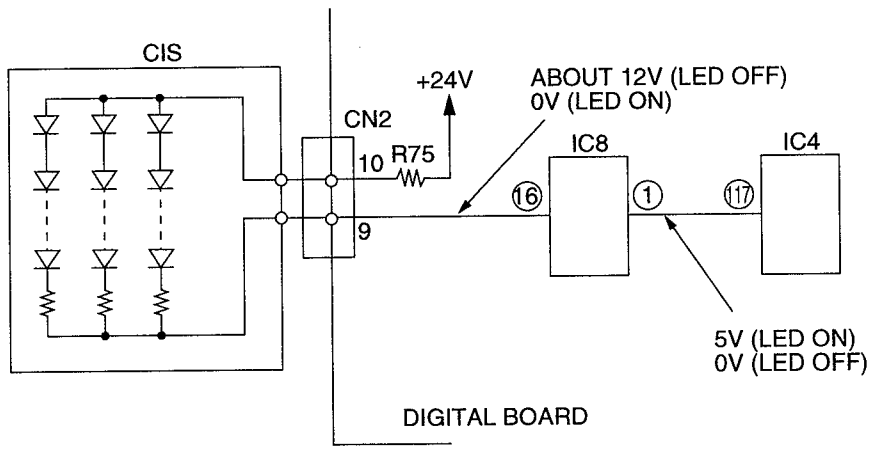
3-5. LED ARRAY(CIS)

The LED ARRAY will light during transmission and copying as a light source to recognize document characters, patterns, or graphics on a document.
It is also possible to light the LED ARRAY in the test mode. (Page 89 scan check in Test Function)

Circuit Diagram



4. FACSIMILE SECTION

4-1. IMAGE DATA FLOW DURING FACSIMILE OPERATION

COPY (Fine, Super-Fine, Half Tone)

(1) Line information is read by CIS, via route ①, and is input to IC4.
(2) In IC4, the data is adjusted to a suitable level for A/D conversion in the Analog Signal Processing Section, and via route ② it is input to A/D conversion (8 bit). After finishing A/D conversion, the data is input to the Image Processing Section via route ③. Then via routes ④ and ⑤, it is stored in RAM as shading data.
(3) The draft's information that is read by CIS is input to IC4 via route ①. After it is adjusted to a suitable level for A/D conversion via route ②, the draft's information is converted to A/D (8 bit), and it is input to the Image Processing Section. The other side, the shading data which flows from RAM via routes ⑥ and ⑦, is input to the Image Processing Section. After finishing the draft's information image processing, white is regarded as "0" and black is regarded as "1". Then via routes ④ and ⑤, they are stored in RAM.
(4) The white/black data stored as above is input to the P/S converter via routes ⑥ and ⑧. The white/black data converted to serial data in the P/S converter is input to the Thermal Head via route ⑨ and is printed out on recording paper.

Note:

Standard:	Reads 3.85 times/mm.
Fine:	Reads 7.7 times/mm.
Super-Fine:	Reads 15.4 times/mm.

