



PF-400

SERVICE MANUAL

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Safety precautions


This booklet provides safety warnings and precautions for our service personnel to ensure the safety of their customers, their machines as well as themselves during maintenance activities. Service personnel are advised to read this booklet carefully to familiarize themselves with the warnings and precautions described here before engaging in maintenance activities.

Safety warnings and precautions

Various symbols are used to protect our service personnel and customers from physical danger and to prevent damage to their property. These symbols are described below:

 **DANGER:** High risk of serious bodily injury or death may result from insufficient attention to or incorrect compliance with warning messages using this symbol.

 **WARNING:** Serious bodily injury or death may result from insufficient attention to or incorrect compliance with warning messages using this symbol.

 **CAUTION:** Bodily injury or damage to property may result from insufficient attention to or incorrect compliance with warning messages using this symbol.

Symbols

The triangle (\triangle) symbol indicates a warning including danger and caution. The specific point of attention is shown inside the symbol.



General warning.



Warning of risk of electric shock.



Warning of high temperature.


 indicates a prohibited action. The specific prohibition is shown inside the symbol.



General prohibited action.



Disassembly prohibited.

 indicates that action is required. The specific action required is shown inside the symbol.



General action required.



Remove the power plug from the wall outlet.



Always ground the copier.

1. Installation Precautions

WARNING

• Do not use a power supply with a voltage other than that specified. Avoid multiple connections to one outlet: they may cause fire or electric shock. When using an extension cable, always check that it is adequate for the rated current.



• Connect the ground wire to a suitable grounding point. Not grounding the copier may cause fire or electric shock. Connecting the earth wire to an object not approved for the purpose may cause explosion or electric shock. Never connect the ground cable to any of the following: gas pipes, lightning rods, ground cables for telephone lines and water pipes or faucets not approved by the proper authorities.



CAUTION:

• Do not place the copier on an infirm or angled surface: the copier may tip over, causing injury.



• Do not install the copier in a humid or dusty place. This may cause fire or electric shock.



• Do not install the copier near a radiator, heater, other heat source or near flammable material. This may cause fire.



• Allow sufficient space around the copier to allow the ventilation grills to keep the machine as cool as possible. Insufficient ventilation may cause heat buildup and poor copying performance.



• Always handle the machine by the correct locations when moving it.



• Always use anti-toppling and locking devices on copiers so equipped. Failure to do this may cause the copier to move unexpectedly or topple, leading to injury.



• Avoid inhaling toner or developer excessively. Protect the eyes. If toner or developer is accidentally ingested, drink a lot of water to dilute it in the stomach and obtain medical attention immediately. If it gets into the eyes, rinse immediately with copious amounts of water and obtain medical attention.













• Advise customers that they must always follow the safety warnings and precautions in the copier's instruction handbook.








2. Precautions for Maintenance

WARNING

- Always remove the power plug from the wall outlet before starting machine disassembly. 
- Always follow the procedures for maintenance described in the service manual and other related brochures. 
- Under no circumstances attempt to bypass or disable safety features including safety mechanisms and protective circuits. 
- Always use parts having the correct specifications. 
- Always use the thermostat or thermal fuse specified in the service manual or other related brochure when replacing them. Using a piece of wire, for example, could lead to fire or other serious accident. 
- When the service manual or other serious brochure specifies a distance or gap for installation of a part, always use the correct scale and measure carefully. 
- Always check that the copier is correctly connected to an outlet with a ground connection. 
- Check that the power cable covering is free of damage. Check that the power plug is dust-free. If it is dirty, clean it to remove the risk of fire or electric shock. 
- Never attempt to disassemble the optical unit in machines using lasers. Leaking laser light may damage eyesight. 
- Handle the charger sections with care. They are charged to high potentials and may cause electric shock if handled improperly. 

CAUTION

- Wear safe clothing. If wearing loose clothing or accessories such as ties, make sure they are safely secured so they will not be caught in rotating sections. 
- Use utmost caution when working on a powered machine. Keep away from chains and belts. 
- Handle the fixing section with care to avoid burns as it can be extremely hot. 
- Check that the fixing unit thermistor, heat and press rollers are clean. Dirt on them can cause abnormally high temperatures. 
- Do not remove the ozone filter, if any, from the copier except for routine replacement. 

• Do not pull on the AC power cord or connector wires on high-voltage components when removing them; always hold the plug itself.



• Do not route the power cable where it may be stood on or trapped. If necessary, protect it with a cable cover or other appropriate item.



• Treat the ends of the wire carefully when installing a new charger wire to avoid electric leaks.



• Remove toner completely from electronic components.



• Run wire harnesses carefully so that wires will not be trapped or damaged.



• After maintenance, always check that all the parts, screws, connectors and wires that were removed, have been refitted correctly. Special attention should be paid to any forgotten connector, trapped wire and missing screws.



• Check that all the caution labels that should be present on the machine according to the instruction handbook are clean and not peeling. Replace with new ones if necessary.



• Handle greases and solvents with care by following the instructions below:



- Use only a small amount of solvent at a time, being careful not to spill. Wipe spills off completely.
- Ventilate the room well while using grease or solvents.
- Allow applied solvents to evaporate completely before refitting the covers or turning the main switch on.
- Always wash hands afterwards.

• Never dispose of toner or toner bottles in fire. Toner may cause sparks when exposed directly to fire in a furnace, etc.



• Should smoke be seen coming from the copier, remove the power plug from the wall outlet immediately.



3. Miscellaneous

WARNING

• Never attempt to heat the drum or expose it to any organic solvents such as alcohol, other than the specified refiner; it may generate toxic gas.



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1-1-1 Specifications

Compatible printer	FS-6020
Number of paper cassettes	1
Paper capacity	250 sheets (60 to 105 g/m ²)
Environmental requirements	Temperature: 10 to 32.5°C/50 to 90.5°F Humidity: 20 to 80% RH Ideal conditions are 23°C/65% RH, altitude under 2000 m.
Power supply	Supplied from printer (5 V DC, 24 V DC)
Dimensions	467 (W) × 410 (D) × 90(H) mm 18 ³ / ₈ " (W) × 16 ¹ / ₈ " (D) × 3 ⁹ / ₁₆ " (H)
Weight	5 kg/11 lbs

1-1-2 Paper specifications

The paper feeder may not be used no print on paper not satisfying the requirements below. Also, special types of print media such as overhead projection (OHP) film, envelopes, adhesive-backed labels, and paper containing watermarks must not be used with the paper feeder installed. These types can result in jams, misfeeds, and paper waste, and in extreme cases can damage the paper feeder.

(1) Paper specifications

The following table summarizes the basic paper specifications.

Table 1-1-1 Paper specifications

Item	Specification
Weight	60 to 105 g/m ²
Thickness	0.086 to 0.110 mm
Dimensional accuracy	± 0.7 mm
Squareness of corners	90° ± 0.2°
Moisture content	4 % to 6 %
Pulp content	80 % or more

Remember that all paper is not the same. Some of the factors to consider when selecting paper for use with the paper feeder are as follows:

(1-1) Condition of the paper

Avoid using paper that is bent at the edges, curled, dirty, torn, or contaminated with lint, clay, or paper shreds. Use of paper in these conditions can lead to illegible printing, misfeeding, and paper jams, and can shorten the life of the paper feeder and the printer. In particular, avoid using paper with a surface coating or other surface treatment. The paper should have as smooth and even a surface as possible.

(1-2) Composition

Do not use paper that has been coated or surface-treated and contains plastic or carbon. The heat of fusing can cause such paper to give off harmful fumes. Bond paper should contain at least 80 % pulp. Not more than 20% of the total paper content should consist of cotton or other fibers.

(1-3) Paper size

Printer's cassettes are available for the paper sizes listed in Table 1-1-2.

Table 1-1-2 Paper sizes for printer's cassette paper feed.

Printer's cassette	Size
ISO A4R	210 × 297 mm
JIS B5	182 × 257 mm
JIS B4	257 × 364 mm
ISO A3	297 × 420 mm
ISO A5	148 × 210 mm
Letter	8.5 × 11 in
Legal	8.5 × 14 in
Ledger	11 × 17 in

(1-4) Smoothness

The paper should have a smooth, uncoated surface. Paper with a rough or sandy surface can cause voids in the printed output. Paper that is too smooth, however, can cause multiple feeding and fogging problems. (Fogging is a gray background effect.)

(1-5) Basis weight

Basis weight is the weight of a standard quantity of paper. In the traditional system the standard quantity is a ream consisting of 500 sheets measuring 17 × 22 inches each. In the metric system the standard quantity is 1 square meter. Paper that is too light or too heavy can cause misfeeding, jams, and premature wear of the paper feeder and the printer. Uneven paper weight can cause multiple feeds, print defects, poor toner fusing, blurring, and other print quality problems. The proper weight is 60 to 90 g/m² (16 to 24 lbs/ream).

(1-6) Thickness (Caliper)

Thick paper is referred to as high-caliper paper and thin paper as low-caliper paper. The paper used with the printer when the paper feeder is installed should be neither extremely thick nor extremely thin. If you are having problems with paper jams, multiple feeds, and faint printing, the paper may be too thin. If you are having problems with paper jams and blurred printing, the paper may be too thick. The proper thickness is 0.086 to 0.110 mm (3.4 to 4.3 mils).

(1-7) Moisture content

Moisture content is defined as the percent ratio of moisture to the dry mass of the paper. Moisture can affect the paper's appearance, feedability, curl, electrostatic properties, and toner fusing characteristics. The moisture content of the paper varies with the relative humidity in the room. When the relative humidity is high and the paper absorbs moisture, the paper edges expand, becoming wavy in appearance. When the relative humidity is low and paper loses moisture, the edges shrink and tighten, and print contrast may suffer. Wavy or tight edges can cause misfeeding and alignment anomalies. The moisture content of the paper should be 4% to 6%.

To ensure the proper moisture content it is important to store the paper in a controlled environment. Some tips on moisture control are:

- Store paper in a cool, dry location.
- Keep the paper in its wrapping as long as possible. Rewrap paper that is not in use.
- Store paper in its original carton. Place a pallet etc. under the carton to separate it from the floor.
- After removing paper from storage, let it stand in the same room as the printer for 48 hours before use.
- Avoid leaving paper where it is exposed to heat, sunlight, or damp.

(1-8) Other paper properties**Porosity:**

Refers to the density of the paper structure; that is, to how openly or compactly the fibers are bonded.

Stiffness:

Limp paper can buckle inside the paper feeder and the printer, while paper that is too stiff may bind. Either way the result is a paper jam.

Curl:

Most paper has a natural tendency to curl in one direction. The paper should be loaded so that the natural curl is downward, to counteract the upward curl imparted by the printer. Printed sheets will then come out flat. Most paper also has a top and bottom surface. Loading instructions are usually given on the paper package.

Electrostatic properties:

During the printing process the paper is electrostatically charged to attract the toner. The paper must be able to release this charge so that printed sheets do not cling together in the output tray.

Whiteness:

The contrast of the printed page depends on the whiteness of the paper. Whiter paper provides a sharper, brighter appearance.

Quality control:

Uneven sheet size, corners that are not square, ragged edges, welded (uncut) sheets, and crushed edges and corners can cause the paper feeder and the printer to malfunction in various ways. A quality paper supplier should take considerable care to ensure that these problems do not occur.

Packaging:

Paper should be packed in a sturdy carton to protect it from damage during transport. Quality paper obtained from a reputable supplier is usually properly packaged.

(1-9) Special paper

The following types of special paper can be used:

- Colored paper
- Preprinted paper

Use paper that is sold specifically for use with copiers (heat-fusing type).

Since the composition and quality of special paper vary considerably, special paper is more likely than white bond paper to give trouble during printing. No liability will be assumed if moisture etc. given off in printing on special paper causes harm to the machine or operator.

Before purchasing any type of special paper, test a sample with the paper feeder and the printer and check that printing quality is satisfactory. Specifications for each type of special paper are given below.

Colored paper:

Colored paper should satisfy the same conditions as white bond paper, listed in Table 1-1-1. In addition, the pigments used in the paper must be able to withstand the heat of fusing during the printing process (up to 200°C or 392°F).

Preprinted paper:

Preprinted paper should have a bond paper base. The preprinted ink must be able to withstand the heat of fusing during the printing process, and must not be affected by silicone oil.

Do not use paper with any kind of surface treatment, such as the type of paper commonly used for calendars.

1-1-3 Parts names and their functions

(1) Parts names

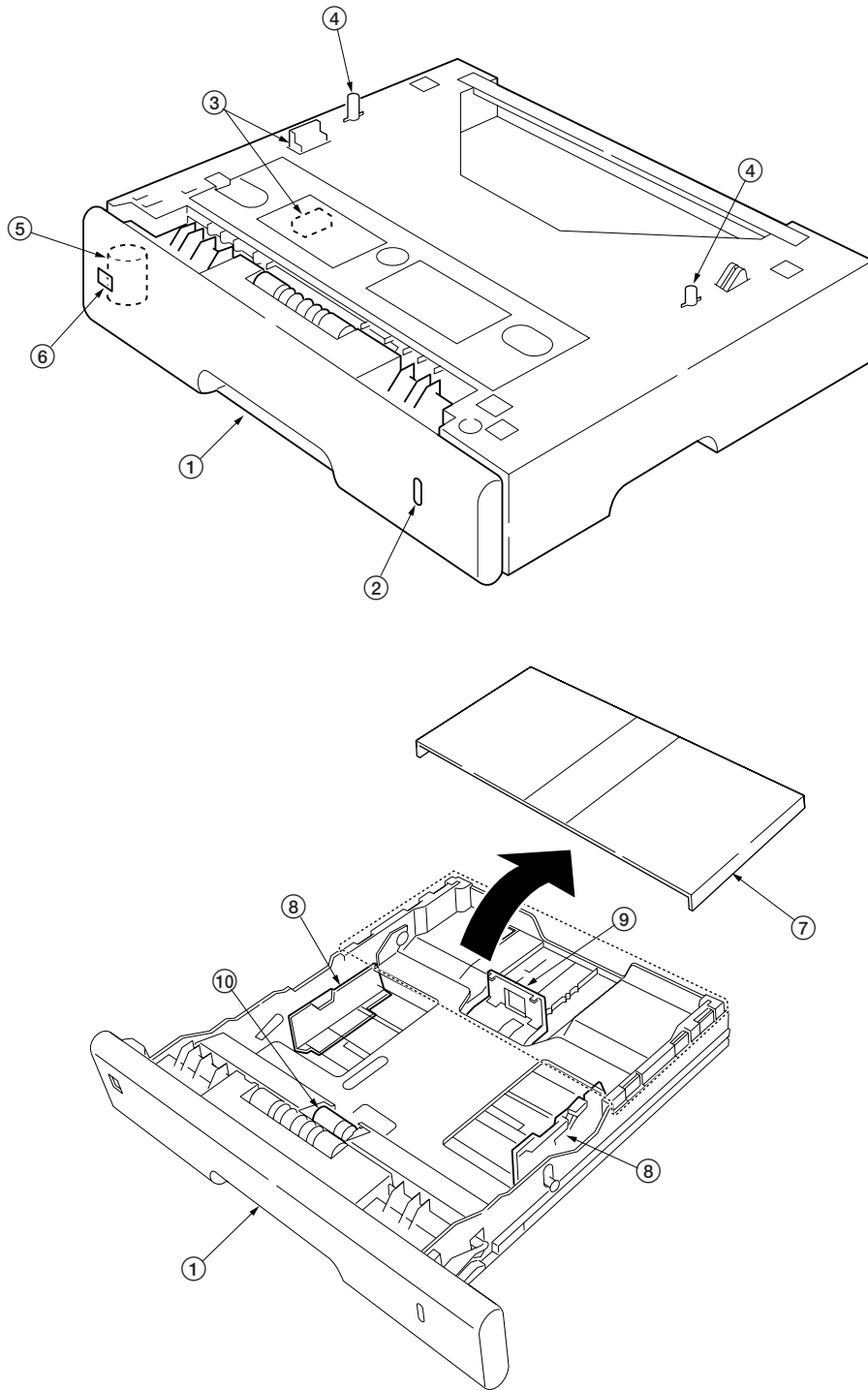


Figure 1-1-1

- | | |
|------------------------|--------------------------------|
| ① Paper cassette | ⑥ Paper size indication window |
| ② Paper gauge | ⑦ Cassette cover |
| ③ Interface connectors | ⑧ Paper guides |
| ④ Positioning pins | ⑨ Paper stopper |
| ⑤ Paper size dial | ⑩ Feed roller |

1-1-4 Operation method

(1) Loading paper

It is required to adjust the paper guides or the paper stopper in the paper cassette to match the actual width of paper to be set prior to setting the paper.

