LBP-NX PCB

SERVICE MANUAL

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Canon

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

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PREFACE

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

This manual consists of six chapters and an appendix which contain the following information:

Chapter 1: General Description
Features, specifications, and operating procedures.

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
An explanation of the mechanical configuration as well as procedures for disassembly, assembly, and adjustments.

Chapter 4: Installation
Requirements for a suitable location, installation procedures, plus the storage and handling of EP-N cartridges

Chapter 5: Maintenance and Servicing
Parts replacement schedule, lists of required tools, cleaning fluids, and lubricants, basic procedures for regular servicing, and so on.

Chapter 6: Troubleshooting
Reference values and procedures for dealing with image defects and malfunctions.

Appendix: General timing chart, a list of signals and commands, as well as schematic diagrams of the overall circuitry and individual printed circuit boards.

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 in Service Information Bulletins, is the only means of cultivating the skills and knowhow required for maintaining this printer's performance and to locate and repair the cause of malfunctions.

CANON INC.
Peripheral Products Technical Documentation Department
Peripheral Products Quality Planning Division

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CHAPTER 1

GENERAL DESCRIPTION

I. FEATURES

This printer offers the following features:

1. **Non-impact page printer**
   This is a non-impact laser beam printer, which employs a combination of electrophotography, laser, and electronics technologies.
2. **High-speed print**
   Print speed is 16.2 images-per-minute print speed in simplex printing (A4).
3. **Large-capacity paper cassettes**
   Paper can be supplied from one of two large-capacity paper cassettes (maximum capacity of each cassette: 500 sheets of paper with a weight of 75 g/m^2).
4. **Print on both sides of the page**
   Installation of the optional duplexing unit enables printing on both sides of the page.
5 **Easy maintenance**
   The primary charging roller, developing unit, photosensitive drum, drum cleaning unit, and other central components of the printer are combined into a module called the "EP-N cartridge."
   The cartridge can be easily replaced and cleaned by the customer as required to maintain consistently high printing quality.
6. **Easy clearing of paper jams**
   The printer can be opened or closed with Tow hands to simplify the clearing of paper jams.
7. **Roller charge/transfer system**
   For the charging and transfer processes, a roller charge/transfer system has been adopted in place of the conventional corona charge/transfer system, resulting in less ozone generation and higher stability during paper transport.
8. **Laser beam printer**
   As a product that employs a laser beam, this printer has been designed with full considerations for safety. It conforms with DHHS radiation performance standard 21CFR Chapter 1 Subchapter J.

II. SPECIFICATIONS

A. Type

Configuration	Desk top page printer
Laser	Semiconductor laser
Scanning pich	Horizontal 300 dots/inch Vertical 300 raster lines/inch
Photosensitive medium	OPC (Organic photoconductor)

B. Construction

Printing method		Electrophotography
Charging		Roller charge
Scanning system		Rotating six-faced prism mirror
Toner		Single-component dry toner (include in EP-N cartridge)
Development		Toner projection development system
Pick-up	Automatic	2 cassettes
	Manual	2 manual feed ports
Transfer		Roller transfer
Separation		Curvature and Static eliminator
Drum cleaning		Blade
Fixing		Heat roller (750W)

C. Performance

Printing speed (less than ±8% (images/min)	Paper size	Cassette Feed		Manual Feed
		Single-side print	Duplex print	Single-side print
	A4	about 16.2	about 14.2	about 6.9
	LTR	about 17.1	about 15.4	
	LGL	about 13.9	about 13.9	
Wait time	90 sec or less (115V/240V), 120 sec or less (100V/220V) (20°C)			
First-print time (sec)	Single-side print			Duplex print
	Cassette Feed		Manual Feed	Cassette
	Face-down	Face-up	Face-up	Face-down
	14.5	13	13.5	26.5
Print delivery	Face-up or Face-down			
Delivery tray capacity ($75g/m^2$)	Face-down tray		Face-up tray	
	About 500 sheets		About 100 sheets	
Cassette types	A4, Letter, Legal, Executive: about 500 sheets of $75g/m^2$			
Option	Duplexing unit, Envelope feeder			

D. Others

Operating environment	Temperature	10°C to 32.5°C
	Humidity	20% to 80% (non condensation)
	Atmospheric pressure	460 to 760 mmHg.
Power source	Voltage and Frequency	100V (±10%) 50/60Hz 115V (±10%) 60Hz 220/240V (±10%) 50Hz
Power consumption	Max.	about 1 kW
	During printing	950 Wh (980 Wh: duplex print)
	At standby	200 Wh
Noise	During printing	60dB or less (1 m from Printer)
	At standby	50dB or less (1 m from Printer)
Dimensions	Width	454 mm
	Depth	570 mm
	Height	483 mm
	Weight	about 44 kg
Consumables	Paper	Keep wrapped to protect against humidity.
	Cartridge	See page 4-9.

E. Media specifications

Cassette feed (from the upper cassette and the lower cassette)	Media		Plain paper, Colored paper
	Sizes		A4, Letter, Legal, Executive (Plain paper only)
	Weight (plain paper)		60g/m^2 to 90 g/m^2
Manual feed (from the upper cassette only)	Medias		Plain paper, Colored paper, labels, Overhead-projector (OHP) film, and designated types of Envelopes
	Sizes	Paper OHP film Labels	Minimum : 98 mm x 216 mm (Upper port) 98 mm x 230 mm (Lower port) Maximum : 216 mm x 356 mm
		Envelopes	Length : 161 mm x 241 mm Width : 98 mm x 191 mm
	Weight (plain paper)		60 g/m^2 to 135 g/m^2

Notes: 1. OHP film, and envelopes can be only manually.
2. Feed OHP films one at a time.
3. Label paper for Europe can only be used with the face down delivery.
4. Envelopes can be used by manual feeding from upper cassette only.

Specifications are subject to change with product improvement.

III. SAFETY INFORMATION

1. Laser Safety
(for the 115V/220V/240V models)

Laser radiation can be hazardous to the human body. For this reason, laser radiation emitted inside this printer is hermetically sealed within the protective housing and external covers. During normal operation of the product by the user, no radiation can leak from the machine.

This printer is classified as a Class 1 laser product under IEC 825 and, as for the U. S., is classified as a Class I product under the Code of Federal Regulations, 1040.10 of Title 21.

The labels shown below are attached to the rear cover of the printer.

(For 220V/240V models only)

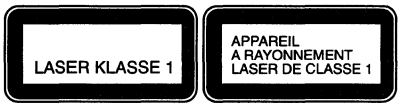


Figure1-1

⚠ CAUTION

When servicing the optical system of the printer, be careful not to place screwdrivers or other reflective objects in the path of the laser beam. Be sure to take off accessories, such as watches and rings, before working on the printer. A reflected beam, though invisible, can permanently damage your eyes.

Since the beam is invisible, the following label is attached to the inside of covers where there is danger of exposure to laser radiation.

Figure1-2

This label is attached to the laser scanner cover inside the printer where there is danger of exposure to laser radiation.

2. Toner Safety

Toner is a non-toxic substance composed of plastic, iron, and a small amount of pigment. Skin and clothing are best cleaned by removing as much toner as possible with a dry tissue, then washing with cold water. Hot water causes toner to jell and permanently fuse into clothing. Toner tends to break down vinyl materials, so avoid contact with vinyl.

3. Ozone Safety

The high voltage supplies found in laser printers and photocopiers generate a small amount of ozone gas (O_3) as a by-product of the image transferring process. Ozone is only generated while the printer is printing.

The only existing standard for ozone emission is established by Underwriters Laboratory (UL). This printer meet this standard when shipped from the factory.

IV. PARTS OF THE PRINTER

A. External View

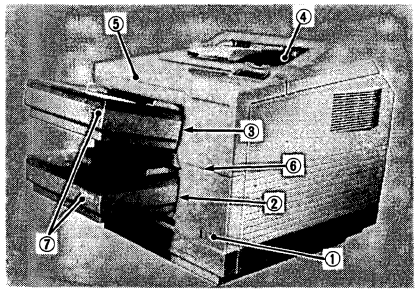


Figure 1-3

1: Sub power switch
2: Lower cassette slot
3: Upper cassette slot
4: Face-down delivery tray
5: Upper unit lock release button
6: Test print button
7: Cassette

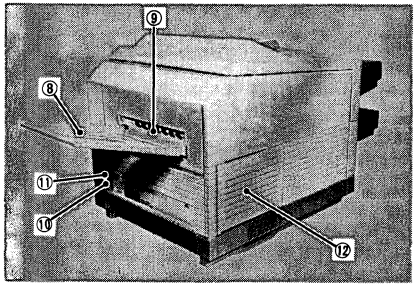


Figure 1-4

8: Face-up delivery tray
9: Face-up delivery outlet
10: AC power inlet
11: Main power switch
12: Left side door

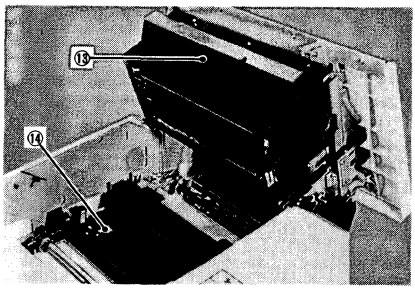
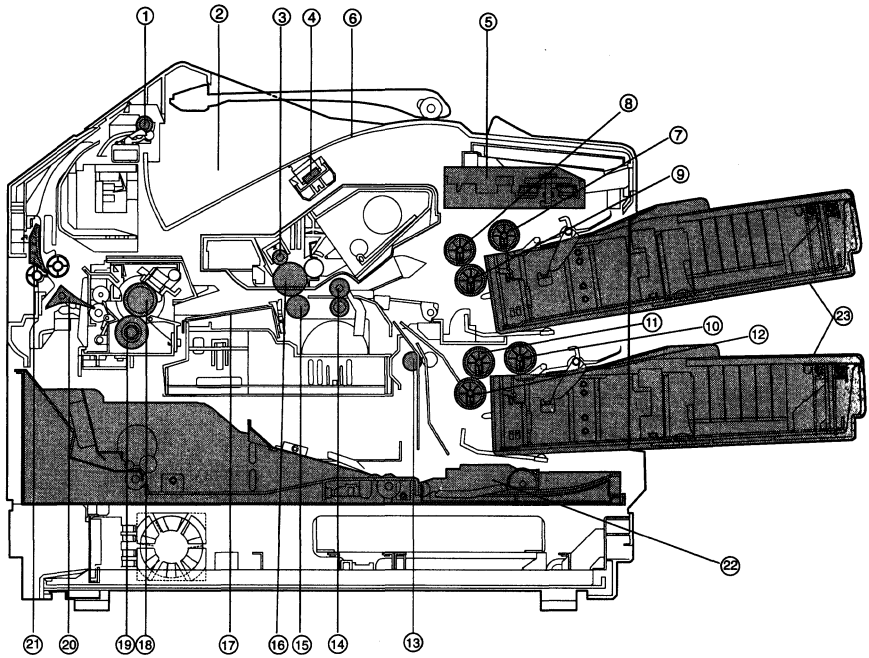


Figure 1-5

13: EP-N cartridge
14: Print density adjustment lever

B. Cross Sectional View



1: Face-down delivery rollers
2: Face-down delivery tray
3: Primary charge roller
4: Mirror
5: Laser/scanner unit
6: Upper unit
7: Upper cassette pick-up roller
8: Upper cassette feed roller
9: Upper cassette separation roller
10: Lower cassette pick-up roller
11: Lower cassette feed roller
12: Lower cassette separation roller
13: Second-pass pick-up roller
14: Registration rollers
15: Transfer charging roller
16: Photosensitive drum
17: Feed guide
18: Upper fixing roller
19: Lower fixing roller
20: Duplex deflector
21: Face-up/down selector
22: Duplexing unit (option)
23: Paper cassette

Figure 1-6

V. OPERATION

1. Test Print Button

The test print button is located on the DC controller PCB and is pressed by inserting a thin pointed object (for example, M3 Hex key wrenche) into the hole in the front right of the printer (see Fig. 1-7).
Pressing this button causes the printer to print the test pattern of the DC controller PCB.
Set the cassette into upper cassette slot.
When the printer is STANDBY, press this button once to print one page of the test pattern.
If the button is held down, the printer will print the test pattern continuously.

Note: Before performing the above operation, make sure the printer is in STANDBY status and is offline to the computer in a normal mode and that paper is loaded.

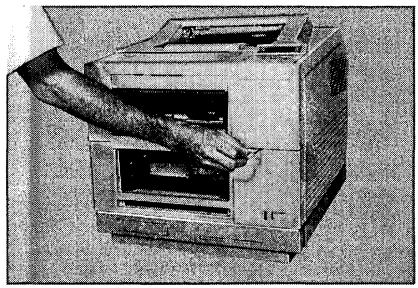


Figure 1-7

2. Print Density Adjustment Lever.

The print density adjustment lever is located on the left side of the feed guide (see Fig. 1-5). It is used to adjust the print density.
Moving this lever toward the paper cassettes lightens the print.
Normally, the lever should be set to the center position as shown in the figure below.

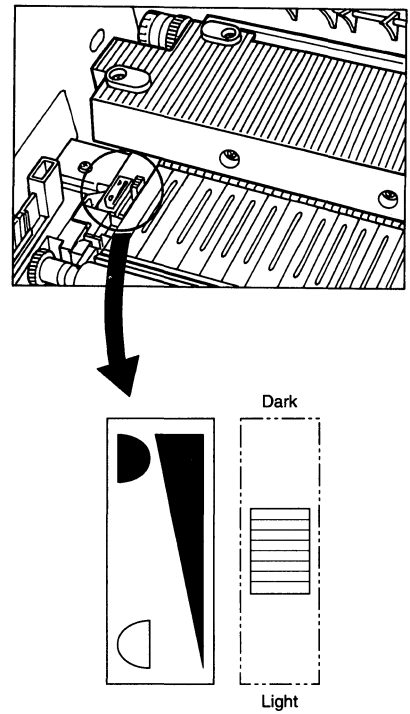


Figure 1-8

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 striped conduits (▮▮▮▮▮), the flow of control signals by solid arrows (——►), and the flow of groups of signals by outlined arrows (⟹).
2. An active-HIGH signal level is indicated by "H" or by a signal name without a slash, such as LLCNT. An active-LOW signal level is indicated by "L" or by a slash signal name, such as /LSRDRV.
   A signal that is "H" or has a name without a slash goes active when it reaches the supply voltage level (indicating that the signal is being output), and becomes inactive when it drops to GND level (indicating that the signal is not being output).
   A signal that is "L" or has a slash name goes active at GND level, and becomes inactive at the supply voltage level.
   A microcomputer is used in this printer, but as the internal operation of the microcomputer cannot be checked. So the explanation of the operation of the microcomputer has been left out.
   As it is assumed that no repair will be made in the circuit boards of the customers, the explanation of the circuits in the circuit board has been limited to an outline using block diagrams. Consequently, the two types of explanations on the circuits concern the everything from the sensor to the input section of the major circuit boards, and from the output section of the major circuit boards to the load, and these are explained with block diagrams according to the functions.

I. BASIC OPERATION

A. Functions

Printer functions can be broadly divided into five groups: the paper pick-up/feed system, the image formation system, the laser/scanner system, the duplexing feeder system, and the control system. (The duplexing feeder system is optional.)

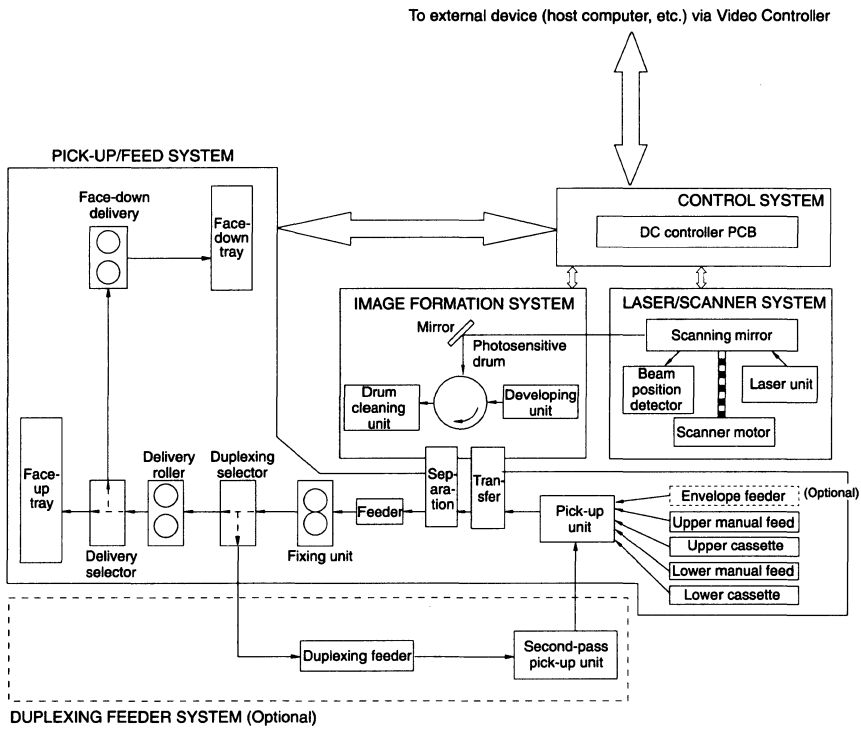


Figure 2-1

B. Outline of Electrical System

The operating sequence of this printer is controlled by three microcomputers that are respectively mounted on the DC controller PCB, paper feed PCB, and DC driver PCB. When the printer is STANDBY, the DC controller PCB generates signals to drive the laser diode, scanner motor, main motor, and other components in accordance with the print commands and image data received from the external device.

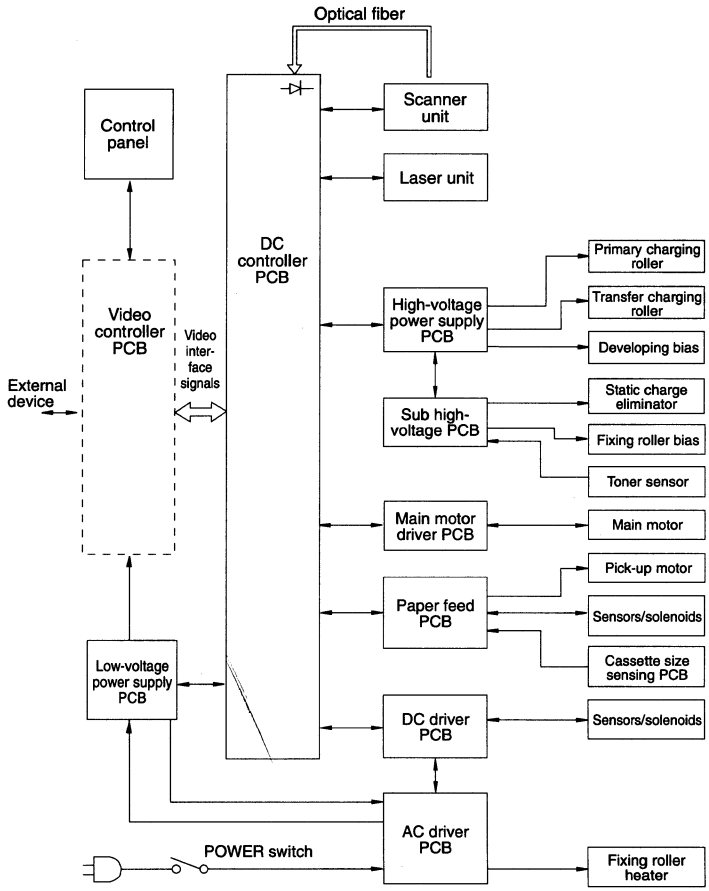


Figure 2-2

C. DC Controller Inputs (1/2)

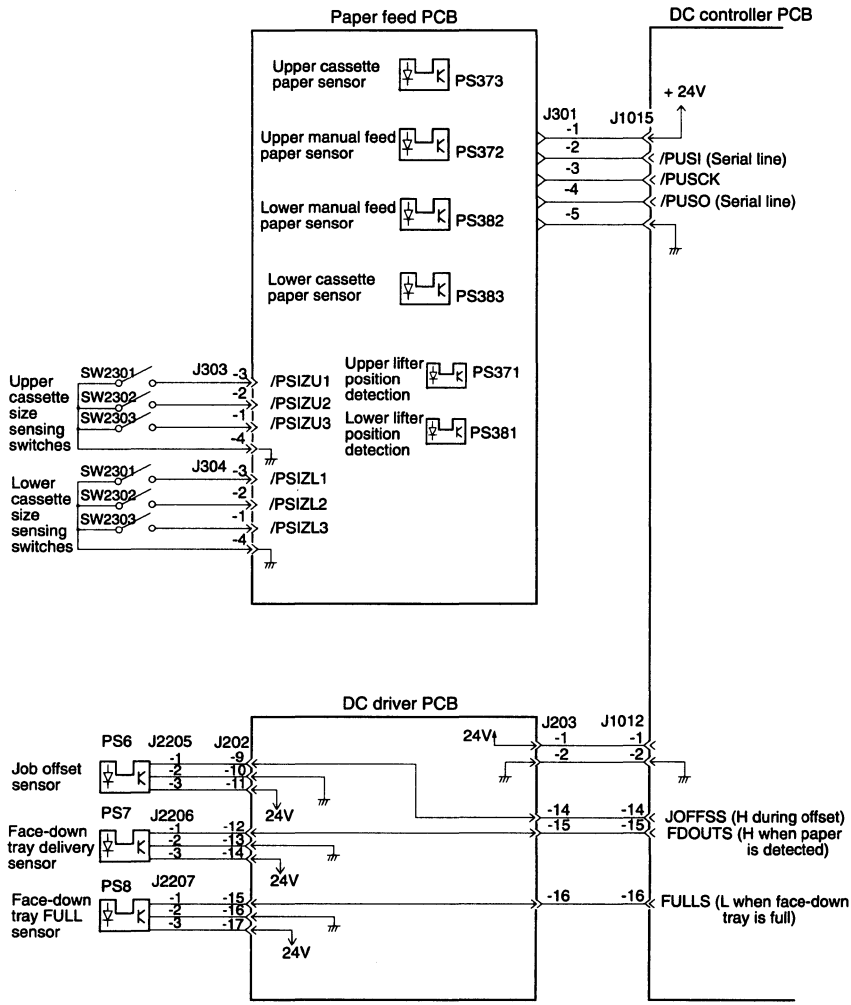


Figure 2-3

DC Controller Inputs (2/2)

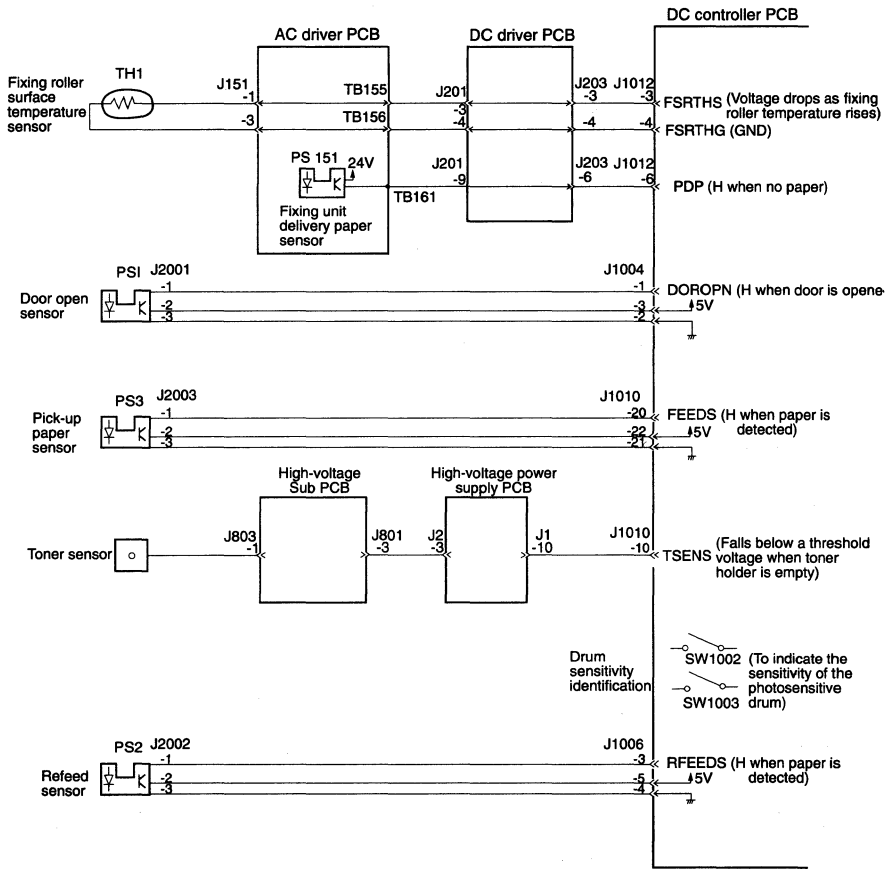


Figure 2-3 (continued)

D. DC Controller Outputs (1/2)

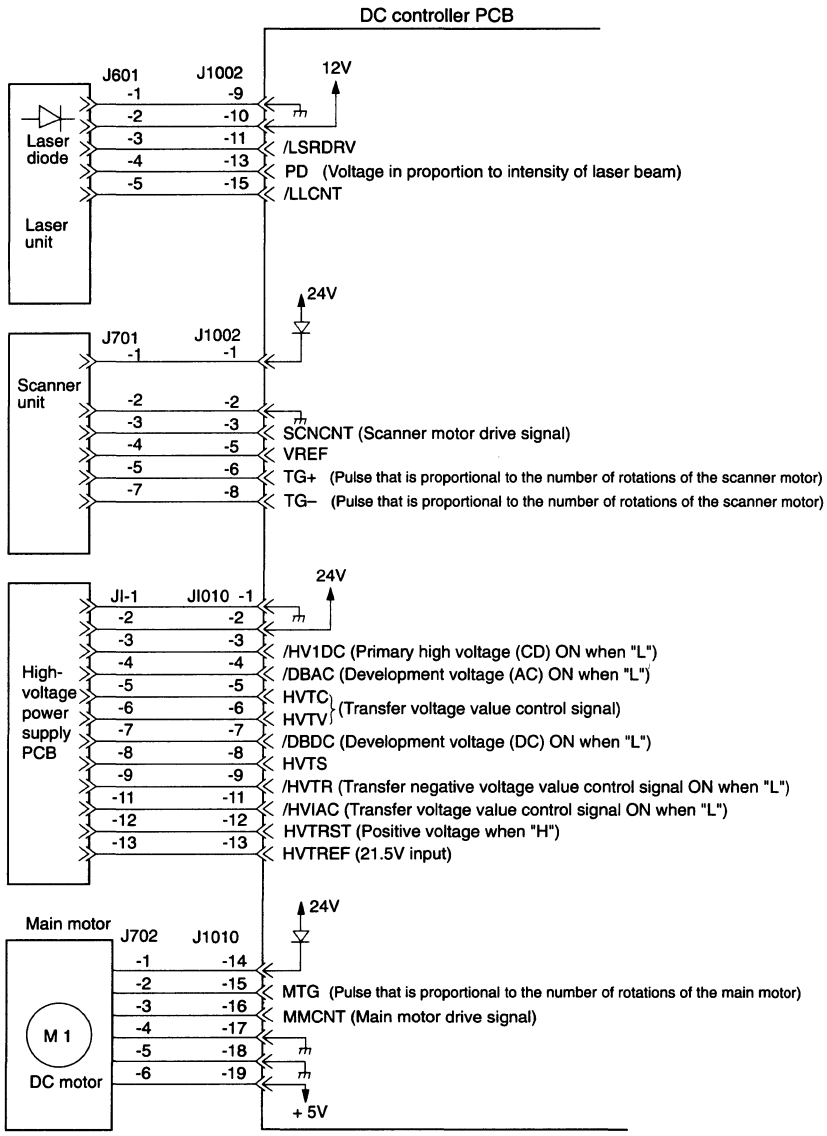


Figure 2-4

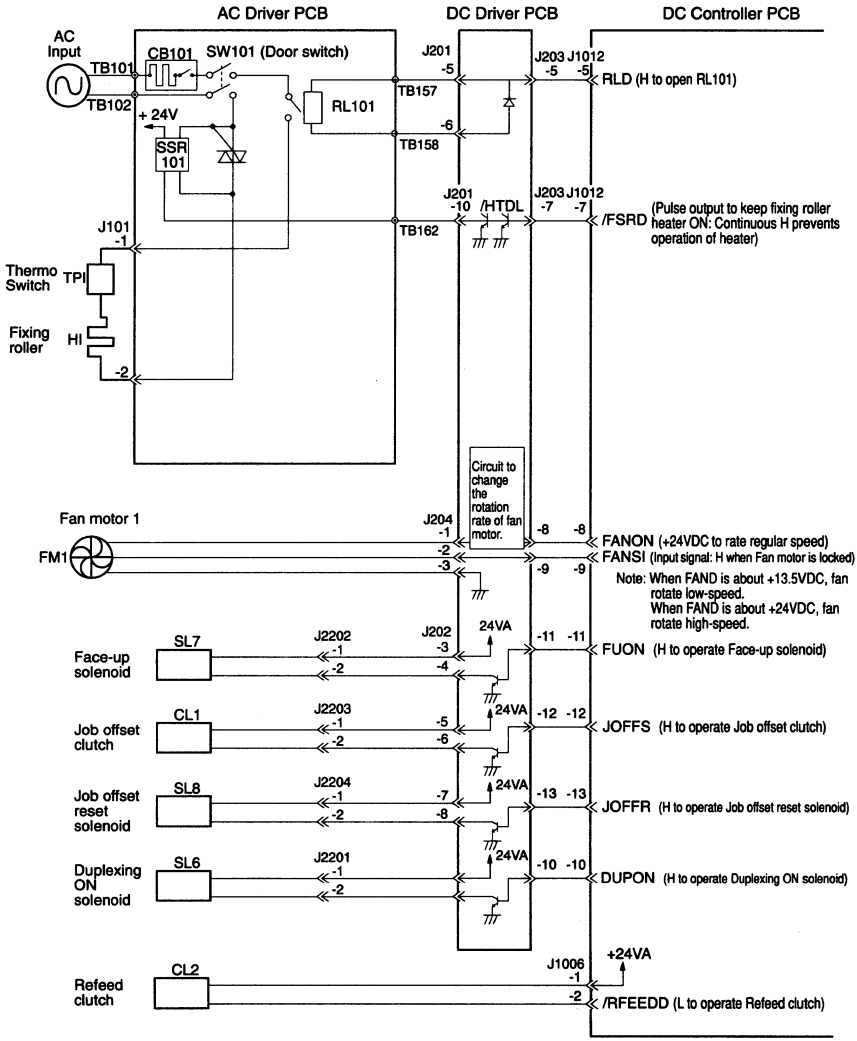


Figure 2-4 (continue)

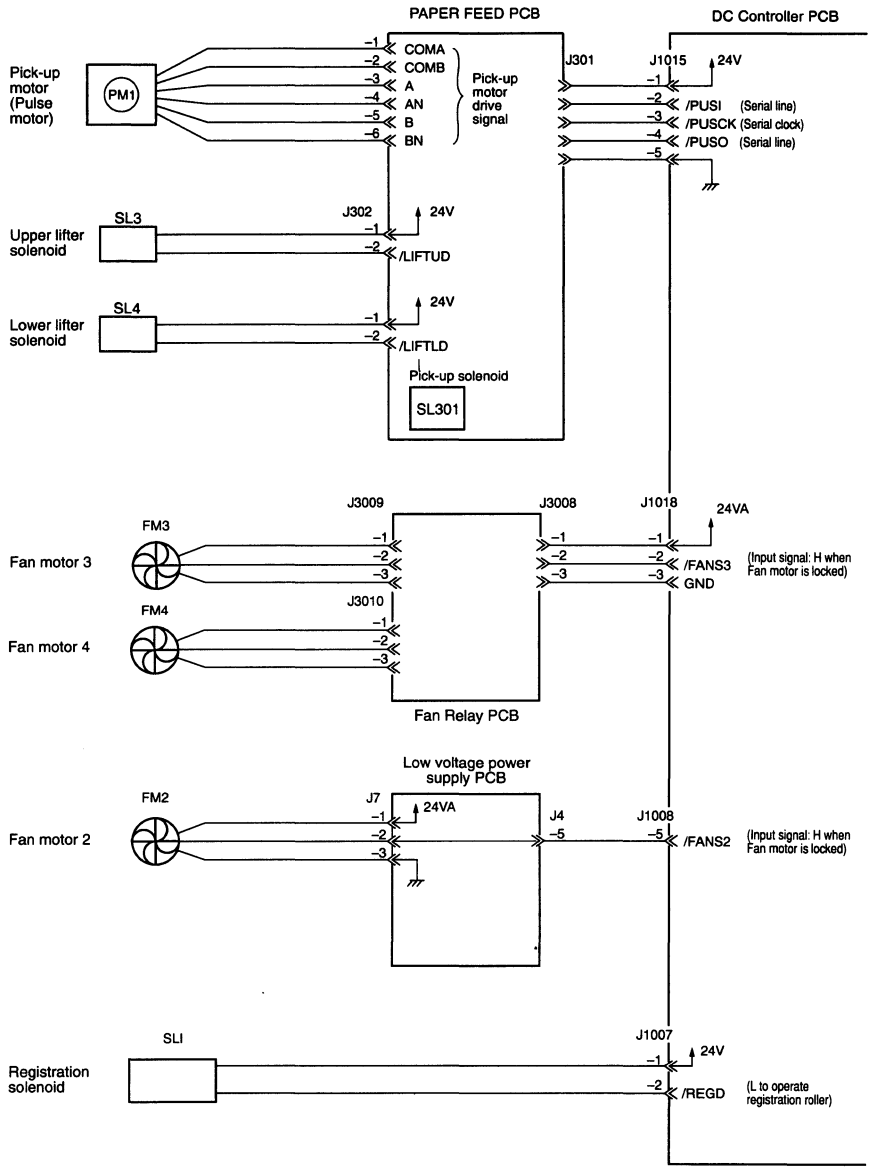


Figure 2-4 (continue)

E. Basic Sequence of Operations

Fig. 2-5 shows the timing chart for two consecutive prints from the cassette on A4 paper.

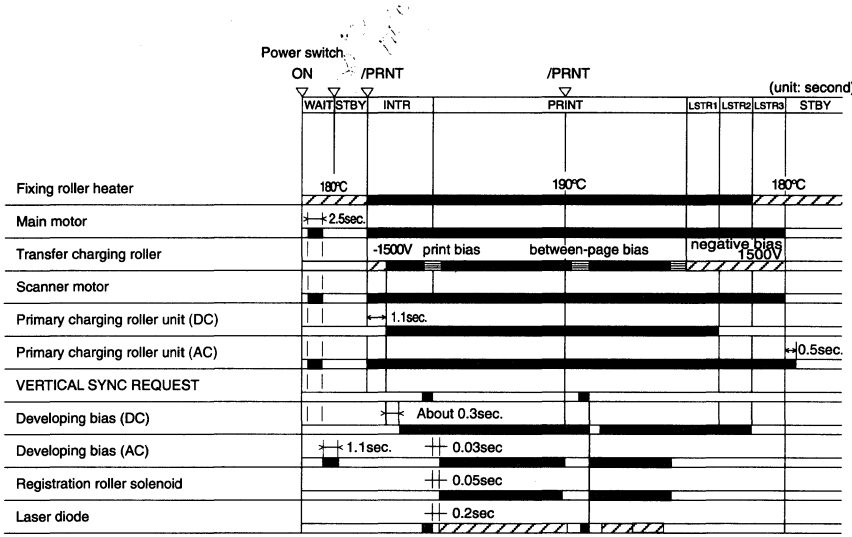


Fig. 2-5

Table 2-1

Period		Purpose	Remarks
WAIT	From POWER ON until the fixing roller temperature reaches 180°C (within 90s (115V/240V) or 120s (110V/220V) in an ambient temperature of 20°C).	Fixing roller warm-up	• Additional initial rotation may occur. (see Note)
STBY (STANDBY)	1. From the end of WAIT period until a /PRNT signal is input from the external device or the video controller PCB, or 2. From the end of LSTR3 period until a /PRNT signal is input from external device or the video controller PCB or until power is switched OFF.	Fixing rollers are held at 180°C to keep printer ready to print.	
INTR (INITIAL ROTATIONS)	From input of /PRNT signal until /VSREQ output by printer.	Stabilizes photosensitivity of the drum and cleans the transfer charging roller in preparation for printing.	

Table 2-1 (Continued)

Period		Purpose	Remarks
PRINT	For about 1.5s after INITIAL ROTATIONS PERIOD until the last printed sheet passes the pick-up paper sensor.	Forms a latent image on drum based on the input of VDO (image data) signals from the external device or the video controller PCB, develops a visible image using toner, then transfers the toner on drum to paper.	
LSTR1 (LAST ROTATIONS 1)	From application of negative bias to transfer charging roller until the primary charging roller goes OFF.	Delivers the last printed page to the tray.	When a /PRNT signal is input from the external device or the video controller PCB, the INITIAL ROTATIONS period is immediately entered.
LSTR2 (LAST ROTATIONS 2)	From when the primary charging roller goes OFF until the developing bias (DC) goes OFF.	Delivers the last printed page to the tray.	When a /PRNT signal is input from external device or the video controller PCB, the INITIAL ROTATIONS period is entered after switching OFF the developing bias (DC).
LSTR3 (LAST ROTATIONS 3)	From when the developing bias (DC) goes OFF until the main motor stops.	Delivers the last printed page to the tray.	When a /PRNT signal is input from external device or the video controller PCB, the INITIAL ROTATIONS period is entered after switching OFF the developing bias (DC).

Note: If the temperature of the fixing roller is below 80°C when the power of the printer is turned ON, additional initial rotations will be performed when the temperature of the fixing roller becomes 140°C.
At this time, the printer rotates the main motor and the scanner motor and switch the transfer voltage to a nagative bias (-1500V).
The additional initial rotations will stop when the temperature of the fixing roller reaches 180°C.
If the fixing roller temperature is 80°C or higher when the printer is turned ON, however, additional initial rotations will not be performed.

II. LASER/SCANNER SYSTEM

A. Outline

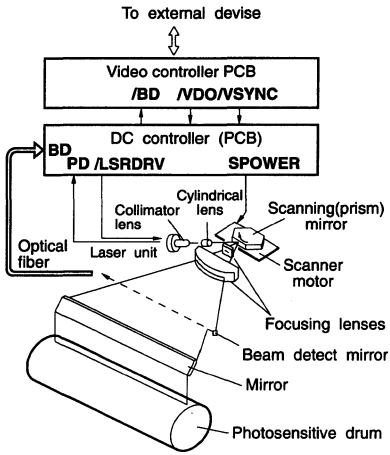


Figure 2-6

In response to the /VDO (Video) signals sent from the video controller PCB, the DC controller PCB generates /LSRDRV (Laser Drive) signals for driving the laser diode and sends them to the laser unit.
The DC controller switches the values of the laser power signal (LSRPOW) in 3 steps and adjusts a laser beam intensity that is the most suitable for the photosensitive drum, in accordance with the sensitivity of the photosensitive drum inside the cartridge.
The laser diode in the laser unit emits light in accordance with the LLCNT (Laser Control) signal sent from the DC controller board. The light beam is received by the photointerrupter adjacent to the laser diode which sends an output proportional to the intensity of the laser beam to the DC controller PCB as a PD (Photoemission Detect) signal.
In order to stabilize the intensity of the laser beam, the DC controller PCB sets the PD signal to a specified value by regulating the LLCNT signal. This process is called "APC" (Automatic Photoemission Control of the laser diode).
After APC ends, the laser unit switches the laser diode ON and OFF in response to the /LSRDRV signal output from the DC controller PCB and thus generates a modulated laser beam.
The modulated laser beam is aligned by a collimator lens into a parallel beam and is aligned the vertical direction focus by a cylindrical lens. And then the laser beam strikes the scanning (hexagonal) mirror which rotates at a constant speed.
The beam is reflected from this mirror, then converged to a point focus on the photosensitive drum by a focusing lens that is positioned in front of the scanning mirror.
While the scanning mirror rotates at a constant speed, each face of the scanning mirror in turn scans the laser beam across the drum at a constant speed.
The drum also rotates at a constant speed. As it rotates, the laser beam successively scans across its surface at a constant speed, thereby forming an image on the drum surface.
In case the printer enters either of the following states, the MPU on the DC controller PCB judges that the laser/scanner system is operating abnormally and so notifies the video controller PCB:

a. If the /BD (Beam Detect) signal could not be input in the correct intervals due to abnormal operation of the scanner unit, or
b. If the /BD signal could not be input due to abnormal laser beam emission.
c. If the intensity of the laser beam could not obtain to the stipulated value when the maximum of D/A conversion value which drive the current to laser diode is supplied to the laser diode.
d. If the rotating speed of the scanner motor could not reach the stipulated value.
e. If the scanner motor deviates from the stipulated rotation speed.

