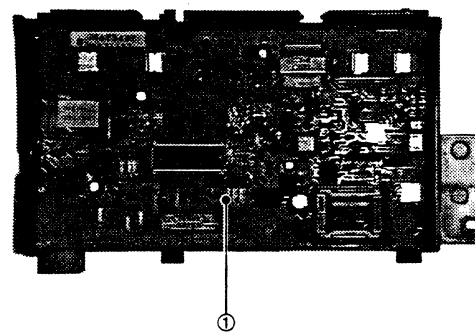
- 1) Remove the cassette.
- 2) Stand the printer on its right side.
- 3) Remove the two screws, release the two hooks, and remove the high-voltage case.



① Screws ② Hooks
③ High-voltage case

Figure 3-57

- 4) Release the four hooks holding the high-voltage power supply PCB to the high-voltage case.



① High-voltage power supply PCB

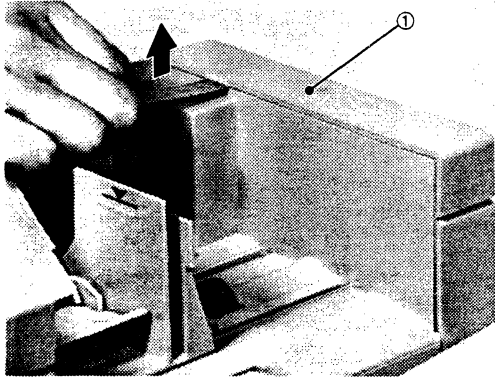
Figure 3-58

VIII. ENVELOPE FEEDER

1. Removing covers

a. Right cover

- 1) Lift the top of the cover, remove the two dowels, then remove the right cover.



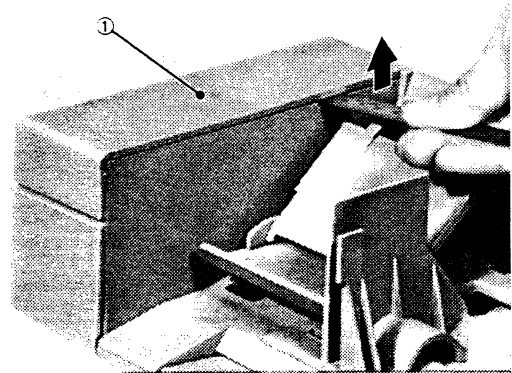
① R.ight cover

Figure 3-59

Note: Before checking the envelope feeder operation, be sure to hold the bottom of the PCB up or tape it to the frame if the right cover is removed.

b. Left cover

- 1) Lift the top of the cover, remove the two dowels, then remove the left cover.

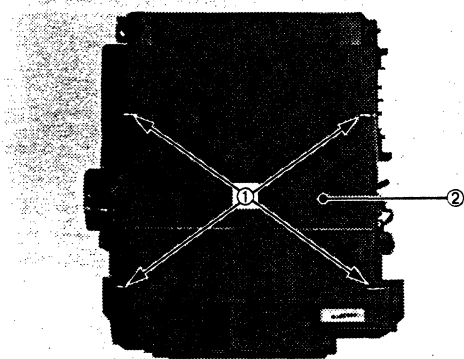


① Left cover

Figure 3-60

c. Bottom cover

- 1) Remove the right cover and left cover.
- 2) Remove the four screws, and then the bottom cover.



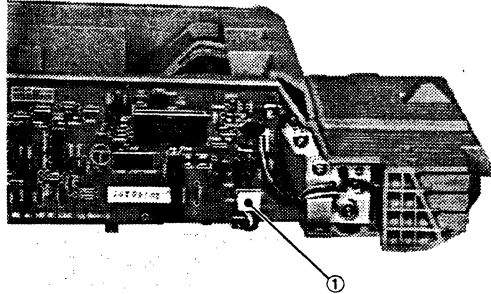
① Screw

② Bottom cover

Figure 3-61

2. Removing the envelope feeder pick-up motor

- 1) Remove the right, left, and bottom covers.
- 2) Disconnect the connector.

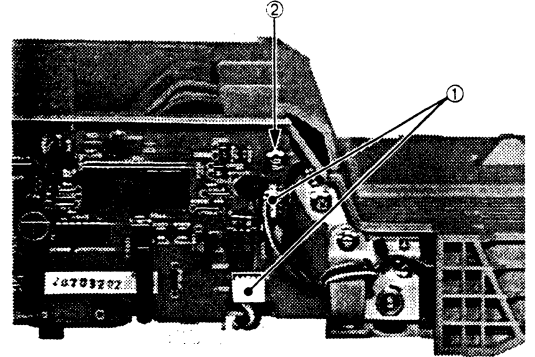


① Connector

Figure 3-62

3. Removing the envelope feeder drive PCB

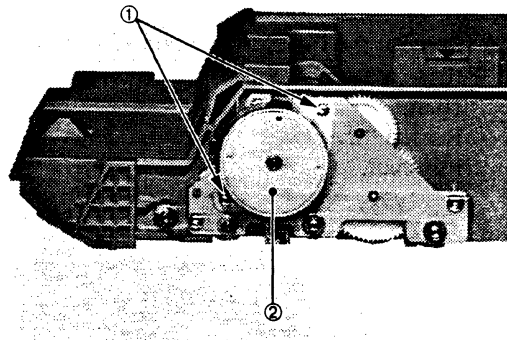
- 1) Remove the right, left, and bottom covers.
- 2) Disconnect the two connectors and remove the screw.



① Connectors ② Screw

Figure 3-64

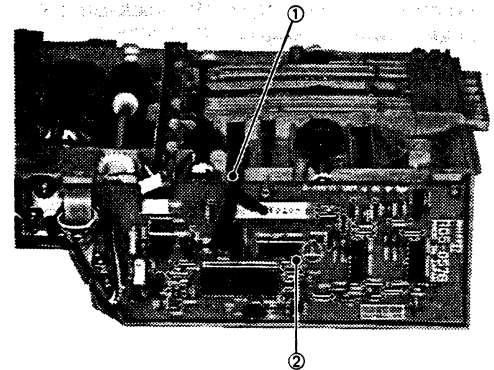
- 3) Remove the two screws, and then the pick-up motor.



① Screws ② Pick-up motor

Figure 3-63

- 3) Remove the sensor lever, and the the envelope feeder driver PCB.

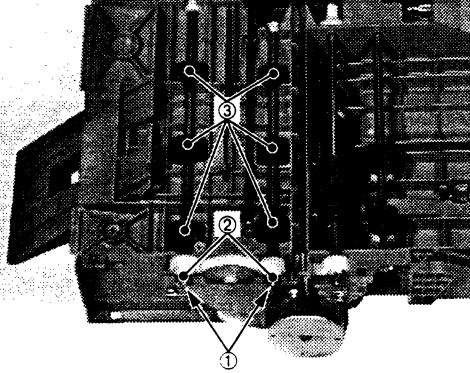


① Sensor lever
② Envelope feeder driver PCB

Figure 3-65

4. Removing the envelope feeder pick-up roller

- 1) Remove the right, left, and bottom covers.
- 2) Remove the two E-rings and two bushings, then remove the pick-up roller shaft.



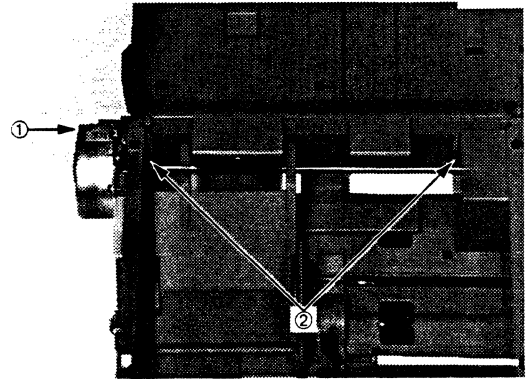
- ① E-rings ② Bushings
 ③ Pick-up rollers

Figure 3-66

- 3) Remove the gear from the pick-up roller shaft. Release the pick-up roller hooks holding the shaft and remove the pick-up rollers.

5. Removing the lower separation roller, upper separation roller, and torque limiter

- 1) Remove the right, left, and bottom covers.
- 2) Remove the screw holding the ground wire. Release the right and left snaps with a flat-blade screwdriver, then remove the upper cover.



- ① Screw ② Snaps

Figure 3-67

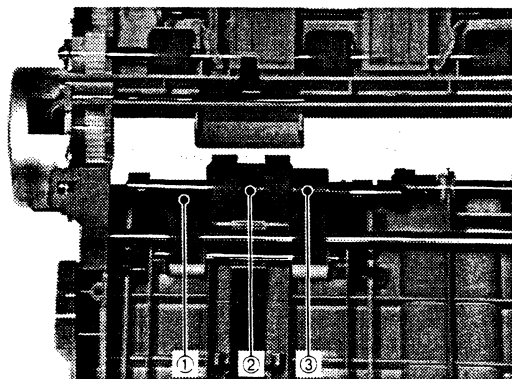
- 3) Remove the two E-rings and two bushings, then remove the lower separation roller shaft. Remove the lower separation roller from the shaft.



- ① E-rings ② Bushings
 ③ Lower separation roller

Figure 3-68

- 4) Remove the separation roller shaft from the guide. Remove the upper separation roller and torque limiter from the shaft.



- ① Guide
- ② Upper separation roller
- ③ Torque limiter

Figure 3-69

Notes: 1: Remove the separation guide and the upper cover as a unit. If the separation guide must be removed separately, adjust the position of the guide after reinstallation. (See page 6-9).

2: When assembling install the old-ham joint as shown below.

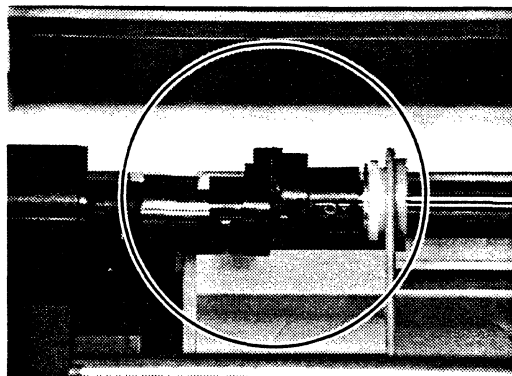
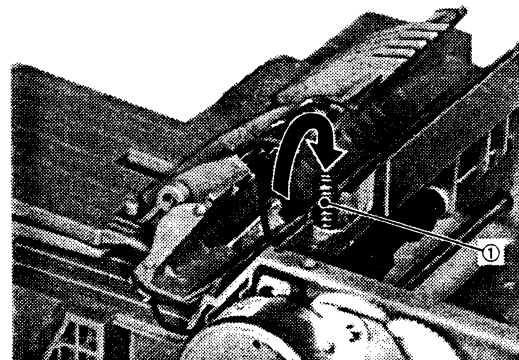


Figure 3-70

- 3:** When assembling, check the separation roller pressure spring has been installed correctly.



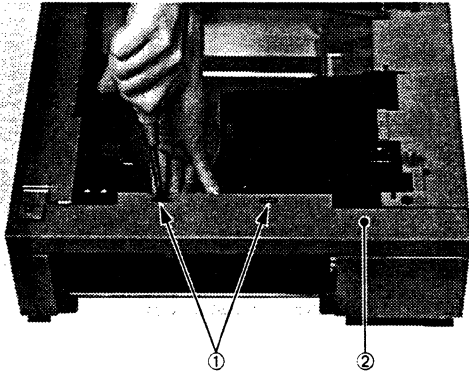
- ① Separation roller pressure spring

Figure 3-71

IX. PAPER FEEDER

1. Removing the drive unit

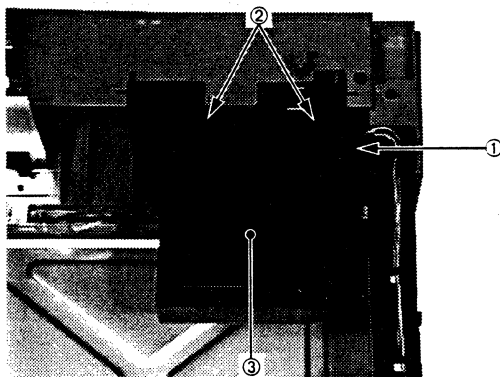
- 1) Release the two claws, and remove the front cover.



① Claws ② Front cover

Figure 3-72

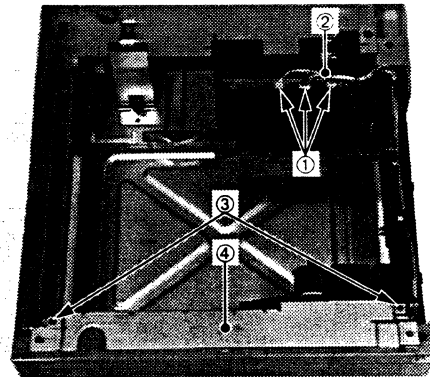
- 2) Remove the screw, release the two claws, and open the PCB cover.



① Screw ② Claws
③ PCB cover

Figure 3-73

- 4) Remove the two screws, and then remove drive unit.



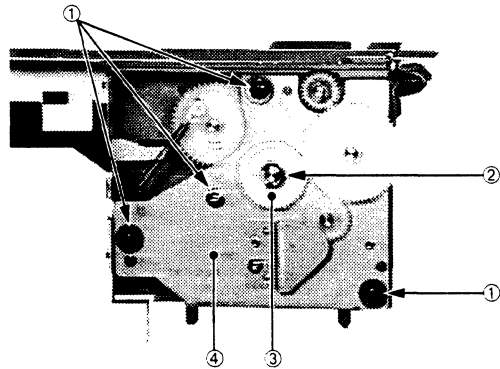
① Connectors ② Cable tie
③ Screws ④ Drive unit

Figure 3-74

- 3) Disconnect the two connectors and remove the cable tie.

2. Removing the paper feeder pick-up motor

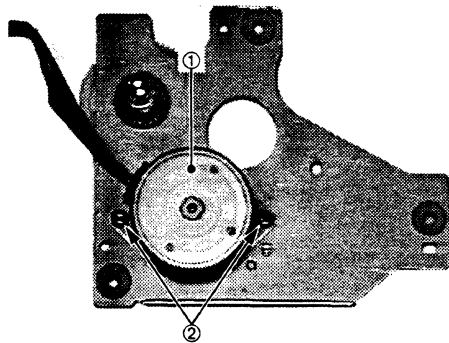
- 1) Remove the drive unit.
- 2) Remove the four screws, the E-ring, the gear, and remove the plate.



- | | |
|----------|----------|
| ① Screws | ② E-ring |
| ③ Gear | ④ Plate |

Figure 3-75

- 3) Remove the two screws, and then the pick-up motor.

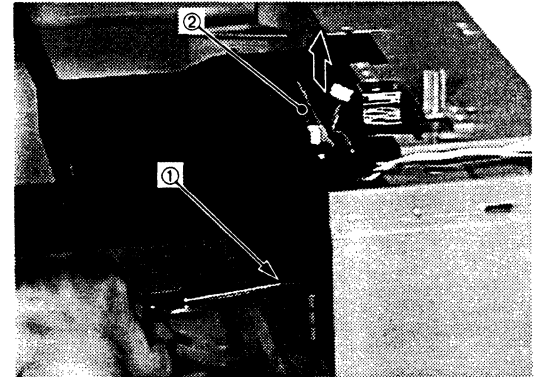


- | | |
|----------|-----------------|
| ① Screws | ② Pick-up motor |
|----------|-----------------|

Figure 3-76

3. Removing the paper feeder driver PCB

- 1) Remove the screw, release the two claws, and open the PCB cover. (See Figure 3-73.)
- 2) Disconnect the three connectors and remove the cable tie.
- 3) Release the claw holding the PCB, then lift the paper feeder driver PCB.

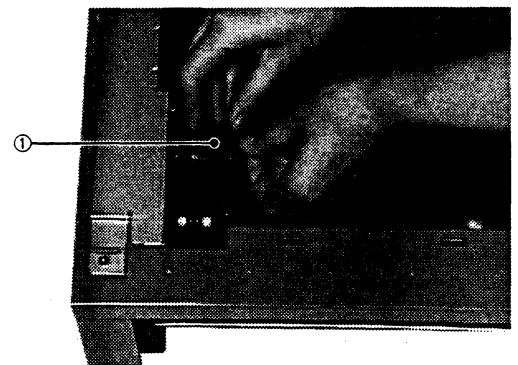


- | |
|---------------------------|
| ① Claw |
| ② Paper feeder driver PCB |

Figure 3-77

4. Removing the paper feeder pick-up roller

- 1) Pull out the pick-up roller by its knob.



- | |
|------------------|
| ① Pick-up roller |
|------------------|

Figure 3-78

CHAPTER 4

INSTALLATION

This printer was carefully adjusted and strictly inspected before being packed. This makes sure that it works as intended, it must be installed correctly. The service engineer must choose a suitable location, install the printer according to the proper procedures, then fully check the printer before it is used. This requires a thorough understanding of the printer.

I. CHOOSING A LOCATION	4-1
II. UNPACKING AND INSTALLATION	4-2

III. STORAGE AND HANDLING OF CARTRIDGES	4-6
--	-----

I. CHOOSING A LOCATION

Make sure the requirements below are met when installing the printer. The service engineer should inspect the place the printer will go before delivery.

1. Power supply

- Line voltage: No more than $\pm 10\%$ outside the rated voltage
- Line frequency: $50/60 \pm 2$ Hz

2. Operating conditions

- Flat level, supporting surface
- Ambient temperature of 10 to 32.5°C
- Humidity of 20 to 80% RH
- No condensation
- Good ventilation

Do not install the printer in these places:

- In the sun
If the printer must go somewhere sunny, the windows must have curtains keep to the sun off.
- Near magnets or equipment that produces a magnetic field
- Where there is vibration
- Where it is dusty
- Near flames or water

3. Installation space

There must be an enough space around the printer to operate it. (See Figure 4-1) The printer must go on a desk or other level surface large enough to accommodate its feet (and those of the paper feeder, if used) and sturdy enough to carry its weight .

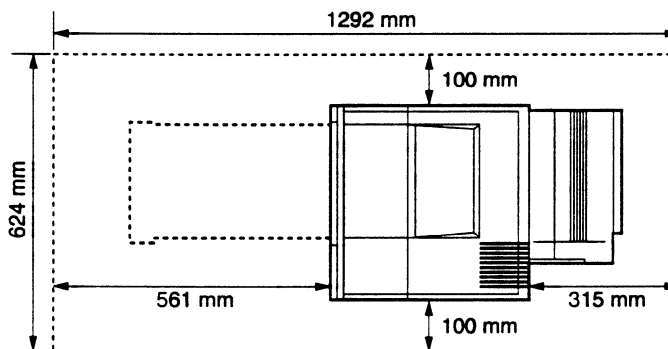


Figure 4-1

II. UNPACKING AND INSTALLATION

If the boxed printer is brought into the warm from a cold storeroom or delivery truck, condensation will form on the printer surfaces. This will cause various problems, such as print defects. To stop this happening, make sure you leave the printer in its box to gradually warm up to room temperature before unpacking it. This will take at least an hour.

1. Unpacking

Step	Action	Check	Remarks
1	Open the box.		
2	Take all the ancillary parts and the documentation out.	Check you have the following: • Power cord • Cartridge	See Figure 4-3.
3	Lift off the styrofoam pads (right and left), then lift the printer out.		See Figure 4-3.
4	Take the printer out of its plastic bag. Peel off the tape holding the various components.	Check that no external damage occurred during transportation.	See Figure 4-3.
5	Open the printer and take the cassette out. Remove the lifting plate retainer from the cassette.		See Figure 4-3.
6	Remove the tape, the protective sheets, and the spacer inside the printer.		See Figure 4-2.
7	Remove the packing material holding the transfer charging roller.		See Figure 4-2.
8	Open the multi-purpose tray and remove the protective sheet.		See Figure 4-3.
9	Open the delivery cover and remove the sheet and the spacer. Push the metal levers on both sides of the fixing unit down.		See Figure 4-3.

