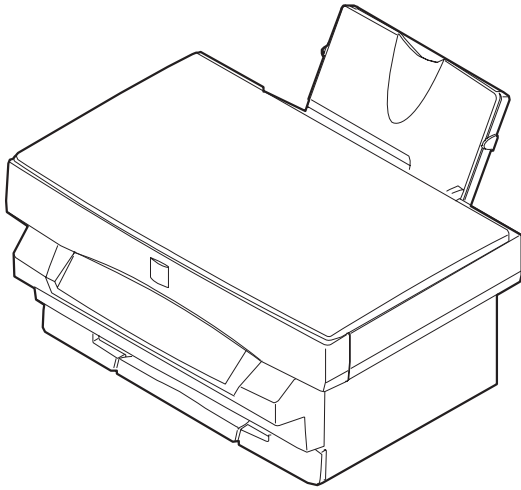


SHARP SERVICE MANUAL

CODE: 00ZAL840//B1E



BASIC MANUAL

DIGITAL COPIER

MODEL AL-800/840

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Parts marked with "△" is important for maintaining the safety of the set. Be sure to replace these parts with specified ones for maintaining the safety and performance of the set.

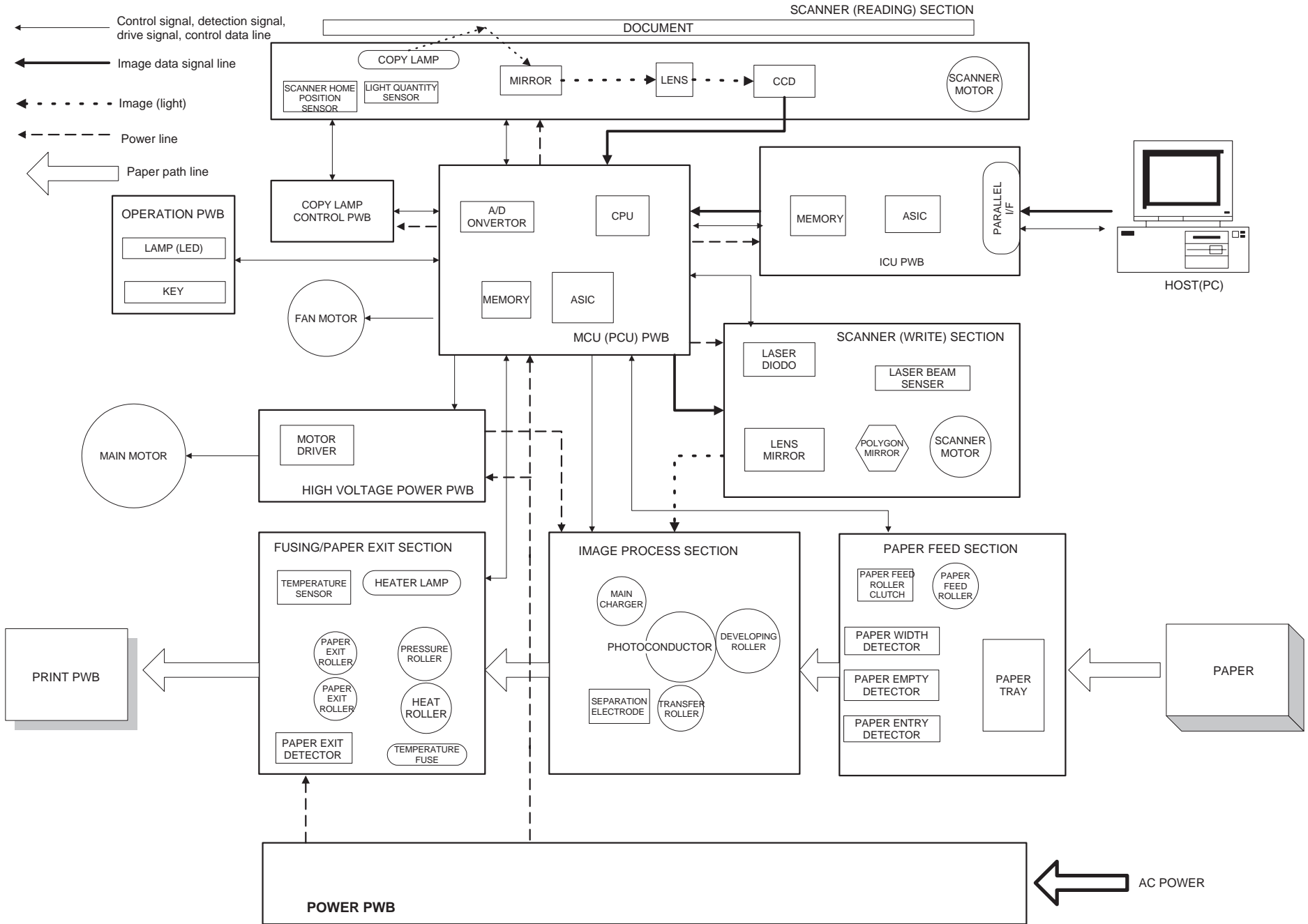
SHARP CORPORATION

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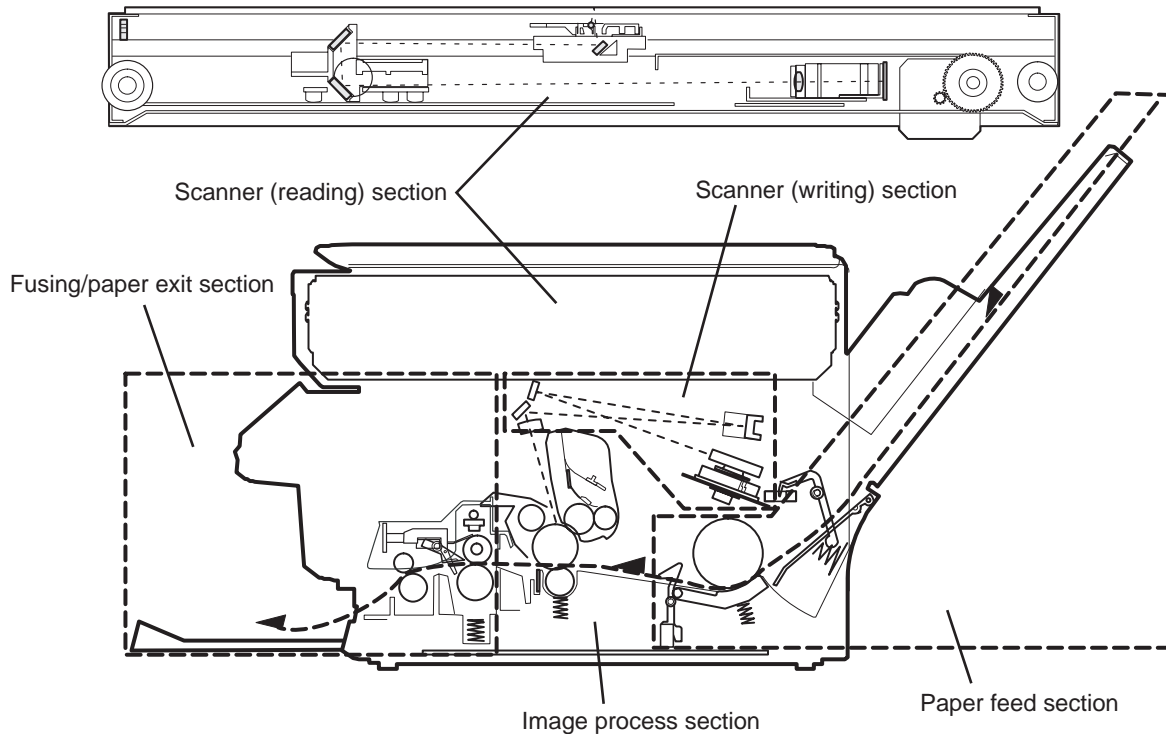
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1. Block diagram



1-1



Scanner (read) section

In this section, the copy lamp (cathode ray tube, Xenon lamp) radiates light onto a document, and the reflected light is detected by the image sensor (CCD element) to convert into electrical signals (analog signals), which are sent to the MCU PWB.

MCU (ICU) PWB

The image data from the scanner (reading) section are converted into digital signals and subject to image process (correction, etc.), and converted into dot image data and outputted to the scanner (writing) section.

During printing, the dot image data from the ICU PWB are outputted to the scanner (writing) section directly. The engine status data are outputted to the ICU PWB.

The loads (motor, solenoid, etc.) are controlled according to the sensor/detector signal.

The above operation is performed by the CPU, ASIC, and memory.

ICU PWB

Print data (compressed data) sent from the host are developed and converted into dot image data and outputted to the scanner (writing) section. The engine status data sent from the MCU (PCU) PWB are outputted to the host (PC).

Scanner (writing) section

In this section, the dot image data sent from the MCU PWB are converted into laser beams (ON/OFF), which is scanned to form latent electrostatic images on the OPC drum.

Paper feed section

The paper feed roller feeds paper to the transfer section.

The paper feed operation is controlled by the paper feed roller clutch and the paper feed roller clutch solenoid.

Image process

This section is composed of the photoconductor section, the developing section, and the transfer/separation section. The images formed by laser beams in the scanner (writing) section are formed into latent electrostatic images on the photoconductor and converted into visible images by toner development.

The operations of this section are composed of five processes; exposure, development, transfer, separation, and discharge.

The OPC drum is used as the photoconductor drum, and one-component toner is employed.

For charging, the rotation brush is employed. For transfer, the roller is employed to eliminate ozone generation. In addition, it is compact.

The high voltage required in this section is supplied by the high voltage PWB.

Fusing/paper exit section

Toner is fused to the paper in the fusing/paper exit section using heat and pressure.

The heat roller surface temperature is detected by the fusing temperature sensor to maintain the constant fusing temperature (155 °C).

The heater lamp is driven by the power PWB unit.

Operation PWB

The operation PWB displays various information and supplied the key operation signals to the MCU (PCU) PWB.

High voltage power PWB

The high voltage power PWB outputs the high voltage for the main charger, the developing bias, and the transfer charger. In addition, the main motor drive circuit is built into the PWB.

Main motor.

The main motor drives the paper feed section, the transport section, the image process section, and the fusing section.

The main motor drive circuit is built into the high voltage power PWB.

Copy lamp control PWB

The copy lamp light quantity is controlled to provide necessary light quantity even though the conditions of the scanner (reading) section are changed.

The copy lamp drive voltage is controlled by the output level of the light quantity sensor in the scanner (reading) section.

Power PWB

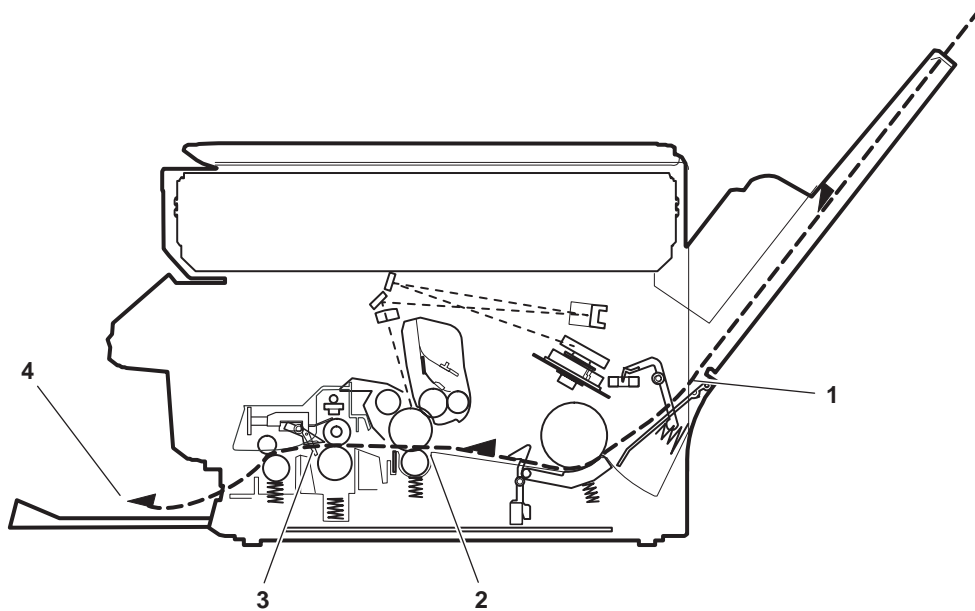
The power PWB outputs the DC power voltages (+24V, +5V, +3.3V, +12V), and drives the heater lamp.

2. Outline of operations

A. Paper path and imaging

Paper is fed, transported, and discharged through the path indicated with the arrow in the figure below.

- 1) Paper feed (Paper on the paper tray is fed to the transfer section by the paper feed roller.)
- 2) Image transfer (The toner image on the photoconductor is transferred onto the paper by the transfer roller.)
- 3) Fusing (The toner image on the paper is fused by the heat roller and the pressure roller.)
- 4) Paper exit (The paper is discharged to the paper exit tray by the paper exit roller.)



B. Image process and data flow

(1) Copy mode

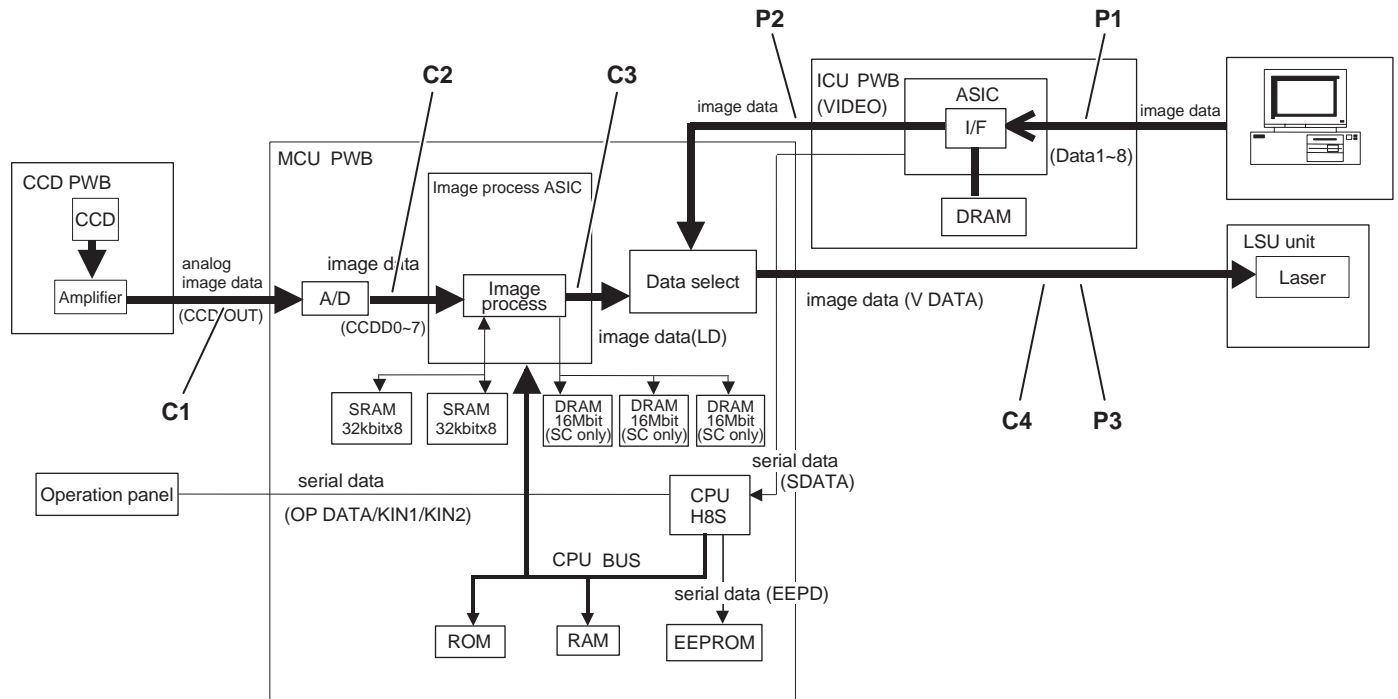
- C1) Images scanned by the image sensor (CCD element) is converted into electrical signals (analog signals) and outputted to the MCU PWB. (CCD unit)
- C2) Image data outputted from the scanner (reading) section are converted into digital signals. (CCDD0-7)
- C3) Image process (area separation, filter process, gamma correction, resolution conversion, zooming) is performed by the ASIC and the line memory (SRAM). The dot image data, the resolution of which is converted from 400dpi to 600dpi, are sent to the data select section. (Image data (LD))
- C4) The data are passed through the data select section to the scanner (writing) section. (Image data (V DATA))

In the multi copy mode, image data of one sheet are stored in the DRAM. (Sharp version only)

(2) Printer mode

- P1) Print data (compressed data) are sent from the host. (Image data (Data 1 – 8))
- P2) Print data are developed by the ASIC and the line memory and converted into the full dot image data and sent to the data select section. (Image data)(VIDEO)
- P3) The data are sent through the data select section to the scanner (writing) section. (image data) (V DATA)