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.

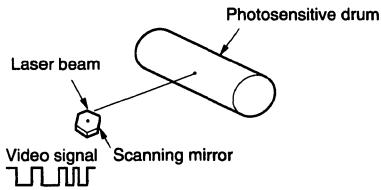


Figure 2-7

When the scanning mirror is rotating and the laser beam strikes a face of the scanning mirror, the reflected laser beam scans from one end of the drum to the other (horizontal scan).
When the laser diode is switched ON and OFF in response to the /VDO (Video) signal during the horizontal scan, a broken line is produced.

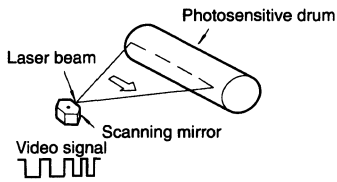


Figure 2-8

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 drum rotates at a constant speed while the laser beam scans across its surface at a constant speed. By the time the beam has swept across the drum and returned to its original position, therefore, the drum surface has shifted downward by about 85 µm (when resolution is 300 raster lines/inch). Each successive scan is thus separated by this interval.

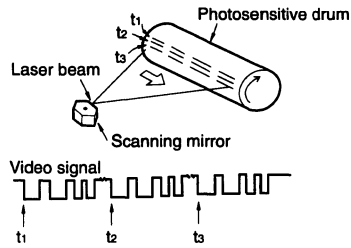


Figure 2-9

Prior to starting a printing operation, the surface of the photosensitive drum is charged to a negative potential by the primary charging roller. When laser light strikes the photosensitive drum during the previously-described horizontal and vertical scans, the electrostatic charge at that location is neutralized, producing an electrostatic latent image on the photosensitive drum surface.
There is a small fixed BD (Beam Detect) mirror to the left edge of the scanning line. 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 an optical fiber that transmits the light to the HORIZONTAL SYNC (/BD) signal generator circuit (on the DC controller PCB), which produces the BD (Beam Detect) signal.
To permit detection of the BD signal, the laser diode goes ON during certain intervals even while the laser beam is not scanning the drum surface so that the beam can strike the BD mirror and identify its position. The signal to switch ON the laser diode is called the UNBL (Unblanking) signal and is generated by the DC controller PCB. The UNBL signal is combined with the VDO signal from the video controller PCB to form the /LSRDRV (Laser Drive) signal which is sent to the laser unit. The laser unit then switches the laser diode ON and OFF in response to the /LSRDRV signal as described in the preceding.

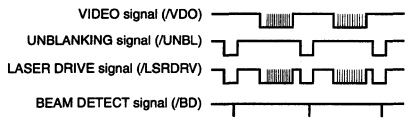


Figure 2-10

C. Laser Control Circuit

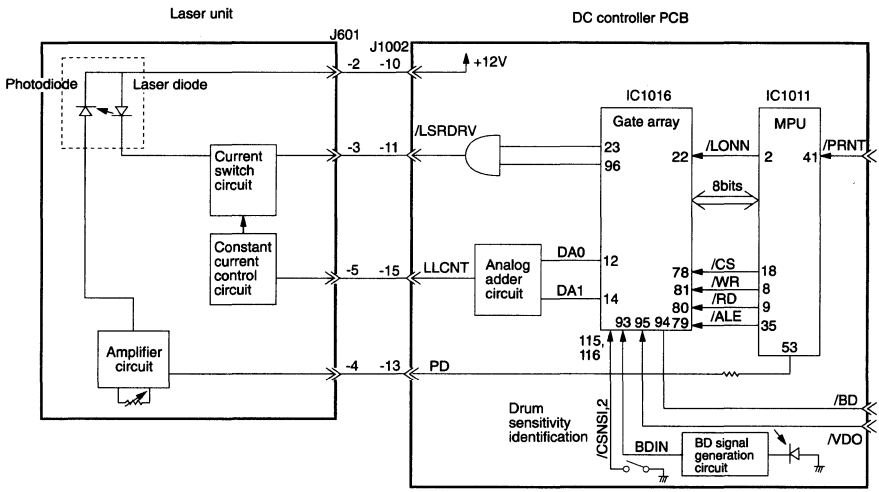


Figure 2-11

1. Outline

This circuit switches the laser diode ON and OFF at a constant light intensity on the basis of the VDO signal sent from the video controller PCB.

The IC1016 gate array generates the UNBL (Unblanking) signal based on the /BD (Beam Detect) signal sent from the BD signal generator circuit on the DC controller PCB.

The /VDO signal sent from the video controller PCB to the DC controller PCB is combined with the UNBL signal at IC1016, then the resulting signal is sent via IC1017 to the current switch circuit in the laser unit as the /LSRDRV signal.

In response to its internal data, IC1011 (MPU) outputs the light intensity control signals (DA0, DA1) from the DA output terminals to the analog adder circuit, then the output of the adder circuit is sent as the LLCNT (Laser Control) signal to the constant current control circuit in the laser unit.

At the analog adder circuit, the DA0 and DA1 signals are added at a weighted ratio of approximately 1:8. The MPU respectively changes the DA0 and DA1 signals for use in fine adjustment and coarse adjustment in order to adjust the output value of the LLCNT signal.

The output current of the constant current control circuit is transmitted to the current switch circuit, and the laser diode is turned ON/OFF according to the /LSRDRV signal.

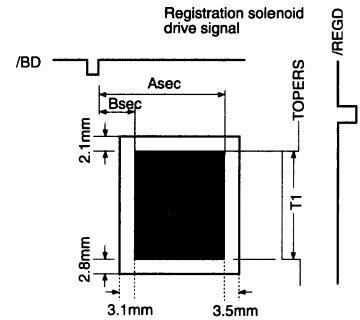
2. APC of the laser diode

APC (Automatic Photoemission Control) of the laser diode is controlled by the IC1011 microcomputer (MPU) on the DC controller PCB so that photoemission by the laser diode is kept at a constant intensity.
This process can be classified into two types: Initial APC and Inter-page APC.

a. Initial APC
   Initial APC is conducted during the INITIAL ROTATIONS period. When the MPU forces the /LSRDRV signal ON via IC1016, it concurrently changes the output value of the DA1 signal (coarse adjustment) and DA0 (fine adjustment) so that the LLCNT signal gradually increases from a low value, thereby causing the laser diode to emit light.
   The intensity of the light emitted by the laser diode is detected by a photodiode and is amplified, then the resulting output voltage is fed back to the MPU as the PD (Photoemission Detect) signal. The MPU constantly monitors the PD signal, holding the LLCNT signal when the intensity of photoemission of the laser diode reaches the stipulated light intensity.
b. Between-page APC
   Between-page APC is conducted just before the /VDO signals for a single page are written onto the surface of the photosensitive drum. When the MPU forces the /LSRDRV signal ON via IC1016, it concurrently changes the respective output values of the DA1 (coarse adjustment) and DA0 (fine adjustment) signals in response to the data of the most recent APC (Initial or Between-page APC) operation to change the intensity of photoemission of the laser diode.
   Similar to Initial APC, the MPU constantly monitors the PD signal, holding the LLCNT signal when the laser diode reaches the stipulated light intensity.
   In the preceding manner, the photoemission of the laser diode is kept at a constant intensity.

3. Photoemission control of the laser diode

When APC ends, the MPU on the DC controller PCB outputs a /VSREQ signal to the video controller PCB.
0.1s after the MPU receives a /VSYNC signal, the /VDO (Video) signals are sent from the video controller PCB. At this time, the IC1016 gate array switches ON the registration rollers.
Within a 2-mm distance from both the leading and trailing edges of the paper, the paper is masked by the TOPERS signal.
The data of the area to be masked, which varies with the size of the paper, is written to IC1016 by the MPU. However, in case of the envelope feeder the masked area shall be B5 size, and in case of manual feed, that shall be Regal size.
The image area in the vertical scanning direction is determined by the interval following the drop of the BD signal. This timing data is preset at the MPU according



Notes: 1. The shaded area indicates the area of the paper to which image data can be written by the laser beam.
2. The T1, A, and B intervals vary with the paper size.
   Note that because the printer cannot distinguish the paper width when paper is fed by manual feed, the A and B values will be set for letter size (the maximum paper width that can be used with this printer).

Figure 2-12

to paper size and is written to IC1016 by the MPU prior to performing APC.

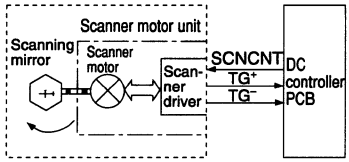


Figure 2-13

D. Scanner Drive

1. Outline

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

The DC controller PCB keeps the speed of the scanner motor constant so that the laser beam reflected by the scanning mirror scans the surface of the photosensitive drum at a constant speed.

The scanner driver drives the scanner motor when it is receiving a SCNCNT (Scanner Motor Control) signal from the DC controller PCB, correspondingly SCNCNT voltage level.

E. Scanner Motor Control Circuit

1. Outline

This printer employs a flat DC motor as its scanner motor. When the power is switched ON, the oscillating frequency of the crystal oscillator (X1001) is divided at IC1016 then is output as a DCK signal. The DCK signal is input to the motor controller as the reference frequency (CPIN) during motor drive.

When the PRNT signal input to the DC controller PCB and the R/S signal input to the motor controller both go "L," the motor controller outputs a scanner motor speed control (AFC) signal and phase control (APC) signal. The AFC and APC signals are supplied via the adder circuit to the scanner motor as the SCNCNT signal which causes the motor to rotate.

When the scanner motor rotates, the output signals of the tachogenerator mounted on the motor are fed back via IC 1016 to the motor controller as the FGIN signal which is compared with the reference frequency to control the rotating speed of the motor.

This PLL (Phase-Locked Loop) method of control stabilizes the speed of motor rotation.

Note that LED 1003 on the DC controller PCB remains lit while the speed of the scanner motor is within a fixed range.

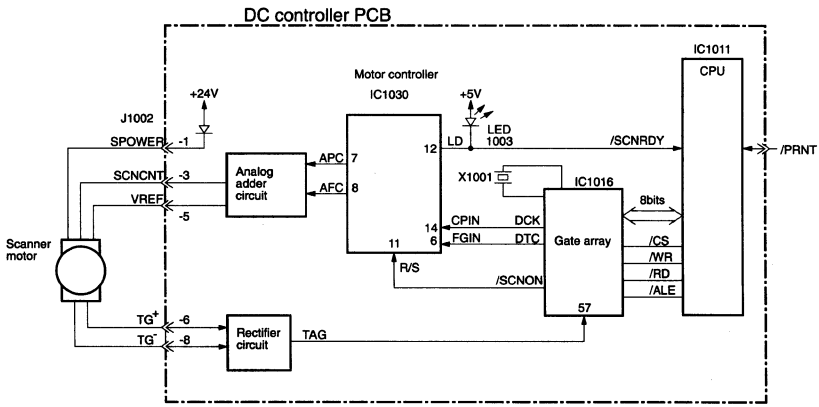


Figure 2-14

2. Malfunction of the scanner motor

In case the printer enters either of the following states, the MPU on the DC controller PCB judges that the scanner motor is operating abnormally and so notifies the video controller PCB:

a. If the scanner motor does not reach the stipulated speed within 30s after commencing rotation, or
b. If the scanner motor deviates from the stipulated speed for a continuous 2.5s interval after reaching the stipulated speed.

III. IMAGE FORMATION SYSTEM

A. Outline

The image formation system is the main part of the printer, where the input of image information encoded in digital VDO signals from an external device or video controller PCB is transformed into a latent image on the photosensitive drum and subsequently transferred to paper by the transfer charging roller as a visible (toner) image. The surface of the photosensitive drum is cleaned by a cleaning blade prior to the formation of each new toner image. As shown in Fig. 2-15, the image formation system consists of the photosensitive drum, developing unit, cleaning unit, and other parts. These functional units are built into the cartridge and cannot be disassembled.

B. Printing Process

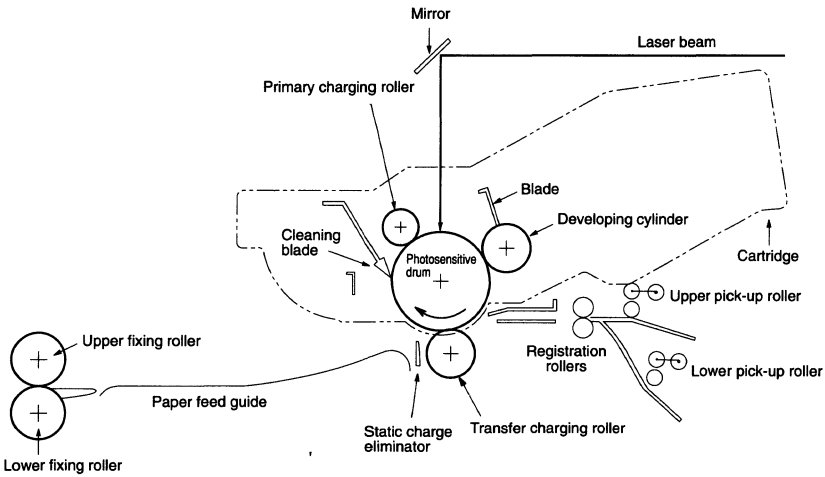


Figure 2-15

This printer uses a seamless photosensitive drum with the structure shown in Fig. 2-16. The outer layer consists of an organic photoconductor (OPC) and the base is aluminum.
The printing process is divided into five main stages.

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

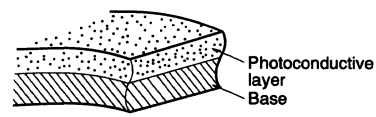


Figure 2-16

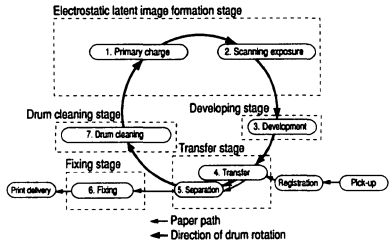


Figure 2-17

1) Electrostatic latent image formation stage

This stage has two steps which together form a pattern of electrical charges on the photosensitive drum. At the end of this stage, negative charges remain in the unexposed "dark" areas and charges are absent from the "light" areas where the laser beam 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."

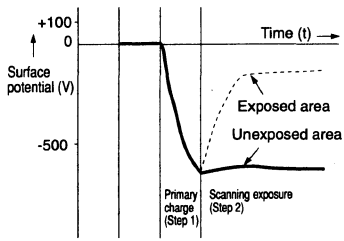


Figure 2-18

Step 1 Primary charge

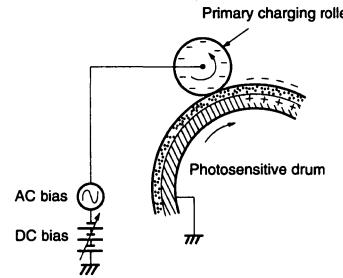


Figure 2-19

To prepare for latent image formation, a uniform layer of negative charges is applied to the surface of the photosensitive drum. For this printer, a direct charge system is used in which the primary charge is directly applied to the photosensitive drum.
The primary charging roller consists of conductive rubber. AC bias coupled with DC bias is applied to the primary charging roller to maintain a uniform potential over the entire drum surface. The DC bias is also changed by the developing DC bias which is determined by the position of the print density adjustment lever.
This direct charge system offers various advantages over the conventional corona charge system, such as lower voltage requirements and practically less ozone generation.

Step 2 Scanning exposure

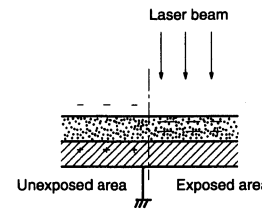


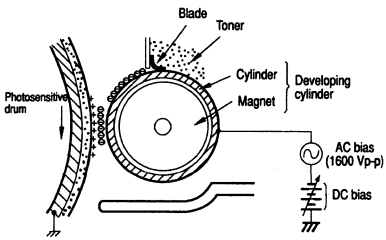
Figure 2-20

When the laser beam scans the drum surface, the negative charge at any area struck by the laser beam is neutralized. The electrostatic latent image forms on the uncharged areas on the drum surface.

2) Developing stage

In this stage, particles of toner are placed onto the electrostatic latent image of the drum to develop a visible image, which is later transferred to paper to produce a printed image. This printer employs the toner projection development method using a single-component toner.

Step 3 Development



Note: The charges on the exposed area on the photosensitive drum are shown as positive in the above figure. Though they are actually negative charges, they are more positive than the developing cylinder so explanation of the developing stage is simplified by regarding them as positive.

Figure 2-21

As shown in Fig. 2-21, the developing unit consists of a developing cylinder and a 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 due to friction between the rubber blade and the rotating cylinder.
The areas on the drum that were exposed by 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 to them (see Figure 2-21), transforming the electrostatic latent image on the surface of the photosensitive drum into a visible image.

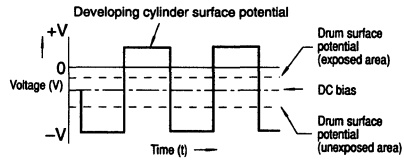
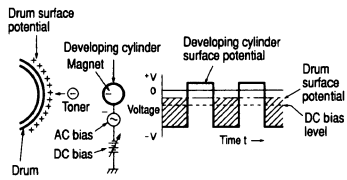
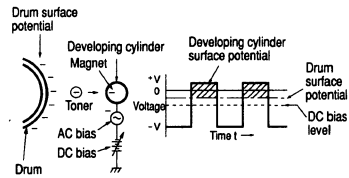
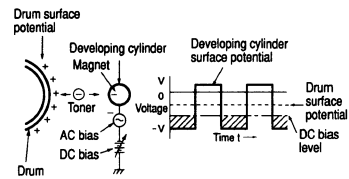
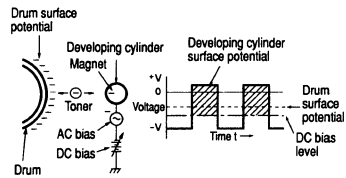


Figure 2-22

An AC bias is applied to the developing cylinder to help project the toner particles onto the drum surface and to improve the contrast of the printed image.
The center voltage of the AC bias (about 1600 Vp-p) varies with the position of the print density adjustment lever.
Sliding the print density adjustment lever changes the DC bias, which changes the potential difference between the cylinder and the drum. This changes the density of the print.

Reference: Toner projection development
Actually, both unexposed and exposed areas on the drum surface have a negative potential. To simplify explanation, however, the drum potential is shown as positive when it is higher (less negative) than the developing cylinder potential, and as negative when it is lower (more negative) than the developing cylinder potential.

Table 2-2

Latent image	Developing bias	Toner movent and electric potentials	Description
Exposed area	Negative bias		The electrostatic attraction caused by the difference in potential between the drum surface and cylinder is sufficient to overcome the attraction of the magnet, so the toner particles are projected from the cylinder to the drum. The amount of toner projected depends on the DC bias on the cylinder.
	Positive bias		When the bias voltage rises slightly above the drum surface potential, the resulting weak electric field combines with the magnetic field to attract toner from the drum back to the cylinder. This removes any excess 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 greater than the attraction toward the drum due to the electric field. Therefore, little toner is projected toward the drum.
	Positive bias		The cylinder bias and the magnetic force now combine to attract the toner strongly to the cylinder, removing excess toner from unexposed areas of the drum and preventing fogging.

3) Transfer stage

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

Step 4 Transfer

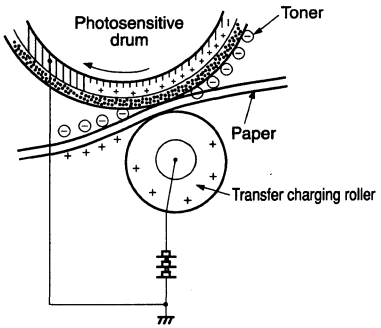


Figure 2-23

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

- Low transfer voltage which is about half that required for corona transfer.
- Minimal generation of ozone.
- The paper is supported by the transfer charging roller and photosensitive drum, so paper feed is more stabilized.

Note: If the image on the photosensitive drum is not completely transferred onto 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 during the printing process. During the INITIAL ROTATIONS and LAST ROTATIONS periods, the printer sets the primary DC voltage to 0V and sets the charge on the drum to 0V. In this case, the transfer voltage is also set negative to attract the negatively charged toner on the transfer charging roller to the drum, thereby cleaning the transfer charging roller.

Step 5 Separation

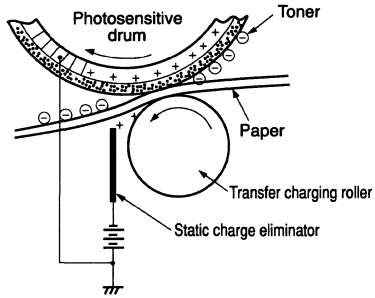


Figure 2-24

The stiffness of the paper causes it to separate from the drum. However, thin paper is less resilient, it may wrap around the drum. To prevent wrapping, separation is facilitated by applying a negative voltage to the static charge eliminator to weaken the electrostatic attraction between the drum and the paper.

4) Fixing stage

The toner image transferred onto 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 transferred onto the paper is fixed by heating the paper and applying pressure. This fuses the toner particles onto the paper to make a permanent image.

Step 6 Fixing

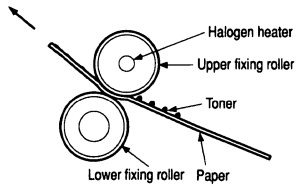


Figure 2-25

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 and distinct.

Step 7 Drum cleaning

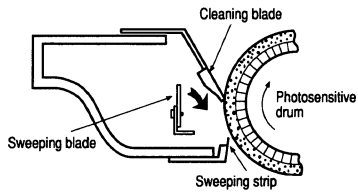


Figure 2-26

In preparation for printing the next image, the residual toner on the drum surface is scraped away with the cleaning blade to clean the drum surface. The removed toner is gathered by the sweeping strip, then swept into the cleaner container by the sweeping blade.

C. Operation

When a PRINT command (/PRNT) is input to the DC controller PCB from the external device or video controller PCB, the DC controller PCB activates the main motor to rotate the photosensitive drum and developing cylinder.

Next, the primary charging roller applies negative charges to the surface of the photosensitive drum, and the laser beam which has been modulated by the /VDO signal strikes the drum surface to form a latent image there.

After the latent image formed on the drum surface is transformed into a visible image by the toner adhering to the developing cylinder, the transfer charging roller transfers the image to paper. The drum surface is cleaned by the cleaning blade to remove residual toner and the primary charging roller evenly distributes the charge over the drum surface to prepare for the formation of a next latent image.

To compensate for variations in drum photosensitivity (due to normal manufacturing variations), two drum sensitivity identification cams on the cartridge actuate one, both, or neither of two switches (SW1002 and SW1003). This sends a signal to the DC controller PCB so it can adjust the laser beam intensity according to the photosensitivity of the drum.

This cartridge also has a toner sensor. When this output becomes lower than a stipulated level, the DC controller PCB judges that there is no toner and sends that information to the video controller PCB.

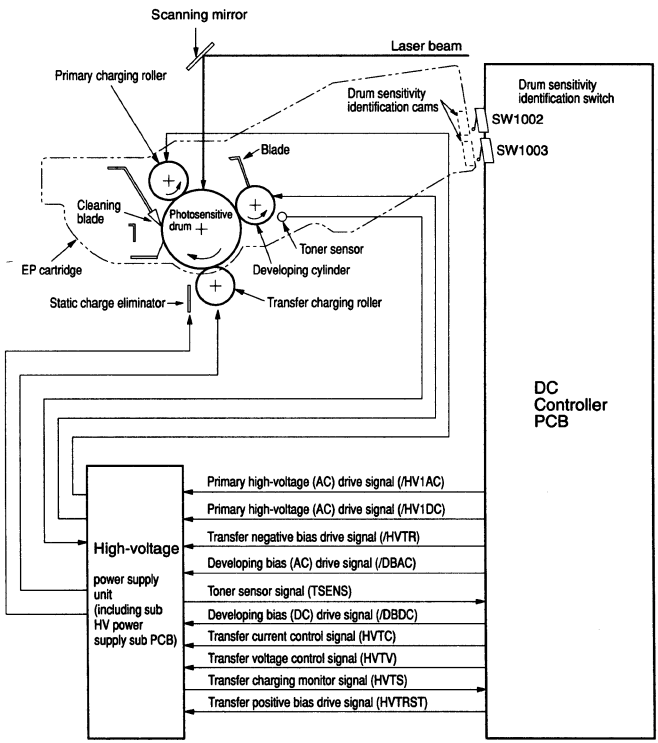


Figure 2-27

D. High-Voltage Power Supply Unit

1. Outline

The high-voltage power supply unit consists of the high-voltage power supply PCB and the high-voltage power supply sub PCB. According to instructions from the MPU on the DC controller PCB, this unit applies an AC bias coupled with DC bias to the primary charging roller and developing cylinder, and applies a positive or negative DC voltage to the transfer charging roller. This unit also applies a negative DC bias to the static charge eliminator.

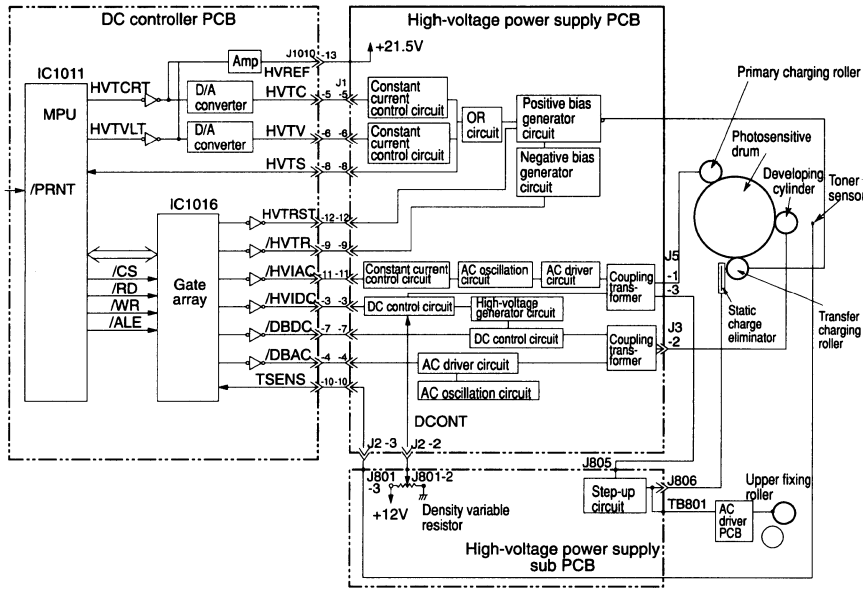


Figure 2-28

2. Operation

a. Generation of the transfer voltages

Negative bias, print bias, or between-page bias is applied to the transfer charging roller according to the stage of the printing process.

Negative bias is applied as negative voltage in the stipulated timing in order to clean the transfer charging roller by moving the toner adhering to the transfer charging roller to the photosensitive drum.

Between-page bias is applied to prevent the residual toner on the photosensitive drum from sticking to the transfer charging roller.

Print bias is applied proper voltage to the transfer charging roller.

The print bias applies proper voltage by the appropriated control.

When the PRNT signal from the external device becomes "L", the initial rotation is started, and at the same time the transfer negative bias drive (HVTR) becomes "L", and a negative bias is applied for a fixed interval.

Next, the between-page bias is applied.

When the VSYNC signal becomes "L", the print bias applies a transfer charge to the roller.

During printing, the between-page bias is applied between pages. When printing ends, negative bias is again applied until the end of the LAST ROTATIONS period.

b. Generation of the developing bias

When the /PRNT signal from the external device becomes "L", the INITIAL ROTATIONS period is started. After a fixed interval, the /DBDC (developing DC bias drive) signal becomes "L", then the developing DC bias is applied to the developing cylinder.

After receipt of the /VSYNC signal, the /DBAC (developing AC bias drive) signal becomes "L" and voltage which couples the developing AC bias with the developing DC bias is applied to the developing cylinder.

The voltage of the developing DC bias can be changed by VR1 (density adjustment lever) on the high-voltage power supply sub PCB, permitting adjustment of the image density.

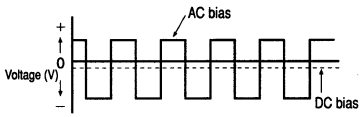


Figure 2-29 Developing bias voltages

c. Generation of the primary high voltage

When the /PRNT signal from the external device becomes "L", the INITIAL ROTATIONS period is started and /HV1AC (primary high-voltage AC drive) signal simultaneously become "L". After a fixed interval, the /HV1DC (primary high-voltage DC drive) signal become "L", then the primary high voltage which couples AC bias and DC bias is applied to the primary charging roller.

The primary high-voltage DC bias changes with the developing DC bias according to the position of the density adjustment lever.

IV. PICK-UP/FEED SYSTEM

A. Outline

The pick-up unit of this printer consists of the paper feed motor, the paper feed PCB, the pick-up roller, feed roller, and the separation roller.

Rotation of the pick-up motor in the pick-up unit causes a pick-up roller, the feed roller, and the separation roller to rotate, thereby feeding the one sheet paper from the cassette into the printer.

The paper is fed by the registration rollers so that its leading edge is aligned with the leading edge of the toner image on the photosensitive drum, then the toner image is transferred to the paper. Next, the paper is separated from the drum, carried by the feeder to the fixing unit, then is delivered to the face-up or face-down tray. Delivery of the printed page is detected by the delivery unit paper sensor (PS151) and face-down tray delivery paper sensor (PS7). The paper holder on the face-down tray also functions as the face-down tray full sensor (PS8).

In case the printer enters the following state, the MPU on the DC controller PCB judges that the lifter is operating abnormally and so notifies the video controller PCB:

a. If the lifter position sensor is not actuated within 7.5 seconds after the lifter is driven.

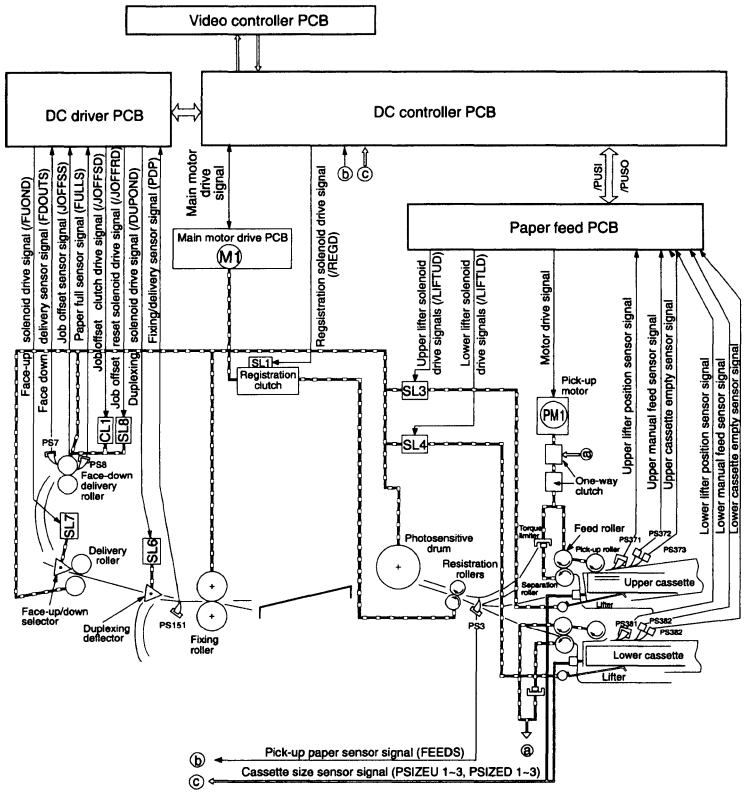


Figure 2-30

B. Operation

When the cassette loaded with the paper is placed in the cassette holder and the fixing rollers reach the stipulated temperature, the printer becomes STANDBY.

The presence/absence and size of the cassette in the cassette holder are sensed by two groups of three switches (SW2301-2303) respectively mounted on the upper and lower cassette holders.

When a cassette is placed in the cassette holder, the main motor (M1) starts rotating, the lifter solenoid (SL3, SL4) ON, a sheet of paper in the cassette is lifted by the lifter to the position detected by a lifter position sensor (PS371 or PS381).

The presence/absence of paper in the cassette is sensed by a cassette empty sensor (PS373 or PS383).

When a /PRNT signal is input to the printer from the external device or the video controller PCB, the main motor (M1) and pick-up motor (PM1) start rotating.

The pick-up motor is a pulse motor which performs forward and reverse rotation.

The paper is picked up from the upper cassette when the pick-up motor is rotating in the forward direction, or from the lower cassette when the pick-up motor is rotating in the reverse direction.

Rotation of the pick-up motor causes a pick-up roller, the feed roller, and the separation roller to rotate so that one sheet of paper is fed to the registration rollers. Because the registration rollers are not rotating at this time, a loop is formed at the leading edge of the paper to correct skew feed of the paper.

The rotation force of the pick-up motor is transmitted to the separation roller via the torque limiter. The direction of the applied rotation force of the separation roller is originally identical to that of the pick-up roller and feed roller (indicated by the outlined arrow in Fig. 2-31). Because the feed roller, paper, and separation roller are in mutual contact, however, the separation roller rotates in the opposite direction (indicated by the solid arrow in Fig. 2-31) along with the feed roller in the paper feeding direction.

When multiple sheets are lifted, the friction between the papers weakens and the rotation of the feed roller is not properly transferred to the separation roller so that the separation roller rotates in opposition to the paper feeding direction, thereby preventing multiple sheets from being fed into the printer. (Figure 2-32)

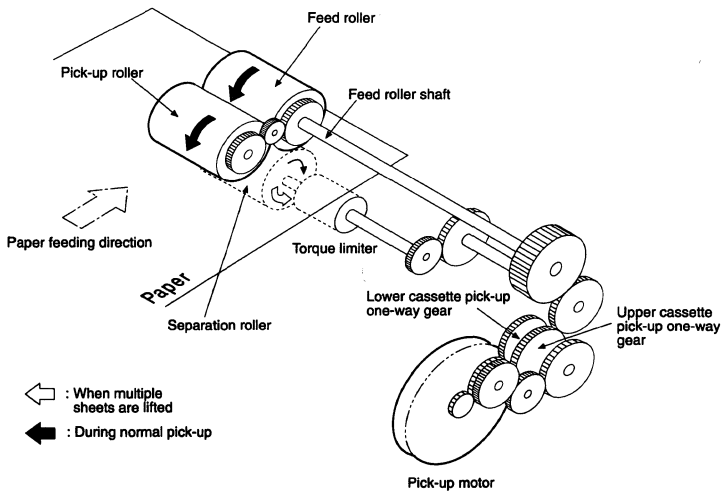


Figure 2-31

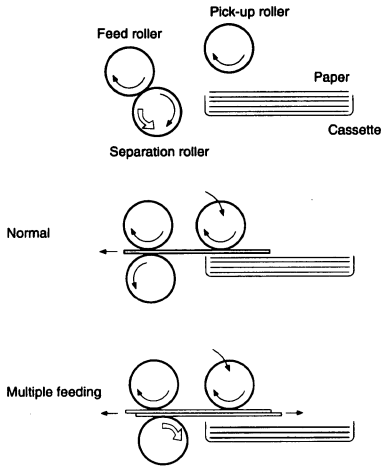


Figure 2-32

C. Cassette Size Sensing System

When a cassette is placed into a cassette holder, cams on the cassette actuate switches to identify the presence/absence and size of the cassette. The MPU on the pick-up driver PCB detects the presence/absence and size of the cassette based on the combination of actuated switches, as described in the table below.

Table 2-3

Cassette size	Cassette size identification switches		
	SW2301	SW2302	SW2301
Executive	ON	ON	ON
A4	ON	ON	OFF
Legal	OFF	OFF	ON
Letter	ON	OFF	OFF
Cassette absent	OFF	OFF	OFF

D. Main Motor Driver

1. Outline

The main motor driver consists of circuitry for driving and controlling the rotation of the main motor.

The main motor is a brushless DC motor with a built-in tachogenerator which outputs clock pulses in proportion to the rotating speed of the main motor.

The main motor is driven by the MMCNT (Main Motor Control) signal which is formed by IC1022 from the main motor rotation control (AFC) signal and phase control (APC) signal.

The signal output from the main motor's tacho generator is fed back via the main motor PCB to IC1022 (PLL controller IC) on the DC controller PCB where it is compared with the reference frequency to maintain the rotation of the main motor at a constant speed. (This type of rotation

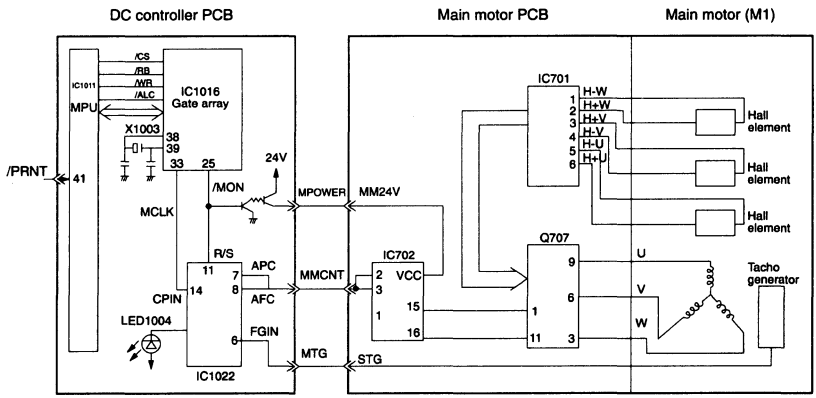


Figure 2-33

control is called "phase-locked loop" control).
Note that LED 1004 on the DC controller PCB remains lit while the speed of the main motor is within a fixed range.

2. Operation
When the MPU (IC1011) on the DC controller PCB receives a /PRNT signal, it writes data for driving the main motor to the IC1016 gate array. Based on this data, IC10116 sets the /MON signal to "L", then supplies +24V to the main motor PCB.
At the same time, IC1016 divides the oscillating frequency of the X1003 crystal oscillator for output as MCLK signals. The MCLK signal is input to IC1022 (PLL controller) as the reference frequency during main motor drive. (CPIN)
When the /MON signal becomes "L" and MCLK is input to IC1022 (PLL controller), IC1022 outputs the main motor rotation control signal (AFC) and phase control signal (APC). The AFC and APC signals are input as the MMCNT (Main Motor Control) signal to IC702 (PWM controller) on the main motor PCB.
The MMCNT signal is converted by IC702 into a signal of variable pulse width which switches transistor arey (Q707) ON and OFF. Only while PWM Signal of Q707 is OFF, +24V is supplied to the main motor so that the main motor rotates. As a result, the main motor rotates at a speed that is proportional to the pulse width of this signal. (This type of rotation control is called "Pulse Width Modulation" control.)
When the main motor starts rotating, clock pulses are output which are fed back to IC1022 on the DC controller PCB as FGIN signals. IC1022 compares the frequency and phase of the FGIN signal with the CPIN signal, then controls the APC and AFC signal to the appropriate values so that the main motor rotates at a constant speed. (This type of rotation control is called "Phase-Locked Loop" control.)

3. Malfunction of main motor
In case the printer enters either of the following states, the MPU on the DC controller PCB judges that the main motor is operating abnormally and so notifies the video controller PCB:

a. If the main motor does not reach the stipulated speed within one second after commencing rotation, or
b. If the main motor deviates from the stipulated speed for a continuous one-second interval after reaching the stipulated speed.