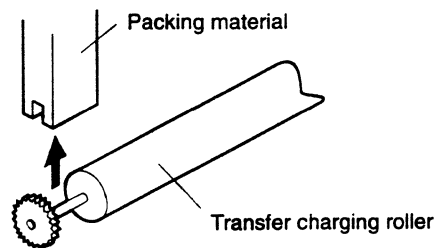
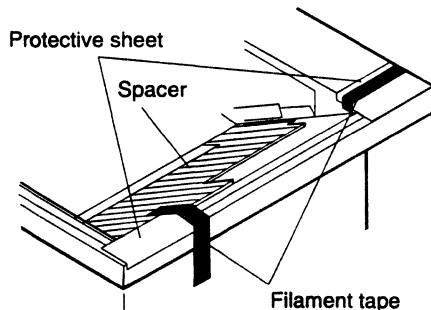


Figure 4-2

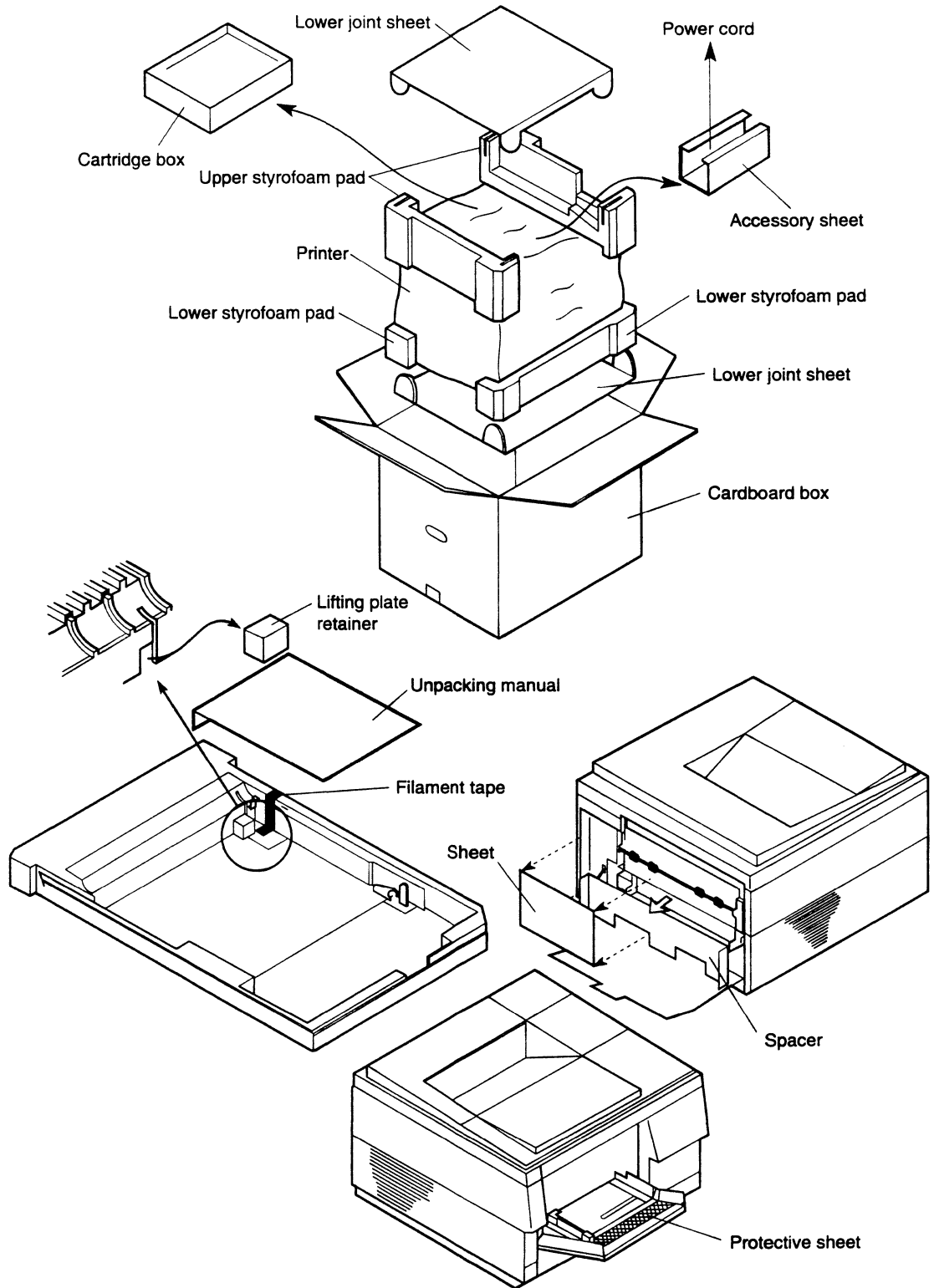


Figure 4-3

2. Unpacking and installing the cartridge

Step	Action	Check	Remarks
1	Open the small box containing the cartridge and take the cartridge out. Take the cartridge out of its aluminum bag.		See Figure 4-4.
2	Hold the cartridge as shown in Fig. 4-5 (page 4-7) and slowly rock it 45° each way, five or six times, to distribute the toner evenly.		See Figure 4-5.
3	Place the cartridge on a level surface, hold its top down with one hand, and pull the tab out with the other hand to remove the sealing tape.		
4	Open the printer, hold the cartridge in both hands, and install it in the printer.		Slowly insert it until it is securely seated at each end.
5	Close the printer.		

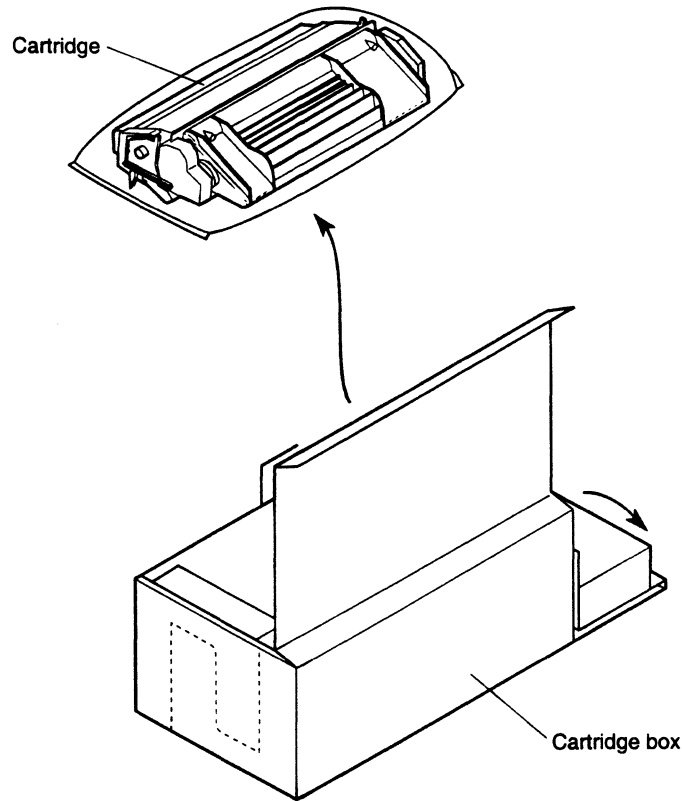


Figure 4-4

3. Operation check

Step	Action	Check	Remarks
1	Load the upper cassette with paper.		
2	Plug the power cord in and switch the printer ON. When the READY /WAIT indicator stops flashing, the printer is standing by; Press the test print switch to run off a test print.	Check that the density of the test print is right.	
3	For safety, keep the area around the printer clear.		

III. STORAGE AND HANDLING OF CARTRIDGES

A cartridge is affected by its storage conditions even if it is sealed in its box, so its life depends on how it is used or stored. Store and handle cartridges carefully.

A. Storage of Sealed Cartridges

When storing cartridges in a warehouse or workshop, maintain the conditions given in Table 4-1. Note the following:

- 1) Keep cartridges out of the sun.
- 2) Do not store cartridges on a surface that vibrates.
- 3) Do not knock or drop cartridge boxes.

Table 4-1 Storage conditions

Temperature	Normal (total storage time × 9/10)		0 to 35°C
	Severe (total storage time × 1/10)	High	35 to 40°C
		Low	-20 to 0°C
Temperature change (within 3 minutes or so)			40°C → 15°C -20°C → 25°C
Relative humidity	Normal (total storage time × 9/10)		35 to 85% RH
	Severe (total storage time × 1/10)	High	85 to 95% RH
		Low	10 to 35% RH
Air pressure			460 to 760 mmHg (0.6 to 1 atm)
Total storage time			2 years 6 months

Note: "Total storage time" in the Table means the cartridge validity period from the date of manufacture. This is part of the cartridge validity data information shown on the cartridge packing.

B. Storage of Unsealed Cartridges

Each cartridge contains a photosensitive drum coated with an organic photoconductor (OPC) that deteriorates when exposed to strong light. The cartridge also contains toner. This makes cartridges delicate item, so tell the customer all about correct storage and handling of cartridges.

1. Storage requirements after unsealing

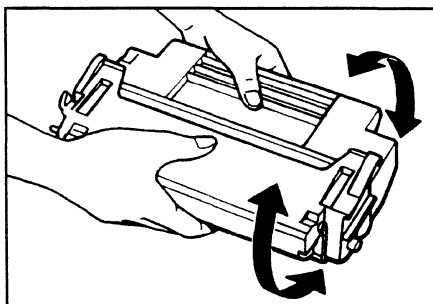
- 1) Store the cartridge in its aluminum bag.
- 2) Avoid places in the sun or near windows. Do not leave a cartridge in a car for a long time, as the inside of the car can get extremely hot. Even if the cartridge is in its box, do not put the box in the sun or leave it in a car for a long time.
- 3) Avoid places that get too hot, too cold, or too humid. Also avoid places where the temperature can change suddenly.
- 4) Avoid places exposed to harmful gases (insecticide, etc.) or salty air.
- 5) Store cartridges in the temperature range 0 to 35°C.
- 6) Keep cartridges away from computer workstation, disk drives, and floppy disks.
- 7) Keep cartridges out of reach of children.

2. Cartridge life

The useful service life of a cartridge is two and a half years from the date of manufacture (printed on the cartridge). The expiry date (date of manufacture plus two and a half years) is given on the cartridge box and the shipping box. A cartridge used after the expiry date will produce prints of reduced quality, so cartridges should be used within their service lives.

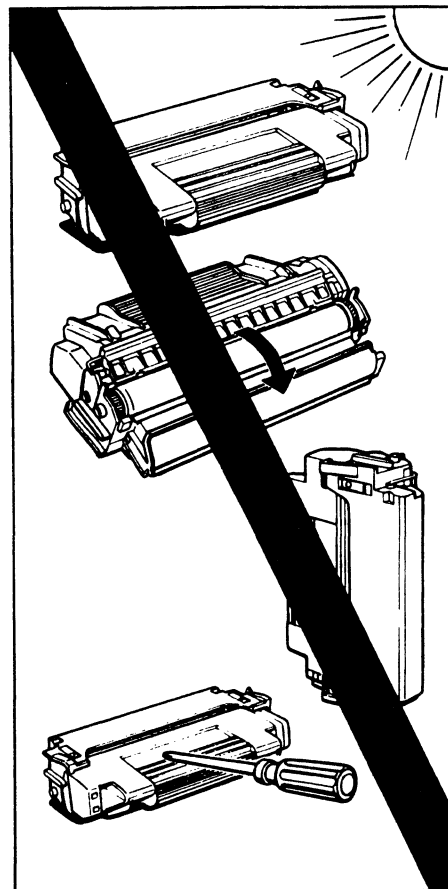
C. Handling Suggestions

- 1) Before installing a new cartridge in the printer (or if blank spots appear on prints during use, because of uneven toner distribution) hold the cartridge horizontally and slowly rock it 45° each way about the drum axis, five or six times, as shown in Figure 4-5. This will distribute the toner evenly. Then install the cartridge in the printer. Using any other method may result in toner leaking from the developing unit or cleaning unit.

**Figure 4-5**

After installing a new cartridge, print three to five test patterns to check for toner leakage.

- 2) Before moving the printer, take the cartridge out, and put it into an aluminum bag or pack it with thick cloth to prevent exposure to light.
- 3) Keep cartridges away from computer workstation, disk drives, and floppy disks. The magnet in the cartridge can corrupt the video data in the memory of the workstation, or the data on disks.

**Figure 4-6**

- 4) Since the photosensitive drum is sensitive to light, never expose it to direct sunlight or strong light (1500 lux or more). If you do, blank spots or black streaks may appear on prints. If this does happen, stop the printer for a while; this will usually solve the problem. If the cartridge is exposed to strong light for a long time, blank spots or black streaks may still appear on prints even after stopping the printer.
- 5) Do not open the protective shield in the bottom of the cartridge and touch the surface of the photosensitive drum. If the drum surface is dirty, clean it with flannel or some other soft cloth liberally sprinkled with toner. Do not use dry cloth, lint-free paper, or solvents.

- 6) Do not turn a cartridge upside down or stand it on end. Always lay it down with its label up.
- 7) Never take a cartridge apart.

Note: If the photosensitive drum gets exposed to normal light of about 1500 lux for about 5 minutes, store the cartridge in a dark place to recover. Direct sunlight is 10,000 to 30,000 lux. Exposing a drum to light this bright will destroy it.

CHAPTER 5

MAINTENANCE AND SERVICING

I. PAPERS REPLACEMENT SCHEDULE	5-1	IV. LIST OF TOOLS	5-2
II. EXPECTED SERVICE LIVES OF CONSUMABLES	5-1	V. LIST OF LUBRICANTS, CLEANERS	5-4
III. PERIODIC SERVICE SCHEDULE	5-1	VI. SERVICE CHECKPOINTS	5-5
		VII. MAINTENANCE BY CUSTOMER	5-7

I. PARTS REPLACEMENT SCHEDULE

None

II. EXPECTED SERVICE LIVES OF CONSUMABLES

The following is a table of consumables which, over the warranty period of the printer, are expected to need replacement once or more because of deterioration or damage. The life of the consumables is expressed in terms of the number of prints processed; replace them when they prove to be faulty.

Table 5-1

As of April 1993

No.	Parts name	Parts No.	Qty	Service life	Remarks
1	Multi-purpose pick-up roller	RB1-2127-000	1	200,000 sheets	Replace the multi-purpose pick-up roller and separation pad together.
2	Separation pad	RF5-0343-000	1	200,000 sheets	
3	Fixing unit	RG5-0454-020	1	200,000 sheets	100-115V
		RG5-0455-020	1	200,000 sheets	220-240V
4	Transfer charging roller	RF5-0349-000	1	200,000 sheets	
5	Cassette pick-up roller	RB1-2126-000	1	200,000 sheets	
6	Exhaust fan	RH7-1143-000	1	25,000 hours	

Note: The values above are estimates only and subject to change based on future data.

III. PERIODIC SERVICE SCHEDULE

None

IV. LISTS OF TOOLS

A. Standard Tools

The standard tools required for servicing the printer are listed below.

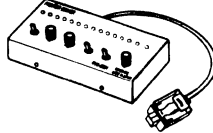
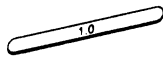
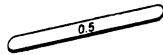
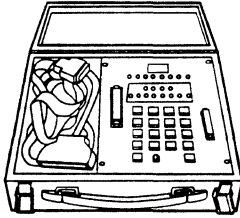
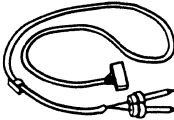
Table 5-2

No.	Tool name	Tool No.	Remarks
1	Tool case	TKN-0001	
2	Jumper wire	TKN-0069	With clips, E-Z hook
3	Thickness gauge	CK-0057	0.02 mm to 0.3 mm
4	Compression spring scale	CK-0058	For checking cassette spring strength (0-600 g)
5	Phillips screwdriver	CK-0101	M4, M5
6	Phillips screwdriver	CK-0104	M3, M4
7	Phillips screwdriver	CK-0105	M4, M5
8	Phillips screwdriver	CK-0106	M4, M5
9	Flat-blade screwdriver	CK-0111	
10	Precision flat-blade screwdriver set	CK-0114	
11	Allen wrench set	CK-0151	
12	File, fine	CK-0161	
13	Allen (hex) screwdriver	CK-0170	M4
14	Diagonal cutting pliers	CK-0201	
15	Needle-nose pliers	CK-0202	
16	Pliers	CK-0203	Slip-joint
17	Retaining ring pliers	CK-0205	For external rings, 19-30 mm
18	Crimper	CK-0218	
19	Tweezers	CK-0302	
20	Ruler	CK-0303	150 mm
21	Soldering iron	CK-0309	100 V, 30 W
22	Mallet, plastic head	CK-0314	
23	Brush	CK-0315	
24	Penlight	CK-0327	
25	Plastic bottle	CK-0328	100cc
26	Solder	CK-0329	ø1.5 (mm) × 1 (m)
27	Desoldering wick	CK-0330	1.5 mm
28	Lint-free paper	CK-0336	500 SH/PKG
29	Soldering iron	CK-0348	240 V, 30 W
30	Oiler	CK-0349	30cc
31	Plastic jar	CK-0351	30cc
32	Digital multimeter	CK-0552	

B. Special Tools

In addition to the standard tools, the following special tools are required for servicing the printer.

Table 5-3

No.	Tool name	Tool No.	Shape	RANK	Application/remarks
1	Printer driver tester	RY9-0091		B	Used for checking the operation of the printer or checking a failure of the laser diode.
2	Thickness gauge	RY9-0088		A	Used for installing the separation guide of the optional envelope feeder.
3	Thickness gauge	QY9-0001		A	
4	Interface signal tester	RY9-0055		C	This printer connects to the printer's interface connector, and sends commands to the printer (video type). Status data that returns from the printer in response to the commands is displayed in the tester's LED. This provides useful information for judging whether the printer is faulty, and allows the site of the fault to be located rapidly. Used for checking the operation of the printer or checking a failure of the laser diode.
5	Adaptor cord for power supply	RY9-0063		C	Used to supply power to the interface signal tester.

Note: Ranks

- A: Each service technician should carry one with him
- B: A group of the service technicians should share one.
- C: Each workshop should keep one.

V. LIST OF LUBRICANTS, CLEANERS

Table 5-4

No.	Material name	Components	Use	Remarks
1	Alcohol: ethyl (pure or denatured) or isopropyl (pure or denatured)	C_2H_5OH , $(CH_3)_2CHOH$	Cleaning: plastic, rubber, external parts	<ul style="list-style-type: none"> • Purchase locally • Flammable: keep away from flame
2	MEK (methyl ethyl ketone)	$CH_3CO-C_2H_5$	Cleaning: oil and toner stains	<ul style="list-style-type: none"> • Purchase locally • Highly flammable: keep away from flame
3	Lubricating oil	ISO VG 68 oil, ESSO Febis K68, MOBIL Vactra oil No. 2, SHELL Tonna oil T68	Apply between gear and shaft	<ul style="list-style-type: none"> • Tool No. CK-0451 (500 g can) • Equivalent oil may be used • Never apply to the molding or the gear at the molding because it has a bad effect on the molding.
4	Lubricating material	Special metallic soap Silicon oil	Apply to gear Can be applied to the molding	<ul style="list-style-type: none"> • Tool No. CK-0551 (20 g tube)

VI. SERVICE CHECKPOINTS

A. Printer

Cartridge

Point	Tool/solvent	Remarks
Photosensitive drum	Toner	Never clean the drum with solvents. Do not touch or clean the drum unless absolutely necessary. Do not expose the drum to light.

Fixing unit

Point	Tool/solvent	Remarks
Separation guide	MEK	Clean the guide. Wipe it softly when removing toner.
Entry guide	MEK	Clean.

Transfer guide

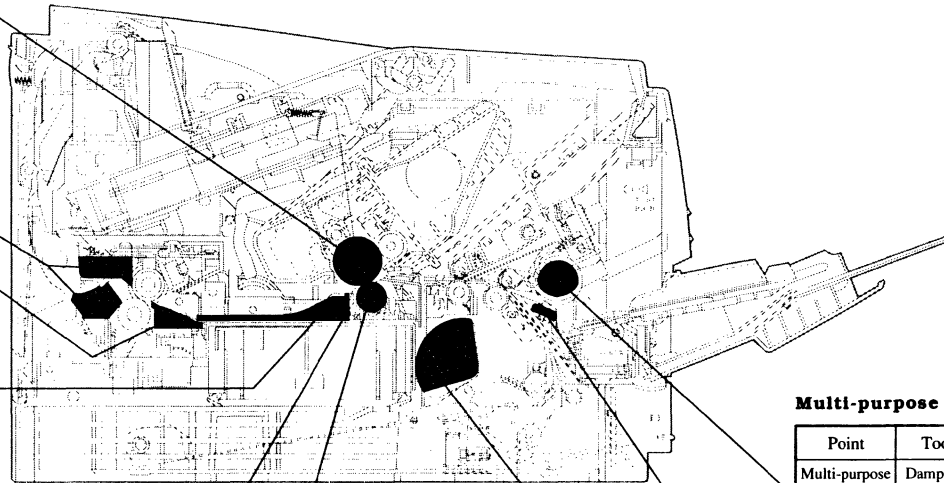
Point	Tool/solvent	Remarks
Transfer guide	Damp cloth	Clean.

Static charge eliminator

Point	Tool/solvent	Remarks
Static charge eliminator	Cleaning brush	Clean.

Transfer charging roller

Point	Tool/solvent	Remarks
Transfer charging roller	Lint-free paper	Clean the roller only if it is very dirty. Do not touch the roller and try not to have any solvents or oil on your hands when cleaning. Never use water or solvents for cleaning



Multi-purpose tray pick-up roller

Point	Tool/solvent	Remarks
Multi-purpose tray pick-up roller	Damp cloth or alcohol	Clean.

Separation pad

Point	Tool/solvent	Remarks
Separation pad	Dry cloth	Clean.

Cassette pick-up roller

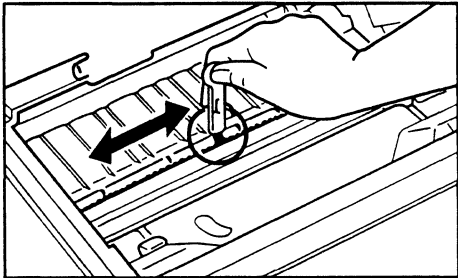
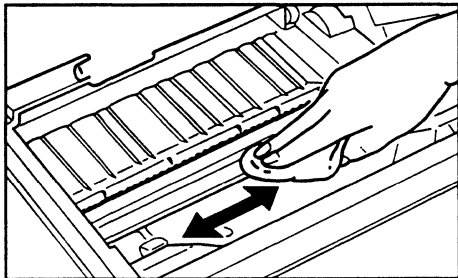
Point	Tool/solvent	Remarks
Cassette pick-up roller	Damp cloth or alcohol	Clean.

Figure 5-1

VII. MAINTENANCE BY CUSTOMER

The customer should do the following maintenance to maximize printer performance.