Note: Make sure to set the stack of paper is newly opened as much as possible. Papers that were left outside for a long time contain moisture and it may cause the paper jams such as feeding the multiple pages lapped over all at once. For the applicable paper specification to the paper cassette, see page 1-1-2.

1. Remove the paper cassette from the paper feeder.
2. Adjust the paper guides and the paper stopper to fit the paper size to use.

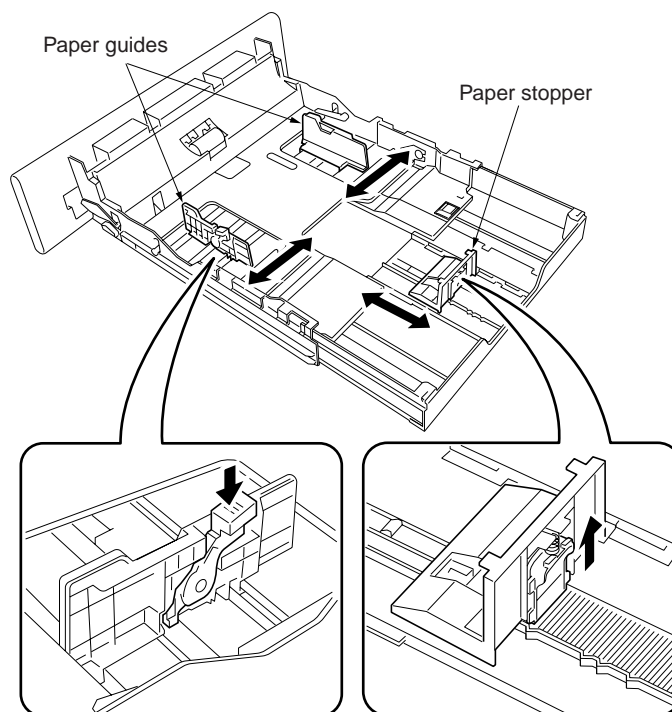


Figure 1-1-2

3. Set the stack of paper that does not exceed the paper upper limit marks on the paper guides and the paper stopper by aligning the top of the stack and placing the rear side first after jogging the leading edge. (Approximate 250 pages with 0.1 mm thickness per page can be loaded.)
4. Turn the paper size dial so that the size of loaded paper is indicated in the paper size indication window. If "OTHER" is selected, paper size setting must be performed on the panel of the printer.
5. Install the paper cassette into the paper feeder.

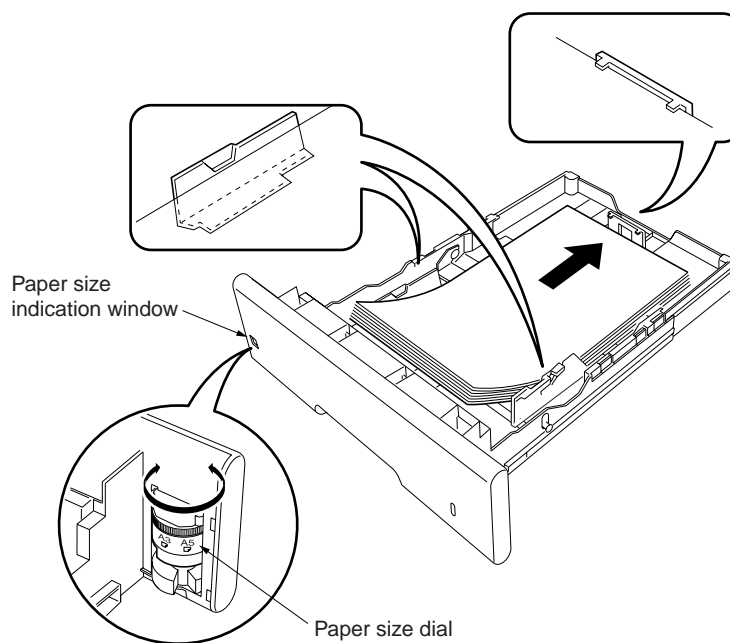


Figure 1-1-3

(2) Setting the paper source of the paper feeder

To set the paper feeder to the paper source, there are methods to set by operating the MENU key from the operation panel of the printer and to set by sending the PSRC command of the prescribe command from the computer to the printer.

(2-1) Setting method by the operation panel of the printer

- ① Check that the message display shows the indication of "Ready" or "Add Paper".
- ② Press the MENU key.
- ③ Press the DOWN key or UP key to display "Set Paper >".
- ④ Press the RIGHT key to display "Paper Source Cassette 1".
- ⑤ Press the ENTER key to blink the ? mark of "? Paper Source Cassette 1".
- ⑥ Press DOWN key or UP key to display the desired paper source.
 - "? Paper Source Cassette 1" (Cassette of the printer)
 - "? Paper Source Cassette 2" (Cassette on the first paper feeder)
 - "? Paper Source Cassette 3" (Cassette on the second paper feeder)
 - "? Paper Source Cassette 4" (Cassette on the third paper feeder)
 - "? Paper Source Cassette 5" (Cassette on the fourth paper feeder)
 - "? Paper Source MP Tray" (MP tray)
- ⑦ Press the ENTER key to determine the paper source.
- ⑧ Press the MENU key to return to the "Ready" indication.

(2-2) Setting method by the prescribing commands

To change the paper source to the paper feeder by using the PSRC command of the prescribing command, send the PSRC command from the computer to the printer as follows.

ECHO !R! PSRC 0; EXIT;>PRN (When the MP tray is set as the paper source.)

ECHO !R! PSRC 1; EXIT;>PRN (When the paper cassette of the printer is set as the paper source.)

ECHO !R! PSRC 2; EXIT;>PRN (When the paper cassette of the first paper feeder is set as the paper source.)

ECHO !R! PSRC 3; EXIT;>PRN (When the paper cassette of the second paper feeder is set as the paper source.)

ECHO !R! PSRC 4; EXIT;>PRN (When the paper cassette of the third paper feeder is set as the paper source.)

ECHO !R! PSRC 5; EXIT;>PRN (When the paper cassette of the fourth paper feeder is set as the paper source.)

Printer automatically operates form feeding. Accordingly, place the PSRC command at the beginning of a file or the head of a page.

The FRPO R4 command of the prescribe commands changes the default (Power ON) setting of the paper source of the printer. To change the paper source to the paper feeder, use the commands sequence as follows.

ECHO !R! FRPO R4 0; EXIT;>PRN (When the MP tray is set as the paper source.)

ECHO !R! FRPO R4 1; EXIT;>PRN (When the paper cassette of the printer is set as the paper source.)

ECHO !R! FRPO R4 2; EXIT;>PRN (When the paper cassette of the first paper feeder is set as the paper source.)

ECHO !R! FRPO R4 3; EXIT;>PRN (When the paper cassette of the second paper feeder is set as the paper source.)

ECHO !R! FRPO R4 4; EXIT;>PRN (When the paper cassette of the third paper feeder is set as the paper source.)

ECHO !R! FRPO R4 5; EXIT;>PRN (When the paper cassette of the fourth paper feeder is set as the paper source.)

1-1-5 Machine cross section

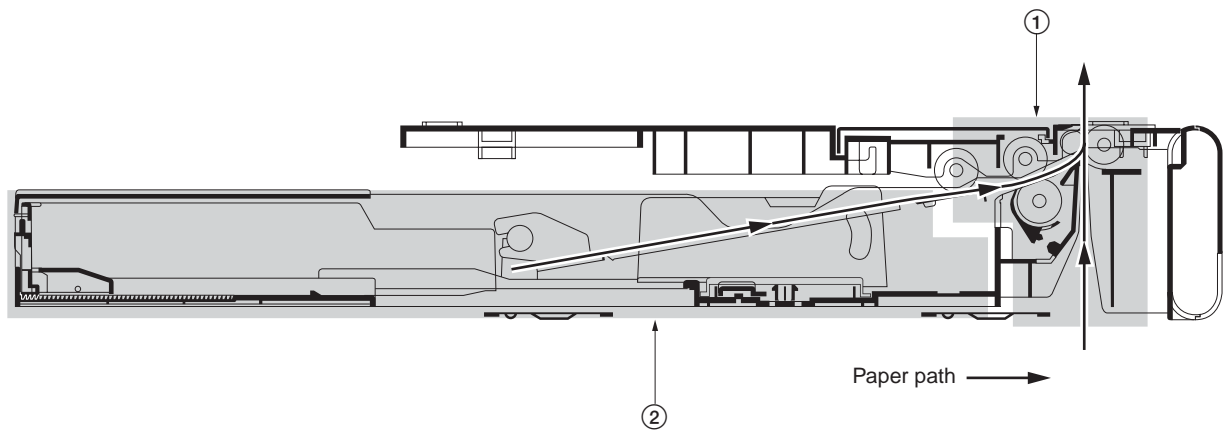


Figure 1-1-4 Machine cross section

- ① Paper feed and vertical path section
- ② Paper capacity (cassette) section

1-1-6 Drive system

(1) Drive system

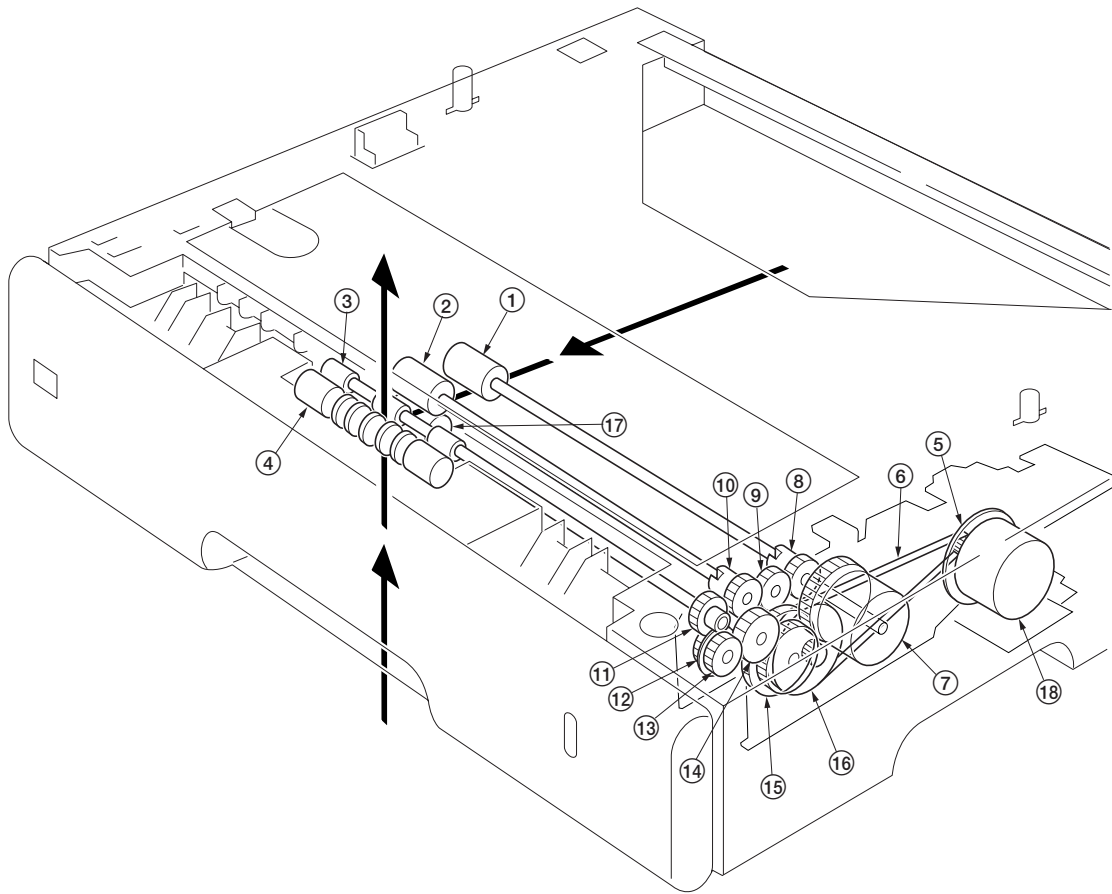


Figure 1-1-5 Drive system

- | | |
|-----------------------------|-----------------------------|
| ① Pickup roller | ⑩ Pickup/Conveying coupling |
| ② Feed roller | ⑪ Gear Z27 |
| ③ Conveying roller | ⑫ Oneway gear Z20 |
| ④ Feed pulley | ⑬ Gear Z28 |
| ⑤ Pulley S15 | ⑭ Gear Z32 |
| ⑥ Belt S2M115040 | ⑮ Gear Z56P72 |
| ⑦ Feed clutch | ⑯ Pulley S2M56/Gear Z18 |
| ⑧ Pickup/Conveying coupling | ⑰ Retard roller |
| ⑨ Gear Z34 | ⑱ Feed motor |

1-2-1 Installation environment

1. Installation location

- Avoid direct sunlight or bright lighting. Ensure that the photoconductor will not be exposed to direct sunlight or other strong light.
- Avoid extremes of temperature and humidity, abrupt ambient temperature changes, and hot or cold air directed onto the machine.
- Avoid dust and vibration.
- Choose a surface capable of supporting the weight of the machine.
- Place the machine on a level surface (maximum allowance inclination: 1°).
- Avoid air-borne substances that may adversely affect the machine or degrade the photoconductor, such as mercury, acidic or alkaline vapors, inorganic gasses, NO_x, SO_x gases and chlorine-based organic solvents.
- Select a room with good ventilation.