E. Pick-up Roller Driver

1. Outline

The pick-up motor of this printer consists of one 4-phase pulse motor.
This pick-up motor is controlled by the MPU on the paper feed PCB to drive the upper cassette pick-up roller and lower cassette pick-up roller.
To drive the pulse motor, a pulse motor driver circuit is required that consecutively switches the flow of DC voltage to each coil of the stators. This pick-up roller driver is also mounted with such a pulse motor driver circuit.

2. Operation

When the MPU (IC1011) on the DC controller PCB receives a /PRNT signal and /CMD (Command) signal, it writes data for driving the pick-up motor to the IC1016 gate array. Based on this data, IC1016 sends the serial /PUSI signal to the MPU on the pick-up driver PCB.
In response, the MPU on the pick-up driver PCB generates two-phase pulses (D7 and D8) as well as a pulse generation signal (SRDY).
The two-phase pulses are input to the drive pulse generator circuit, which produces the A and AN signals plus their common signal (COMA), as well as the B and BN signals plus their common signal (COMB) in order to drive the pick-up motor.

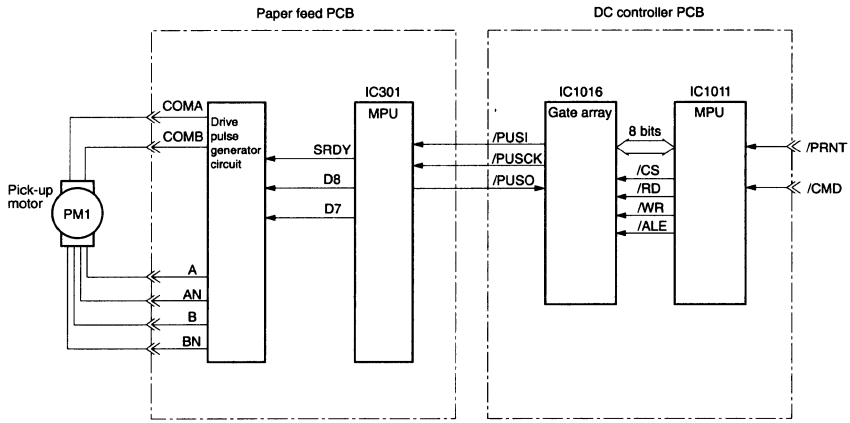


Figure 2-34

The cassette from which paper is to be picked up is selected by changing the rotation (forward or reverse) of the pick-up motor.
The duty ratio of the four-pulse waveforms (A, AN, B, BN) supplied to the pick-up motor is 50%, and each waveform is output with a phase difference of 90°. Consequently, by exciting the stators of the pick-up motor in the A-B-AN-BN sequence, the stators produce a rotating force which causes the pick-up motor to rotate.
If the stators are excited in the BN-AN-B-A sequence, the pick-up motor rotates in the reverse direction.
Note that the rotating speed of the pick-up motor is accurately controlled, because the /PUSCK signal generated by IC1016 on the DC controller PCB is the reference signal for the two-phase pulses generated by the MPU on the pick-up driver PCB.

F. Fixing and Delivery Unit

1. Outline

The upper/lower rollers of the fixing unit, the face-up delivery roller, and the face-down delivery rollers are driven by the main motor (M1).
The upper roller is heated by a fixing roller heater (H1: 750W). The upper roller's surface temperature is detected by the thermistor (TH1). As the surface temperature increases, both the resistance of the thermistor (TH1) and the voltage of the FSRTHS (Fixing Roller Surface Temperature) signal drops.
Based on the voltage of this FSRTHS signal, the MPU on the DC controller sends the FSRD (Fixing Roller Heater Drive) signal to the DC driver PCB. The DC driver PCB receives this signal, and controls the "H" and "L" of the /HTDL (Heater Drive Low) signal to set the upper roller's surface temperature to the specified value.

STANDBY : Maintained at 180°C
PRINTING: Maintained at 190°C

The printer has one thermoswitch. When the upper roller's surface temperature rises abnormally, this switch goes OFF to cut off the power supply to the fixing roller heater.

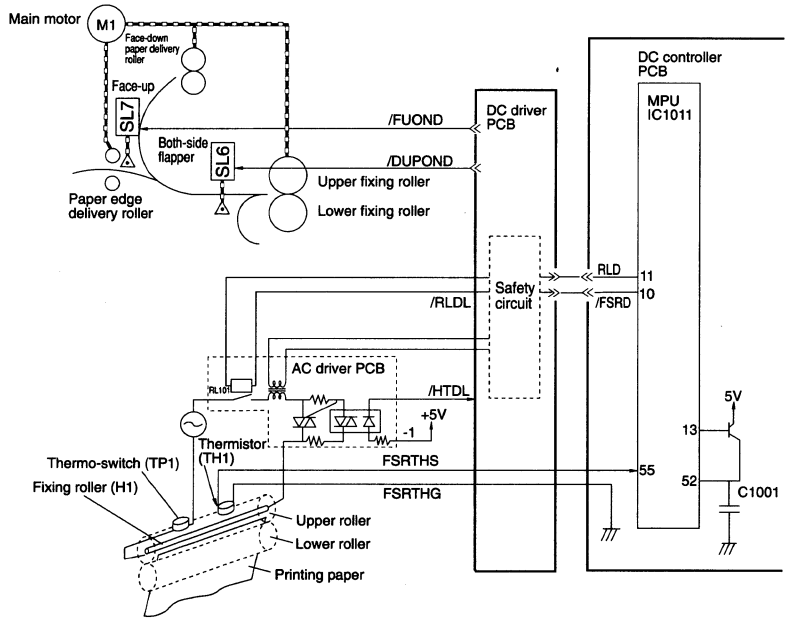


Figure 2-35

Upon clearing the fixing rollers, the paper actuates the fixing/delivery unit paper sensor and arrives at the duplexing deflector.
When duplex printing is to be performed, the deflector is tilted toward the duplexing feeder unit so that the paper is fed to the duplexing feeder unit (optional).
The face-up/down deflector selects face-up or face-down delivery. In case of face-up delivery, the paper is delivered to the rear printer tray as is. In case of face-down delivery, it is delivered to the face-down delivery tray on the top printer.
The face-down tray has a face-down tray full sensor and a face-down delivery paper sensor.

2. Malfunction of the fixing roller heater

If the fixing unit is abnormally heated for any reason or the fixing unit does not reach the specified temperature due to a malfunction of the fixing roller heater (H1), the MPU on the DC controller PCB sets Pin 54 to "H" so that the C1001 capacitor is charged. The MPU next notifies the malfunction of the fixing roller heater to the video controller PCB.

When the power is switched ON, the MPU reads the voltage of Pin 52 (terminal voltage of C1001). If the voltage is higher than the specified value, the MPU assumes the malfunction of the fixing roller heater occurred before the power was switched ON and cuts off the current to the fixing roller heater.

In case the printer enters any of the following states, the MPU on the DC controller PCB judges that the fixing unit is operating abnormally and so notifies the video controller PCB.

a. If C1001 has been charged to 1.79V or more when the power is switched ON.
b. If the upper roller's temperature does not reach 30°C within 30 seconds after the power is switched ON or after the top cover is opened and closed.
c. If the upper roller's temperature does not reach 190°C within 200 seconds after the power is switched ON or the top cover is opened and closed.
d. If the upper roller's temperature is 80°C or higher but does not reach 180°C within 200 seconds after the power is switched ON or the top cover is opened and closed.
e. If the upper roller's temperature falls to 150°C or less in the standby state or during printing.
f. If the upper roller temperature rises to 215°C or higher.

Note: If the fixing roller heater malfunctions, switch OFF the printer and do not switch it back ON for approximately 30 minutes. Even if the printer is switched ON during this interval, the fixing roller heater will not activate so as to avoid overheating of the fixing unit.

3. Safety Circuit

This circuit is located on the DC driver PCB, and when it receives the output from the safety circuit during an abnormality, it turns OFF the relay (RL101) on the AC driver PCB and cuts off the current to the fixing roller heater.

The following is an explanation of this circuit.

The voltage that is generated by the current through the fixing roller heater is input to the input pins (Pin 2 and Pin 5) of the comparator (IC201).

When this voltage becomes higher than 12.05V or lower than 11.95 V, the output of one of the output pins (Pin 1 or Pin 7) of the comparator (IC201) becomes "L".

As a result, the transistor (Q201) is turned OFF and the condenser (C205) is charged and the transistor (Q202) is turned ON.

The fixing heater OFF circuit is triggered and /RLDL becomes "H" and the relay (RL101) is turned OFF.

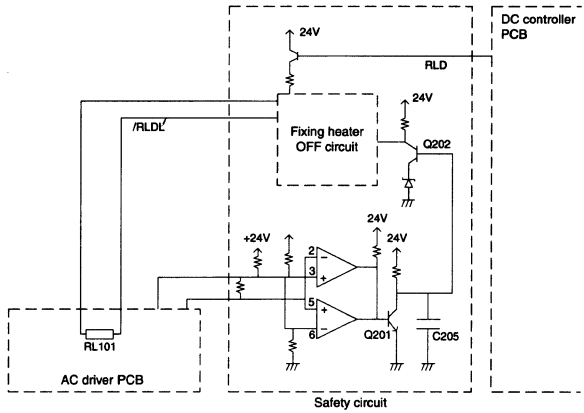


Figure 2-36

4. Job offset system

a. Outline

The face-down delivery roller has a job offset function and can feed paper one sheet every some papers by shifting the fixed distance and home position. Due to this, the printed papers can be sorted out.

b. Operation

When the /JOFFSD (Job Offset) signal is input to the job offset clutch (CL1) within the face-down delivery unit, the CL1 clutch is activated which causes the delivery roller unit to be ~~sift~~ in the ➡ arrow direction. When the delivery roller unit is ~~sift~~, it interlocks with SL8. In this status, the paper will be ~~sift~~ by a fixed distance before being delivered.

A job offset operation can be reset by forcing the /JOFFRD (Job Offset Reset Drive) signal to "L" level. When the /JOFFRD signal goes "L", Job offset reset solenoid (SL8) is activated and releases the delivery roller unit so that the delivery roller unit is returned in the ⇨ arrow direction.

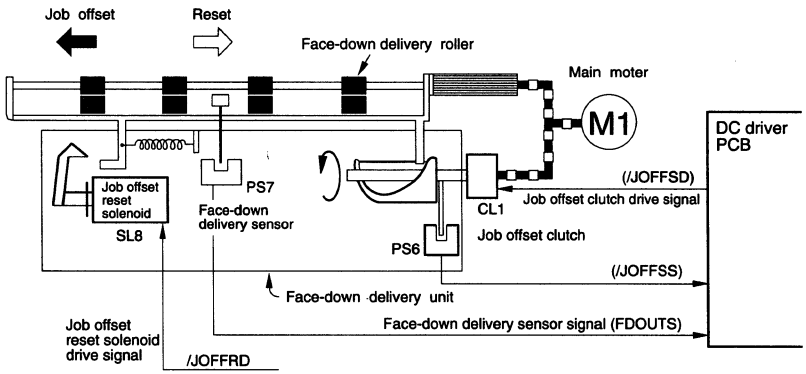


Figure 2-37

The following indicates the timing of the job offset operation

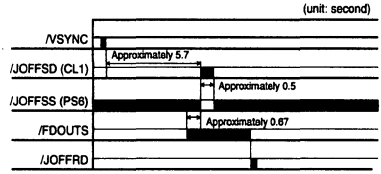


Figure 2-38

5. Malfunction of the fan motor

In case the printer enters the following state, the MPU on the DC controller PCB judges that the fan motor is operating abnormally, stops the printer at the end of the printing job, and notifies the video controller PCB of the malfunction.

a. If either FAN1, FAN2, or FAN3 stops operating for a continuous 3-second interval.

G. Paper Jam Detection

This printer is equipped with the paper sensors listed below to detect the presence/absence of paper and whether or not the paper is being fed normally:

1. Pick-up paper sensor (PS3)
2. Fixing unit delivery paper sensor (PS151)
3. Face-down tray delivery paper sensor (PS7)

The MPU on the DC controller PCB judges if a paper jam has occurred by ascertaining whether the paper arrives at or passes the pertinent sensor at the times preset in memory.

If the MPU detects a jam, printing is discontinued and the video controller PCB is notified that a jam has occurred.

The types of paper jams and their detection times are described in the following. (The detection times all represent the case of printing on A4 paper.)

1. Pick-up delay jam

If the paper does not arrive at the pick-up paper sensor (PS3) within the specified time after the pick-up motor is activated.

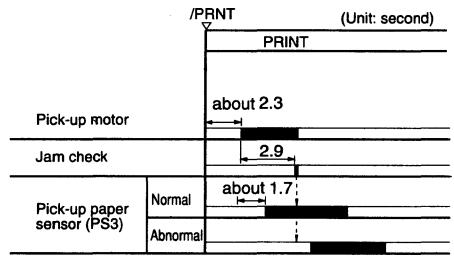


Figure 2-39

2. Fixing unit delivery delay jam
If the paper does not arrive at the fixing unit delivery paper sensor (PS151) within the specified time after the registration rollers go ON.

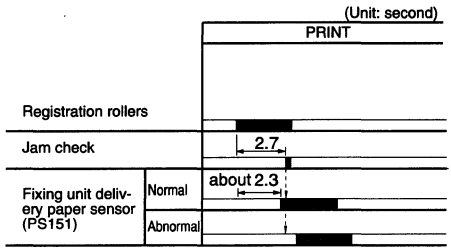


Figure 2-40

3. Fixing unit stationary jam
If the paper does not pass the fixing unit delivery paper sensor (PS151) within the specified time after the registration rollers go ON.

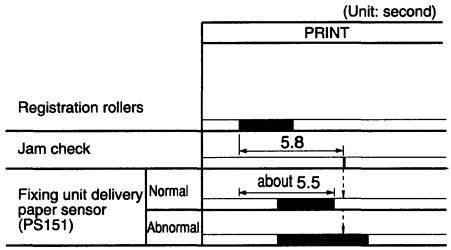


Figure 2-41

4. Face-down tray delivery delay jam
If the paper does not arrive at the face-down tray delivery paper sensor (PS7) within the specified time after the registration rollers go ON.

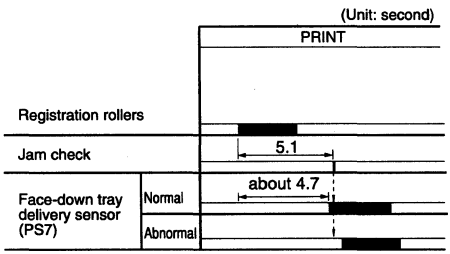


Figure 2-42

5. Face-down tray delivery stationary jam
If the paper does not pass the face-down tray delivery paper sensor (PS7) within the specified time after the registration rollers go ON.

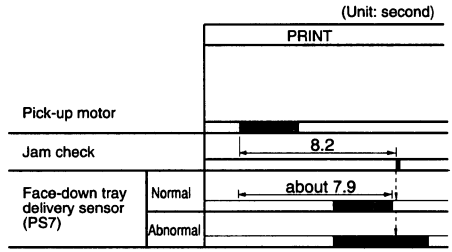


Figure 2-43

V. POWER SUPPLIES

A. Outline

When the main POWER switch is set to ON, the AC line voltage is supplied via the circuit breaker and line filter on the AC driver PCB to the low-voltage power PCB. The AC driver PCB is provided with a door switch (SW1001) which turns the AC power and the +24 VB ON and OFF.

The low-voltage power supply PCB has circuits for generating +24VDC, +12VDC, and +5VDC power. When the sub Power switch is ON, +5VDC power is ON. This printer constantly monitors the +24VA level. When the power is switched OFF, the +24VA power supply cannot be reactivated unless the +24VA signal output is +0.4V or lower. About 5 seconds are required to reset this +24VA value.

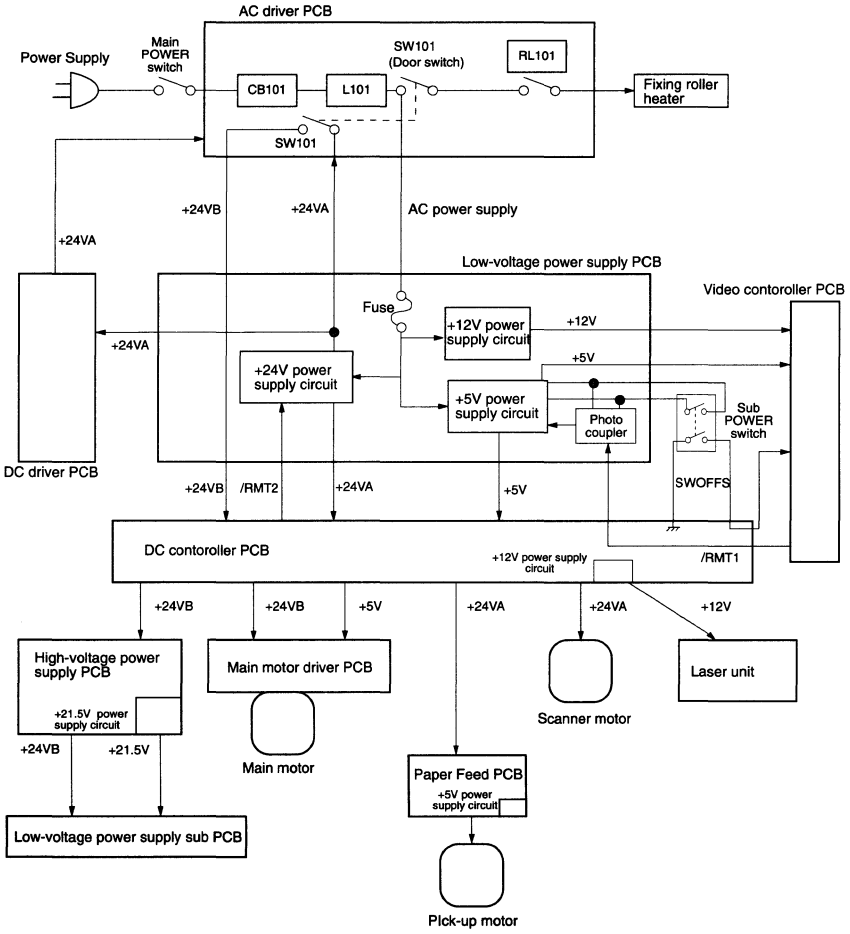


Figure 2-44

In addition, when the +5V signal output from a +5V power circuit falls below the specified level, a RESET signal is output to reset the printer.
The video controller receives a SWOFFS signal. When the sub POWER switch turns OFF, a SWOFFS becomes "H". Then, after the necessary sequence, a /RMT1 from the video controller PCB to the low-voltage power supply PCB becomes "H". And the power supply become activated.

B. Protective System
The +24V and +5V power circuits are provided with an overcurrent protection function and an excess voltage protection function, whereas the +12V power circuits are provided with an overcurrent protection function. If an error occurs at any of these power circuits, all of the power circuits are automatically switched OFF. If this happens, make sure to unplug the power cord from the electrical socket before attempting to correct the cause of the problem.

VI. SYSTEM INTERFACE

A. Outline

In order to use this printer by connecting it to external devices such as a host computer, etc., it is necessary to add a video controller circuit (interface circuit) between the this printer and the external device.

Consequently, the types of interface signals between this printer and the video controller, and the interface signals used by this printer are explained in operational sequence as follows.

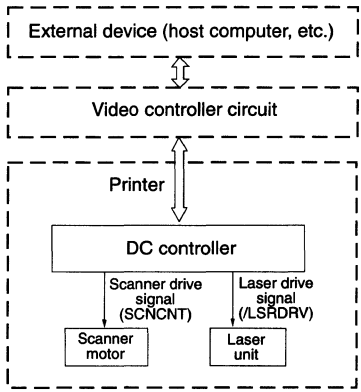


Figure 2-45

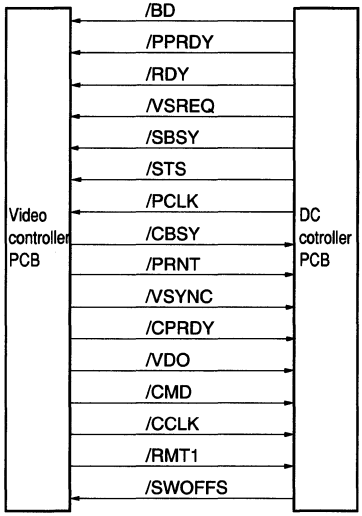


Figure 2-46

B. Operation

When the printer power is switched ON, the printer goes into WAIT status.
At the end of the WAIT period, and the DC controller transmits the /RDY (Ready) signal to notify the video controller PCB that the printer is ready for printing.
The /RDY signal becomes "L" and when data for printing of 1 page has been accumulated, the video controller PCB sends a print signal (/PRNT) to the DC controller PCB, and the INITIAL ROTATION (INTR) priod is started.
At the end of the INITIAL ROTATIONS period, the DC controller PCB transmits the /VSREQ (Vertical Sync Request) signal to the video controller PCB, and the video controller PCB responds by sending the /VSYNC (Vertical Sync) signal to DC controller PCB.
The printer then begins the printing process. The video controller PCB receives the Horizontal Sync (/BD: Beam Detect) signal,then transmits /VDO (Video) signals synchronized with the BD signal and VSYNC signal to the interface circuit.
The DC controller converts the VDO signals into /LSRDRV (Laser Drive) signals, which are transmitted to the laser unit. The laser beam emitted by the laser diode is switched ON and OFF in response to the /LSRDRV (Laser Drive) signals sent from the DC controller to the laser unit's laser driver PCB. The resulting laser beam scans the photosensitive drum to form an electrostatic latent image on the drum surface.
This latent image is transferred from the drum surface to plain paper by an electrophotographic process, then the printed page is delivered to the face-up or face-down tray.
During the printing cycle for a page, the printer checks whether or not a /PRNT signal for the next page is being transmitted from the video controller PCB. If not, the printer terminates the printing process and begins the LSTR (LAST ROTATIONS) operations. After completion of the LSTR operations, the printer enters STBY (Standby).
If a /PRNT signal is received from the video controller PCB, however, the printer continues the printing process.

CHAPTER 3

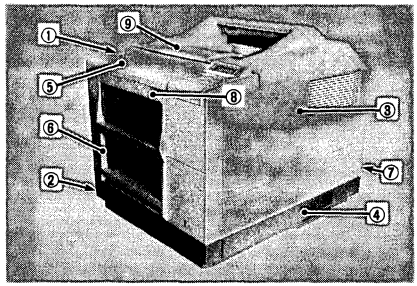
THE MECHANICAL SYSTEM

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-N 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-N cartridge and font 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

A. Covers and Panels



① Left cover (4)
② Left bottom cover (2)
③ Right cover (2)
④ Right bottom cover (2)
⑤ Front upper cover (6)
⑥ Front lower cover (4)
⑦ Rear lower cover (2)
⑧ Envelope cover
⑨ Upper unit (4)

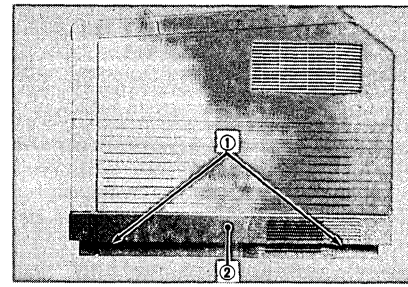
Note: Throughout this chapter, a number enclosed in parentheses represents the number of screws to be removed or loosened in the step.

Figure 3-1

When cleaning, inspecting, or repairing the inside of the printer, remove the pertinent covers and/or panels as described in the following steps. Note that the disassembly procedure for a cover that simply involves the removal of its screws has been omitted.

1. Right bottom cover

1) Remove the two screws and move it backward.
   Remove the right bottom cover.

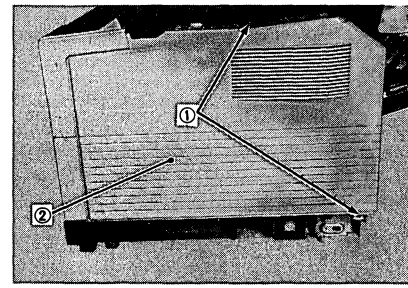


① Screws ② Right bottom cover

Figure 3-2

2. Right cover

1) Remove the right bottom cover and remove the screw.
2) Open the printer and remove the screw.



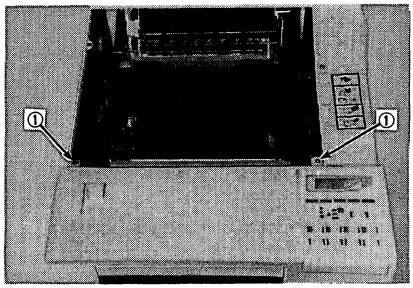
① Screws ② Right cover

Figure 3-3

3) Move the right cover backward and pull the backside toward you slightly.

3. Front upper cover

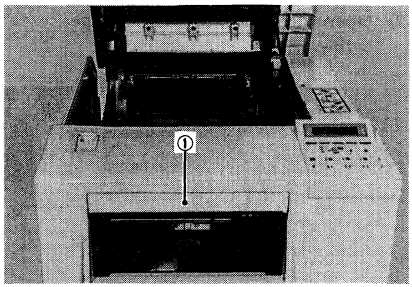
1) Remove the right cover.
2) Remove the two screws.



① Screws

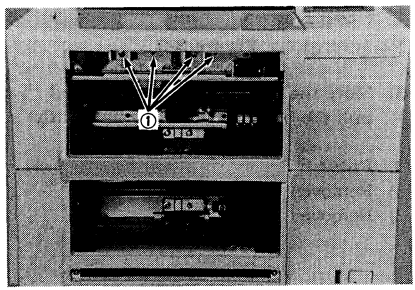
Figure 3-4

3) Remove the envelope cover and remove four screws.



① Envelope cover

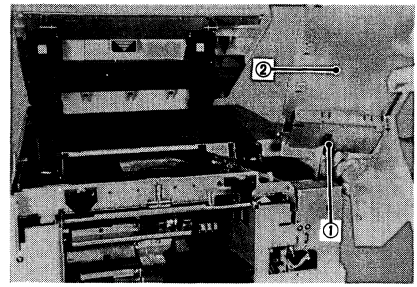
Figure 3-5



① Screws

Figure 3-6

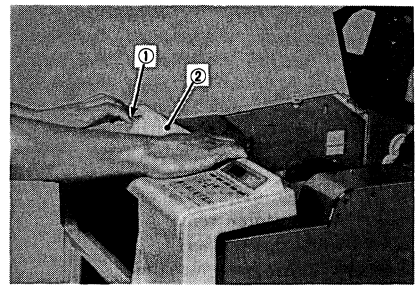
4) Remove the front upper cover. **(A connector is attached to the control panel, so remove the front cover carefully.)**
5) Remove the connector and remove the front upper cover.



① Connector ② Front upper cover

Figure 3-7

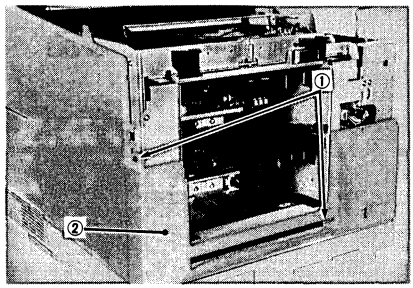
Note: When attaching, insert the front upper cover while pushing the upper unit lock release button.



① Upper unit lock release button
② Front upper cover

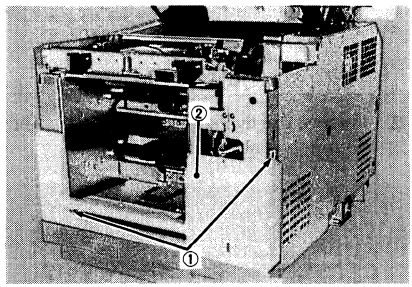
Figure 3-8

4. Front lower cover
1) Remove the front upper cover.
2) Remove the four screws and remove the claw on right side.
Remove the front lower cover.



① Screws ② Front lower cover

Figure 3-9a

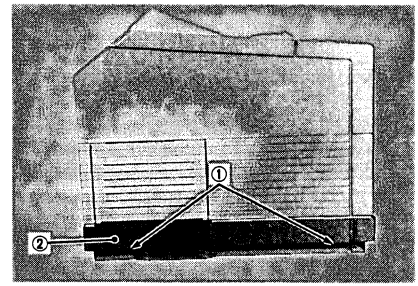


① Screws ② Front lower cover

Figure 3-9b

5. Left bottom cover

1) Remove the two screws and pull the backside of the left bottom cover and move it backward.
Remove the left bottom cover.

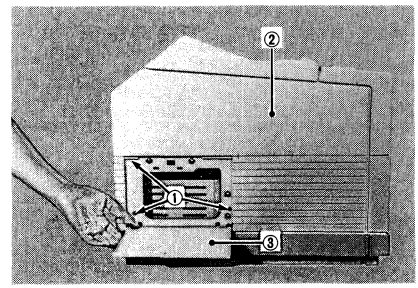


① Screw ② Left bottom cover

Figure 3-10

6. Left cover

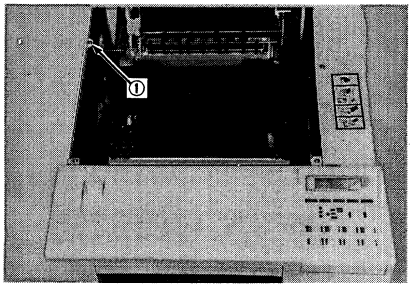
1) Remove the left bottom cover.
2) Open the left side door and remove three screws.
Close the left side door.



① Screw ② Left cover
③ Left side door

Figure 3-11

3) Open the printer and remove the screw.



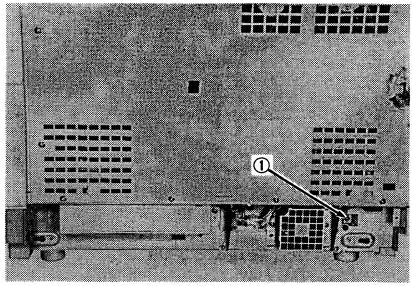
① Screw

Figure 3-12

4) Pull the left cover toward you slightly and move it backward.
Remove the left cover.

B. Bottom Box Tray

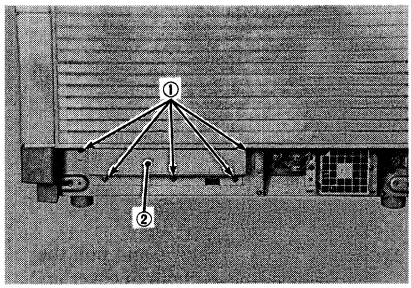
1) Remove the right bottom cover and remove the screw.



① Screw

Figure 3-13

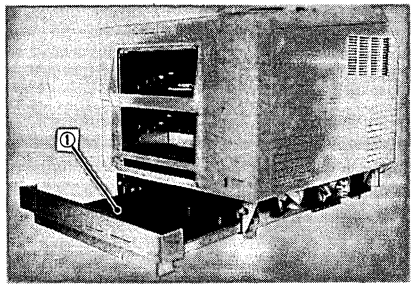
2) Remove the five screws and remove the bottom box shield plate (right).



① Screw ② Bottom box shied plate

Figure 3-14

3) Pull out the cables in the bottom box and pull out the bottom box tray forward.

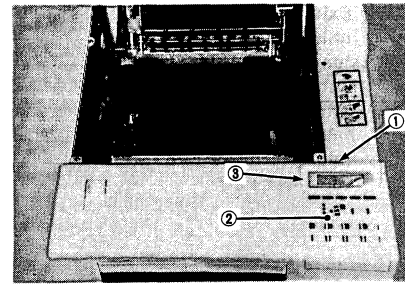


① Bottom box tray

Figure 3-15

C. Control Panel

1) Remove the front upper cover.
2) Remove the two screws and remove the claws on the both sides.
   Remove the control panel from the front upper cover.
3) Remove the connector.



① Screw
② Control panel
③ Connector

Figure 3-16

D. Fan Motor Unit

1. Outline

This printer has four fan motors. They are designed primarily to circulate air in the printer and keep the temperature down. Here are the main roles of these fans.

Exhaust fan (FM1):

Exhaust the air from space of fixing unit

Exhaust fan (FM2):

Exhaust the air from space of printer

Inhalant fan (FM3,4):

Inhalant the air into space of video controller PCB.

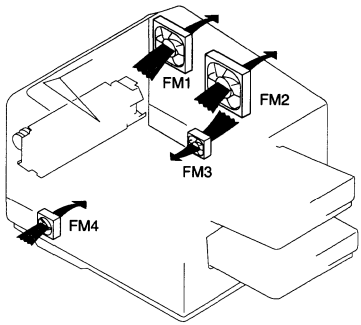
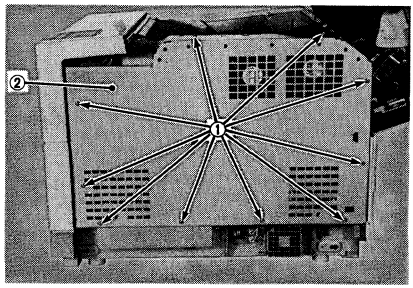


Figure 3-17

2. Disassembly and reassembly

a. Fan motor FM2 (fixed on the low-voltage power supply PCB)

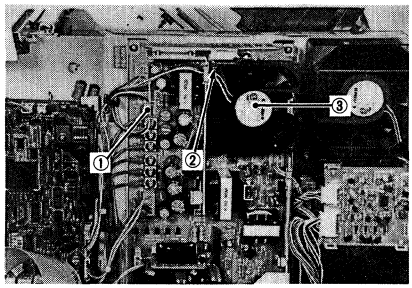
1) Remove the right cover.
2) Remove the ten screws and remove the outer shield plate.



① Screws ② Outer shield plate

Figure 3-18

3) After disconnecting the connector, remove the two screws and remove fan motor FM2.



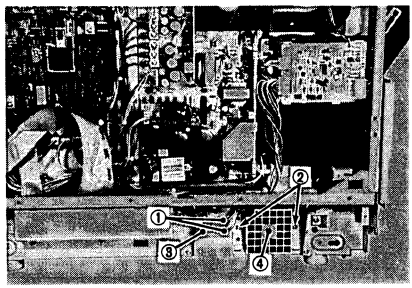
① Connector ② Screw
③ Fan motor FM2

Figure 3-19

Note: When attaching, install it so as to exhaust the air.

b. Fan motor FM3 (on the right side of the bottom box)

1) Remove the right bottom cover.
2) Remove the connector on the fan relay PCB.
3) Remove the two screws and remove the fan guard (right).



① Connector ② Screw
③ Fan relay PCB ④ Fan guard (right)

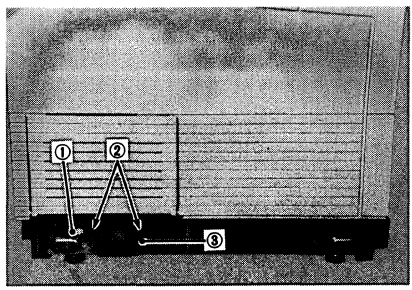
Figure 3-20

4) Remove the fan motor FM3 from the fan guard.

Note: When attaching, install it so as to inhalant the air.

c. Fan motor FM4 (on the left side of the bottom box)

1) Remove the left bottom cover.
2) Remove the connector of the cable to the fan.
3) Remove the two screws and remove the fan guard (left).



① Connector ② Screw
③ Fan guard (left)

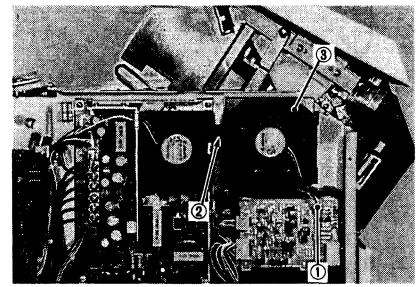
Figure 3-21

4) Remove the fan motor FM4 from the fan guard.

Note: When attaching, install it so as to inhalant the air.

d. Fan motor FM1

1) Remove the right cover.
2) Remove the ten screws and remove the outer shield plate.
3) After disconnecting the connector from the DC driver PCB and removing the screw, pull the duct and the fan motor FM1 out toward you .



① Connector ② Screw
③ Duct

Figure 3-22

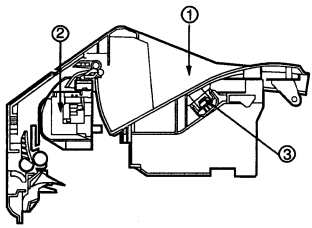
4) Remove the fan motor FM1 from the duct.

Note: When attaching, install it so as to exhaust the air.

E. Upper Unit

1. Configuration

The configuration of the upper unit is shown below.

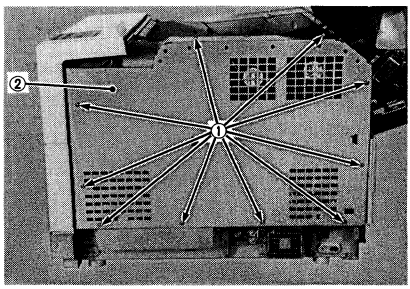


① Face-down delivery tray
② Delivery unit
③ Mirror

Figure 3-23

2. Separating the upper unit from the lower unit

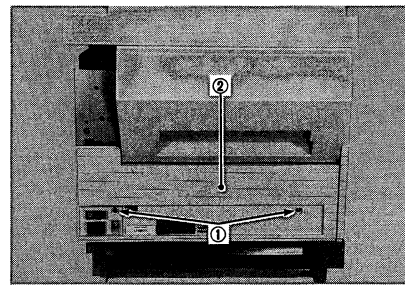
1) Open the printer.
2) Remove the EP-N cartridge.
3) Remove the right cover.
4) Remove the ten screws and remove the outer shield plate.



① Screws ② Outer shield plate

Figure 3-24

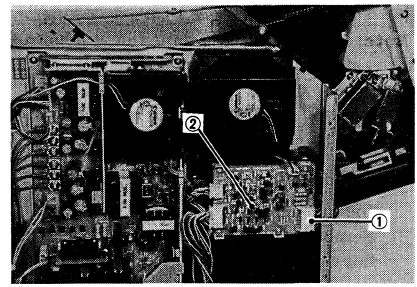
5) Remove the two screws and remove the rear lower cover.



① Screws ② Rear lower cover

Figure 3-25

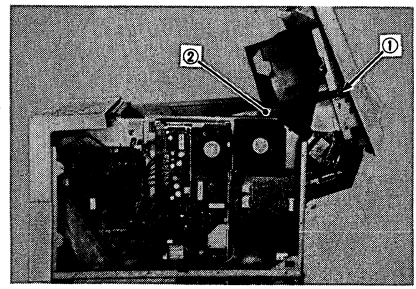
6) Remove the connector from DC driver PCB.



① Connector ② DC driver PCB

Figure 3-26

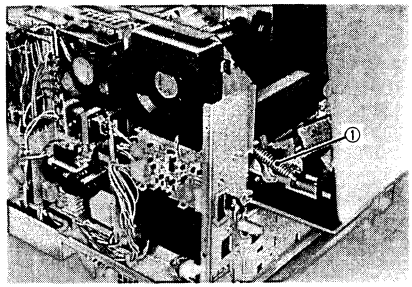
7) Remove the screw and remove the link.



① Screw ② Link

Figure 3-27

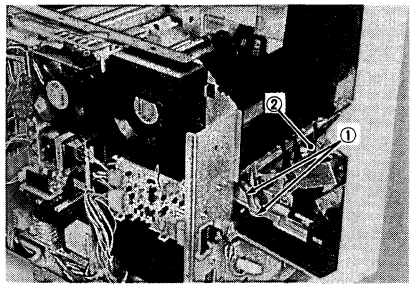
8) Remove the left and right hinge springs.



① Hinge springs

Figure 3-28

9) Remove the four screws securing the upper unit to the hinges.



① Screws ② Upper unit

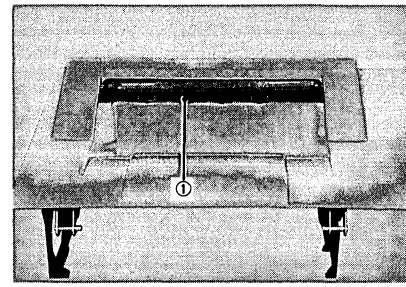
Figure 3-29

10) While holding the upper unit with both hands, remove it from the hinge shaft.