Table 5-5

Item	Customer maintenance
Cartridge	Rock the cartridge to redistribute toner. If necessary relace it.
Static charge eliminator	<p data-bbox="764 562 1437 621">When replacing the cartridge, clean the static charge eliminator with the green cleaning brush in the printer.</p> 
Transfer guide area	<p data-bbox="764 945 1437 1003">When replacing the cartridge, clean the transfer guide area with the soft dry cloth.</p> 

CHAPTER 6

TROUBLESHOOTING

I. INTRODUCTION.....	6-1	VI. PAPER TRANSPORT	
II. EXPLANATION OF		TROUBLESHOOTING	6-40
SPECIAL TOOL	6-4	VII. LOCATION OF ELECTRICAL	
III. MEASUREMENT AND		PARTS/FUNCTION	6-44
ADJUSTMENT	6-8	VIII. VARIABLE RESISTORS, LEDS,	
IV. IMAGE DEFECTS	6-14	TEST PINS, JUMPERS, AND	
V. TROUBLESHOOTING		SWITCHES ON PC BOARDS.....	6-54
MALFUNCTIONS	6-28		

I. INTRODUCTION

A. Initial Check

1. Operating environment

Check that:

- a. The line voltage does not vary more than 10% from the voltage shown on the rating plate.
- b. The printer is installed on the level.
- c. The room temperature is kept between 10 and 32.5°C, and the relative humidity, between 20 and 80%.
- d. The printer is not exposed to ammonia gas and is not located anywhere hot or humid (for instance, near a water faucet, boiler, or humidifier), near open flames, or anywhere dusty.
- e. The printer is not exposed to direct sunlight. If it has to be put somewhere sunny, the window should be curtained.
- f. The room is well ventilated.

2. Print paper

Check that:

- a. The recommended paper is being used. If the paper is too thick or too thin, or tends to curl, paper jams or transfer problems may occur, or prints may be blurred.
- b. The paper is not damp. Use new print paper and check whether the print quality improves.

3. Consumables

Check whether the toner indicator on the display panel flashes when an EP-E cartridge is installed in the printer. If the indicator flashes, the amount of toner is insufficient; prepare a new cartridge. If blank spots appear on prints, the toner is unevenly distributed in the cartridge. Take the cartridge out and slowly rock it from side to side to distribute the toner evenly as described in Section III of Chapter 4.

4. Other points

During winter, if the printer is brought into a warm room from a cold one (for instance, a warehouse), condensation will occur inside the printer, causing various problems.

For example:

- a. Condensation on optical surfaces (such as the scanning mirror and lenses) will make the print image light.
- b. If the photosensitive drum is stored in a cold area, its electrical resistance will be high, making it impossible to obtain correct print contrast.

If condensation occurs, wipe the assemblies or parts with a dry cloth, or leave the printer ON for 10 to 20 minutes. If an EP-E cartridge is unsealed shortly after being brought into a warm room from a cold one, condensation will also occur inside the cartridge; this may cause image defects.

Be sure to inform the customer they must let the EP-E cartridge adjust to room temperature before unsealing it. This will take an hour or two.

B. Basic Procedure

If an image defect or a malfunction occurs, perform the initial check, then follow the basic procedure below.

1. If the printer malfunctions, read section V on troubleshooting.
2. If an image defect occurs, determine the type of image defect from the list of image defect samples on page 6-14, and correct the defect.

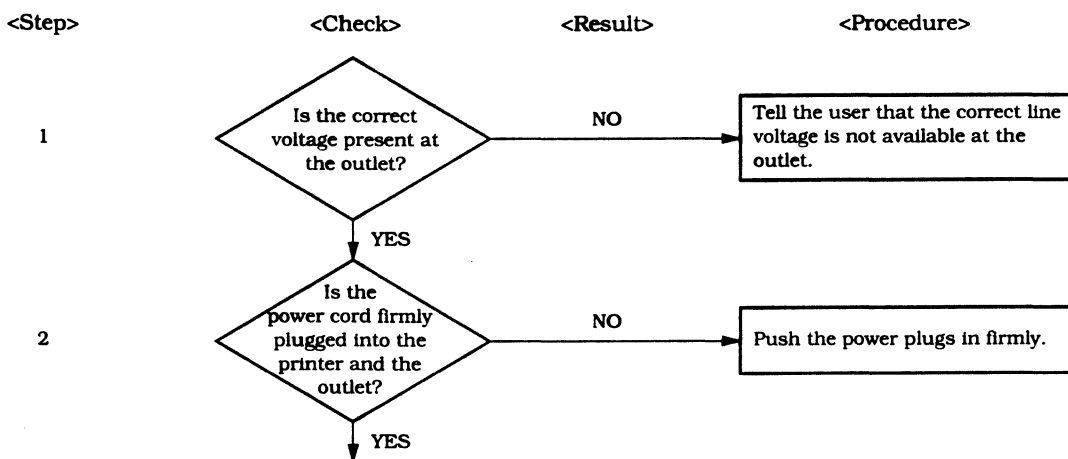
C. How to use the Troubleshooting Tables

The troubleshooting tables in this section have been created from general flowcharts. The way of using these tables is described below, based on the following examples.

Example: No AC Power

Possible cause	Step	Check	Result	Prcocedure
Line voltage	1	Is the correct voltage present at the outlet?	NO	Advise the user that the correct line voltage is not available at the outlet.
Power plug	2	Is the power cord firmly plugged into the printer and the outlet?	NO	Push the power plugs in firmly.

- ◆ To find the possible causes (parts likely to be defective) of a particular fault, refer to the item marked [Possible cause] in the table.
In the case of "No AC Power" in the above table, it is possible that the line voltage or power plug is defective.
- ◆ To repair or check the fault, follow the numbers in the "Step" column and answer the questions in the "Check" column with YES or NO. If the answer agrees with that in the "Result" column, follow the procedure given in the "Procedure" column. If this does not corrected the problem, proceed to the next check.



II. EXPLANATION OF SPECIAL TOOL

A. Printer Driver Tester

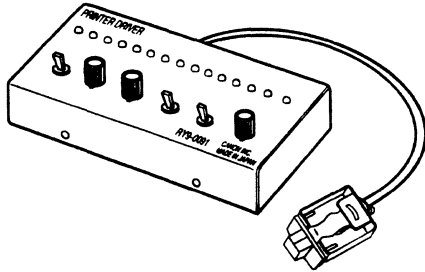


Figure 6-1

1. Outline

The printer driver tester allows the printer to operate without being connected to an interface to determine whether the printer is operating normally.

The tester has the following two functions:

- a. It permits the printer to print a black image, horizontal or vertical lines, or a white image to being determine whether the trouble is caused by the printer or by the video controller (external device).
- b. It operates the laser in the printer. Measure the output voltage (APCIN signal), which is proportional to the intensity of the laser beam, with a digital multimeter and confirm that the output voltage is within the stipulated range.

2. Description of control panel

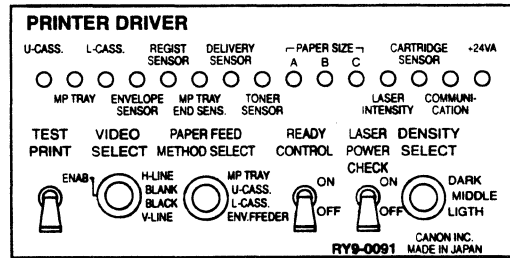


Figure 6-2

TEST PRINT

Permits the printer to print the pattern specified by VIDEO SELECT.

VIDEO SELECT

Selects the test pattern to be printed: black image, vertical lines, horizontal lines, or a white image.

PAPER FEED METHOD SELECT

Picks up the paper or the envelope from one of the following:

- Upper cassette
- Multi-purpose tray
- Lower cassette (cassette feeder)
- Envelope feeder

READY CONTROL

ON places the printer in a READY state when the power is ON, even if one of the following conditions is present (the READY INHIBIT mode).

- No cartridge
- No paper
- Paper jam
- BD error

Note: When turning the READY CONTROL switch ON to set the tester to the READY INHIBIT mode, connect the tester to the printer before turning ON the printer switch. To cancel this mode, disconnect the tester and then turn the printer switch OFF/ON. Connecting the tester with its READY CONTROL switch ON to the on-line printer causes the printer to enter the READY INHIBIT mode.

which continues even when the tester is disconnected.
This mode continues until the printer is turned OFF.

LASER POWER CHECK

Permits the laser diode to emit light.

Note: Do not set the LASER POWER CHECK switch to ON while the printer is operating, otherwise the back of the print paper will become dirty.

DENSITY SELECT

Adjusts the image density.

U-CASS. (LED)

Lights if there is paper in the upper cassette.

MP TRAY (LED)

Lights if there is paper on the multi-purpose tray.

L-CASS. (LED)

Lights if there is paper in the lower cassette.

ENVELOPE SENSOR (LED)

Lights if there is an envelope in the envelope feeder.

REGIST SENSOR (LED)

Lights when paper is at the regist paper sensor.

MP TRAY END SENS. (LED)

Lights when paper is at the MP tray paper end sensor.

DELIVERY SENSOR (LED)

Lights when paper is at the paper delivery sensor.

TONER SENSOR (LED)

Lights if there is toner in the cartridge when the primary AC bias is being output.

PAPER SIZE (LED)

Indicates the paper size of the cassette in the paper pick-up unit specified by the PAPER FEED METHOD SELECT switch.

Table 6-1

	A	B	C
No paper	ON	ON	ON
Executive	OFF	OFF	ON
B5	ON	OFF	ON
Legal	ON	OFF	OFF
A4	OFF	ON	ON
Letter	OFF	ON	OFF

LASER INTENSITY (LED)

Lights if the intensity of the laser beam is insufficient.

CARTRIDGE SENSOR (LED)

Lights if there is a cartridge in the printer when the primary AC bias is output.

COMMUNICATION (LED)

Flashes twice a second when the tester communicates with the printer.

+24VA (LED)

Lights when +24 VA is supplied to the tester.

3. List of signals

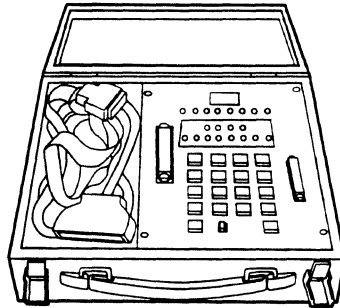
Table 6-2

Connector contact No.	Signal name	Function
J1-1	+24VA	+24VA
J1-2	OUT	Serial line (output)
J1-3	IN	Serial line (input)
J1-4	GND	GND

4. Procedure

- 1) Set the printer power switch to OFF.
- 2) Attach the tester connector to the connector (J135) for the paper feeder or the connector (J136) for the envelope feeder.
- 3) Set the printer power switch to ON.
- 4) When the printer goes into stand-by, operate the tester to perform the check.

Note: If your body is electrically charged when you operate the printer driver tester, printer misoperation or malfunction may occur. So, be sure to touch a metal part of the printer with your hand to discharge the static electricity on your body before operating the tester.

B. Interface Signal Tester**Figure 6-3**

The tester comes with an interface cable for connection to a video type printer (designed to accommodate an external video controller; LBP-EX). Once connected to the printer, the tester allows checks on the printer; the tester sends a command, and the printer responds to it by way of a status signal.

See the user's guide for details of the tester.

III. MEASUREMENT AND ADJUSTMENT

A. Image Adjustment

If an image problem occurs, follow the procedure below to perform a test print.

- 1) Switch the power ON.
- 2) When the printer is ready, press the TEST PRINT switch.
This makes one test print as shown in the figure below.

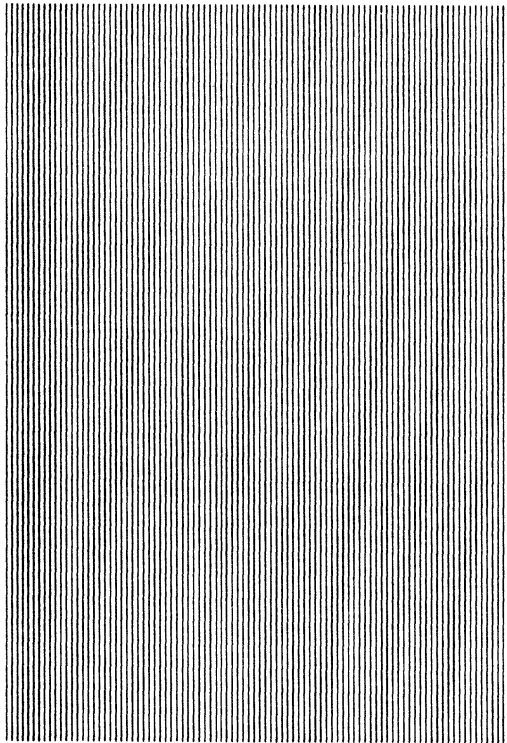


Figure 6-4

- 3) Determine the type of image problem from the test print, then proceed to Section IV.

B. Mechanical Adjustment

1. Checking the nip width of the lower fixing roller

The fixing unit does not allow adjustment of the pressure (nip width). If the nip width is set incorrectly, a fixing problem may occur.

Follow the procedure below to check the nip width.

- 1) Either take along one or two A4/letter-size all-black copies made on copier, or make such a copy using a copier at the customer site.
- 2) Put the all-black copy on the multi-purpose tray.
- 3) Press the TEST PRINT switch.
- 4) When the leading edge of the print emerges at the face-down tray, switch the printer OFF, wait for about 10 seconds, then switch the printer ON again.
- 5) Measure the width of the glossy band across the print (Measure 15 mm from the leading edge of the paper.), and check that it meets the requirements shown in the table below.

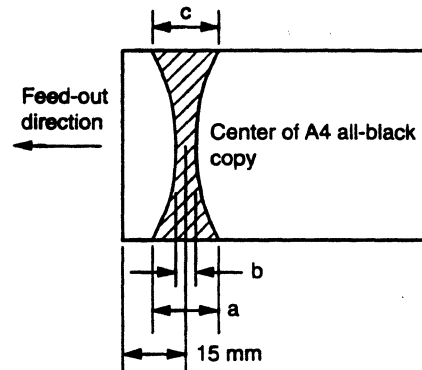


Figure 6-5

Table 6-3

	Measurement
a, c	2.0 - 4.0 mm
b	1.5 - 2.7 mm

2. Installing the separation guide (Adjusting the gap between the separation guide and the lower separation roller)

Under normal conditions, remove the separation guide along with the upper cover. If you removed just the separation guide or replaced a bent separation guide, adjust the gap as follows.

Install the separation guide at the position 1.5mm away from the lower separation roller. Adjust its position by inserting the thickness gauges (1mm and 0.5mm) into the gap between the separation guide and the lower separation roller.

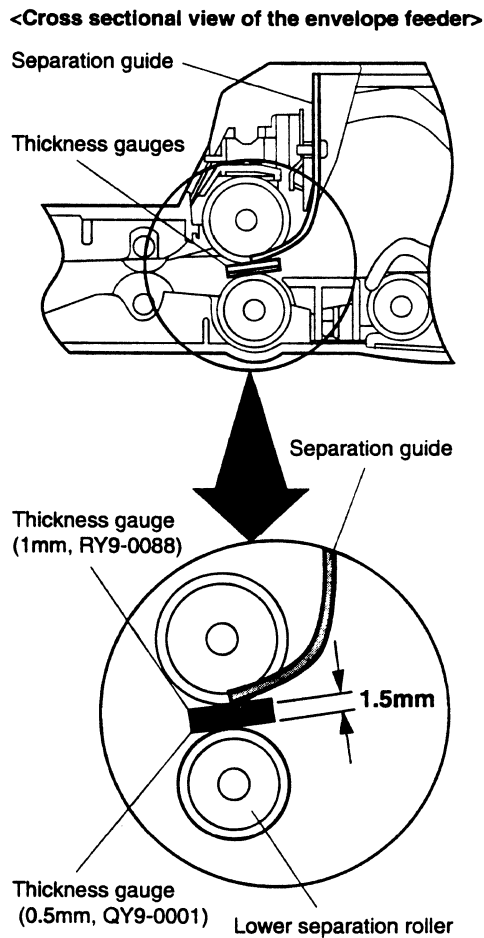


Figure 6-6

C. Electrical Adjustment

1. Leading edge registration adjustment

VR202 on the DC controller PCB has been adjusted at the factory. Therefore, it does not require adjustment in the field during installation. However, when the DC controller PCB is replaced, the leading edge registration must be readjusted by using the following procedure. (If you replace the paper pick-up unit or the laser/scanner unit, make several test prints and check the leading edge registration is 2.0 mm. If it is not, adjust it.)

- 1) Perform steps 1 and 5 on page 3-18, and replace the DC controller PCB.
- 2) Set VR202 PCB on the DC controller to ± 0 , then place sheets in the cassette. Press the TEST PRINT switch and obtain several test prints.
- 3) Measure the distance (a) from the leading edge of each sheet to the pattern. (See Figure 6-7) Take the average of the measured distances.
- 4) Adjust VR202 so that the value obtained in step 3 is 2.0 mm according to Table 6-4. For example, if the average value in step 3 is 2.6 mm, the difference is 0.6 mm. Set VR202 to +2 by turning it clockwise. (See the table 6-4 and figure 6-8.)
- 5) Obtain several prints again. Perform step 3 again and confirm that the leading edge registration is 2.0 mm. If it is not, perform steps 2 to 5 again.

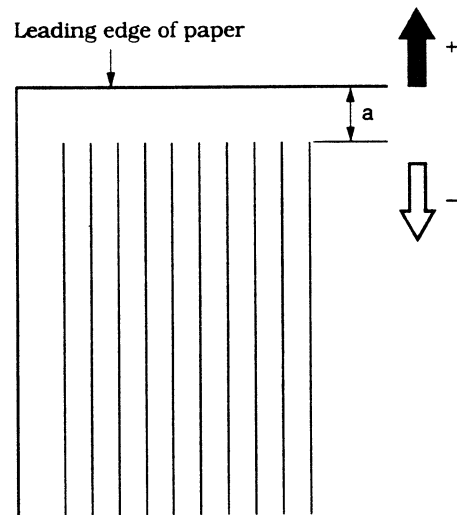


Figure 6-7

Table 6-4

VR202 position	Correction distance (mm)	VR202 reading	Correction distance (mm)
+10	+3.02	(-1)	-0.30
(+9)	+2.71	-2	-0.60
+8	+2.41	(-3)	-0.90
(+7)	+2.11	-4	-1.21
+6	+1.81	(-5)	-1.51
(+5)	+1.51	-6	-1.81
+4	+1.21	(-7)	-2.11
(+3)	+0.90	-8	-2.41
+2	+0.60	(-9)	-2.71
(+1)	+0.30	-10	-3.02
± 0	± 0		

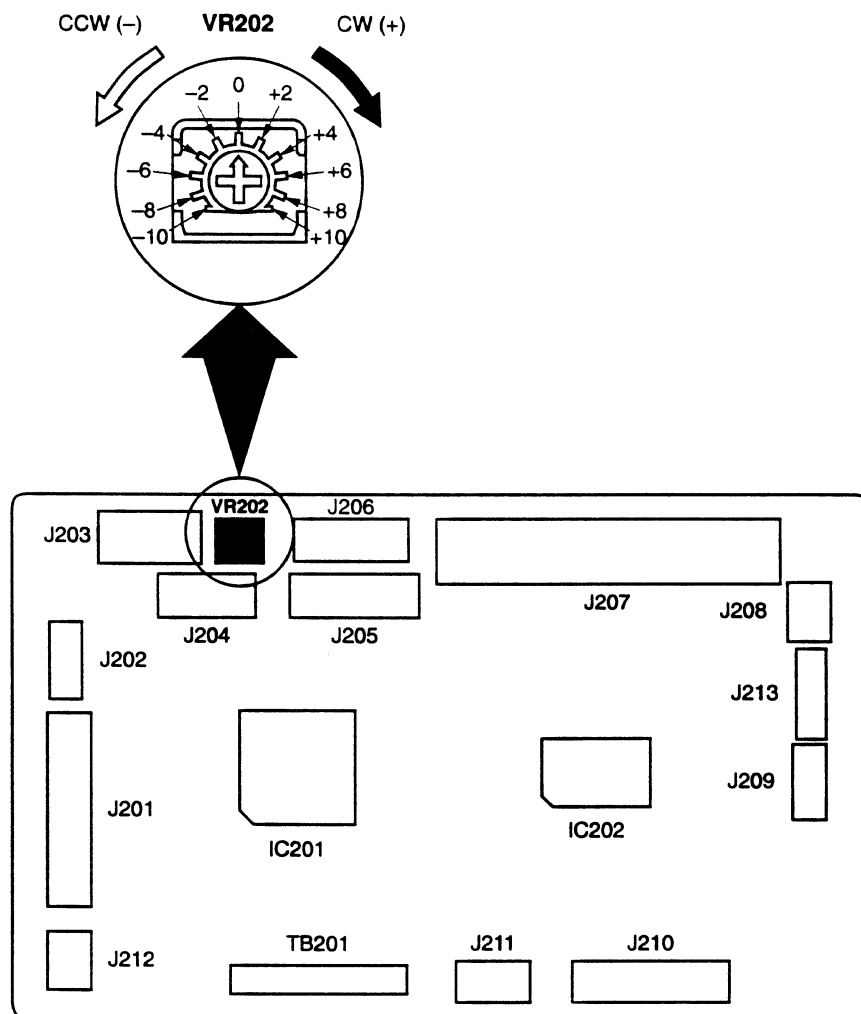


Figure 6-8

◆ **Laser malfunction diagnosis flowchart**

The laser beam is invisible. When a problem in the laser output occurs, use the laser diagnosis flowchart to determine whether the malfunction was caused with the laser/scanner unit or the DC controller PCB.

Notes for the flowchart

1. The following abbreviations are used in the flowchart.
 - a. Printer driver tester →→→ Driver tester
 - b. Digital multimeter →→→ Meter
 - c. EP-E cartridge →→→ Cartridge
2. The printer driver tester switches marked with "x" can be set to any position.
3. The voltage must be measured three times, and the average taken.

Before using the flowchart

1. Set the printer power switch to OFF and remove the cartridge.
2. Attach the driver tester connector to the envelope feeder connector (J136).
3. Set the driver tester switches as follows:
TEST PRINT **NOT ENAB**
VIDEO SELECT ×
PAPER FEED METHOD SELECT ×
READY CONTROL **INH**
4. Check by using the flowchart on the next page.