DATA FLOW DIAGRAM



3. Operations of each section

A. Paper feed, paper transport section

(1) Outline

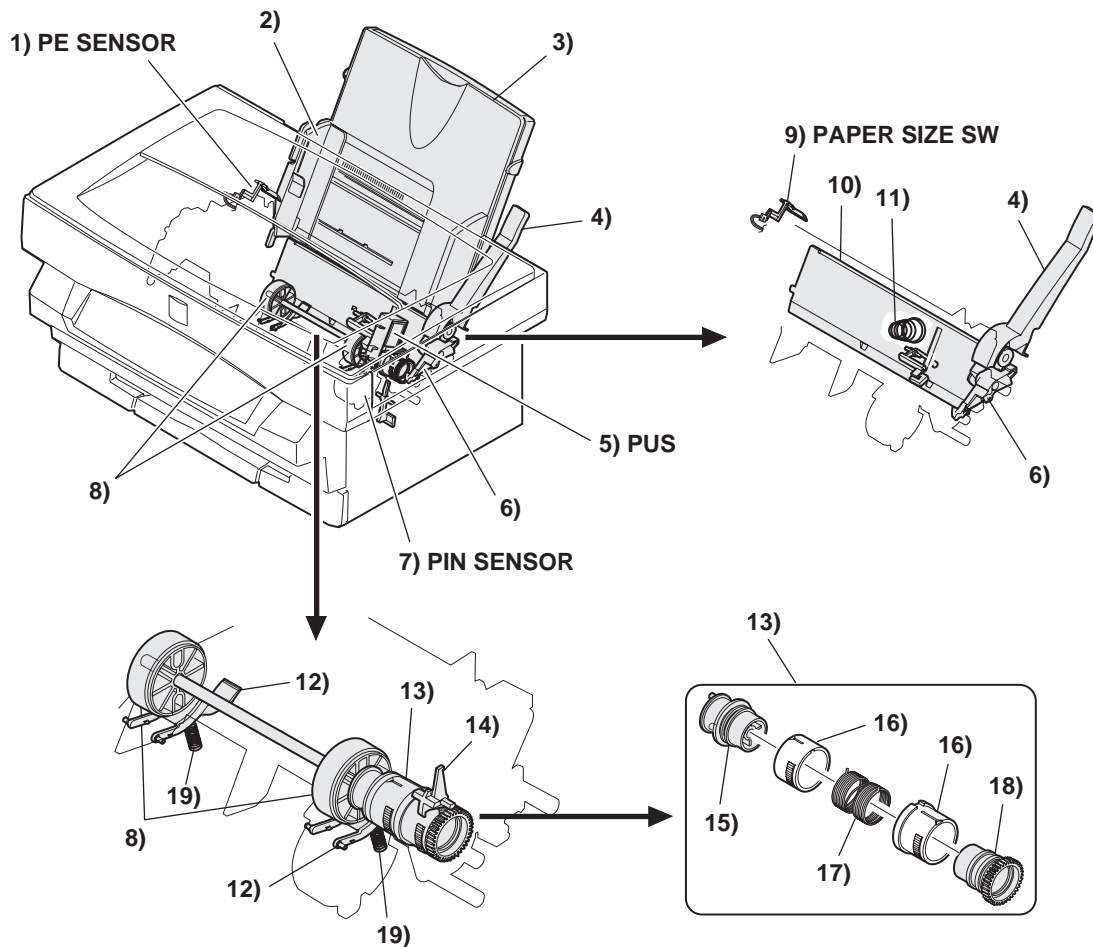
The paper feed tray contains about 200 (250) sheets of paper.

The paper is passed to the transfer section by the paper feed roller.

The paper feed operation is controlled by the paper feed roller clutch and the paper feed roller clutch solenoid. The paper feed clutch employs the mechanical spring clutch.

Paper mis-feed and paper jam are detected by the paper empty sensor and the paper entry sensor. The paper size (width) is detected by the paper size (width) detector to prevent toner from attaching to the area over the paper width.

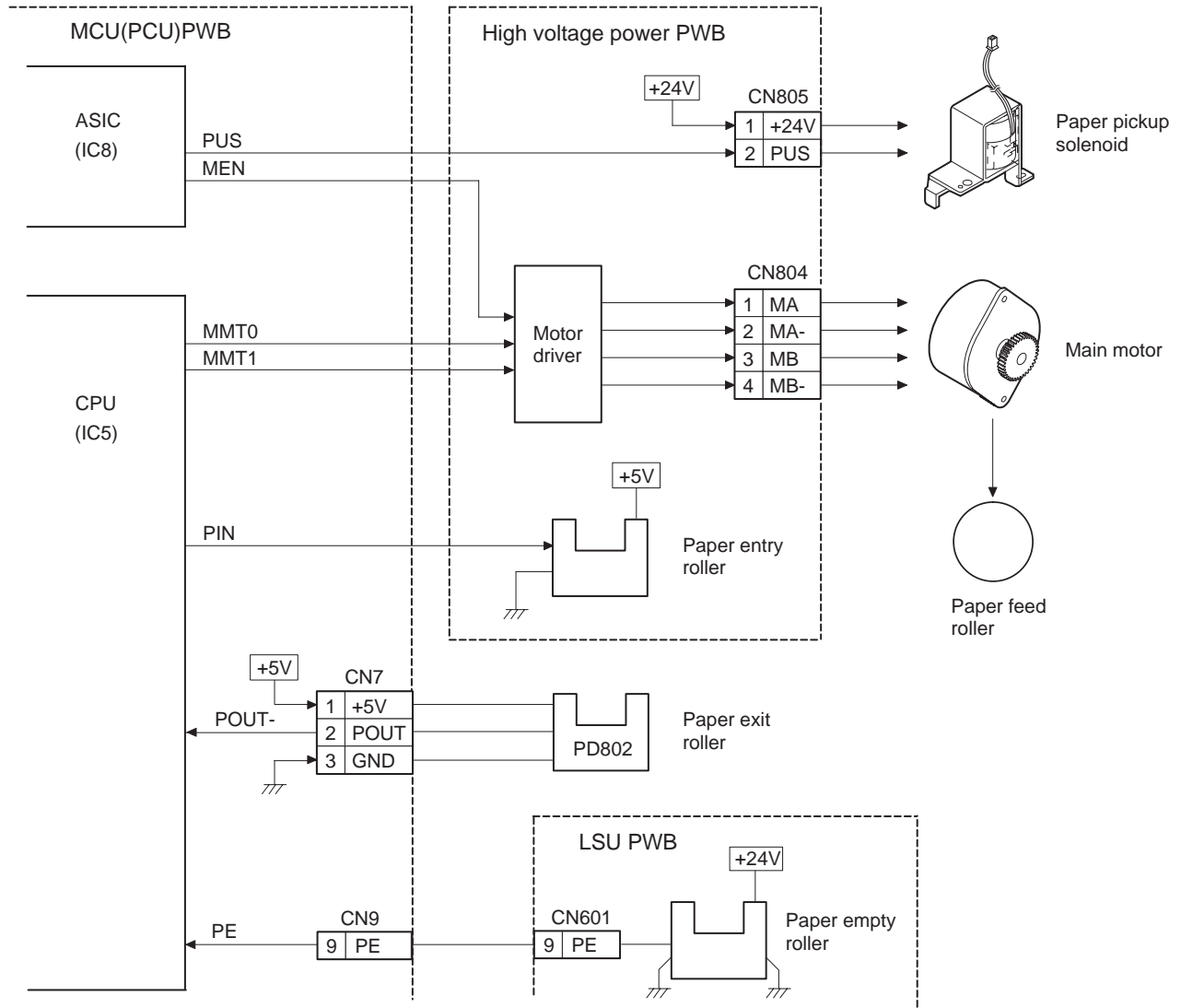
(2) Major parts



No.	Parts						Note
	Code	Signal name	Name	Type	Function/operation	Active condition	
1	PE SENSOR	PEMP IN	Paper empty detector	Photo transmission sensor	Detects paper on the paper tray.	LOW (0V) when paper is detected.	
2			Paper guide		Adjust the paper width.		
3			Paper feed tray		Sets the print paper. (Capacity: XXX sheets)		
4			Paper release lever		Put this lever straight to set paper to release paper feed. Put this lever down to enable paper feed.		
5	PUS	PUS	Paper feed clutch solenoid		Controls (on/off) the main motor drive for the paper feed roller.		
6			Paper feed release lever		When the paper feed lever is put straight, this lever releases paper feed solenoid drive. This partially reduces stress to the paper feed roller clutch in removing paper.		
7	PIN SENSOR	PIN	Paper in detector	Photo transmission sensor	Detects whether the fed paper is transported to the transfer position or not. By the timing of this detector signal, the relative positions of paper and print image are controlled.	LOW (0V) when paper is detected.	
8			Paper feed roller		Feeds paper.		
9	PAPER SIZE SW	PAPER SIZE IN	Paper width detector	Mechanical switch (Micro switch)	Detects the paper width. This signal controls the laser beam radiation area.	LOW (0V) when the max. width is detected.	
10			Paper pressure plate		Presses paper onto the paper feed roller.		
11			Paper pressure spring		Presses paper onto the paper feed roller.		
12			Paper separator		Separates paper in paper feed operation.		
13			Paper feed clutch	Mechanical spring type clutch	Controls ON/OFF of the paper feed roller. (The paper feed roller is driven by the paper feed clutch solenoid and the main motor.		
14			Paper feed clutch lever		Driven by the paper feed clutch solenoid to control ON/OFF of the paper feed clutch. Prevents against reverse rotation of the paper feed roller.		
15			Paper feed clutch joint		Links the paper feed roller and the paper feed roller clutch.		
16			Paper feed clutch sleeve		Controls ON/OFF of the paper feed roller. (The paper feed roller is driven by the paper feed clutch solenoid and the main motor.)		
17			Paper feed clutch spring		Transmits the paper feed clutch rotation to the paper feed clutch sleeve.		
18			Paper feed clutch gear		Transmits the main motor power to the paper feed roller.		
19			Paper separator spring		Applies a proper pressure to the paper separator.		

(3) Operation

a. Block diagram



b. Operation

- * The main motor is a 4-phase stepping motor of 2-phase excitation bipolar system, which serves as the drive source of the paper feed and transport system.
- * The pickup solenoid operates on 24V and turns ON/OFF paper feed operation.
- * The following sensors are used.

Paper empty sensor (transmission photo transistor):

It is installed on the LSU PWB and is used to detect whether there is paper in the paper feed tray or not.

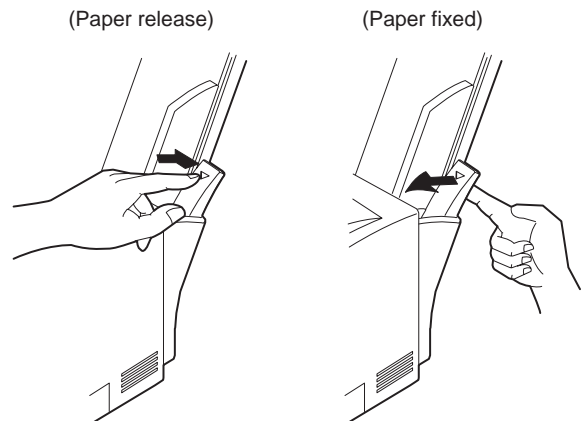
Paper entry sensor (Transmission photo transistor):

This sensor is used to detect the paper feed timing of next paper (in pre-feed) and to make synchronization between paper transport and image forming on the drum. It is also used to detect a paper jam.

Paper exit sensor (Transmission photo transistor):

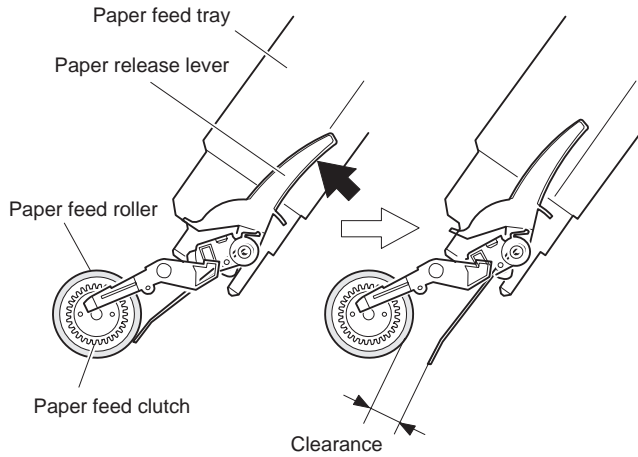
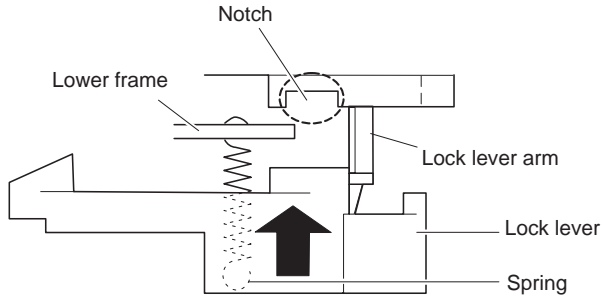
This sensor is used to detect that paper is discharged. It is also used to detect a paper jam.

*** Paper release lever**

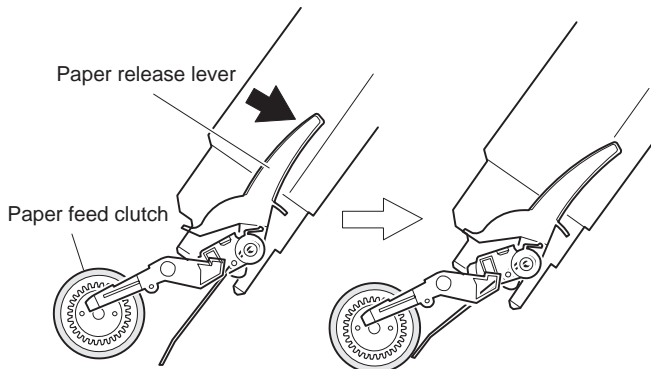
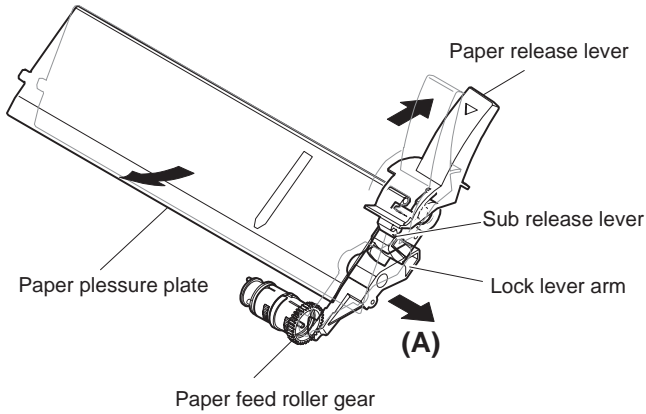


The paper release lever is used to fix or release paper. To release paper, pull the lever toward you as shown in the figure below. To fix paper, push the lever forward. The lever mechanism is as shown below.

(Paper release operation)



The lock lever arm is always pressed onto the paper release lever by the spring. When the paper release lever is pulled toward you, the lock lever arm is brought into contact with the lower frame so that the paper pressure plate is fixed at the paper release position. Under this condition, a clearance is provided between the paper feed roller and the paper feed tray as shown in the figure below, and the paper is released.



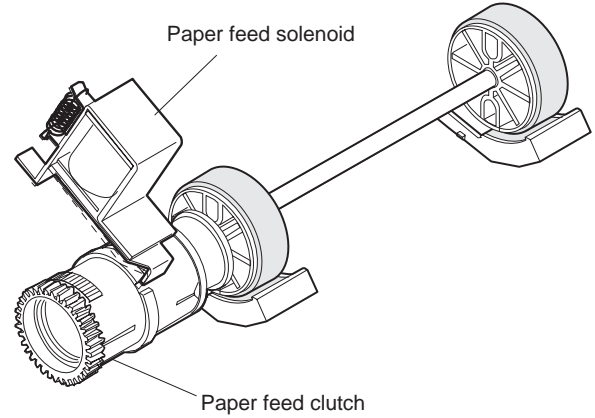
(Paper fixing operation)

When the paper release lever is pushed down, the paper release lever arm pushes the lock lever arm in the direction of arrow (A).

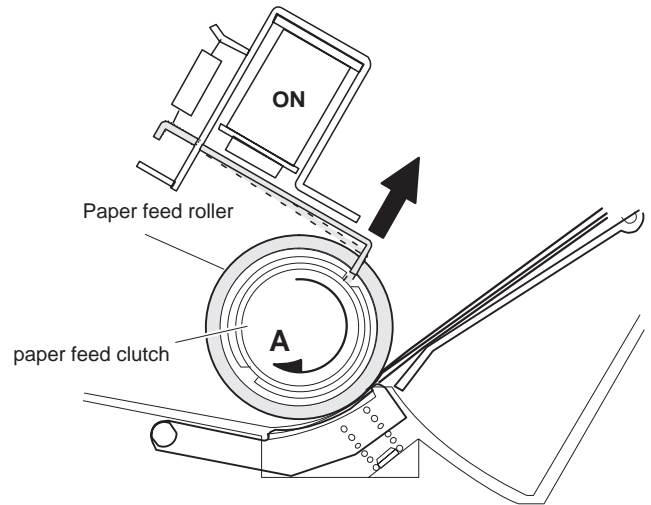
By the above operation, the rotating disk is lifted and the paper is pushed by the paper feed roller.