3. Disassembly and reassembly

a. Delivery unit

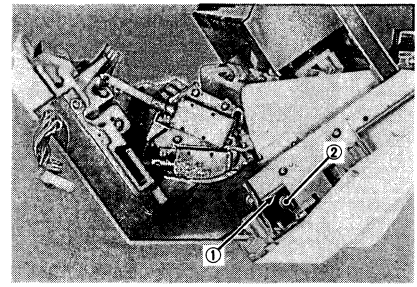
1) Move the face-down delivery roller toward the right until it locks in place.



① Face-down delivery roller

Figure 3-30

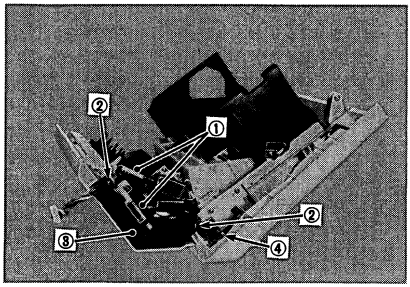
2) Remove one screw and then remove the blinding board that is attached to the face-down delivery roller.



① Screw ② Blinding board

Figure 3-31

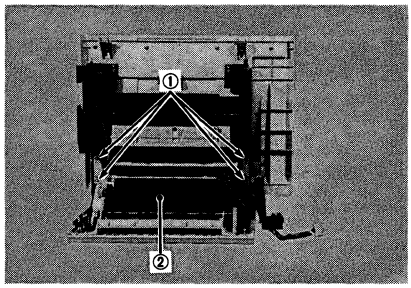
3) Disconnect the two links attached to the solenoid.
4) Remove the two screws and remove the cable cover.
5) Disconnect the connector.



① Links ② Screws
③ Cable cover ④ Connector

Figure 3-32

6) Remove the four screws and remove the delivery unit.

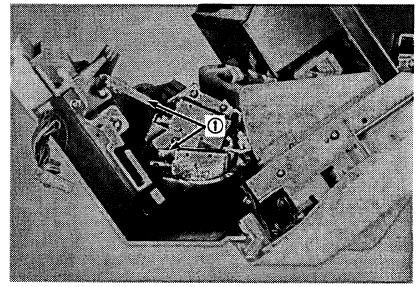


① Screws
② Delivery unit

Figure 3-33

b. Delivery unit cover

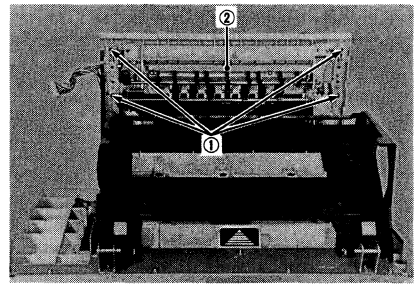
1) Remove the two links attached to the solenoid.



① Links

Figure 3-34

2) Remove the four screws securing the delivery unit cover.
3) Slide the delivery unit cover backward to remove it from the upper unit.

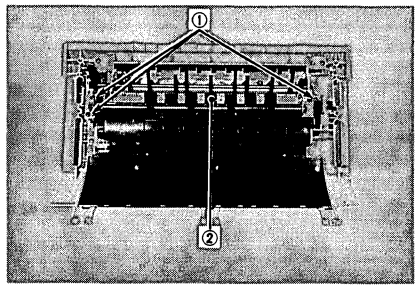


① Screws ② Delivery unit cover

Figure 3-35

c. Face-up delivery roller

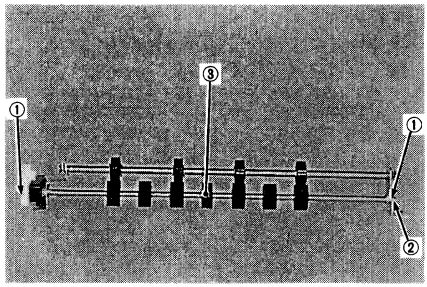
1) Execute step 1), 2) and 3) of "b. Delivery unit cover" shown on page 3-10.
Remove the delivery unit cover.
2) Remove the three screws and remove the face-up delivery roller unit from the delivery unit cover.



① Screws
② Face-up delivery roller unit

Figure 3-36

3) Remove the two E-rings and the bearing and remove the face-up delivery roller.

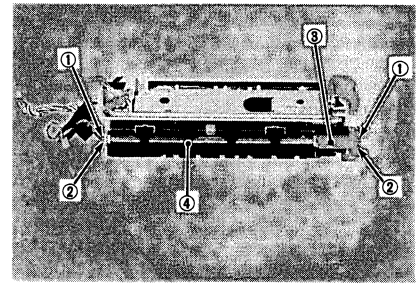


① E-rings ② Bearing
③ Face-up delivery roller

Figure 3-37

d. Face-down delivery roller

1) Execute step 1) to 6) of "a. delivery unit" shown on page 3-9 and 3-10. Remove the delivery unit cover.
2) Remove the two E-rings, the two bearings, the gear and the dewel pin. Remove the face-down delivery roller.

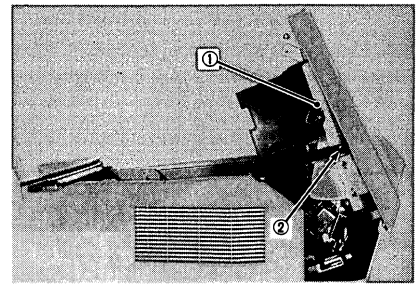


① E-rings ② Bearings
③ Gear ④ Face-down delivery roller

Figure 3-38

e. Reflecting mirror

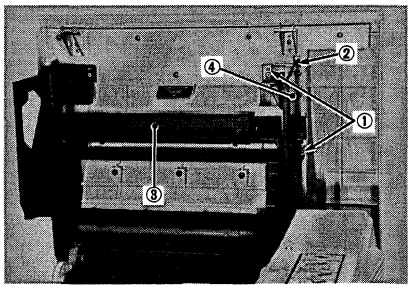
1) Remove the screw from the link.



① Screw ② Link

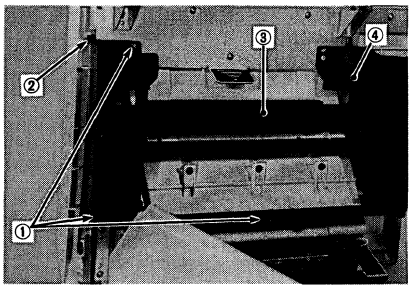
Figure 3-39

2) Remove the five screws and the two claws.
Remove the reflecting mirror with the reflecting mirror stand.



① Screws ② Claws
③ Reflecting mirror
④ Reflecting mirror stand

Figure 3-40a



① Screws ② Claws
③ Reflecting mirror
④ Reflecting mirror stand

Figure 3-40b

3) Remove the reflecting mirror from the reflecting mirror stand.

II. DRIVE SYSTEM

A. Main Motor Unit

1. Removing the main motor unit

1) Open the printer.
2) Execute step 1), 2) and 3) of "2. Removing the fixing unit" on page 3-20. Remove the fixing unit.
3) Execute step 1) and 2) of "C. Feed Guide" on page 3-18. Remove the feed guide.
4) Execute step 1) and 2) of "B. Transfer Guide Unit" on page 3-17. Remove the transfer guide unit.
5) Execute step 1), 2) and 3) of "B Transfer Charge Roller" on page 3-25. Remove the transfer charging roller.

Notes: 1. Don't touch the transfer charging roller.
2. In order not to drop the transfer roller, hold it by the sides (shown in the Figure 3-41) when removing it.

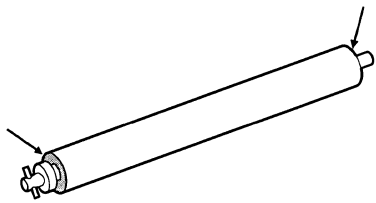
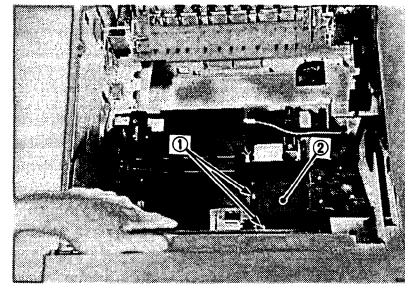


Figure 3-41

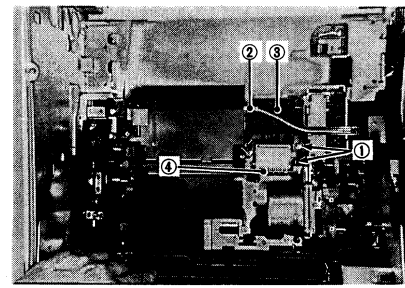
6) Remove the two screws and remove the motor cover.



① Screws ② Motor cover

Figure 3-42

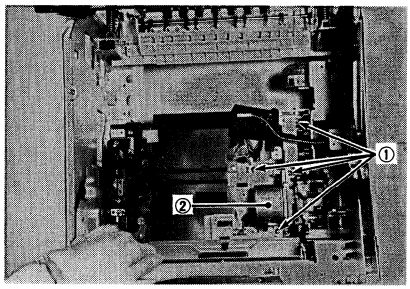
7) Disconnector the connector from the high voltage unit and remove the holder.
8) Remove the connector and the M4 screw, then remove the motor driver PCB.



① Screws ② Connector
③ Holder ④ Motor driver PCB

Figure 3-43

9) Remove the four M4 screws, the remove the main motor unit.



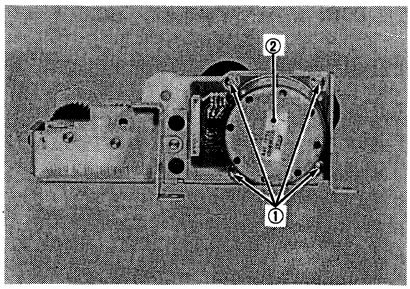
① Screws ② Main motor unit

Figure 3-44

2. Disassembly and reassembly

a. Main motor

1) Remove the four screws and remove the main motor.



① Screws ② Main motor

Figure 3-45

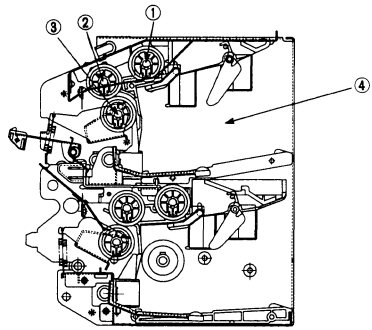
Note: When removing the main motor, be careful to avoid damaging the gears.

III. PAPER TRANSPORT SYSTEM

A. Pick-Up Unit

1. Configuration

The Pick-up unit feeds a paper to the regis-tration rollers.
This unit have the separation roller to prevent multi-feed.

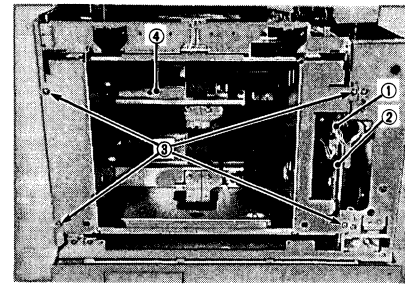


① Pick-up roller ② Feed roller
③ Separation roller ④ Cassette slot

Figure 3-46

2. Removing the pick-up unit

1) Remove the front upper cover and front lower cover.
2) Disconnect the connector from the paper feed PCB.
3) Remove the four screws, then remove the pick-up unit.



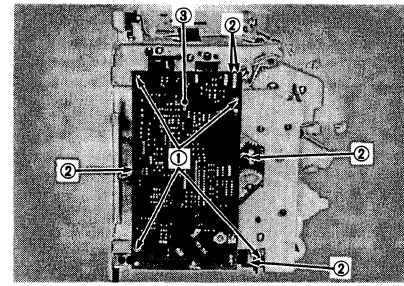
① Connector ② Paper feed PCB
③ Screws ④ Pick-up unit

Figure 3-47

3. Disassembly and reassembly

a. Pick-up motor

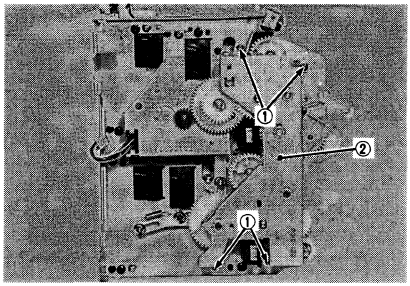
1) Remove the four screws, disconnect the five connectors, then remove the paper feed PCB.



① Screws ② Connectors
③ Paper feed PCB

Figure 3-48

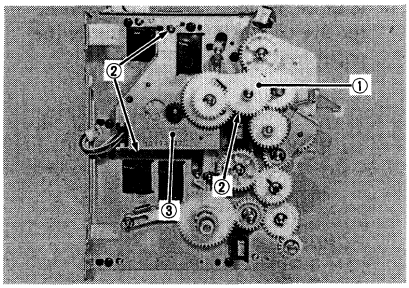
2) Remove the four screws and remove the side pick-up driver plate.



① Screws ② Side pick-up driver plate

Figure 3-49

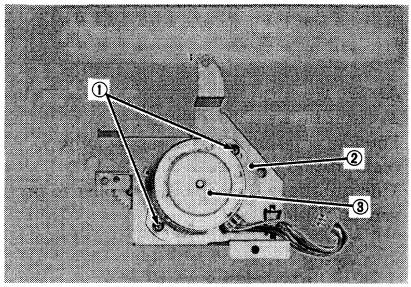
3) Remove the gear and the three screws, then remove the motor base.



① Gear ② Screws
③ Motor base

Figure 3-50

4) Remove the two screws and remove the pick-up motor from the motor base.



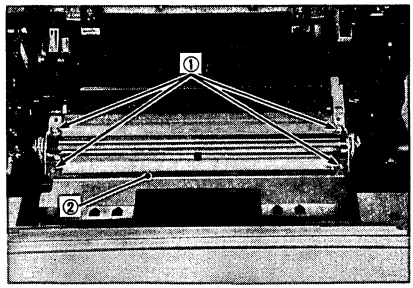
① Screws ② Pick-up motor base
③ Pick-up motor

Figure 3-51

B. Transfer Guide Unit

1. Removing the transfer guide unit.

1) Open the printer.
2) Remove the four screws and remove the transfer guide unit.



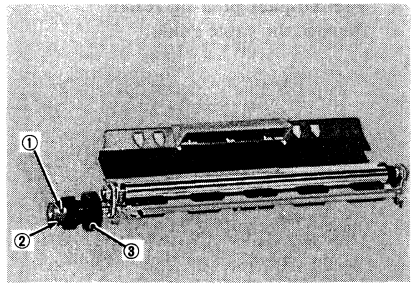
① Screws ② Transfer guide unit

Figure 3-52

2. Disassembly and reassembly

a. Registration roller

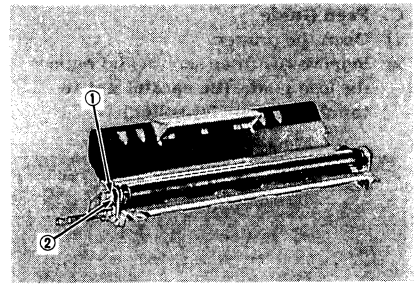
1) Loosen the setscrew that secures the clutch drum to the registration roller shaft.
2) Remove the clutch drum, and gear all together from the registration roller shaft.



① Setscrew ② Clutch drum
③ Gear

Figure 3-53

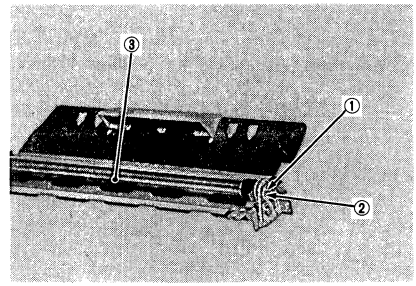
3) Remove the two E-rings, then remove the bearing.



① E-ring ② Bearing

Figure 3-54

4) Remove the E-ring, then remove the bearing. **(Be careful not to loose the dowel pin in the gear.)**
Remove the registration roller.

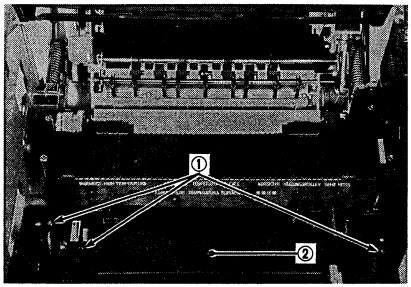


① E-ring ② Bearing
③ Registration roller

Figure 3-55

C. Feed Guide

1) Open the printer.
2) Remove the three screws and remove the feed guide. **(Be careful not to touch the transfer roller.)**



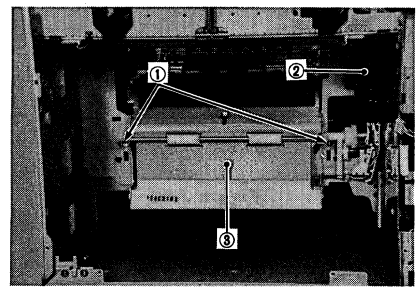
① Screws ② Feed guide

Figure 3-56

D. Second-Pass Pick-Up Unit

1. Removing the second-pass pick-up unit

1) Remove the front upper cover and the front lower cover.
2) Execute the step 1), 2) and 3) of "2. Removing the pick-up unit" on page 3-15. Remove the pick-up unit.
3) Remove the two screws and the connector Ass'y, then remove the second-pass pick-up unit. **(Don't pull on the cables.)**



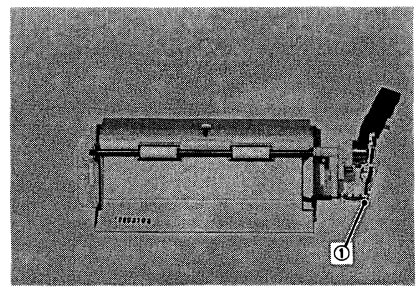
① Screws ② Connector Ass'y
③ Second-pass pick-up unit

Figure 3-57

2. Disassembly and reassembly

a. Second-pass pick-up roller

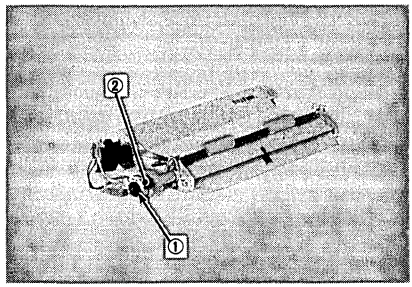
1) Remove the cable guide.



① Cable guide

Figure 3-58

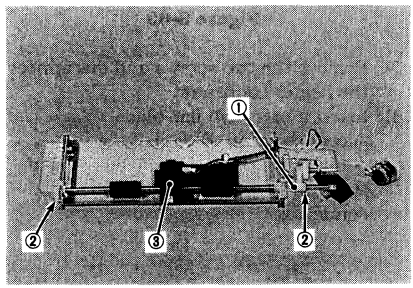
2) Remove the grip ring and remove the second-pass pick-up clutch.



① Grip ring
② Second-pass pick-up clutch

Figure 3-59

3) Remove the three E-rings, then remove the second-pass pick-up coupler and two bearings.



① Second-pass pick-up coupler
② Bearings
③ Second-pass pick-up sensor

Figure 3-60

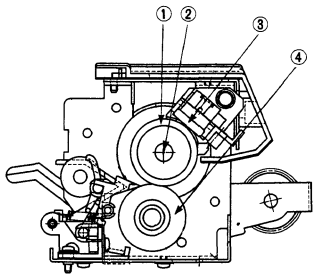
4) Remove the second-pass pick-up sensor, then remove the second-pass pick-up roller.

IV. FIXING SYSTEM

A. Fixing Unit

1. Configuration

The fixing unit heats and fixes the toner image onto the paper to make a permanent image. A cross-section of the fixing unit is shown below.

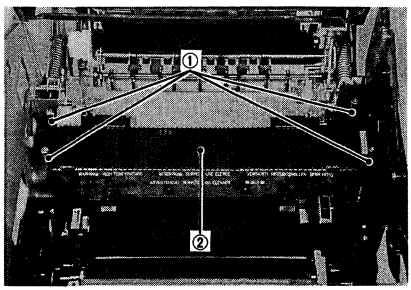


① Upper fixing roller ② Fixing roller heater
③ Thermo-switch ④ Lower fixing roller

Figure 3-61

2. Removing the fixing unit

1) Open the printer.
2) Remove the four screws securing the fixing unit.
3) Move the fixing unit to the far left (to permit the removal of the connector), then remove the fixing unit.



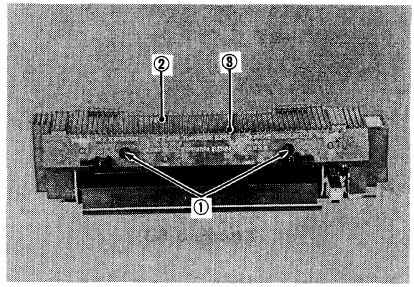
① Screws ② Fixing unit

Figure 3-62

3. Disassembly and reassembly

a. Fixing roller heater

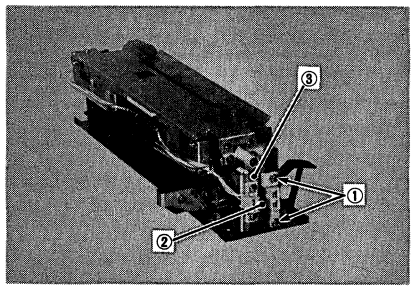
1) Remove the cover.
2) Remove the two screws and remove the fixing unit cover.



① Screws ② Cover
③ Fixing unit cover

Figure 3-63

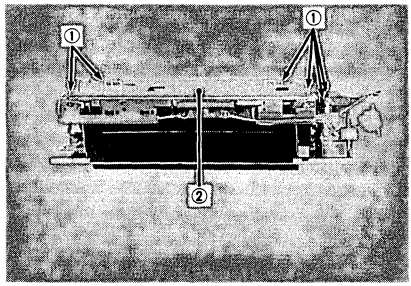
3) Remove the two screws and disconnect the heater connector.
4) Insert a precision flat-blade screwdriver into the tip of the connector to release the lead wires of the fixing roller heater from the connector.



① Screws ② Heater connector
③ Lead wire

Figure 3-64

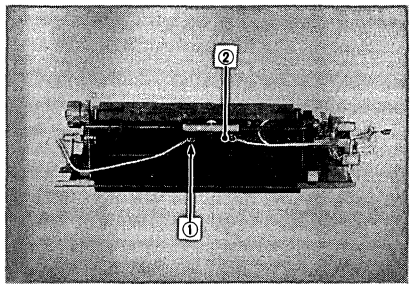
5) Remove the six screws and remove the top plate of the fixing unit.



① Screws ② Top plate

Figure 3-65

6) Remove the screw from the thermo-switch holder.

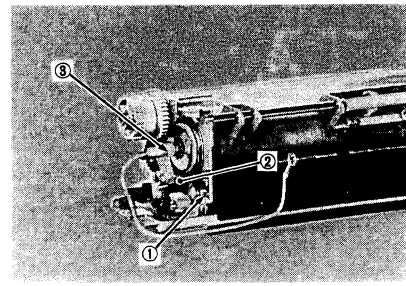


① Screw ② Thermo-switch holder

Figure 3-66

Note: In order enable the thermo-switch to be correctly re-mounted, make sure to remove the top plate before removing the lead wires from the fixing unit.

7) Remove the screw and remove the heater holder. Next, carefully pull out the fixing roller heater.

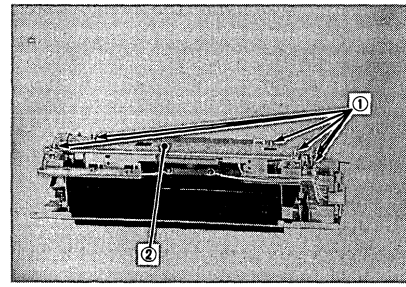


① Screw ② Heater holder
③ Fixing roller heater

Figure 3-67

b. Thermo-switch

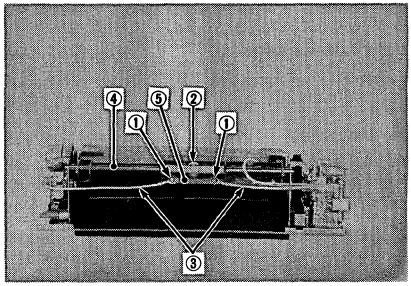
1) Remove the fixing unit cover. (2)
2) Remove the six screws and remove the top plate of the fixing unit.



① Screws ② Top plate

Figure 3-68

3) Remove the two screws and detach the thermo-switch holder from the lead wires.



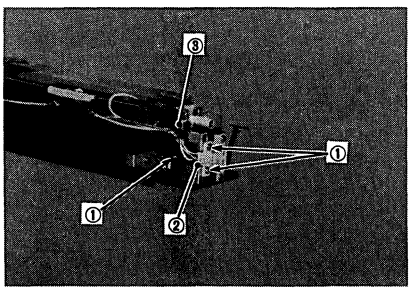
① Screws
② Thermo-switch
③ Lead wires
④ Thermo-switch shaft
⑤ Thermo-switch holder

Figure 3-69

4) Pull the thermo-switch shaft out of the thermo-switch holder and remove the thermo-switch from the thermo-switch holder.

c. Thermistor

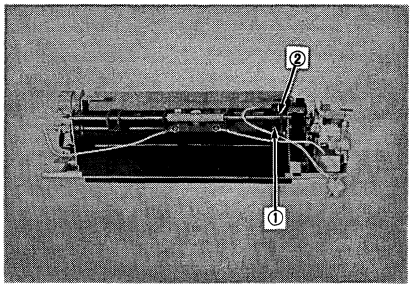
1) Execute the step 1) and 2) of "b. Thermo-switch" on page 3-21. Remove the top plate of the fixing unit. (6)
2) Remove the three screws and disconnect the connector. Remove the screw and remove the cord holder.



① Screws ② Connector
③ Cord holder

Figure 3-70

3) Remove the screw and remove the thermistor.



① Screw ② Thermistor

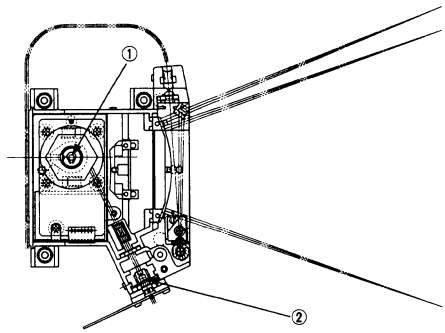
Figure 3-71

V. EXPOSURE SYSTEM

A. Laser/Scanner Unit

1. Configuration

The laser/scanner unit sweeps a laser beam across the surface of the photosensitive drum. Its configuration is shown in the figure below.

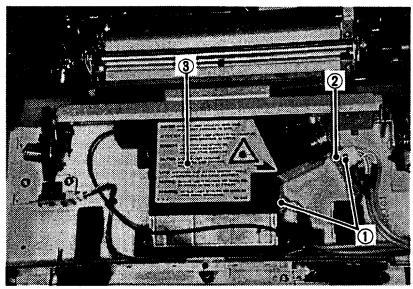


① Scanner unit ② Laser unit

Figure 3-72

2. Removing the laser/scanner unit

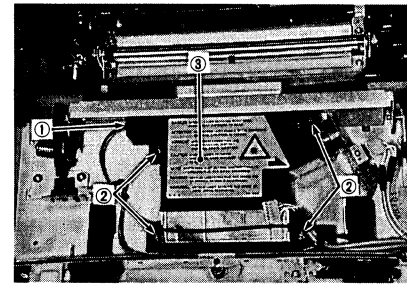
1) Remove the front upper cover.
2) Disconnect the connector from the laser driver PCB.
3) Disconnect the connector from the laser/scanner unit.



① Connectors ② Laser driver PCB
③ Laser/scanner unit

Figure 3-73

4) While holding the connector of the fiber-optic cable, gently disconnect the fiber-optic cable.
5) Remove the four screws and remove the laser/scanner unit.



① Connector of fiber-optic cable
② Screws
③ Laser/scanner unit

Figure 3-74

Note: 1. When disconnect the fiber-optic cable, hold the connec-tor of the fiber-optic cable.
2. Don't pull the fiber-optic cable.

⚠ CAUTION

Do not disassemble the laser/scanner unit. Hazardous invisible laser radiation inside. It cannot be adjusted in the field.

VI. ELECTROSTATIC IMAGE/DEVELOPING/CLEANING SYSTEM

A. EP-N Cartridge

1. Configuration

The EP-N cartridge houses the photosensitive drum, primary charge roller, developing unit, and Cleaning blade.

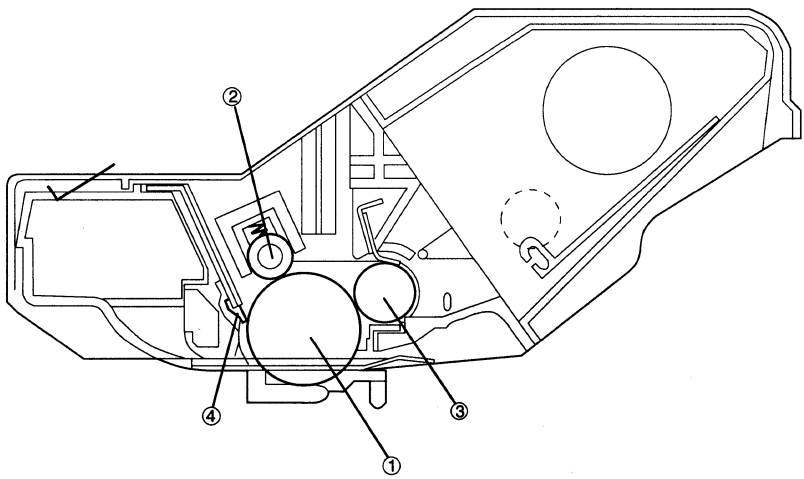
During a printing process, the drum rotates insides the EP-N cartridge and an invisible latent image is formed on its surface based on the print data, then developed into a visible image by toner.

Note that the EP-N cartridge is so constructed that it cannot be disassembled.

a. Protective shutter

Because exposure of the photosensitive drum to strong light for an extended period would cause blank areas or black streaks to appear on the prints, the photosensitive drum is protected by a protective shutter. Do not open the protective shutter unless absolutely necessary. (The protective shutter is automatically opened after the EP-N cartridge is installed and the upper cover unit is closed.)

Note: Unless absolutely required, the drum should not be touched or cleaned. Never clean the drum with solvents. If required, clean the drum with toner applied on a dry, lint-free cloth.

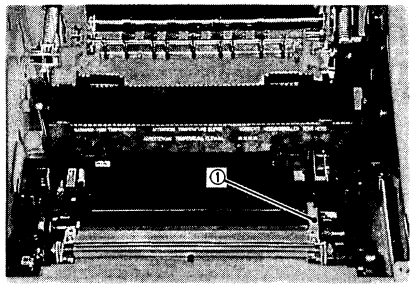


① Photosensitive drum ② Primary charge roller
③ Developing unit ④ Cleaning blade

Figure 3-75

B. Transfer Charge Roller

1) Open the upper unit.
2) Remove the stopper.



① Stopper

Figure 3-76

3) Move the bearing to the right, then remove the transfer charge roller.

Note: In order not to drop the transfer roller, hold it by the sides (shown in Figure 3-77) with your fingers when removing it.

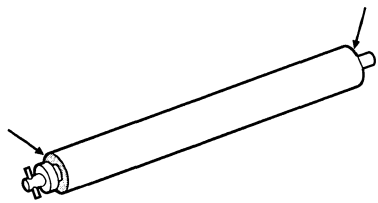
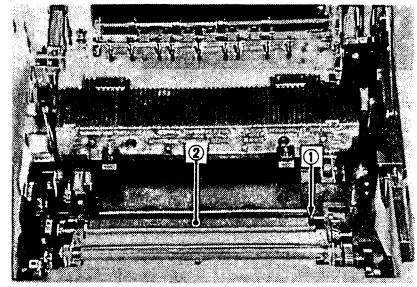


Figure 3-77



① Bearing ② Transfer charge roller

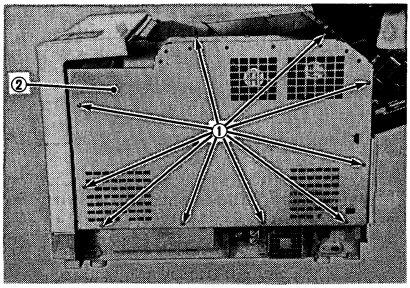
Figure 3-78

Notes:
1. Don't touch the sponge part of transfer charge roller. Hold the shaft of transfer charge roller.
2. To clean the transfer charge roller, wipe it off with lint-free paper. Never use solvent to clean the transfer charge roller.
3. Replace the transfer charge roller in the cases below:
   When paper dust, toner, or other foreign matter adhered to the transfer charge roller cannot be wiped by using the above-mentioned lint-free paper;
   When the roller has become deformed;
   or When faulty transfer or other defect caused by the transfer charge roller occurs, and persists even after cleaning the transfer charge roller.

VII. ELECTRICAL COMPONENTS

A. DC Controller PCB

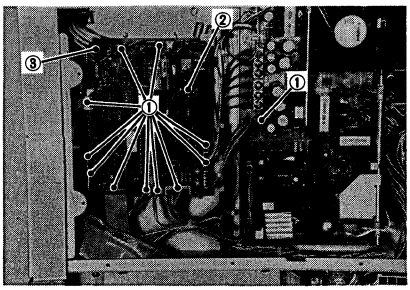
1) Remove the right cover.
2) Remove the ten screws, then remove the outer shield plate.



① Screws ② Outer shield plate

Figure 3-79

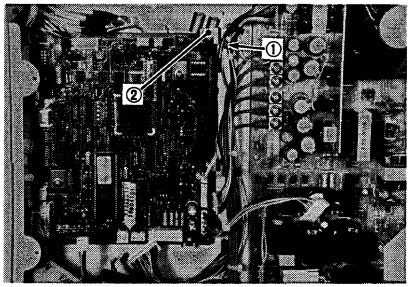
3) Disconnect the connector from the low-voltage power unit.
4) Disconnect the eleven connector from the DC controller PCB and disconnector the connector of the optical fiber cable.



① Connector ② DC controller PCB
③ Connector of the optical fiber cable

Figure 3-80

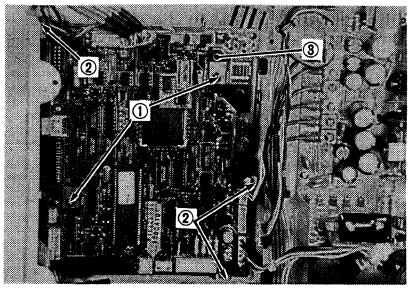
5) Remove the screw and remove the PCB holder.



① Screw ② PCB holder

Figure 3-81

6) Remove the two screws and locking support, then remove the DC controller PCB.

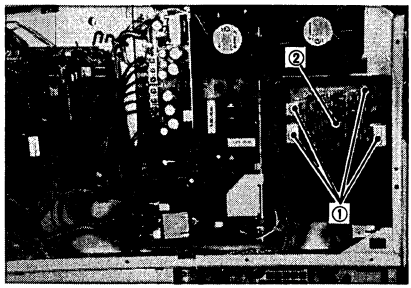


① Screws ② Locking support
③ DC controller PCB

Figure 3-82

B. AC Driver PCB

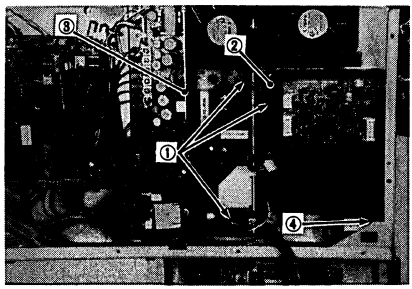
1) Execute the step 1) to 5) of "E. Upper Unit 2. Separation the upper unit from the lower unit" on page 3-8.
   Remove the rear lower cover.
2) Disconnect the four connectors from the DC driver PCB.



① Connectors ② DC driver PCB

Figure 3-83

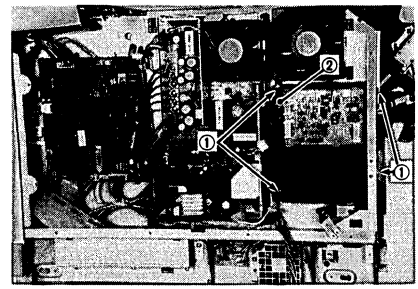
3) Disconnect the connector from the AC driver PCB and disconnect the two connectors from the low-voltage power supply PCB.
4) Disconnect the connector from the main power switch.



① Connectors ② AC driver PCB
③ Low-voltage power supply PCB
④ Main power switch

Figure 3-84

5) Remove the four screws and remove the AC driver PCB with the case.



① Screws ② AC driver PCB

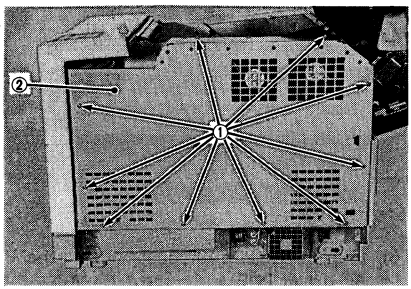
Figure 3-85

6) Release the four latches securing the AC driver PCB and remove the AC driver PCB from the case.

Note: Before re-mounting the AC driver PCB, make sure to remove the fixing unit from the printer chassis.

C. DC Driver PCB

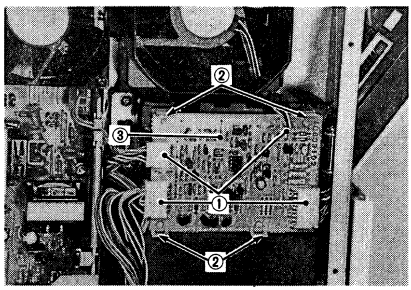
1) Remove the right cover and the rear lower cover.
2) Remove the ten screws, then remove the outer shield plate.



① Screws ② Outer shield plate

Figure 3-86

3) Disconnect the four connectors and board cover, then remove the DC driver PCB.

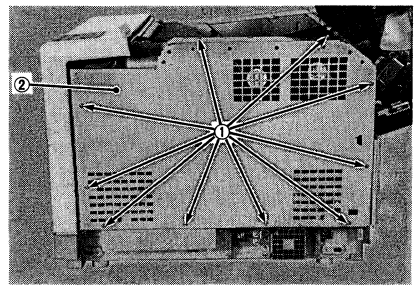


① Connectors ② Board cover
③ DC driver PCB

Figure 3-87

D. Low-Voltage Power Supply unit

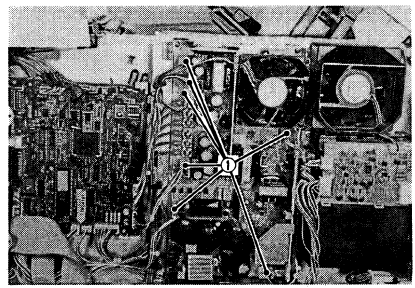
1) Remove the right cover and the right bottom cover.
2) Remove the ten screws, then remove the outer shield plate.



① Screws ② Outer shield plate

Figure 3-88

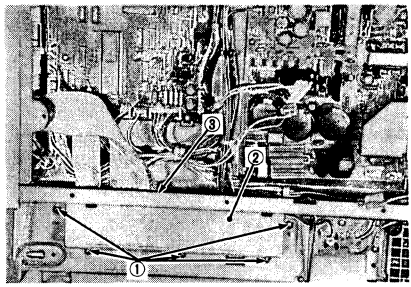
3) Disconnect seven connectors from the low-voltage power supply unit.



① Connectors

Figure 3-89

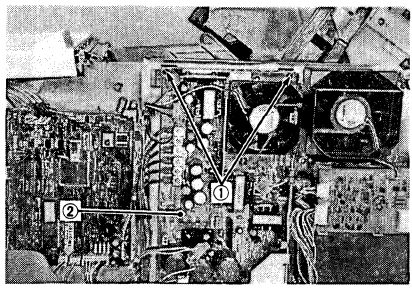
4) Remove the five screws and remove the bottom box shield plate (right). Disconnect the connector on the video controller PCB.



