LASER PRINTER

SERVICE MANUAL

MECHANICS & ELECTRONICS

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PREFACE

This service manual contains basic information required for after-sales service of the laser printer (hereinafter referred to as "this machine" or " the printer"). This information is vital to the service technician in maintaining the high printing quality and performance of the printer.

This manual consists of the following chapters:

ChapterI	:	General Features, specifications, etc.
ChapterII	:	Theory of Operation Basic operation of the mechanical system and the electrical system, and their timing.
ChapterIII	:	Electrical System Theory of the electronics circuit
ChapterIV	:	Mechanical System Requirements for a suitable location, disassembling and reassembling procedure of mechanical system.
ChapterV	:	Maintenance and Servicing Parts replacement schedule, list of tools, lubricants and cleaners.
ChapterVI	:	Troubleshooting Reference values and adjustment, troubleshooting for image defects, troubleshooting for malfunctions, etc.
Appendices	:	Engine Block Diagram, PCB Circuitry Diagrams, etc.

Information in this manual is subject to change due to improvement or re-design of the product. All relevant information in such cases will be supplied in service information bulletins (Technical Information).

A thorough understanding of this printer, based on information in this service manual and service information bulletins, is required for maintaining its quality performance and for fostering the practical ability to find the cause of troubles.

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CHAPTER I GENERAL

1. FEATURES

A. This high-speed, non-impact (low-noise) printer is based on electrophotography, electronics and laser technology.

B. The printer is compact and easy to carry. The internally-storable, front-loading paper cassette enables you to save an occupation space for the machine; the printer can now be installed in a smaller place.

C. The charging roller, developing cylinder, photosensitive drum and cleaner of the printer are combined into a single assembly called an "EP-ED cartridge". The cartridge can be replaced by the user when necessary without a need of service call. High printing quality is maintained by a simple cleaning procedure.

D. Laser beam safety is designed into the printer. The printer is approved by the US Center for Devices and Radiological Health (CDRH).

E. Paper can be fed in two ways, by the multi-purpose paper feed tray and paper cassette.

F. Maintenance is easy with print component units which are directly detachable, and they require no adjustment after reassembly.

2. SPECIFICATIONS

(1)	Type	Desktop page printer
(2)	Printing method	Electrophotography (single-component dry toner)
(3)	Printing speed	
	Cassette feed	12 pages/minute (A4/Letter size by cassette feed) 10.2 pages/minute (Legal size)
(4)	First print time	Approx. 20 seconds (A4 size by face-down print delivery from the paper cassette)
(5)	Warm-up (WAIT) time	Max. 1 minute at 20°C (68°F)
(6)	Optical system	
	Laser	Semiconductor laser Output power : 5mW max. Wave length : 780 nm
	Scanning system	Rotating six-faced polygon mirror
(7)	Resolution	
	Horizontal	600 dots/inch and high resolution control (HRC)
	Vertical	600 raster lines/inch

(8) Printing system

Photosensitive drum	OPC
Charging	Charging Roller
Exposure	Laser scanning system
Development	Toner projection development system
Paper feed	Cassette or manual feed
Image transfer	Roller method
Separation	Natural(utilizing a small drum radius), Static charge eliminator
Fixing	Heated fixing roller
Toner supply	Included in the replaceable EP-ED cartridge
Life expectancy	6000 pages/cartridge

(9) Paper

Cassette feed	Plain paper for Letter, Legal, A4, ISO B5, A5, ISO B6, A6, Executive (A4 or letter size paper with the print density set at level 8 with 4% coverage, recommended: 60 g/m^2 —105 g/m^2) and Envelope (com10, monarch, C5, DL, ISO B5)
Multi-purpose Tray	Plain paper of 90 x 148 mm — 216 x 356 mm (recommended: 60g/m^2 — 135 g/m^2, overhead projector (OHP) film, postcards, label stock and envelopes (specified sizes)

(10) Cassette (Tray 1)

Universal cassette	A4, Letter, Legal, ISO B5, Executive, A5, ISO B6, and A6
Maximum load height	55 mm (500 sheets of 80 g/m^2 paper)
Feedable paper type	60 — 105 g/m^2
Envelopes	40 envelopes

(11) Print delivery — Face-down or (face-up)

(12) Print delivery tray capacity

Face-down	250 sheets (80 g/m^2)
Face-up	Discharge only

(13) Effective printing area

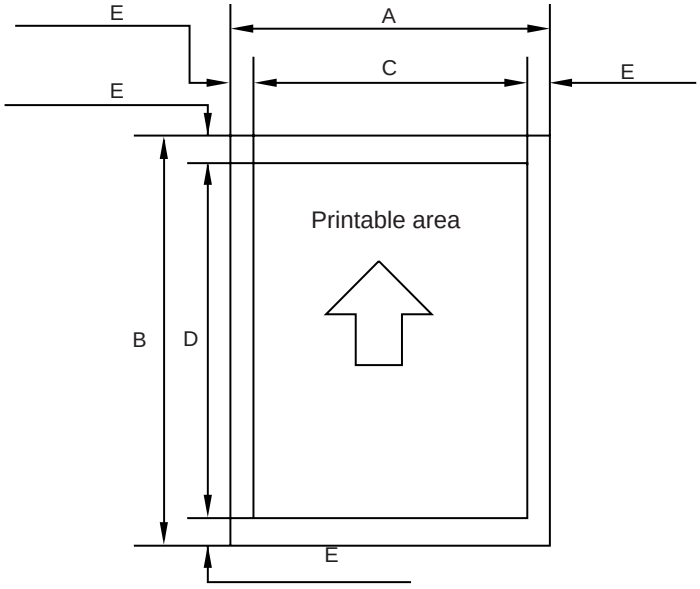


Figure 1.1 Printable Area

Effective printable area is referred to as a area within which is guaranteed the printing of all interface signal data on a hard copy without any omission.

The tables below shows the effective printable area for each paper size.

Table 1.1 Plain Paper

SIZE	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
A 4	210.0	297.0	203.2	288.5	3.39 ± 1.0
Letter	215.9	279.4	207.4	270.9	4.23 ± 1.0
Legal	215.9	355.6	207.4	347.1	4.23 ± 1.0
B 5 (ISO)	176.0	250.0	167.5	241.5	4.23 ± 1.0
Executive	184.2	266.7	175.7	258.2	4.23 ± 1.0
A 5	148.0	210.0	139.5	201.5	4.23 ± 1.0
B 6 (ISO)	125.0	176.0	116.5	167.5	4.23 ± 1.0
A 6	105.0	148.0	96.5	139.5	4.23 ± 1.0

Table 1.2 Envelope

SIZE	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
COM-10	104.8	241.3	96.3	232.8	4.23 ± 1.0
MONARCH	98.4	190.5	89.9	182.0	4.23 ± 1.0
DL	110.1	221.0	101.6	212.5	4.23 ± 1.0
C5	162.2	228.6	154.1	220.1	4.23 ± 1.0
B5 (ISO)	176.0	250.0	167.5	241.5	4.23 ± 1.0

(The sizes above are nominal sizes according to ISO.)

An A4 sheet accepts 80 PICA-pitch characters (203.2mm).

(14) Standard interfaces

Automatic interface selection
- Centronics, Bi-directional parallel
- RS-232C serial

Baud rate : 150, 300,1200, 2400, 4800, 9600 19200, 38400, 57600 bps
Stop bit : 1 bit
Start bit : 1 bit or 2 bits
Data length : 7 bits or 8 bits
Parity : Odd, Even, or None
Protocol : Xon/Xoff or DTR

(15) Emulation

Automatic emulation selection
- HP Laser Jet 5 (PCL Level 6)
- EPSON FX-850
- IBM Proprinter XL
- BR-Script level 2 (PostScript language emulation interpreter)
- HP- GL

(16) CPU

MB86832

(17) Resident fonts

75 scalable fonts and 12 bitmapped fonts

■ HP Laser Jet 5, EPSON FX-850, IBM Proprinter XL

Scalable Fonts:

Intellifont Compatible Fonts:
- Albertville, Extrabold
- Antique Oakland, Oblique, Bold
- Brougham, Oblique, Bold, Bold Oblique
- Cleveland Condensed
- Connecticut
- Guatemala Antique, Italic, Bold, Bold Italic
- Letter Gothic, Oblique, Bold
- Maryland
- Oklahoma, Oblique, Bold, Bold Oblique
- PC Brussels Light, Light Italic, Demi, Demi Italic
- PC Tennessee Roman, Italic, Bold, Bold Italic
- Utah, Oblique, Bold, Bold Oblique
- Utah Condensed, Oblique, Bold, Bold Oblique