If printing is made without pushing down the paper release lever, the lock lever arm is pushed by the paper feed roller gear boss in the direction of arrow (A) and the paper feed tray is pushed to fix the paper.

* Paper feed roller, paper feed solenoid



The paper feed solenoid is used to turn ON/OFF the paper feed clutch. When the paper feed solenoid is turned on, the paper feed roller is rotated.

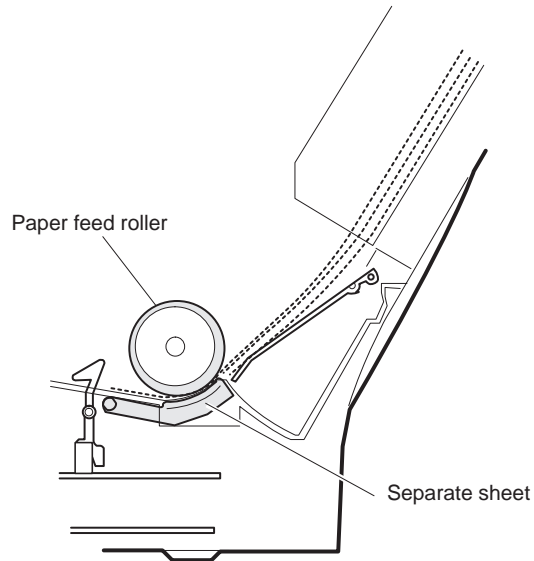


The paper feed clutch is a spring clutch. The paper feed roller gear rotation is transmitted to the paper feed roller only in the direction of (A). That is, the paper feed roller is rotated only in the direction of (A) (paper feed direction).

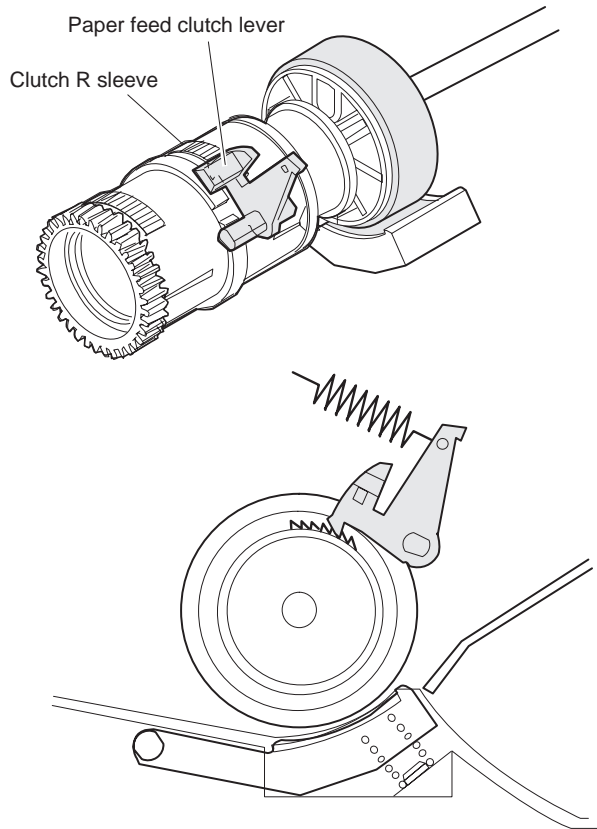
B. Scanner (reading) section

(1) Outline

In this section, the copy lamp (Xenon lamp) radiates light onto a document, and the reflected light is detected by the image sensor (CCD element) to convert into electrical signals (analog signals), which are sent to the MCU PWB.



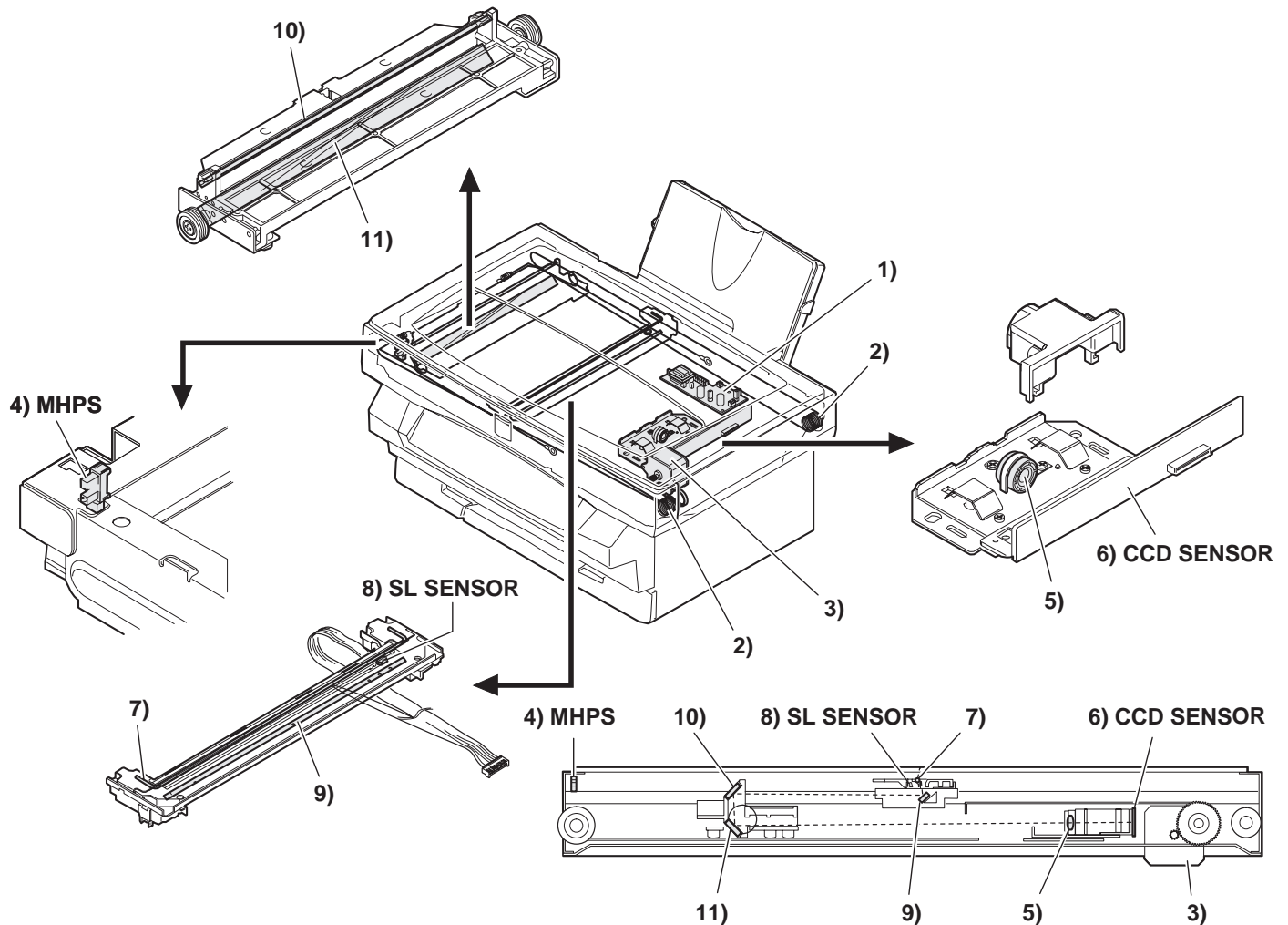
The paper feed roller is of circular form, and double paper feed is prevented by the separate sheet.



The paper feed clutch lever is provided to prevent the paper feed roller from rotating reversely. When paper feed is not performed, the paper feed clutch lever is engaged with the paper feed roller boss gear.

When removing paper for paper replacement, a reverse rotation power is applied to the paper feed roller. In this case, the paper feed solenoid provides enough power to prevent the paper feed roller from rotating reversely, however an excessive stress is applied to the spring clutch, which may be damaged. Therefore the paper feed clutch lever is used to lock and protect the spring clutch from an excessive stress.

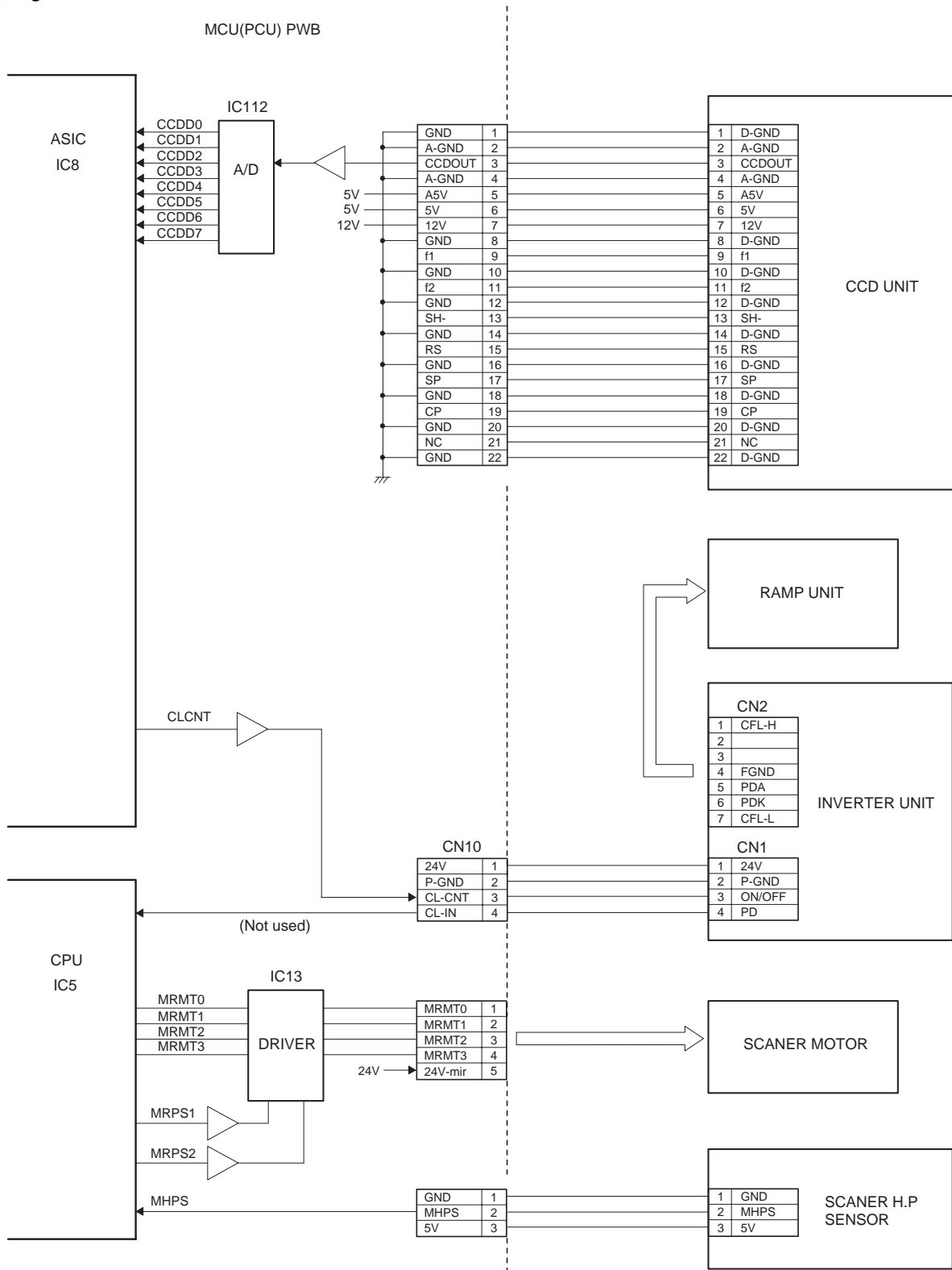
(2) Major parts



No.	Parts				Function/operation	Active condition	Note
	Code	Signal name	Name	Type			
1			Scanner lamp control PWB		Drives the scanner lamp. Maintains the lamp light quantity at a constant level.		
2			Scanner drive wire		Transmits the scanner motor power to the scanner unit.		
3			Scanner motor		Drives the scanner unit.		
4	MHPS	MHPS	Scanner home position sensor	Photo transmission sensor	Detects the scanner home position. By this signal the image scanning operation is controlled.	HIGH (5V) when the home position is detected.	
5			Lens		Transfers the document image to CCD.		
6	CCD SENSOR	CCD OUT	CCD (Image) sensor	CCD	Scans the document images (photo signals) and converts them into electrical signals.	Digital signal (8Bit)	
7			Scanner lamp		Radiates light to the document to allow the CCD to scan the document images.		
8	SL SENSOR	PDA/PDK	Scanner lamp light quantity sensor	Photo diode	Detects the scanner lamp light quantity. This signal is inputted to the scanner lamp control PWB to control the scanner lamp drive voltage to maintain a constant level of light quantity.	Analog signal (0 ~ 0.5V)	
9			No. 1 mirror		Leads the document image to CCD.		
10			No. 2 mirror		Leads the document image to CCD.		
11			No. 3 mirror		Leads the document image to CCD.		

(3) Operation

a. Wiring diagram



*** Copy lamp**

A cathode ray tube (Xenon lamp) is used as the light source for reading images.

To maintain the lamp light quantity at constant level, the following operations are performed.

The copy lamp light quantity sensor is provided in the scanner unit to detect the copy lamp light quantity.

The copy lamp drive voltage corresponding to the sensor output level (CLIN) is outputted.

The copy lamp is driven by the scanner lamp control PWB.

* CCD unit

Images (light) is converted into an electrical signal (analog signal) by the CCD.

The image signal read by the CCD is converted into a digital signal by the A/D converter in the MCU PWB and outputted to the ASIC, where the image is processed.

* Scanner motor

The scanner unit is driven by the scanner drive motor.

* Scanner home position sensor

The scanner home position sensor senses the scanner position. The copy image position control is performed by the sensing timing of this sensor.

* Zooming

Zooming is performed by changing the copy magnification ratio in the sub scanning direction or changing the scanning speed.

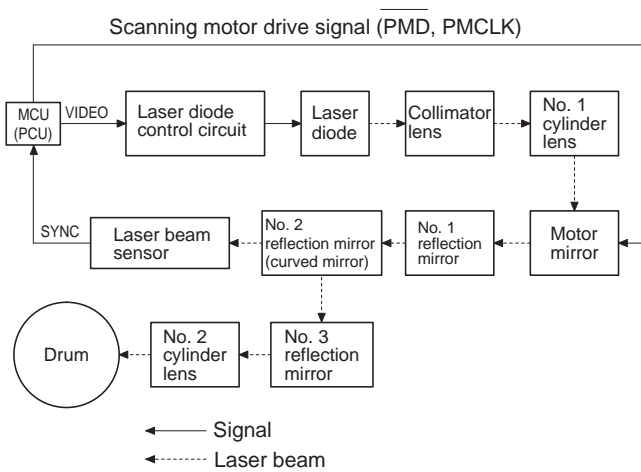
The copy magnification ratio in the main scanning direction is changed by the software in the ASIC.

C. Scanner (writing) section

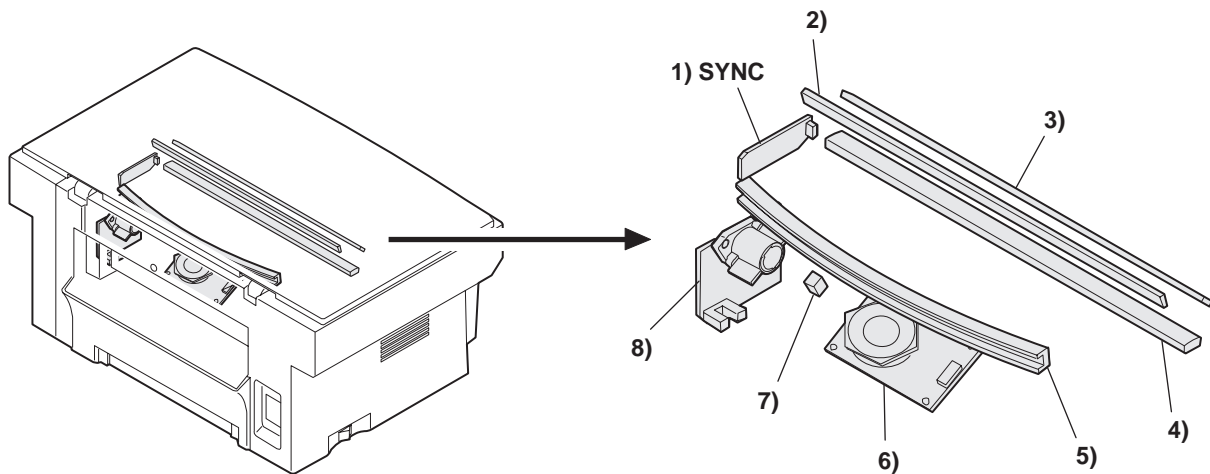
(1) Outline

In this section, the dot image data sent from the MCU PWB are converted into laser beams (ON/OFF), which are scanned to form latent electrostatic images on the OPC drum. It is composed of the laser beam generating section (where dot image data signals are converted into laser beams (ON/OFF)), the laser beam correction section, the laser beam scanning section, and the laser beam detecting section. The major parts and their functions are described in the following.