① Screws ② Bottom box shield plate
③ Connector

Figure 3-90

5) Remove the two screws, then lift the low-voltage power supply unit slightly and remove it.

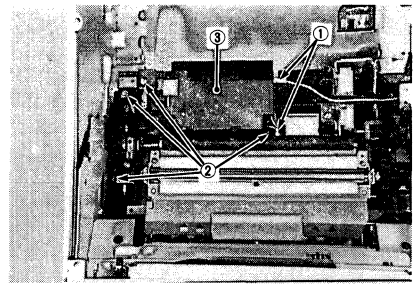


① Screws
② Low-voltage power supply PCB

Figure 3-91

E. High-Voltage Power Supply Unit

1) Open the printer.
2) Execute step 1), 2) and 3) of "2. Removing the fixing unit" on page 3-20. Remove the fixing unit.
3) Execute the step 1) and)2 of "C. Feed Guide" on page 3-18. Remove the feed guide unit.
4) Disconnect the two connectors and remove the four screws, then remove the high-voltage power supply unit.



① Connector ② Screws
③ High-voltage power supply unit

Figure 3-92

F. Motor Driver PCB

1) Execute the step 1) to 8) of "1. Removing the main motor unit" on page 3-13. Remove the driver PCB.

G. Paper Feed PCB

1) Execute the step 1) of "3. Disassembly and reassembly a. Pick-up motor" on page 3-15. Remove the paper feed PCB.

CHAPTER 4

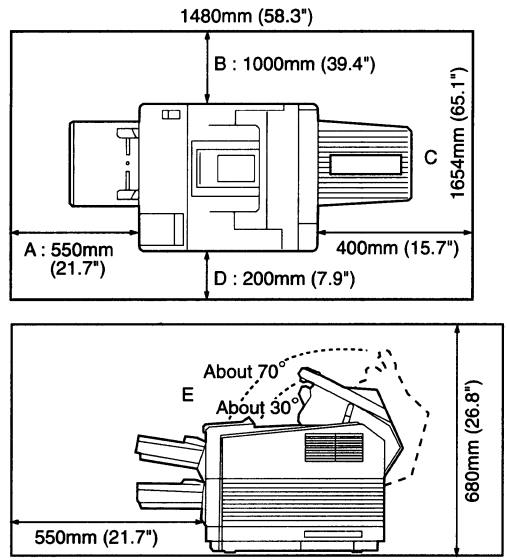
INSTALLATION

This printer has been carefully adjusted and strictly inspected before packing and shipment. To ensure that it operates as intended, it is important to install the printer correctly. Based on a thorough understanding of the printer, the service engineer must choose a suitable location, install it according to proper procedures, and fully check the installed printer before actual use.

I. CHOOSING A LOCATION

It is recommended that the service engineer visit the customer site before delivery to determine the planned location for installing the printer. A suitable location should meet the following conditions.

- The printer should be directly connected to an electrical socket providing a supply voltage within 10% of the voltage indicated on the printer's rating plate.
- The temperature should be between 10°C to 32.5°C and the relative humidity between 20% to 80%. The printer should not be located in the proximity of a water faucet, humidifier, refrigerator, or air conditioner.
- Avoid any place exposed to open flames, dust, ammonia fumes, or direct sunlight.
  If it must be located in a sunny place, the windows should be curtained to block direct sunlight.
- The location should be well ventilated.
- The printer must be placed on a stable, level surface.
- ⚠ **CAUTION: The printer should be grounded.**
- To permit easy operation, provide sufficient clearance around the printer as shown in Figure 4-1.

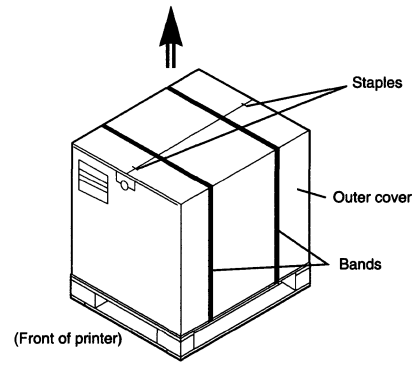
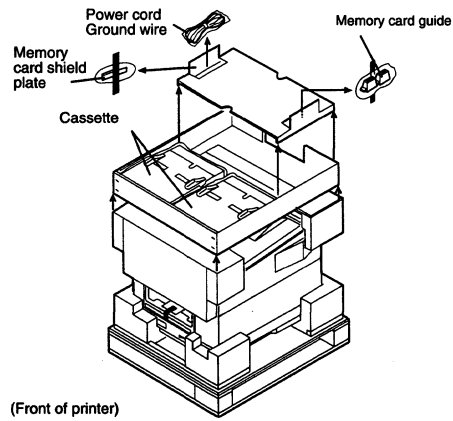


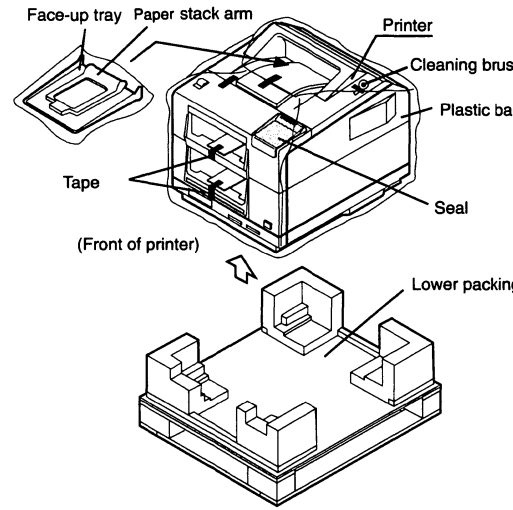
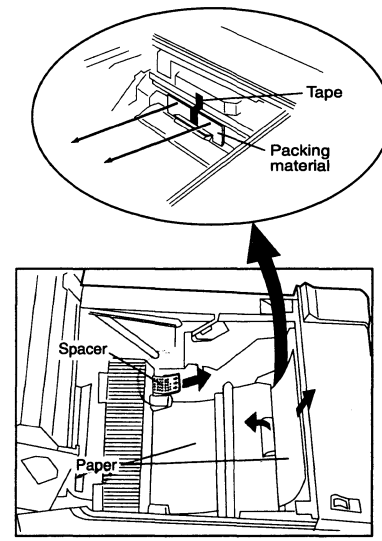
A : Space for installing the cassette
B : Space for pulling out the sealing tape from the EP-N cartridge
C : Space for using the face-up tray
D : Space for ventilation
E : Space for opening the upper unit

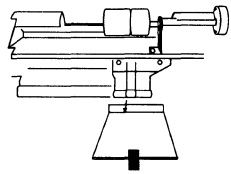
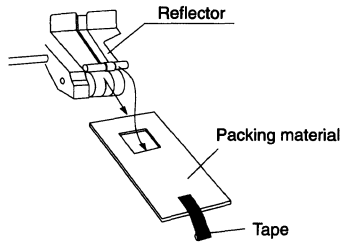
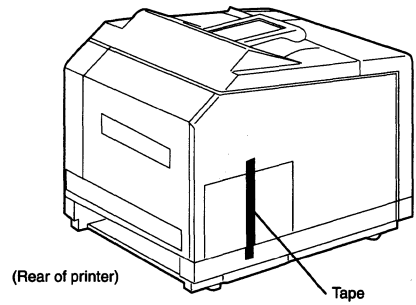
Figure 4-1

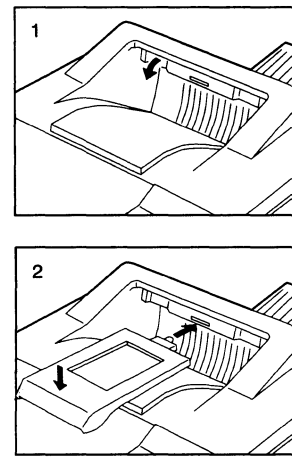
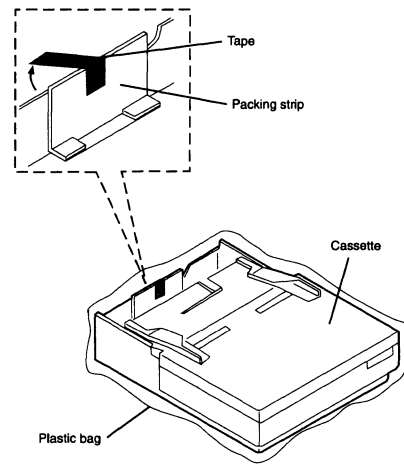
II. UNPACKING AND INSTALLATION

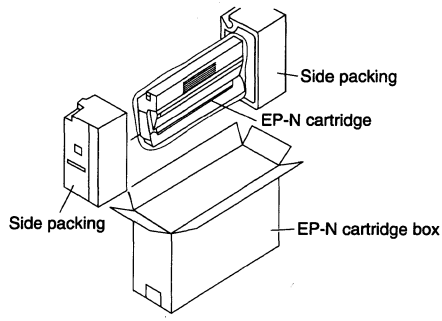
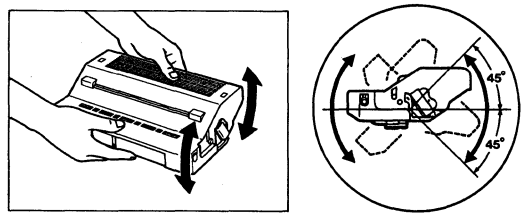
If the printer is moved in its shipping carton from a cold room into a warm room and unpacked, condensation may occur inside the printer (particularly in winter) when it is exposed to room temperature. To avoid the possibility of temporary malfunctions due to internal condensation, therefore, leave the printer at room temperature for at least one hour before unpacking it.

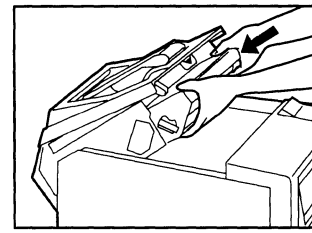
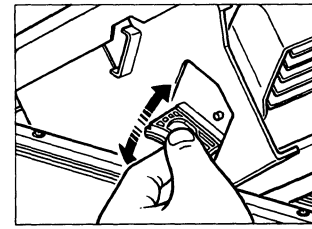
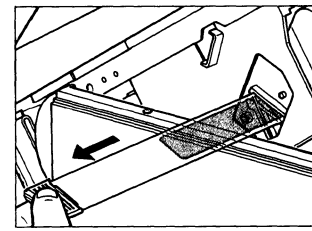
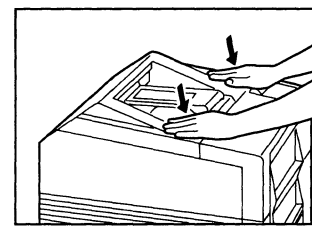
No.	Sequence	Checkpoints	Remarks
1	Check the cardboard box.	Check for dents and other damage to the Cardboard box during shipment.	
2	Use diagonal cutting pliers to cut the bands securing the outer cover of the box, then lift off the outer cover.	 **Figure 4-2** ⚠ **CAUTION: Two persons are required to lift the printer out of its box and place it in the installation site.**	
3	Remove the power cord, two paper cassettes.	 **Figure 4-3**	

No.	Sequence	Checkpoints	Remarks
4	The printer must be lifted out of its box by two persons, then placed in the desired location.	 **Figure 4-4**	
5	Remove the plastic bag from around the printer, then open the printer. Remove the two spacer and packing material. **⚠ Caution** **In order not to touch the transfer charging roller, don't remove the paper over the transfer charging roller.** After removing the spacer and packing material, being careful not to touch the transfer charging roller, hold the lift the grip of the transfer guide and pull out the edge of the paper.	 **Figure 4-5**	

No.	Sequence	Checkpoints	Remarks
	Remove packing material on the cassette slot of the pick-up unit.	Upper cassette slot  Lower cassette slot  **Figure 4-6**	
	Remove the tape on the left side of the printer.	 **Figure 4-7**	
6	Check that the all of the required items are present and are not scratched, soiled, or otherwise abnormal.	**The items below should be included:** **1. One printer** **2. Two cassettes** **3. Paper stack arm** **4. Power cord, Ground wire** **5. Face-up tray** **6. Cleaning brush** **Check that a printer model of suitable voltage specifications has been delivered.**	

No.	Sequence	Checkpoints	Remarks
7	Attach the paper stack arm to the face-down tray and lower it.	 **Figure 4-8**	
8	Remove each paper cassette from its plastic bag, and remove the tape and packing strip.	 **Figure 4-9**	
9	Place paper of appropriate size into each cassette, put each cassette's top cover back in place, then insert the cassettes into the cassette holder.		

No.	Sequence	Checkpoints	Remarks
10	Open the small box containing the EP-N cartridge, take out the cartridge, then remove the EP-N cartridge from its aluminum bag.	 **Figure 4-10**	
11	Make sure the cartridge is not scratched, soiled, or otherwise abnormal.	**Check that the box contains the following items:** **1. One cartridge**	
12	Holding the cartridge horizontal with both hands, slowly rock it back and forth (about 45° to each side) to distribute the toner evenly.	 **Figure 4-11**	

No.	Sequence	Checkpoints	Remarks
13	Open the printer, then insert the cartridge into the cartridge holder.	 Figure 4-12	
14	Flex the tab on the side of the cartridge up and down until it breaks off.	 Figure 4-13	
15	Pull out the tab and remove the sealing tape completely.	 Figure 4-14	
16	Close the printer gently by pushing down on both sides of the upper unit until it locks into place.	 Figure 4-15	

No.	Sequence	Checkpoints	Remarks
17	Plug in the power cord and switch ON the printer. When printer becomes STANDBY status, press the test print button to make a test print.	• Make sure the print density adjustment dial is set to the center position. • Check that the test print has the correct density.	For details on making a test print, see subsection V, "1. Test Print Button" in Chapter 1.
18	Clean up around the printer so it is ready to use.		

III. STORAGE AND HANDLING OF EP-N CARTRIDGES

An EP-N cartridge is affected by its storage conditions over time, even when it is sealed in its package. Proper handling and storage will enable longer use of EP-N cartridges and should thus be performed with care.

A. Storage of Sealed EP-N Cartridges

In a warehouse or workshop, EP-N cartridges must be stored under the conditions described in Table 4-1. The following points must also be observed:

1) Avoid exposure to direct sunlight.
2) Do not store cartridges on a surface subject to vibration.
3) Do not strike or drop packages containing cartridges.

Table 4-1 Storage conditions

Temperature	Normal (90% of total storage time)		0 to 35°C
	Extreme (10% of total storage time)	High	35 to 40°C
		Low	-20 to 0°C
	Temperature change (Within about 3 min.)		40°C→15°C -20°C→25°C
Humidity	Normal (90% of total storage time)		35 ~ 85% RH
	Extreme (10% of total storage time)	High	85 ~ 95% RH
		Low	10 to 35% RH
	Atmospheric pressure		460 to 760mmHg (0.6 to 1 atm)
	Total storage time		2.5 years

Note: "Total storage time" in the table above refers to the cartridge service life following the date of manufac-ture indicated on the

B. Storage of Unsealed EP-N Cartridges

Each EP-N cartridge contains a photosensitive drum consisting of an organic photo-conductor (OPC) which deteriorates when exposed to strong light. Because each cartridge also contains toner, the customer should be fully advised on correct storage and handling of unsealed EP-N cartridges.

1. Storage requirements

1) Avoid places exposed to direct sunlight or near a window and, in warm weather, do not leave an EP-N cartridge inside a car for an extended period because the interior temperature may rise excessively.
2) Avoid places of extremely high or low temperature and/or humidity. Also avoid exposure to the direct draft from an air-conditioner and other places subject to abrupt changes in temperature or humidity.
3) Avoid dusty places or places exposed to the fumes of ammonia gas or organic solvents.
4) EP-N cartridges must be stored within a temperature range of 0°C to 35°C.
5) Avoid places in the proximity of display monitors, disk drives, floppy disks, or other magnetic objects.

2. Life of EP-N cartridges

The useful life of an EP-N cartridge is 2.5 years from the date of manufacture which is indicated in abbreviated form on the cartridge. Because prints of lower quality can be expected from an EP-N cartridge that has exceeded its expiration date, EP-N cartridges should be used within its indicated service life.

C. Handling Precautions

1) Before loading a new EP-N cartridge, hold the cartridge horizontal with both hands and rock it slowly back and forth (about 45° to each side) to distribute the toner evenly as shown in Figure 4-16.
After the cartridge is loaded, print three to five pages of test patterns to check for toner leakage. Even if toner has leaked, clean prints will be produced after the test print.

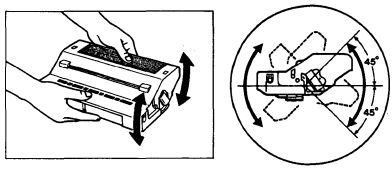


Figure 4-16

2) If blank spots occur on prints due to lack of toner, remove the cartridge and rock it as shown in Figure 4-16 above to evenly distribute the toner.
3) When handling the EP-N cartridge, never touch the shaded area indicated in Figure 4-17.
Do not open the drum protection shutter. Opening the drum protection shutter may damage the drum, which will adversely affect the print quality.
If the drum surface is dirty, clean it with flannel or other soft cloth sprinkled liberally with toner.
Never use a dry cloth, lint-free paper, or solvents.

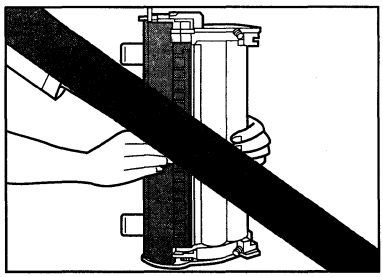


Figure 4-17

4) Always keep the cartridge notice facing up. Do not lean the cartridge against anything and nor place it upside down.
Keep the cartridge away from display monitors, disks drives, or floppy disks. The magnet in the cartridge can destroy data stored in the display monitor or disk.

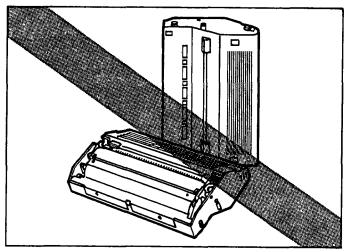


Figure 4-18 Bad examples of placing the cartridge

5) Never attempt to disassemble the cartridge.
6) Do not subject a cartridge to vibration or impact.
7) Because the photosensitive drum is extremely sensitive to light, blank spots or black streaks may appear on prints if the cartridge is exposed to strong light. If this happens, the problem is usually solved by turning off the printer for a while.
To avoid residual blank spots or black streaks on the drum's surface, observe the following precautions:
   1. To minimize exposure of the drum to light, clear paper jams or replace the cartridge as quickly as possible.
   2. To store a EP-N cartridge which has been used, either put it back in it's box or cover it with cloth. Do not leave it exposed to light.
   3. Do not leave the printer's top cover open for a long period with the cartridge left loaded in the printer.

Note: In case the photosensitive drum is exposed to normal room light (about 1,500 lux) for about five minutes, leaving the cartridge in a dark room for at least five minutes will enable recovery of the print quality, though an image may be retained on the drum for some time.
Avoid exposure to direct sunlight, which is ranges from 10,000 to 30,000 lux.

CHAPTER 5

MAINTENANCE AND SERVICING

I. PARTS REPLACEMENT SCHEDULE

To ensure optimum performance of the printer, the parts listed in Table 5-1 should be replaced in regular intervals even though they may be functioning properly and showing no signs of wear or damage.
These parts should be replaced during the regular service visit which is closest to the expiration of the service life of the part concerned.

Table 5-1

As of Sept. 1991

No.	Part name	Part number	Q'ty	Service life	Remarks
1	Fixing Ass'y	RG5-0046-000	1	200,000 images	100/115V
		RG5-0047-000	1		220/240V
2	Pick-up, Feed, Separation roller	RG5-0041-000	6	200,000 papers	
3	Transfer charging roller Ass'y	RG5-0044-000	1	200,000 images	
4	Registration roller Ass'y	RG5-0037-000	1	300,000 images	
5	Face-down delivery roller	RB1-0531-000	1	500,000 images	
6	Face-up delivery roller	RB1-0558-000	1	500,000 images	
7	Pick-up cam clutch Ass'y	RG5-0036-000	1	500,000 images	
8	Torque limitter	RB1-0109-000	1	750,000 images	

Note: The above figures represent estimated values only and are likely to change based on field data.

II. EXPECTED SERVICE LIFES OF CONSUMABLES

Note: The above figures represent estimated values only and are likely to change based on field data.

Table 5-2

As of Sept. 1991

No.	Part name	Part number	Q'ty	Service life	Remarks
1	Fan motor (FM1)	RH7-1104-000	1	10,000 hours	
2	Fan motor (FM2)	RH7-1106-000	1	10,000 hours	
3	Fan motor (FM3, 4)	RH7-1131-000	2	30,000 hours	

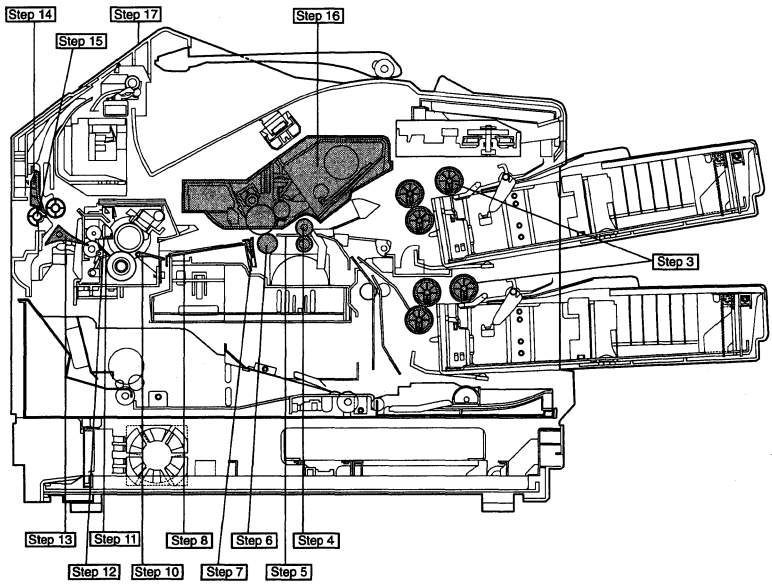
III. BASIC PROCEDURES FOR REGULAR SERVICING

Notes: 1. As a basic rule, a regular service visit should be made **every 200,000 images.**
2. Before making a regular service visit, check the service ledger to ascertain if any parts will require replacement.

A. Outline

The parts which are to be serviced during a regular service visit are indicated in Fig. 5-1. Refer to this figure when planning a regular service visit and strive to keep the printer in optimum operating conditions. The 20 steps involved in a regular service visit are described from the following page.

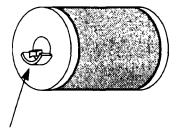
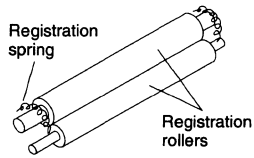
Unless otherwise specified, use a water damp cloth for cleaning. For wiping with a dry cloth, use lint-free cloth. Do not use solvents or oils that have not been specified.



Step 1 : Greet
Step 2 : Test print
Step 3 : Pick-up roller unit
Step 4 : Registration rollers
Step 5 : Transfer guide
Step 6 : Transfer charging roller
Step 7 : Static charge eliminator
Step 8 : Feed guide
Step 9 : Fixing unit
Step 10: Fixing unit entrance guide and fixing unit entrance roller
Step 11: Fixing unit feed guide
Step 12: Separation claw in fixing unit
Step 13: Duplex deflector
Step 14: Face-up/down selector
Step 15: Face-up deliverly roller
Step 16: Cartridge
Step 17: External cover
Step 18: Test print
Step 19: Clean up around the printer
Step 20: Report

Figure 5-1

B. Basic Procedures

Step	Sequence	Checkpoints	Remarks
1	Greet the person in charge	Confirm the printer's operating status.	
2	Make two or three test print	1) Inconsistent print density or smeared images 2) Specks on the background 3) Registration on the top edge 4) Registration on the left edge 5) Image skew 6) Improper fixing or wrinkling of paper 7) Back of paper is dirty 8) Abnormal noise	
3	Remove each of the six pick-up rollers (three each for the upper and lower cassettes) from the printer by pulling its tab, then change the rollers.	 Pick and pull this tab. • Check for wear, particularly uneven wear, of the rubber of the rollers. • Check cleanliness of rubber.	Each pick-up roller unit consists of a pick-up roller, feed roller, and separation roller. Because of their identical shape, use of these rollers is interchangeable. If necessary, replace the pertinent roller. Clean a dirty roller with a soft cloth moistened with water, ethyl alcohol, or isopropyl alcohol.
4	Clean the registration rollers.	• Cleanliness of registration rollers. • Normal operation of the springs at both ends of the registration rollers.  	Clean with damp cloth. For stubborn stains, clean metallic areas with methyl ethyl ketone and rubber areas with ethyl or isopropyl alcohol. A detached spring will cause image skew and paper jam. Replace the registration rollers when it has been used 200,000 images.
5	Clean the transfer guides	• Cleanliness of transfer guides	Clean with dry, lint-free cloth.

Step	Sequence	Checkpoints	Remarks
6	Change the transfer charging roller	• Cleanliness of the transfer charging rollers	The transfer charging roller should not require cleaning unless toner or dust has scattered inside the printer. If the transfer charging roller needs to be cleaned, remove it from the printer and clean the roller with a dry, lint-free cloth. Do not use cleaning solutions or the printer will be damaged. Replace the transfer charging roller when it has been used 200,000 images. Replace the transfer charging roller even if it is not dirty enough to influence the image. **If finger oil is applied to the transfer charging roller, the image will become poor. Therefore, do not touch the sponge part of roller.** If finger oil is appplied to the transfer charging roller, replace the roller.
7	Clean the static charge eliminator	• Cleanliness of the static charge eliminator	Use an cleaning brush to clean dust or dirt around the static charge eliminator.
8	Clean the feed guide	Cleanliness of feed guide	Clean with dry, lint-free cloth.
9	Check the fixing unit		Replace the fixing unit if it has been used for 200,000 images or more. Perform the following steps 9 to 11 when the fixing unit has been used for less than 200,000 images.
10	Clean the fixig unit entrance guide and fixing unit entrance roller.	Cleanliness of fixing unit entrance guide and fixing unit entrance roller	Clean with damp cloth. **⚠ CAUTION: The fixing roller gets hot so take care to avoid burns.**

Step	Sequence	Checkpoints	Remarks
11	Clean the fixing unit feed guide (after removing the fixing unit from the printer)	Cleanliness of fixing unit feed guide	Clean with damp cloth. **⚠ CAUTION: The fixing roller gets hot so take care to avoid burns.**
12	Clean the separation claws in the fixing unit (after removing the fixing unit from the printer)	Cleanliness and wear of the separation claws	Clean off toner with damp cloth. If extremely worn, replace it.
13	Clean the duplexing deflector	Cleanliness and operation of duplexing deflector	Clean with damp cloth.
14	Clean the face-up/down selector	Cleanliness and operation of delivery selector	Clean with damp cloth.
15	Clean the face-up delivery roller	Cleanliness of the face-up delivery roller	Clean with damp cloth.
16	Inspect the cartridge	Cleanliness of cartridge	Use an air blower to blow off dust or dirt around the connector. **Unless absolutely required, the drum should not be touched or cleaned. Never clean the drum with solvents. If required, clean the drum with toner applied on a clean, dry, lint-free cloth.**
17	Clean the external covers	Cleanliness of external covers	Clean with damp cloth. Be sure to perform this step; **it is an important part of regular servicing.**
18	Make a test print	Run the same test that you initially ran to check the printer	
19	**Clean up around the printer.**		
20	Report the contents and results of servicing to the customer		

IV. SERVICE CHECKPOINTS

Table 5-3 lists the main service checkpoints. When performing service, use only the cleaning solvents and lubricants specified in this manual.

Table 5-3

△ : Clean ● : Replace As of Sept. 1991

Section	Description	Instal-lation	Maintenance Serving	Service life	Remarks
Externals	Fan motor (FM1)		Inspect during the periodic servicing closest to the forecast end of the lifespan and if defective, replace.	10,000 hours	Surround tempera-ture is 25°C
	Fan motor (FM2)			10,000 hours	
	Fan motor (FM3)			30,000 hours	
Pick-up	Pick-up, Feed, Separation roller		●	200,000 papers	6 rollers
	Registration roller Ass'y		●	300,000 images	
	Pick-up cam clutch Ass'y		●	500,000 papers	
	Torque limitter		●	750,000 images	
	Pick-up guide		△	200,000 images	
Feed	Transfer charging roller Ass'y		●	200,000 images	
Fixing	Static charge eliminator		△	200,000 images	
	Fixing unit		●	200,000 images	
Delivery	Face-down delivery roller		●	500,000 papers	
	Face-up delivery roller		●	500,000 papers	

Note: The above figures represent estimated values only and are likely to change based on field data.

V. MAINTENANCE BY CUSTOMER

For optimum printer performance, the customer should perform the maintenance described below.

Table 5-4

Item	Customer maintenance
EP-N cartridge	Rock the cartridge to redistribute toner. Replace the cartridge when necessary.
Transfer guide	Clean the transfer guide when the cartridge is replaced or necessary.
Static charge eliminator	Clean the static charge eliminator with the cleaning brush of this printer when the cartridge is replaced.
Fixing unit separation claws	Clean the fixing unit separation claws with the cleaning brush of this printer when the cartridge is replaced.

Note: The EP-N cartridge is a single unit processing cartridge containing a photosensitive drum and a supply of toner. When the toner runs out, the EP-N cartridge should be replaced with a new one.
A new EP-N cartridge can print approximately 7,000 pages (A4 size paper) of the typical word processing text. A typical page has a 4% dot ratio. The actual life of the cartridge varies according to the actual dot ratio on the page.

VI. LIST OF STANDARD TOOLS

The standard tools required for servicing are listed in the table below.

Table 5-5

No.	Tool name	Tool No.	Remarks
1	Tool box	TKN-0001	
2	Jumper cable	TKN-0069	Clip attached
3	Thickness gauge	CK-0472	0.45 to 0.65 mm
		CK-0057	0.02 to 0.3 mm
4	Compression spring scale	CK-0058	For checking cassette spring strength (0-600g)
5	Phillips screwdriver	CK-0101	M4, M5 (363 mm long)
6	Phillips screwdriver	CK-0104	M3, M4 (155 mm long)
7	Phillips screwdriver	CK-0105	M4, M5 (191 mm long)
8	Phillips screwdriver	CK-0106	M4, M5 (85 mm long)
9	Flat-blade screwdriver	CK-0111	
10	Precision flat-blade screwdriver set	CK-0114	6 drivers
11	Allen wrench set	CK-0151	5 wrenches
12	File, fine	CK-0161	
13	Allen (hex) key	CK-0170	M4 (107 mm long)
14	Diagonal cutting pliers	CK-0201	
15	Needle-nose pliers	CK-0202	
16	Pliers	CK-0203	
17	Retaining ring pliers	CK-0205	
18	Crimper	CK-0218	
19	Tweezers	CK-0302	
20	Ruler	CK-0303	For 150 mm measurements
21	Soldering iron	CK-0309	100V/30W
22	Mallet, plastic head	CK-0314	
23	Brush	CK-0315	
24	Penlight	CK-0327	
25	Bottle, plastic	CK-0328	100 cc
26	Solder	CK-0329	1.5 mm diameter x 1 m
27	Desoldering wick	CK-0330	1.5 mm
28	Lint free clothes	CK-0336	500 SH/PHG
29	Oiler	CK-0349	30 cc
30	Jar, plastic	CK-0351	30 cc
31	Digital multimeter	CK-0436	

VII. LIST OF LUBRICANTS, CLEANERS

Table 5-6

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	• Purchase locally • Flammable: keep away from flame
2	MEK (methyl ethyl ketone)	$CH_3CO\text{-}C_2H_5$	Cleaning: oil and toner stains	• 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	For drum drive clutch spring	• Tool no. CK-0451 (500g can) • Equivalent oil may be used
4	Lubricating material	MoS_3 Polyalkylene glycol Lithium soap	For cassette pick-up roller clutch spring	• Tool no. CK-0549 (20g bottle)
5	Lubricating material	MoS_2 Polyalkylene glycol	For cassette pick-up roller clutch spring	• Tool no. CK-0550 (20cc bottle)
6	Lubricating material	Special metallic soap Silicon oil	Apply to drive mechanism	• Tool no. CK-0551 (20g tube)

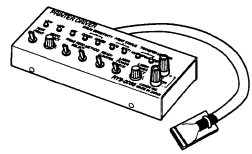
▲ CAUTION

Be careful not to put lubricants or cleaners on the transfer charging roller.

VIII. SPECIAL TOOLS

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

Table 5-7

No.	Tool name	Tool no.	Shape	Application/remarks
1	Printer driver /laser driver checker	RY9-0086		Used for checking the operation of the printer, or when checking the radiation intensity of the laser diode.

Note: This is tool which need one for a group of five service technicians.

CHAPTER 6

TROUBLESHOOTING

I. INTRODUCTION

A. Initial Check

(1) Operating environment

Check if:

- The line voltage does not vary more than 10% from the voltage shown on the rating plate.
- The printer is installed on a sturdy, level surface.
- The room temperature is kept between 10°C to 32.5°C with a relative humidity between 20% to 80%.
- The printer is not exposed to ammonia gas or other harmful gases.
- The printer is not located in a hot or humid area (near a water tab or humidifier), in a cold place (in the direct draft of an air-conditioner), near open flames, nor in a dusty place.
- The printer is not exposed to direct sunlight. If unavoidably placed in a sunny location, the windows should be curtained.
- The room is well ventilated.

(2) Transfer charging roller

Check if:

- The transfer charging roller is clean and undamaged. (Replace it if it cannot be cleaned or is damaged.)

(3) Print paper

Check if:

- The recommended print paper is being used. (If the paper tends to curl or is too thick or too thin, the paper may get jammed, image transfer may be faulty, or the prints may be blurred.
- Print paper is not damp. (Use fresh print paper and check whether the print quality improves.)

(4) Disposable supplies

Check if:

- When there is an EP-N cartridge in the printer. If blank spots occur, remove the cartridge and slowly rock to redistribute the toner evenly as shown in Fig. 4-11 in Chapter 4). If blank spots still occur on prints, replace the cartridge with a new one.

(5) Other checks

Check if:

- The transfer guides and feed guide are clean. (If not, clean them with a dry, lint-free cloth.)

During winter, if the printer is moved from a cold room into a warm room, various temporary problems may result from condensation occurring inside the printer. For example:

- Condensation on an optical surface (such as the scanning mirror, lenses, or reflecting mirror) will cause the print image to become faint.
- When the photosensitive drum is cold, the electrical resistance of its photosensitive layer will become high, making it impossible to obtain correct contrast in prints.
- Condensation on the pick-up guide and feed guide will cause paper transport problems.

If condensation occurs, wipe the above units or parts with a dry cloth or leave the printer switched ON for 10 to 20 minutes before use.

If an EP-N cartridge is unsealed soon after being taken from a cold room into a warm room, condensation will also occur inside the cartridge which may lead to image defects. Be sure to instruct the customer to allow the cartridge to come to room temperature before unsealing it. This will take one to two hours.

B. Basic Procedure

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

(1) If a malfunction occurs, perform troubleshooting as Section V, "TROUBLESHOOTING MALFUNCTIONS.".

(2) If a defective image is printed, go to Section IV, "IMAGE DEFECTS," to determine the type of image defect and perform troubleshooting.

C. How to Use the Troubleshooting Tables

The troubleshooting tables in Sections III to V give information on how to perform troubleshooting when image defects, malfunctions, or paper transport problems occur. The procedure for using the troubleshooting is explained below using the example of AC power failure.

Example: AC power failure

Table 6-1

Possible cause	Step	Check	Result	Measure
AC line voltage	1	Is normal line voltage being supplied to the printer?	NO	This is not a printer problem. Advise the customer that the electrical socket is faulty.
Power cord	2	Is the power cord plugged in?	NO	Plug it into the electrical socket.
Main POWER switch (SW101)	3	Place the tester's lead rod between the pins of the main Power switch. When the main switch is on, is the resistance 0 ohms and when the switch is off, is the resistance ∞ ohms?	NO	Replace the main Power switch.
Circuit breaker (CB101)	4	Is the circuit breaker off?	YES	Switch on the circuit breaker. When the power is turned ON, if the circuit breaker immediately goes off again, check if there is a short-circuit in the AC line.
Low-voltage power supply PCB	5	On the low-voltage power supply PCB, is the voltage at J1 between pins 1 and 2 at the rated level?	YES	Check as "M-2 DC power failure".
AC driver PCB			NO	Replace the low-voltage power supply PCB.

The above table indicates that "AC power failure" may be caused by AC line voltage, the power cord, Main POWER switch, circuit breaker, low-voltage power supply PCB, or AC driver PCB. To solve a problem, start at Step 1 and do the check described in the "Check" column. If the result is as indicated in the "Result" column, take the measure described the "Measure" column. If the result is different, go to the next step and repeat the same process. Fig. 6-4 shows a portion of the above table in the form of a flowchart.

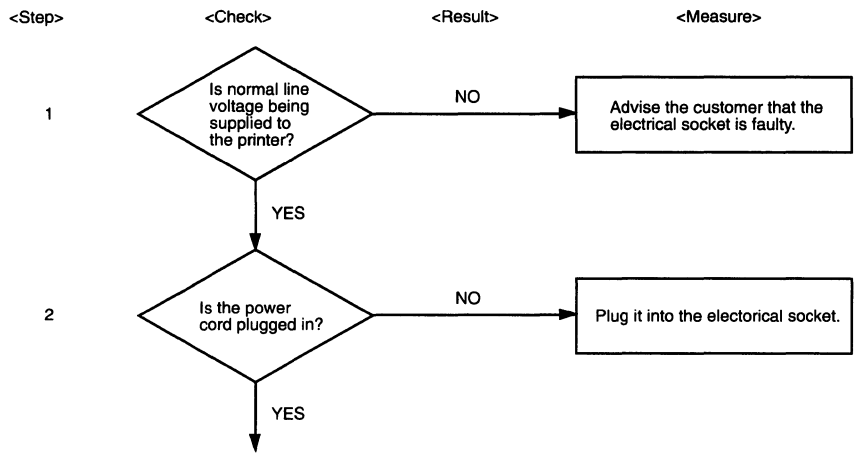

<Step>
<Check>
<Result>
<Measure>
1
Is normal line voltage being supplied to the printer?
NO
Advise the customer that the electrical socket is faulty.
YES
2
Is the power cord plugged in?
NO
Plug it into the electorical socket.
YES

Figure 6-1

II. Special Tools

A. Printer Driver Checker

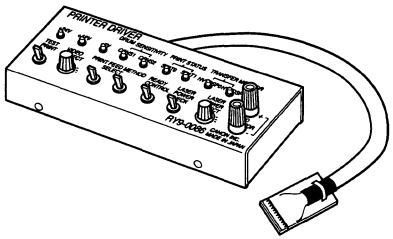


Figure 6-2

1. Overview

This checker drives a laser printer by itself to inspect the laser printer operation. This checker has three applications.

a. It prints vertical lines, horizontal lines, and white images, judges whether the printed images are good or not, and judges whether the problem is in the printer itself or in the video controller (external device).
b. It forcibly lights up the laser diode used in the laser printer, uses a digital multimeter to measure the photodiode output voltage (PD signal) proportional to the light emitted, and checks whether the amount of laser light is within the correct range.
c. If the printer breaks down, this checker displays the error data sent from the printer to the video controller (external device) with its LEDs. The cause of the breakdown can be inferred by reading off this display.

2. Operation panel

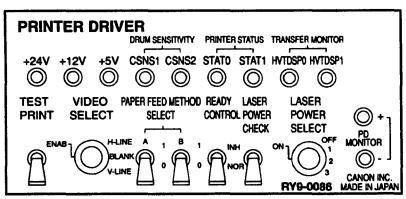


Figure 6-3

TEST PRINT
Prints the pattern selected with VIDEO SELECT. For continuous printing, the job offset operation is carried out for each sheet.