Windows 3.1 Compatible Fonts:
- Tennessee Roman, Italic, Bold, Bold Italic
- Helsinki, Oblique, Bold, Bold Oblique
- BR Symbol
- W Dingbats

BR-Script Fonts:
- Atlanta Book, Book Oblique, Demi, Demi Oblique
- Copenhagen Roman, Italic, Bold, Bold Italic
- Portugal Roman, Italic, Bold, Bold Italic
- Calgary Medium Italic

Brother Original Fonts:
- Bermuda Script
- Germany
- San Diego
- US Roman

Bitmapped Fonts (Portrait and Landscape):
- Letter Gothic 16.66 Medium, Italic, Bold, Bold Italic
- OCR-A
- OCR-B

■ BR-Script Level 2 Mode

Scalable Fonts:

- Atlanta Book, Book Oblique, Demi, Demi Oblique
- Brussels Light, Light Italic, Demi, Demi Italic
- Brougham, Oblique, Bold, Bold Oblique
- Helsinki, Oblique, Bold, Bold Oblique
- Helsinki Narrow, Oblique, Bold, Bold Oblique
- Copenhagen Roman, Italic, Bold, Bold Italic
- Portugal Roman, Italic, Bold, Bold Italic
- Tennessee Roman, Italic, Bold, Bold Italic
- Calgary Medium Italic
- BR Symbol
- BR Dingbats
- Albertville, Extrabold
- Antique Oakland, Oblique, Bold
- Cleveland Condensed
- Conecticut
- Guatemala Antique, Italic, Bold, Bold Italic
- Letter Gothic, Oblique, Bold
- Maryland
- Oklahoma, Oblique, Bold, Bold Oblique
- Utah, Oblique, Bold, Bold Oblique
- Utah Condensed, Oblique, Bold, Bold Oblique
- Bermuda Script
- Germany
- San Diego
- US Roman

(18) RAM	8M bytes (expandable to 72M bytes)
(19) Font cartridge/card slots	Two slots One font cartridge slot and one font card slot
(20) Power souse	USA and Canada : AC 110 to 120 V, 60 Hz Europe and Australia : AC 220 to 240 V, 50 Hz
(21) Power consumption	Printing : 500 WH or less Stand-by : 80 WH or less Sleep : 20 WH
(22) Noise	Printing : 49 dB A or less Stand-by : 40 dB A or less
(23) Dimensions (W x H x D)	371.6 x 326.5 x 393 mm (14.6 x12.9 x 15.5 inches)
(24) Weight	Approx. 15 kg (32.6 lbs)
(25) Environmental conditions	
Operating environment	Temperature 10 ~ 32.5°C Relative humidity 20 ~ 80%RH (No condensation allowed) Air pressure 613 ~ 1013 hPa (0 ~ 2,500 m above sea level)
Non-operating environment	Temperature 0 ~ 35°C Relative humidity 10 ~ 80%RH (No condensation allowed)
Storage conditions	
• Printer	Temperature Normal (total storage time x 9/10) 0 ~ 35°C Severe (total storage time x 1/10) High Low 35°C ~ 60°C -20°C ~ 0°C Temperature change (within 3 minutes) High Low 60°C → 15°C -20°C → 25°C

Relative humidity
Normal (total storage time x 9/10)
35 ~ 85%RH
Severe (total storage time x 1/10)

High	Low
85 ~ 95%RH	10 ~ 35%RH

Air pressure 613 ~ 1013 hPa

Total storage time 0.5 years

• EP-ED cartridge

Temperature
Normal (2.45 years max.)
0 ~ 35°C
Severe (0.05 years max.)

High	Low
35°C ~ 40°C	-20°C ~ 0°C

Temperature change (within 3 minutes)

High	Low
40°C → 15°C	-20°C → 25°C

Relative humidity
Normal (2.45 years max.)
35 ~ 85%RH
Severe (0.05 years max.)

High	Low
85 ~ 95%RH	10 ~ 35%RH

Air pressure 613 ~ 1013 hPa

Maximum total storage time: 2.5 years including used time

3. SAFETY INFORMATION

3.1 Laser Safety (110 ~ 120V Model only)

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

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

3.2 CDRH Regulations (110 ~ 120V Model only)

The center for Devices and Radiological Health (CDRH) of the US Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States. The label shown below indicates compliance with the CDRH regulations and must be attached to laser products marketed in the United States.

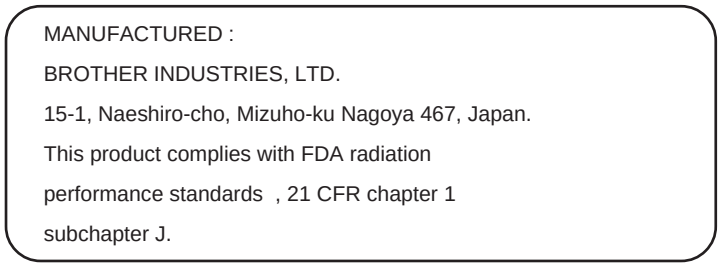


Figure 1.2

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

3.3 Additional Information

When servicing or adjusting 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 any personal accessories such as watches and rings before working on the printer. A reflected beam, though invisible, can permanently damage the eyes.

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

Figure 1.3

4. PARTS OF THE PRINTER

4.1 External Views

① Upper cover
② Control panel
③ MP tray
④ Tray 1
⑤ Tray 2 (Option)
⑥ Font card slot
⑦ Font cartridge slot
⑧ Power switch
⑨ AC inlet
⑩ Face-up print delivery port
⑪ Fan outlet port
⑫ Rating label
⑬ Optional I/O slot
⑭ RS-232C interface connector
⑮ Centronics interface connector
⑯ Optional interface connector