(2) Block diagram



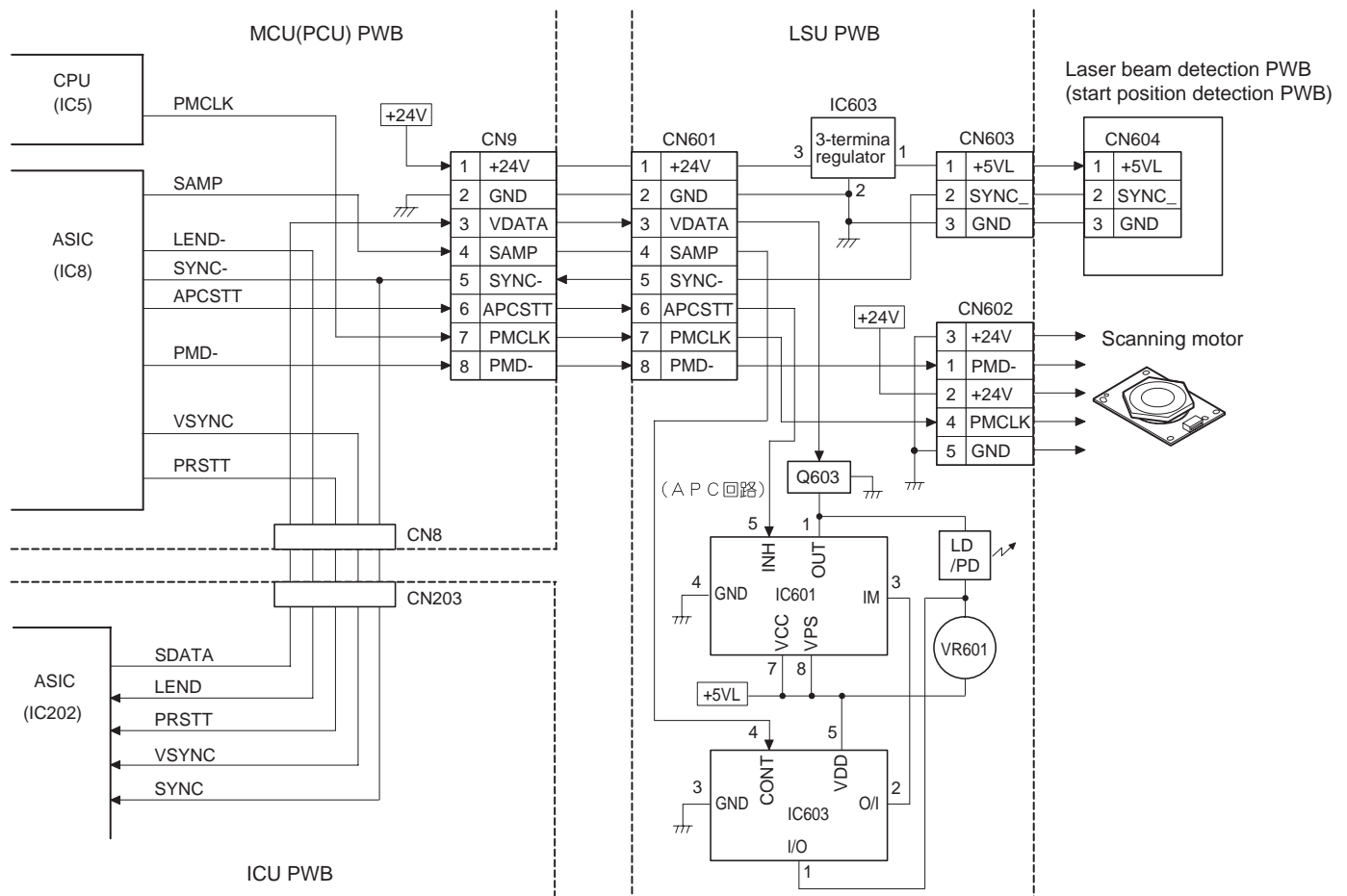
(3) Major parts



No.	Parts						Note
	Code	Signal name	Name	Type	Function/operation	Active condition	
1	SYNC	SYNC IN	Laser beam sensor	Bin diode	Detects the laser beam position. By this signal the left image print start position is controlled.	LOW (0V) when laser beam is detected.	
2			No. 1 mirror				
3			No. 3 mirror		Leads the laser beam to the OPC drum.		
4			Second cylindrical lens		Corrects the laser beam deflection by variations in the scanning mirror angle. Corrects the optical section dirt.		
5			F θ mirror (No. 2 mirror)		Corrects the laser beam form and pitch.		
6			Scanning mirror (rotation mirror)		Scans the laser beam and performs imaging.		
7			No. 1 cylindrical lens		Adjust the direction of laser beam.		
8			Laser diode		Generates laser beam. (Controls ON/OFF for imaging)		

(4) Operation

a. Wiring diagram



b. Operation

The APC circuit is started by the APCSTT signal sent from the MCU (PCU) PWB, and laser diode is turned on/off according to the VIDEO signal. (The laser diode is turned on when the VDATA signal is HIGH.)

When the laser diode is turned on, 780nm infrared semiconductor laser beams are radiated from the laser diode and arranged to be parallel beams by the collimator lens and focused to the photoconductor drum by No. 1 cylinder lens and sent to the scanning mirror.

Rotation of the scanning mirror is controlled by the scanning motor to scan laser beams.

The scanning mirror is a 6-surface mirror. Six lines are printed for one rotation of the scanning motor. Laser beams reflected by the scanning mirror are passed to the curved mirror by the No. 1 reflection mirror. Before reaching the curved mirror, the laser beams enter the laser beam sensor on the start position detection PWB to make horizontal synchronization (generating SYNC signal).

The laser beams from No. 1 reflection mirror are arranged to be parallel beams by the curved mirror and passed to No. 3 reflection mirror. The laser beams reflected by No. 3 reflection mirror are passed through No. 2 cylinder lens to the photoconductor drum.

No. 2 cylinder lens corrects deflection of laser beams due to variations in the duplex scanning mirror installing angle, and leads the stable laser beams for each line to the photoconductor drum.

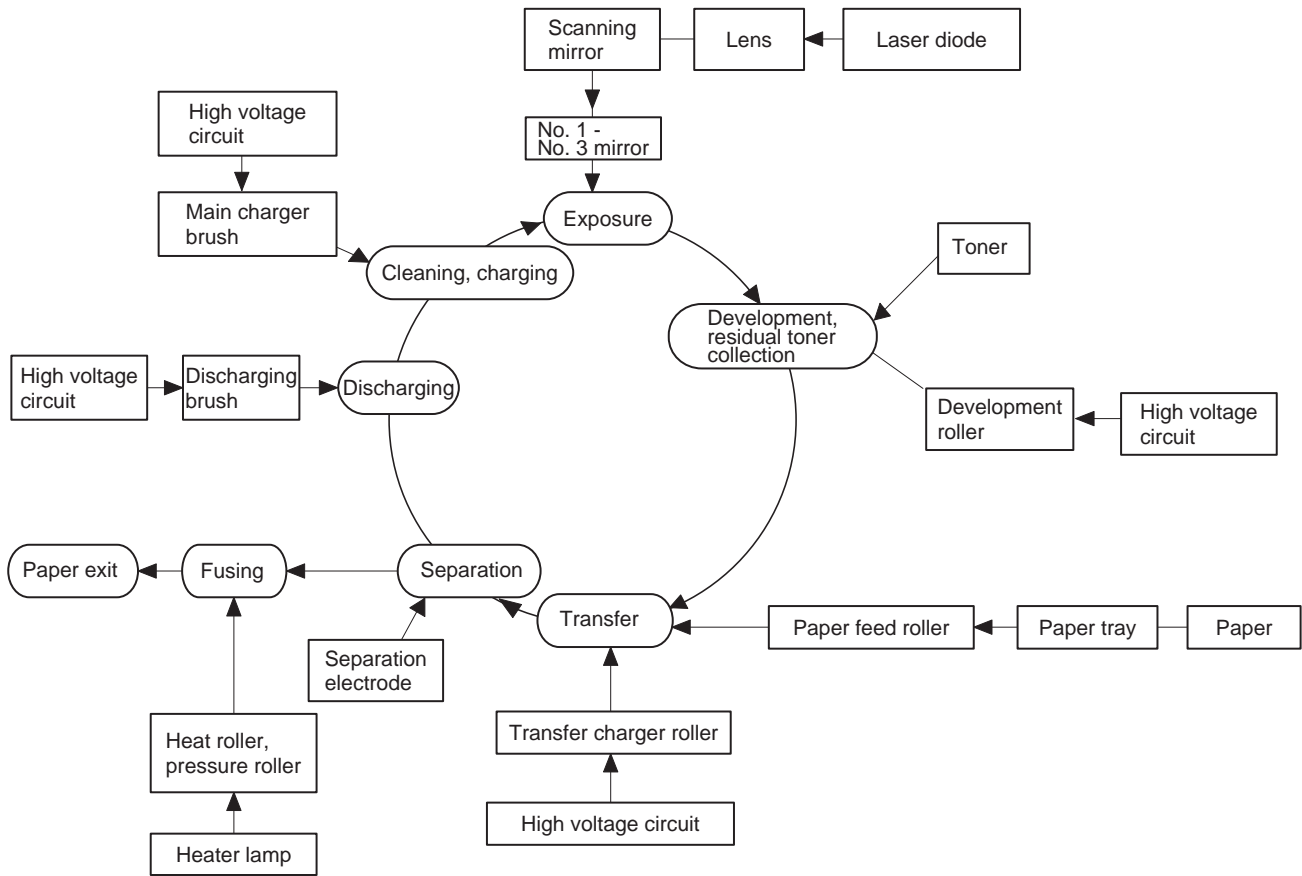
Part name	Function
Laser diode	The laser power is controlled by the APC (Auto Power Control) circuit. In addition, the paper empty sensor is provided. The laser diode radiates 780nm infrared semiconductor laser beams under control of the laser control PWB.
Collimator lens	The collimator lens arranges laser beams radiated from the laser diode to be parallel beams and converges them on the photoconductor drum.
No. 1 cylindrical lens	Adjusts the direction of the laser beams.
Scanning motor/ Scanning mirror	Used to rotate the scanning mirror. Started by the drive signal (PMD_) from the PCU. The RPM is controlled by the clock signal (PMCLK_). The motor RPM is 11811 RPM. The scanning mirror is a 6-surface mirror, and it reflects laser beams. By this operation, 6 lines of printing is made for one rotation of the scanning motor.
No. 1 mirror	This mirror reflects laser beams to the curved mirror.
Laser beam sensor PWB (Start position detection PWB)	Used to detect laser beams to make horizontal synchronization. The photo sensor on the PWB detects laser beams to generate SYNC signal.
No. 2 mirror (Curved mirror)	Laser beams are scanned by the scanning mirror. But the dot interval of laser beams radiated onto the photoconductor differs at the center and at the corners. This mirror corrects this difference to provide even dot interval of laser beams. For this reason, it is of curved structure.
No. 3 mirror	This mirror passes the laser beams reflected from the curved mirror to the photoconductor mirror.
No. 2 cylindrical lens	This lens is used to correct laser beam deflection due to variations in the scanning mirror angle.

D. Image process section

(1) Outline

This section is composed of the photoconductor section, the developing section, the transfer/separation section. Images formed by laser beams formed by the scanner (Writing) section are converted into a latent electrostatic images, which are formed into visible images by toner development. The toner images are transferred onto paper.

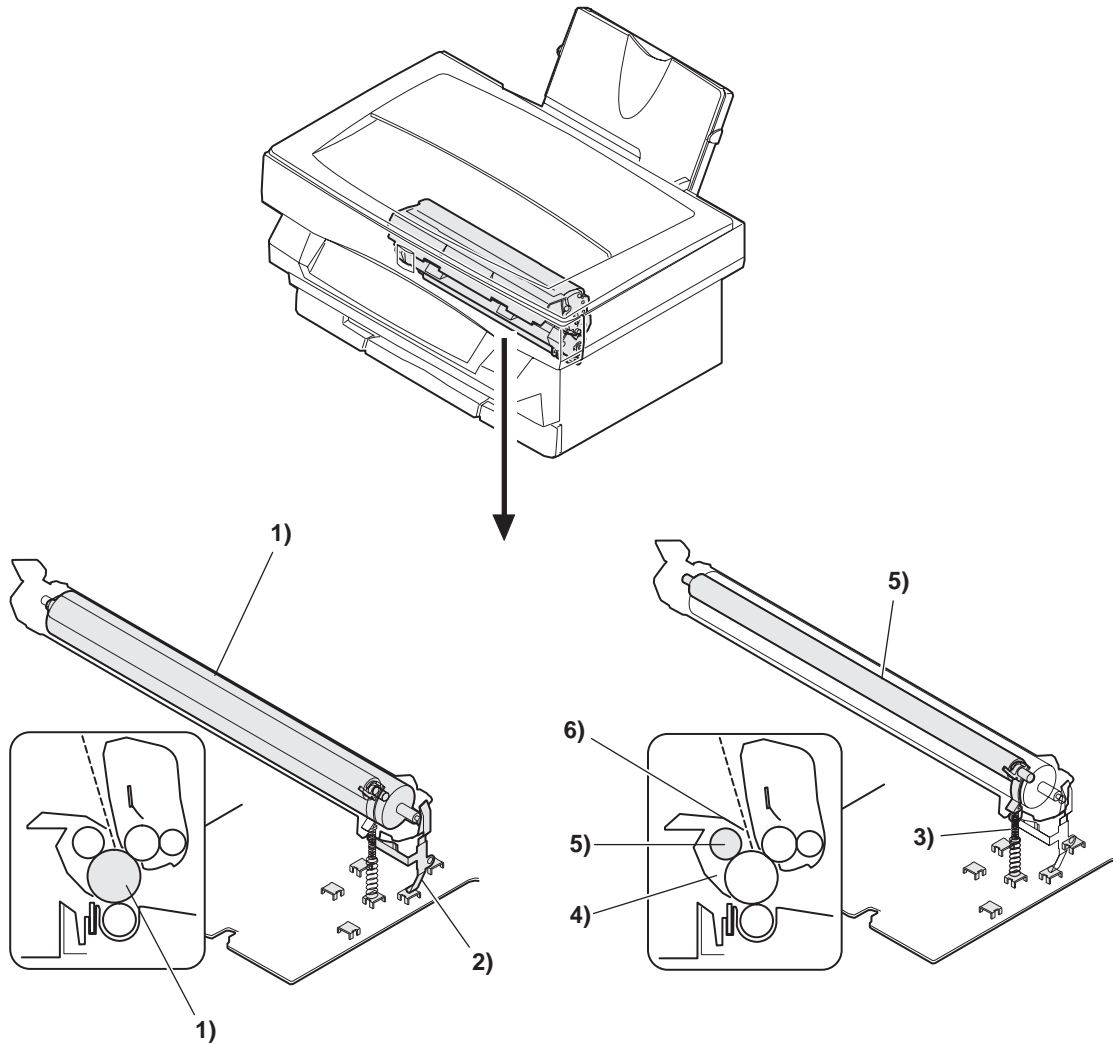
(2) Image forming process diagram



The operation of this section are composed of the six processes: charging, exposure, development, transfer, separation, and discharging. An OPC drum is used as the photocoductor drum. Toner is of one-component. For charging, the rotation brush is used. For transfer, the roller is used and virtually no generation of ozone. It is also compact. The high voltage required in this section is provided by the high voltage power PWB.