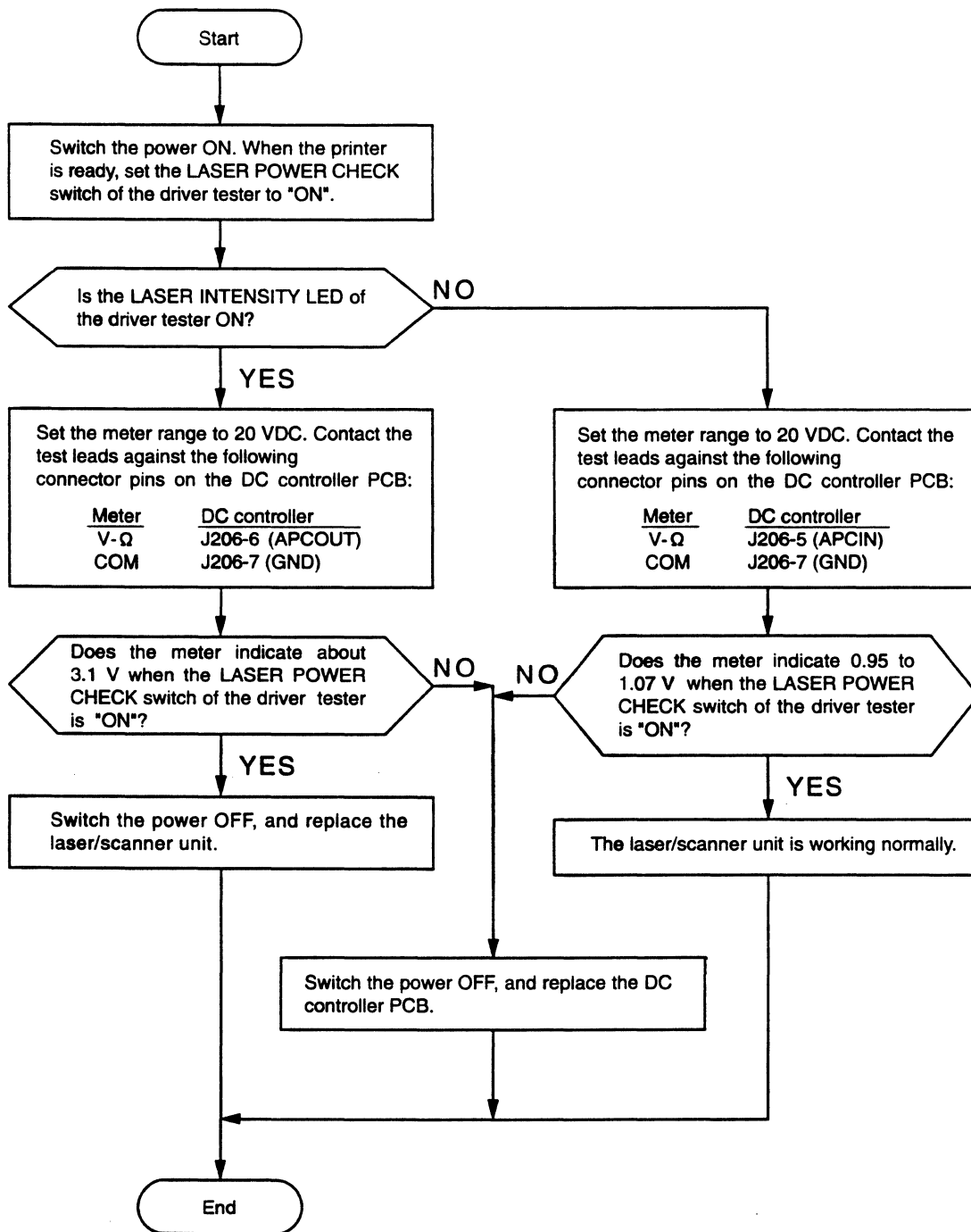


Figure 6-9

IV. IMAGE DEFECTS

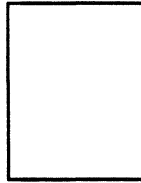
A. Examples of Image Defects



I-1 Light



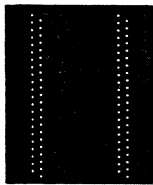
I-2 Dark



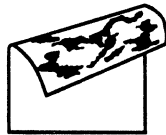
I-3 Completely blank



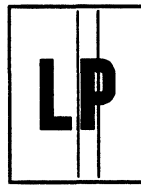
I-4 All black



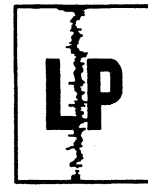
I-5 Large dots vertically in line



I-6 Dirt on back of paper



I-7 Vertical black streaks



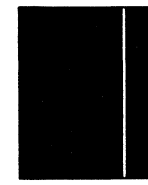
I-8 Irregular and smudged vertical bands



I-9 Irregular and smudged horizontal bands



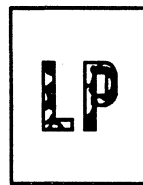
I-10 Blank spots



I-11 Solid vertical white lines



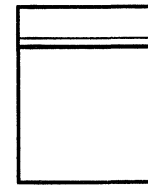
I-12 Faulty registration



I-13 Poor fixing



I-14 Distortion

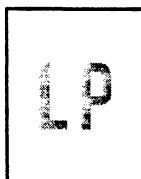


I-15 Missing BD signal

Figure 6-10

B. Troubleshooting Image Defects

I - 1 Light



Possible cause	Step	Check	Result	Procedure
	1	Does the print quality improve when the image density is adjusted?	YES	Adjust the image density using the external device.
Lack of toner	2	Does the print quality improve when the EP-E cartridge is replaced?	YES	Replace the cartridge.
	3	Open the printer while a print is being made, and open the drum protective shield of the EP-E cartridge. Is the toner image on the drum being transferred to the paper? (Do not open the drum protective shield for more than 10 seconds.)	YES	If the toner image is very faint, go to step 7.
Print paper	4	Does the print quality improve when new paper is used?	YES	Replace the print paper. Advise the customer of the proper method to store paper.
Transfer charging roller	5	Does the image become darker when the transfer charging roller is replaced?	YES	Replace the roller.
High-voltage power supply PCB (transfer voltage)	6	Perform a test print. About two seconds after the main motor starts, does the voltage between J210-9 (SLO2) and J210-10 (GND) on the DC controller PCB become about 0.76 VDC?	YES	Check the continuity between the high-voltage contact and the shaft of the transfer charging roller. If it is within the proper value, replace the high-voltage power supply PCB.
DC controller PCB			NO	Replace the DC controller PCB.

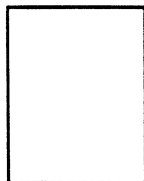
Possible cause	Step	Check	Result	Procedure
High-voltage power supply PCB (Developing bias)	7	Perform a test print. About five seconds after the main motor starts, does the voltage between J210-9 (SLO2) and J210-10 (GND) on the DC controller PCB become about 0.76 VDC?	YES	Check whether the high-voltage contact is making good contact with the developing bias contact of the cartridge. If it is, replace the high-voltage power supply PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.
DC controller PCB			NO	Replace the DC controller PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.

I - 2	Dark
-------	------



Possible cause	Step	Check	Result	Procedure
	1	Does the print quality improve when the image density is adjusted?	YES	Adjust the image density from the external device.
High-voltage contact	2	Clean the printer drum grounding contact and cartridge contact, then perform one test print. Does the print density improve?	YES	Clean the contacts so they make proper contact.
High-voltage power supply PCB (Primary high voltage)	3	About one second after the main motor starts, does the voltage between J210-6 (HVRST) and J210-10 (GND) on the DC controller PCB change from 0 V to about 5 VDC?	YES	Check whether the high-voltage contact is making good contact with the primary charging roller of the cartridge. If it is, replace the high-voltage power supply PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.
DC controller PCB			NO	Replace the DC controller PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.

I - 3	Completely blank
--------------	-------------------------



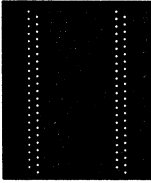
Possible cause	Step	Check	Result	Procedure
DC controller PCB	1	About one second after the main motor starts, does the voltage between J210-6 (HVRST) and J210-10 (GND) on the DC controller PCB change from about 5 VDC to 0 V?	NO	Replace the DC controller PCB.
High-voltage power supply PCB (Developing bias)	2	Perfrom a test print. About five seconds after the main motor starts, does the voltage between J210-9 (SLO2) and J210-10 (GND) on the DC controller PCB become about 0.76 VDC?	YES	Check whether the high-voltage contact is making good contact with the developing bias contact of the cartridge. If it is, replace the high-voltage power supply PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.
DC controller PCB			NO	Replace the DC controller PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.

I - 4	All black
--------------	------------------



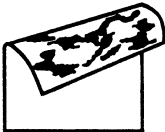
Possible cause	Step	Check	Result	Procedure
EP-E cartridge	1	Does the print quality improve when the cartridge is replaced?	YES	Replace the cartridge.
High-voltage power supply PCB (Primary voltage)	2	Perform a test print. About one second after the main motor starts, does the voltage between J210-9 (SLO2) and J210-10 (GND) on the DC controller PCB become about 0.76 VDC?	YES	Replace the high-voltage power supply PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.
DC controller PCB			NO	Replace the DC controller PCB. If the problem persists after replacing the PCB, check by using the laser malfunction diagnosis flowchart in Section III C.

I - 5 Large dots vertically in line



Possible cause	Step	Check	Result	Procedure
Static charge eliminator	1	Is the static charge eliminator dirty?	YES	Clean the static charge eliminator.
	2	Is the static charge eliminator grounded?	NO	Ground the static charge eliminator properly.
Transfer charging roller	3	Is the transfer charging roller dirty?	YES	Clean the roller. If it is not possible to clean it, replace it.

I - 6 Dirt on back of paper



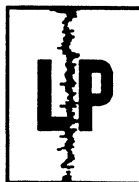
Possible cause	Step	Check	Result	Procedure
Transfer charging roller	1	Is the transfer charging roller dirty?	YES	Clean the roller. If it cannot be cleaned, replace it.
Entrance guide	2	Is the entrance guide dirty?	YES	Clean the guide.
Fixing unit	3	Are the upper and lower fixing rollers grounded via the diode?	NO	Ground the rollers properly.
	4	Is the lower fixing roller dirty?	YES	Clean the roller. If it is not possible to clean it, replace it.
Paper feed guide			NO	Clean the paper feed guide.

I - 7 Vertical black streaks



Possible cause	Step	Check	Result	Procedure
EP-E cartridge	1	Open the upper cover while printing is performed, and open the protective shield of the cartridge. Are vertical black streaks on the drum?	YES	Replace the cartridge.
Fixing unit			NO	Replace the fixing unit.

I - 8 Irregular and smudged vertical bands



Possible cause	Step	Check	Result	Procedure
EP-E cartridge	1	Does the print quality improve when the cartridge is replaced?	YES	Replace the cartridge.

I - 9 Irregular and smudged horizontal bands



Possible cause	Step	Check	Result	Procedure
EP-E cartridge	1	Do the bands appear at regular intervals?	YES	Replace the cartridge.
Fixing unit			NO	Replace the fixing unit.

I - 10 Blank spots



Possible cause	Step	Check	Result	Procedure
Print paper	1	Is the recommended paper being used?	NO	Perform a test print on recommended paper. If the problem disappears, advise the customer to only use the recommended paper.
	2	Is the paper damp?	YES	Replace the paper. Instruct the customer to wrap and store the paper to prevent it from becoming damp.
Transfer charging roller	3	Is the transfer charging roller dirty or deformed?	YES	Replace the roller.
EP-E cartridge	4	Does the print quality improve when the cartridge is replaced?	YES	Replace the cartridge.
High-voltage power supply PCB (Developing bias)	5	Perform a test print. About five seconds after the main motor starts, does the voltage between J210-9 (SLO2) and J210-10 (GND) on the DC controller PCB become about 0.76 VDC?	YES	Check whether the high-voltage contact is making good contact with the developing bias contact of the cartridge. If it is, replace the high-voltage power supply PCB.
DC controller PCB.			NO	Replace the DC controller PCB.

I - 11	Solid vertical white lines
---------------	-----------------------------------



Possible cause	Step	Check	Result	Procedure
Lack of toner	1	Is there one or more straight vertical white streaks of uniform width?	YES	Take out the cartridge, rock it as shown in Section III of Chapter 4 to distribute the toner evenly, then put it back.
EP-E cartridge	2	Open the protective shield of the cartridge. Are vertical white streaks on the drum surface?	YES	Replace the cartridge.
Reflection mirror	3	Is paper dust adhering to the reflection mirror in the laser/scanner unit?	YES	Replace the laser/scanner unit.
Adherence of foreign matter	4	Is any foreign matter, such as a hair, adhering to the laser outlet of the printer or the laser inlet of the cartridge?	YES	Remove the foreign matter.
			NO	Replace the laser/scanner unit.

I - 12 Faulty registration



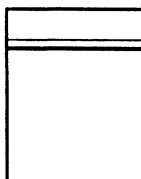
Possible cause	Step	Check	Result	Procedure
Number of sheets	1	Is the multi-purpose tray or the cassette overloaded?	YES	Advise the user not to load the tray or the cassette with excessive amount of paper.
Print paper	2	Is the recommended paper being used?	NO	If the problem disappears, advise the customer to only use the recommended paper.
Paper pick-up roller	3	Is paper dust adhering to the paper pick-up roller.	YES	Clean the roller. If the roller is worn, replace it.
Leading edge registration adjustment	4	Does the registration improve when the registration is adjusted?	YES	End
Regist paper sensor lever Regist paper sensor			NO	Check the sensor lever and sensor. Replace them if defective.

I - 13	Poor fixing
---------------	--------------------



Possible cause	Step	Check	Result	Procedure
Transfer charging roller	1	Is the transfer charging roller dirty?	YES	Clean the roller. If it is not possible to clean, replace it.
Thermistor	2	Obtain ten test prints. Is the last image lighter than the first?	YES	Replace the thermistor.
Fixing rollers (upper and lower)	3	Does poor fixing occur in a vertical band?	YES	Check whether the upper and lower fixing rollers are damaged.
Lower fixing roller	4	Is the lower fixing roller dirty?	YES	Clean the roller. If it is not possible to clean it, replace it.
Print paper	5	Is the nip width correct?	YES	Perform a print using the recommended paper. If the problem disappears, advise the customer to only use the recommended paper.
Fixing unit			NO	Replace the fixing unit.

I - 14	Distortion
I - 15	Missing BD signal



Possible cause	Step	Check	Result	Procedure
Connector	1	Are connectors J205 and J206 on the DC controller PCB making good contact?	NO	Attach the connectors.
	2	Is connector J731 on the BD PCB making good contact?	NO	Attach the connector.
Laser/scanner unit DC controller PCB	3	Check by using the laser malfunction diagnosis flowchart in Section III C of this chapter. Is the laser/scanner unit faulty?	YES	Replace the laser/scanner unit.
			NO	Replace the DC controller PCB.

V. TROUBLESHOOTING MALFUNCTIONS

When performing any of the corrective actions described below, exercise the following precautions:

- ◆ **When measuring voltages at designated connector pins, first check the connector for faulty contacts.**

M - 1	No AC Power
--------------	--------------------

Possible cause	Step	Check	Result	Procedure
Line voltage	1	Is the correct voltage present at the outlet?	NO	Advise the user that the correct line voltage is not available at the outlet.
Power plug	2	Is the power cord securely plugged into the printer and the outlet?	NO	Push the power plugs in firmly.
Circuit breaker	3	Is the circuit breaker OFF?	YES	Remove the power supply, push the circuit breaker, and turn the circuit breaker ON. If the breaker turns OFF again as soon as the power is switched ON, check for a short circuit.
Wiring	4	Pull out the power cord. Measure the resistance between the two terminals of the power switch by contacting the test leads against the terminals. Is the resistance zero when the switch is turned ON, and infinite when it is turned OFF?	YES	Check the AC power line.
Power supply			NO	Replace the power supply.

M - 2 No DC Power

Possible cause	Step	Check	Result	Procedure												
Overcurrent detection circuit	1	Does the problem improve when the power switch is turned OFF, then back ON?	YES	Determine why the over-current detection circuit of the power supply activates.												
AC power	2	Detach connector J102. Turn the power switch ON. Is AC power present between J102-1 and J102-2 of the AC power supply?	NO	Check by following the steps in M-1, "No AC Power".												
Wiring DC load DC controller PCB	3	Turn the power switch OFF, detach connector J103. Turn the power switch ON, and measure the voltage between the terminals shown in the table below. Is the voltage normal?	YES	Check the wiring from the DC controller PCB and DC load. If it is normal, replace the DC controller PCB.												
Power supply			NO	Replace the power supply.												
		<table border="1"> <thead> <tr> <th>Test leads (+)</th> <th>Test leads (-)</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>J103-1</td> <td>J103-4</td> <td>About 5 V</td> </tr> <tr> <td>J103-2</td> <td>J103-5</td> <td>About 5 V</td> </tr> <tr> <td>J103-3</td> <td>J103-6</td> <td>About 24 V</td> </tr> </tbody> </table>	Test leads (+)	Test leads (-)	Voltage	J103-1	J103-4	About 5 V	J103-2	J103-5	About 5 V	J103-3	J103-6	About 24 V		
Test leads (+)	Test leads (-)	Voltage														
J103-1	J103-4	About 5 V														
J103-2	J103-5	About 5 V														
J103-3	J103-6	About 24 V														

M - 3 Display panel LEDs do not light

Possible cause	Step	Check	Result	Procedure
Connectors	1	Are the connectors J204 on the DC controller PCB and J551 on the display panel PCB making good contact?	NO	Reattach the connectors.
Display panel PCB	2	Does the problem improve when you replace the display panel PCB?	YES	Replace the display panel PCB.
DC controller PCB			NO	Replace the DC controller PCB.

M - 4	Printer detects a jam and stops even though a paper jam has not occurred
--------------	---

Possible cause	Step	Check	Result	Procedure
Operation mistake	1	Is the delivery cover open?	YES	Securely close the cover.
/	2		YES	Proceed to step 3.
			NO	Proceed to step 5.
Sensor arm Regist paper sensor	3	Connect the printer driver tester to the printer. Is the REGIST SENSOR LED of the tester ON?	YES	Check whether the regist paper sensor arm is damaged. If it is , replace it; if it is not, replace the regist paper sensor.
Sensor arm Delivery paper sensor	4	Is the DELIVERY SENSOR LED of the tester ON?	YES	Check whether the delivery paper sensor arm is damaged. If it is, replace it; if it is not, replace the delivery paper sensor.
Pick-up motor driver PCB DC controller PCB			NO	Replace the pick-up motor driver PCB. If the problem persists, replace the DC controller PCB.
Sensor arm	5	Is the regist paper sensor arm or delivery paper sensor arm damaged?	YES	Replace the damaged paper sensor arm.
Delivery paper sensor	6	When the delivery paper sensor arm is moved, does the voltage between connectors J208-3 (PSNS) and J208-2 (GND) on the DC controller PCB change from zero to about 5 VDC?	NO	Replace the delivery paper sensor.
Pick-up motor driver PCB DC controller PCB	7	When the regist paper sensor arm is moved, does the voltage between connectors J605-6 (RESS) and J605-5 (GND) on the pick-up motor driver PCB change from about 5 VDC to zero?	YES	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.
Regist paper sensor			NO	Replace the regist paper sensor.

M - 5	PAPER OUT indicator is flashing even though paper is loaded in the selected paper source.
--------------	--

Possible cause	Step	Check	Result	Procedure
/	1	Has the upper cassette been selected?	YES	Proceed to step 5 and subsequent steps.
	2	Has the multi-purpose tray been selected?	YES	Proceed to step 7 and subsequent steps.
	3	Has the lower cassette been selected?	YES	Proceed to step 9 and subsequent steps.
	4	Has the envelope feeder been selected?	YES	Proceed to step 11 and subsequent steps.
Pick-up motor driver PCB (cassette size sensing switch)	5	Connect the printer driver tester to the printer. When the upper cassette size sensing switch is pressed, does the PAPER SIZE LED of the tester light?	NO	Replace the pick-up motor driver PCB.
DC controller PCB	6	When a cassette containing paper is loaded in the printer, does the U-CASS. LED of the tester light?	YES	Replace the DC controller PCB.
Cassette paper sensor			NO	Replace the cassette paper sensor.
/	7	Is the print paper loaded correctly?	NO	Load the paper correctly.
DC controller PCB	8	Connect the printer driver tester to the printer. When paper is put on the multi-purpose tray, does the MP TRAY LED of the tester light?	YES	Replace the DC controller PCB.
Sensor PCB (multi-purpose tray paper sensor)			NO	Replace the sensor PCB.
Paper feeder driver PCB (cassette size sensing switch)	9	Connect the printer driver tester to the printer. When the paper feeder cassette size sensing switch is pressed, does the PAPER SIZE LED of the tester light?	NO	Replace the paper feeder driver PCB.
DC controller PCB	10	When a cassette containing paper is loaded in the printer, does the L-CASS. LED of the tester light?	YES	Replace the DC controller PCB.
Paper feeder driver PCB (paper feeder paper sensor)			NO	Replace the paper feeder driver PCB.
/	11	Are envelopes loaded correctly?	NO	Load the envelopes correctly.
DC controller PCB	12	Connect the printer driver tester to the printer. When an envelope is loaded in to the envelope feeder, does the ENVELOPE SENSOR LED of the tester light?	YES	Replace the DC controller PCB.
Envelope feeder driver PCB (envelope feeder paper sensor)			NO	Replace the envelope feeder driver PCB.