VIDEO SELECT
Selects vertical lines, horizontal lines, or white (blank) as the test printing pattern.

PAPER FEED METHOD SELECT
These switches select the cassette slot and duplex or single-sided printing according to the table below.

Table 6-2

Without envelope feeder mounted

A	B	Paper feed inlet
1	1	Upper cassette, single-sided
1	0	Upper cassette, duplex
0	1	Lower cassette, single-sided
0	0	Lower cassette, duplex

With envelope feeder mounted

A	B	Paper feed inlet
1	1	Upper cassette, single-sided
1	0	Envelope feeder, single-sided
0	1	Lower cassette, single-sided
0	0	Lower cassette, duplex

READY CONTROL
If this switch is set to INH and the power is switched on (this switch has no effect any other time), even if the printer goes into one of the following conditions, it goes into Ready mode.

- No paper
- No cartridge
- Jam
- Irregular operation in the duplex printing (NOTE 1) or irregular operation in the manual feed printing (NOTE 2)
- BD error, BD malfunction
- Scanner malfunction
- Fan motor malfunction
- Lifter malfunction

- Switchback motor malfunction
- Horizontal registration guide malfunction

Notes: 1. When a duplexing unit is available and the envelope feeder is selected as paper feed section, a duplexing unit is selected as the paper destination is specified.

Notes: 2. Paper is inserted from the manual feed slot while the lifter is going up or before it goes up.

LASER POWER CHECK
Lights up the laser diode.

Note: Do not press this switch during printing. It can make the back side dirty.

LASER POWER SELECT
Sets the drum sensitivity to one of three gradations and changes the laser diode light emission amount to one of three gradations to match the drum sensitivity.

Table 6-3

	Drum sensitivity	Laser light emission
OFF	—	—
1	H	Small
2	M	Regulation value
3	L	Large

PD MONITOR
Measurement pins for the laser light amount detection (PD) signal output voltage

+24V, +12V, +5V
LEDs for monitoring the power supplies

DRUM SENSITIVITY
LED for no-cartridge detection (Only effective when the LASER POWER SELECT switch is in the OFF position)
Goes out when no cartridge is detected.

PRINTER STATUS
LEDs for monitoring printer error data; the number of times the LEDs blink indicates the nature of the error as listed in the table 6-4.

Table 6-4

Blinking count		Error
STAT0	STAT1	
0	1	Pick-up delay jam
0	2	Fixing unit delivery delay jam
0	3	Fixing unit stationary jam
0	4	F/D tray delivery delay jam
0	5	F/D tray delivery stationary jam
0	6	Duplexing unit feed delay jam
0	7	Duplexing unit feed stationary jam
0	8	Switchback delay jam
0	9	Second-pass pick-up unit delay jam
0	10	Pick-up stationary jam
0	11	Switchback stationary jam
0	12	Second-pass pick-up stationary jam
1	1	Fixing unit malfunction: Thermistor open (*1)
		Heater open (*2)
		Thermistor short or heater run wild (*3)
1	4	Error memory capacitor charge (*4)
2	3	Main motor malfunction: Not attaining regulation rotation rate
3	2	Laser breakdown
5	1	+24VA not starting up

Notes: 1. See Item "b" in Chapter 2 IV-F-2 Fixing roller heater malfunction detection
2. See Items "c" and "d" in Chapter 2 IV-F-2 Fixing roller heater malfunction detection
3. See Item "e" in Chapter 2 IV-F-2 Fixing roller heater malfunction detection
4. See Item "a"s in Chapter 2 IV-F-2 Fixing roller heater malfunction detection

<Display method>
When one of the above errors occurs, the STAT0 and STAT1 LEDs both light up for one second, then first the STAT0 blinks for 0.3 second then 0.5 second later STAT1 blinks for 0.25 second. Then 0.5 second later, the cycle is repeated from the start. When the table above indicates that STAT0 LED is "0" (for jam or for door open), restoring with the error release ends the blinking display.

TRANSFER MONITOR
LED for monitoring the phototransfer high-voltage output

Table 6-5

HVTDSP0	HVTDSP1	Transfer voltage output state
OFF	OFF	Transfer voltage not output
ON	OFF	Transfer between pages voltage output
OFF	ON	Transfer negative voltage output
ON	ON	Transfer voltage output

3. List of connector signals

Table 6-6

Pin No.	Signal	Function
J808-1	+24V	+24V
J808-2	/TMODE0	In combination with /TMODE1, sets the cassette slot.
J808-3	/TMODE1	In combination with /TMODE0, sets the cassette slot.
J808-4	/DBDC	N.C.
J808-5	+12V	+12V
J808-6	/DBAC	N.C.
J808-7	GND	GND
J808-8	/HV1DC	N.C.
J808-9	+5V	+5V
J808-10	/HVTCHK	N.C.
J808-11	/HVDDL	N.C.
J808-12	/TSA	In combination with /TSB and /TSTPE, sets the printing test pattern.
J808-13	/TSTPT	When "L", test printing
J808-14	/TSB	In combination with /TSA and /TSTPE, sets the printing test pattern.
J808-15	/RDYINH	When "L", this unit can operate even in not-ready mode.
J808-16	/TSTPE	In combination with /TSA, and /TSB, sets the printing test pattern.
J808-17	/LPCHK	When "L", lights up the laser diode.
J808-18	/CSNT0	In combination with /CSNT1, sets the amount of laser light.
J808-19	/SCNON	N.C.
J808-20	/CSNT1	In combination with /CSNT0, sets the amount of laser light.
J808-21	/DINPUT0	N.C.
J808-22	/DINPUT1	N.C.
J808-23	/DOUPT0	In combination with /DOUPT1, outputs this unit's error state.
J808-24	/DOUPT1	In combination with /DOUPT0, outputs this unit's error state.
J808-25	DOUPT2	In combination with /DOUPT3, outputs the transfer voltage output state.
J808-26	DOUPT3	In combination with /DOUPT2, outputs the transfer voltage output state.
J808-27	AOUTPT0	Voltage proportional to the amount of laser light.
J808-28	AOUTPT1	N.C.
J808-29	AINPUT0	N.C.
J808-30	AINPUT1	N.C.

4. Operation method

1) Switch OFF the main POWER switch of the printer.
2) Remove the upper front cover and the lower front cover of the printer.
3) Fasten the printer driver checker's alligator clip to a metal section of the printer.
4) Connect the checker's connector to the connector (J1013) on the DC controller PCB of the printer.
5) Switch on the main POWER switch of the printer.
6) When the printer goes on standby, operate this checker to check the printer.

Note: When you are operating this printer driver checker, if your body has static electricity built up on it, the printer may malfunction. Therefore, when connecting this checker, always fasten the alligator clip to a metal part of the printer, make sure the printer is well grounded, then touch your hand to the metal part of the printer to discharge yourself before starting to operate the checker.

III. MEASUREMENT AND ADJUSTMENT

A. Test Printing

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

1) Turn the power ON.
2) Wait for the printer to be STANDBY.
3) Set the cassette into upper cassette slot. Press the test print button on the front of the printer using a thin stick (for example, M3 Hex Key wrench) and make one test print as shown in Figure 6-4.

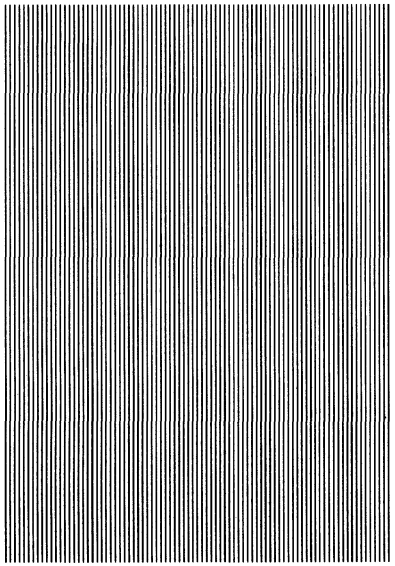


Figure 6-4

4) Go to Section IV to determine the type of image defect.

B. Checking the Nip Width

The fixing unit is not designed to permit adjustment of the nip width. If the nip width is not correct, a fixing problem may occur. To check the nip width, follow the procedure below.

1) Either take along one or two all-black copies of A4 or Letter size made with a copier, or make a similar all-black print using a copier at the customer site.
2) Turn ON the printer and place the black print on the manual feed slot.
3) Press the test print switch on the front of the printer.
4) When one of the print comes out to the fixing unit, turn the printer OFF and wait for 10 seconds.
5) Open the printer and pick paper up outside printer.
6) Measure the widths of the glossy band across the print as shown in Figure 6-2, then check if they meet the requirements listed in Table 6-7.

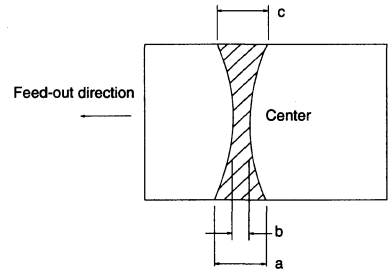


Figure 6-5

Table 6-7

	Measurement
b	4 to 5 (mm)
| a-c |	1 mm or less
| a-b|	1 mm or less
| a-c |	1 mm or less

C. Adjustment of the Installation Position of the Registration Spring clutch

When installing the registration spring clutch, use a thickness gauge to adjust the distance between the clutch gear and the E-ring to 0.2 mm, then fix the clutch into position.

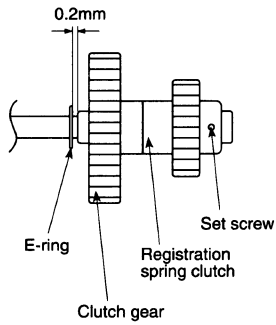


Figure 6-6

D. Adjustment of the Installation Position of the Solenoid

When installing all solenoid using this printer, use a thickness gauge to adjust the distance between the stopper and the body of solenoid to 0.5 mm, then fix the solenoid.

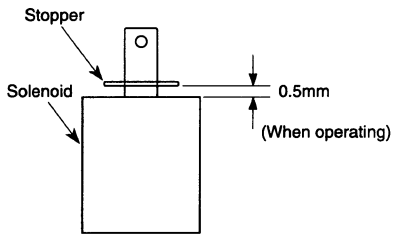


Figure 6-7

E. Electrical Adjustments

This printer has no controls that require adjustment by the user.

This printer uses laser beam and the laser beam it uses is not visible to the human eye. Therefore, if a problem arises that is thought to arise from the amount of laser beam, use the laser malfunction diagnostic flowchart on the next few pages to judge whether the problem is in the laser/scanner unit or on the DC controller PCB.

Measure voltages three times and take the average of the three readings.

◆ **Laser malfunction diagnostic flowchart**

This printer uses laser beam and the laser beam it uses is not visible to the human eye. Therefore, if a problem arises that is thought to arise from the amount of laser beam, use this laser malfunction diagnostic flowchart to judge whether the problem is in the laser/scanner unit or on the DC controller PCB.

(Precautions for using this flowchart)

1. This flowchart uses the following abbreviations.
   a. Printer driver checker ---> Driver checker
   b. Digital multimeter ---> Multimeter
   c. EP-N cartridge ---> Cartridge
2. "X" in listings of printer driver checker switch settings indicates that the setting of the switch in question does not matter.
3. Measure currents three times and take the average of the three readings.

(Before starting to use this flowchart)

1. Switch off the printer power, then remove the EP-N cartridge from the printer.
2. Remove the right cover, outer shield plate, upper front cover, lower front cover.
3. Fasten the driver checker's alligator clip to a metal section of the printer and securely ground the printer, then connect the J1013 connector to the J1013 connector on the DC controller circuit board.
4. Set the driver checker's switches this way:
   TEST PRINT.....NOT ENAB
   VIDEO SELECT x
   PAPER FEED METHOD SELECT.....x
   READY CONTROL.....INH
   LASER POWER SELECT 2
5. Carry out the check according to the flowchart given in Figure 6-8.

Table 6-8

LASER POWER SELECT	PD
1	2.36 ~ 2.40
2	2.78 ~ 2.82
3	3.20 ~ 3.24

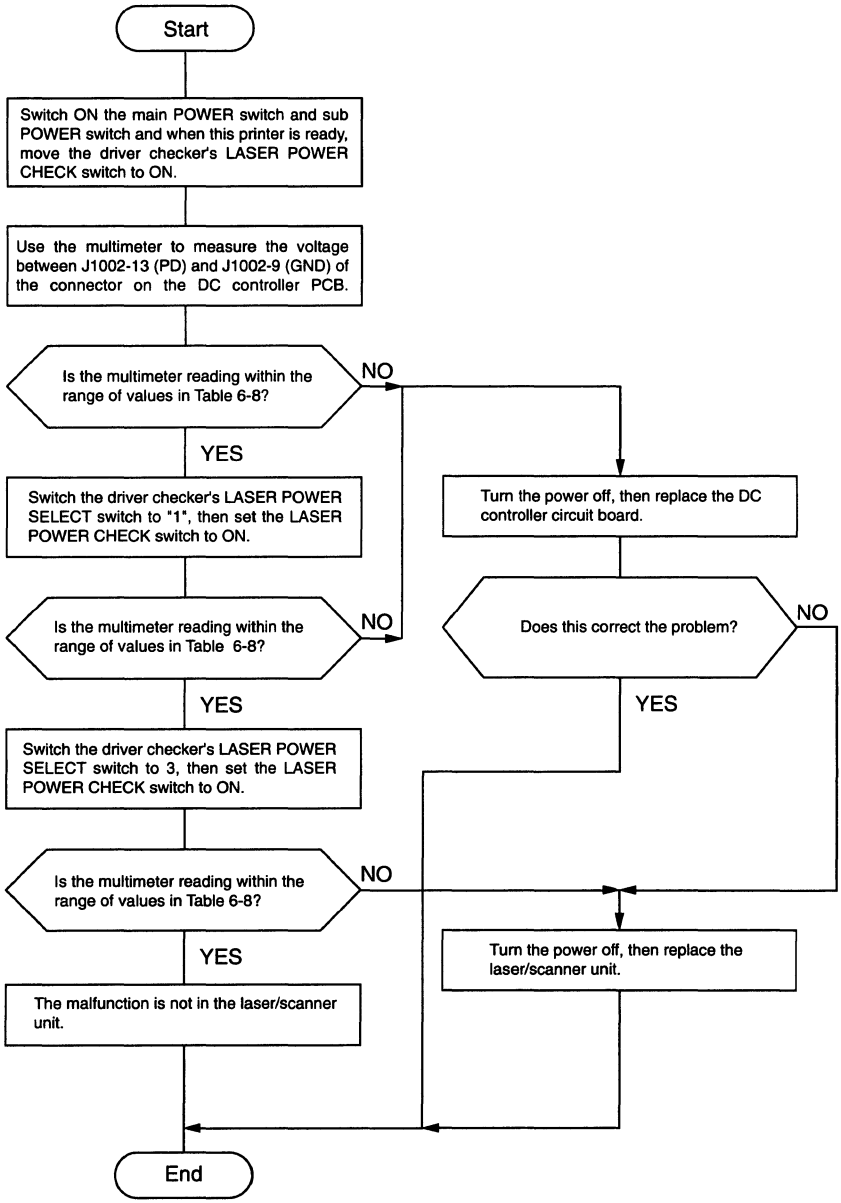

Start
Switch ON the main POWER switch and sub POWER switch and when this printer is ready, move the driver checker's LASER POWER CHECK switch to ON.
Use the multimeter to measure the voltage between J1002-13 (PD) and J1002-9 (GND) of the connector on the DC controller PCB.
Is the multimeter reading within the range of values in Table 6-8?
NO
YES
Switch the driver checker's LASER POWER SELECT switch to "1", then set the LASER POWER CHECK switch to ON.
Turn the power off, then replace the DC controller circuit board.
Is the multimeter reading within the range of values in Table 6-8?
NO
Does this correct the problem?
NO
YES
YES
Switch the driver checker's LASER POWER SELECT switch to 3, then set the LASER POWER CHECK switch to ON.
Is the multimeter reading within the range of values in Table 6-8?
NO
YES
Turn the power off, then replace the laser/scanner unit.
The malfunction is not in the laser/scanner unit.
End

Figure 6-8

Note 1: If you use the driver checker and test print in RDYINH mode, the image for the first page may be distorted.

Note 2: If you use the driver checker and print consecutive duplex pages in RDYINH mode, the first page is printed on one side only, then the first of every three pages is printed on one side and the second two on both sides.

IV. IMAGE DEFECTS

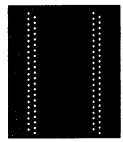
A. Examples of Image Defects

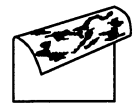
I-1 Faint print

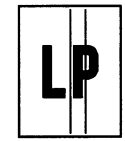

I-2 Dark


I-3 Blank page

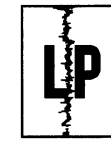

I-4 Black page


I-5 Large dots in vertical lines


I-6 Back of page dirty



I-7 Vertical black lines



I-8 Black smudged vertical bands

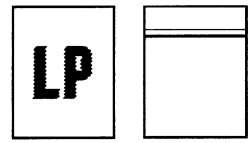
I-9 Black smudged horizontal bands


I-10 Blank spots


I-11 Solid-white Vertical lines


I-12 Faulty registration

I-13 Improving fixing



I-14 Image distortion
I-15 BD can not be detected

Figure 6-9

B. Troubleshooting Image Defects

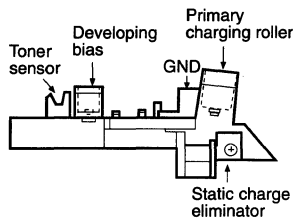
I-1 Faint print

Possible cause	Step	Check	Result	Measure
	1	Is the print density adjustment lever set to a "Dark" position?	NO	Set it to a darker position.
Lack of toner	2	Does print quality improve when the EP-N cartridge is replaced?	YES	Replace the cartridge.
	3	Open the printer while a print is being made. When the cartridge's drum protection shutter is manually opened (for no more than 10 seconds), is the toner image on the drum transferred to the paper?	YES	If the toner image on the drum is very faint, skip to Step 7.
Print paper	4	Does print quality improve when fresh paper is used?	YES	Change paper with freshly unpacked paper.
Transfer charge roller	5	Does print quality improve when the transfer charging roller is replaced?	YES	Replace the transfer charging roller.
Dirty reflecting mirror	6	Is there paper dust or other foreign matter on the reflecting mirror?	YES	Replace the reflecting mirror. The reflecting mirror should not be touched or cleaned.
High-voltage power supply unit (high-voltage transfer voltage)	7	Load paper and make one test print. While the print comes out to the face-down tray, at J1010 on the DC controller PCB, are the approximate voltage between Pin 5 (HVTC) and 1 (GND), Pin 6 (HVTV) and 1 the following value? Pin 5: +17.0 → +14.0 → +17.0 (VDC) Pin 6: +7.0 → +11.0 → +13.5 → +11.0 → +7.0 (VDC)	YES	Check if voltage is passing from the high-voltage contact point to the transfer charging roller's shaft. Check if connector FT101 is making good contact. If both contacts are okay, check the wiring from the DC controller PCB's connector J1010 to the high-voltage power supply PCB's connector J1. If the wiring is okay, replace the high-voltage power supply unit.
DC controller PCB			NO	Replace the DC controller PCB.

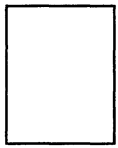
Possible cause	Step	Check	Result	Measure
High-voltage power supply unit (developing bias)	8	Load paper and make one test print. One second after the pick-up rollers begin turning, at J1010 on the DC controller PCB, does the voltage between pins 4 (/DBAC) and 1 (GND) drop from about +8.5 VDC to 0V and does the voltage between pins 7 (/DBDC) and 1 (GND) drop from about +8.5VDC to 0V?	YES	Check if voltage is passing from the high-voltage contact point to the contact point for the cartridge's developing bias. If so, replace the high-voltage power supply unit.
DC controller PCB			NO	Replace the DC controller PCB.
Drum sensitivity identification switches (SW1002, SW1003)	9	When the drum sensitivity identification switch SW1002 (pick-up side) on the DC controller PCB is pressed, does the voltage at J1014 between pins 18 (/CSNS1) and 7 (GND) drop from +5VC to 0V? When the drum sensitivity identification switch SW1003 (delivery side) is pressed, does the voltage at J1014 between pins 20 (/CSNS2) and 7 (GND) drop from +5VDC to 0V?	NO	Replace the DC controller PCB. If replacement does not solve the problem, check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter.

I-2 Dark

[redacted]

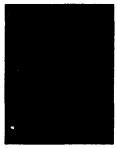
Possible cause	Step	Check	Result	Measure
	1	Is the print density adjustment lever set to a "Light" position?	NO	Set it to a lighter position
EP-N Cartridge	2	Does the print quality improve when the EP-N cartridge is replaced?	YES	Replace the cartridge.
High-voltage connector	3	Are the GND terminal of the high-voltage connector and the GND contact point of the cartridge dirty? 	YES	Clean the high-voltage connector and cartridge contact point with a dry cloth.
High-voltage power supply unit (primary high voltage)	4	Load paper and make one test print. When the main motor starts rotating, at J1010 on the DC controller PCB, does the voltage between pins 3 (/HV1DC) and 1 (GND) drop from about +8.5VDC to 0V and does the voltage between pins 11 (/HV1AC) and 1 (GND) drop from about +8.5VDC to 0V?	YES	Check if voltage is passing from the high-voltage contact point to the contact point for the cartridge's primary charging roller. If so, replace the high-voltage power supply unit.
Drum sensitivity identification switches (SW1002, SW1003)	5	When the drum sensitivity identification switch SW1002 (pick-up side) on the DC controller PCB is pressed, does the voltage at J1014 between pins 18 (/CSNS1) and 7 (GND) drop from +5VDC to 0V? When the drum sensitivity identification switch SW1003 (delivery side) is pressed, does the voltage at J1014 between pins 20 (/CSNS2) and 7 (GND) drop from +5VDC to 0V?	NO	Replace the DC controller PCB. If replacement does not solve the problem, check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter.

I-3 Blank page



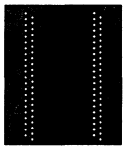
Possible cause	Step	Check	Result	Measure
	1	Does print quality improve when the EP-N cartridge is replaced?	NO	Replace the cartridge.
Transfer charging roller	2	Does print quality improve when the transfer charging roller is replaced?	YES	Replace the transfer charging roller.
High-voltage power supply unit (high-voltage transfer voltage)	3	Load paper and make one test print. While the print comes out to the face-down tray, at J1010 on the DC controller PCB, are the approximate voltage between Pin 5 (HVTC) and 1 (GND), Pin 6 (HVTV) and 1 the following value? Pin 5: +17.0 → +14.0 → +17.0 (VDC) Pin 6: +7.0 → +11.0 → 13.5 → +11.0 → 7.0 (VDC)	YES	Check if voltage is passing from the high-voltage contact point to the transfer charging roller's shaft. Check if connector FT101 is making good contact. If both contacts are okay, check the wiring from the DC controller PCB's connector J1010 to the HV power supply PCB's connector J1.
High-voltage power supply unit (developing bias)	4	Load paper and make one test print. One second after the pick-up rollers begin turning, at J1010 on the DC controller PCB, does the voltage between pins 4 (/DBAC) and 1 (GND) drop from about +8.5 VDC to 0V and does the voltage between pins 7 (/DBDC) and 1 (GND) drop from about +8.5VDC to 0V?	YES	Check if voltage is passing from the high-voltage contact point to the contact point for the cartridge's developing bias. If so, replace the high-voltage power supply unit.
DC controller PCB			NO	Replace the DC controller PCB. If replacement does not solve the problem, check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter.

I-4 Black page



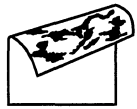
Possible cause	Step	Check	Result	Measure
EP-N cartridge	1	Does print quality improve when the EP-N cartridge is replaced?	YES	Replace the cartridge.
High-voltage power supply unit (primary high voltage)	2	Load paper and make one test print. When the main motor starts rotating, at J1010 on the DC controller PCB, does the voltage between pins 3 (/HV1DC) and 1 (GND) drop from about +8.5VDC to 0V and does the voltage between pins 11 (/HV1AC) and 1 (GND) drop from about +8.5 VDC to 0V?	YES	Replace the high-voltage power supply unit. If replacement does not solve the problem, check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter.
DC controller PCB			NO	Replace the DC controller PCB. If replacement does not solve the problem, check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter.

I-5 Large dots in vertical lines



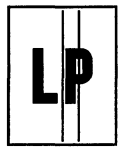
Possible cause	Step	Check	Result	Measure
Static charge eleminator	1	Is the static charge eliminator dirty?	YES	Clean it using an air blower.
	2	Is the correct voltage supplied to the static charge eliminator?	NO	Clean the high-voltage connector.
Transfer charging roller	3	Is the transfer charging roller dirty?	YES	Replace the transfer charging roller.

I-6 Back of page dirty



Possible cause	Step	Check	Result	Measure
Transfer charging roller	1	Is the transfer charging roller dirty?	YES	Replace the transfer charging roller.
Feed guide	2	Is the feed guide dirty?	YES	Clean it with dry cloth, then wipe with dry cloth.
Fixing unit entrance guide	3	Is the fixing unit entrance guide dirty?	YES	Clean it with damp cloth.
Fixing unit	4	Is the lower fixing roller dirty?	YES	Clean it with dry cloth. If dirt persists, replace the lower fixing roller.
			NO	Replace the DC controller PCB.

I-7 Vertical black lines



Possible cause	Step	Check	Result	Measure
EP-N cartridge	1	Open the printer while a print is being made. When the cartridge's drum protection shutter is manually opened, can vertical streaks be seen on the drum? (Is there a scratch is the rotating driection of the Fixing rollers?)	YES	Replace the cartridge.
Fixing unit			NO	Replace the fixing unit.

I-8 Black smudged vertical bands

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

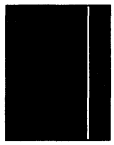
I-9 Black smudged horizontal bands

Possible cause	Step	Check	Result	Measure
EP-N 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	Measure
EP-N cartridge	1	Does print quality improve when the EP-N cartridge is replaced?	YES	Replace the cartridge.
Print paper	2	Has the print paper absorbed moisture?	YES	Replace it with freshly unpacked paper. Advise the customer to wrap print paper in packing paper before storage to prevent damp paper.
Developing bias	3	Is the output of developing bias normal?	NO	Replace the high-voltage power supply unit.
Transfer charging roller	4	Is the transfer charging roller dirty or deformed?	YES	Replace the transfer charging roller.
High-voltage power supply unit (developing bias)	5	Load paper and make one test print. Two seconds after the pick-up rollers begin turning, at 1010 on the DC controller PCB, does the voltage between pins 4 (/DBAC) and 1 (GND) drop from about 8.5 VDC to 0V and does the voltage between pins 7 (/DBDC) and 1 (GND) drop from about 8.5 VDC to 0V?	YES	Check if voltage is passing from the high voltage contact point to the contact point for the cartridge's developing bias. If so, replace the high-voltage power supply unit.
DC controller PCB			NO	Replace the DC controller PCB. If replacement does not solve the problem, check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter.

I-11 Solid-white vertical lines



Possible cause	Step	Check	Result	Measure
Lack of toner	1	Do vertical white streaks appear on the paper?	YES	Remove the cartridge from the printer, then rock the cartridge to evenly distribute the toner as shown in Figure 4-16 in Chapter 4, then reinstall it.
EP-N cartridge	2	Open the printer while a print is being made. When the cartridge's drum protection shutter is manually opened, can white vertical bands be seen on the drum?	YES	Replace the cartridge.
Foreign matter	3	Is there hair or other foreign matter on the printer's laser beam outlet or the cartridge's laser beam inlet?	YES	Remove the foreign matter.
Reflecting mirror	4	Is there paper dust or other dirt on the reflecting mirror?	YES	Replace the reflecting mirror. The reflecting mirror should not be touched or cleaned.
Fixing unit	5	Is there a scratch in the rotating direction of the fixing rollers?	YES	Replace the fixing unit.
Transfer charging roller	6	Is there a scratch in the rotating direction of the transfer charging roller?	YES	Replace the transfer charging roller.
			NO	Replace the fixing unit.

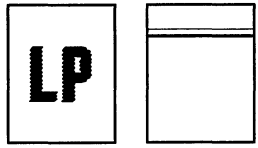
I-12 Faulty registration

Possible cause	Step	Check	Result	Measure
Cassette	1	Is the cassette overloaded?	YES	Advise the customer not to load too much paper in the cassette.
Pick-up rollers	2	Are any pick-up rollers worn?	YES	Replace the pertinent pick-up rollers.
Print paper	3	Is paper being recommended by Canon being used?	YES	Make a test print with Canon-recommended paper. If the problem disappears, advise the customer to use the recommended paper.
Registration roller spring	4	Has the spring come loose?	YES	Re-attach the spring.
Registration rollers	5	Are the registration rollers dirty?	NO	Clean the metallic areas with methyl ethyl ketone and clean the rubber areas with ethyl or isopropyl alcohol.
Registration roller clutch	6	Is the clutch spring deformed, rusted, or worn?	YES	Replace the clutch spring.
DC controller PCB	7	Load paper and make one test print. Three seconds after the pick-up rollers begins turning, does the voltage at J1007 on the DC controller PCB between pins 2 (/REGD) and 1 (GND) drop from about +24VDC to about 0V?	NO	Replace the DC controller PCB.
Registration rollers			YES	Replace the registration rollers.

I-13 Improper fixing

Possible cause	Step	Check	Result	Measure
Fixing roller heater	1	Make 10 consecutive test prints. Is the toner density lighter on the last print than on the first print?	YES	Replace the thermistor (TH1).
Fixing rollers	2	Does improper fixing occur in vertical lines?	YES	Check whether the upper and lower fixing rollers are damaged.
Lower fixing roller	3	Is the lowering fixing roller dirty?	YES	Clean with dry cloth. If dirt persists, replace the roller.
Fixing unit	4	Is the nip width too small?	YES	Replace the fixing unit.
Print paper			NO	Make a test print with Canon-recommended paper. If the problem disappears, advise the customer to use the recommended paper.

I-14/I-15 Picture distortion; BD can not be detected.



Possible cause	Step	Check	Result	Measure
Optical fiber	1	Is the contact at connector J1001 on the DC controller PCB good?	NO	Fix the connection.
	2	Is the optical fiber damaged?	YES	Replace the optical fiber.
Connector contact no good	3	Is the contact at connector J1002 on the DC controller PCB good?	NO	Fix the connection.
Laser/scanner unit	4	Check according to Item III E "Laser malfunction Diagnostic Flowchart" in this chapter. Is the laser/scanner unit no good?	YES	Replace the laser/scanner unit.
DC controller PCB			NO	Replace the DC controller PCB.

V. TROUBLESHOOTING MALFUNCTIONS

When performing any of the corrective measures described in this section, observe the following precautions:

1. Before measuring voltage between designated terminal pins, check the connector for faulty contacts.
2. When performing troubleshooting with the printer turned on, be very careful to avoid electrical shocks.

M-1 AC power failure

Possible cause	Step	Check	Result	Measure
AC line voltage	1	Is normal line voltage being supplied to the printer?	NO	This is not a printer problem. Advise the customer that the electrical socket is faulty.
Power cord	2	Is the power cord plugged in?	NO	Plug it into the electrical socket.
Main POWER switch (SW101)	3	Place the tester's lead rod between the pins of the main Power switch. When the main Power switch is on, is the resistance 0 ohms and when the switch is off, is the resistance ∞ ohms?	NO	Replace the main Power switch.
Circuit breaker (CB101)	4	Is the circuit breaker off?	YES	Switch on the circuit breaker. When the power is turned ON, if the circuit breaker immediately goes off again, check if there is a short-circuit in the AC line
Low-voltage power supply PCB	5	On the low-voltage power supply PCB, is the voltage at J1 between pins 1 and 2 at the rated level?	YES	Check as "M-2 DC power failure".
AC driver PCB			NO	Replace the low-voltage power supply PCB.

M-2 DC power failure

<table>
<tr><th>Possible cause</th><th>Step</th><th>Check</th><th>Result</th><th>Measure</th></tr>
<tr><td>Fuse</td><td>1</td><td>Is the fuse blown on the low-voltage power supply PCB?</td><td>YES</td><td>Replace the fuse.</td></tr>
<tr><td>AC power</td><td>2</td><td>When the main Power switch and the sub-power switch are ON, on the low-voltage power supply PCB, is the AC voltage at J1 between pins 1 and 3 supplied?</td><td>NO</td><td>Check as "M-1 AC power failure".</td></tr>
<tr><td>DC controller PCB</td><td>3</td><td>Turn the power ON, measure the voltages between the pins of the low-voltage power supply PCB as shown in the table below, and see if they are the regulation values.
<table><tr><th>Pin</th><th>Voltage</th></tr><tr><td>J4-1, J4-2</td><td>about 5V</td></tr><tr><td>J2-1, J2-2</td><td>about 12V</td></tr><tr><td>J5-1, J5-2</td><td>about 24V</td></tr></table></td><td>YES</td><td>Replace the DC controller PCB.</td></tr>
<tr><td>Sub Power switch</td><td rowspan="2">4</td><td rowspan="2">Is the voltage conducting between pins 1 and 2 of J8 on the low-voltage power supply PCB.</td><td>NO</td><td>Replace the sub Power switch.</td></tr>
<tr><td>Low-voltage power supply unit</td><td>YES</td><td>Replace the low-voltage power supply PCB.</td></tr>
</table>

M-3 Pick-up motor does not rotate

Possible cause	Step	Check	Result	Measure
Paper feed PCB	1	Does the motor rotate after the paper feed PCB is replaced?	YES	Replace the paper feed PCB.
DC controller PCB	2	Does the motor rotate after the DC controller PCB is replaced?	YES	Replace the DC controller PCB.
			NO	Replace the pick-up motor.

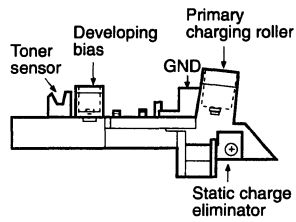
M-4 Main motor does not rotate

Possible cause	Step	Check	Result	Measure
Main motor and main motor drive PCB	1	Set the printer to READY status. When the test print button is pressed, on the DC controller PCB, is the voltage at J1010 between pins 14 (MPOWER) and 17 (GND) about +22VDC?	YES	Replace the main motor with main motor drive PCB.
DC controller PCB			NO	Replace the DC controller PCB.

M-5 No pick-up from upper (lower) cassette

Possible cause	Step	Check	Result	Measure
Pick-up rollers	1	Are all three pick-up rollers of the upper (lower) pick-up roller rotating?	YES	Replace all upper (lower) pick-up rollers.
Pick-up one-way gear	2	Is the upper (lower) cassette pick-up one-way gear rotating only in one direction?	NO	Replace the pick-up one-way gear.
Pick-up motor	3	Make a test print. On the paper feed PCB, is each voltage at J301 between pins 1 (+24VDC) and 5 (GND) +24VDC pulse?	YES	Replace the pick-up motor.
Paper feed PCB	4	Is pick-up performed when the paper feed PCB is replaced?	YES	Replace the paper feed PCB.
DC controller PCB			NO	Replace the DC controller PCB.

M-6 Abnormal output of high-voltage power supply

<table>
<tr><th>Possible cause</th><th>Step</th><th>Check</th><th>Result</th><th>Measure</th></tr>
<tr><td>Highh-voltage connector</td><td>1</td><td>Is any terminal or contact point of the high-voltage connector dirty or burnt?
 
</td><td>YES</td><td>Clean the high-voltage connector.</td></tr>
<tr><td>High-voltage power supply PCB</td><td rowspan="2">2</td><td rowspan="2">Make a test print.
At J1010 on the DC controller PCB, do the voltages in the table below change as be stipulated.
<table><tr><td>/HV1AC</td><td>J1010-11</td><td>6.5V→0V</td></tr><tr><td>/HV1DC</td><td>J1010-3</td><td>6.5V→0V</td></tr><tr><td>/DBAC</td><td>J1010-4</td><td>6.5V→0V</td></tr><tr><td>/DBDC</td><td>J1010-7</td><td>6.5V→0V</td></tr><tr><td>/HVTC</td><td>J1010-5</td><td>17.0V→14.0V →17.0V</td></tr><tr><td>/HVTV</td><td>J1010-6</td><td>7.0V→11.0V →13.0V→11.0V →7.0V</td></tr></table></td><td>YES</td><td>Replace the high-voltage power supply PCB.</td></tr>
<tr><td>DC controller PCB</td><td>NO</td><td>Replace the DC controller PCB.</td></tr>
</table>

M-7 Paper is not jammed, but the PAPER JAM indicator flashes and the printer stops

Possible cause	Step	Check	Result	Measure
Pick-up paper sensor arm	1	Is the pick-up paper sensor arm damaged?	YES	Replace the pick-up paper sensor arm.
Pick-up paper sensor (PS3)	2	When paper is placed on the pick-up paper sensor (PS3), at J1010 on the DC controller PCB, does the voltage between pins 20 (FEEDS) and 21 (GND) rise from 0V to about +5VDC?	NO	Replace the pick-up paper sensor (PS3).
Fixing unit delivery paper sensor arm	3	Is the fixing unit devlivery paper sensor arm damaged?	YES	Replace the fixing unit paper sensor arm.
Fixing unit delivery paper sensor (PS151)	4	When paper is placed on the fixing unit delivery paper sensor (PS151), does the voltage at J1012 between pins 6 (PDP) and 2 (GND) drop from about +4VDC to 0V?	NO	Replace the fixing unit paper sensor (PS151).
Face-down delivery paper sensor arm	5	Is the face-down delivery paper sensor arm damaged?	YES	Replace the face-down delivery paper sensor arm.
Face-down delivery paper sensor (PS7)	6	When paper is placed in front of the face-down delivery paper sensor, does the voltage at J1012 between pins 15 (FDOUTS) and 2 (GND) rise from 0V to about +5VDC?	NO	Replace the face-down delivery paper sensor.
			YES	Replace the print paper with Canon-recommended paper that is freshly unpacked.

M-8 Fixing unit heater does not operate

Possible cause	Step	Check	Result	Measure
Thermistor (TH1)	1	Remove the fixing unit and measure the resistance at J151 of the fixing unit between pins 1 and 3. Is the resistance (at room temperature) about 220 kΩ?	NO	Replace the thermistor.
Fixing roller heater (H1)	2	Is the fixing roller heater conducting voltage?	NO	Replace the fixing roller heater.
Thermoswitch (TP1)	3	Is the thermoswitch on the fixing unit conducting voltage?	NO	Replace the thermo-switch.
AC driver PCB	4	5 seconds after the printer is turned on, measure the voltage between pins 10 (/HTDL) and 2 (GND) at J201 on the DC driver PCB. Does the voltage drop from +24VDC to OV?	YES	Replace the AC driver PCB.
DC driver PCB	5	5 seconds after the printer is turned on, measure the voltage between pins 7 (/FSRD) and 2 (GND) at J1012 on the DC controller PCB. Does the voltage drop from +24VD to 0V?	NO	Replace the DC driver PCB.
DC controller PCB			YES	Replace the DC controller PCB.

Note: When the printer detects a fixing unit fault, it automatically shuts off current to the fixing roller heater to prevent overheating. If it is required to operate the heater for servicing, the printer should be switched OFF for at least 20 minutes before it is switched ON again.

M-9 Fan motor (FM1) malfunction

Possible cause	Step	Check	Result	Measure
Connector contact no good	1	Is the contact at connector J1012 on the DC controller PCB good?	NO	Fix the connection.
Low-voltage power supply unit	2	Is the voltage between Pins 1 (+24VA) and 4 (GND) on connector J1009 on the DC controller circuit board about 24VDC?	NO	Replace the low-voltage power supply unit.
DC controller PCB	3	About two seconds after the voltage is supplied between Pins 8 (FANON) and 2 (GND) of connector J1012 on the DC controller circuit board, does the voltage change from about 0.2VDC to about 0.7VDC?	NO	Replace the DC controller PCB.
DC driver PCB	4	Make a test print. About two seconds after the voltage is supplied between Pins 1 (FAND) and 3 (GND) of connector J204 on the DC driver PCB, does the voltage change from about 13.5VDC to about 24VDC?	NO	Replace the DC driver.
Fan motor (FM1)			YES	Replace the fan motor (FM1).