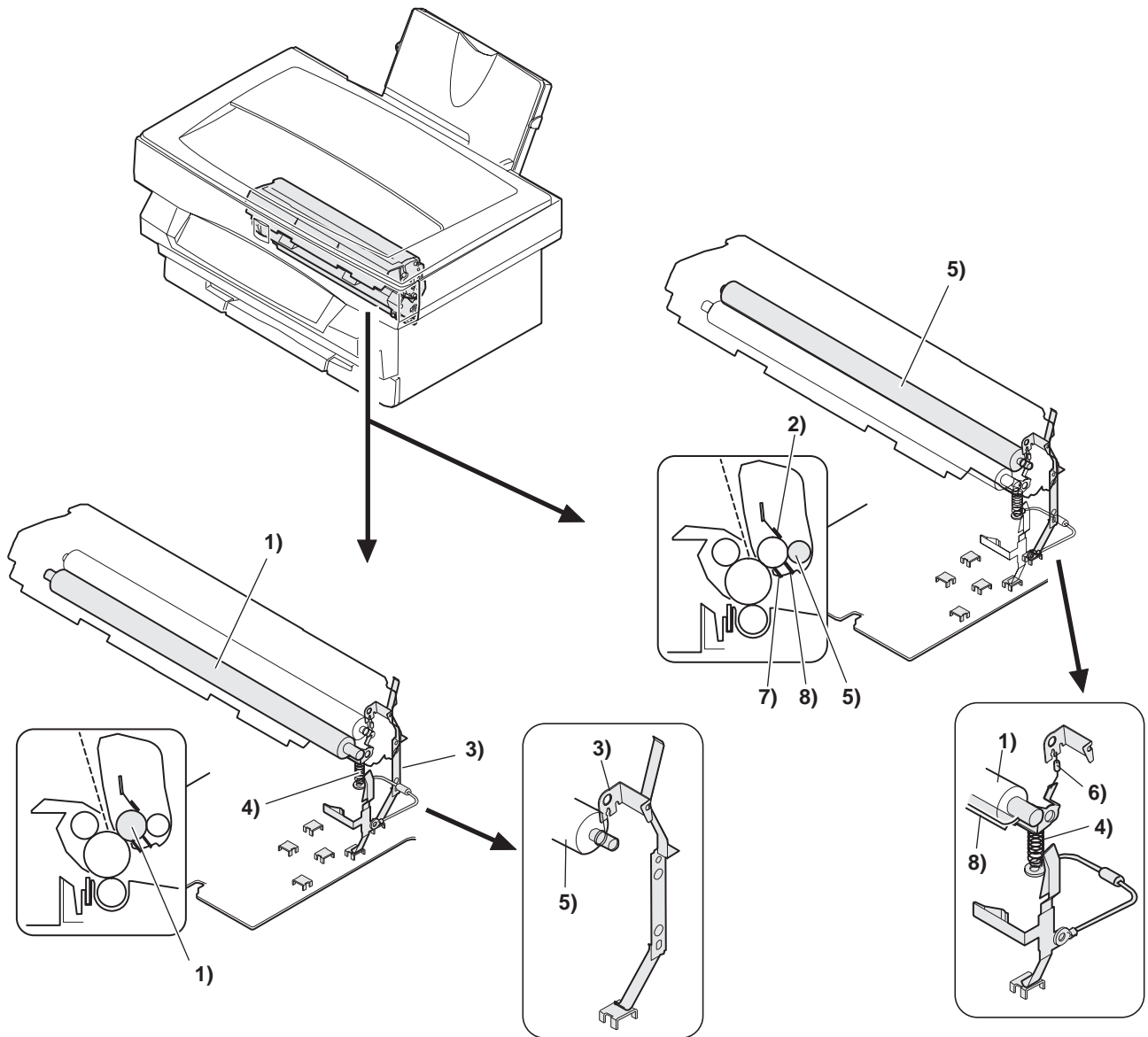
(3) Major parts

a. Photoconductor section



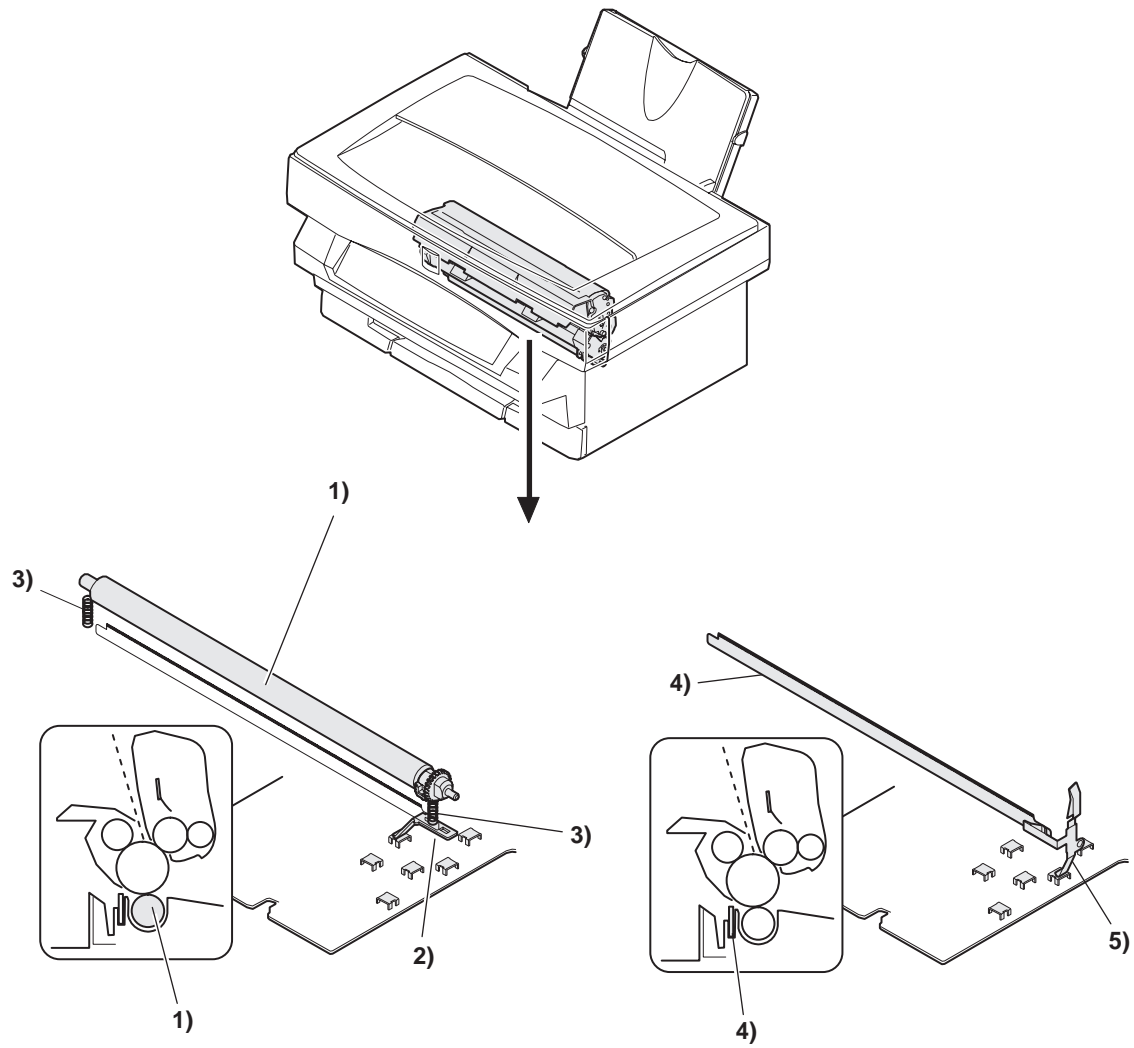
No.	Parts			Note
	Name	Type	Function/operation	
1	OPC drum	OPC	Forms latent electrostatic images.	
2	OPC drum earth electrode		Connects the OPC drum aluminum layer and the earth (high voltage PWB).	
3	Main charger electrode		Connects the main charger output (high voltage PWB) and the main charger brush.	
4	Discharge brush		Discharges (lower the potential of) the OPC drum surface.	Japan only
5	Main charger brush		Charges the OPC drum.	
6	Toner seal		Shield to prevent toner from leaking outside the OPC drum unit.	

b. Development section



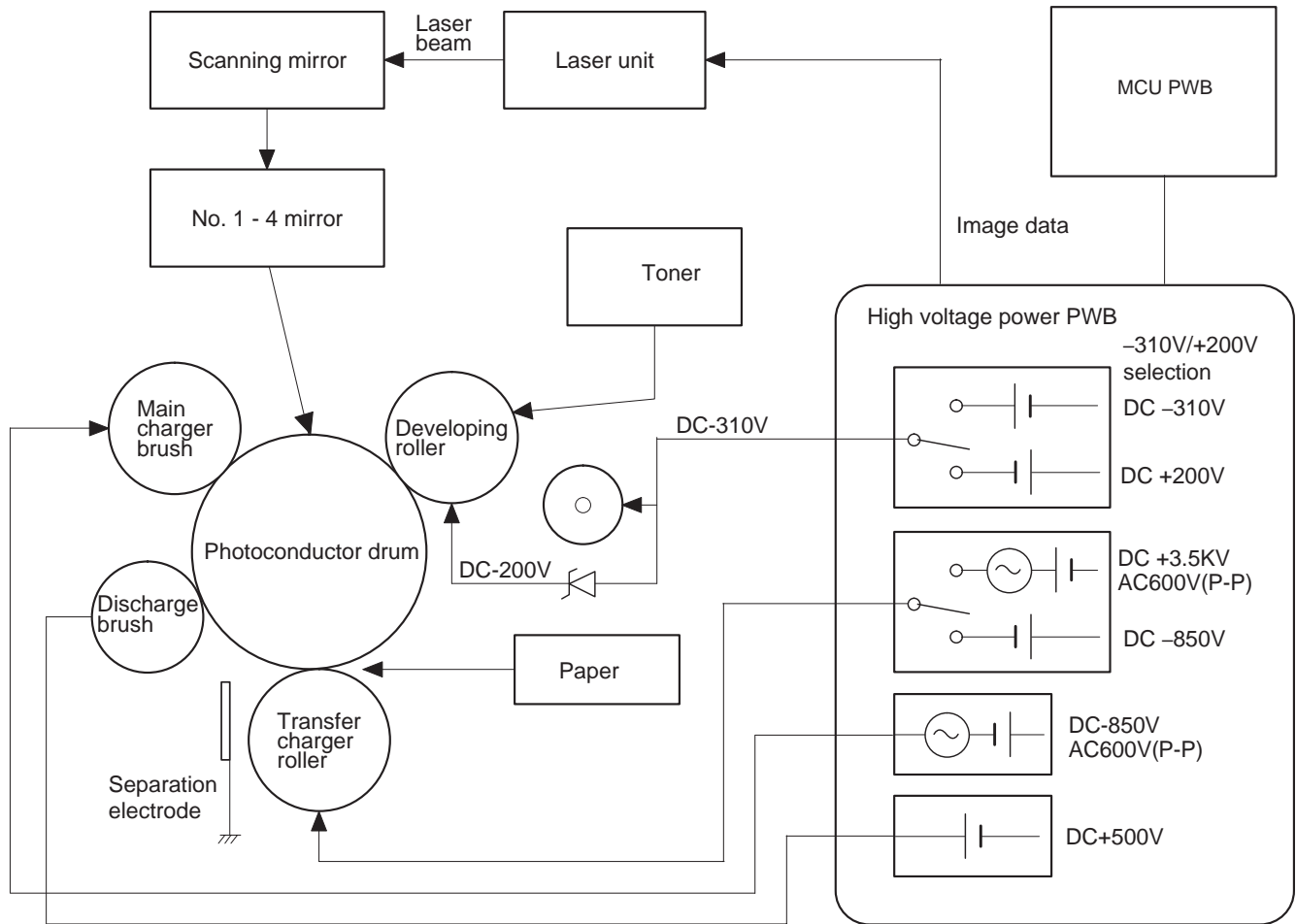
No.	Parts			Note
	Name	Type	Function/operation	
1	Developing roller		Attaches toner to the latent electrostatic images on the OPC drum to convert it into a visible image.	
2	Developing doctor		Controls toner quantity on the developing roller and charges toner.	
3	Developing bias electrode		Connects the developing roller and the bias voltage output (high voltage PWB).	
4	Potential control electrode		Connects the developing roller and the bias voltage output (high voltage PWB).	
5	Toner stirring roller		Lead toner to the developing roller and charges toner.	
6	Zenor diode		Maintains the potential between the developing roller and the toner stirring roller at a constant level.	
7	Toner seal		Shields toner from leaking outside the developing unit.	
8	Potential control sheet		Maintains the developing roller potential at a constant level.	

c. Transfer/separation section



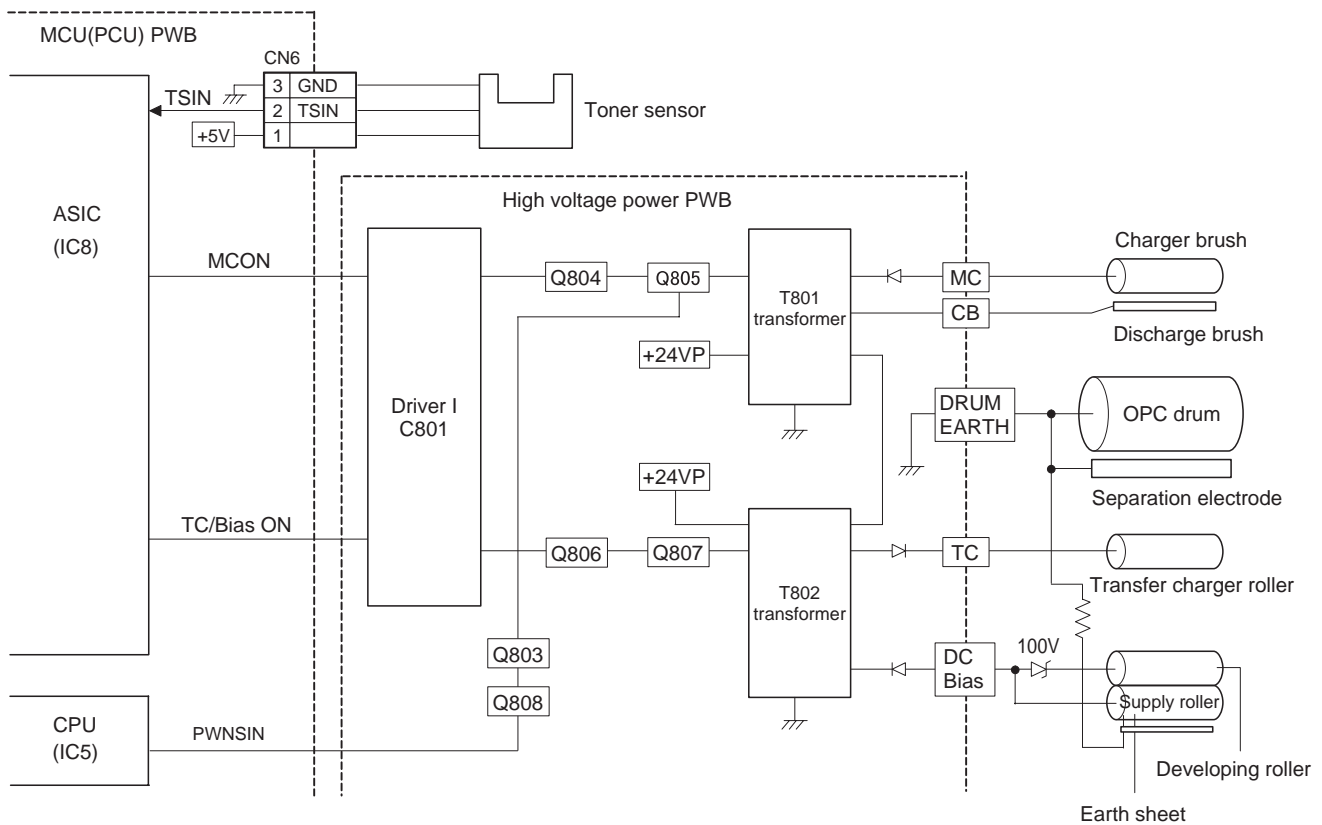
No.	Parts		Note
	Name	Function/operation	
1	Transfer roller	Transfers toner images on the OPC drum onto the paper.	
2	Transfer roller electrode	Connects the transfer roller and the transfer voltage output (high voltage PWB).	
3	Pressure spring	Applies pressure to the transfer roller, paper, and the OPC drum to improve transfer efficiency.	
4	Separation electrode	Reduces paper charging potential to facilitate separation of paper.	
5	Earth electrode	Connects the separation electrode and the earth (high voltage PWB).	

(4) System diagram

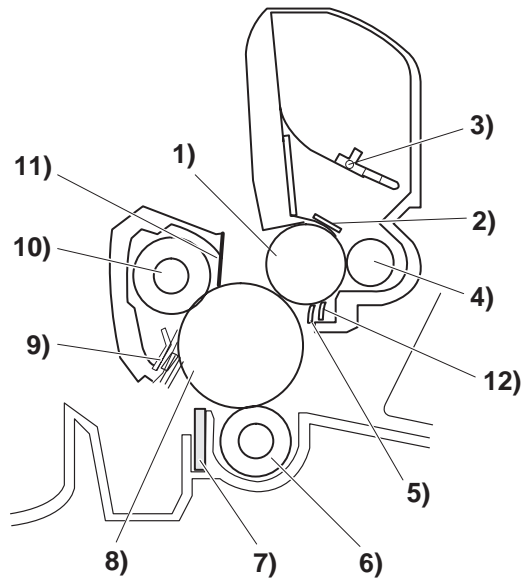


(5) Operation

a. Wiring diagram



b. Major parts functions and operations



1	Developing roller	5	Toner seal	9	Discharge brush
2	Doctor	6	Transfer charger roller	10	Main charger brush
3	Toner stirring plate	7	Separation electrode	11	Toner seal
4	Toner supply roller	8	Phot conductor drum	12	Discharge (Earth) sheet

<1> Photoconductor drum unit

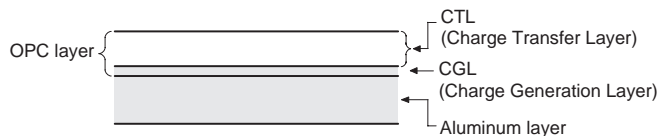
The photoconductor surface is charged and latent electrostatic images are formed, then visible images are formed with toner.