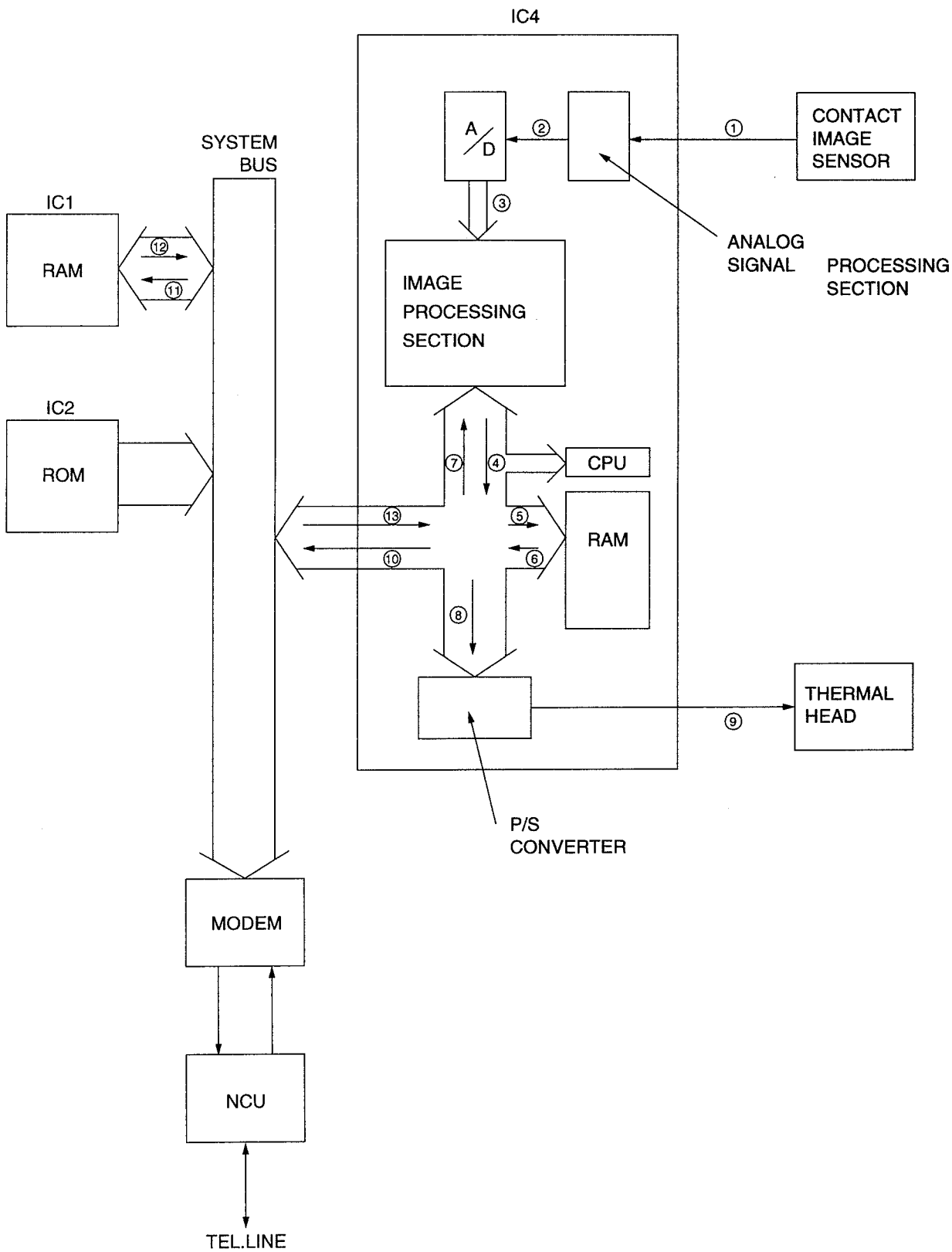
Transmission

(1) Same processing as **COPY** items 1) - 3).
(2) The data stored in RAM of IC4 is output from IC4 via routes ⑥ and ⑩, and is stored in the system bus. Via route ⑪, it is stored in the communication buffer inside RAM (IC1).
(3) While fetching data stored in the communication buffer synchronous with the modem, the CPU inputs data to the modem along route ⑫. There it is converted to serial analog data and forwarded over telephone lines via the NCU Section.

Reception

(1) The serial analog image data is received over telephone lines and input to the modem via the NCU section, where it is demodulated to parallel digital data. Then the CPU stores the data in the communication buffer of RAM (IC1) along route ⑫.
(2) The data stored in RAM (IC1) is decoded by the CPU via route ⑫, and is stored in RAM by routes ⑬ and ⑤.
(3) Same processing as **COPY** item 4).

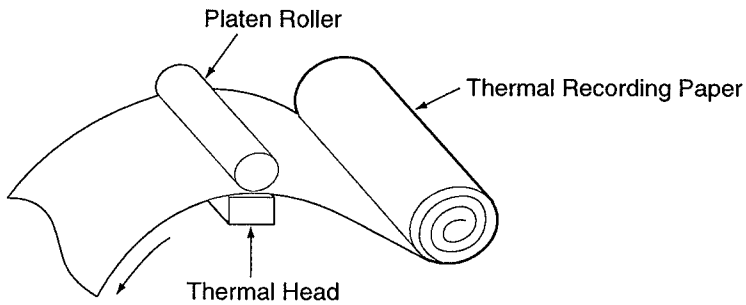
Block Diagram



4-2. THERMAL HEAD

(1) Function

This unit utilizes the state of the art thermal printer technology.
The recording paper (roll paper) is chemically processed. When the thermal head contacts this paper it emits heat momen-tarily, and black dots (appearing like points) are printed on the paper. If this continues, letters and/or diagrams appear, and the original document is reproduced.



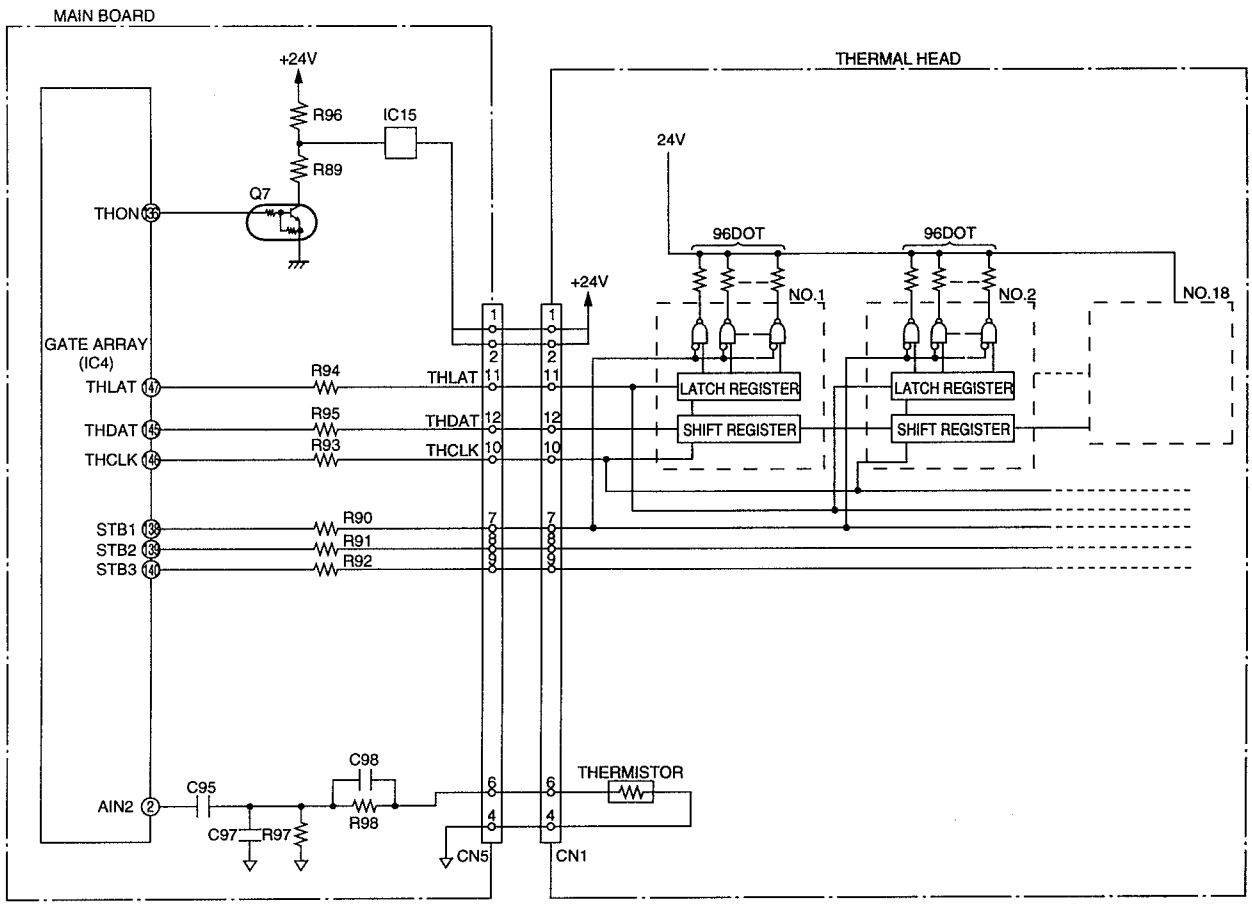
COMPOSITION OF THE RECEIVE RECORD SECTION (THERMAL RECORDING FORMAT)