M-10 Fan motor (FM2) malfunction

Possible cause	Step	Check	Result	Measure
Connector contact no good	1	Is the contact at connector J7 on the DC controller PCB good?	NO	Fix the connection.
Low-voltage power supply unit	2	Is the voltage between Pins 1 (+24VA) and 3 (GND) on connector J7 on the low-voltage power supply PCB about 24VDC?	NO	Replace the low-voltage power supply unit.
Fan motor (FM2)			YES	Replace the fan motor (FM1).

M-11 Fan motor (FM3 or FM4) malfunction

Possible cause	Step	Check	Result	Measure
Connector contact no good	1	Is the contact at connector J1018 on the DC controller PCB good?	NO	Fix the connection.
Low-voltage power supply unit	2	Is the voltage between Pins 1 (+24VA) and 4 (GND) on connector J1009 on the low-voltage power supply PCB about 24VDC?	NO	Replace the low-voltage power supply unit.
DC controller PCB	3	Is the voltage between Pins 1 (+24VA) and 3 (GND) on connector J1018 on the low-voltage power supply PCB about 24VDC?	NO	Replace the DC controller PCB.
Fan relay circuit	4	Test print one sheet. Does the voltage between Pins 1 (+24VA) and 3 (GND) of connector J3009 on the fan relay board for FM3 or between Pin 1 of connector J3009 (+24VA) and Pin 1 of connector J3010 (GND) for FM4 become about 24VDC?	NO	Replace the on relay PCB.
Fan motor (FM3 or FM4)			YES	Replace the fan motor (FM3 or FM4).

M-12 Scanner malfunction

Possible cause	Step	Check	Result	Measure
Connector contact no good	1	Is the contact at connector J1002 on the DC controller PCB good?	NO	Fix the connection.
Low-voltage power supply unit	2	Is the voltage between Pins 1 (+5V) and 2 (GND) on connector J1008 on the low-voltage power supply PCB about 5VDC?	NO	Replace the low-voltage power supply unit.
Laser/scanner unit	3	Make a test print. Does the voltage between Pins 3 (SCNCNT) and 2 (GND) of connector J1002 on the DC controller circuit board change from about 10VDC to 0V then to about 3VDC?	YES	Replace the laser/scanner unit.
DC controller PCB			NO	Replace the DC controller PCB.

M-13 BD malfunction

Possible cause	Step	Check	Result	Measure
Laser/scanner unit	1	Is the optical fiber pulled out of connector J1001 on the DC controller PCB?	YES	Connect it properly.
DC controller PCB			NO	Check according to Item III C "laser malfunction diagnostic flowchart" in this chapter.

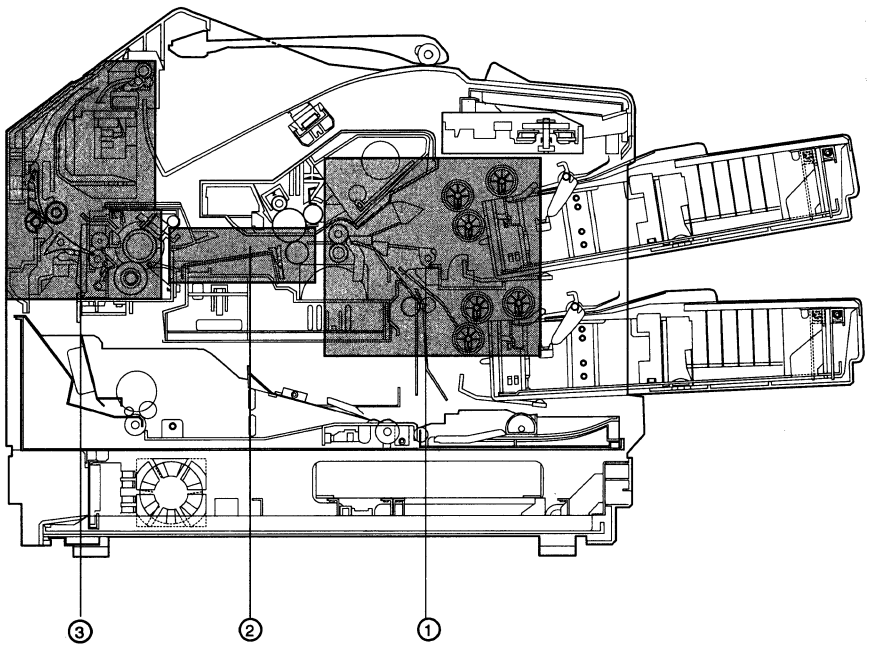
M-14 Job offset malfunction

Possible cause	Step	Check	Result	Measure
Job offset cam	1	Is the job offset cam broken?	YES	Replace the job offset cam.
Job offset clutch	2	Is the job offset clutch broken?	YES	Replace the job offset clutch.
DC driver PCB	3	Check if the voltage between Pins 6 (/JOFFSD) and 10 (GND) of connector J202 on the DC driver PCB changes from about 24VDC to 0V when the job offset is operated during the test printing.	NO	Replace the DC driver PCB.
DC controller PCB			YES	Replace the DC controller PCB.

VI. PAPER TRANSPORT TROUBLESHOOTING

A. Print Paper Jams

Transport of the paper through the printer can be divided into through three major sections: (1) pick-up section, (2) separation and feed section, and (3) fixing and delivery section. This section explains the troubleshooting procedures for jams occurring in each of these sections as well as for imperfect paper transport.



1: pick-up section
2: Fixing and deliverly section
3: Separation and feed section

Figure 6-10

T-1 Pick-up section

Possible cause	Step	Check	Result	Measure
Print paper	1	Is paper being recommended by Canon being used?	NO	Advise the customer to use the recommended paper.
	2	Is the paper curled or wrinkled?	YES	Change the paper and advise the customer on proper paper storage.
Cassette	3	Is the cassette overloaded?	YES	Advise the customer not to load too much paper in the cassette.
Pick-up rollers	4	Are any pick-up rollers deformed or worn?	YES	Replace the pertinent pick-up roller(s).
		Do the pick-up rollers rotate in the printing?	NO	Check as "M-5 No pick-up from upper (lower) cassette".
Registration rollers	5	Are the registration rollers dirty or worn?	YES	If worn , replace them. If dirty, clean the metallic areas with methyl ethyl ketone and clean the rubber areas with ethyl or isopropyl alcohol.
Registration roller clutch	6	About 3 seconds after the test print button is pressed, measure the voltage between pins 2 (/REGD) and 1 (GND) of J1007 on the DC controller board. Is the voltage changed from about +24VDC to OV?	YES	Replace the registration roller clutch.
DC controller PCB			NO	Replace the DC controller PCB.

T-2 Separation and feed section

Possible cause	Step	Check	Result	Measure
Static charge eliminator bias	1	Clean the contacts between the high-voltage connector and the static charge eliminator, and make several test prints. Does a jam not occur?	YES	Ensure that the high-voltage connector is in good contact with the static charge eliminator.
High-voltage power supply unit			YES	Replace the high-voltage power supply unit.

T-3 Fixing and delivery section

Possible cause	Step	Check	Result	Measure
Fixing unit entrance guide and fixing unit entrance roller	1	Are the fixing unit entrance guide and fixing unit entrance roller to the fixing unit dirty?	YES	Clean it with damp cloth.
Separation claws in the fixing unit	2	Are the claws worn or damaged?	YES	Replace the claws.
Fixing rollers	3	Is the upper or lower fixing roller dirty or worn?	YES	Replace the fixing unit.
Fixing unit delivery paper sensor arm	4	Does the sensor arm move not smoothly?	YES	Repair the arm to permit smooth movement.
Delivery selector (for face-up tray delivery)			NO	Check the operation of the deflector and clean it.
Face-down delivery rollers (face-up delivery rollers: for face-down tray delivery)			NO	Check the operation of the face-down delivery rollers and clean it (face-up delivery rollers: for face-up tray delivery).

B. Imperfect Paper Transport

T-1 Multiple feed

Possible cause	Step	Check	Result	Measure
Print paper	1	Is paper recommended by Canon being used?	YES	Advise the customer to use Canon-recommended paper.
Separation roller	2	Is the separation roller deformed or worm?	YES	Replace the separation roller.
Cassette	3	Is the paper catching properly on the cassette hooks?	YES	Check if the cassette hooks are deformed. If so, replace the cassette.
			NO	Set the paper properly.

T-2 Wrinkles in paper

Possible cause	Step	Check	Result	Measure
Print paper	1	Is paper recommended by Canon being used?	NO	Advise the customer to use Canon-recommended paper.
	2	Does wrinkling stop when fresh paper is used?	YES	Advise the customer on proper storage to prevent damp paper.
Pick-up unit	3	Open the printer to observe the paper passing through the feed guide at time, does it become wrinkled or move at an angle?	YES	Check the operation of the pick-up unit and registration rollers.
Fixing unit entrance guide	4	Are the fixing unit entrance guide and fixing unit entrance roller dirty?	YES	Clean it with damp cloth.
Fixing unit			NO	Replace the fixing unit.

VII. ASSEMBLY LOCATION DIAGRAM (1/2)

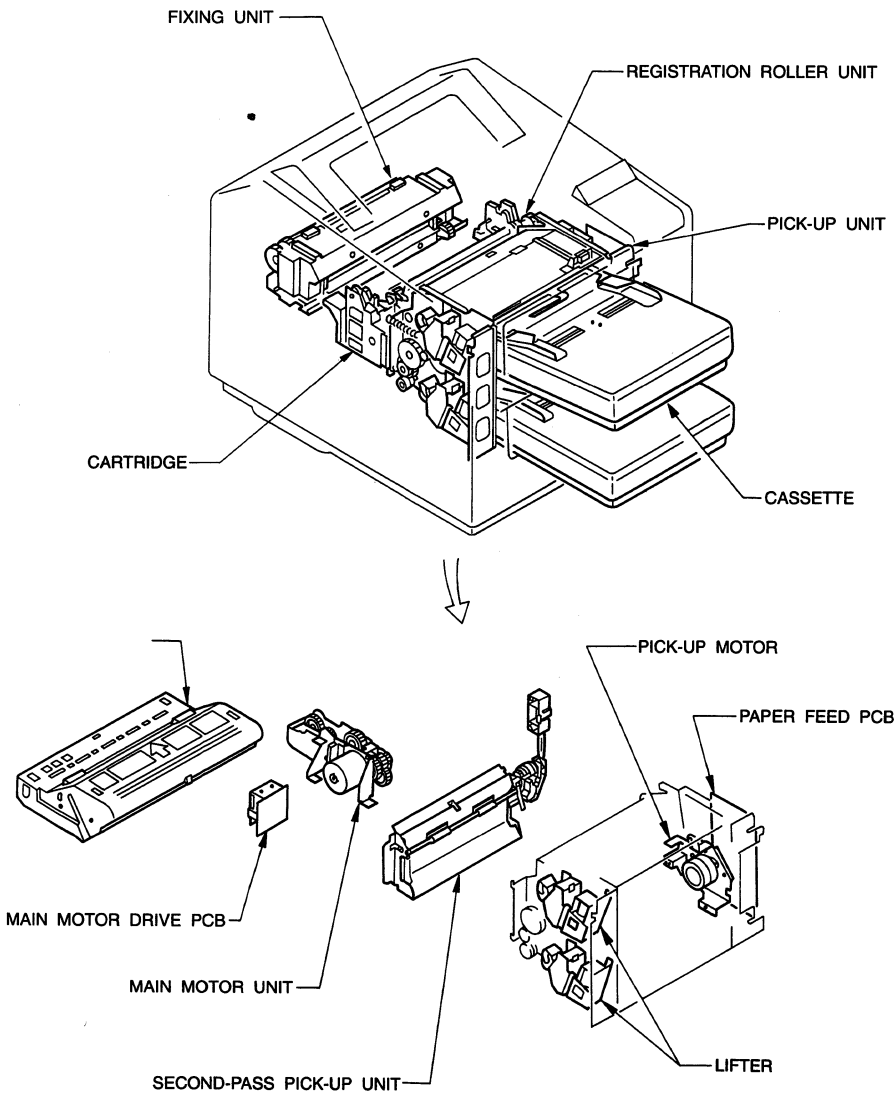


Figure 6-11

ASSEMBLY LOCATION DIAGRAM (2/2)

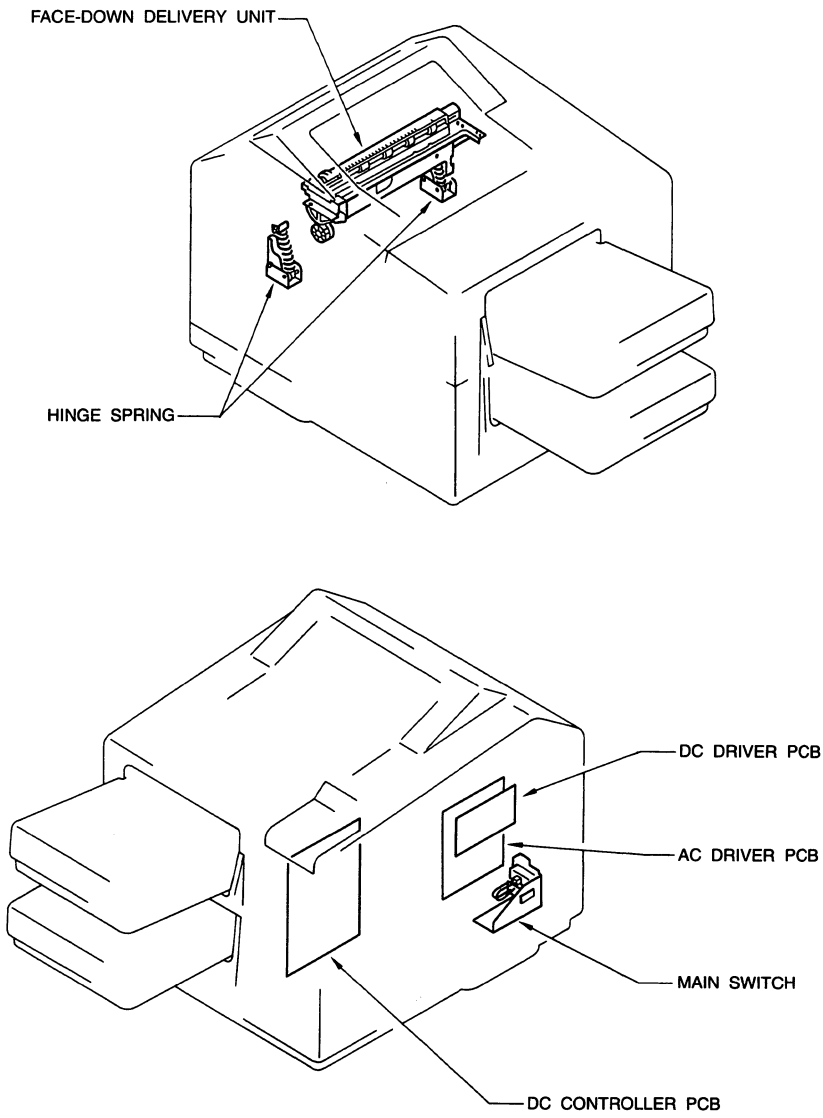


Figure 6-12

VIII. LOCATION OF ELECTRICAL PARTS/FUNCTION (1/2)

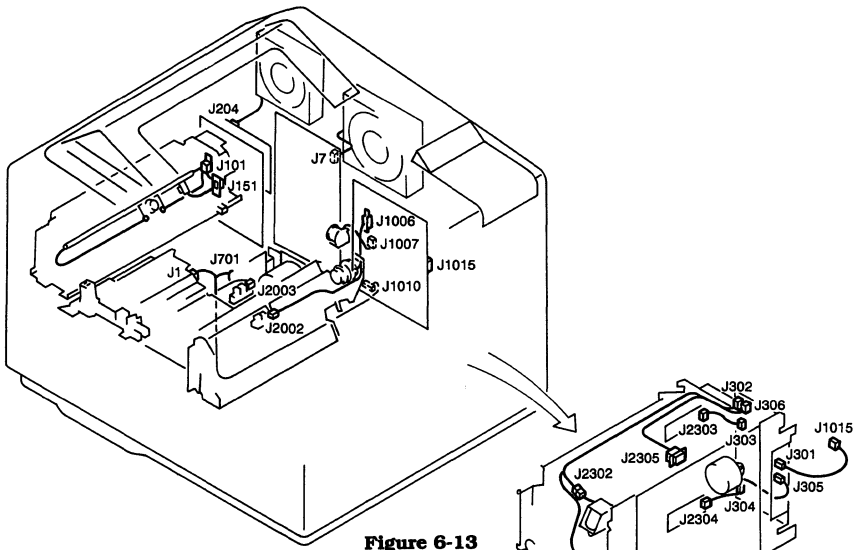


Figure 6-13

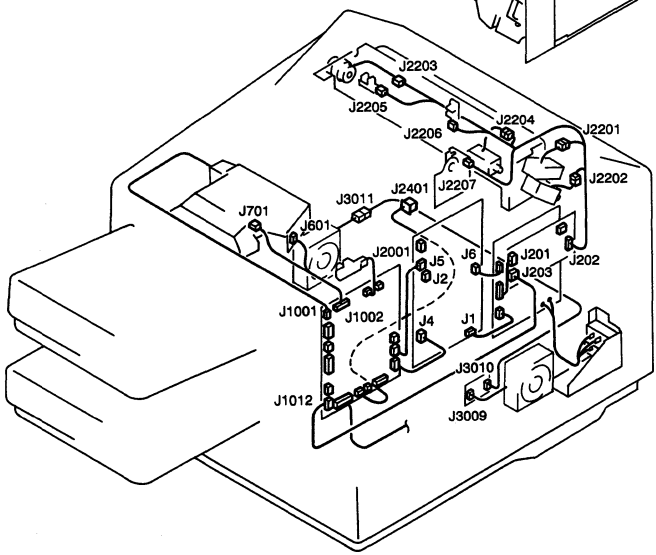


Figure 6-14

LOCATION OF ELECTRICAL PARTS/FUNCTION (2/2)

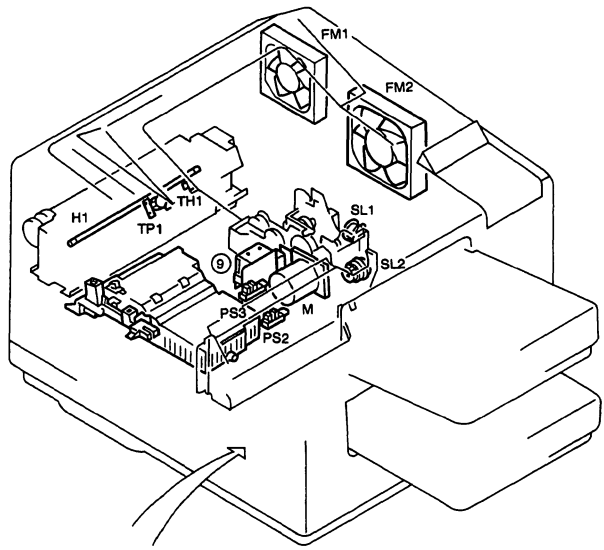


Figure 6-15

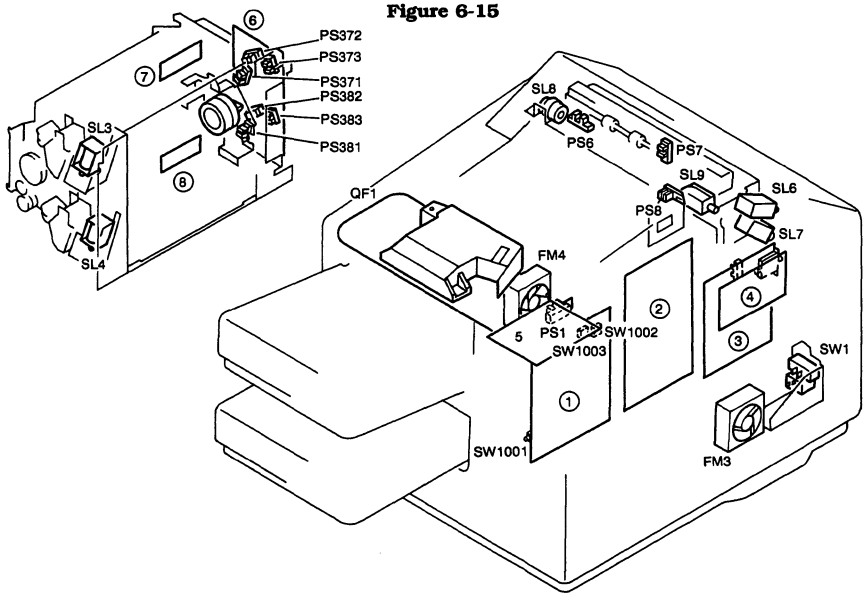


Figure 6-16

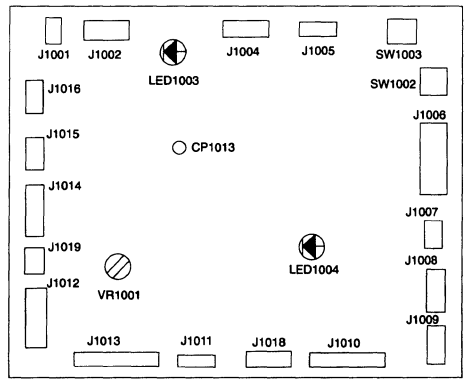
Symbol	Name	Function
①	DC controller PCB	Controlling printing operations, video interface
②	Low-voltage power supply unit	Supplying DC voltage
③	AC driver PCB	Fixing roller heater driver
④	DC driver PCB	Delivery unit driver
⑤	Control panel	Operation panel
⑤	Paper feed PCB	Pick-up unit driver
⑥	Cassette sensing PCB	Sensing cassette size (Upper)
⑦	Cassette sensing PCB	Sensing cassette size (Lower)
M	Main motor	Drive motor for drum, fixing unit, feed unit
PM1	Paper pick-up motor	Drive motor for pick-up unit
FM1	Fan motor 1	Exhaust fan for space of fixing unit
FM2	Fan motor 2	Exhaust fan for space of printer
FM3	Fan motor 3, 4	Inhalant fan for space of video controller PCB
H1	Heater	Heating fixing roller
TH1	Thermistor	Sensing fixing roller surface temperature
TP1	Thermo-switch	Fixing upper roller abnormal temperature rise detection
PS1	Photointerrupter 1	Sensing door open
PS2	Photointerrupter 2	Sensing paper in refeeder
PS3	Photointerrupter 3	Sensing paper in paper feed
PS6	Photointerrupter 6	Sensing job-offset home position
PS7	Photointerrupter 7	Sensing paper in face-down delivery roller
PS8	Photointerrupter 8	Sensing full paper in face-down tray
SL1	Solenoid 1	Operating registration roller
SL2	Solenoid 2	Operating refeed roller
SL3	Solenoid 3	Operating lifter solenoid (upper)
SL4	Solenoid 4	Operating lifter solenoid (lower)
SL6	Solenoid 6	Operating duplex deflector
SL7	Solenoid 7	Operating face-up/down selector
SL8	Solenoid 8	Operating job-offset deflector
SL9	Solenoid 9	Operating job-offset reset solenoid
CL1	Clutch 1	Operating job-offset clutch
QF1	Optical fiber	Optical fiber
SW1	Switch	Power switch
SW002	Switch	Sensing drum sensitivity
SW003	Switch	Sensing drum sensitivity
SW101	Switch	Cutting off AC power to fixing unit

IX. VARIABLE RESISTORS, LEDS, TEST PINS, JUMPERS, AND SWITCHES ON PCB BOARDS

Variable resistors, LED indicators, test pins, jumpers, and switches required in after-sales service are indicated in the following figures.
Any such board elements which are not shown in the figures are for factory use only. They must be set with high precision using special tools and measuring instruments. During after-sales servicing, therefore, do not touch them.

Notes: 1. Some of the LED indicators receive leakage current during normal operation, causing a dim glow even when they should be OFF.
2. Potentiometers which may be adjusted in after-sales service are indicated as: ⊘
Potentiometers which must not be adjusted in after-sales service are indicated as: ⊘

A. DC Controller PCB

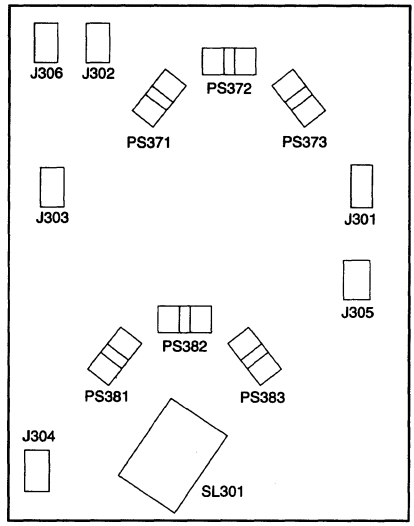


VR NO.	FUNCTION
VR1001	For factory use

LED NO.	FUNCTION
LED1003	Lights when rotation of the scanner motor reaches the specified speed.
LED1004	Lights when rotation of the main motor reaches the specified speed.

CP No.	FUNCTION
CP1013	For factory use

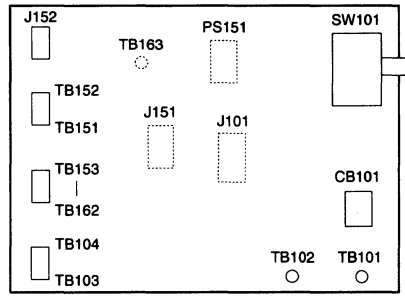
B. Paper Feed PCB



PS NO.	FUNCTION
PS371	Detects the position of the upper lifter, position.
PS372	Detects paper pick-up from the upper manual feed slot.
PS373	Detects the presence/absence of paper in the upper cassette.
PS381	Detects the position of the lower lifter, position.
PS382	Detects paper pick-up from the lower manual feed slot.
PS383	Detects the presence/absence of paper in the lower cassette.

PS NO.	FUNCTION
SL301	Setting the pick-up roller.

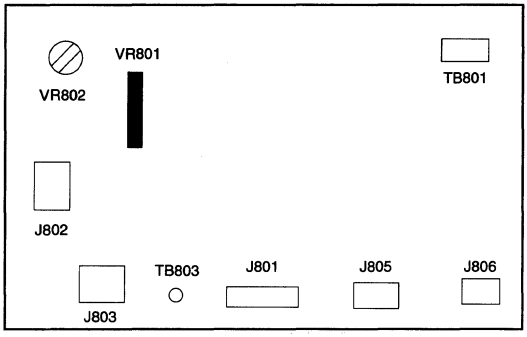
C. AC Driver PCB



PS NO.	FUNCTION
PS151	Detects the fixing unit delivery of paper.

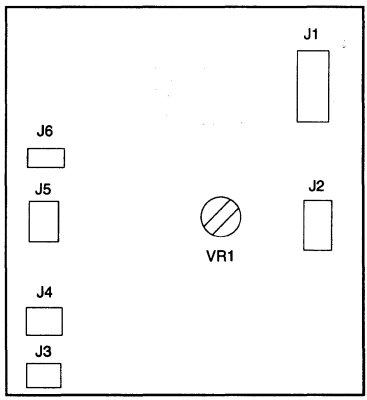
SW NO.	FUNCTION
SW101	This switch goes OFF when the upper cover is opened.

D. High-Voltage Power Supply Sub PCB



VR NO.	FUNCTION
VR801	Used to adjust the print density.
VR802	For factory use.

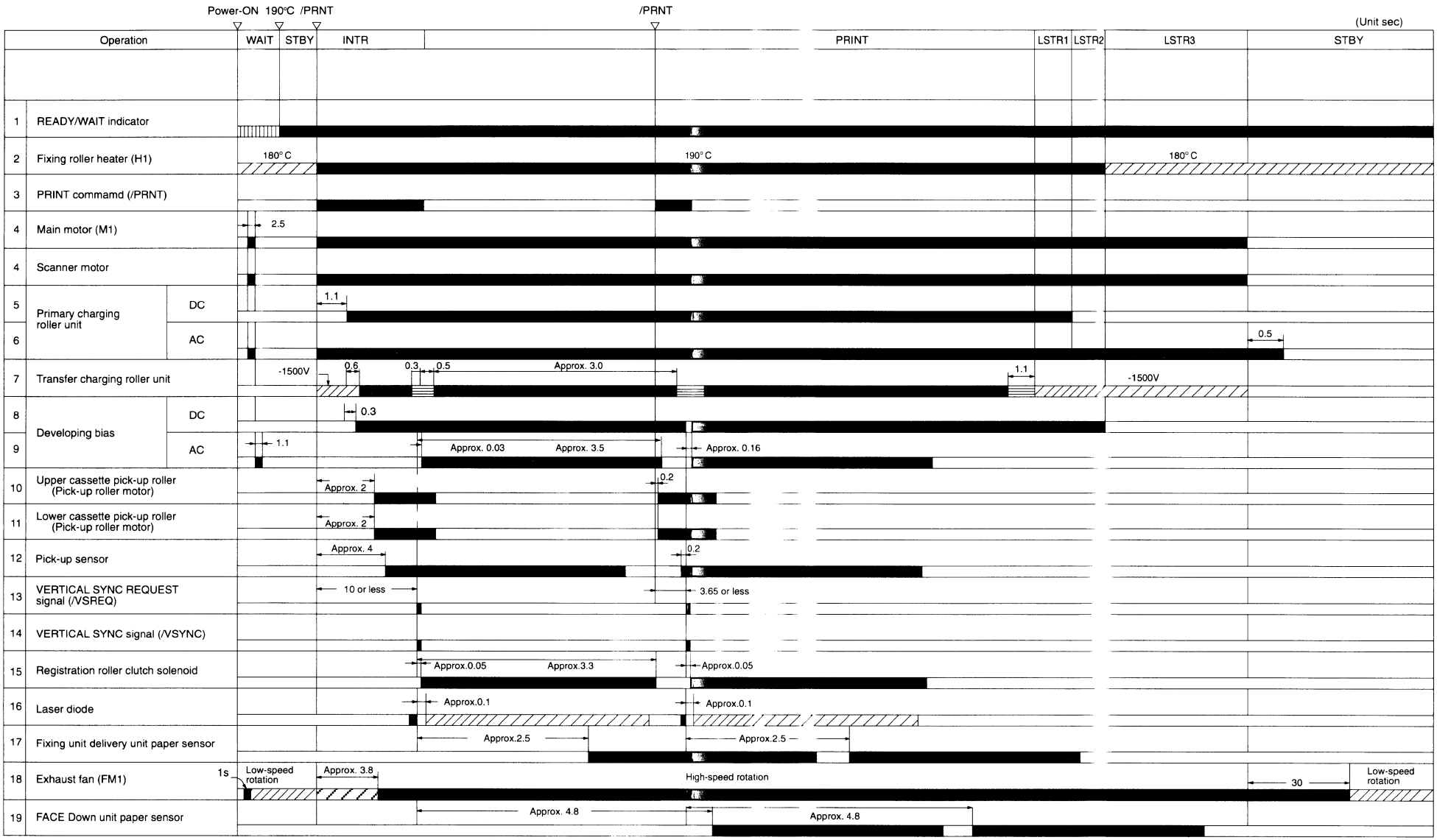
E. High-Voltage Power Supply PCB



VR NO.	FUNCTION
VR1	For factory use.

APPENDIX

● Timing chart for two consecutive single-side prints on A4 paper



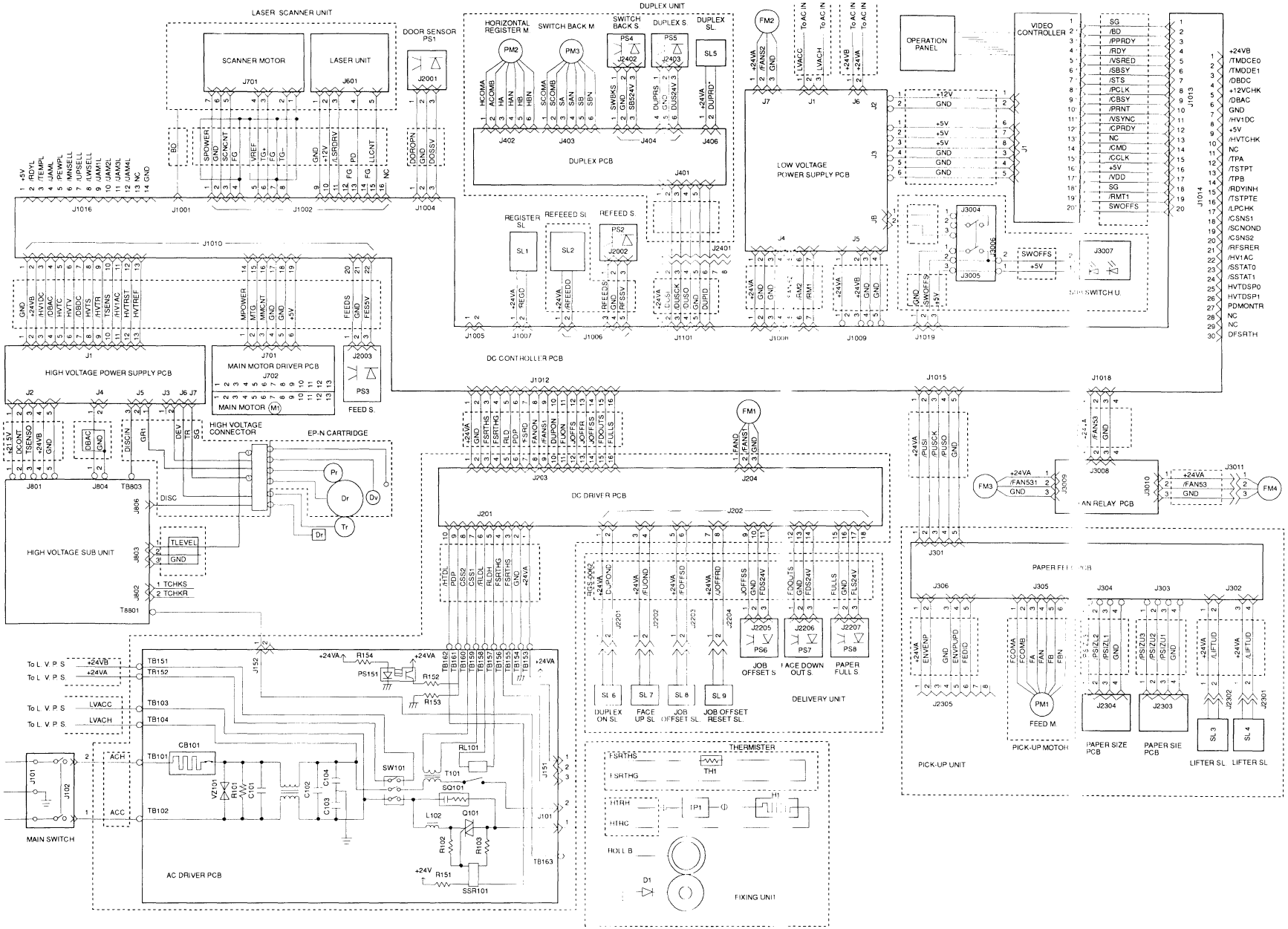
II. LIST OF SIGNALS/COMMANDS

A. DC Controller PCB

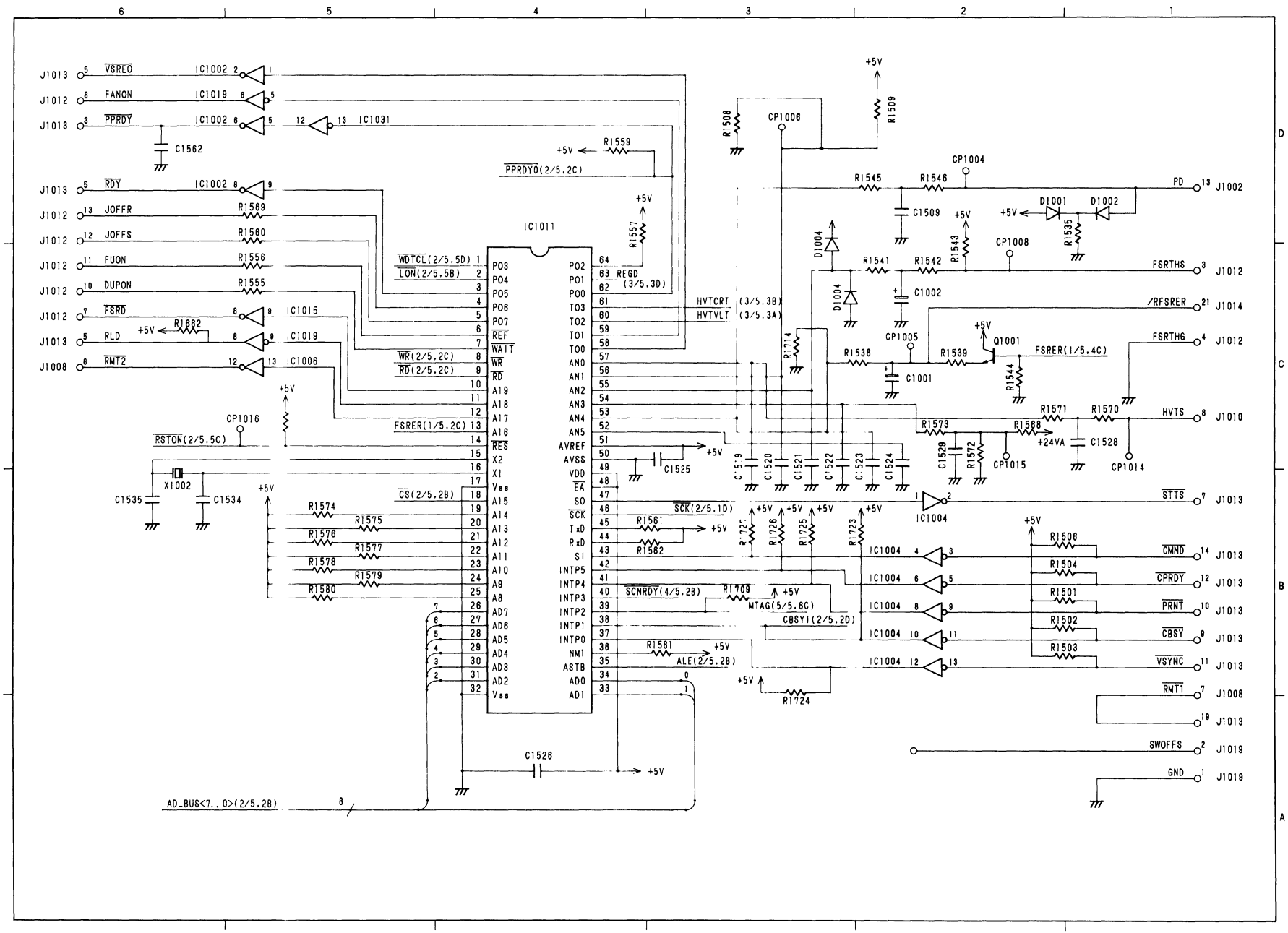
Abbreviation	Name	Function
/BD	BEAM DETECTION signal (horizontal sync pulse)	Signal used for identifying left margin of print paper.
/CBSY	COMMAND BUSY signal	Identifies that the Video controller PCB is sending a command to the DC controller.
/CCLK	CONTROLLER CLOCK signal	Sync pulse for commands sent from the Video controller PCB to the DC controller.
/CMD	COMMAND signal	Printer control command sent from the Video controller PCB to the DC controller.
/CPRDY	CONTROLLER POWER READY signal	Indicates that power for the Video controller circuits is ON.
/CSNS1 /CSNS2	DRUM SENSITIVITY IDENTIFICATION signals	Indicate the sensitivity of the photosensitive drum.
/DBAC	DEVELOPING BIAS (AC) DRIVE signal	Causes bias voltage to be applied to developing cylinder.
/DBDC	DEVELOPING BIAS (DC) DRIVE signal	
DOROPN	DOOR OPEN SENSOR signal	Senses if printer is open.
DUPON	DUPLEXING SELECTRO SOLENOID DRIVE signal	Causes the duplexing selector solenoid to operate.
FANON	FAN DRIVE signal	Causes the fixing unit ventilation fan to operate.
/FSRD	FIXING ROLLER HEATER DRIVE signal	Causes the fixing roller heater to operate.
FSRTHS	FIXING ROLLER TEMPERATURE signal (analog)	Indicates the fixing roller temperature.
FUON	FACE-UP SOLENOID DRIVE signal	Causes the face-up solenoid to operate.
/HV1AC	PRIMARY HIGH-VOLTAGE (AC) ON signal	Causes the primary high-voltage (AC) to operate.
/HV1DC	PRIMARY HIGH-VOLTAGE (DC) ON signal	Causes the primary high-voltage (DC) to operate.
HVTC	TRANSFER HIGH-VOLTAGE CURRENT control signal	Causes the transfer high-voltage current to control.
/HVTR	TRANSFER NEGATIVE BIAS ON signal	Causes the transfer negative bias to operate.
HVTRST	TRANSFER HIGH-VOLTAGE RESET signal	Prevents the transfer high-voltage outputs.
HVTS	TRANSFER HIGH-VOLTAGE SENSING signal	Senses the transfer high-voltage outputs.
HVTV	TRANSFER HIGH-VOLTAGE controll signal	Causes the transfer high-voltage to control.
JOFFR	JOB OFFSET RESET SOLENOID DRIVE signal	Causes the job-offset RST solenoid to operate.
JOFFS	JOB OFFSET CLUTCH DRIVE signal	Causes the job-offset clutch to operate.
/LSRDRV	LASER DRIVE signal	Causes the laser to operate.
MMCNT	MAIN MOTOR DRIVE signal	Causes the main motor to operate.