1) Photoconductor drum

Latent electrostatic images are formed and visible images are formed with toner.

An OPC (Organic Photo Conductor) drum is used. The OPC drum surface is negatively charged by the main charger brush.

When laser beams are radiated on the OPC drum, the electric resistance at the radiated area is reduced to generate an electric charge inside the OPC drum. As a result, the charges on the OPC drum are removed. This process is used to form latent electrostatic images.



2) Main charger brush

The main charger brush charges the OPC drum surface. It is composed of brush textures and of a roller shape.

A high voltage of AC 600V (P-P) is applied to DC-850V to charge the brush.

The main charger brush is in contact with the OPC drum. By supplying electric charges to the OPC drum, the OPC drum is charged to about -850V.

3) Toner seal

The OPC drum has two toner seals. The toner seals are used to prevent residual toner on the OPC drum from leaking outside.

<2> Developing unit

Visible images are formed with toner over the latent electrostatic images formed on the OPC drum surface. Toner is filled in the developing unit.

1) Developing roller

The developing roller is made of urethane and it has considerably high electrical resistance. It is flexible and pressed onto the OPC drum. Toner is attached to the latent electrostatic images on the OPC drum to make visible images. A voltage of DC-310V/+200V is applied to the developing roller. A voltage of -310V is applied when developing. A voltage of +220V is applied when cleaning.

2) Doctor

The doctor is pressed onto the developing roller. It adjust the toner quantity on the developing roller surface.

The doctor is made of a conductive material.

3) Toner supply roller

The toner supply roller transports toner to the developing roller.

4) Toner stirring plate

The toner stirring plate stirs toner in the developing unit to transport toner to the developing roller smoothly.

5) Toner seal

The toner seal prevents toner from leaking outside the developing unit.

6) Discharge (Earth) sheet

The discharge sheet maintains the developing roller surface potential at a constant level.

<3> Transfer charger roller

The transfer charger roller is made of urethane and its electrical resistance is considerably high. It is flexible and pressed onto the OPC drum.

A high voltage of AC600V (P-P) is applied to DC +3500V.

Paper transported from the paper feed section is charged positively and negatively charged toner on the OPC drum are transferred onto the paper.

During cleaning, a voltage of -850V is applied.

<4> Separation electrode

The separation electrode is connected to the drum earth. This discharges paper charged positively in the transfer section to reduce potential difference with the OPC drum, reducing electrostatic attraction power between paper and the OPC drum, facilitating paper separation.

<5> High voltage unit

The high voltage is made by the inverter system, and is supplied to the main charger unit, the transfer unit, and the developing roller.

c. Actual image forming process

Step 1 (Cleaning, charging): Residual toner on the OPC drum is stirred and negative charges are distributed evenly on the OPC drum. (The OPC drum is evenly charged.)

The main charger brush is of roller shape and is rotating. The main charger brush stirs residual toner and paper dust on the OPC drum.

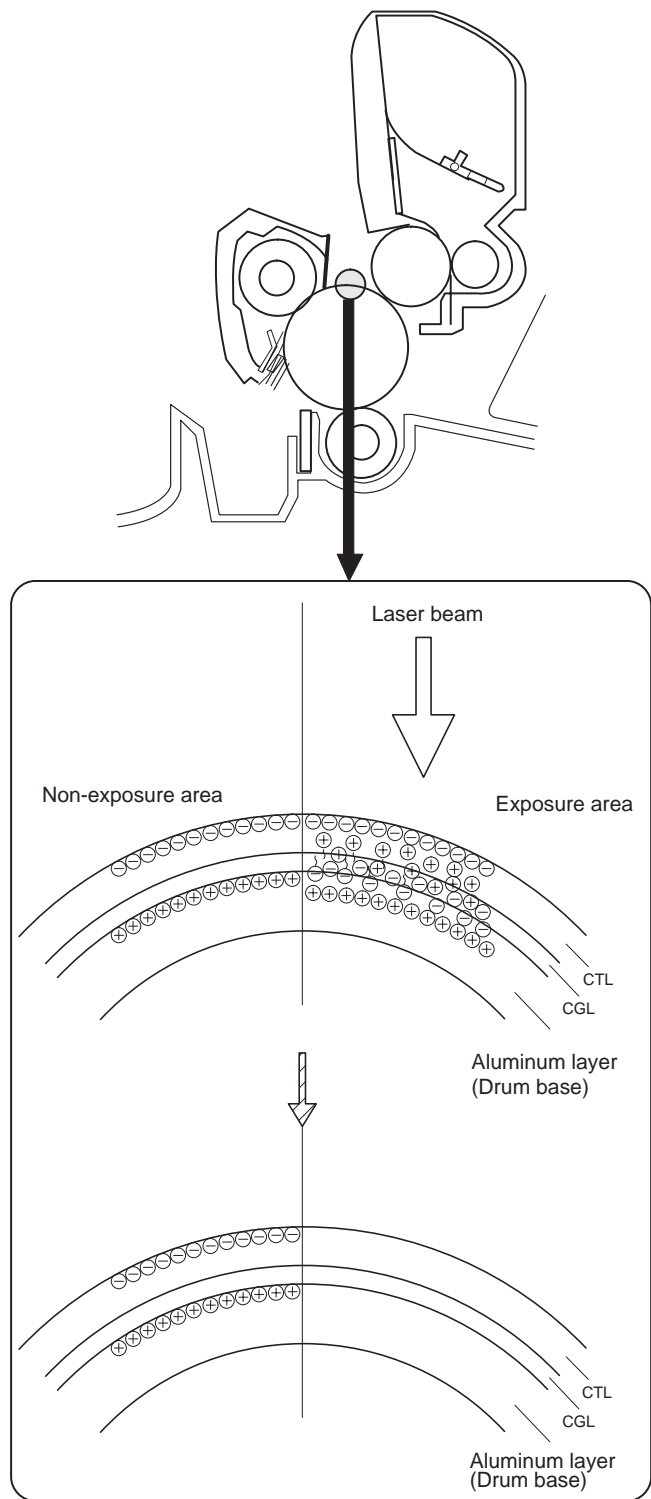
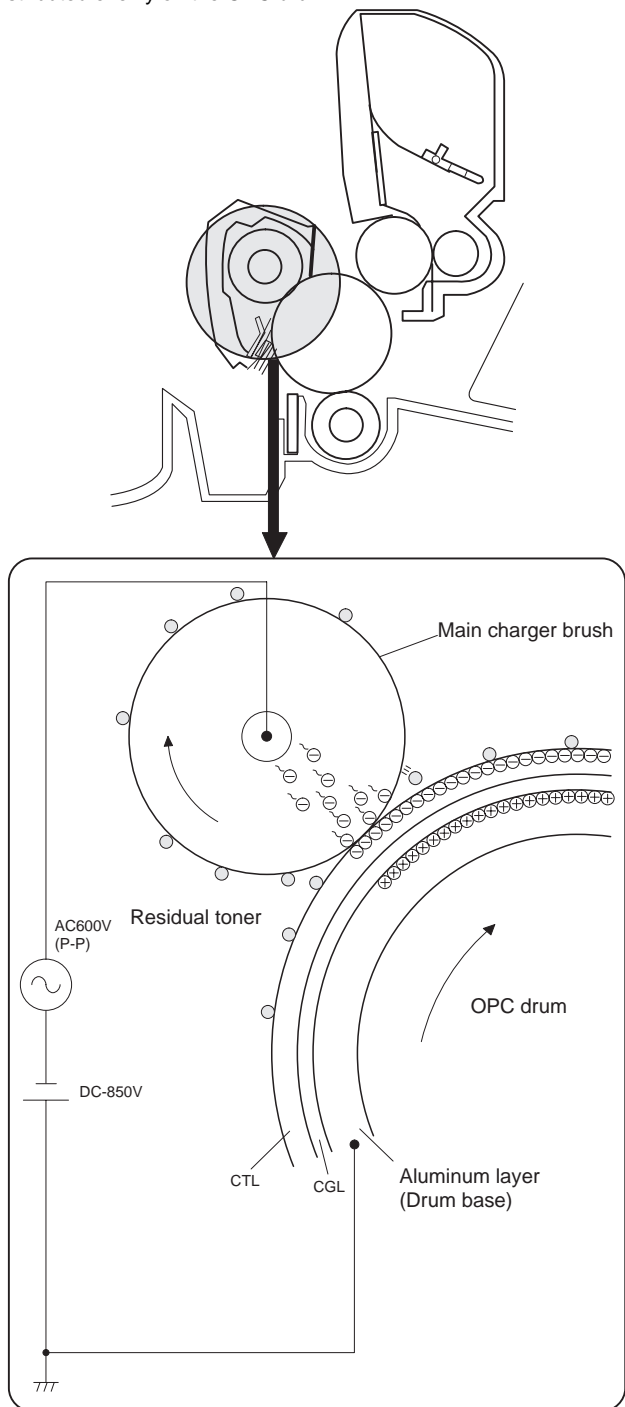
At the same time, a high voltage of AC 600V (P-P) is applied to DC -850V and applied to the main charger brush to make electric discharge between the roller and the OPC drum to form positive and negative charges. The negative charges are attracted to the OPC drum which is positively charged. And negative charges are evenly distributed on the OPC drum. (The OPC drum surface is evenly charged.)

Residual toner and paper dust stirred by the main charger brush are distributed evenly on the OPC drum.

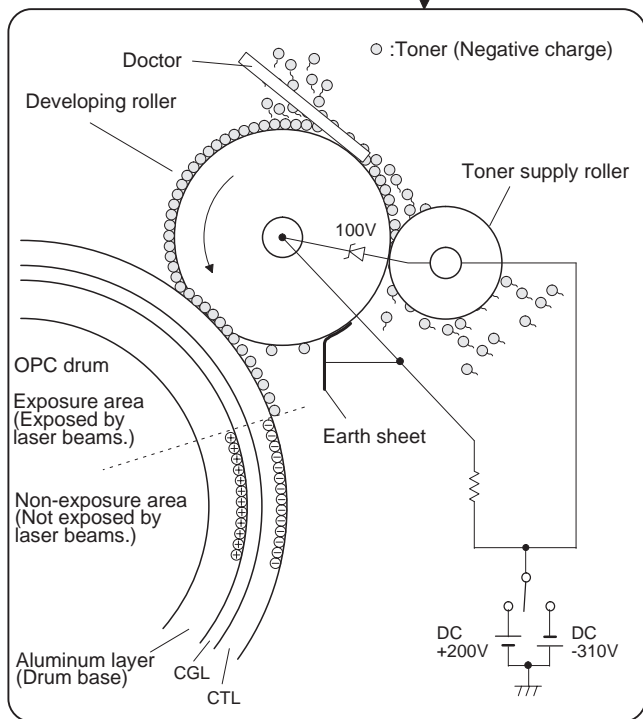
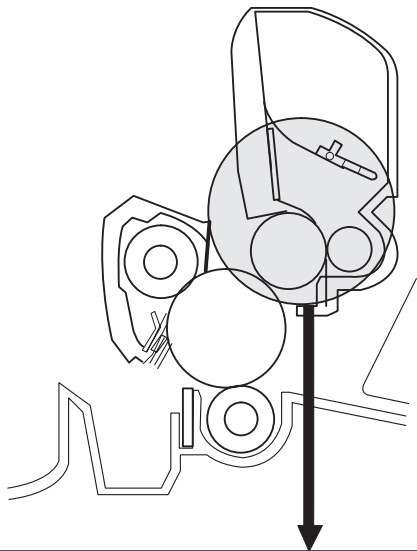
Step 2 (Exposure); Laser beam scanning light corresponding to the print data is radiated onto the OPC drum.

Positive and negative charges are generated in the CGL of the OPC drum which are radiated with laser beams. The positive charges in the CGL are moved to the OPC drum surface, and the negative charges are moved to the aluminum layer.

Therefore, positive and negative charges are neutralized in the OPC drum exposed with laser beams and the aluminum layer, reducing the OPC drum surface potential. On the other hand, there is no change in the area which is not exposed with laser beams. So the OPC drum surface is kept negatively charged to maintain a high potential. As a result, latent electrostatic images are formed on the OPC drum.



Step 3 (Development): Toner is attached to the latent electrostatic images formed on the OPC drum.



Toner enters between the developing roller and the doctor, and a thin layer of toner (a certain fixed amount) is formed on the developing roller by a pressure applied to the doctor.

Toner is negatively charged by friction when passing between the developing roller and the doctor.

When the OPC drum surface area where there is no charges because of exposure of laser beams is brought into contact with the developing roller, toner is moved from the developing roller to the OPC drum surface. The principle of the process is as follows:

A bias voltage of $-310V$ is applied to the developing roller. Toner which is charged by potential difference between the bias voltage and the OPC drum surface potential is attracted to the OPC drum surface (positively charged).

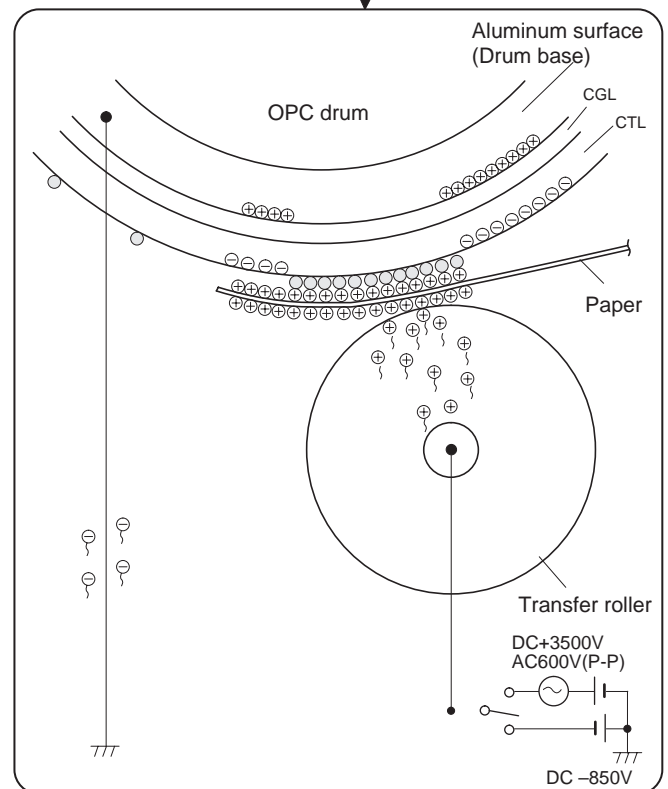
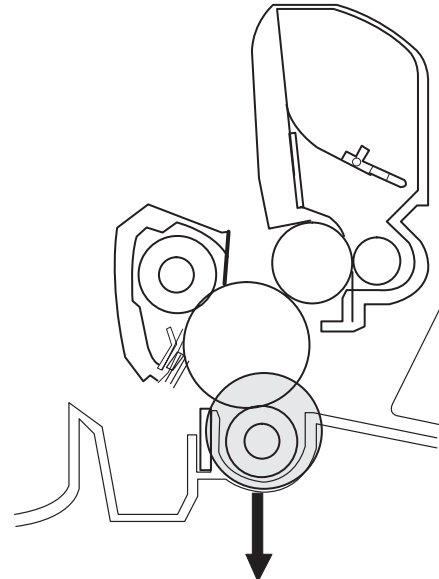
At that time, the potential of the OPC drum surface where there is no charge by exposure of laser beams is higher than the developing roller potential. On the other hand, there are negative charges in the OPC drum surface area which is not exposed to laser beams. When that area is brought into contact with the developing roller, if toner is attached to the OPC drum, toner is moved to the developing roller which is in a high potential than the OPC drum.

As a result, unnecessary toner and paper dust on the OPC drum are collected in the developing unit.

In this operation, toner is moved from the OPC drum to the developing roller.

In cleaning operation mode, DC $+200V$ is applied to the developing roller and cleaning capacity is further increased.

Step 4 (Transfer): Visible images of toner on the OPC drum are transferred to the paper.