M - 6 TONER indicator does not light properly

Possible cause	Step	Check	Result	Procedure
EP-E cartridge	1	Is the cartridge loaded properly?	NO	Load the cartridge again.
	2	Shake the cartridge following the instructions, and load it in to the printer. Does the message disappear?	YES	The toner is insufficient. Prepare a new cartridge.
High-voltage power supply (high-voltage contacts)	3	Is the toner sensor contact or the developing bias contact of the high-voltage contacts dirty?	YES	Clean the high-voltage contact.
DC controller PCB	4	Turn the printer OFF, connect the printer driver tester, and turn the power back ON. Does the TONER SENSOR LED of the tester light for a while after the power switch is turned ON.	YES	Replace the DC controller PCB.
High-voltage power supply			NO	Replace the high-voltage power supply PCB.

M - 7 Faulty Pick-up Motor

Possible cause	Step	Check	Result	Procedure
Connecters	1	Are the connectors (J601, J602) from connector J201 on the DC controller PCB to connector J701 on the sensor PCB making good contact?	NO	Reattach the connectors.
Sensor PCB	2	Are the connectors J701 and J702 on the sensor PCB properly aligned ?	NO	Replace the sensor PCB.
Pick-up motor	3	Place paper in the upper cassette and perform a test print using the printer driver tester. After the prescribed time, do the voltages between the following pairs of terminals on the pick-up motor driver PCB change from about 24 VDC to about 15 VDC? <ul style="list-style-type: none"> • J701-A1 (PA) and J701-A5 (GND) • J701-B3 (PB) and J701-A5 (GND) 	YES	Replace the pick-up motor.
Pick-up motor driver PCB DC controller PCB			NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.

M - 8 Faulty Paper Feeder Pick-up Motor

Possible cause	Step	Check	Result	Procedure
Connectors	1	Are the connectors (J601, J603, J135, J851) between connector J201 on the DC controller PCB and connector J852 on the paper feeder driver PCB making good contact?	NO	Reconnect the connectors.
Pick-up motor driver PCB DC controller PCB	2	Does the problem improve when the paper feeder is replaced?	NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.
Paper feeder pick-up motor	3	Place some paper in the lower cassette and perform a test print by using the printer driver tester. After the prescribed time, do the voltages between the following pairs of terminals on the paper feeder driver PCB change from about 24 VDC to about 15 VDC? • J852-1 (A) and J851-4 (GND) • J852-3 (B) and J851-4 (GND)	YES	Replace the paper feeder pick-up motor.
Paper feeder driver PCB			NO	Replace the paper feeder driver PCB.

M - 9 Faulty Envelope Feeder Pick-up Motor

Possible cause	Step	Check	Result	Procedure
Connectors	1	Are the connectors (J601, J604, J136, J931) from connector J201 on the DC controller PCB to connector J932 on the envelope feeder driver PCB making good contact?	NO	Reconnect the connectors.
Pick-up motor driver PCB DC controller PCB	2	Does the problem improve when the envelope feeder is replaced?	NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.
Envelope feeder pick-up motor	3	Place some envelopes on the envelope feeder and perform a test print by using the printer driver tester. After the prescribed time, do the voltages between the following pairs of terminals on the envelope feeder driver PCB change from about 24 VDC to about 15 VDC? • J932-1 (A) and J931-4 (GND) • J932-3 (B) and J932-4 (GND)	YES	Replace the envelope feeder pick-up motor.
Envelope feeder driver PCB			NO	Replace the envelope feeder driver PCB.

Note: Before checking the envelope feeder operation, be sure to hold the bottom of the PCB up or tape it to the frame if the right cover is removed.

M - 10 No Paper Pick-up from Upper Cassette

Possible cause	Step	Check	Result	Procedure
Video controller PCB	1	Place some paper in the upper cassette and perform a test print by using the printer driver tester. Is the paper picked up from the cassette?	YES	Replace the video controller PCB.
Pick-up motor	2	Place some paper in the upper cassette and perform a test print by using the printer driver tester. After the prescribed time, does the pick-up motor start running?	NO	Check by following the steps in M-7, "Faulty Pick-up Motor".
Pick-up motor driver PCB DC controller PCB	3	Place some paper in the upper cassette and perform a test print by using the printer driver tester. After the prescribed time, does the voltage between connectors J701-A3 (1ST) and J701-A5 (GND) on the pick-up motor driver PCB change from 0 V to about 1.3 VDC?	NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.
Cassette feed roller clutch solenoid	4	When step 3 is carried out, does the voltage between connectors J704-2 (1STD) and J704-1 (24V) on the sensor PCB change from 0 V to about 24 VDC?	YES	Replace the cassette feed roller clutch solenoid.
Sensor PCB			NO	Replace the sensor PCB.

M - 11	No Paper Pick-up from Multi-purpose Tray
---------------	---

Possible cause	Step	Check	Result	Procedure
Video controller PCB	1	Place some paper on the multi-purpose tray and perform a test print by using the printer driver tester. Is the paper picked up from the tray?	YES	Replace the video controller PCB.
Pick-up motor	2	Place some paper on the multi-purpose tray and perform a test print by using the printer driver tester. After the prescribed time, does the pick-up motor start running?	NO	Check by following the steps in M-7, "Faulty Pick-up Motor".
Pick-up motor driver PCB DC controller PCB	3	Place some paper on the multi-purpose tray and perform a test print by using the printer driver tester. After the prescribed time, does the voltage between connectors J701-A2 (MP) and J701-A5 (GND) on the pick-up motor driver PCB change from 0 V to about 1.3 VDC?	NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.
MP tray pick-up roller clutch solenoid	4	When step 3 is carried out, does the voltage between connectors J702-2 (MPD) and J702-1 (24V) on the sensor PCB change from 0 V to about 24 VDC?	YES	Replace the MP tray pick-up roller clutch solenoid.
Sensor PCB			NO	Replace the sensor PCB.

M - 12 No Paper Pick-up from Lower Cassette

Possible cause	Step	Check	Result	Procedure
Video controller PCB	1	Place some paper in the lower cassette and perform a test print by using the printer driver tester. Is the paper picked up from the cassette?	YES	Replace the video controller PCB.
Pick-up motor driver PCB DC controller PCB	2	Does the problem disappear when the paper feeder is replaced?	NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.
Pick-up motor	3	Place paper in the lower cassette and perform a test print by using the printer driver tester. After the prescribed time, does the paper feeder pick-up motor start running?	NO	Check by following the steps in M-8, "Faulty Paper Feeder Pick-up Motor".
Paper feeder pick-up roller clutch solenoid	4	Place paper in the lower cassette and perform a test print by using the printer driver tester. After the prescribed time, does the voltage between connectors J853-3 (2STD) and J853-1 (24V) on the paper feeder driver PCB change from 0 V to about 24 VDC?	YES	Replace the paper feeder pick-up roller clutch solenoid.
Paper feeder driver PCB			NO	Replace the paper feeder driver PCB.

M - 13 No Envelope Pick-up from Envelope Feeder

Possible cause	Step	Check	Result	Procedure
Envelope	1	Are the envelopes curbed, or made of special paper?	YES	Change the envelopes.
Video controller PCB	2	Place envelope on the envelope feeder and perform a test print by using the printer driver tester. Is the envelope picked up from the feeder?	YES	Replace the video controller PCB.
Pick-up motor driver PCB DC controller PCB	3	Does the problem disappear when the envelope feeder is replaced?	YES	Check according to M-9, "Faulty Envelope Feeder Pick-up Motor".
			NO	Replace the pick-up motor driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB.

M - 14 Poor Output from High-voltage Power Supply

Possible cause	Step	Check	Result	Procedure
High-voltage contact	1	Is any terminal of the high-voltage connector dirty or carbonized?	YES	Clean the terminals of the high-voltage contact.
High-voltage power supply PCB	2	Does the problem improve when the high-voltage power supply PCB is replaced?	YES	Replace the high-voltage power supply PCB.
DC controller PCB Connector PCB			NO	Replace the DC controller PCB. If the problem persists after replacing the PCB, replace the connector PCB.

M - 15 Faulty Exhaust Fan

Possible cause	Step	Check	Result	Procedure
Connector	1	Is connector J209 on the DC controller PCB making good contact?	NO	Reattach the connector.
DC controller PCB	2	Immediately after the power is turned ON, does the voltage between connectors J209-1 (FAND) and J209-3 (GND) on the DC controller PCB change from 0 V to about 24.5 VDC, then to about 16 VDC?	NO	Replace the DC controller PCB.
Exhaust fan	3	When the power is turned ON, is the voltage between connectors J209-2 (FLOCK) and J209-3 (GND) on the DC controller PCB 2.2 VDC or more?	YES	Replace the exhaust fan.
DC controller PCB			NO	Replace the DC controller PCB.

M - 16 Laser Malfunction

Possible cause	Step	Check	Result	Procedure
Laser/scanner unit DC controller PCB	1	_____	_____	Check by using the laser malfunction diagnostic flowchart in Section III C.

M - 17 Fixing Unit Heater Does Not Work (Fixing Unit Malfunction)

Possible cause	Step	Check	Result	Procedure
Connector	1	Are connector J210 on the DC controller PCB and connectors J741 and J743 on the connector PCB making good contact?	NO	Reattach the connectors.
Broken thermistor wire	2	Remove the fixing unit and measure the resistance between connectors J743-6 and J743-7. Is the resistance 180 to 280 kΩ (at room temperature)?	NO	Check the wiring from connector J210 on the DC controller PCB to the thermistor. If wiring is proper, replace the thermistor.
Fixing roller heater thermoswitch	3	Remove the fixing unit. Is there continuity between connector J743-1 and J743-8 on the fixing unit?	NO	Check continuity in the fixing roller heater and thermoswitch individually. Replace any defective parts.
DC controller PCB	4	Open the delivery cover and let the fixing roller cool. Close the cover and switch the power ON. Is the voltage between connectors J212-1 (/FSRD) and TB201-6 (GND) on the DC controller PCB initially about 5.1 VDC, and does it change to about 1.5 VDC as the fixing roller warms up?	NO	Replace the DC controller PCB.
Power supply	5	Switch the power ON. Is the voltage between connectors J212-2 (RLD) and TB201-6 (GND) on the DC controller PCB about 5 VDC?	YES	Replace the power supply.
DC controller PCB			NO	Replace the DC controller PCB.

Note: If the printer detects a fixing unit malfunction, turn the power OFF, and do not switch the power ON for about ten minutes.
 If you switch the power ON within ten minutes, the printer will automatically shut OFF the current to the fixing roller heater to prevent overheating.

M - 18 BD Malfunction

Possible cause	Step	Check	Result	Procedure
EP-E cartridge	1	Is the laser beam shutter open/close boss of the EP-E cartridge damaged?	YES	Replace the cartridge.
Laser/scanner unit DC controller PCB	2	Are connectors J205 and J206 on the DC controller PCB making good contact?	YES	Check by using the laser malfunction diagnostic flowchart in Section III C.
Connector			NO	Reattach the connectors.

M - 19 Scanner Motor Malfunction

Possible cause	Step	Check	Result	Procedure
Connector	1	Is connector J205 on the DC controller PCB making good contact?	NO	Reconnect the connector.
Power supply	2	Does the voltage between connectors J205-6 (24VA) and J205-4 (GND) on the DC controller PCB become about 24 VDC?	NO	Check whether +24 VDC is present between connectors TB201-3 (24VA) and TB201-6 (GND) on the DC controller PCB. If it is not, replace the power supply.
Laser/scanner unit	3	Perform a test print. Does the voltage between connectors J205-7 (/SCNON) and J205-4 (GND) on the DC controller PCB change from about 5 VDC to 0 V?	YES	Replace the laser/scanner unit.
DC controller PCB			NO	Replace the DC controller PCB.

M - 20 Main Motor Malfunction

Possible cause	Step	Check	Result	Procedure
Connecters	1	Are connector J211 on the DC controller PCB and connector J131 of the main motor making good contact?	NO	Reconnect the connectors.
Main motor	2	Perform a test print. Does the voltage between connectors J211-2 (/MON) and J211-3 (GND) change from about 5 VDC to 0 V?	YES	Replace the main motor.
DC controller PCB			NO	Replace the DC controller PCB.

VI. PAPER TRANSPORT TROUBLESHOOTING

A. Print Paper Jams

Paper passes through two major sections in the printer: (1) the pick-up section and (2) the fixing and delivery section. The following explains how to troubleshoot jams in each of these sections.

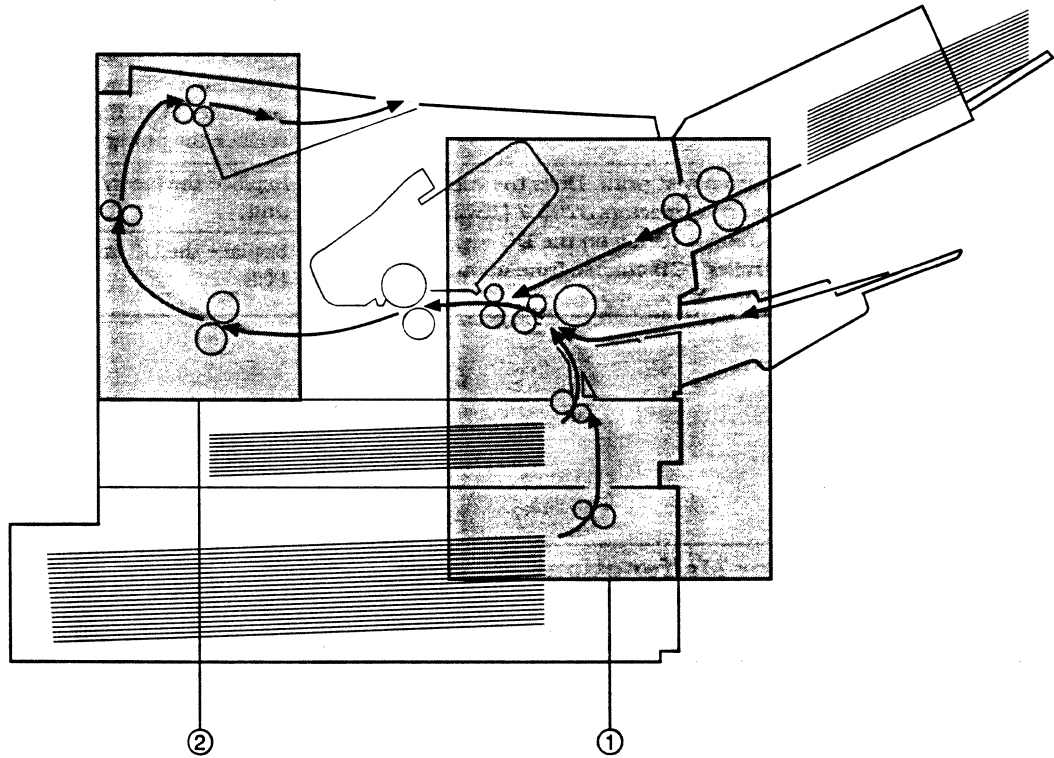


Figure 6-11

- 1: Pick-up section
- 2: Fixing and delivery section

T - 1	Pick-up section
--------------	------------------------

Possible cause	Step	Check	Result	Procedure
Print paper	1	Is the recommended paper being used?	NO	Advise the user to only use the recommended paper.
	2	Is the paper curled or wrinkled?	YES	Replace the paper. Advise the customer on how to store the paper.
/	3	Does this problem occur with the cassette feed?	YES	Proceed to step 8.
/	4	Does this problem occur when feeding from the envelope feeder?	YES	Proceed to step 13.
Print paper loaded incorrectly on the multi-purpose tray	5	Does the left leading edge of the print paper touching the end of the multi-purpose tray?	NO	Load the paper correctly into the multi-purpose tray.
Too much paper on the multi-purpose tray	6	Is the multi-purpose tray overloaded?	YES	Advise the user not to load the excessive amount of paper.
Pick-up roller Pick-up failure	7	Does the pick-up roller rotate when printing is performed?	YES	Replace the roller.
			NO	Check by following the steps in M-11, "No Paper Pick-up from Multi-purpose Tray".
Cassette	8	Is the cassette positioned correctly in the printer or the paper feeder?	NO	Position the cassette correctly.
Paper loaded incorrectly in the cassette	9	Is the paper touching the cassette hook properly?	NO	Load the paper correctly.
Paper	10	Is the paper folded?	YES	Replace the paper.
Too much paper in cassette	11	Is the cassette overloaded?	YES	Advise the user not to load the excessive amount of paper.
Cassette pick-up rollers	12	Are the cassette pick-up rollers worn or deformed?	YES	Replace the rollers.
Pick-up failure			NO	Check by following the steps in M-10 "No Paper Pick-up from Upper Cassette", or in M-12, "No Paper Pick-up from Lower Cassette".

Possible cause	Step	Check	Result	Procedure
Envelope	13	Are the proper envelopes being used in the envelope feeder ?	NO	Advise the user to only use the recommended envelopes.
Number of envelopes	14	Are there too many envelopes in the envelope feeder ?	YES	Advise the user not to load number of envelopes.
Envelope guide	15	Is the envelope guide exerting excess pressure on the envelopes?	YES	Inform the customer not to set the envelope guide too tightly against the envelopes.
Pick-up roller Separation roller	16	Are any rollers worn or deformed?	YES	Replace defective rollers.
Pick-up error			NO	Check in the same manner as for M-13 "No Envelope Pick-Up from Envelope Feeder".

T - 2	Fixing and delivery section
--------------	------------------------------------

Possible cause	Step	Check	Result	Procedure
Entrance guide	1	Is the entrance guide dirty? Is the guide damaged or is there toner on it?	YES	Clean the guide.
Delivery guide	2	Is the delivery guide dirty? Is the guide damaged or is there toner on it?	YES	Clean the guide.
Lower fixing roller	3	Is the lower fixing roller dirty?	YES	Clean the roller.
Paper sensor arm	4	Does the sensor arm (fixing unit side, printer side) move smoothly?	YES	Check the movement of the delivery roller.
Delivery roller			NO	Adjust the roller to move smoothly.

B. Incomplete Paper Feed

T - 1	Sheets stuck together
--------------	------------------------------

Possible cause	Step	Check	Result	Procedure
Paper	1	Is the recommended paper being used?	NO	Advise the user to only use the recommended paper.
Separation pad	2	Is the surface of the separation pad worn?	YES	Replace the separation pad.
Cassette	3	Is the paper positioned correctly under the hold-down tabs?	YES	Check whether the hold-down tabs are bent.
			NO	Load paper correctly.

T - 2	Wrinkles
--------------	-----------------

Possible cause	Step	Check	Result	Procedure
Print paper	1	Is the recommended paper being used?	NO	Advise the user to only use the recommended paper.
	2	Does the paper stop becoming wrinkled when new paper is used?	YES	Advise the customer on how to store the paper to prevent it becoming damp.
Pick-up unit	3	Open the printer while a sheet of paper is passing through the feeder unit after pick-up. Is the paper wrinkled at this point? Is the paper skewed?	YES	Check the pick-up unit.
Entrance guide	4	Is the entrance guide dirty?	YES	Clean the guide.
Fixing unit	5	Is the lower fixing roller dirty?.	YES	Clean the roller.
			NO	Replace the fixing unit.