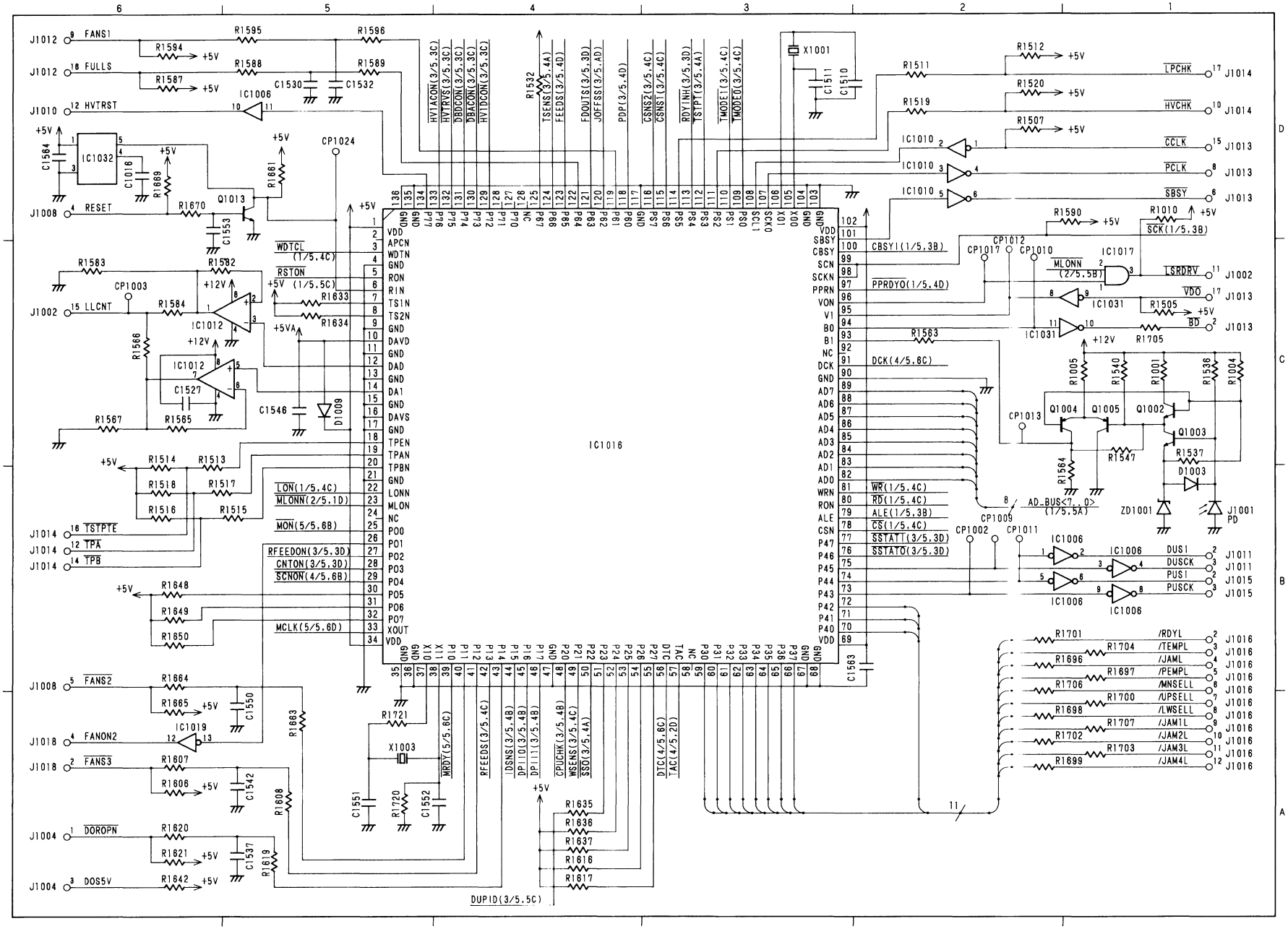
Abbreviation	Name	Function
/PCLK	PRINTER CLOCK signal	Sync pulse for status information signals from the DC controller to the Video controller PCB.
PD	LASER POWER SENSOR signal	Indicates the laser power.
PDP	FIXING UNIT PAPER SENSOR signal	Indicates that paper has emerged from the fixing rollers.
/PPRDY	PRINTER POWER READY signal	Indicates that the printer power is ON.
/PRNT	PRINT signal	Causes the printer to operate.
/RDY	READY signal	Indicates that printing is possible.
/REGD	REGISTRATION ROLLER CLUTCH SOLENOID DRIVE signal	Causes the registration roller clutch solenoid to operate.
RESET	RESET command	RESETS the microprocessors.
/SBSY	STATUS BUSY signal	Indicates that the DC controller is sending status information to the Video controller PCB.
SCNCONT	SCANNER MOTOR DRIVE signal	Causes the scanner motor to operate.
/STS	STATUS signal	Status signal sent from the DC controller to the Video controller PCB.
TSENS	TONER SENSOR signal	Indicates if there is sufficient toner in the EP-N cartridge.
/VDO	VIDEO signal	Print data sent from the interface circuit to the DC controller.
/VSREQ	VERTICAL SYNC REQUEST signal	Requests a VERTICAL SYNC (VSYNC) signal.
/VSYNC	VERTICAL SYNC signal	Determines the top margin on the printed page.

III. GENERAL CIRCUIT DIAGRAM



IV. DC CONTROLLER PCB (1/5)




IC1016
IC1032
IC1012
IC1019
IC1006
IC1010
IC1017
IC1031
X1001
X1003
Q1013
Q1004
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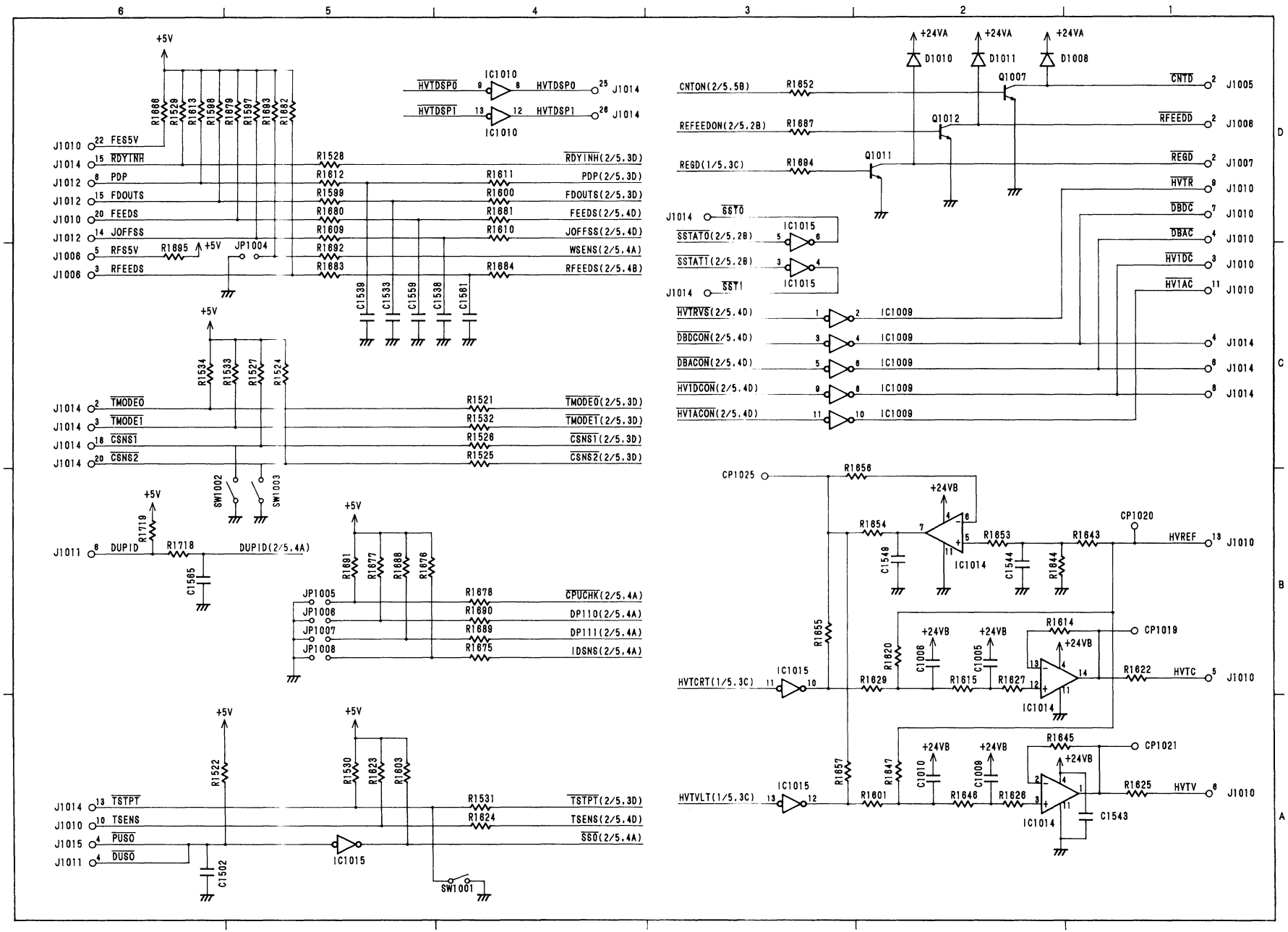
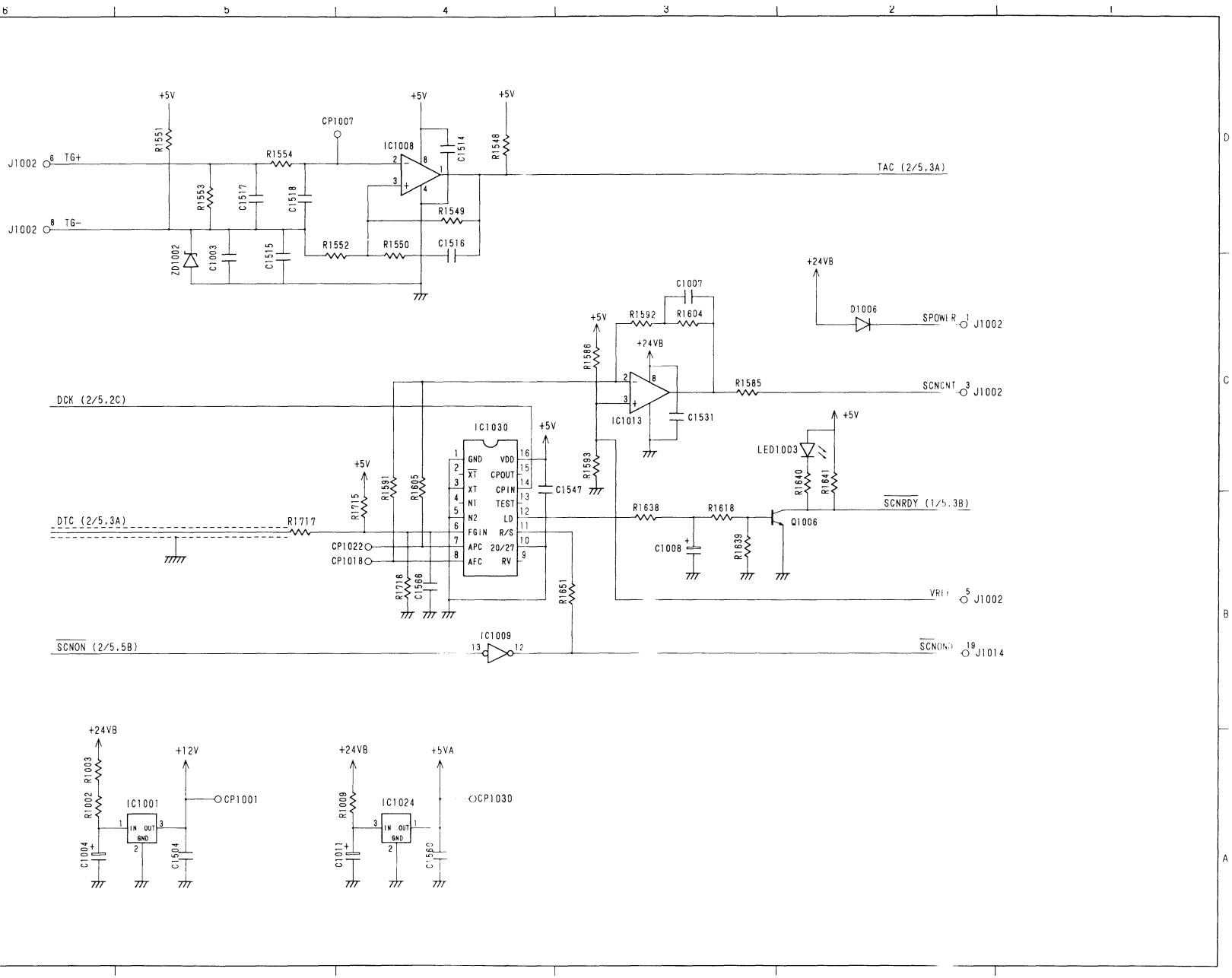
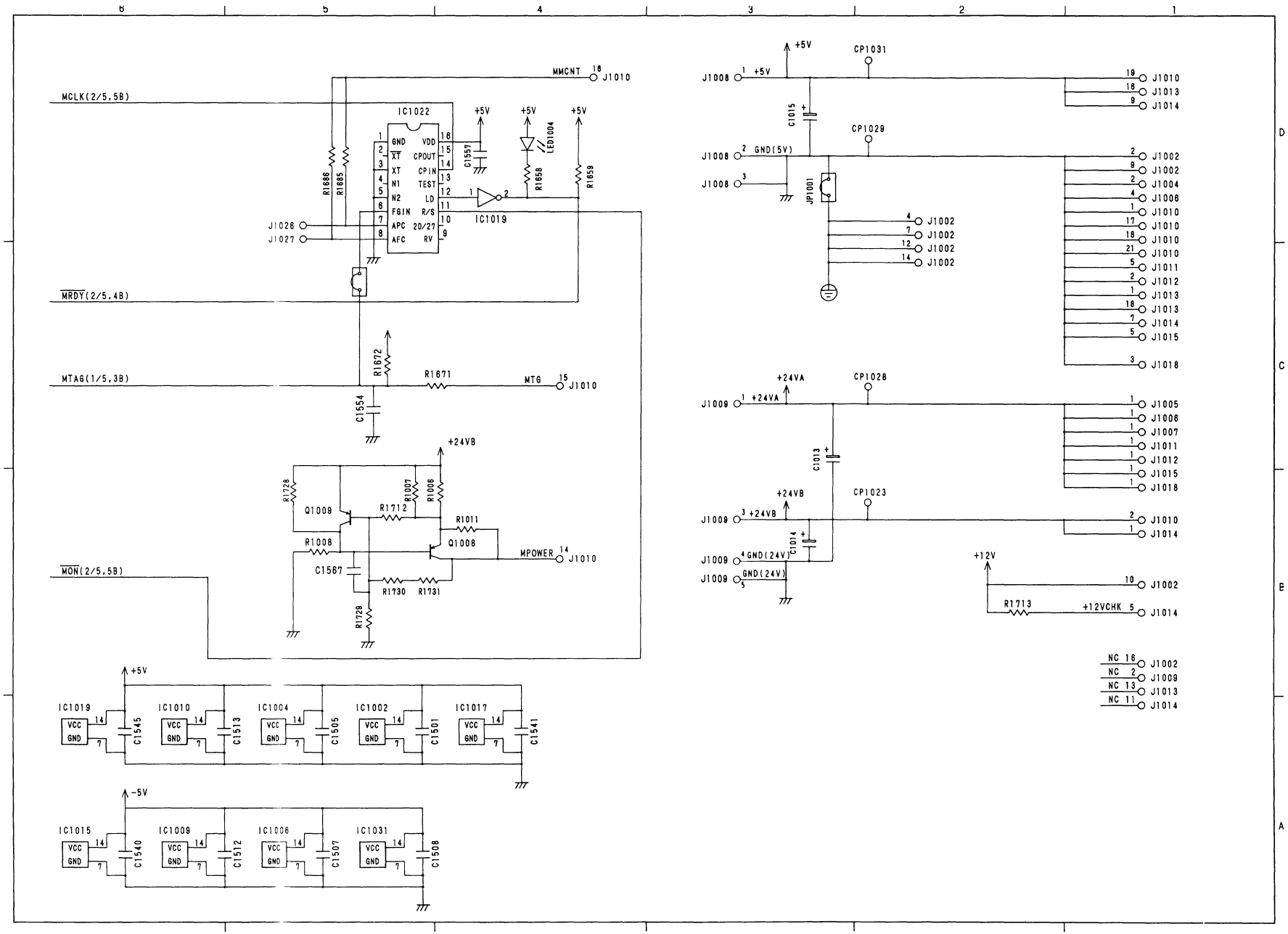
Q1002
Q1003
D1009
D1003
ZD1001
CP1024
CP1003
CP1009
CP1012
CP1017
CP1010
CP1013
CP1002
CP1011
+5V
+12V
+5VA
RESET
WDTCL (1/5.4C)
RSTON
LLCNT
TSTPTE
TPA
TPB
FANS1
FULLS
HVTRST
FANS2
FANON2
FANS3
DOROPN
DOS5V
LON(1/5.4C)
MLONN(2/5.1D)
MON(5/5.6B)
RFEEDON(3/5.3D)
CNTON(3/5.3D)
SCNON(4/5.6B)
MCLK(5/5.6D)
HV1ACON(3/5.3C)
HVTRYS(3/5.3C)
DBDCON(3/5.3C)
DBACON(3/5.3C)
HV1DCON(3/5.3C)
TSENS(3/5.4A)
FEEDS(3/5.4D)
FDOUTS(3/5.3D)
JOFFSS(3/5.AD)
PDP(3/5.4D)
CSNS2(3/5.4C)
CSNS1(3/5.4C)
RDYINH(3/5.3D)
TSTPT(3/5.4A)
TMODE1(3/5.4C)
TMODE0(3/5.4C)
CBSY1(1/5.3B)
PPRDYO(1/5.4D)
DCK(4/5.6C)
WR(1/5.4C)
RD(1/5.4C)
ALE(1/5.3B)
CS(1/5.4C)
SSTAT1(3/5.3D)
SSTAT0(3/5.3D)
AD-BUS<7..0> (1/5.5A)
LPCHK
HVCHK
CCLK
PCLK
SBSY
SCK(1/5.3B)
MLONN (2/5.5B)
LSRDRV
VDO
BD
DUS1
DUSCK
PUS1
PUSCK
/RDYL
/TEMPL
/JAML
/PEMPL
/MNSELL
/UPSELL
/LWSELL
/JAM1L
/JAM2L
/JAM3L
/JAM4L
WRDY(5/5.6C)
RFEEDS(3/5.4C)
DSNS(3/5.4B)
DP110(3/5.4B)
DP111(3/5.4B)
CPUCHK(3/5.4B)
WSENS(3/5.4C)
SSO(3/5.4A)
DTC(4/5.6C)
TAC(4/5.2D)
DUPID(3/5.5C)

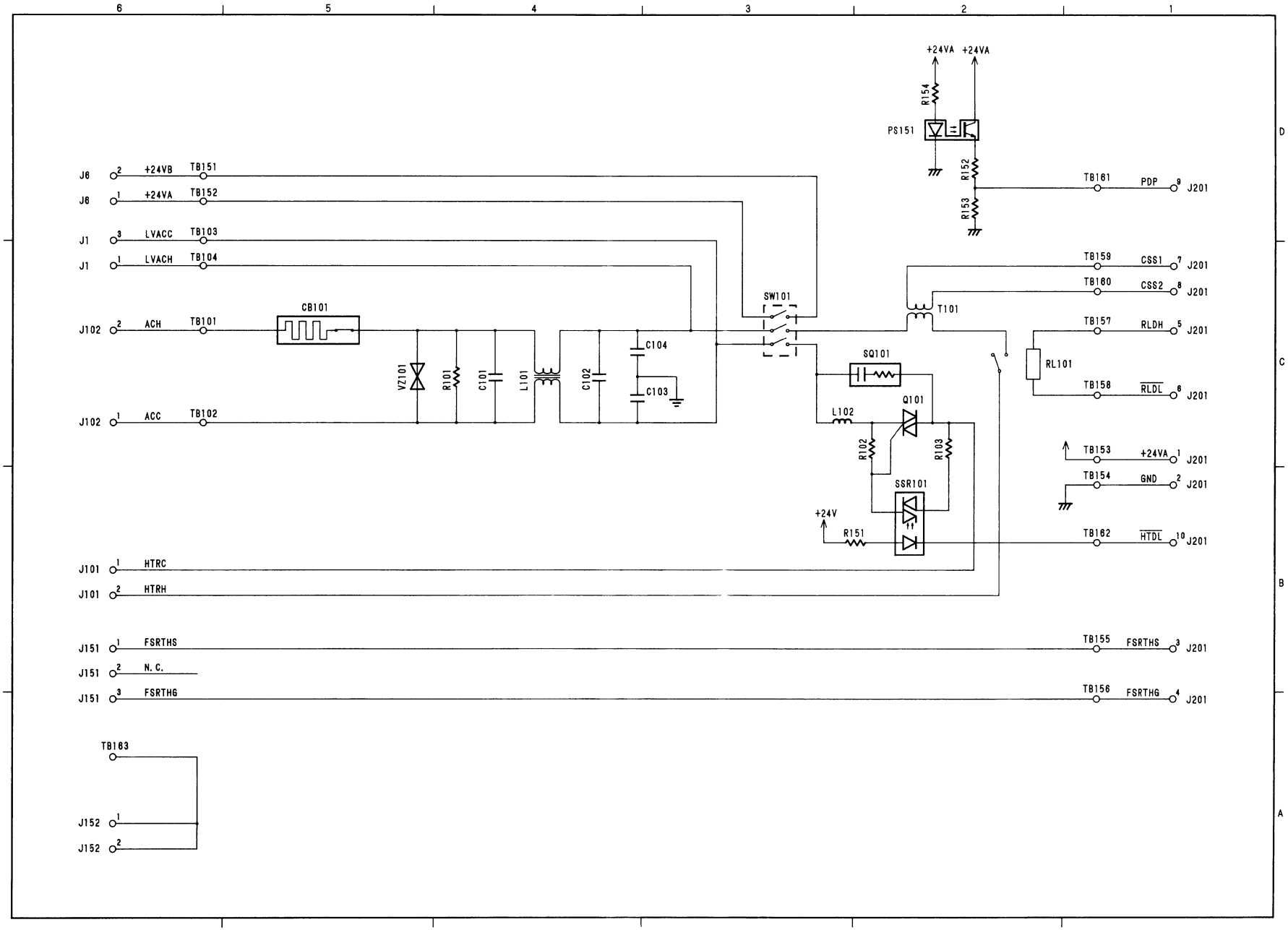
IV. DC CONTROLLER PCB (3/5)

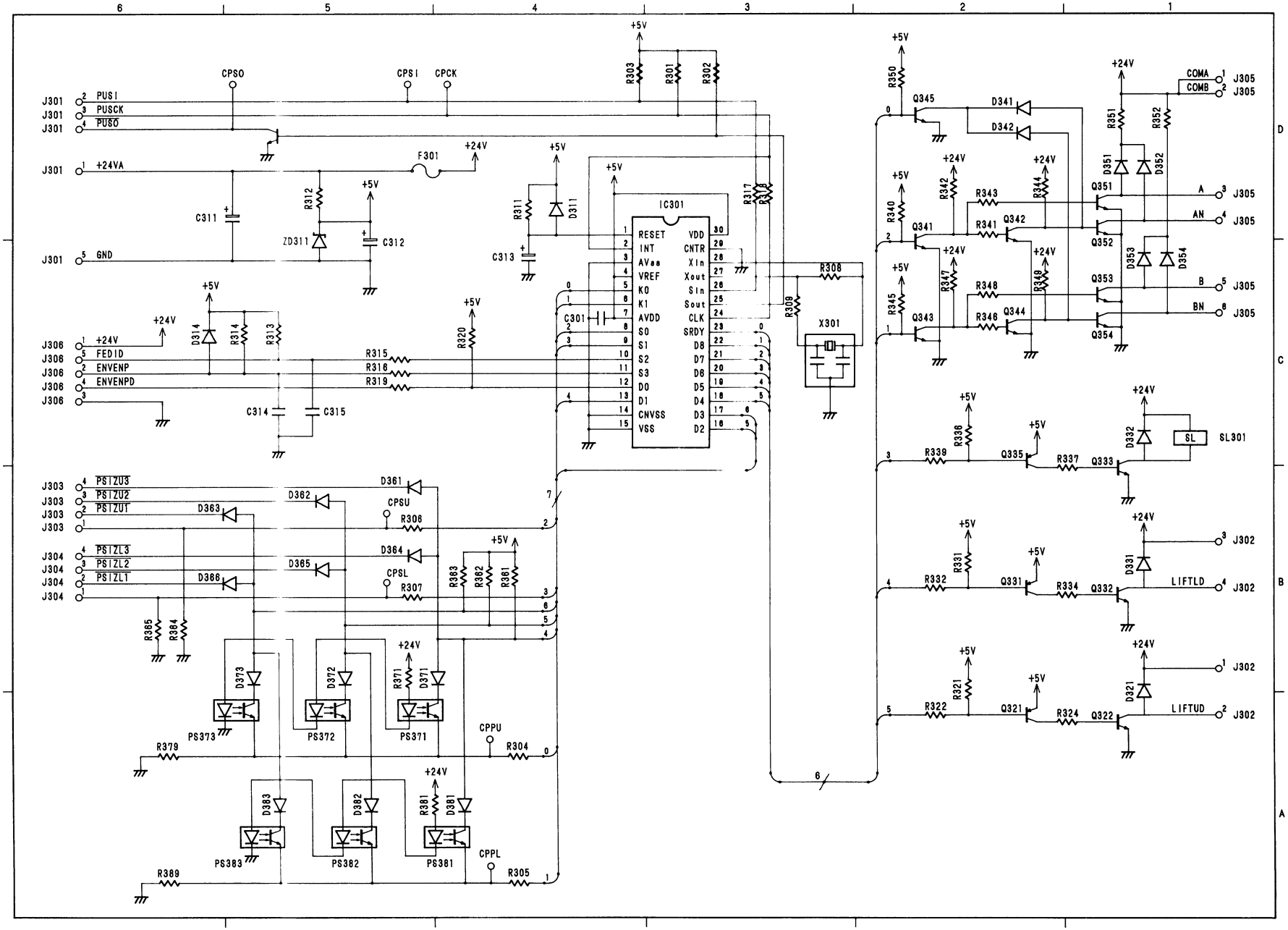


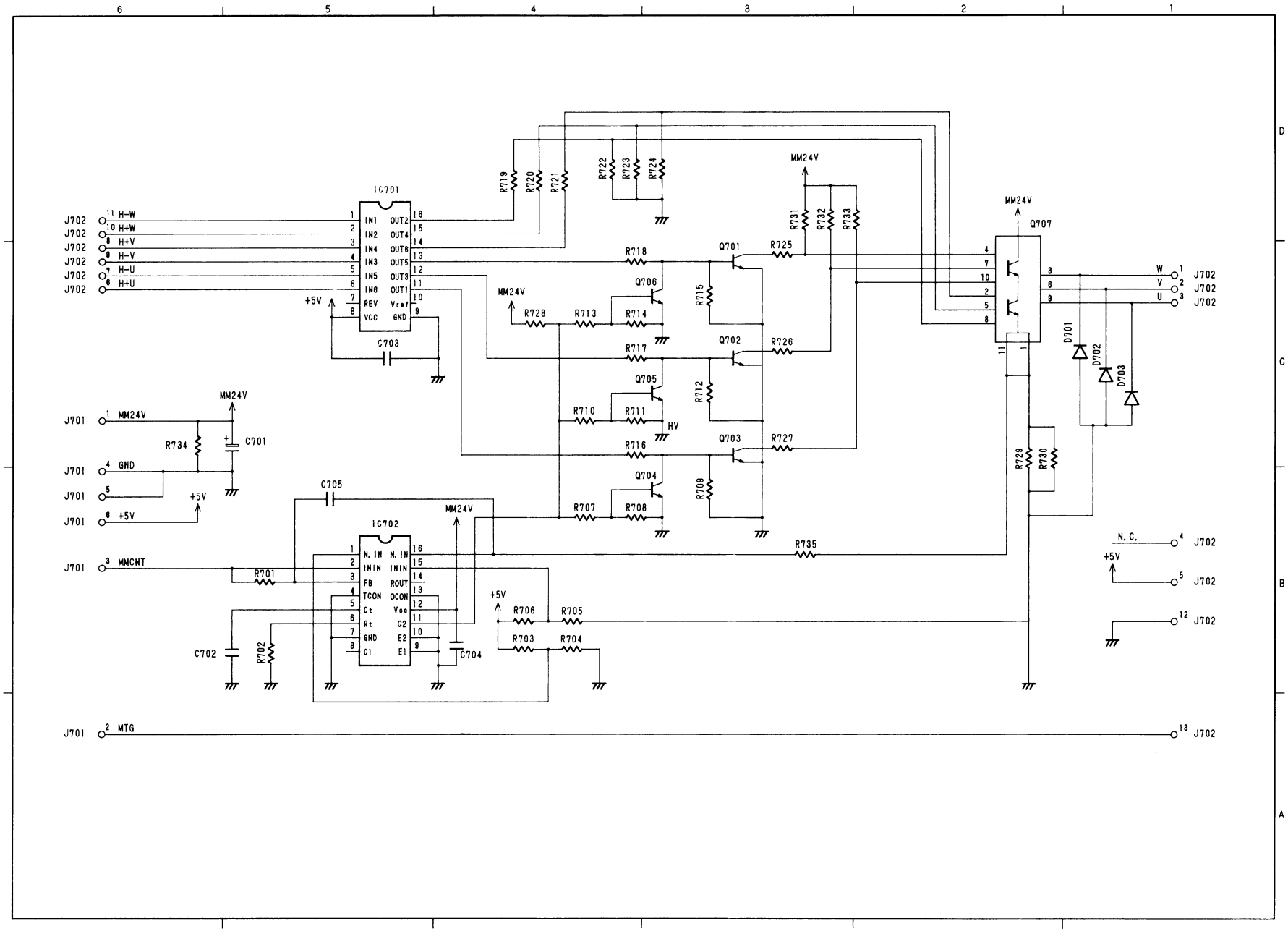

J1002 6 TG+
J1002 8 TG-
+5V
R1551
R1554
CP1007
IC1008
C1514
R1548
TAC (2/5,3A)
R1553
C1517
C1518
R1549
R1552
R1550
C1516
ZD1002
C1003
C1515
+24VB
C1007
R1592
R1604
D1006
SPOWER 1 J1002
R1586
R1585
SCNCNT 3 J1002
IC1013
C1531
DCK (2/5,2C)
IC1030
LED1003
R1640
R1641
SCNRDY (1/5,3B)
R1715
R1591
R1605
C1547
R1593
R1638
R1618
Q1006
DTC (2/5,3A)
R1717
CP1022
CP1018
C1008
R1639
R1716
C1566
R1851
VRE 5 J1002
IC1009
SCNON (2/5,5B)
SCNON 19 J1014
R1003
R1002
IC1001
+12V
CP1001
C1004
C1504
R1009
IC1024
+5VA
CP1030
C1011
C1580

IV. DC CONTROLLER PCB (5/5)

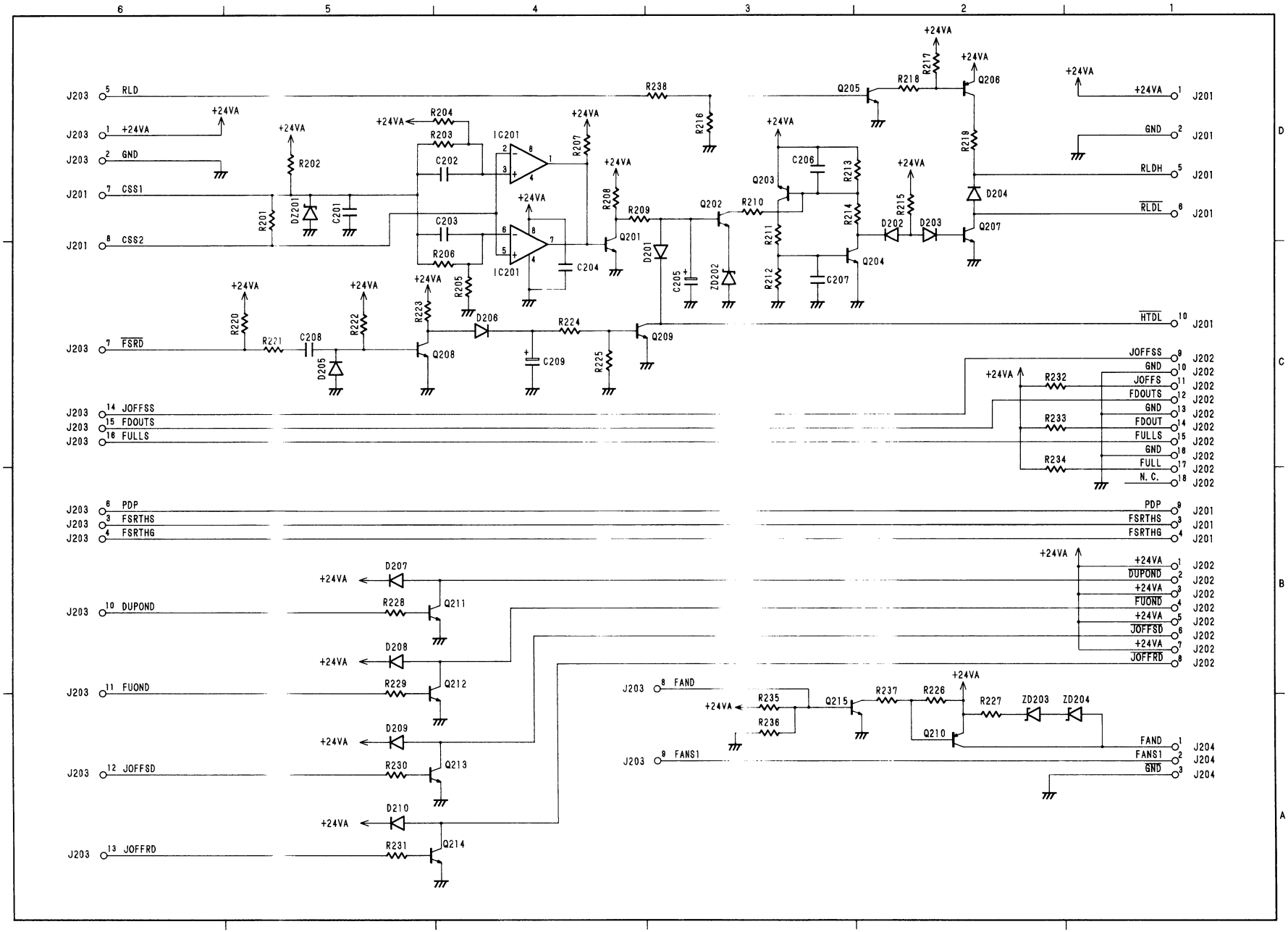



6
5
4
3
2
1
D
C
B
A
+24VA
+24VA
R154
PS151
R152
R153
TB161
PDP
J201
J6
+24VB
TB151
J6
+24VA
TB152
J1
LVACC
TB103
J1
LVACH
TB104
TB159
CSS1
J201
TB160
CSS2
J201
SW101
T101
CB101
J102
ACH
TB101
TB157
RLDH
J201
RL101
TB158
RLDL
J201
VZ101
R101
C101
L101
C102
C104
C103
SQ101
Q101
L102
J102
ACC
TB102
R102
R103
TB153
+24VA
J201
TB154
GND
J201
SSR101
+24V
R151
TB162
HTDL
J201
J101
HTRC
J101
HTRH
J151
FSRTHS
TB155
FSRTHS
J201
J151
N. C.
J151
FSRTHG
TB156
FSRTHG
J201
TB163
J152
J152


6
5
4
3
2
1
D
C
B
A
J301
PUSI
PUSCK
PUSO
+24VA
GND
CPSO
CPSI
CPCK
F301
+24V
+5V
C311
C312
R312
ZD311
R311
D311
C313
IC301
RESET
INT
AVss
VREF
K0
K1
AVDD
S0
S1
S2
S3
D0
D1
CNVSS
VSS
VDD
CNTR
Xin
Xout
Sin
Sout
CLK
SRDY
D8
D7
D6
D5
D4
D3
D2
C301
R308
R309
X301
R303
R301
R302
R317
R318
J306
FED1D
ENVENP
ENVENPD
D314
R314
R313
R315
R316
R319
R320
C314
C315
J303
PSIZU3
PSIZU2
PSIZU1
J304
PSIZL3
PSIZL2
PSIZL1
D361
D362
D363
D364
D365
D366
CPSU
CPSL
R306
R307
R383
R362
R361
R365
R364
D373
D372
D371
R371
PS373
PS372
PS371
CPPU
R304
R379
D383
D382
D381
R381
PS383
PS382
PS381
CPPL
R305
R389
R350
Q345
D341
D342
R351
R352
D351
D352
COMA
COMB
J305
A
AN
B
BN
R340
Q341
R342
R343
R344
Q342
Q351
Q352
D353
D354
R345
Q343
R347
R348
R349
R346
Q344
Q353
Q354
R338
Q335
R339
R337
Q333
D332
SL
SL301
R331
Q331
R332
R334
Q332
D331
J302
LIFTLD
R321
Q321
R322
R324
Q322
D321
LIFTUD


IC701
IC702
Q701
Q702
Q703
Q704
Q705
Q706
Q707
J702 11 H-W
J702 10 H+W
J702 8 H+V
J702 9 H-V
J702 7 H-U
J702 6 H+U
J701 1 MM24V
J701 4 GND
J701 5
J701 6 +5V
J701 3 MMCNT
J701 2 MTG
J702 W 1
J702 V 2
J702 U 3
J702 N. C. 4
J702 +5V 5
J702 12
J702 13
MM24V
+5V
HV
R701
R702
R703
R704
R705
R706
R707
R708
R709
R710
R711
R712
R713
R714
R715
R716
R717
R718
R719
R720
R721
R722
R723
R724
R725
R726
R727
R728
R729
R730
R731
R732
R733
R734
R735
C701
C702
C703
C704
C705
D701
D702
D703

VIII. DC DRIVER PCB



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