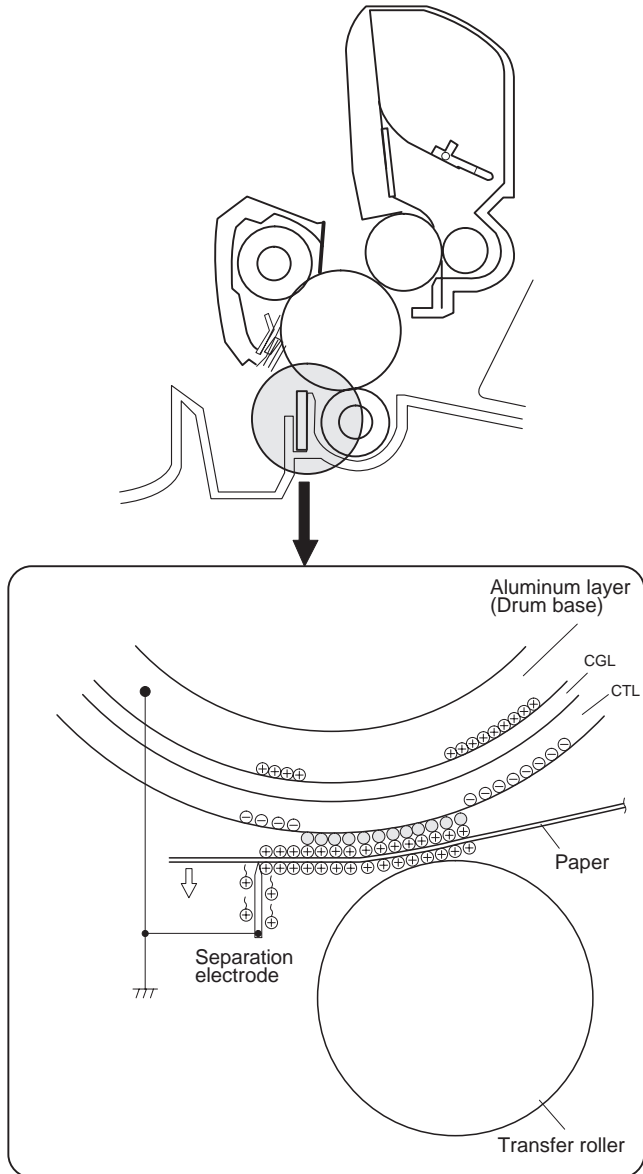
A high voltage of AC 60V (P-P) is applied to DC +350V and applied to the transfer roller, generating electric discharge between the roller and the OPC drum, generating positive and negative charges.

The positive charges are attracted to the OPC drum which is negatively charged, and put on the paper transported between the transfer roller and the OPC drum. The paper, therefore, is charged positively.

The negative charged toner on the OPC drum is attracted to the paper which is positively charged and visible images of toner are transferred onto the paper.

In the cleaning mode, a voltage of -850 V is applied. If there is toner on the transfer roller, the toner is attracted to the OPC drum.

Step 5 (Paper separation): Paper is separated from the OPC drum.

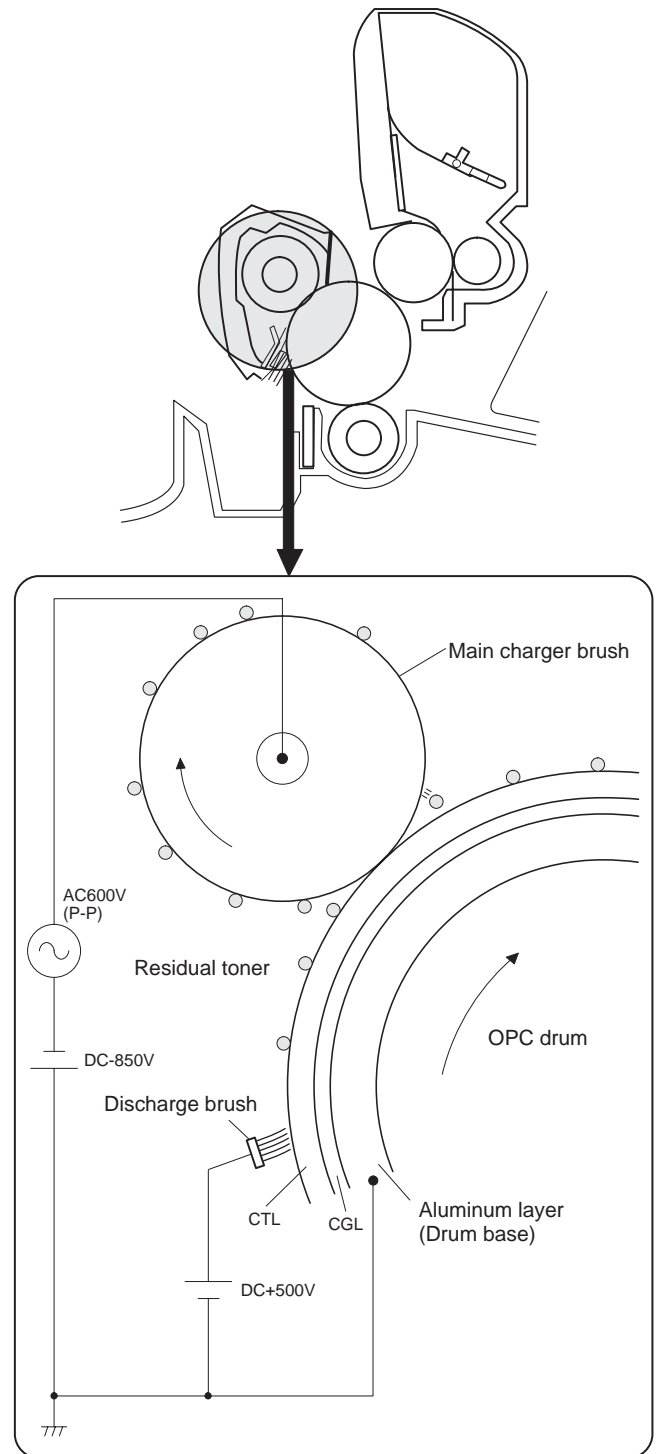


An electric force is acting between the paper which is positively charged in the transfer process and the OPC drum which is negatively charged. Positive charges on the paper are moved to the aluminum layer through the separation electrode to reduce the potential difference between the OPC drum and the paper.

By this operation, the paper can be easily separated from the OPC drum.

Step 6 (Discharging): The drum surface is discharged by the discharge brush to facilitate cleaning. (Residual toner can be easily collected by the main charger roller.)

Step 7 (Cleaning): Residual toner on the OPC drum is removed.

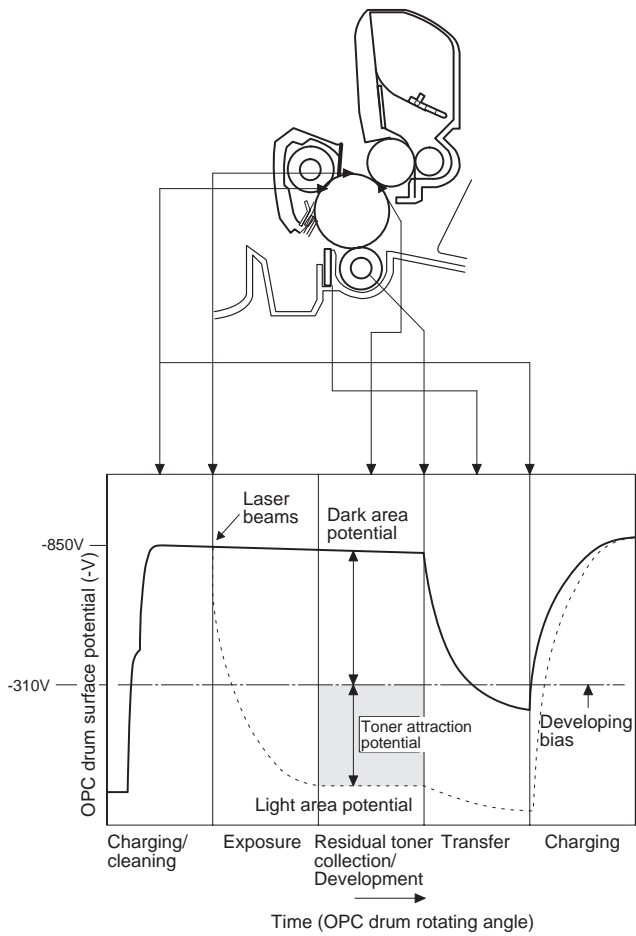


The main charger brush is of roller shape and is rotating.

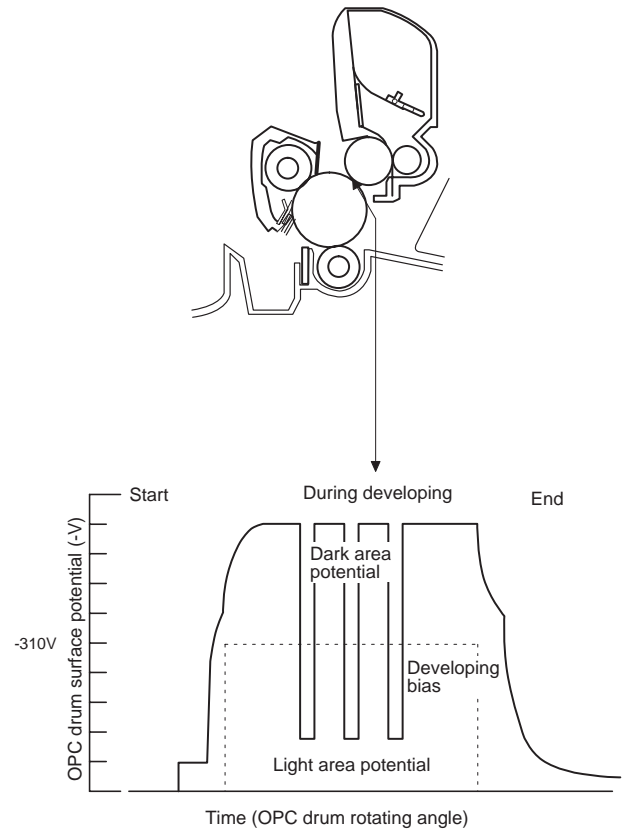
The main charger brush stirs residual toner and paper dust on the OPC drum. The residual toner and paper dust are evenly distributed and put on the OPC drum again to be sent to the developing roller.

d. OPC drum surface potential

<1> OPC drum surface potential shift in printing



<2> OPC drum surface potential and developing bias voltage during developing

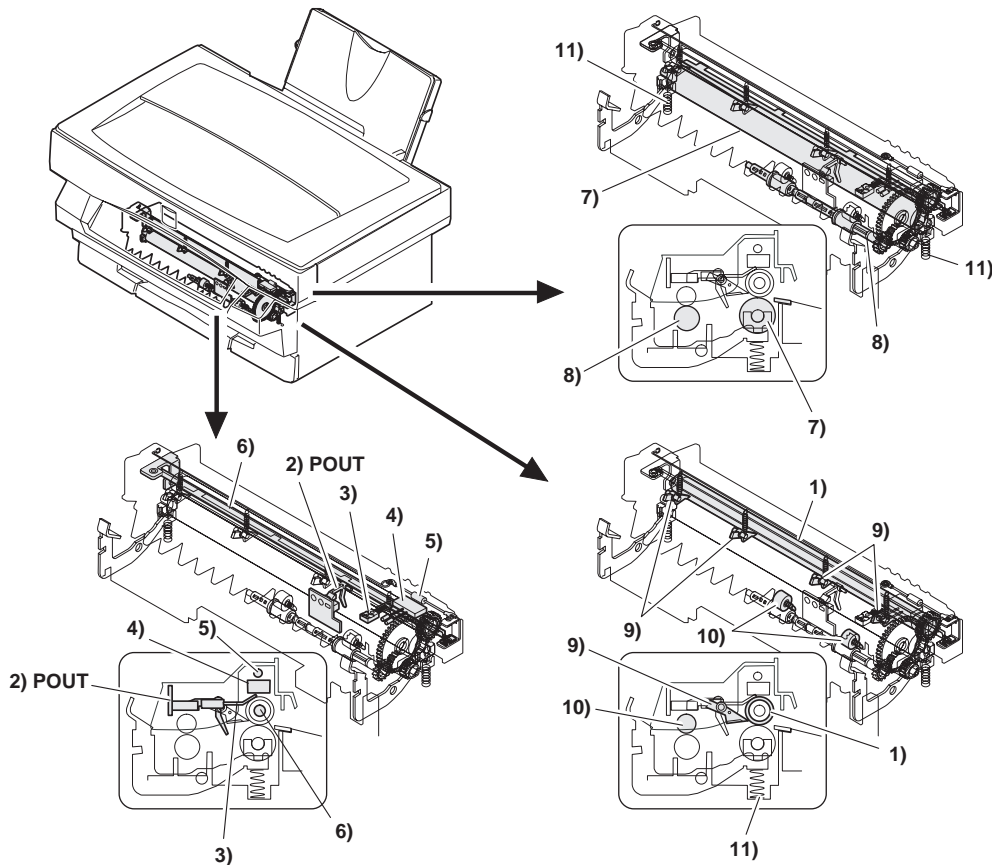


E. Fusing/paper exit section

(1) Outline

Toner attracted to the paper in the transfer section is fused by heat and pressure of the heat roller. The heat roller is of thin aluminum roller which is high heat conductivity, minimizing the warm up time. The heat roller surface temperature is detected by the fusing temperature sensor to maintain the fusing temperature at a constant level (160/155 °C).

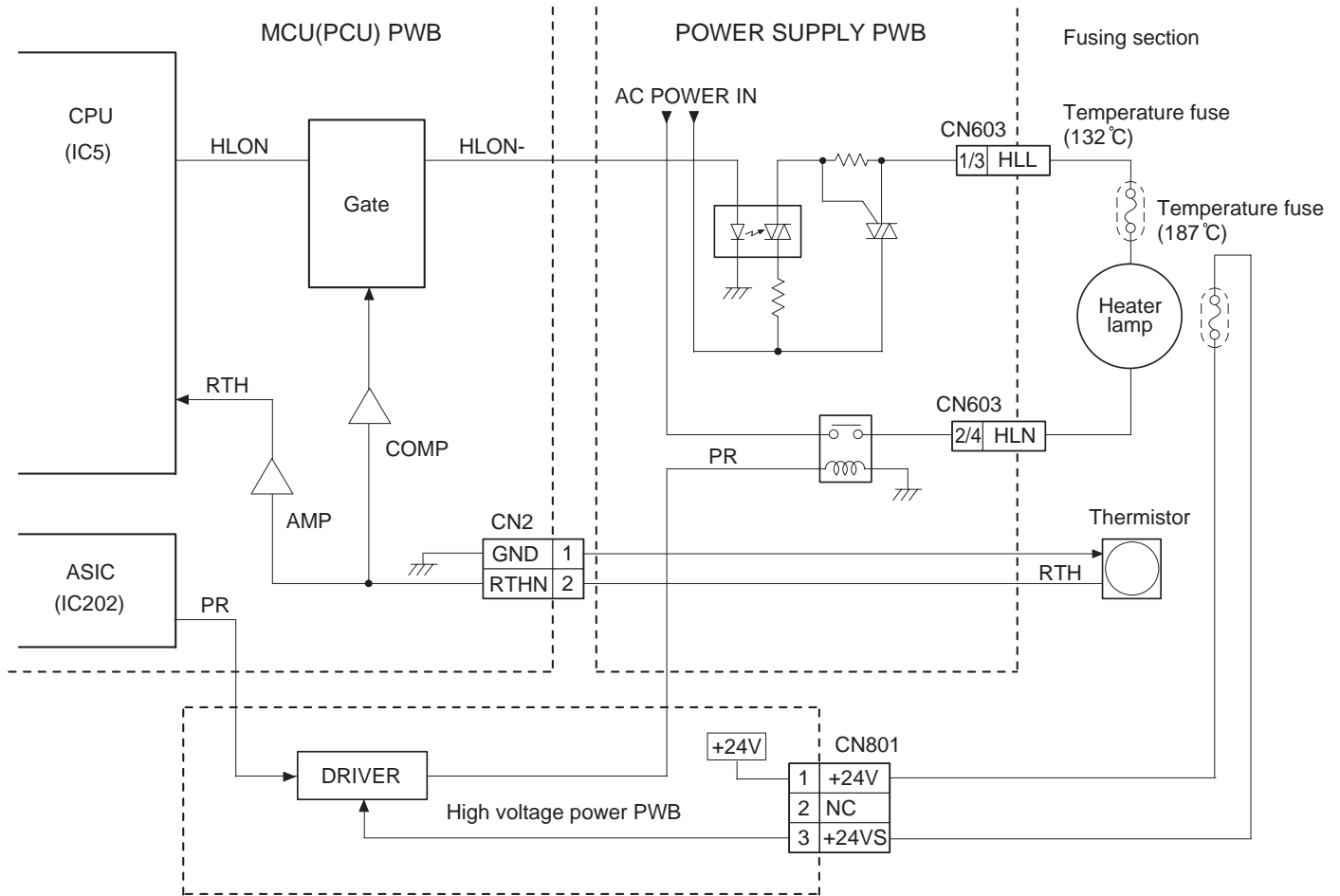
(2) Major parts



No.	Parts						MODEL	Note
	Code	Signal name	Name	Type	Function/operation	Active condition		
1			Heat roller		Heats toner on the paper and fuses onto the paper.	LOW (0V) when paper is detected.		
2	POUT	POUT IN	Paper exit detector	Photo transmission sensor	Detects paper exit.			
3		RTH IN	Fusing temperature sensor	Thermistor	Detects the heat roller surface temperature.			
4			Temperature fuse 1 (Fusing section)	Mold	Assures safety in overheating.			
5			Temperature fuse 2 (Fusing section)	Mold	Assures safety in overheating.			
6		HL	Heater lamp	Halogen lamp	Heats the heat roller.		100V series 120V series 200V series	10V 500W 120V 500W 230V 500W
7			Pressure roller		Applies a pressure to the heat roller and paper to improve fusing efficiency.			
8			Paper exit roller		Discharges paper after fusing.			
9			Separation pawl		Separates paper from the fusing roller mechanically.			
10			Paper exit roller		Discharges paper outside the machine after fusing.			
11			Pressure spring		Applies a pressure to the heat roller, paper, and pressure roller to improve transfer efficiency.			