(2) Circuit Operation

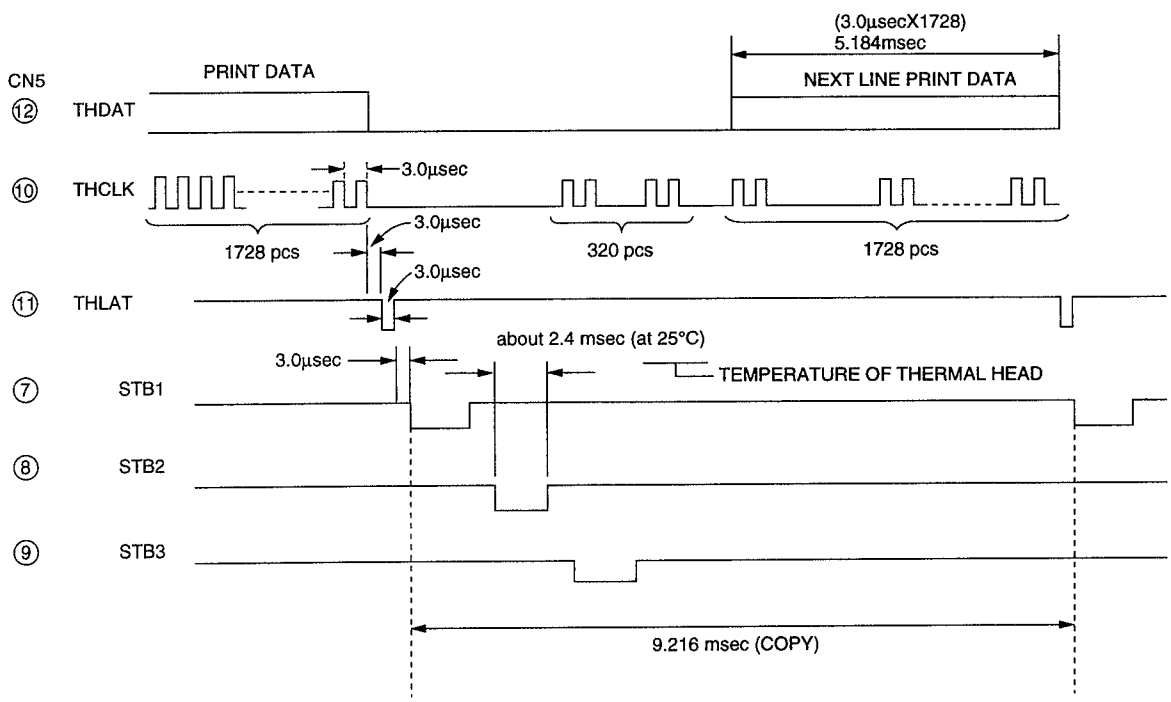
There are 18 driver ICs aligned horizontally on the thermal head and each one of these ICs can drive 96 heat emitting registers. This means that one line is at a density of 96×18=1728 dots=(8 dots/mm).
White/Black (white=0, black=1) data in one line increments is synchronized at IC4 pin 146 (THCLK), and sent from IC4 pin 145 (THDAT) to the shift register of the ICs. The shift registers of the 18 ICs are connected in series, and upon the shift of dot increment 1728, all the shift registers become filled with data, and a latch pulse is emitted to each IC from IC4 pin 147 (THLAT).

With this latch pulse, all the contents of the shift registers are latched to the latch registers. Thereafter, through the addition of strobes from the IC4 pins (138,139,140) only black dot locations (=1) among latched data activates the driver, and the current passes to heat the emitting body causing heat emission.
Here, the three line strobes, STB1 to STB3, impress at intervals of 9.216 msec, as required for one-line printout.
The sequence is shown on the next page. [Moreover, for the strobe width, the thermistor value inside the thermal head is detected according to IC4 pin 2. (See page 114.) Depending on that value, the strobe width is recorded in ROM (IC2). Accordingly, the strobe width is determined.
When the thermal head is not used, the IC4 (136, THON) becomes low, Q7 turns OFF, IC15 turns OFF, and the +24 V power supply for the thermal head driver is not impressed to protect the IC.