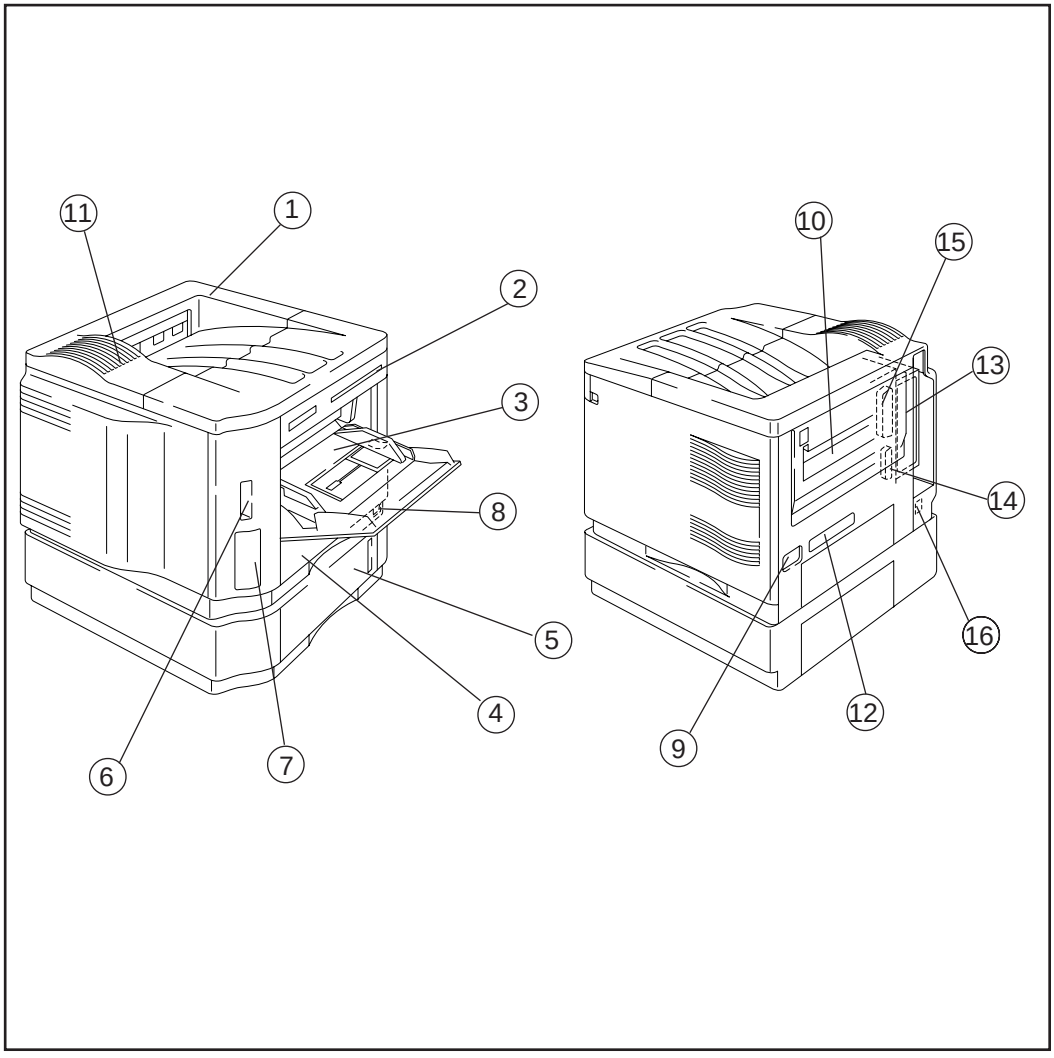
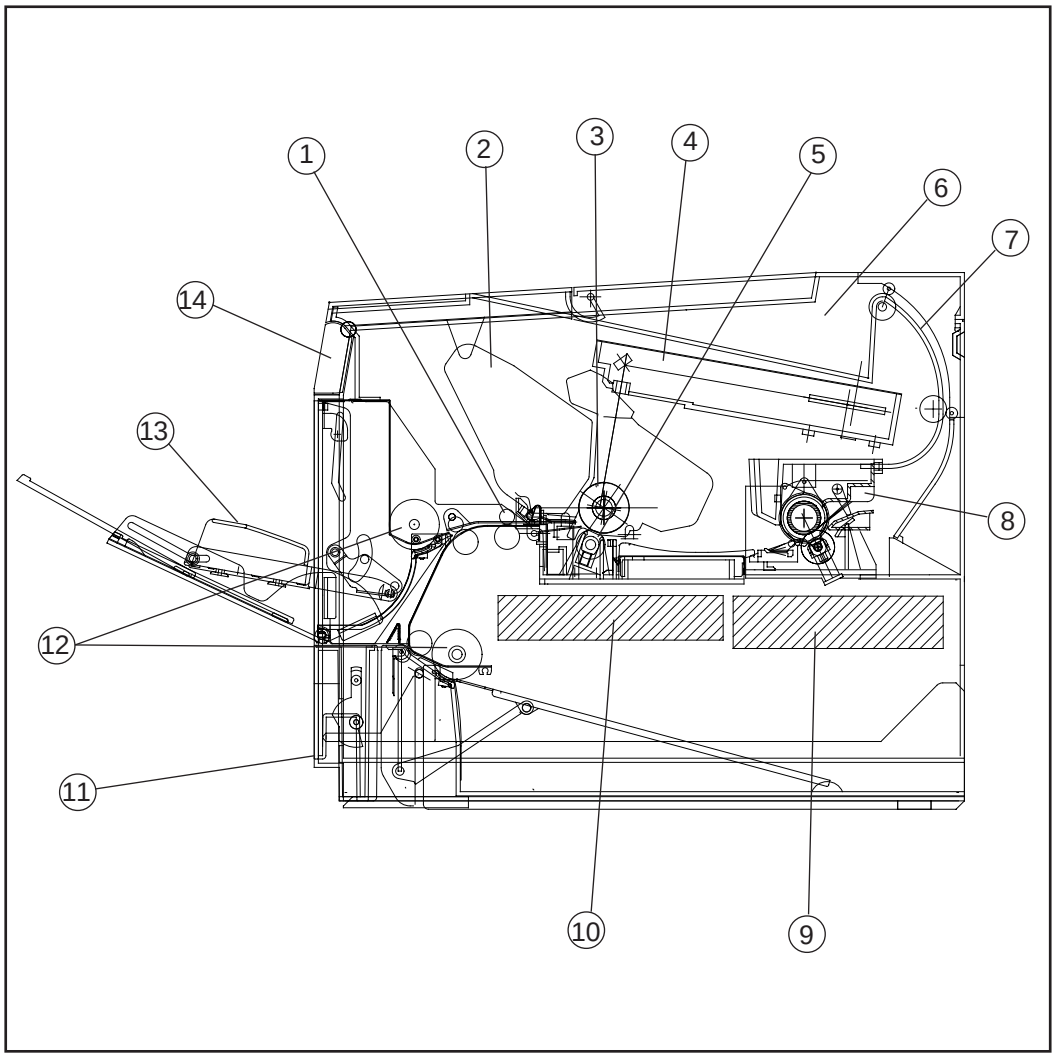


Figure 1.4

4.2 Cross Sectional View



1. Registration rollers
2. EP-ED cartridge
3. Photosensitive drum
4. Laser scanner unit
5. Transfer unit
6. Face-down tray
7. Print-delivery path
8. Fixing unit
9. Low-voltage power supply assy
10. High-voltage power supply assy
11. Paper cassette (Tray 1)
12. Pick-up rollers
13. MP tray
14. Control panel

Figure 1.5

5. STORAGE AND HANDLING OF EP-ED CARTRIDGES

An EP-ED cartridge is influenced by the storage conditions even if it is sealed in its package, so its life depends on the way in which it is used or stored. EP-ED cartridges should be handled carefully.

5.1 Storage of Sealed EP-ED Cartridges

When storing sealed EP-ED cartridges in a warehouse or workshop, the storage conditions shown in (25) Environmental conditions on Page 1-5 must be met. Follow the instructions below:

1) Avoid direct sunlight.
2) Do not store cartridges on a surface that is subject to vibration.
3) Do not hit or drop the packages containing cartridges.
4) The cartridges should be stored horizontal when they are removed from the body (with their label side upside).
5) Avoid putting the cartridges near a CRT screen, a disk or a floppy disk (to keep their data from being destroyed).

5.2 Storage of Unsealed EP-ED Cartridges

Each EP-ED cartridge contains a photosensitive drum that has an organic photoconductor (OPC) which deteriorates when exposed to strong light. It also contains toner. The user, therefore, should be fully informed about the correct storage and handling of EP-ED cartridges.

(1) Storage requirements

1) Avoid places exposed to direct sunlight or near a window. Do not leave an EP-ED cartridge in a car in warm or hot weather even if it is in its storage box.
2) Avoid places with a too-high or too-cool temperature and/or humidity. Also avoid places exposed to sudden temperature or humidity changes (such as near an air conditioner outlet).
3) Avoid dusty places or places exposed to ammonia fumes or other harmful fumes.
4) Do not store an EP-ED cartridge in a temperature above 40°C.

(2) EP-ED cartridge life

The effective life of an EP-ED cartridge is 2.5 years from the date of manufacture (printed on the cartridge.) The expiry year and month (date of manufacture plus 2.5 years) is shown on the EP-ED cartridge box. An EP-ED cartridge used after the expiry may produce low-quality printing, so a cartridge should be used within the stated period.

CHAPTER II THEORY OF OPERATION

This chapter describes the printer functions, the relationship between the electrical systems and mechanical systems, and the timing of operations. Striped conduits (▬▬) indicate mechanical linkages; solid thin arrows (⟶) appearing with a signal name indicate the transmission of single control signals and outlined thick arrows (⇨) indicate the transmission of groups of signals.

1. BASIC OPERATIONS

1.1 Mechanical Configuration

The printer functions can be divided into four blocks: the laser/scanner system, the image formation system, the paper pick-up/feed system and the control system.