(3) Operation

a. Wiring diagram



b. Operation

The heater lamp ON/OFF is controlled by the detection signal (voltage value) from the thermistor to maintain the heat roller surface temperature at the optimum level.

The heat roller surface temperature is controlled to 160/155 °C in the print mode and to 80 °C in the pre-heat mode.

As a protective measure in case of abnormally high temperature in the fusing section, two temperature fuses are provided in the heater lamp power line.

The heater lamp is lighted by the AC power source.

Heat roller:

The heat roller is made of aluminum tube coated with teflon to provide a good separation capability.

Heater lamp:

A halogen lamp is used as the heater lamp.

Pressure roller:

Silicon rubber is used to provide enough pressure.

Thermistor:

A chip-type thermistor of good response is used to detect the heat roller surface temperature.

Temperature fuse (132 °C): The temperature fuse (132 °C) is attached to the fusing cover. When the fusing cover ambient temperature becomes abnormally high, this fuse is blown off.

Temperature fuse (187 °C): The temperature fuse (187 °C) is closely attached to the heat roller. When the heat roller temperature becomes abnormally high, this fuse is blown off.

Separation pawl:

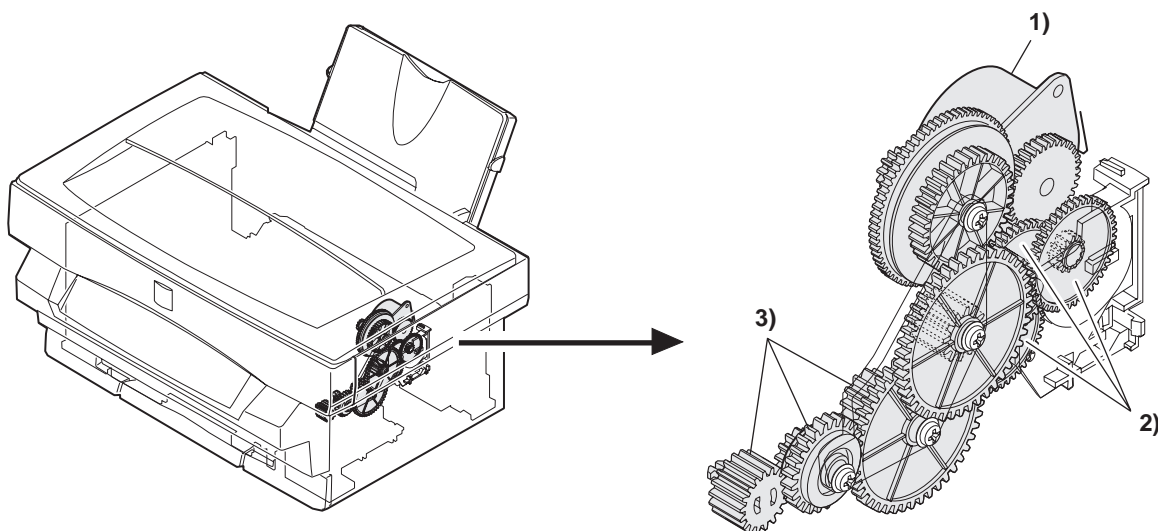
The separation pawl separates paper from the heat roller mechanically.

F. Drive section

(1) Outline

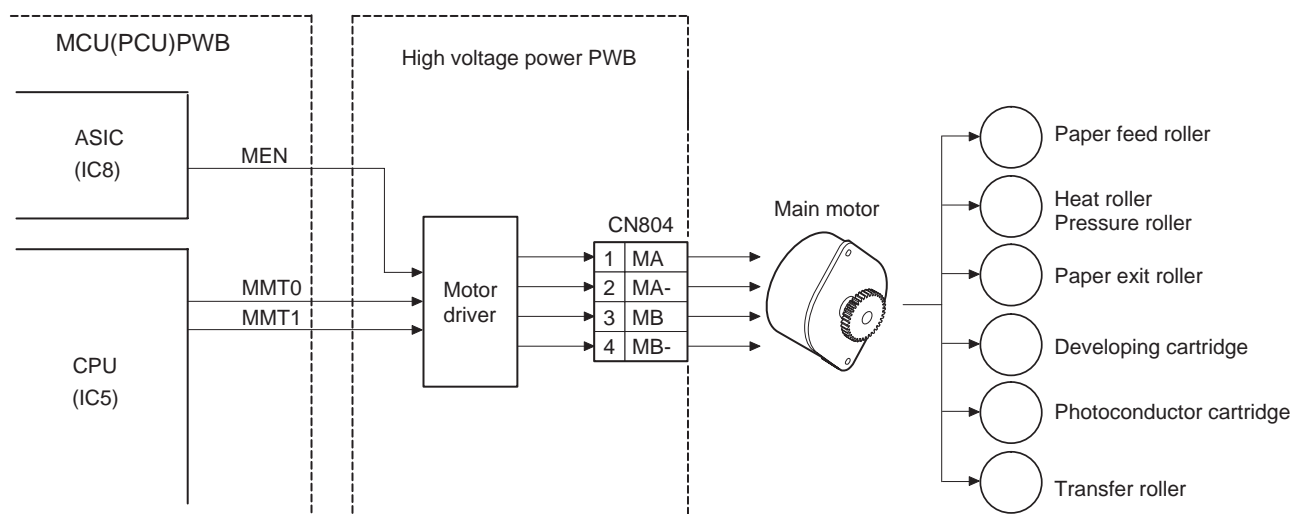
The main motor drives the paper feed section, the transport section, the image process section, and the fusing section. The main motor drive circuit is built in the high voltage power PWB.

(2) Major parts



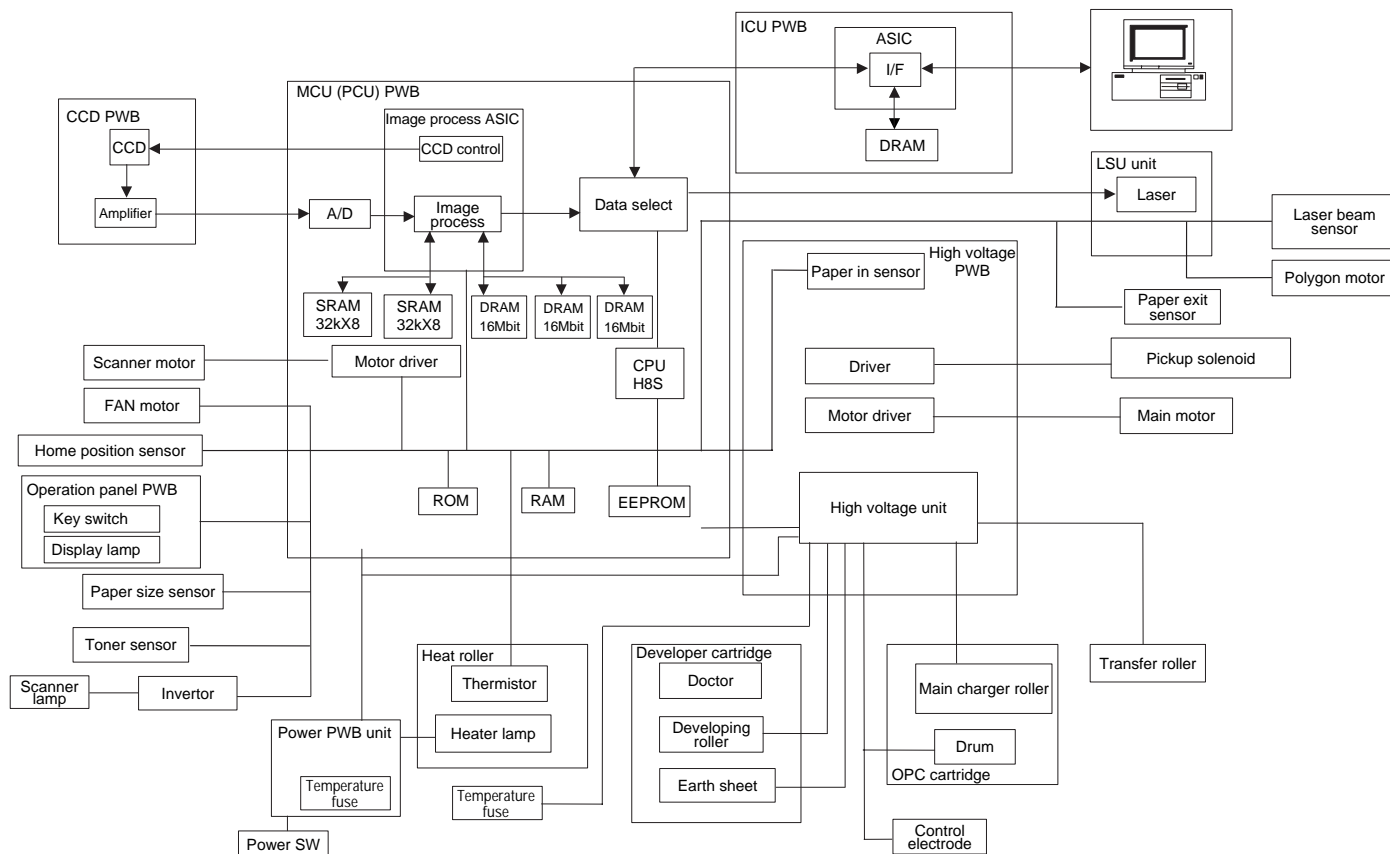
No.	Parts			Function, operation	Note
	Code	Name	Type		
1	MM	Main motor	Stepping motor (+24V)	Drives the paper feed section, the paper transport section, the fusing section, and the image process section.	
2		Paper feed section drive gear		Transmits the main motor power to the paper feed section.	
3		Imaging process/ fusing section drive gear		Transmits the main motor power to the imaging process section and the fusing section.	

(3) Wiring diagram



G. Electrical section

(1) Block diagram



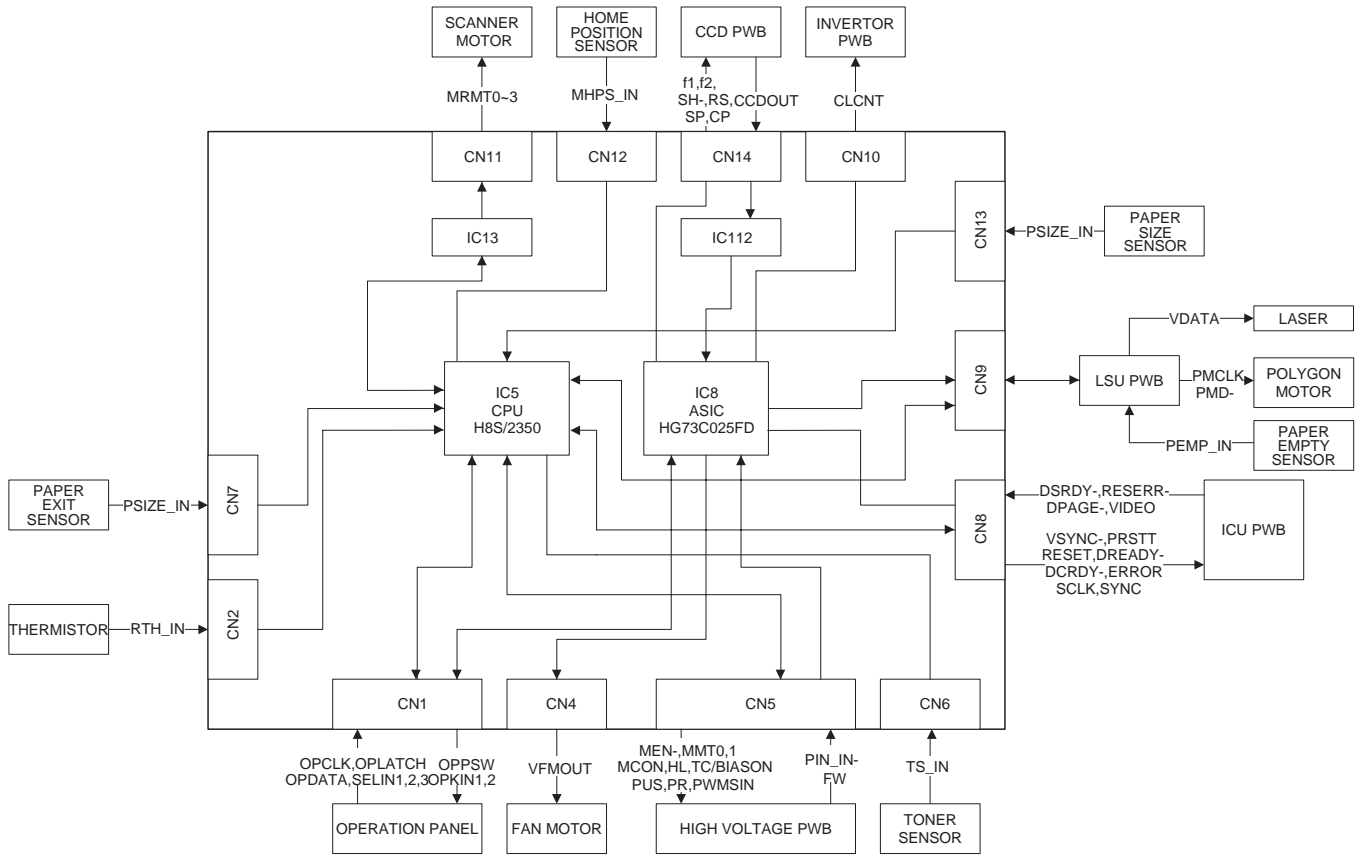
a. Major sections operations and functions

MCU (PCU) PWB

The CPU controls the engine, and the ASIC performs image process. Image data (analog signals) from the scanner (reading) section are converted into digital signals by the A/D convertor and image process (area separation, filter process, gamma correction, resolution conversion, zooming) is performed by the ASIC and the line memory (SRAM). The processed data are outputted to the scanner (writing) section.

During printing, the dot image data from the ICU PWB are received and outputted to the scanner (writing) section straightly. The CPU controls the machine operations according to the key operation signals from the operation PWB. The loads (motor, lamp, solenoid, high voltage power PWB, etc.) are controlled according to the sensors and detectors signals. At the same time, the machine status data are outputted to the operation section and the ICU PWB.

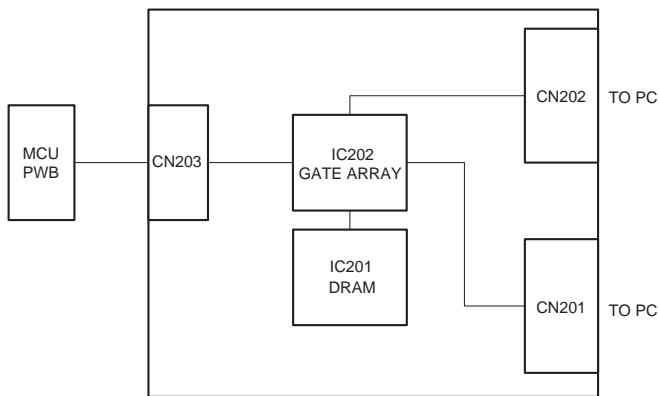
MCU PWB BLOCK DIAGRAM



ICU PWB

Print data from the host (PC) are developed by the ASIC and the line memory (DRAM) to be converted into full dot image data, which are then outputted to the data select section in the MCU PWB. The machine status data from the MCU PWB are outputted to the host (PC). In addition, the ASIC controls the parallel I/F.

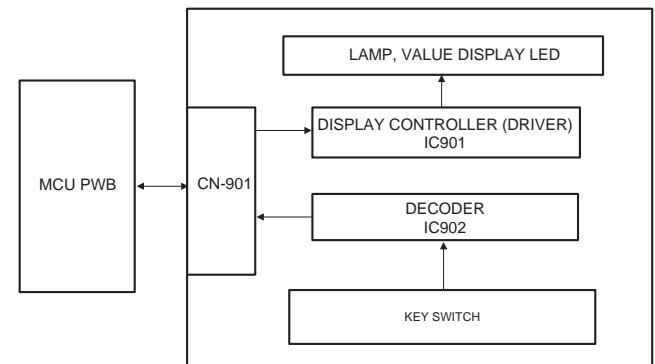
ICU PWB



Operation PWB

Status data from the MCU PWB are converted into the lamp and lamp display by the display controller. The key operations are converted into key data signals and outputted to the MCU (PCU) PWB.

OPERATION PWB BLOCK DIAGRAM



High voltage power PWB

This PWB supplies the high voltage used in the image process section. (Main charger, developing bias, transfer charger) It also includes the driver for the main motor. The power output is controlled by the control signals from the MCU (PCU) PWB.

Copy lamp control PWB

The copy lamp light quantity is controlled so that the necessary quantity of light is provided even when conditions of the scanner (reading) section are changed.

The copy lamp drive voltage is controlled by the output level of the light quantity sensor in the scanner (reading) section. Control is made with the control signals from the MCU (PCU) PWB.

Power PWB

The power PWB outputs DC power voltages (+24V, +5V, +3.3V, +12V) and drives the heater lamp.

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