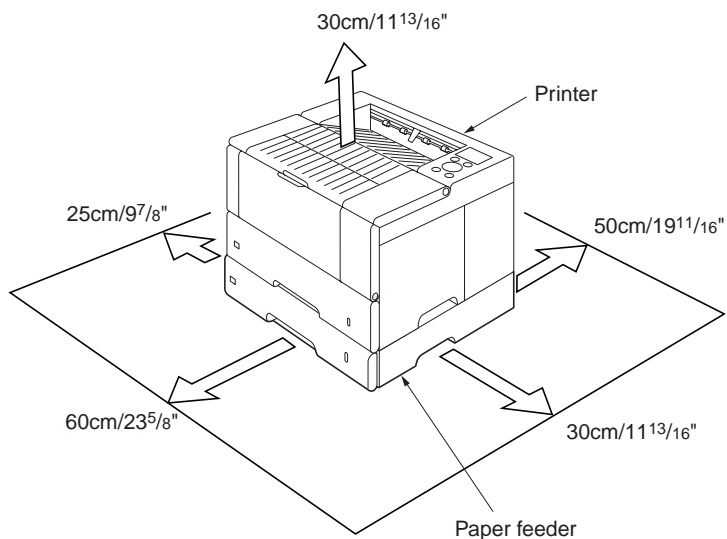


Figure 1-2-1 Installation dimensions

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1-3-1 Unpacking and installation

(1) Installation procedure

Unpacking the machine

Unpack the package of paper feeder and check that the contents are sufficient.

Attaching the paper feeder

Maximum four paper feeders can be used in piles.

1. To stack paper feeders, make sure to stack a paper feeder on the other in advance.

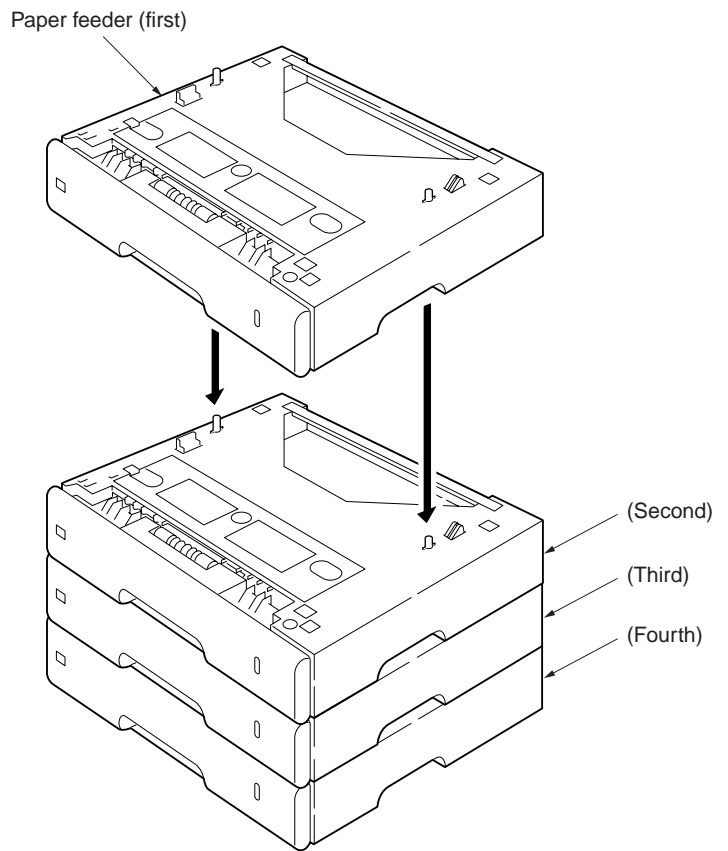


Figure 1-3-1

2. Lift the printer without slanting, align the attaching holes of printer bottom with the positioning pins on the upper part of the paper feeder and then put it down slowly. Make sure that the interface connector is securely connected with the connector of printer side.

Completion of the machine installation.

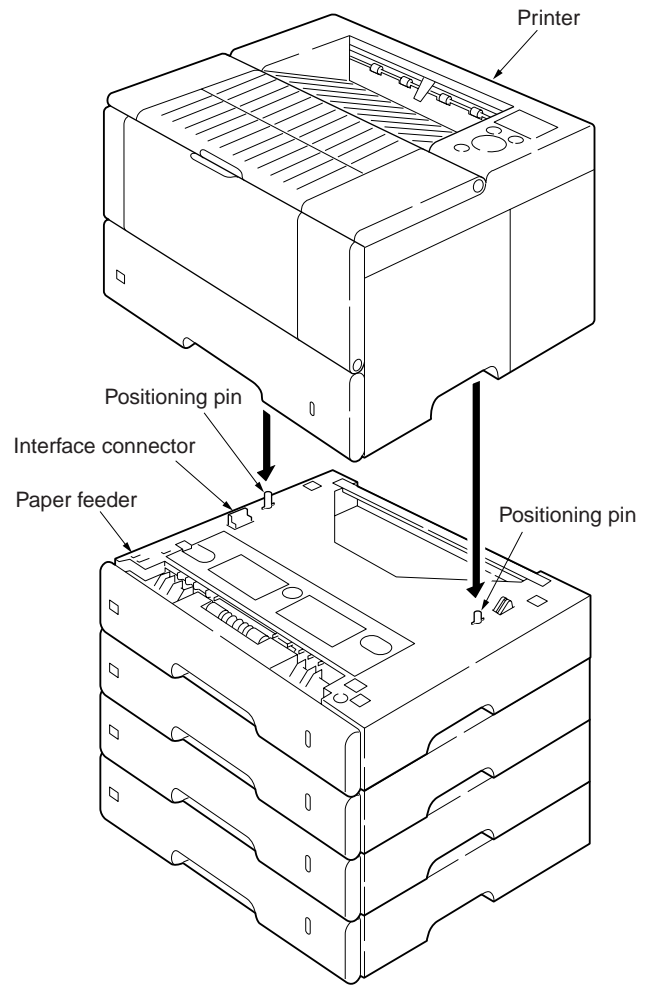


Figure 1-3-2

1-4-1 Paper misfeed detection

(1) Paper misfeed indication

If a paper does not reach the registration sensor of the printer unit within the specified time of period after feeding started from the paper feeder, it is judged that paper misfeed occurred in the paper feeder and the paper misfeed indication is displayed on the operation panel of the printer and then the printer operation stops.

When a paper misfeed occurred with the paper feeder, pull out the paper cassette and remove the jammed paper and then reset the paper feeder to the previous position. Next, open and close the upper cover of the printer once and then the paper misfeed indication is reset and printing starts again.

When using two or more paper feeders stacked on each other at the same time, there might also be jammed paper remaining in the feeder above the feeder in which the paper jammed, so check both of these feeders.

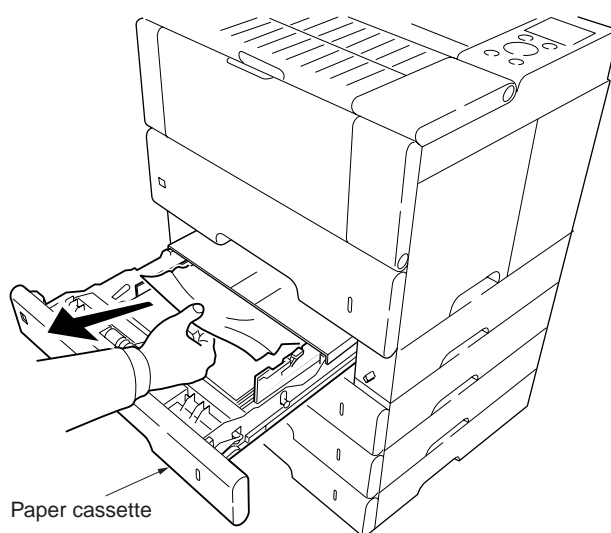


Figure 1-4-1 Correcting a paper misfeed

1-4-2 Self-diagnosis

(1) Self-diagnostic function

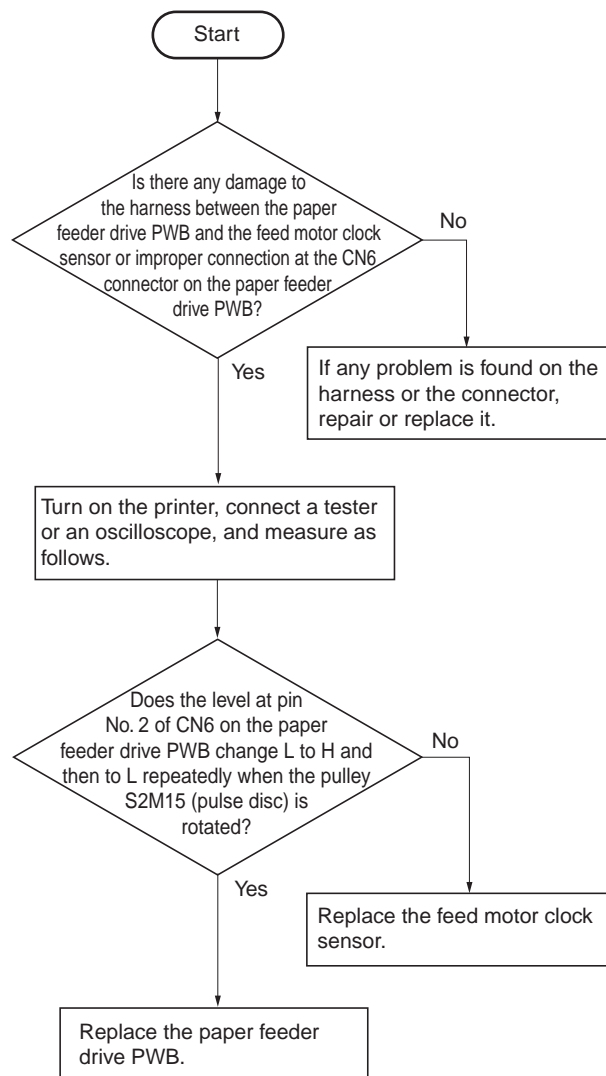
The printer is equipped with a self-diagnostic function. When a problem is detected, the printer stops printing and an error message is displayed on the operation panel. An error message consists of a message prompting contact to service personnel, total print count, and a four-digit error code (2 digits for F0 only) indicating the type of the error.

(1-1) Error code 2610 [B2] (paper feeder 1 feed motor error)

Detection conditions

- When the paper feeder drive PWB of the optional paper feeder 1 drives the feed motor, no proper clock pulse is input from the feed motor clock sensor.

Corrective measures



(1-2) Error code 2620 [B3] (paper feeder 2 feed motor error)**Detection conditions**

- When the paper feeder drive PWB of the optional paper feeder 2 drives the feed motor, no proper clock pulse is input from the feed motor clock sensor.

Corrective measures

- Same as error code 2610 [B2]

(1-3) Error code 2630 [B4] (paper feeder 3 feed motor error)**Detection conditions**

- When the paper feeder drive PWB of the optional paper feeder 3 drives the feed motor, no proper clock pulse is input from the feed motor clock sensor.

Corrective measures

- Same as error code 2610 [B2]

(1-4) Error code 2640 [B5] (paper feeder 4 feed motor error)**Detection conditions**

- When the paper feeder drive PWB of the optional paper feeder 4 drives the feed motor, no proper clock pulse is input from the feed motor clock sensor.

Corrective measures

- Same as error code 2610 [B2]

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1-5-1 Precautions for assembly and disassembly

(1) Precautions

- Be sure to turn the main switch off and disconnect the power plug before starting disassembly.
- When handling PCBs, do not touch connectors with bare hands or damage the board.
- Do not touch any PCB containing ICs with bare hands or any object prone to static charge.
- Use the following testers when measuring voltages:

Hioki 3200

Sanwa MD-180C

Sanwa YX-360TR

1-5-2 Paper feed section

(1) Detaching and refitting the pickup roller, feed roller and conveying roller

Follow the procedure below to clean or replace the pickup roller, feed roller and conveying roller.

Procedure

1. Remove the paper cassette.
2. Remove the four screws and then remove the upper guide.

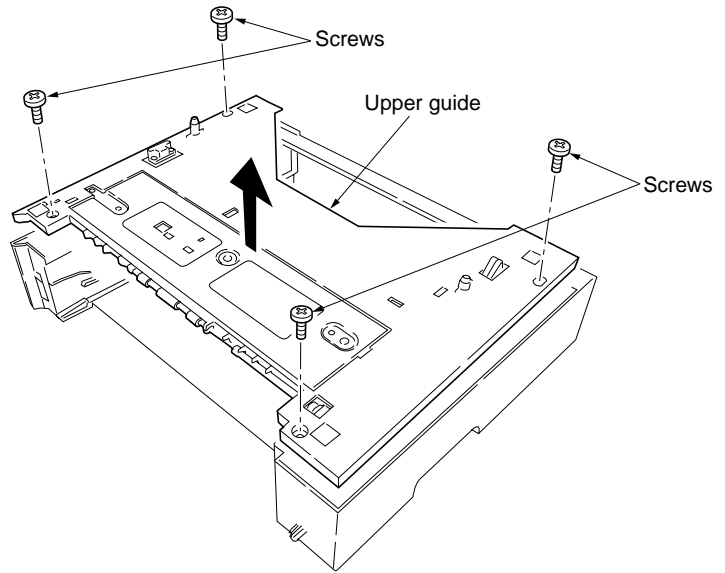


Figure 1-5-1

3. Push the stoppers and slide the conveying coupling E. Remove the feed roller and pickup roller.
4. Remove the conveying roller from bearing holder.
5. Remove the two bearings from the conveying roller.
6. Clean or replace the feed roller, pickup roller and conveying roller.
7. Refit all the removed parts.