Circuit Diagram



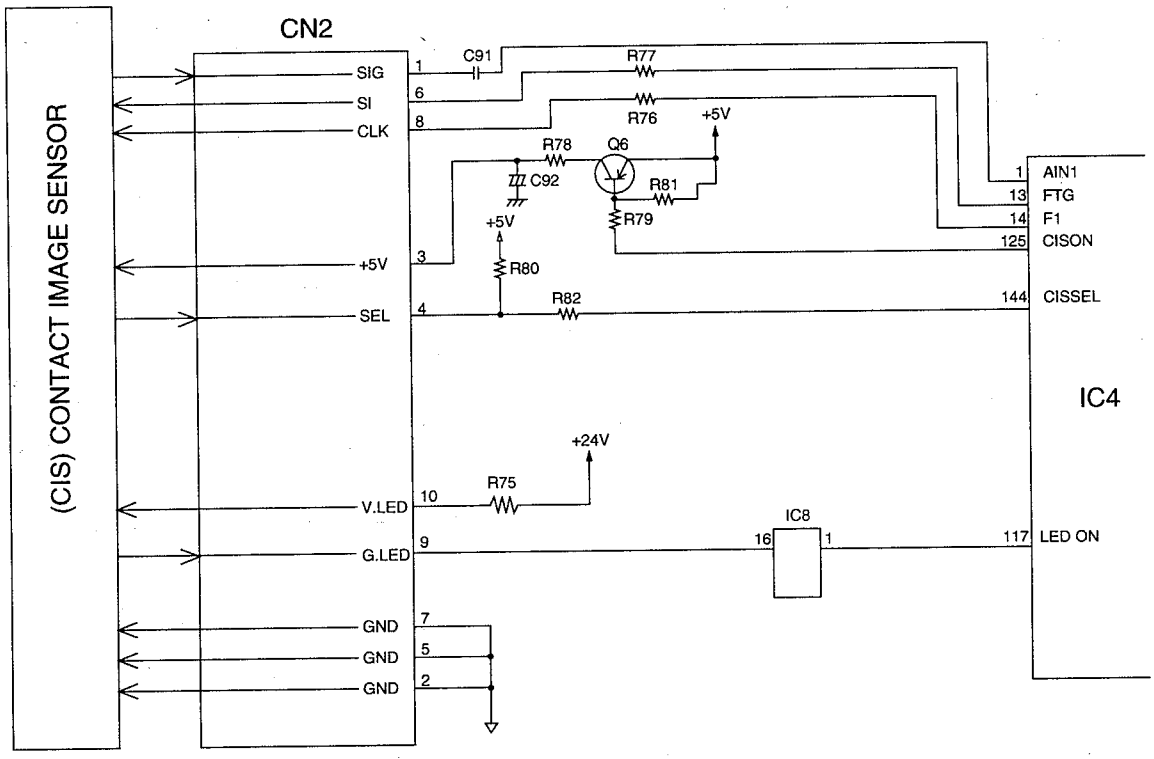
Timing Chart



4-3. SCANNING BLOCK

The scanning block of this device consists of a control circuit and a contact image sensor made up of a celfoc lens array, an LED array (Page 117), and photoelectric conversion elements.

Circuit Diagram



When an original document is inserted and the start button pressed, pin 117 of IC4 goes to a high level and the transistor inside IC8 turns on.This applies voltage to the LED array to light it. At the same time, pin 125 of IC4 goes to a low level and Q6 turns on to supply +5V power to the contact image sensor. The contact image sensor is driven by each of the FTG-F1 signals output from IC4, and the original image illuminated by the LED array undergoes photoelectric conversion to output an analog image signal (SIG). The analog image signal is input to the system LSI on AIN1 (pin 1 of IC4) and converted into 8-bit data by the A/D converter inside IC4. Then this signal undergoes digital processing in order to obtain a high-quality image.

4-4. STEPPING MOTOR DRIVE CIRCUIT

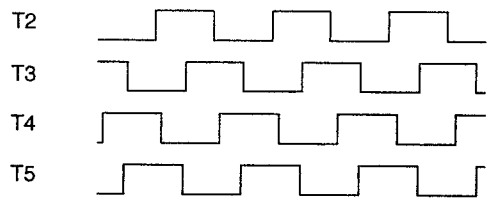
(1) Function

The stepping motors are used to feed the documents and recording paper synchronized for reading and printing in the transmission and reception operations.

(2) Circuit Operation

During motor drive, ASIC IC4 pin 130 becomes a high level, and then Q8 turns ON. +24 V is supplied to the motor coil. Stepping pulses are output from ASIC IC4, causing driver IC8 to go ON. The motor coil is energized sequentially in 2 phase increments or 1-2 phase increments, which causes a 1-step rotation. A 1-step rotation is 0.13mm of recording paper or document paper.
The timing chart is shown below.

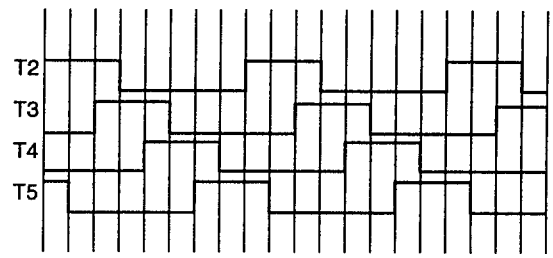
Timing Chart (2 Phase)



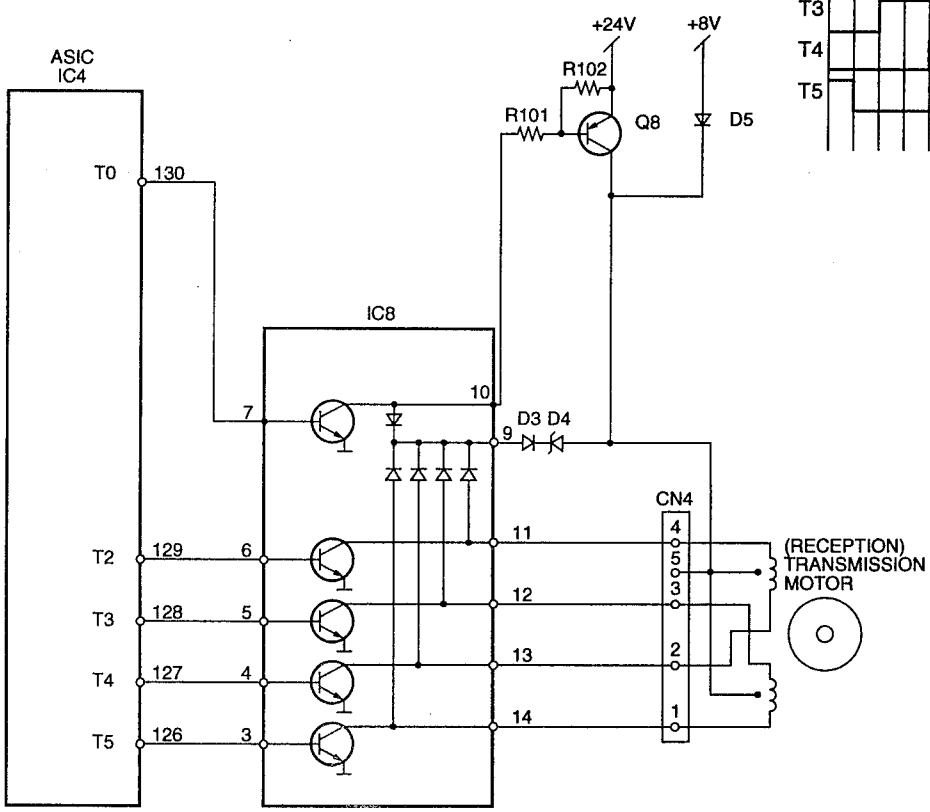
Stepping Motor Phase Pattern

Function	Mode	Drive Phase Pattern	Speed
Copy	Fine/Half Tone	1-2	217 pps
	Super Fine	1-2	108.5 pps
FAX	STD	2	217 pps
	Fine/Half Tone	1-2	217 pps
	Super Fine	1-2	108.5 pps
———	Paper Feed	1-2	434 pps

1-2. Phase (Asic IC4 T2-T5, output)



Circuit Diagram



When the motor is OFF, ASIC IC4 pin 130 becomes a low level and Q8 also turns OFF. Instead of +24V, +8V is supplied through D4 so that the motor is held in place.