VII. LOCATION OF ELECTRICAL PARTS/FUNCTION

A. Switches

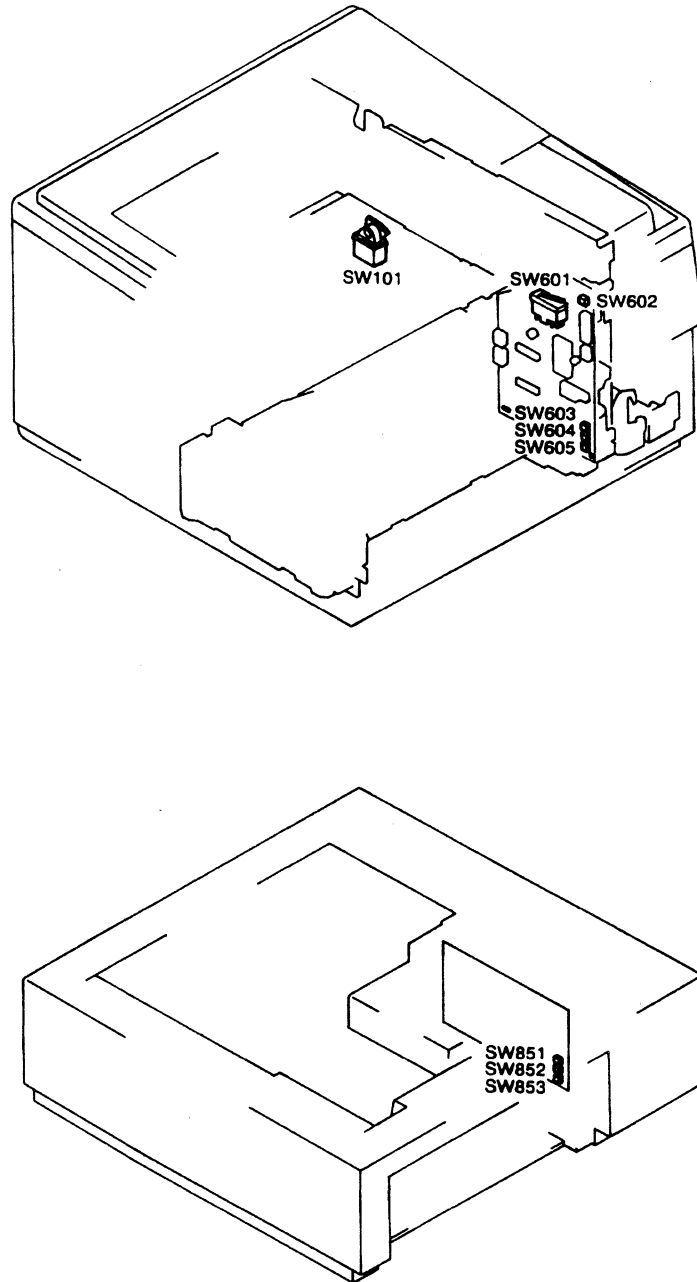
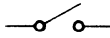


Figure 6-12

Table 6-5

Symbol	Name	Symbol	Function
	Switch	SW101	Power switch
		SW601	Detects when door is open and cuts off the +24VB output
		SW602	Test print switch
		SW603	Upper cassette size-sensing switch 1
		SW604	Upper cassette size-sensing switch 2
		SW605	Upper cassette size-sensing switch 3
		SW851	Lower cassette size-sensing switch 1 (paper feeder)
		SW852	Lower cassette size-sensing switch 2 (paper feeder)
		SW853	Lower cassette size-sensing switch 3 (paper feeder)

B. Sensors and Solenoids

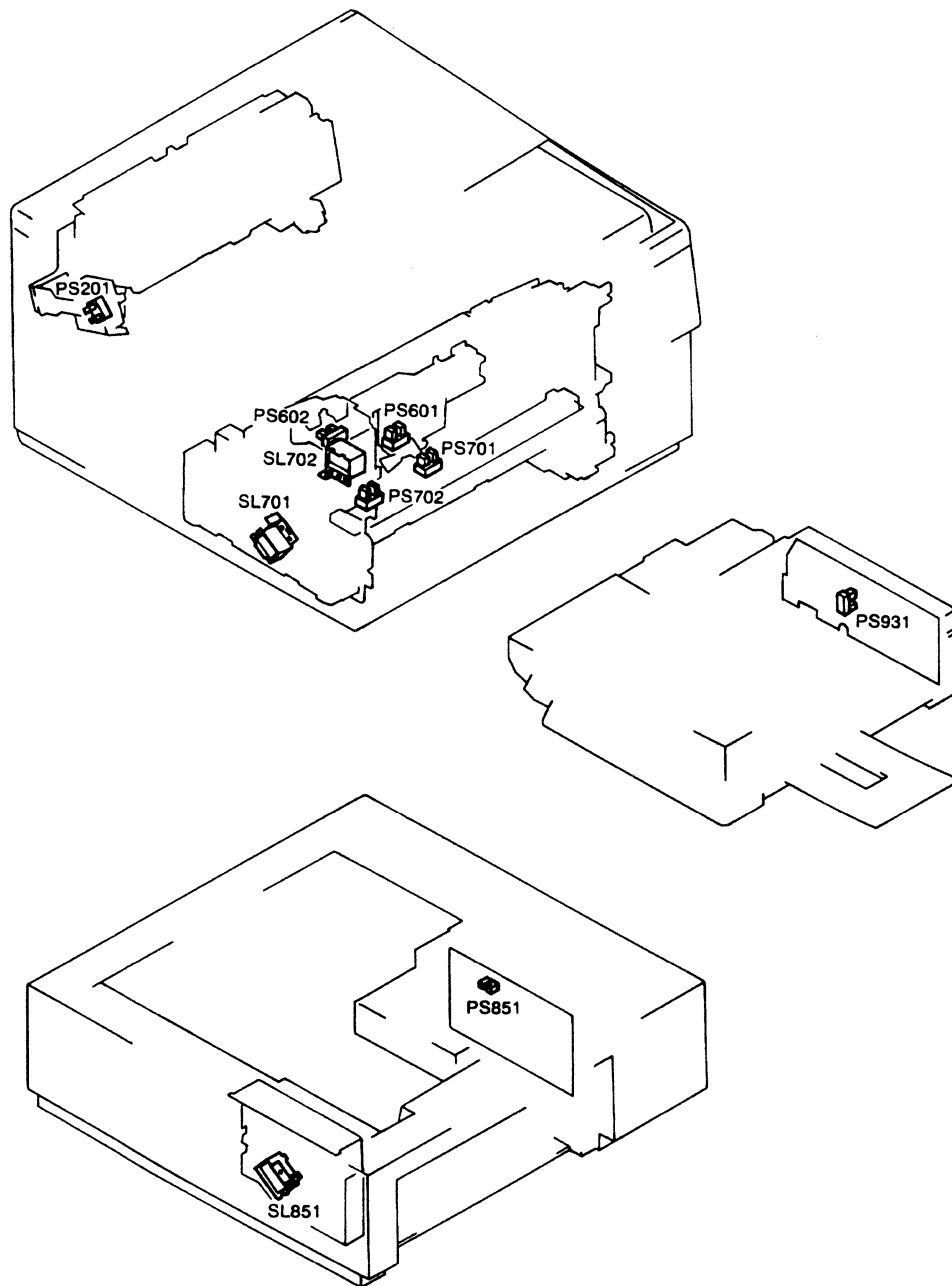




Figure 6-13

Table 6-6

Symbol	Name	Symbol	Function
	Photointerrupter	PS201	Delivery paper sensor
		PS601	Cassette paper sensor
		PS602	Regist paper sensor
		PS701	Multi-purpose tray paper end sensor
		PS702	Multi-purpose tray paper sensor
		PS851	Paper feeder paper sensor (paper feeder)
	Solenoid	PS931	Envelope feeder paper sensor (envelope feeder)
		SL701	Cassette pick-up roller clutch solenoid
		SL702	Multi-purpose tray pick-up roller clutch solenoid
		SL851	Paper feeder pick-up roller clutch solenoid (paper feeder)

C. Motors and Others

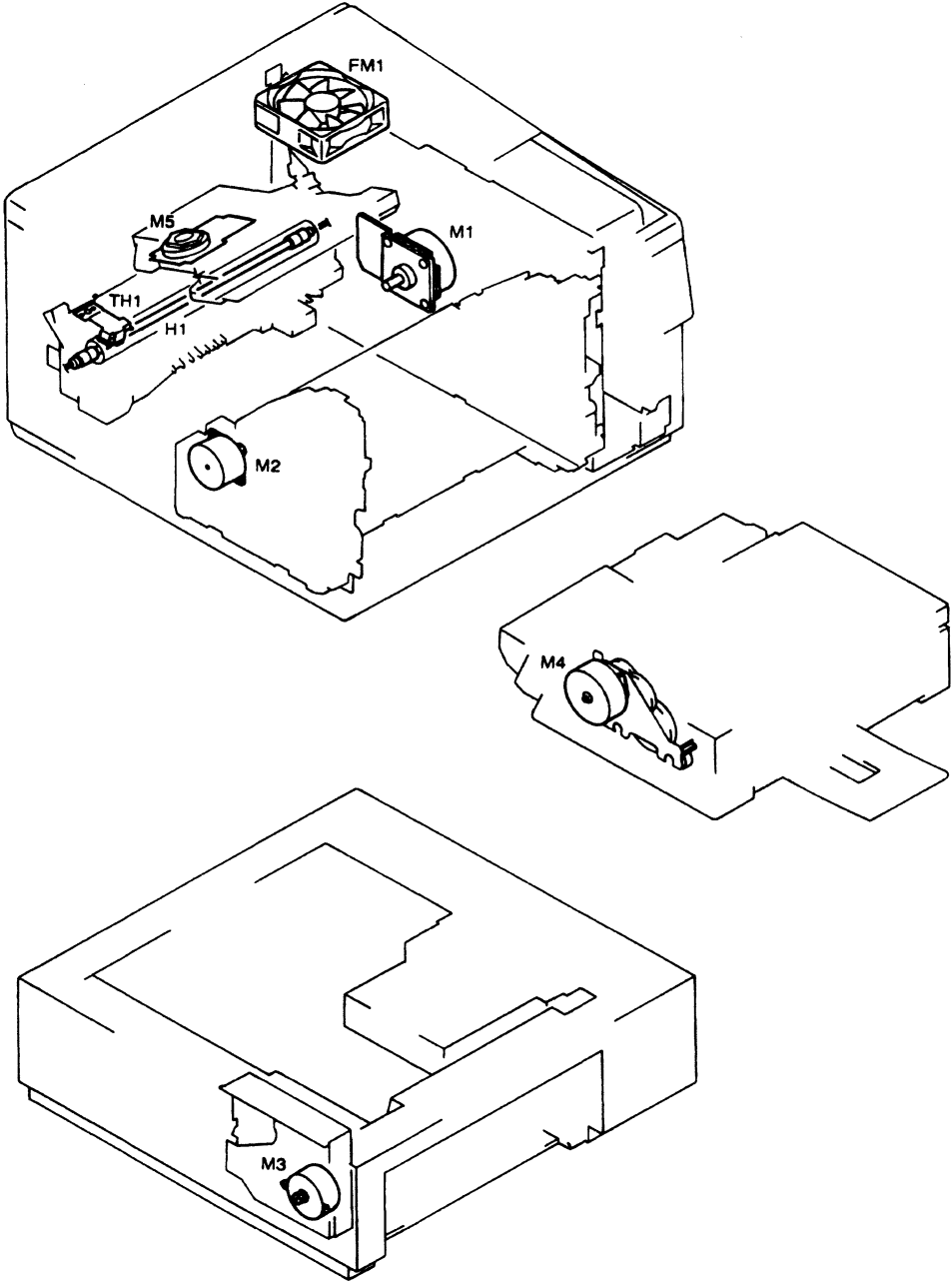






Figure 6-14

Table 6-7

Symbol	Name	Symbol	Function
	Motor	M1	Drives the photosensitive drum and feed rollers
		M2	Drives the paper pick-up rollers
		M3	Drives the paper feeder pick-up rollers (paper feeder)
		M4	Drives the envelope feeder pick-up rollers (envelope feeder)
		M5	Drives the scanning mirror
	Fan motor	FM1	Exhaust fan
	Fixing roller heater	H1	Heats the upper fixing roller
	Thermistor	TH1	Detects the upper fixing roller surface temperature

D. PC Boards

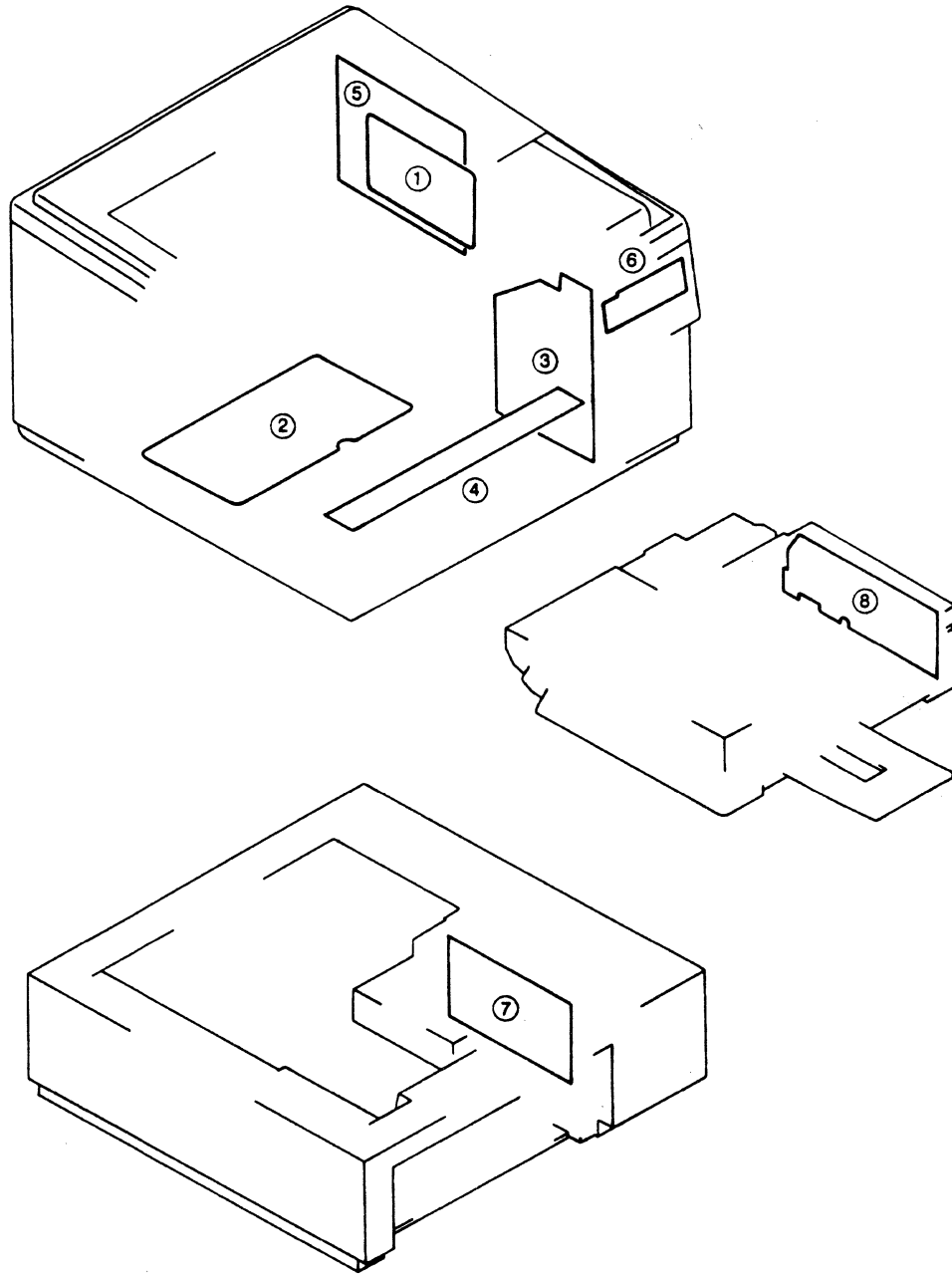


Figure 6-15

Table 6-8

No.	Name	Function
1	DC controller PCB	Controls the printing sequence
2	High-voltage power supply PCB	Applies high voltage to the primary and transfer charging rollers and the developing cylinder
3	Pick-up motor driver PCB	Drives the motors and the solenoids
4	Sensor PCB	Relays signals between the sensors, solenoids, motors, and pick-up motor driver PCB
5	Video interface PCB (LBP-EX)	Connects PCB for interface signals between the printer and the external device
6	Display panel PCB (LBP-EX PCB/LBP-EX PCB II)	Indicates state of operation
7	Paper feeder driver PCB	Drives the paper feeder clutch and the motor (paper feeder)
8	Envelope feeder driver PCB	Drives the envelope feeder motor (envelope feeder)

E. Connectors

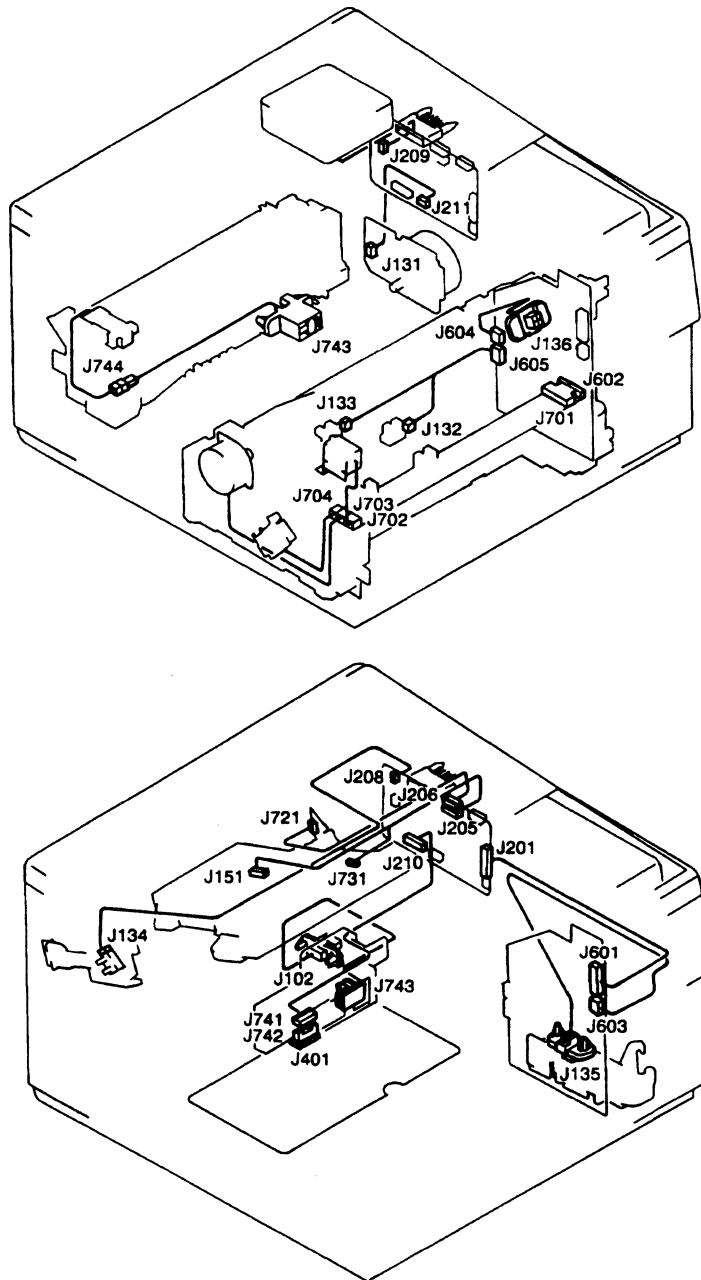


Figure 6-16

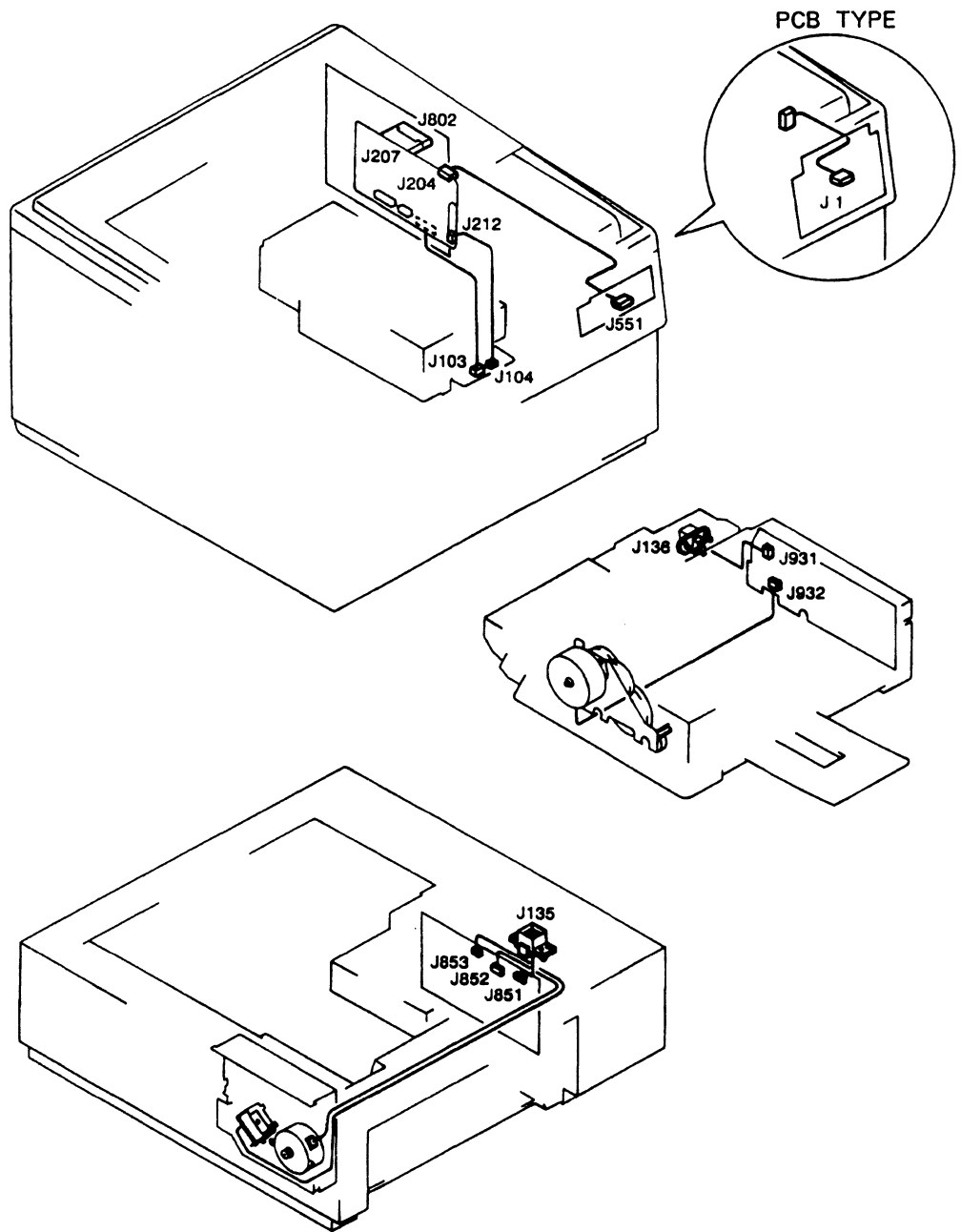



Figure 6-17

VIII. VARIABLE RESISTORS, LEDS, TEST PINS, JUMPERS, AND SWITCHES ON PC BOARDS

Variable resistors, LED indicators, test pins, jumpers, and switches that are made use of when servicing are listed below.

Any variable resistors, test pins, etc., not listed below are for factory use only; they require special tools and measuring instruments, and must be set with high precision. Do not touch them when servicing.

Notes: 1. Some LEDs receive leakage current during normal operation, causing them to glow dimly when they should be OFF.