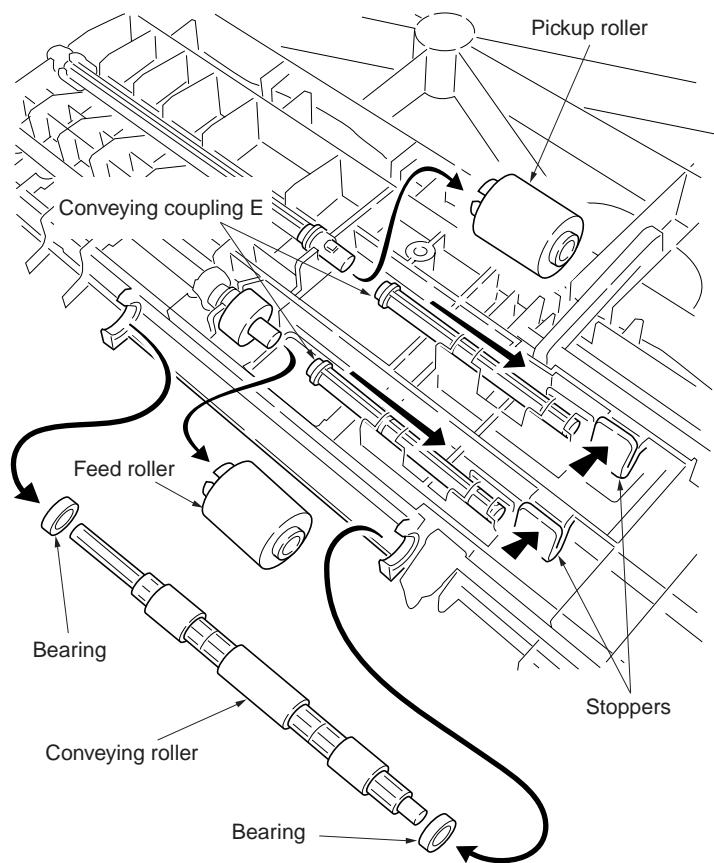


Figure 1-5-2

(2) Detaching and refitting the retard roller

Follow the procedure below to clean or replace the retard roller.

Procedure

1. Remove the retard roller holder from the paper cassette.
2. Remove the retard roller from the retard roller holder.
3. Refit all the removed parts.

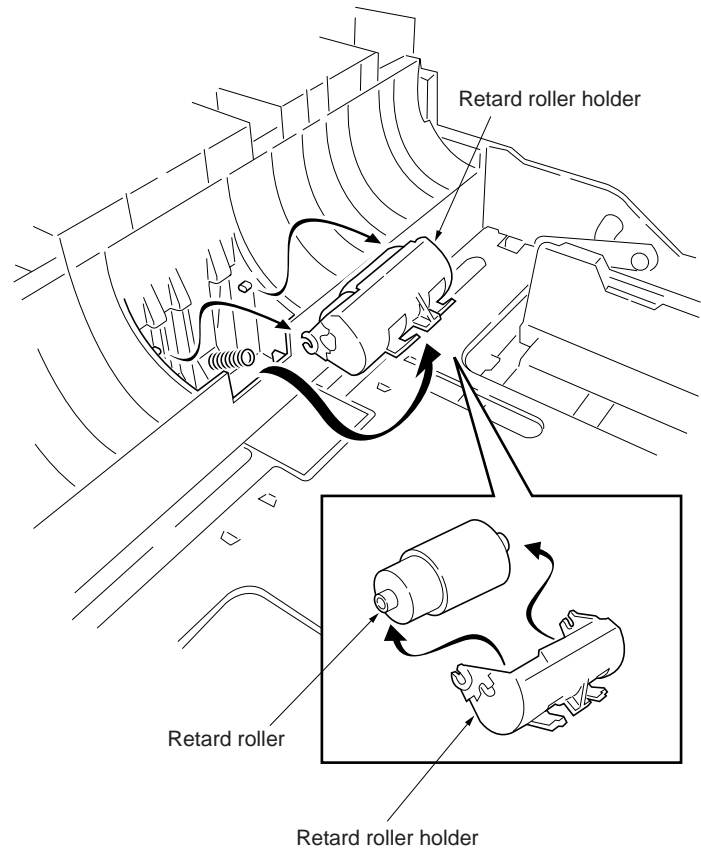


Figure 1-5-3

(3) Detaching and refitting the paper feeder drive PWB

Follow the procedure below to check or replace the paper feeder drive PWB.

Procedure

1. Remove the upper guide (see page 1-5-2).
2. Remove the three screws and then remove the PWB bracket.

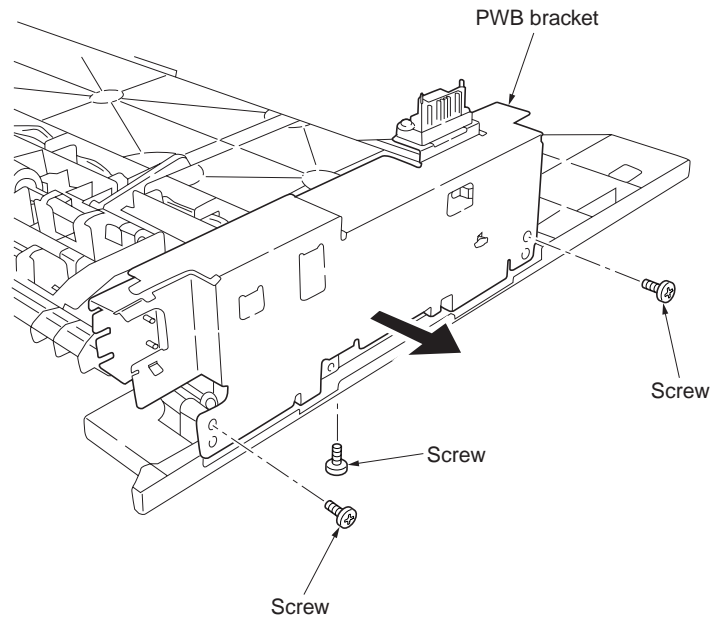


Figure 1-5-4

3. Remove the all (six) connectors and then remove the paper feeder drive PWB.
4. Check or replace the paper feeder drive PWB.
5. Refit all the removed parts.

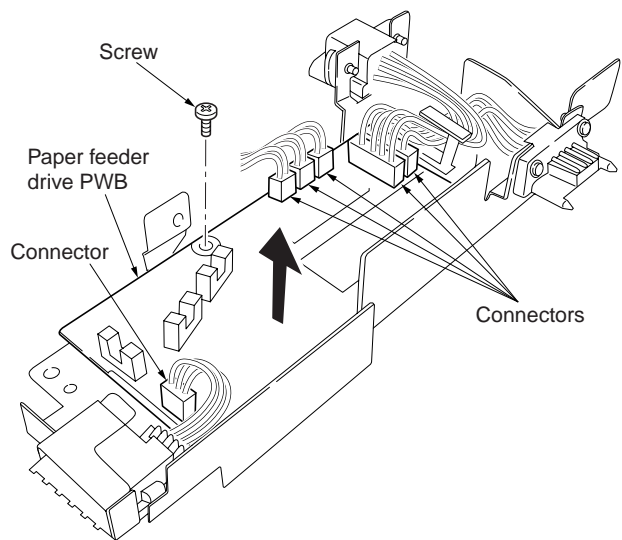


Figure 1-5-5

2-1-1 Paper feed section

(1) Paper feeding drive mechanism

Paper feed section consists of the parts shown in the following illustration and it feeds the papers set in the paper cassette to the printer. When the paper feeders are used being stacked, it vertically conveys the paper that is fed from the lower paper feeder.

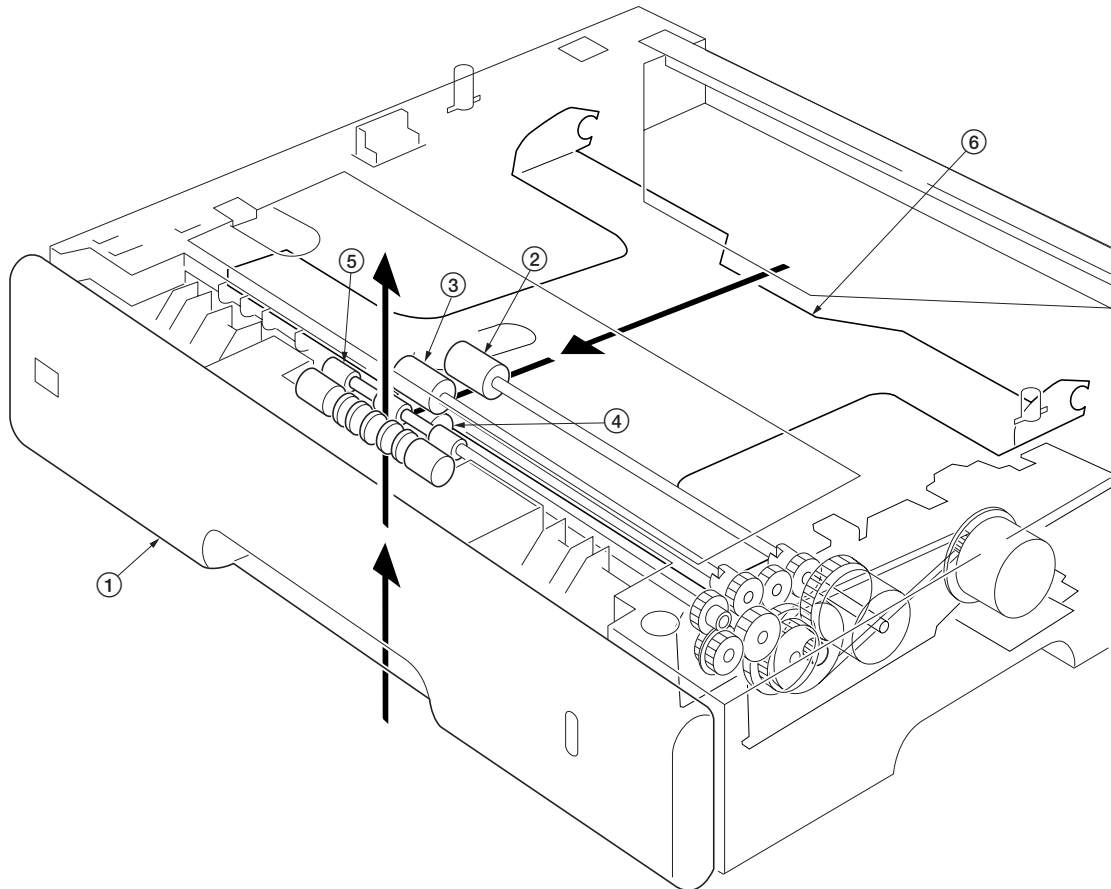


Figure 2-1-1 Paper feed section

- | | |
|------------------|--------------------|
| ① Paper cassette | ④ Retard roller |
| ② Pickup roller | ⑤ Conveying roller |
| ③ Feed roller | ⑥ Bottom plate |

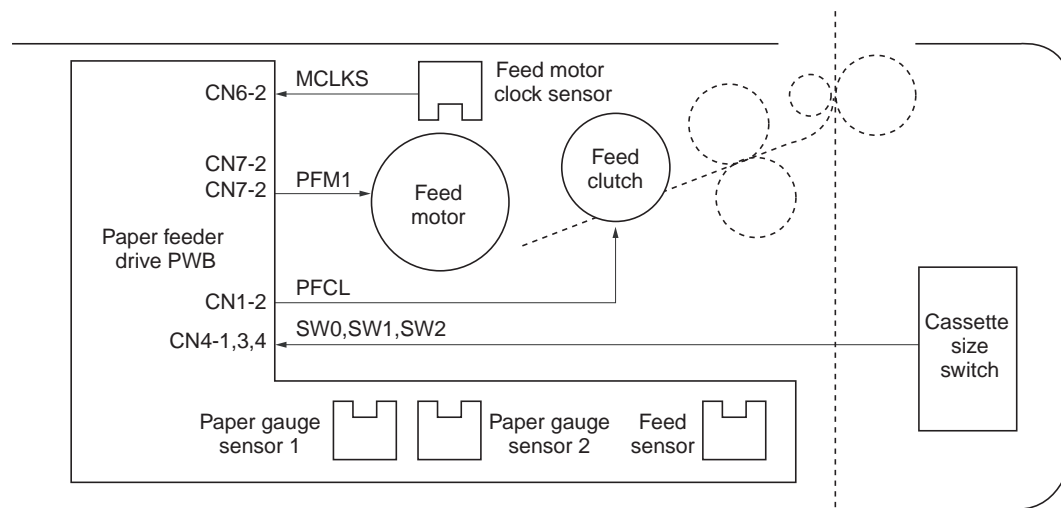


Figure 2-1-2 Paper feed section block diagram

(2) Detecting the paper remaining amount

Paper remaining amount can be detected by the paper remaining amount gauge located at the front side of cassette and it is also possible to detect it at 4 levels (to 2/3, 2/3 to 1/3, 1/3 or less, and NO PAPER) from the computer in which the software (KM-NET VIEWER Utility) is installed. The top section of the papers set on the bottom plate activates the actuator. Two light shielding plates are located at ends of the actuator and each of them turns on/off the paper gauge sensor 1 and 2 that is the photo interrupter equipped on the paper feeder drive PWB. Actuator does not operate if no paper exists on the bottom plate because it drops in the slot provided on the bottom plate.