4-5. GEAR SECTION

(1) Function

This model provides a motor-driven mechanism for copying, printing received faxes and reading documents.

(2) Operation (Refer to Fig. A and B)

When a motor with *Drive Motor Gear* attached rotates counterclockwise (:CCW), *Swing Gear C* will rotate around pivot point 3. Then, G2 engages G1 and drives G8 and G4 as well as G7 to turn clockwise.
The following is an outline of how the motor mechanism works in each mode.

① **Transmit mode**

Swing Gear A turns around pivot point 1. G8 engages G9 and conveys its drive power to *the Read Roller Gear* through G10 and sets the platen roller for feeding documents.

② **Cutter & Retraction (Reverse) mode**

G8 of *Swing Gear A* disengages G9. G4 of *Swing Gear B* engages G5 and drives G11 which has the *Cutter Arm* attached. Then, the cutter blade is rotated. G11, which is partially connected to *the Outer Gear of G11*, makes a full rotation after copying/receiving are completed. In the meantime, *Outer Gear of G11* engages *the Print Roller Gear* and makes the platen roller rotate counterclockwise. After copying/receiving are completed, the recording paper is pulled back to the printing start position. Lastly, the paper is fed to the point where *the Jam Sensor* turns on and it stops. If recording paper is stuck, the sensor does not go through the ON → OFF → ON process, so that the "Paper jam" can be detected. When starting to copy documents/receive faxes, the edge of the recording paper remaining on the sensor will be pulled back to the printing start point.

③ **Receive mode**

G8 of *Swing gear A* disengages G9. G4 of *Swing gear B* engages G6, and conveys its drive power to the Print Roller Gear on the cabinet.

④ **Copy mode**

Swing Gear B rotates around pivot point 2. G4 engages G6 and conveys its drive power to *the Print Roller Gear* on the cabinet and sets the platen roller for feeding recording paper. Then, G8 engages G9 and conveys its drive power to the Read Roller Gear through G10 and sets the platen roller for feeding documents.

The controlling positions of *Swing Gears A and B* determine which gears convey their drive power in each mode. *Swing Gears A and B* have a small protrusion in their lower end which determines the positions of the swing gears. There are grooves each protrusion can fit into inside Upper *CAM 1* for *Swing Gear A* and *Lower CAM 1* for *Swing Gear B.* (*Upper CAM 1* shown in Fig. B, which is located above *Lower CAM 1,* is not illustrated in Fig. A.) Different grooves are selected in different modes. When setting a groove's position to select a specific mode, rotate *Upper/Lower CAM 1* and indicate the mode you want to use with *the Mode Marker.* Mode options **R**, **C**, **P** and **RP** are displayed on *Upper CAM 1.* For example, if *the Mode Marker* points to **R** (Transmit mode), G8 of *Swing Gear A* engages G9, and G4 of *Swing Gear B* is fixed so it will not contact G6 and G5. Mode **C** (Retraction mode) is for starting to copy documents/receive faxes. **P**(Receive mode) is for receiving faxes. **RP**(Copy mode) is for copying documents. *Switch 1* is for detecting the **R** position by the indent in *Upper CAM 1.* Other modes are determined by how many rotations the stepping motor makes from the starting position of **R.** The motor revolving clockwise (:CW) will prompt *Swing Gear C* to rotate around pivot point 3 and engage G3 and then it will set *Upper CAM 1* to rotate clockwise.

⑤ **SUMMARY**

The Drive Motor Gear first rotates clockwise (:CW) to select a mode, and then the gear rotates counterclockwise (:CCW) to provide its driving force to the selected gear.

Switch 2 is for checking the position where the cutter blade is open to the maximum (default value) and the location of *the Outer Gear of G11.* When the switch lever goes into the indent in G11, the switch is ON (initialized) and G11 makes a full turn starting from that position.

If the cutter blade is stuck due to "Paper Jam" and does not stop at the normal position, you can release the cutter blade by pushing down the Cutter Release Lever which pushes up the Cutter Arm.

This motor-driven mechanism operation in each mode is illustrated in further detail on the next page.