2. Potentiometers that may be adjusted when servicing are marked 

Potentiometers that may not be adjusted when servicing are marked 

A. DC Controller PCB

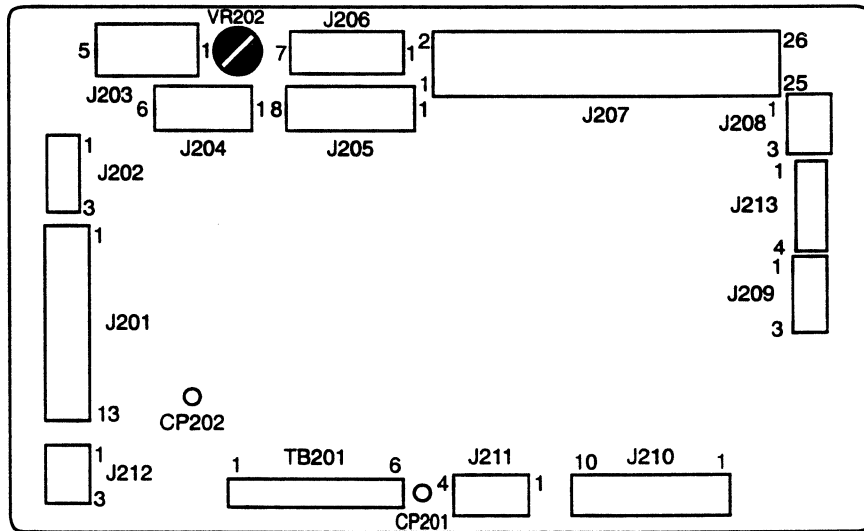


Figure 6-18

Table 6-9

VR No.	Function
VR202	Adjusting leading-edge registration

Table 6-10

CP No.	Function
CP201	GND
CP202	For factory use

B. High-voltage Power Supply PCB

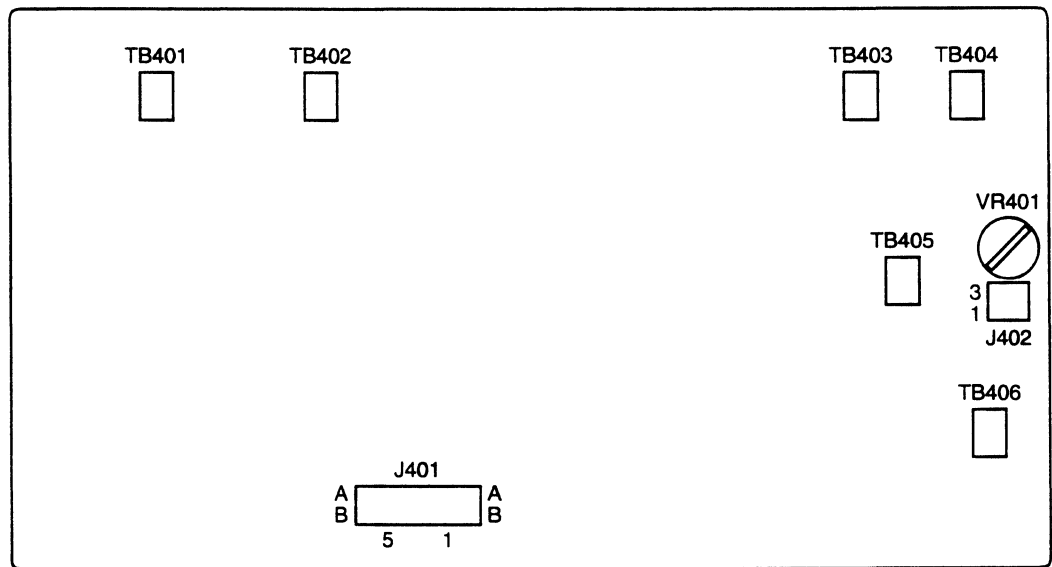


Figure 6-19

Table 6-11

VR No.	Function
VR401	For factory use

C. Pick-up Motor Driver PCB

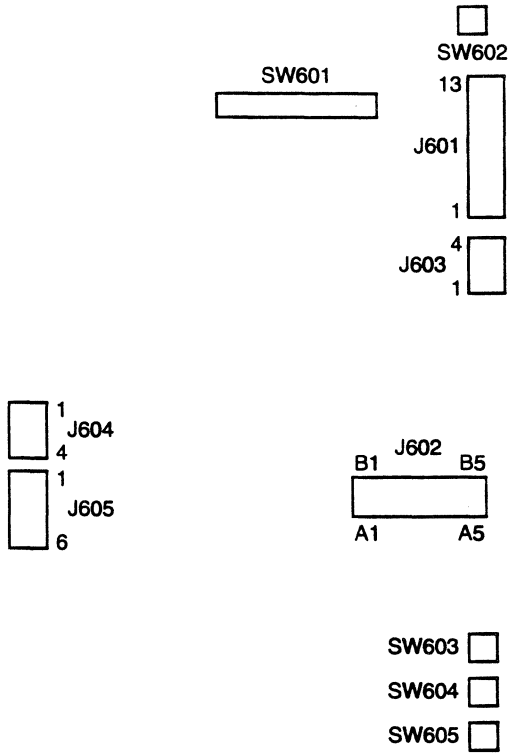


Table 6-12

SW No.	Function
SW601	Door sensing switch
SW602	Test print switch
SW603	Cassette size sensing switch (See page 2-28 .)
SW604	
SW605	

Figure 6-20

D. Paper Feeder Driver PCB

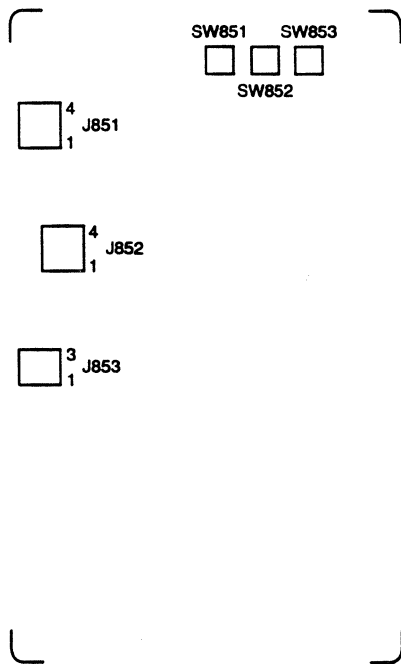


Table 6-13

SW No.	Function
SW801	Cassette size sensing switch (See page 2-28 .)
SW802	
SW803	

Figure 6-21

APPENDIX

I.	GENERAL TIMING CHART	A-1
II.	LIST OF SIGNALS	A-3
III.	GENERAL CIRCUIT	A-5
IV.	DC CONTROLLER	A-6
V.	PICK-UP MOTOR DRIVER	A-8
VI.	SENSOR CIRCUIT	A-10

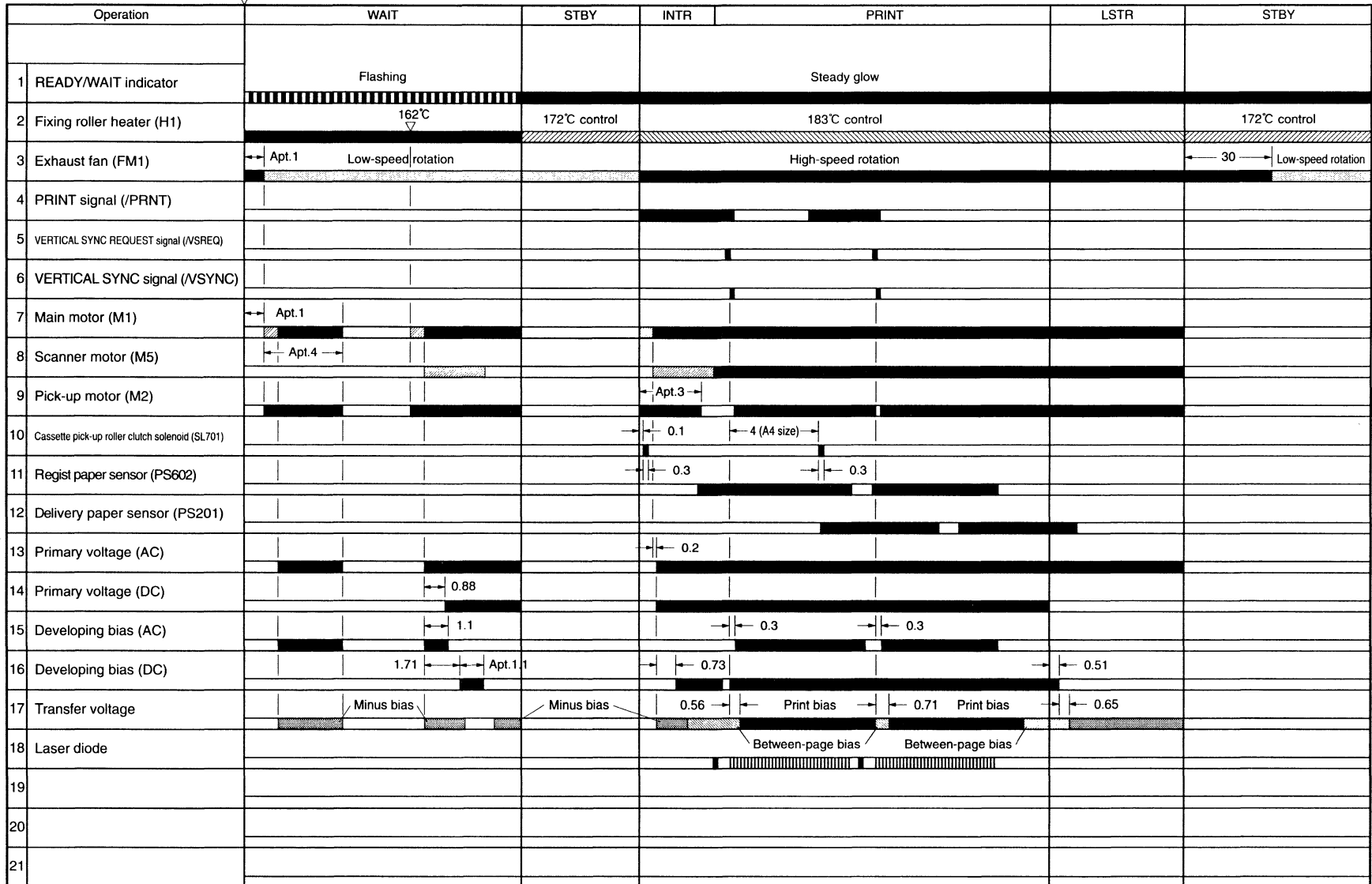
VII.	VIDEO INTERFACE CIRCUIT (LBP-EX).....	A-11
VIII.	DISPLAY CIRCUIT (LBP-EX/LBP-EX PCB II).....	A-12
IX.	PAPER FEEDER DRIVER	A-13
X.	ENVELOPE FEEDER DRIVER..	A-14

• Timing chart for two consecutive prints on A4 paper (Cassette feed)

I. GENERAL TIMING CHART

Power switch ON

(Unit: Seconds)



II. LIST OF SIGNALS

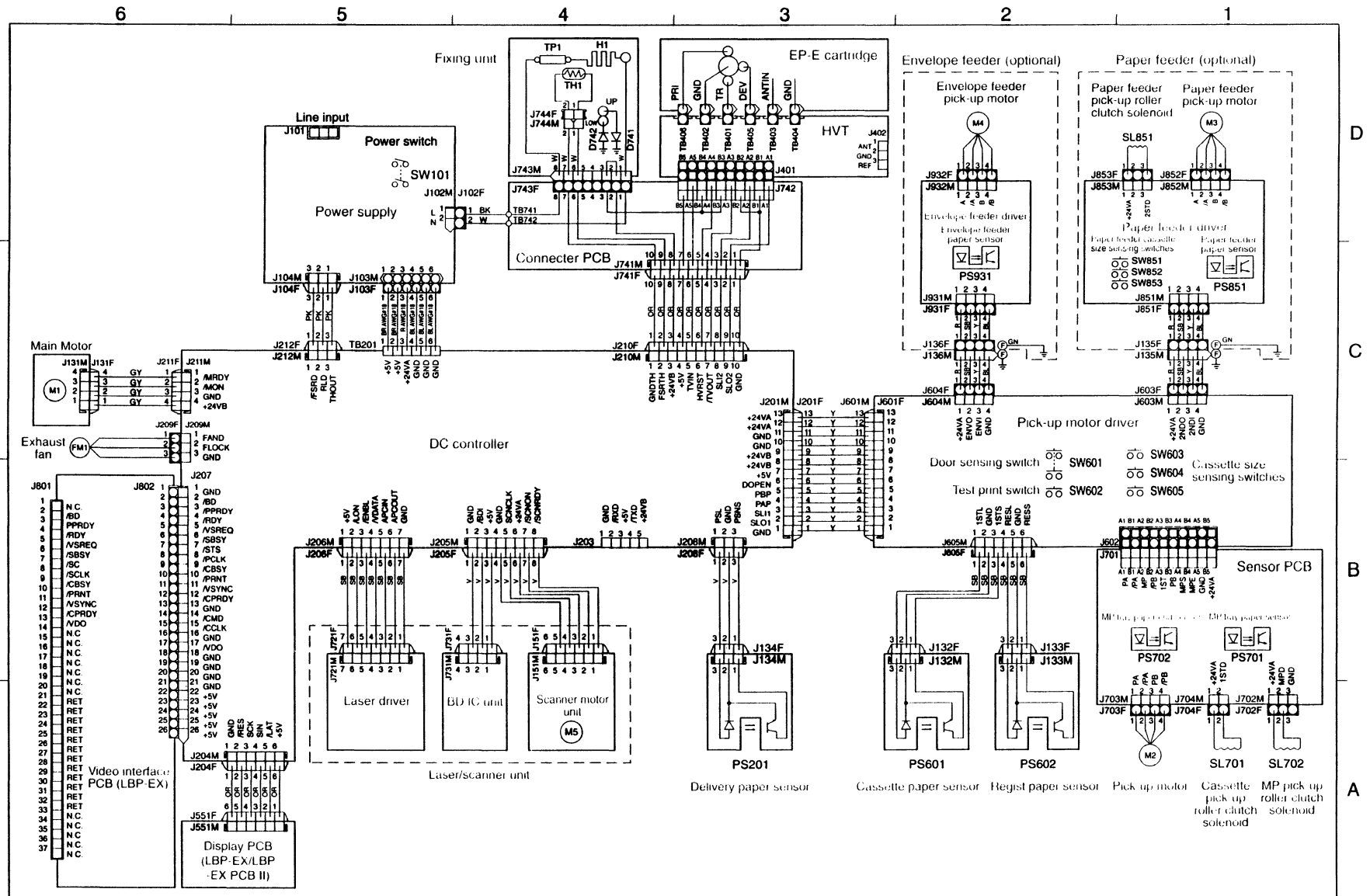
A. DC controller

Abbreviation	Name
APCIN	AUTOMATIC POWER CONTROL INPUT signal (analog)
APCOUT	AUTOMATIC POWER CONTROL OUTPUT signal (analog)
/BD	BEAM DETECTION (Horizontal sync pulse) signal
/BDI	BD INPUT signal
/CBSY	COMMAND BUSY signal
/CCLK	CONTROLLER CLOCK signal
/CMD	COMMAND signal
/CPRDY	CONTROLLER POWER READY signal
DOPEN	DOOR OPEN DETECT signal
/ENBL	VIDEO DATA ENABLE signal
FAND	EXHAUST FAN DRIVE signal
FLOCK	EXHAUST FAN LOCK DETECT signal
/FSRD	FIXING ROLLER HEATER DRIVE signal
FSRTH	FIXING ROLLER SURFACE TEMPERATURE signal
HVRST	HVT RESET signal
/LON	FORCIBLE LASER ON signal
/MON	MAIN MOTOR DRIVE signal
/MRDY	MAIN MOTOR READY signal
/PCLK	PRINTER CLOCK signal
/PPRDY	PRINTER POWER READY signal
/PRNT	PRINT signal
PSNS	DELIVERY PAPER SENSOR signal
/RDY	READY signal
RLD	RELAY DRIVE signal
SCNCLK	SCANNER REFERENCE CLOCK signal
/SCNON	SCANNER MOTOR DRIVE signal
/SCNRDY	SCANNER MOTOR READY signal
/SBSY	STATUS BUSY signal
/STS	STATUS signal
SLI1	INPUT SERIAL LINE 1
SLI2	INPUT SERIAL LINE 2
SLO1	OUTPUT SERIAL LINE 1
SLO2	OUTPUT SERIAL LINE 2
THOUT	THERMOSWITCH MONITOR signal
TVIN	HVT MONITOR signal
/TVOUT	CONSTANT VOLTAGE OUTPUT signal
/VDATA	LASER DRIVE signal

APPENDIX

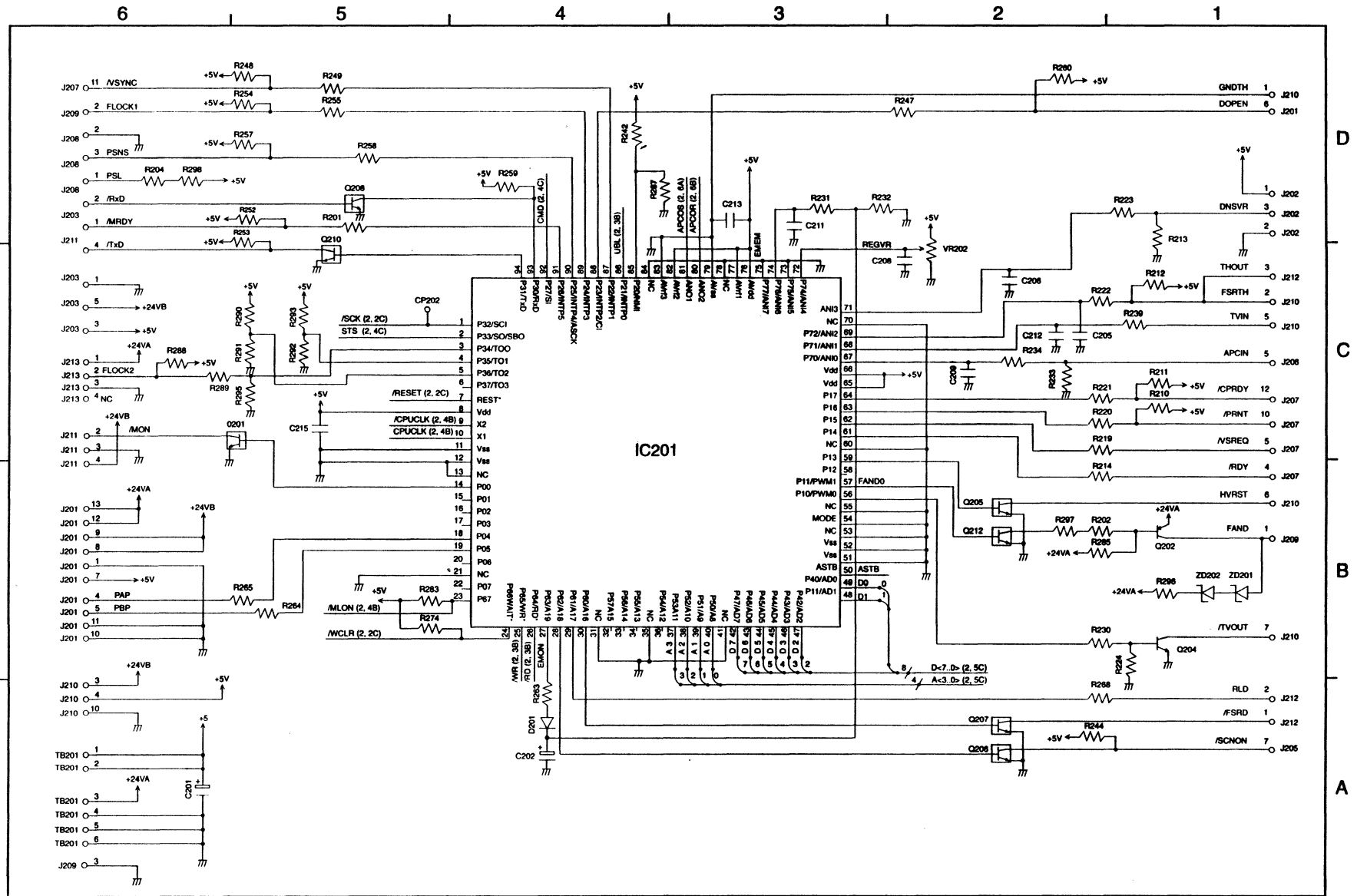
Abbreviation	Name
/VDO	VIDEO signal
/VSREQ	VERTICAL SYNC REQUEST signal
/VSYNC	VERTICAL SYNC signal