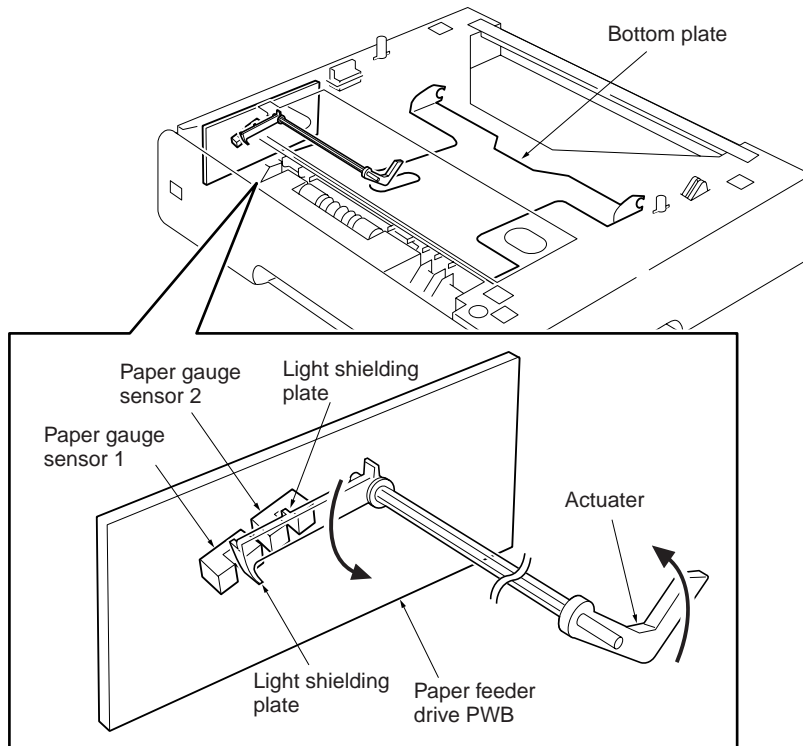


Figure 2-1-3 Paper remaining amount detection

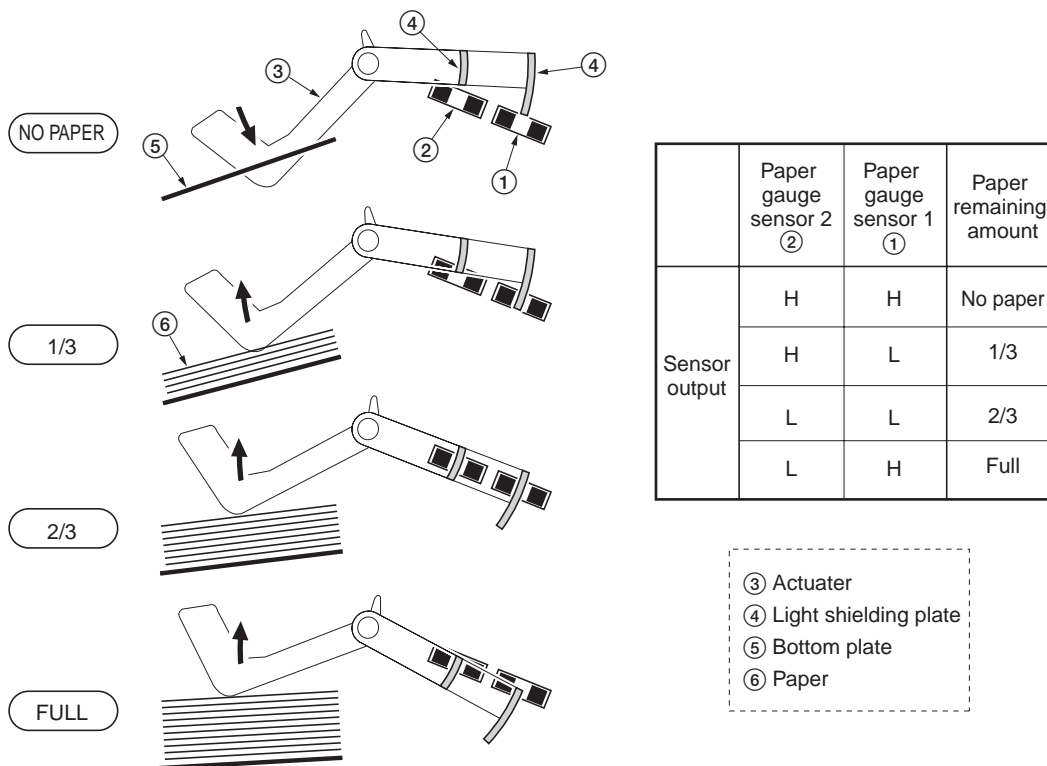


Figure 2-1-4 Paper remaining amount detection output

(3) Detecting the cassette size

Cassette size switch consists of three push switches (SW0, SW1, and SW2) and it outputs the 3-bit output to the paper feeder drive PWB. Paper size dial has the different concavo-convex patterns, which identifies the paper size, depending on the rotating position. These patterns allow the paper feeder drive PWB to determine the paper setting of the paper size dial according to this 3-bit input. When all inputs of 3-bit are H level (all switches are turned OFF), it is judged that the paper cassette is not securely set or it is removed.

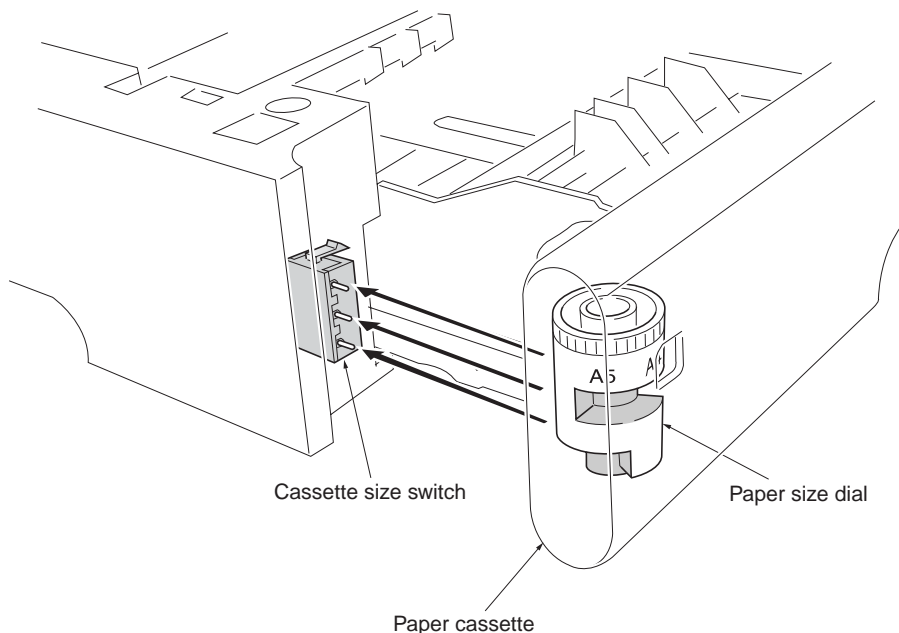


Figure 2-1-5 Cassette size detection

Cassette size switch	Paper size dial (indicator)								Cassette not installed
	Metric	OTHER	A3	A4	A4R	A5	B4	B5	
	Inch	OTHER	LGR	LGL	LTR-R	LTR	A3	A4	
SW0	L	L	L	L	L	H	H	H	H
SW1	H	H	L	L	L	L	L	H	H
SW2	H	L	L	H	H	L	L	H	H

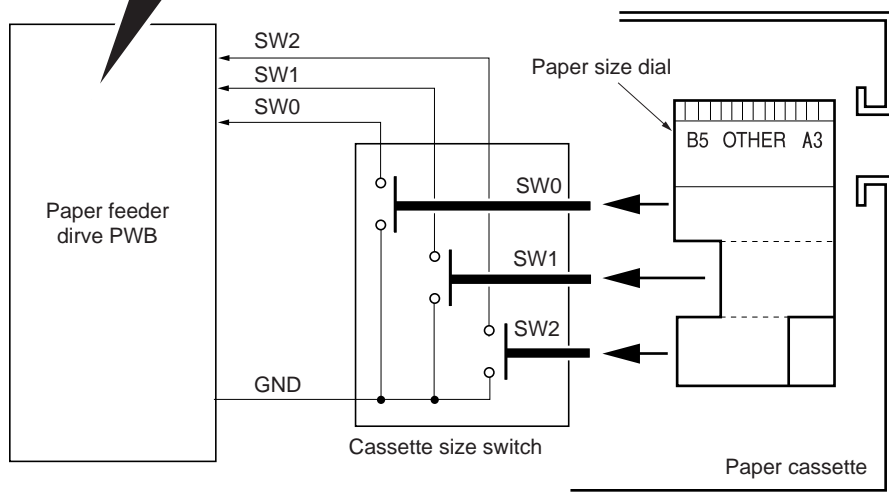


Figure 2-1-6 Cassette size detection output

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2-2-1 Electrical parts layout

(1) Electrical parts

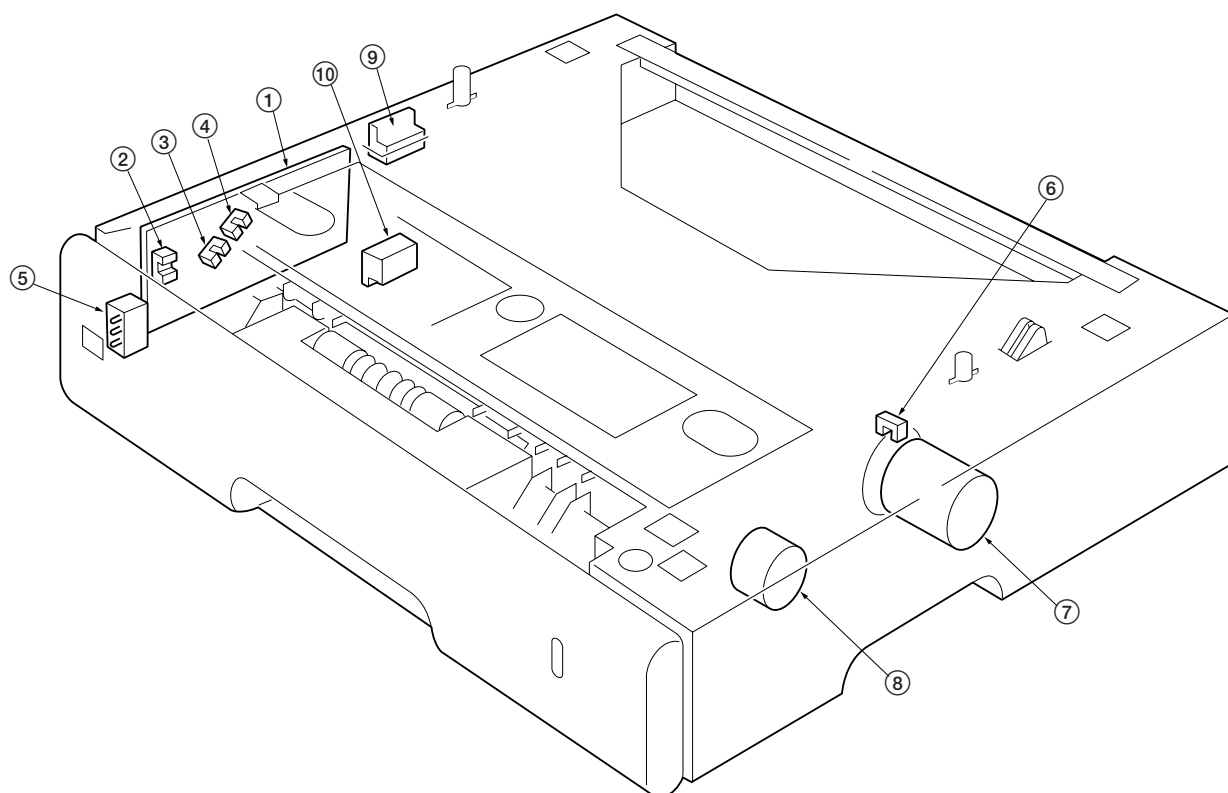


Figure 2-2-1 Electrical parts

- | | |
|--|--|
| 1. Paper feeder drive PWB | Controls the input/output of electrical parts in the paper feeder. |
| 2. Feed sensor | Detects the leading and trailing edges of paper. Detects paper misfeed. |
| 3. Paper gauge sensor 1 | Detects the remaining amount of paper in the paper cassette. |
| 4. Paper gauge sensor 2 | Detects the remaining amount of paper in the paper cassette. |
| 5. Cassette size switch | Detects the paper size setting in the paper cassette. Detects the existence of the paper cassette. |
| 6. Feed motor clock sensor | Detects the number of feed motor rotation. |
| 7. Feed motor | Drives the pickup roller, feed roller and conveying roller. |
| 8. Feed clutch | Controls switching the drive of the feed roller and conveying roller. |
| 9. Interface connector (upper side) | Connects the signal wire and power supply with the printer or the upper paper feeder. |
| 10. Interface connector (lower side) | Connects the signal wire and power supply with the lower paper feeder. |

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2-3-1 Paper feeder drive PWB

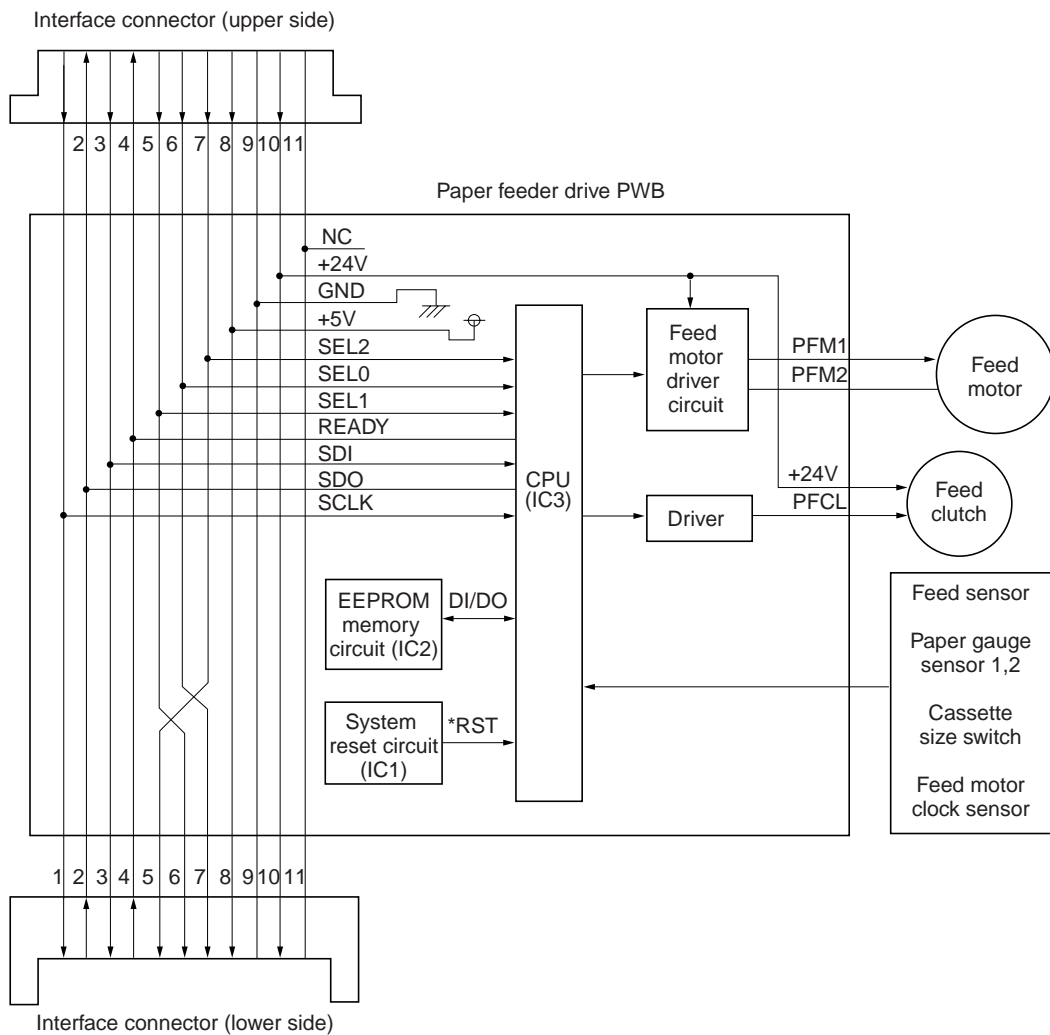


Figure 2-3-1 Paper feeder drive PWB block diagram

The paper feeder drive PWB consists of the feed motor driver circuit and its peripheral circuits with a focus on the operation of the CPU (IC3), and it is controlled by the engine/high voltage PWB of the printer. The paper feeder drive PWB serially communicates with the engine/high voltage PWB of the printer by sending/receiving the control signal. CPU (IC3) drives the feed motor via the feed motor driver circuit and then drives the feed clutch via the driver. The speed of the feed motor is fed back in the form of rotation pulses from the detection input of the feed motor clock sensor that pinches the slit plate attached to the feed motor and then the CPU (IC3) controls the system so that the speed of motor is maintained constant. The paper size setup of the paper cassette and the existence of cassettes are judged by the detection input from the cassette size switch and the condition of paper jam is judged by the detection input of the feed sensor. The paper remaining amount is judged by four levels (no paper, 1/3, 2/3 and full) from the detection input of the paper gauge sensor 1 and 2. The system reset circuit detects the voltage drop and outputs the reset signal to the CPU (IC3) by the operation of the voltage detection/system reset IC (IC1). The CPU (IC3) performs the action to write the count value of the total number of pages, which was counted on the built-in RAM before the system goes down, to the EEPROM (IC2). The printer supplies the power of 24 V DC and 5 V DC and this 24 V DC is used as the drive power for the feed motor and feed clutch, and 5 V DC is the operation power source for the circuits including sensors.