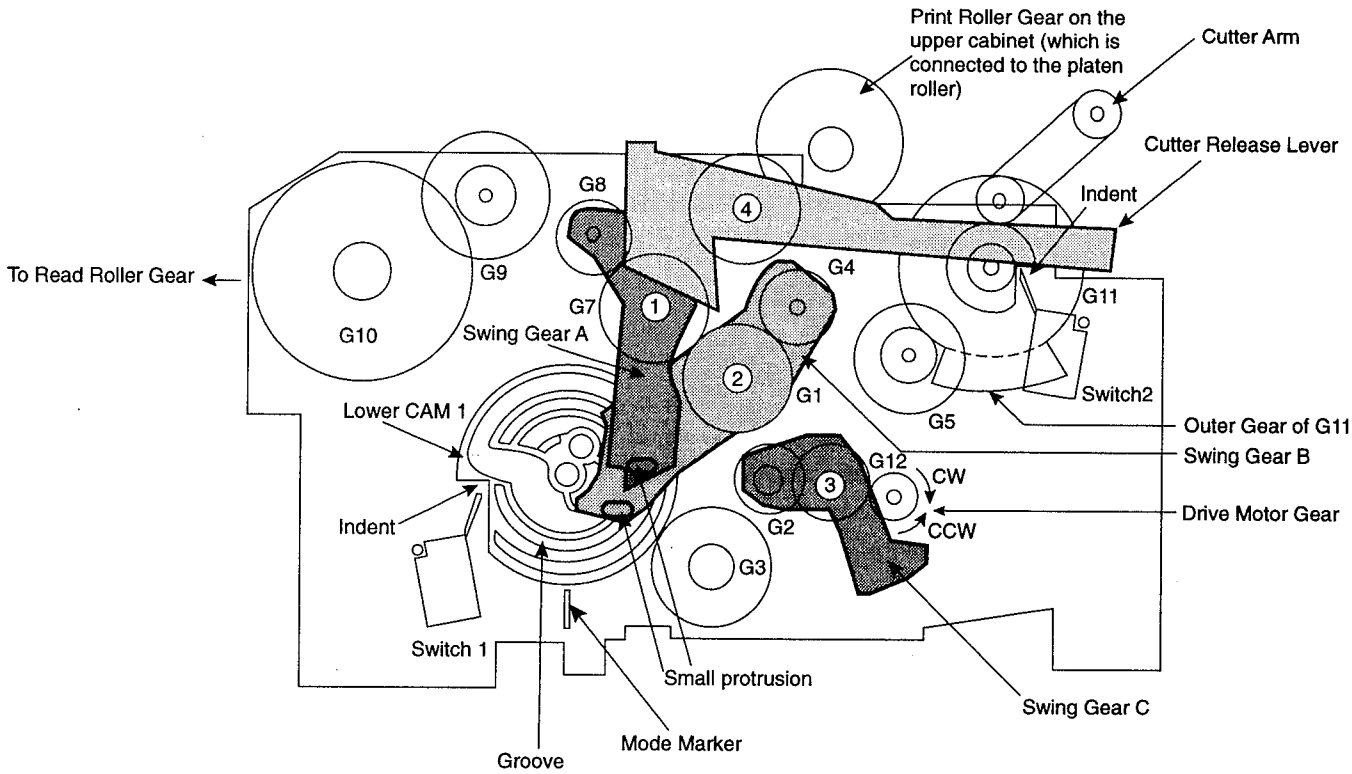
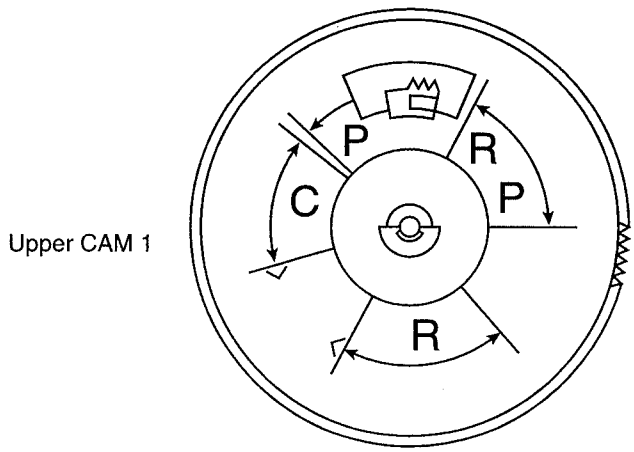