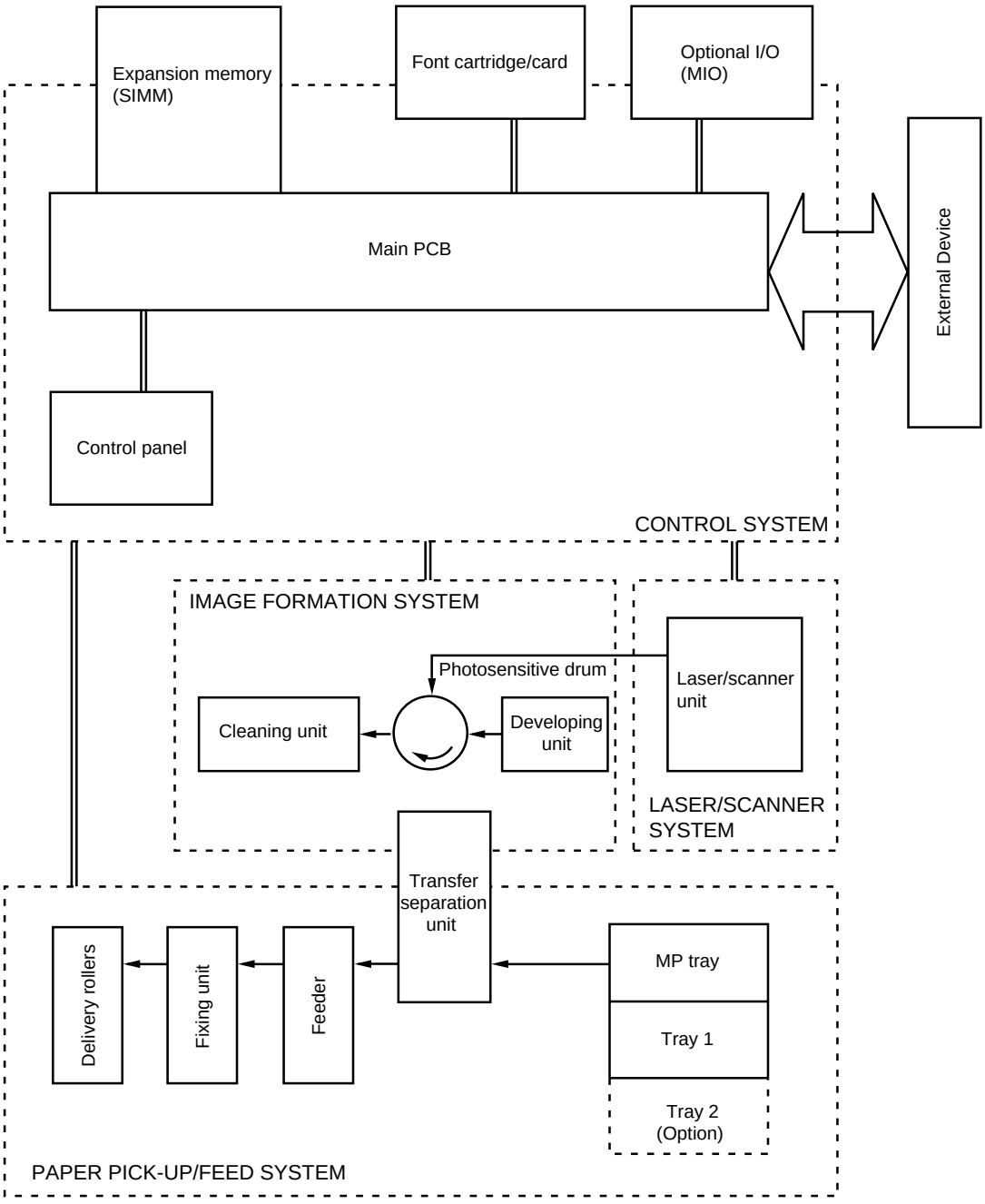
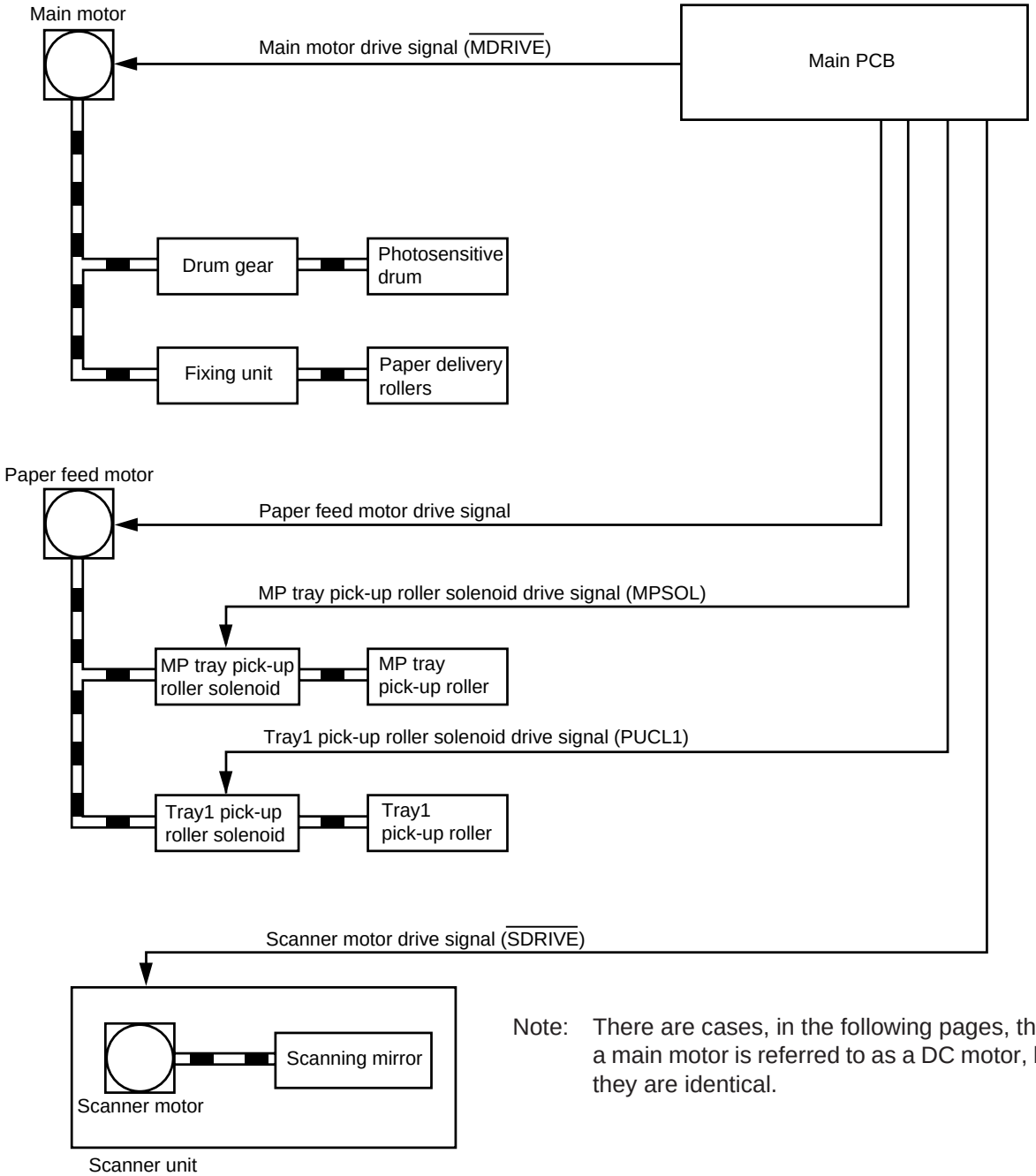


Figure 2.1

1.2 Main Drive

The power necessary for driving the printer is supplied by the main motor, the paper feed motor and the scanner motor.

The main motor is controlled by the main motor drive signal ($\overline{\text{MDRIVE}}$) output from the main PCB, and the paper feed motor is controlled by the paper feed motor drive signal output from the main PCB, and the scanner motor is controlled by the scanner motor drive signal ($\overline{\text{SDRIVE}}$) output from the main PCB.



Note: There are cases, in the following pages, that a main motor is referred to as a DC motor, but they are identical.

Figure 2.2

1.3 Basic Sequence of Operations

Timing for two consecutive prints on A4 paper.