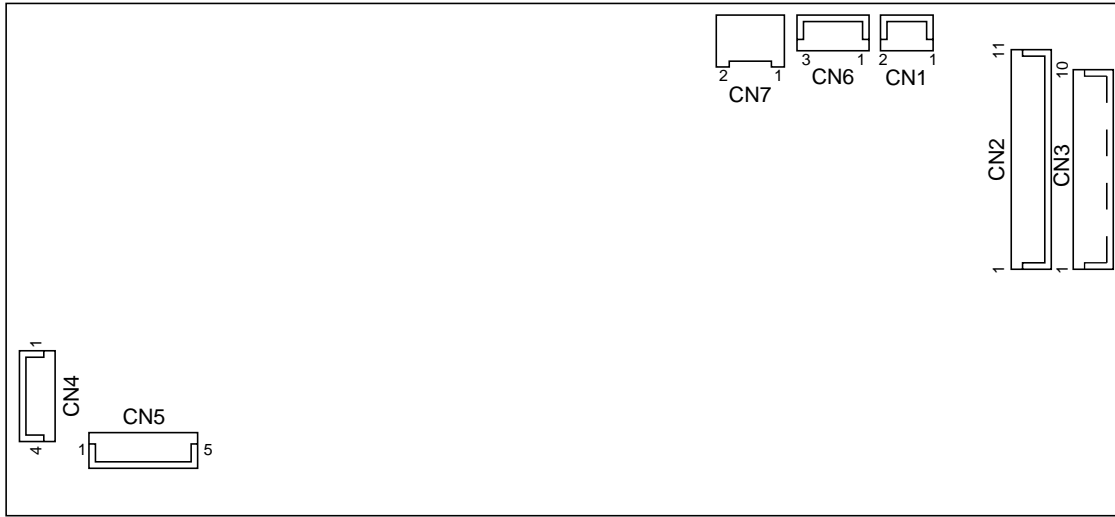
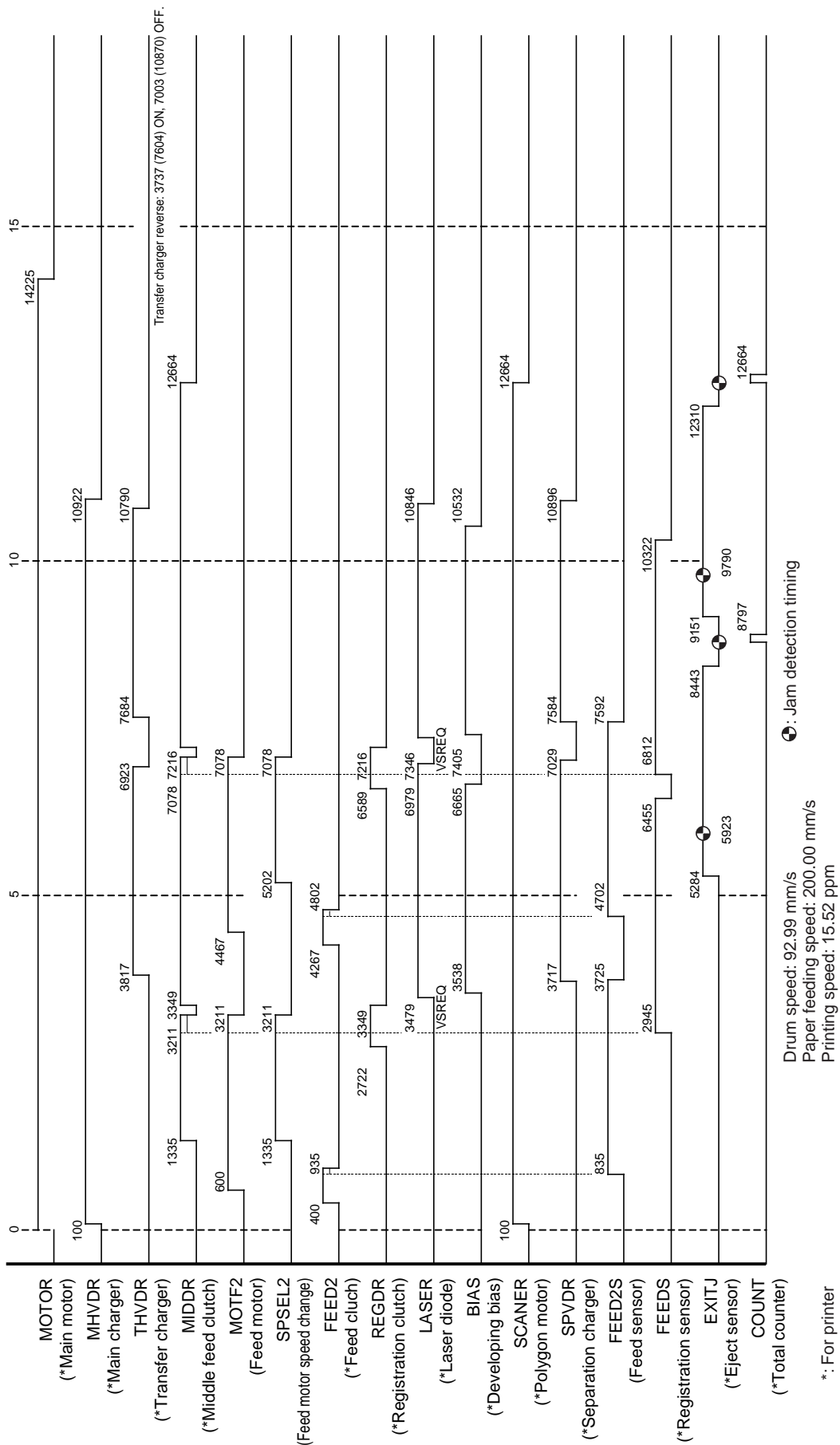


Figure 2-3-2 Paper feeder drive PWB silk-screen diagram

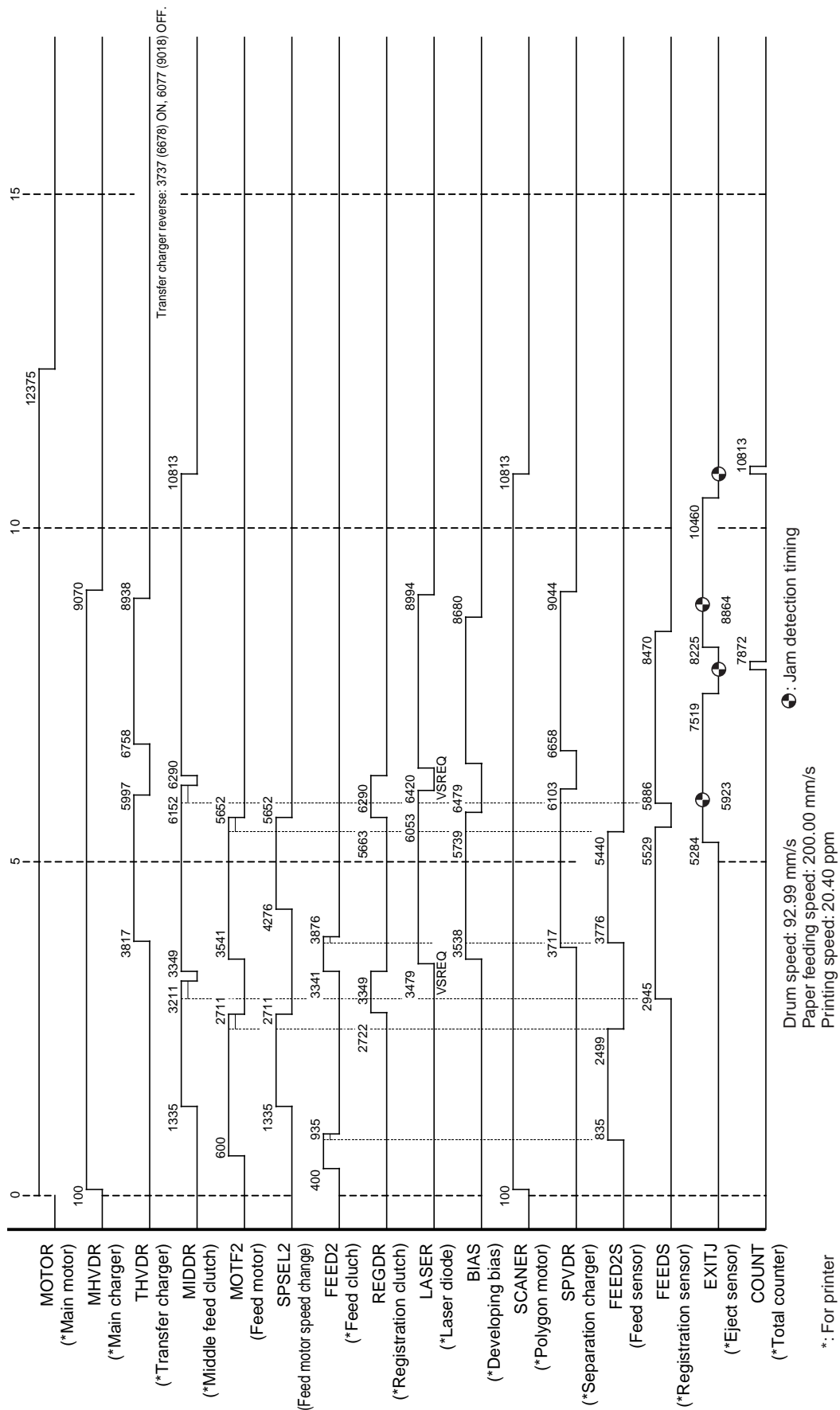
Connector	Pin No.	Signal	I/O	Voltage	Description
CN1 Connected to the feed clutch.	1	+24 V	O	24 V DC	24 V DC power supply for feed clutch Feed clutch: On/Off
	2	PFCL	O	0/24 V DC	
CN2 Connected to the interface connector (upper side).	1	SCLK	O	0/5 V DC (pulse)	Clock signal for serial communication Serial communication output signal Serial communication input signal Paper feeder ready signal Paper feeder select signal 1 Paper feeder select signal 0 Paper feeder select signal 2 5 V DC power input Ground 24 V DC power input Not used
	2	SD0	O	0/5 V DC (pulse)	
	3	SD1	I	0/5 V DC (pulse)	
	4	READY	O	0/5 V DC	
	5	SEL1	I	0/5 V DC	
	6	SEL0	I	0/5 V DC	
	7	SEL2	I	0/5 V DC	
	8	+5 V	I	5 V DC	
	9	GND	-	Ground	
	10	+24 V	I	24 V DC	
	11	NC	-	-	
CN3 Connected to the interface connector (lower side).	1	SCLK	O	0/5 V DC (pulse)	Clock signal for serial communication Serial communication output signal Serial communication input signal Paper feeder ready signal Paper feeder select signal 1 Paper feeder select signal 0 Paper feeder select signal 2 5 V DC power output Ground 24 V DC power output Not used
	2	SD0	O	0/5 V DC (pulse)	
	3	SD1	I	0/5 V DC (pulse)	
	4	READY	O	0/5 V DC	
	5	SEL1	I	0/5 V DC	
	6	SEL0	I	0/5 V DC	
	7	SEL2	I	0/5 V DC	
	8	+5 V	O	5 V DC	
	9	GND	-	Ground	
	10	+24 V	O	24 V DC	
	11	NC	-	-	
CN4 Connected to the cassette size switch.	1	SW0	I	0/5 V DC	Cassette size switch (SW0): On/Off Ground Cassette size switch (SW1): On/Off Cassette size switch (SW2): On/Off
	2	SGND	-	Ground	
	3	SW1	I	0/5 V DC	
	4	SW2	I	0/5 V DC	
CN5 Not used	1	SIMSW1	I	0/5 V DC	Not used Not used Not used Not used Not used
	2	SIMSW2	I	0/5 V DC	
	3	SIMSW3	I	0/5 V DC	
	4	SIMSW4	I	0/5 V DC	
	5	GND	-	Ground	
CN6 Connected to the feed motor clock sensor.	1	SGND	-	Ground	Ground Output pulse for feed motor clock sensor Power supply for feed motor clock sensor
	2	MCLKS	I	0/5 V DC (pulse)	
	3	+5 V	O	5 V DC	
CN7 Connected to the feed motor.	1	PFM1	O	0/24 V DC	Feed motor: On/Off Ground
	2	PFM2	-	Ground	