Fig.A



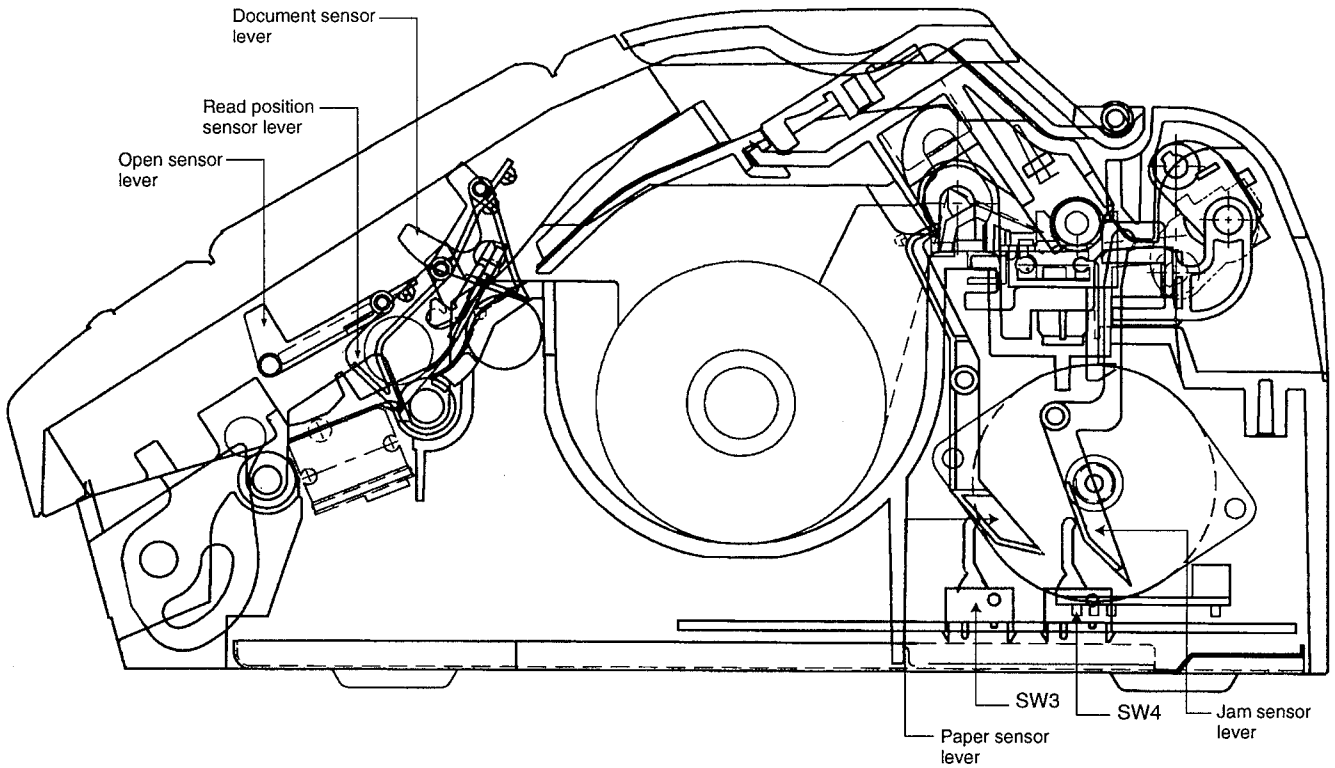
R: Transmit (Read) mode

C: Cutter & Retraction (Reverse) mode

P: Receive (Print) mode

RP: Copy (Read,Print) mode

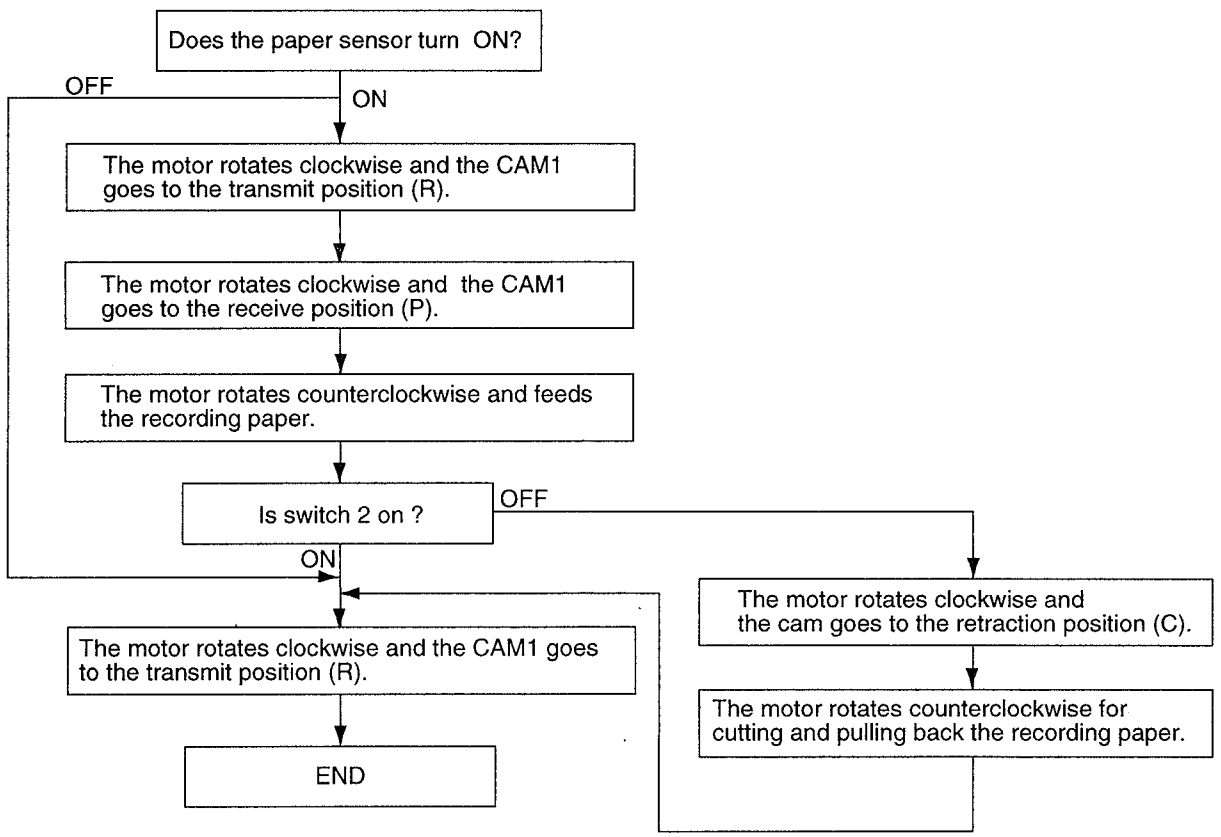
Fig.B



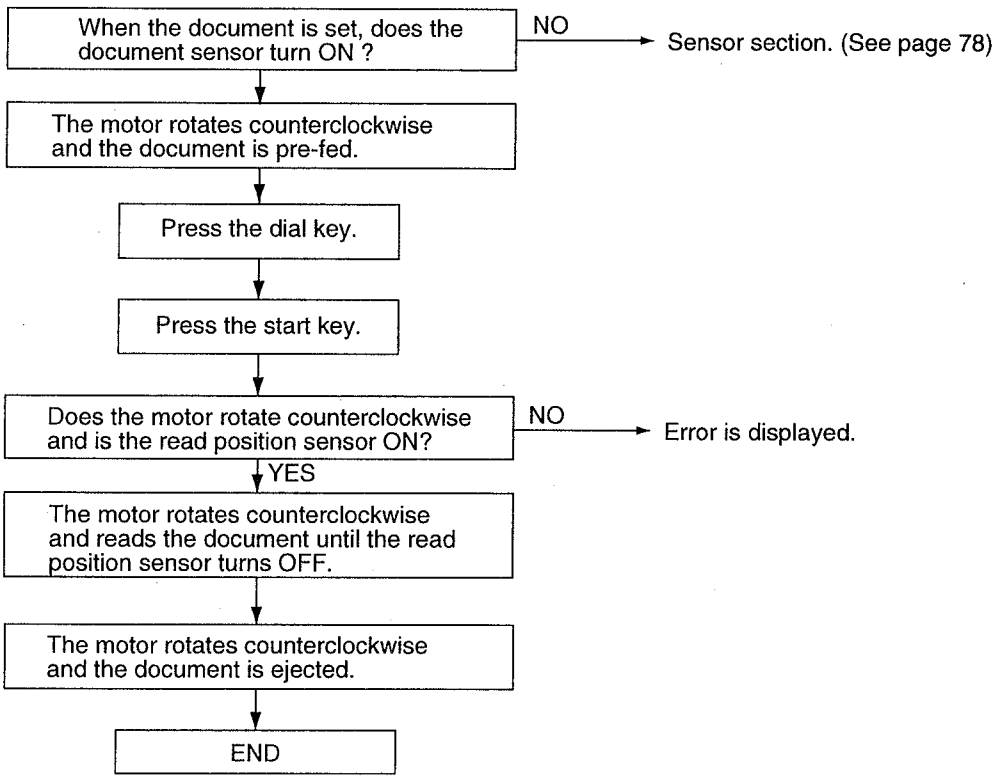
• For the sensor operation, refer to the Sensor and SW Section.