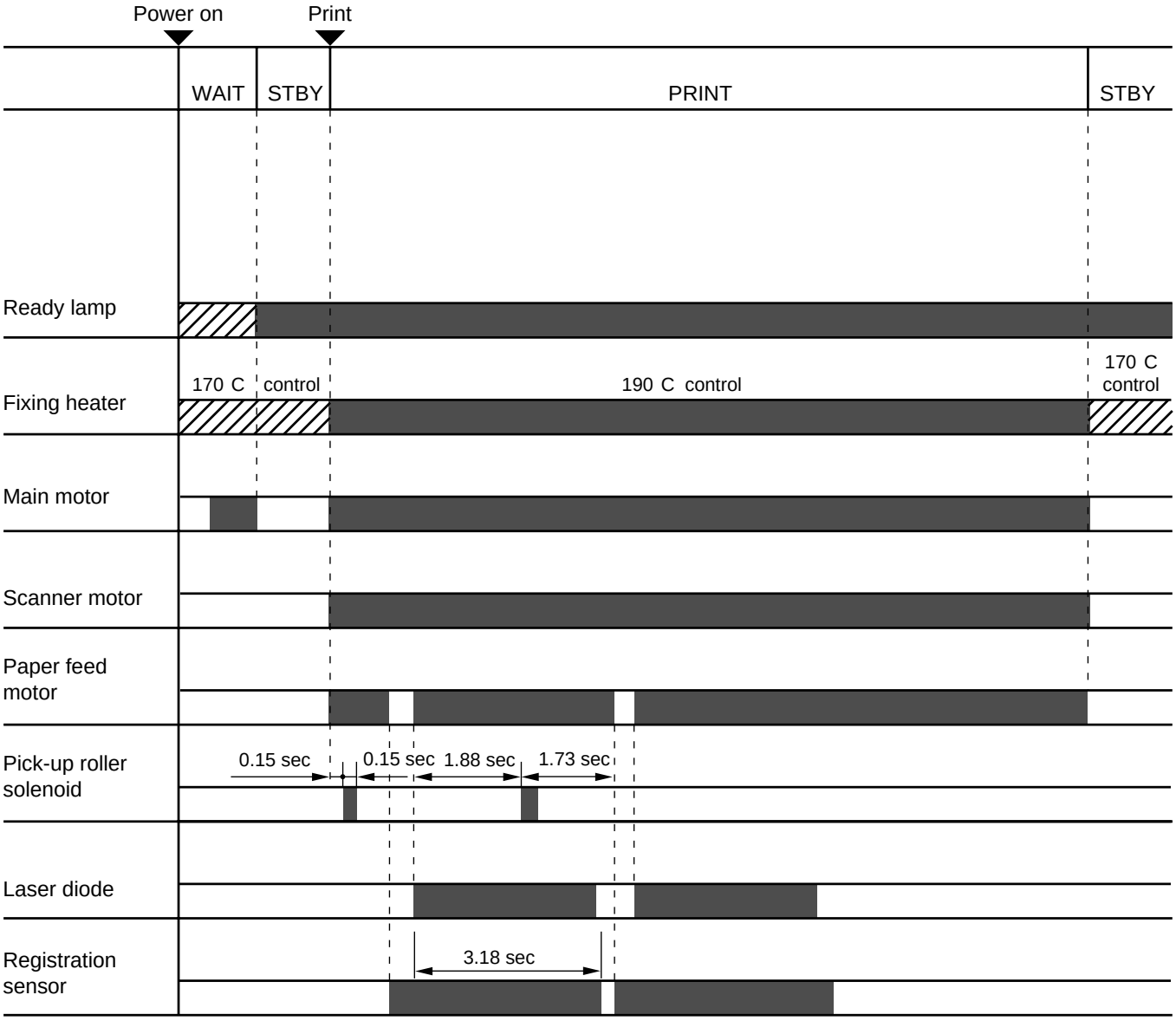


Figure 2.3

2. LASER/SCANNER SYSTEM

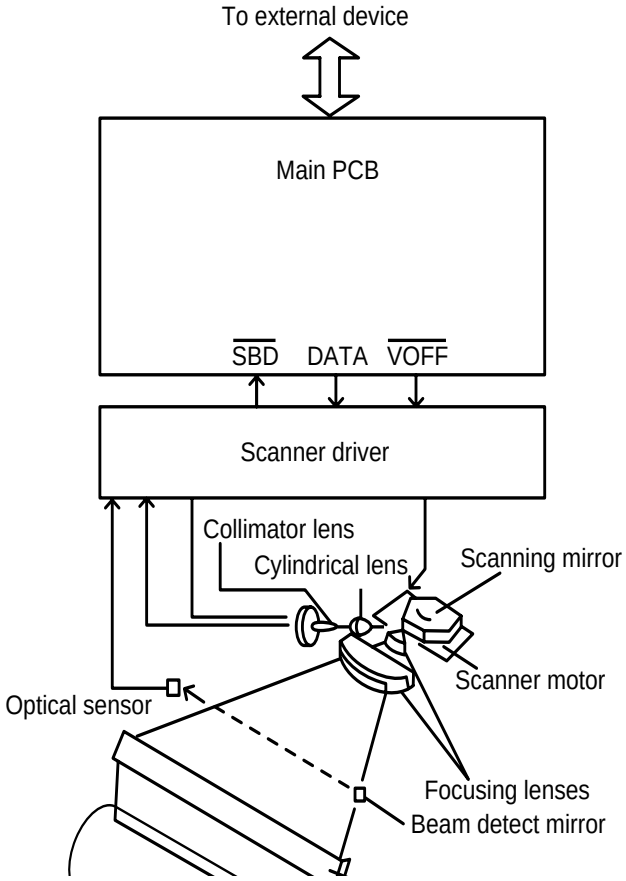


Figure 2.4

In response to the print signal transmitted from the external device, the main PCB generates the drive signals (DATA,$\overline{\text{VOFF}}$) for the laser diode and sends the signals to the scanner unit.

The laser diode in the scanner unit generates a laser beam modulated by DATA.

The modulated laser beam is aligned into a parallel beam by a collimator lens and a cylindrical lens and then brought to the scanning mirror which is rotating at a constant speed.

The laser beam reflected by the scanning mirror focuses on the photosensitive drum via the focusing lenses arranged in front of the scanning mirror.

The path of the beam coming through the focusing lenses is reflected by the reflective mirror.

As the scanning mirror rotates at a constant speed, the laser beam scans the photosensitive drum at a constant speed.

As the photosensitive drum rotates at a constant speed and the laser beam scans the drum, an images is formed on the drum.

3. IMAGE FORMATION SYSTEM

3.1 Outline

The image formation system is the main part of the printer. The print information, after input from the video controller circuit into the engine controller circuit as a TVDO signal, forms a toner image on the photosensitive drum.

Then the toner image is transferred onto the paper by the transfer charging roller. The image formation system is composed of the photosensitive drum the charging unit, the developing unit and the cleaning unit.

3.2 Printing Process

The major part of the image formation system is contained in the cartridge, as shown in Figure 2.5.

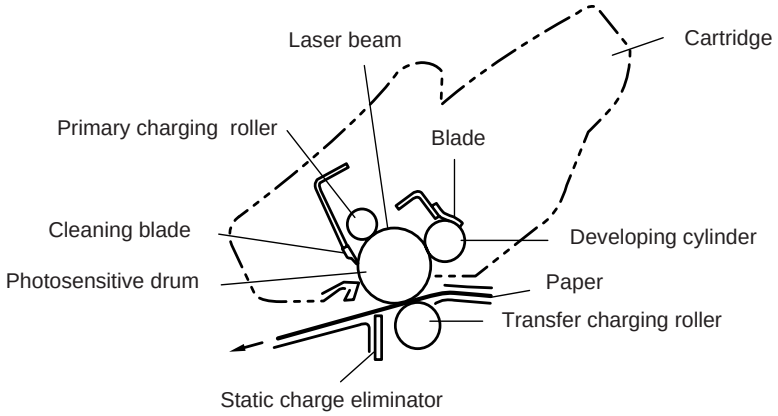


Figure 2.5

The cartridge used by the printer has a seamless photosensitive drum with the structure shown in Figure 2.6. The outer layer of the drum consists of an organic photoconductor (OPC); the base is aluminum.

The printing process can be divided into five major stages:

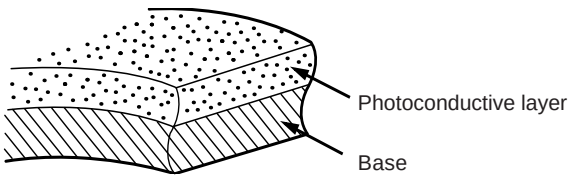


Figure 2.6

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

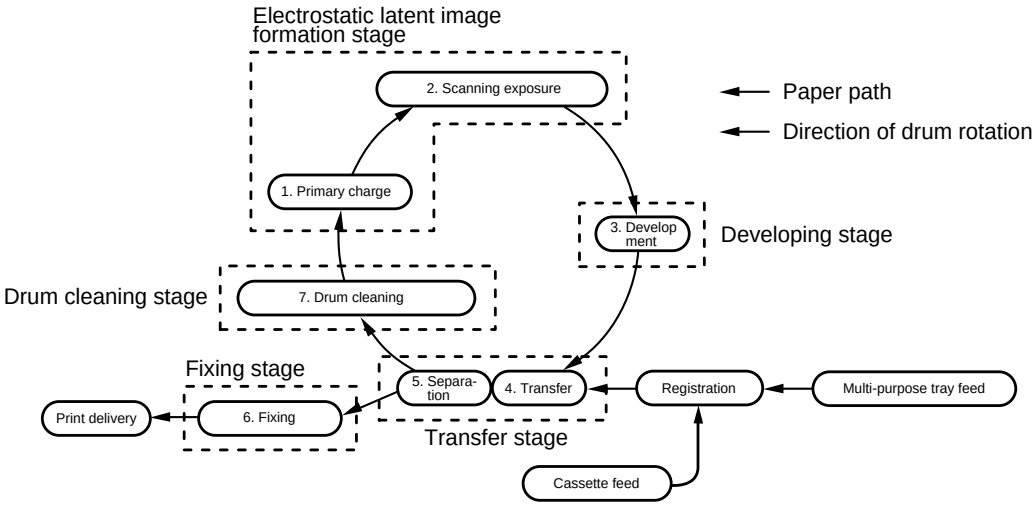


Figure 2.7

3.2.1 Electrostatic latent image formation stage

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

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

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

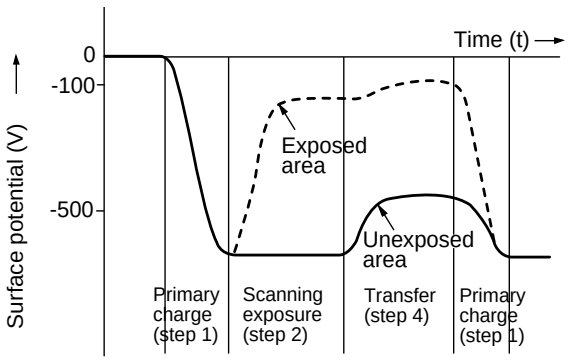


Figure 2.8

Step 1 Primary charge

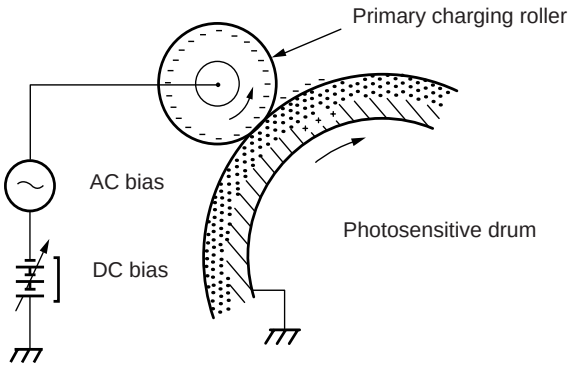


Figure 2.9

As preparation for latent image formation, a uniform negative potential is applied to the photosensitive drum surface. The printer uses the charging method that directly charges the drum for the primary charge.

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

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

Step 2 Scanning exposure

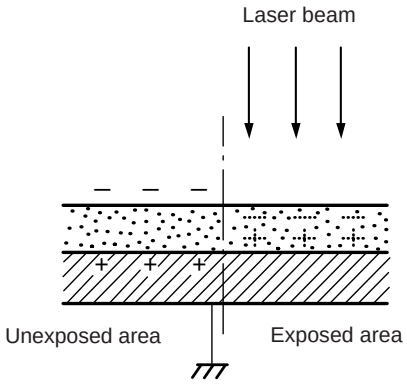


Figure 2.10

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

3.2.2 Developing stage

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

Step 3 Development

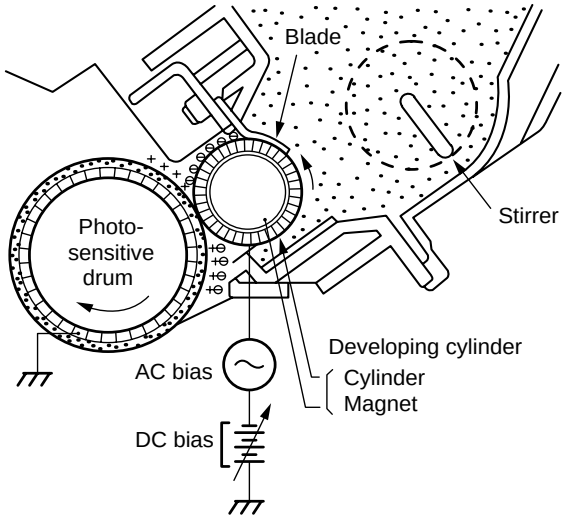


Figure 2.11

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

As shown in Figure 2.11, the developing unit consists of a developing cylinder and rubber blade. The developing cylinder rotates around a fixed internal magnet. The single-component toner consists of magnetite and a resin binder, and is held to the cylinder by magnetic attraction. The toner is an insulator, and acquires a negative charge by friction due to the rotation of the cylinder.

The areas on the drum that were exposed to the laser beam have a higher potential (are less negative) than the negatively charged toner particles on the developing cylinder. When these areas approach the cylinder, the potential difference projects the toner particles onto them. This is called toner projection, and the latent image on the drum becomes visible.

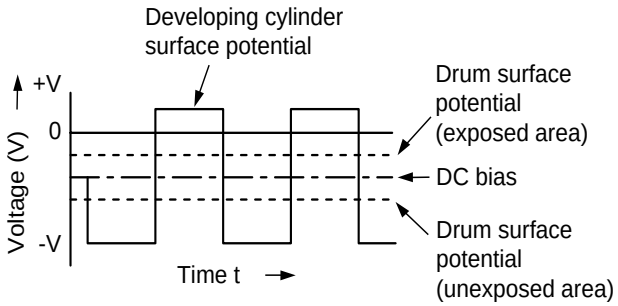


Figure 2.12

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

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

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

3.2.3 Transfer stage

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

Step 4 Transfer

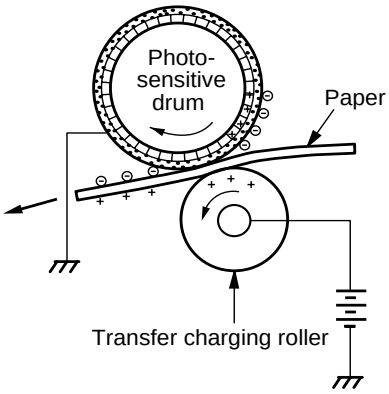


Figure 2.13

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

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

Reference:

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

Step 5 Separation

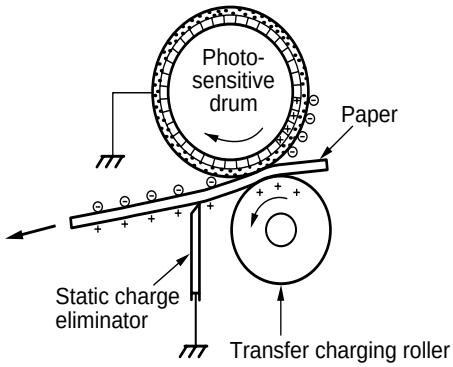


Figure 2.14

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

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

3.2.4 Fixing stage

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

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

Step 6 Fixing

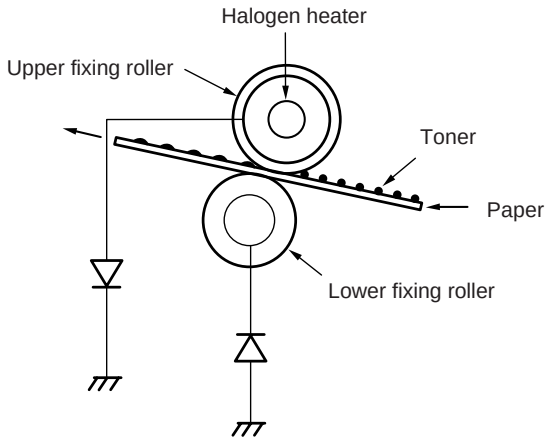


Figure 2.15

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

3.2.5 Drum cleaning stage

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

Step 7 Drum cleaning

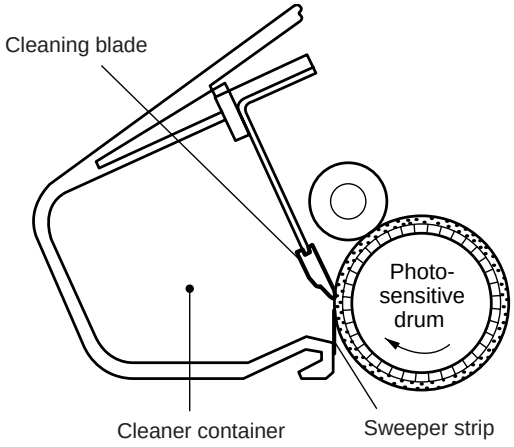


Figure 2.16

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

3.3 Operation

When the engine controller circuit receives a print signal ($\overline{\text{PRINT}}$) or a pre-feed signal ($\overline{\text{PRFD}}$) from the video controller circuit, the engine controller circuit drives the main motor to rotate the photosensitive drum.

After the drum surface is charged negatively by the primary charge roller, the laser beam modulated by a DATA signal scans the drum surface to from a latent image on the drum.

The latent image formed on the drum surface is converted into a visible image by the toner on the developing cylinder and then image is transferred onto the paper by the transfer roller unit. Then the residual toner is removed from the drum surface with the cleaner blade.