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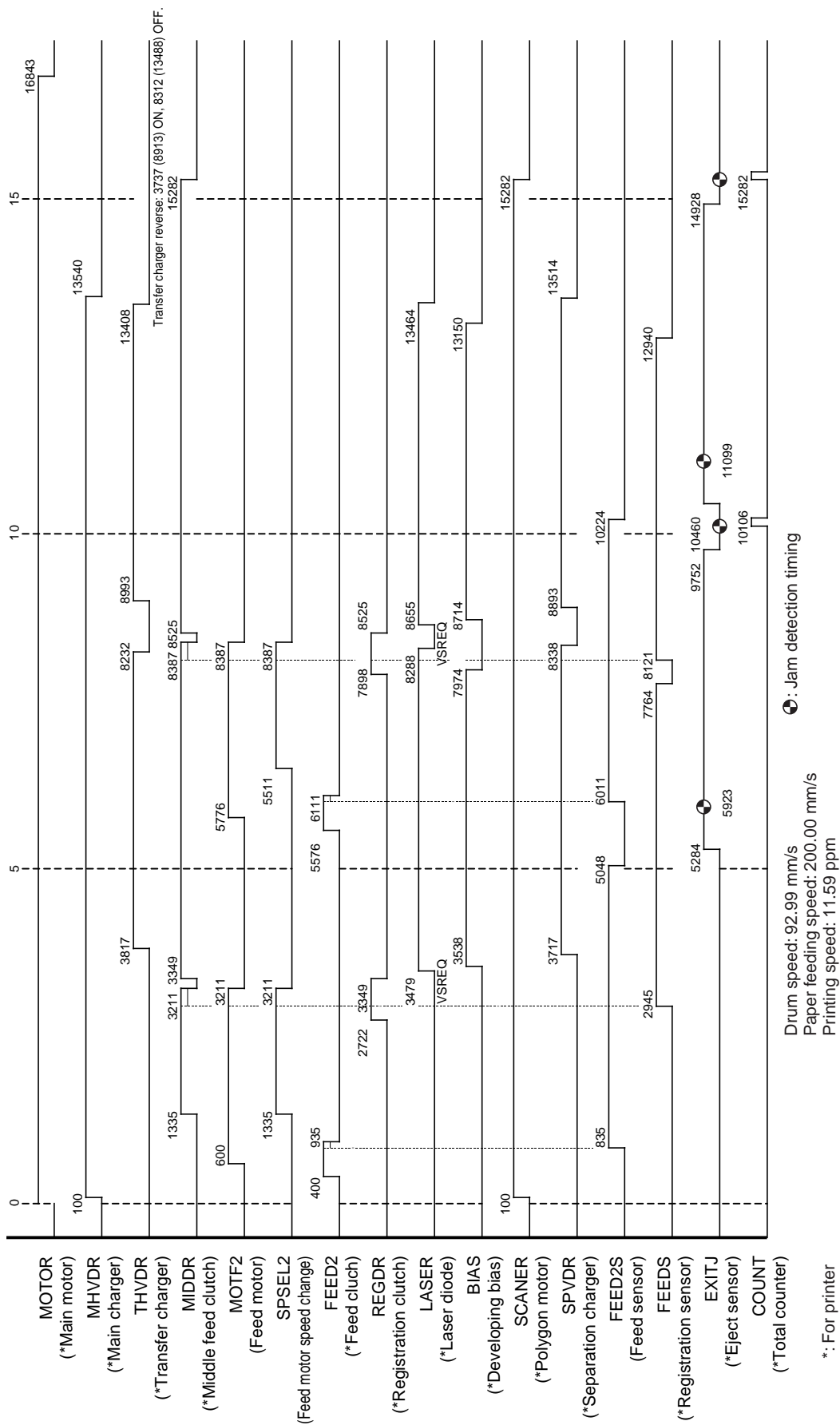
Timing chart No. 1 Continuous printing onto two sheets of A4 (vertical)



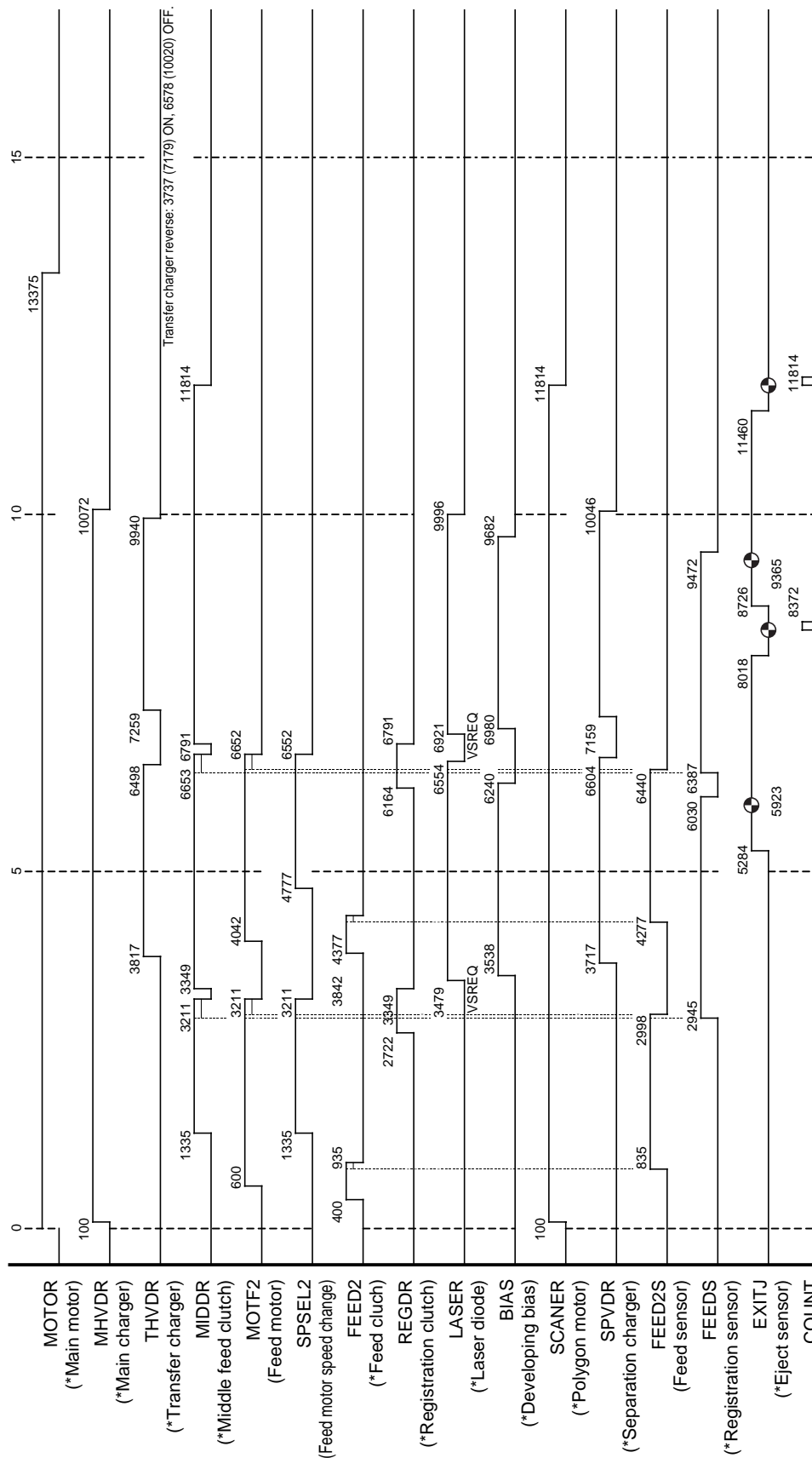
Timing chart No. 2 Continuous printing onto two sheets of A4 (horizontal)



Timing chart No. 3 Continuous printing onto two sheets of A3



Timing chart No. 4 Continuous printing onto two sheets of B5

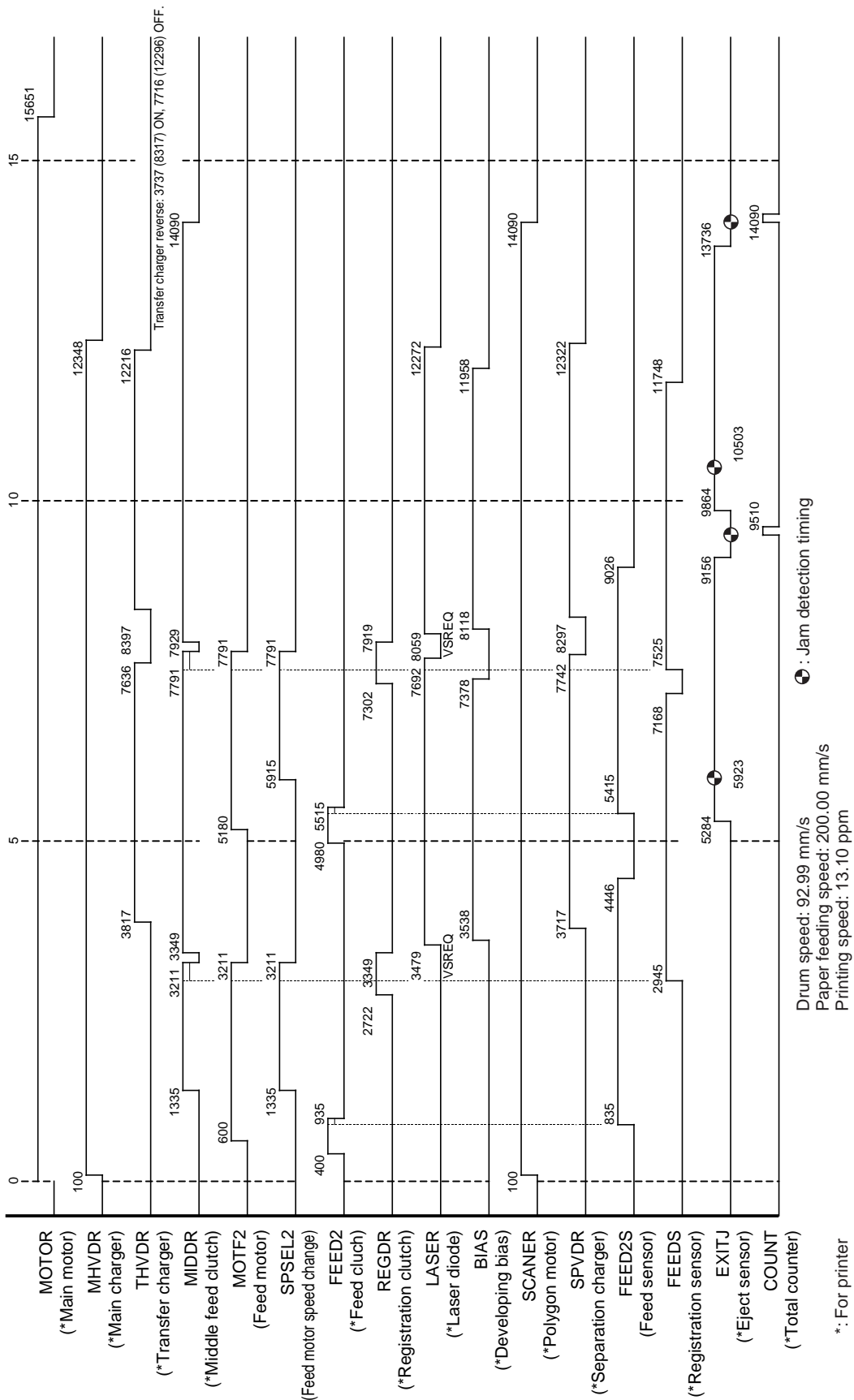


Drum speed: 92.99 mm/s
 Paper feeding speed: 200.00 mm/s
 Printing speed: 17.43 ppm