III. GENERAL CIRCUIT DIAGRAM



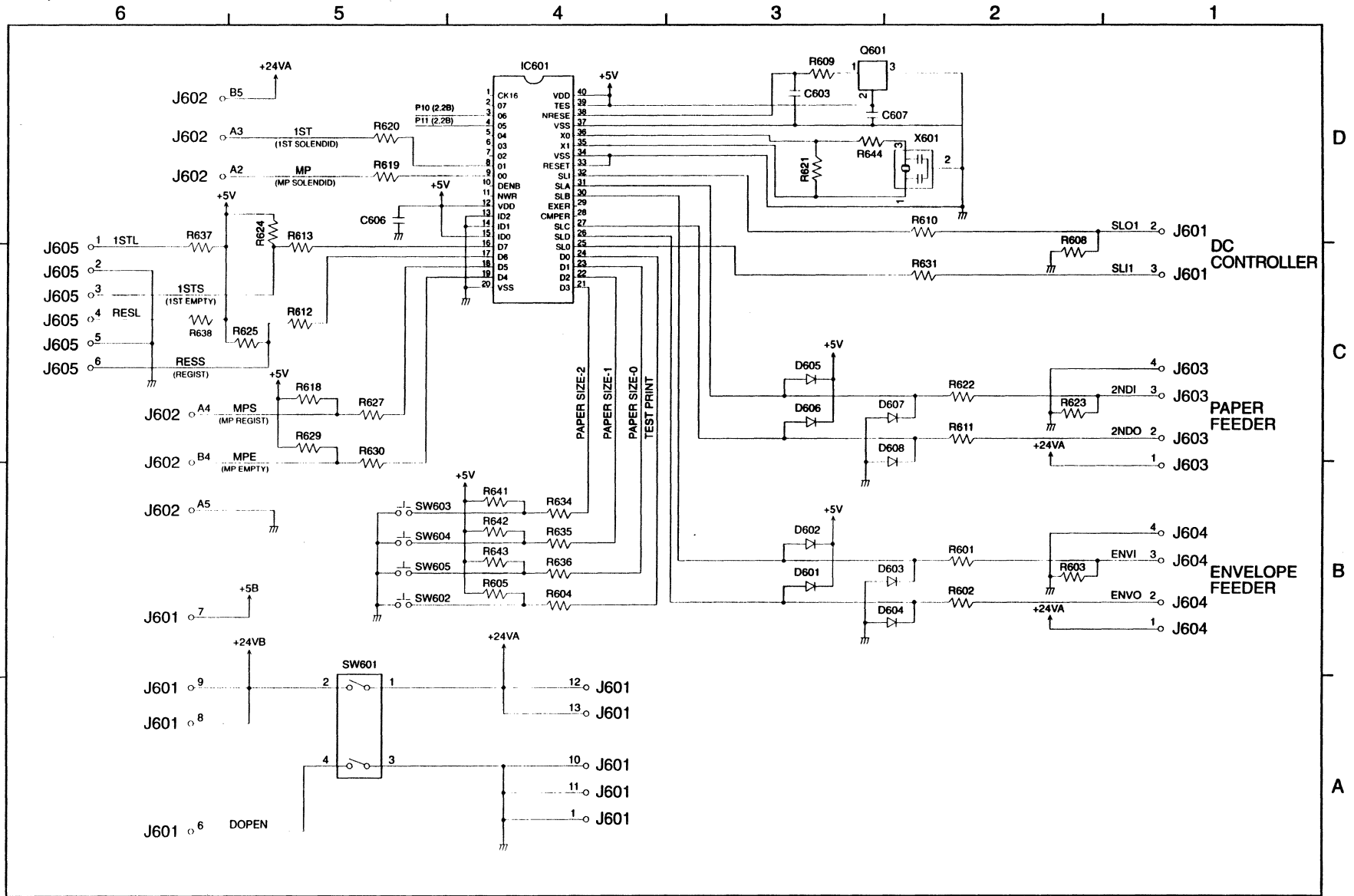
IV. DC CONTROLLER

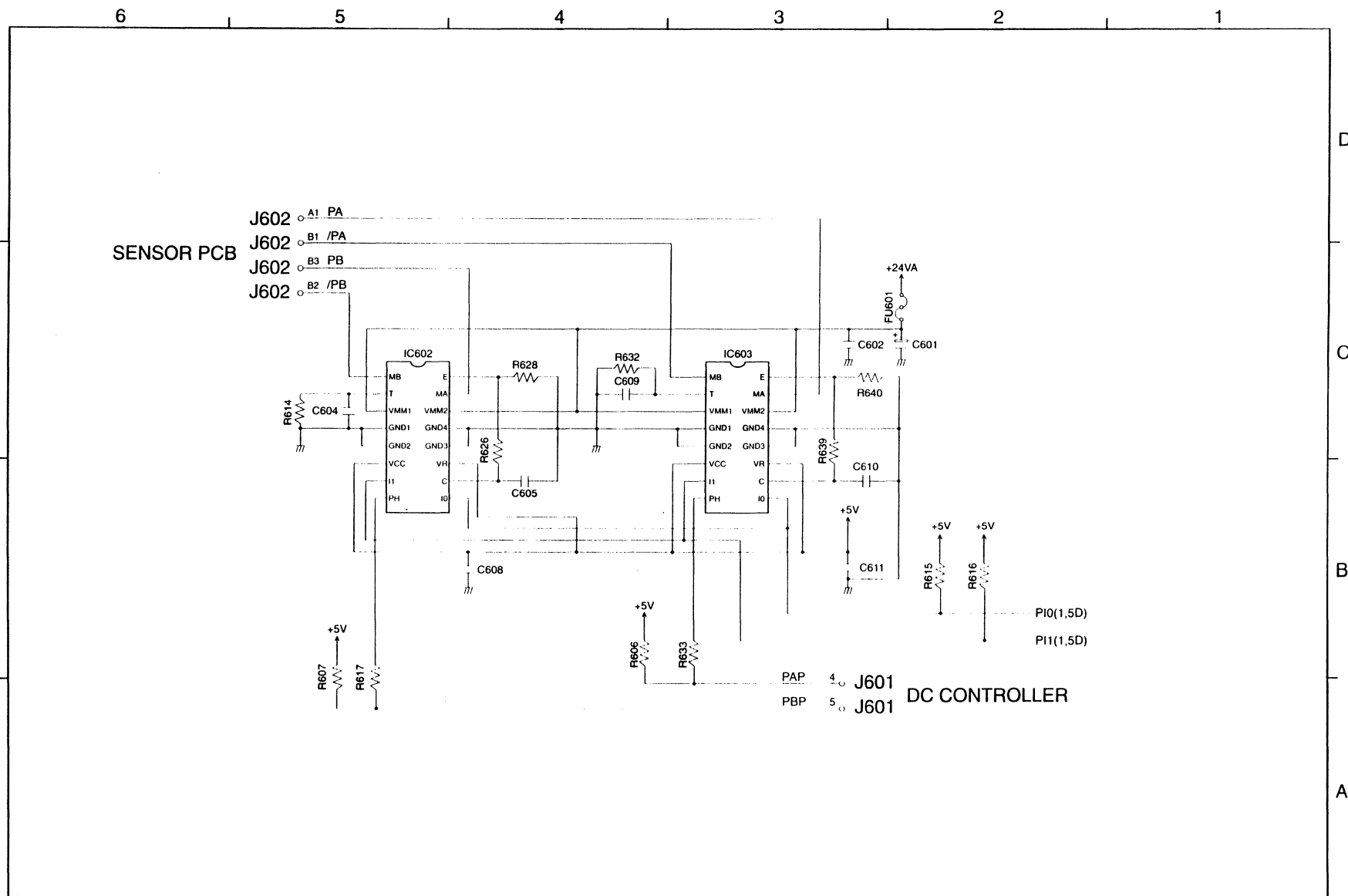
DC controller - 1/2



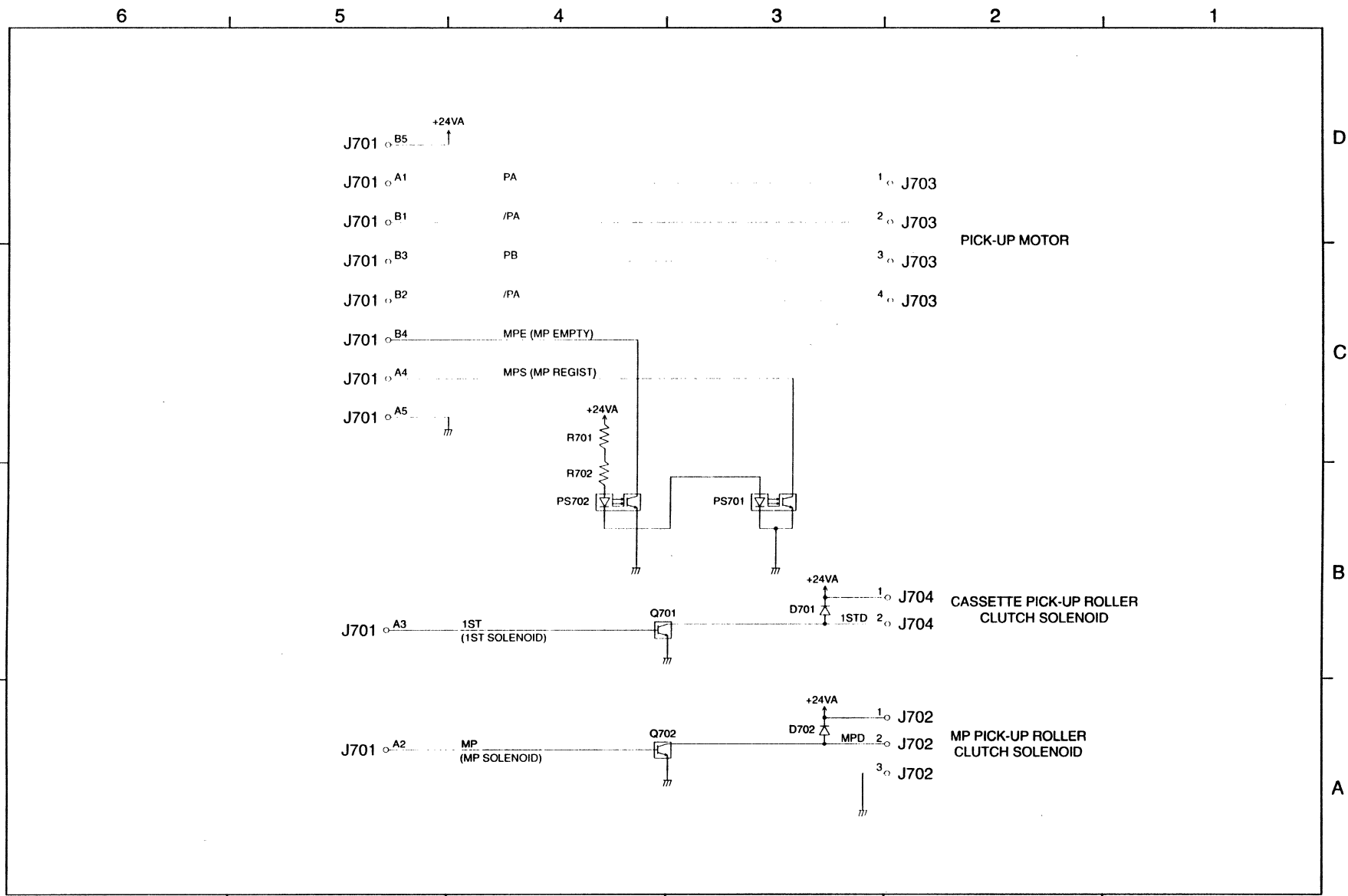
V. PICK-UP MOTOR DRIVER

Pick-up motor driver - 1/2

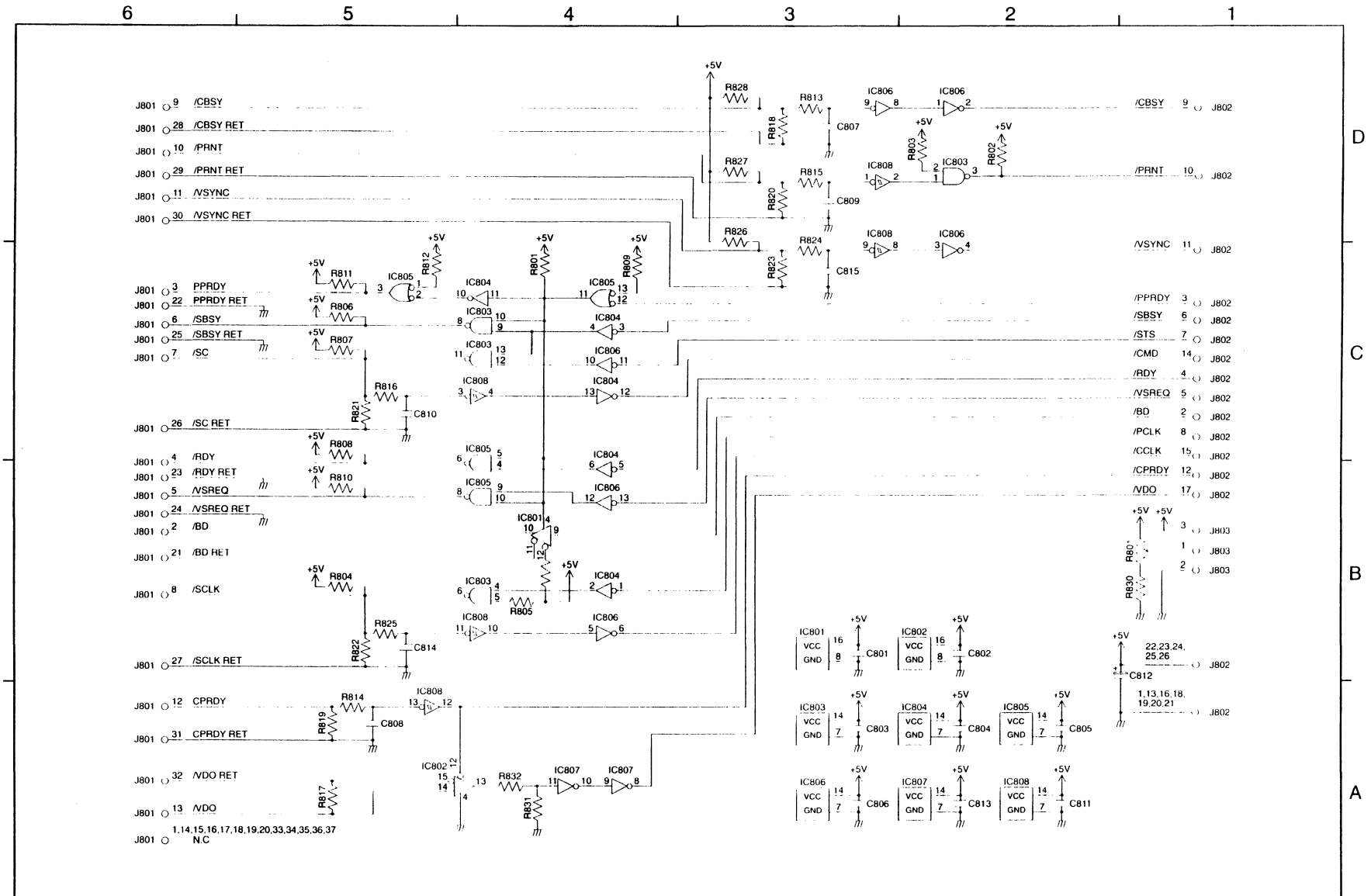




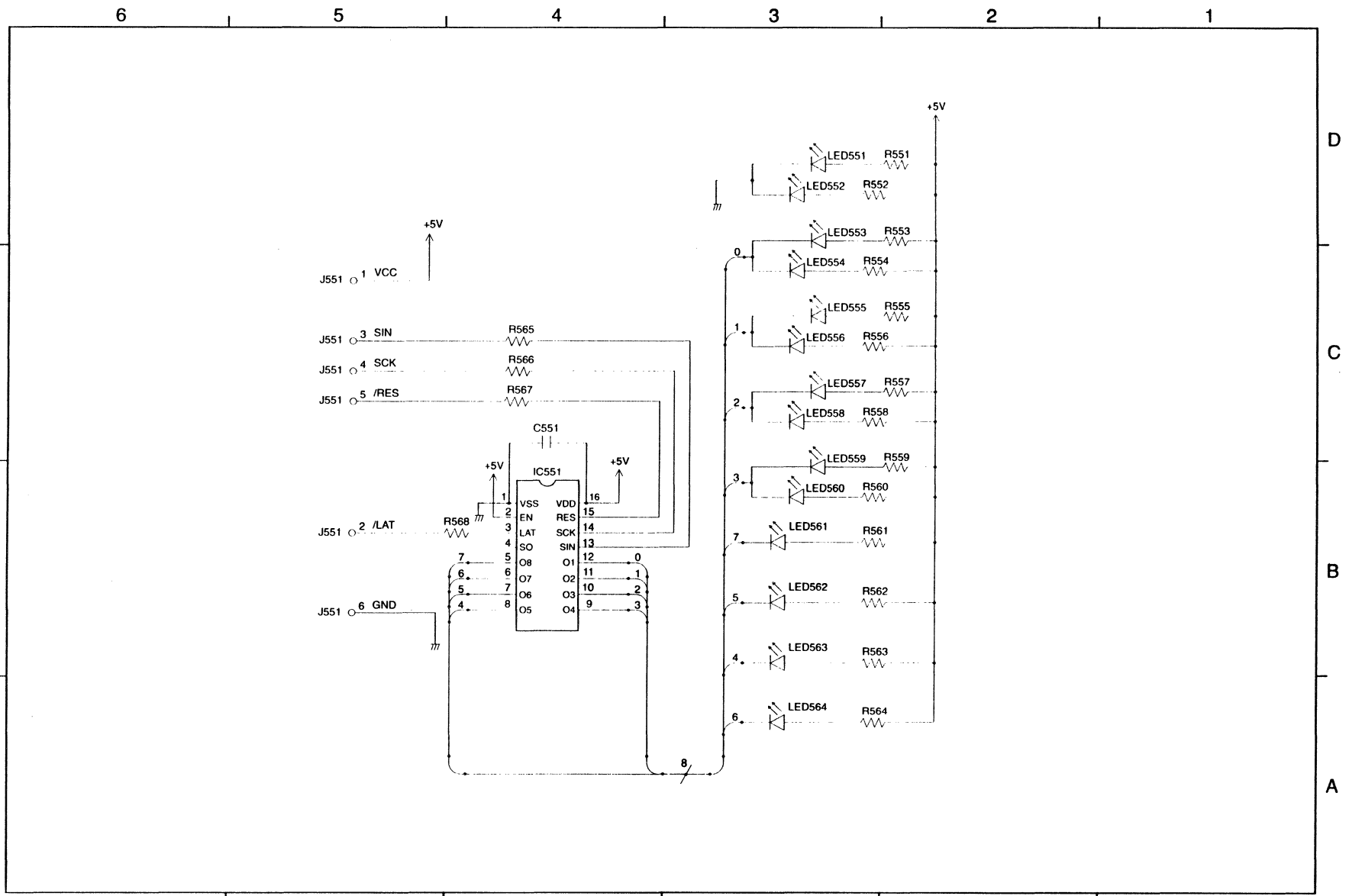
VI. SENSOR CIRCUIT



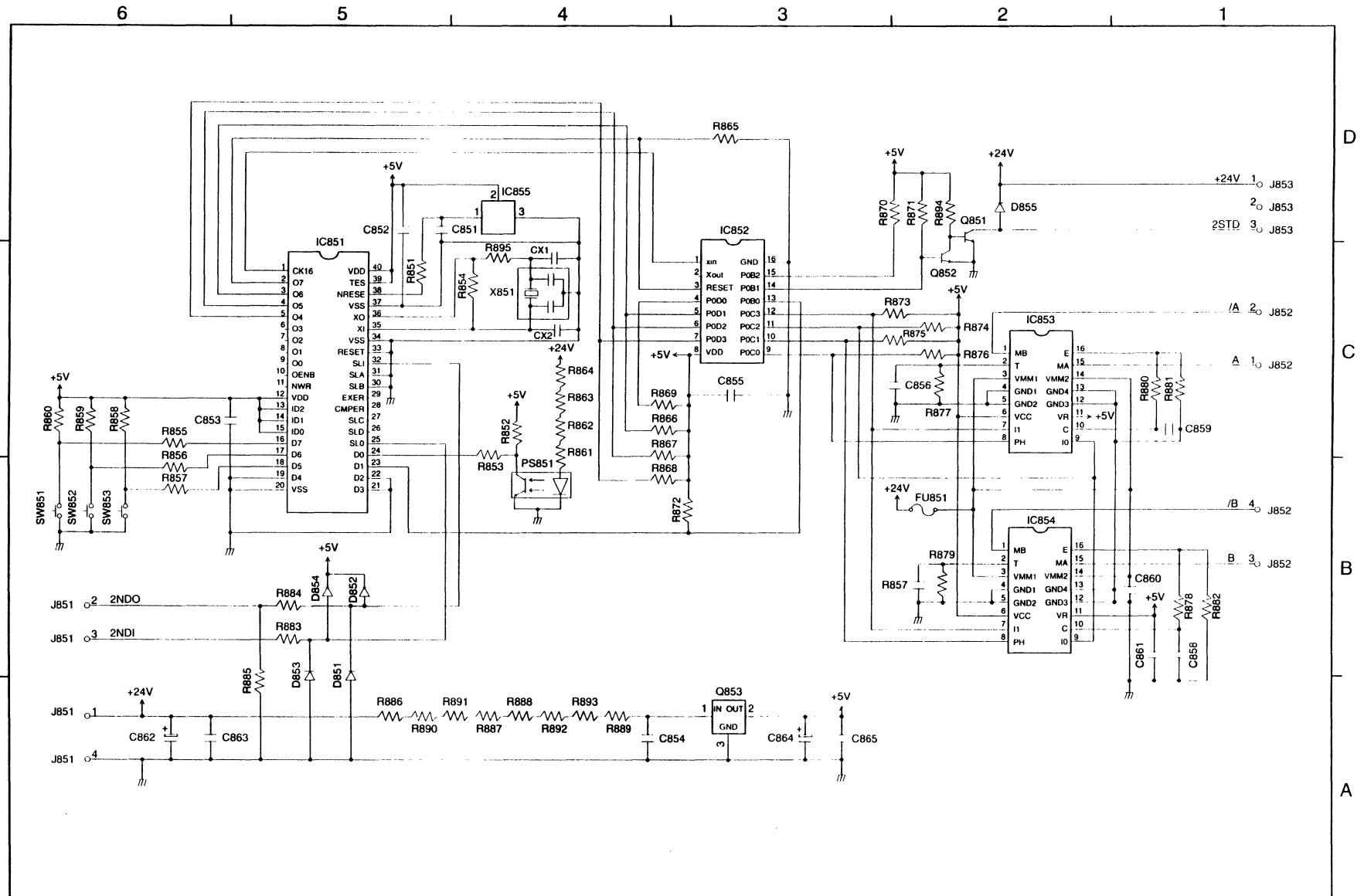
VII. VIDEO INTERFACE CIRCUIT



VIII. DISPLAY CURCUIT



IX. PAPER FEEDER DRIVER CIRCUIT



X. ENVELOPE FEEDER DRIVER CIRCUIT