The cartridge also has a toner sensor. When the output from this sensor falls below a certain level, it warns that the EP-ED cartridge will be out of toner with an alarm.

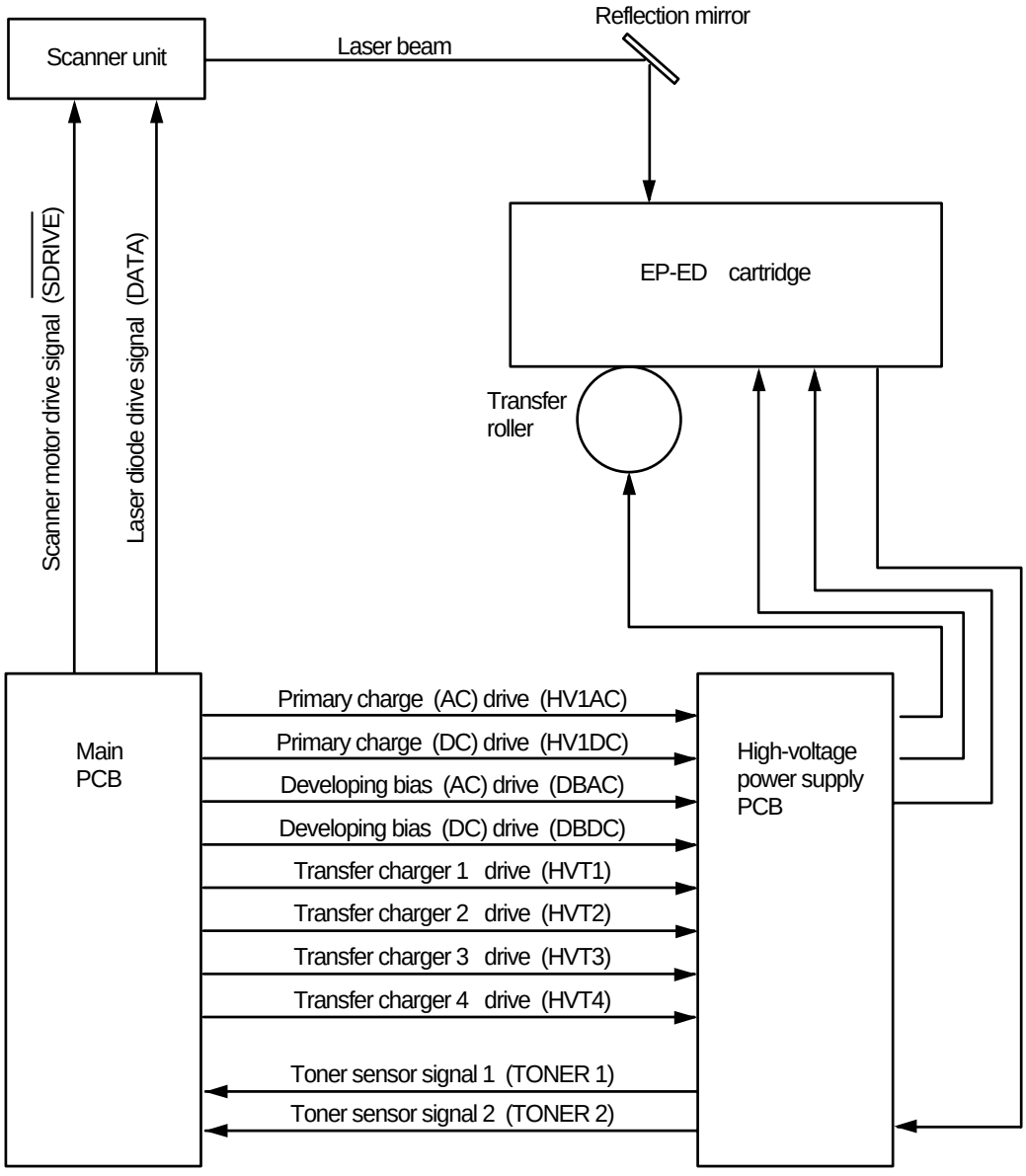


Figure 2.17

4. PAPER PICK-UP/FEED SYSTEM

4.1 Outline

If a tray1 paper pick-up roller solenoid drive signal (PUCL1) is input to the circuit while the paper feed motor is rotating, the paper pick-up solenoid comes on and the paper pick-up roller solenoid is engaged. As a result, the paper pick-up roller rotates to feed paper down to the photosensitive drum.

The paper position is controlled by the registration sensor so that the leading edge of the paper is aligned with the leading edge of the image on the photosensitive drum. After this operation, the paper is deliveried to the face down tray via the fixing unit. Paper ejection is detected by the paper ejection sensor; if printed paper has not reached or not cleared the paper ejection sensor in a specified time, the printer judges that a paper jam has occurred. In this case a paper jam is noticed to the external devise by a status signal.

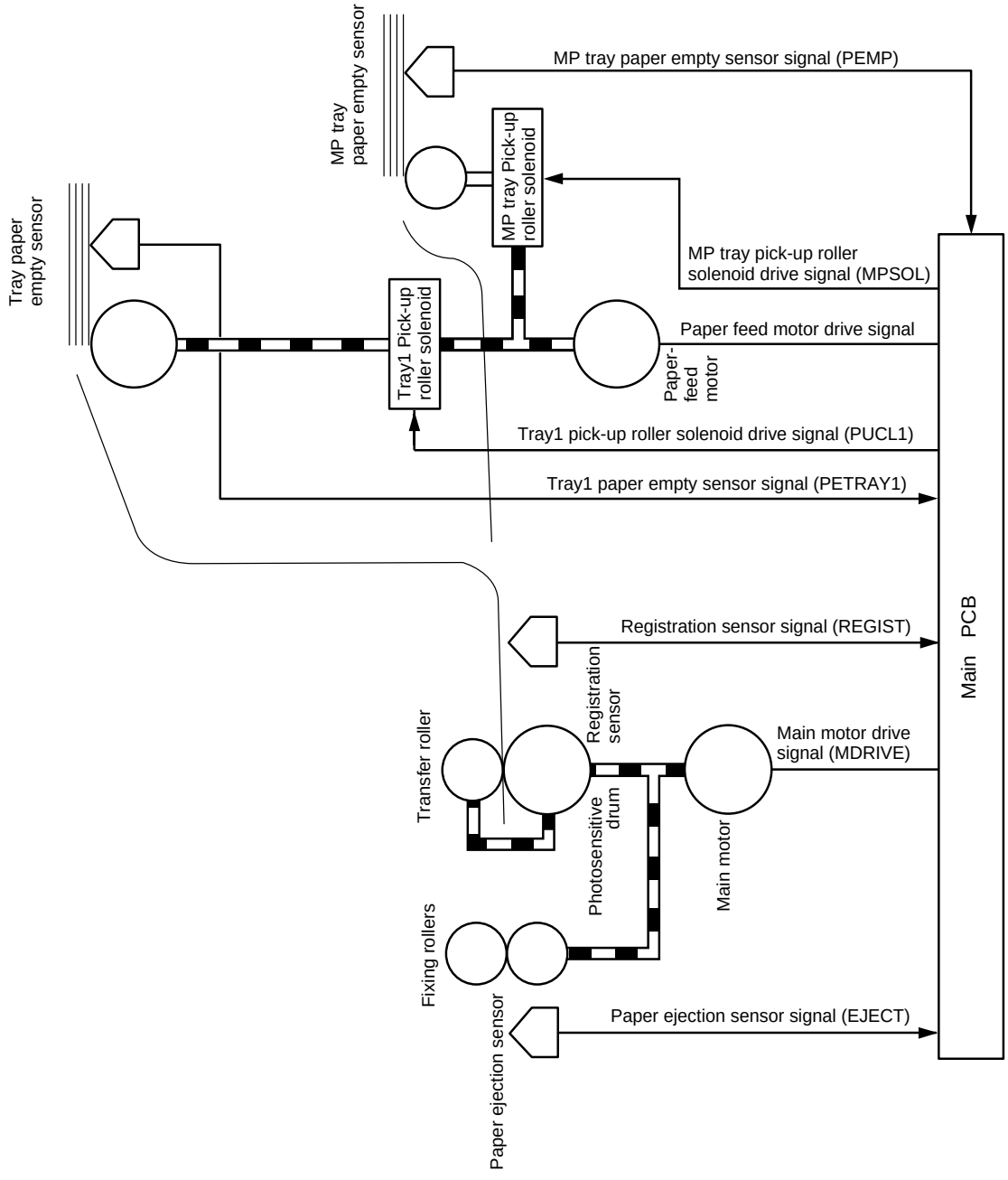


Figure 2.18

4.2 Cassette Feed

When the fixing rollers reach the specified temperature while a cassette with paper is in the printer, the READY lamp changes from flashing to lighting.