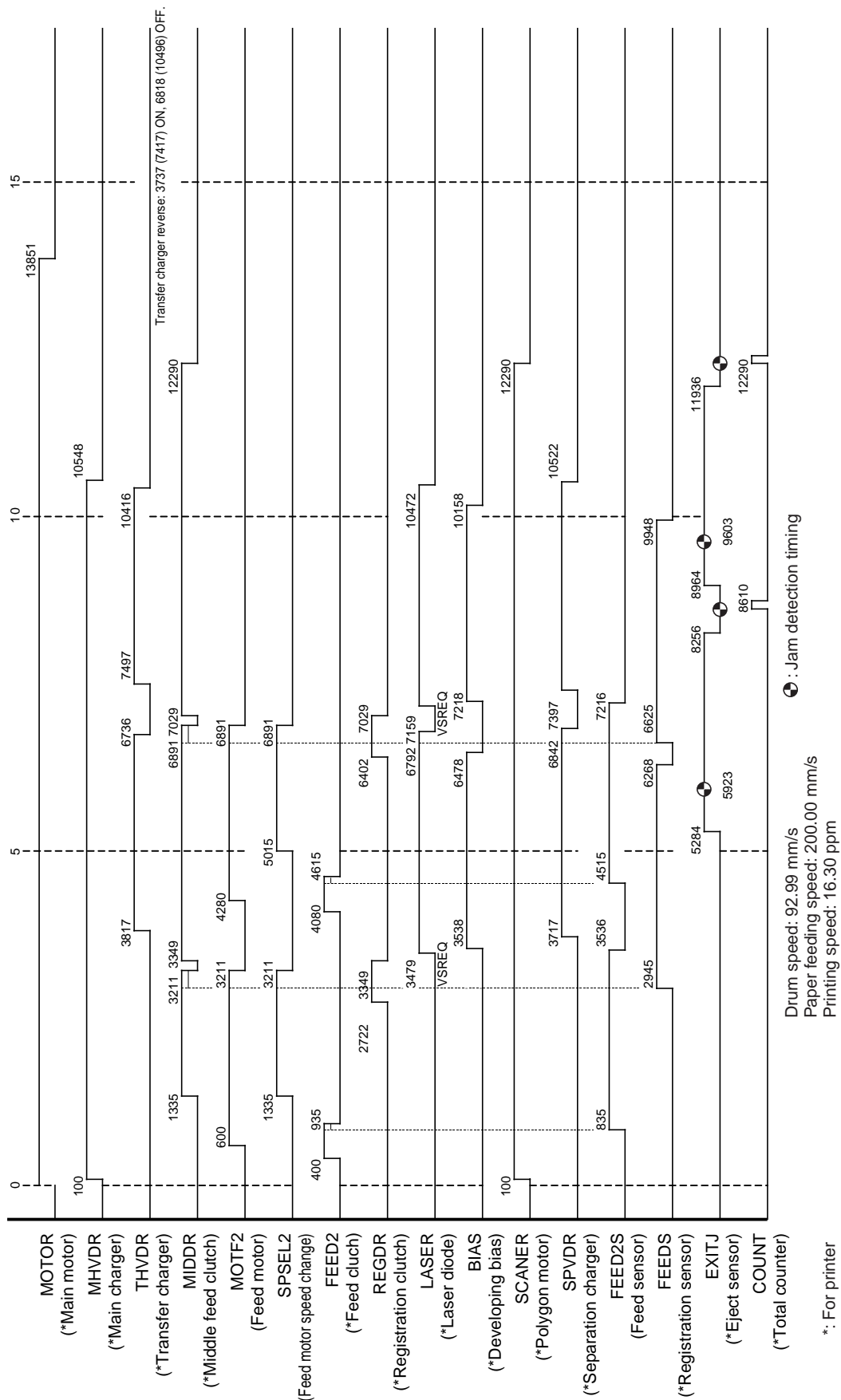
⊗ : Jam detection timing

*: For printer

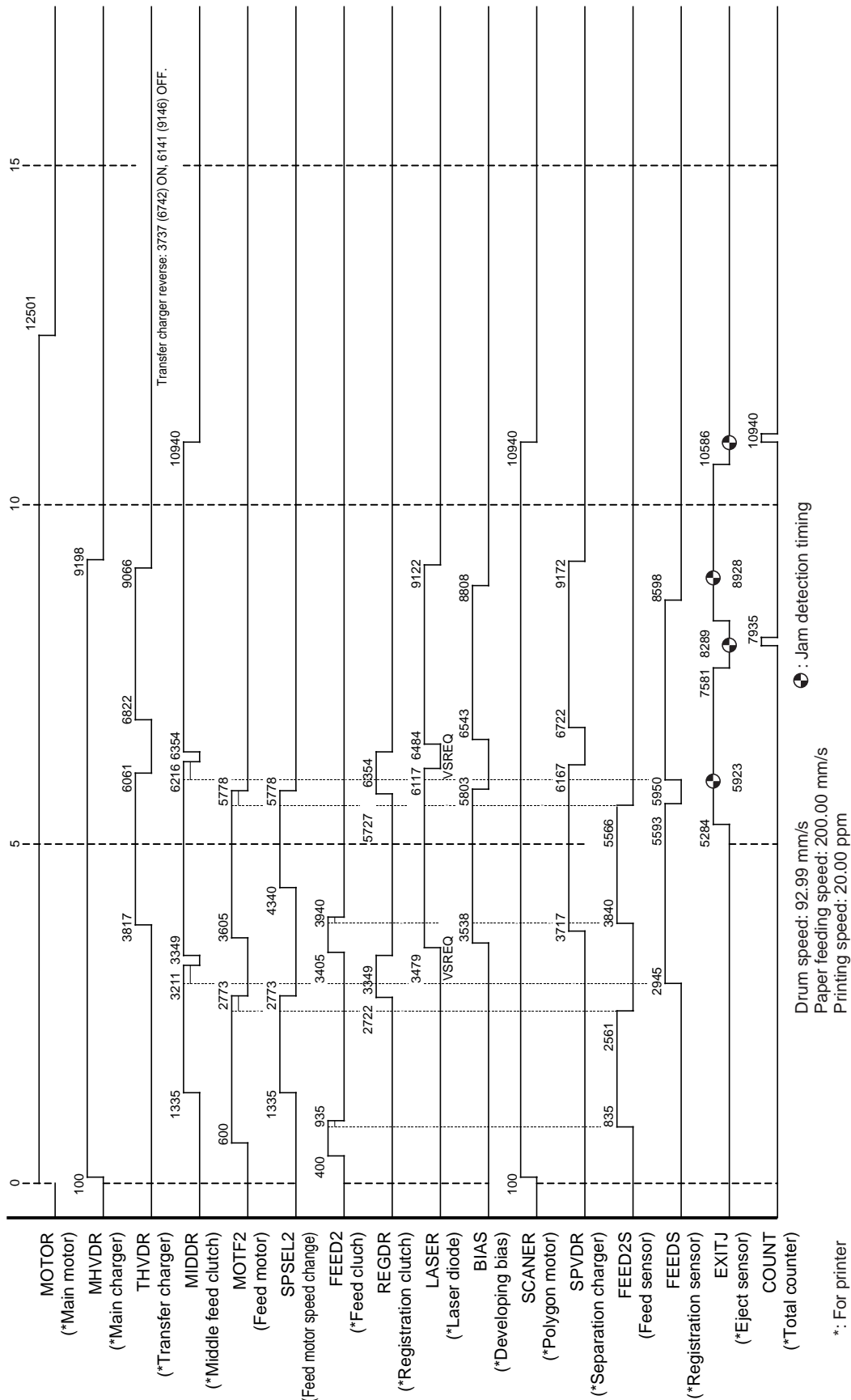
Timing chart No. 5 Continuous printing onto two sheets of B4



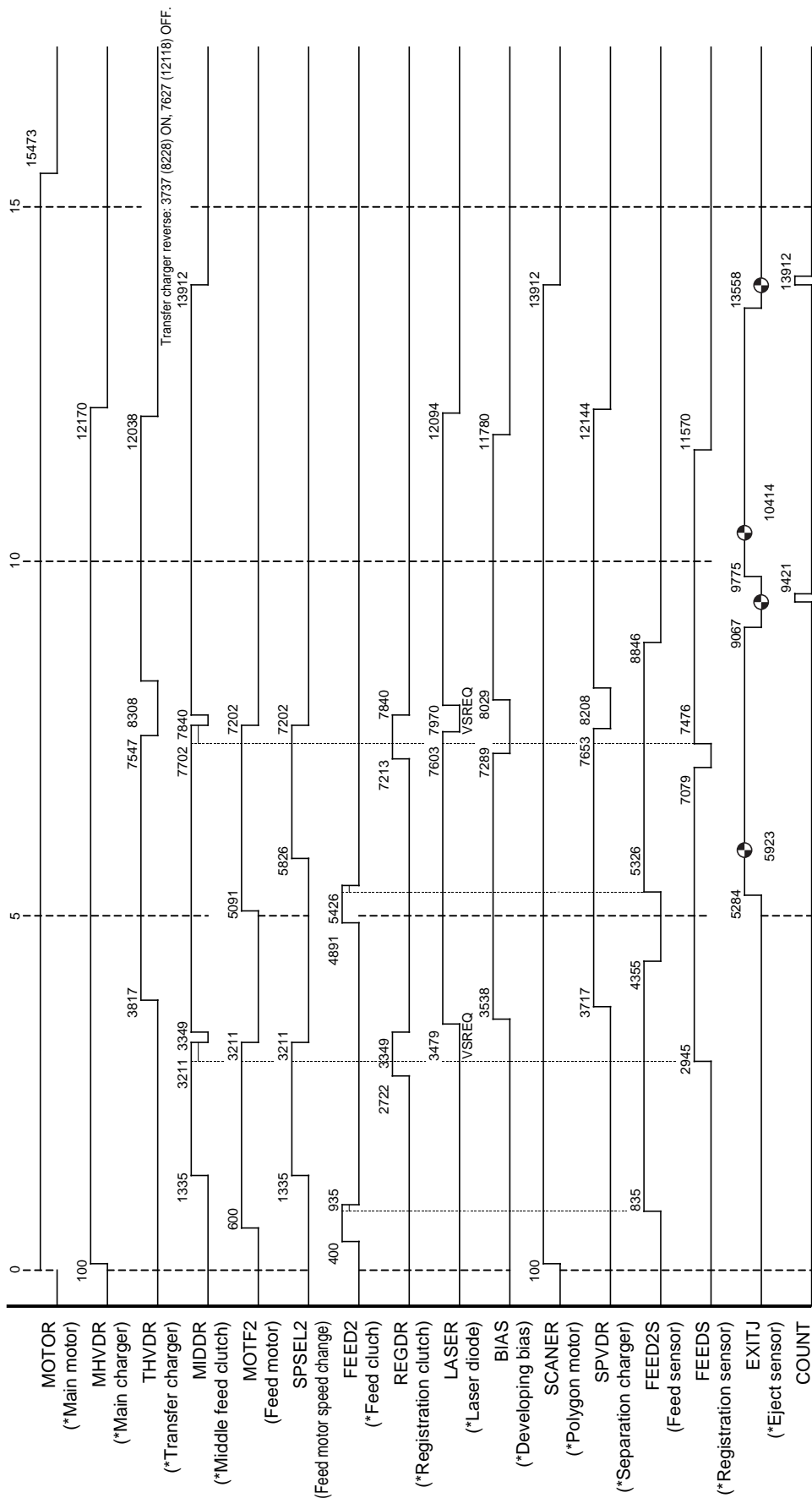
Timing chart No. 6 Continuous printing onto two sheets of letter (vertical)



Timing chart No. 7 Continuous printing onto two sheets of letter (horizontal)



Timing chart No. 8 Continuous printing onto two sheets of legal

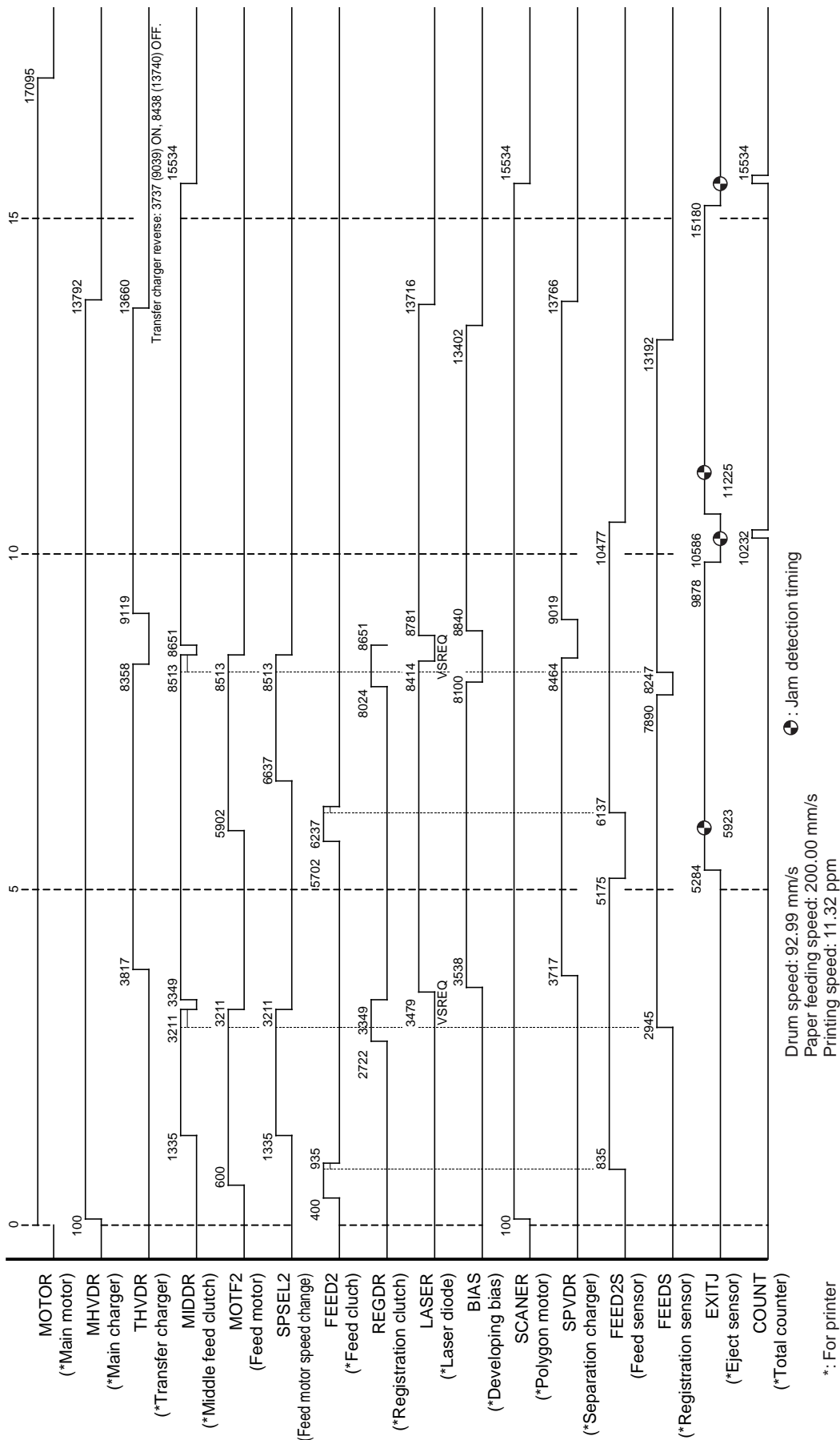


Drum speed: 92.99 mm/s
 Paper feeding speed: 200.00 mm/s
 Printing speed: 13.36 ppm

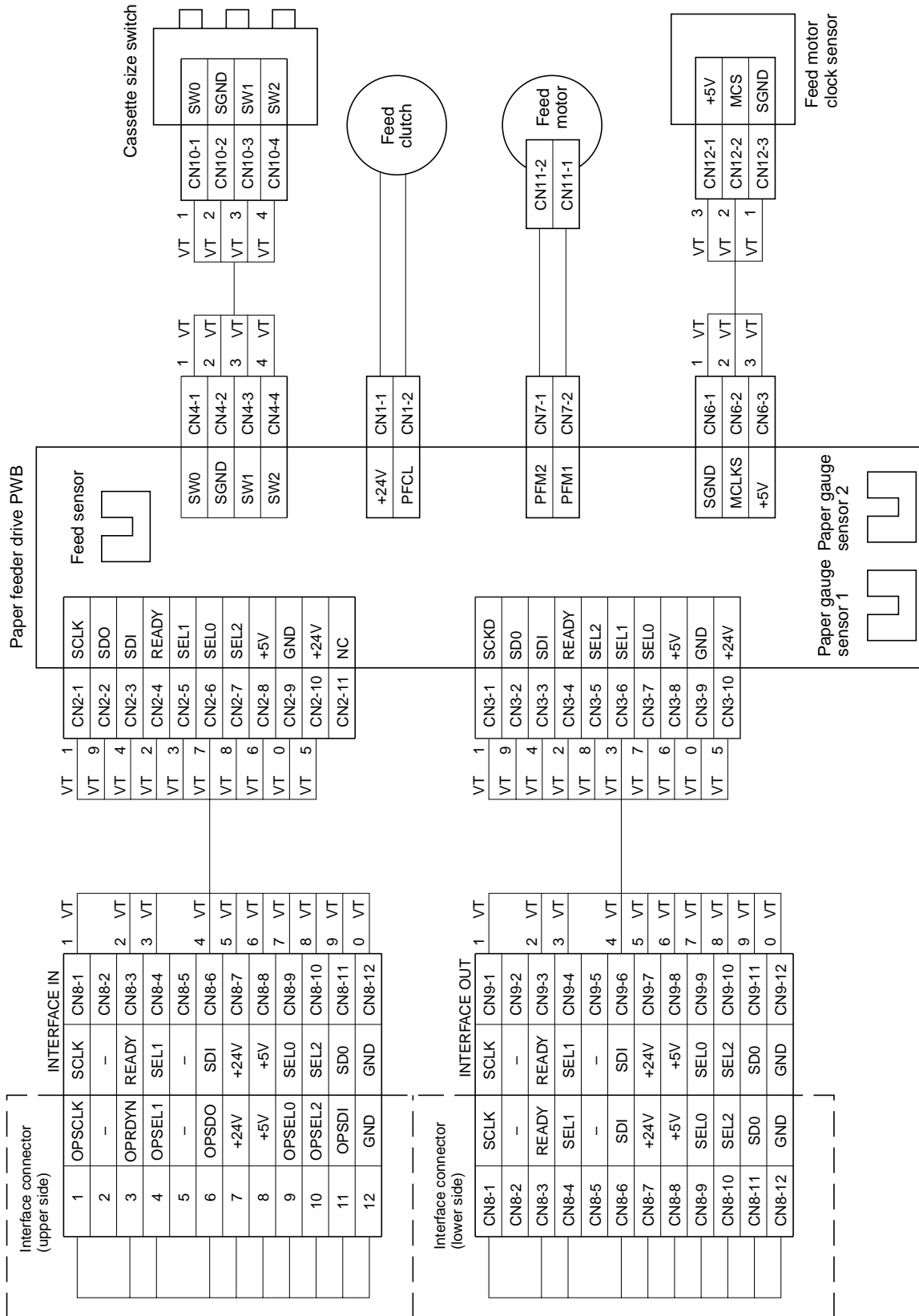
● : Jam detection timing

*: For printer

Timing chart No. 9 Continuous printing onto two sheets of ledger



Connection diagram



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