When the engine controller circuit receives $\overline{\text{PRNT}}$ or $\overline{\text{PRFD}}$ signal from the video controller circuit, the paper feed motor starts rotation. About 0.2 seconds later, the printer actuates the tray1 pick-up roller solenoid and the pick-up roller makes one rotation. This feeds paper to the photosensitive drum.

Timing chart for the pick-up one sheet

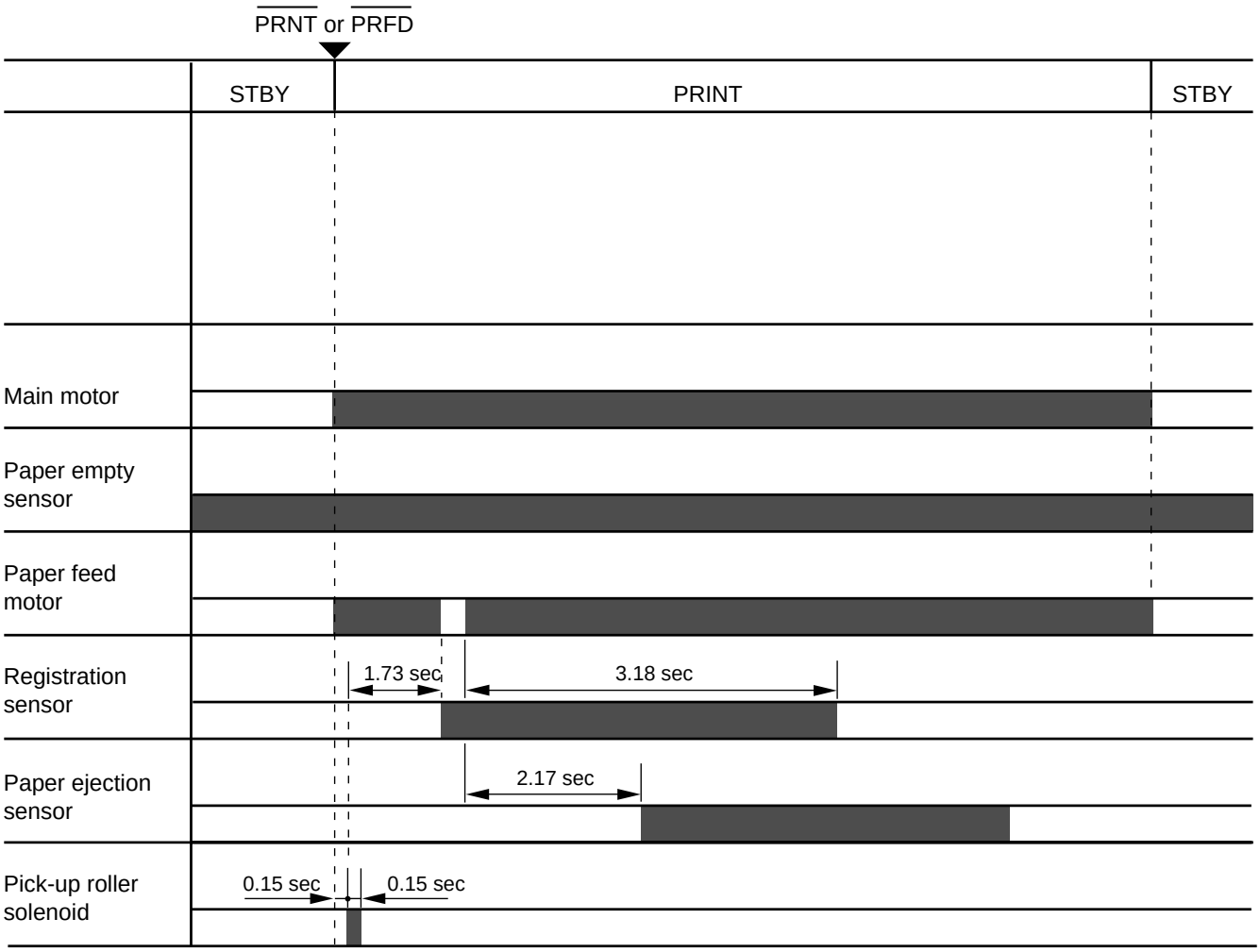


Figure 2.19

4.3 MP Tray Feed

The timing of the MP tray feed is identical to the timing of the cassette paper feed except for the following points:

(1) The paper empty sensors are different.

Cassette feed : Tray1 paper empty sensor

MP tray feed : MP tray paper empty sensor

(2) The pick-up roller solenoids are different.

Cassette feed : Tray1 pick-up roller solenoid

MP tray feed : MP tray pick-up roller solenoid

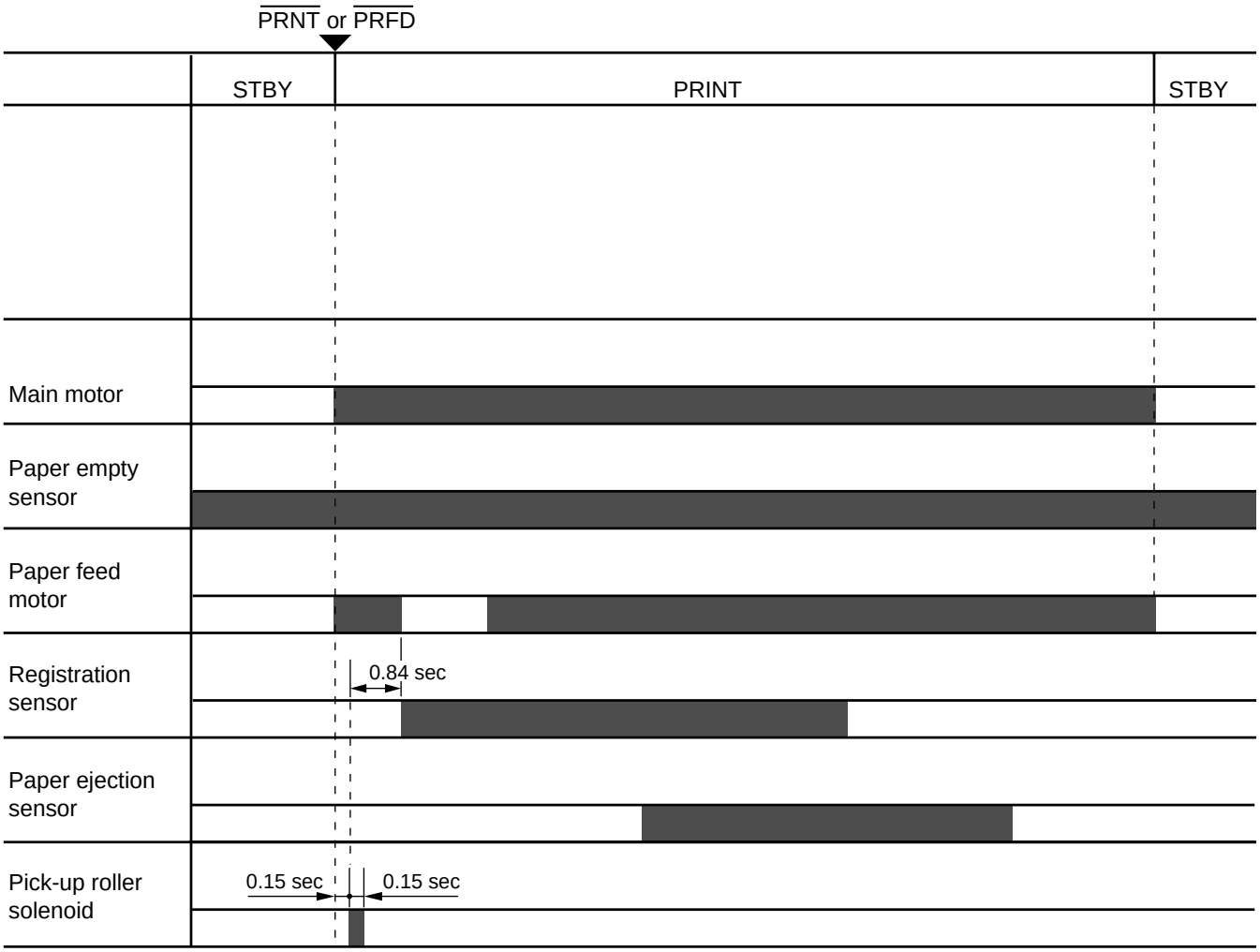


Figure 2.20