(3)-1 Idle mode

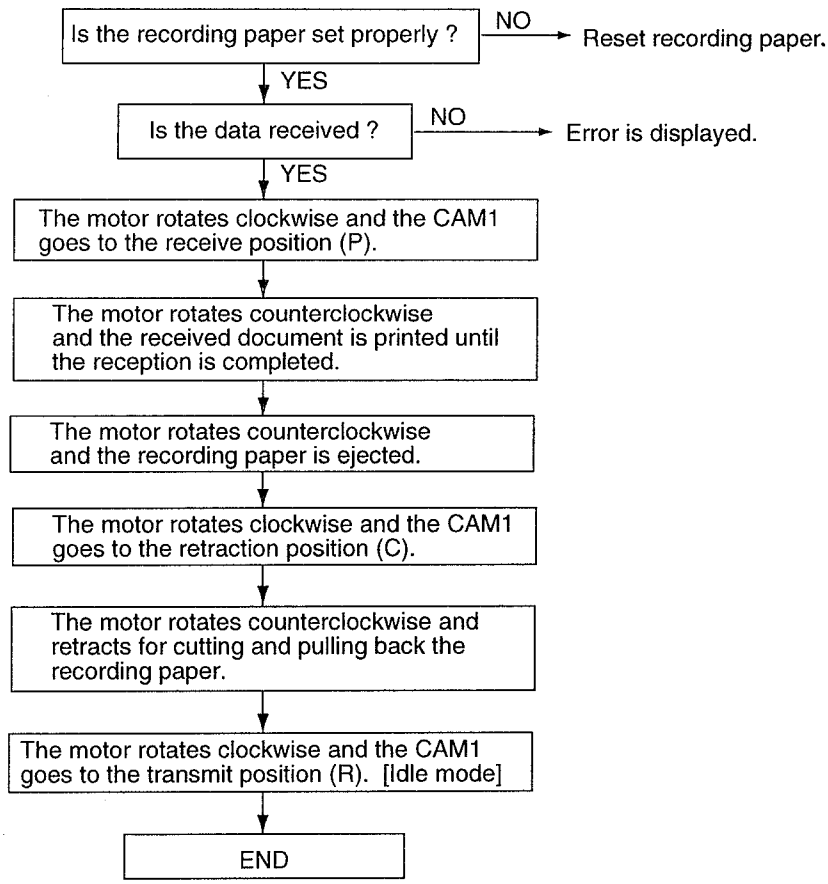
After turning on the unit, it will operate as follows:



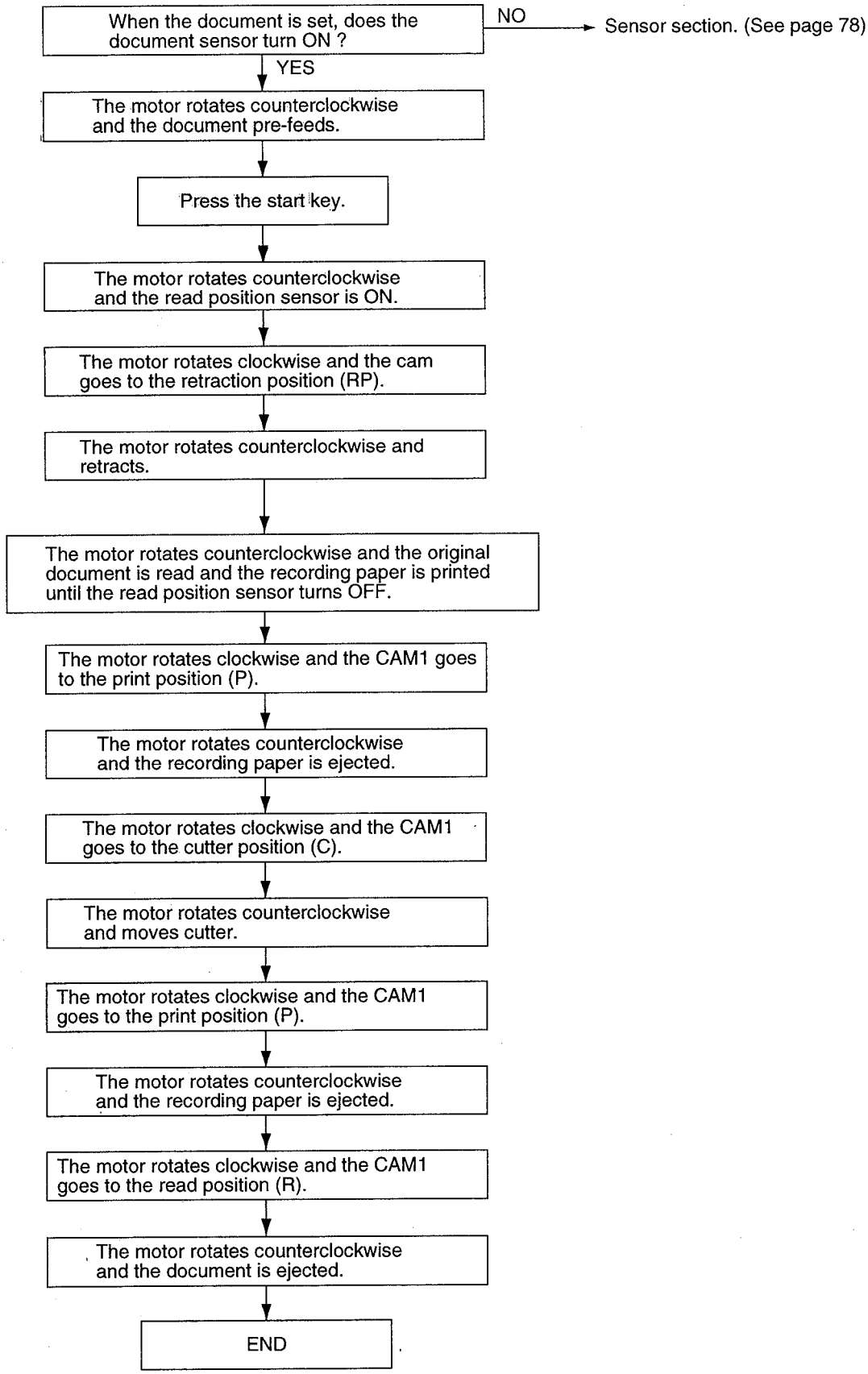
(3)-2 Transmitting documents



(3)-3 Receiving FAX



(3)-4 Copying


When the document is set, does the document sensor turn ON ?
NO
Sensor section. (See page 78)
YES
The motor rotates counterclockwise and the document pre-feeds.
Press the start key.
The motor rotates counterclockwise and the read position sensor is ON.
The motor rotates clockwise and the cam goes to the retraction position (RP).
The motor rotates counterclockwise and retracts.
The motor rotates counterclockwise and the original document is read and the recording paper is printed until the read position sensor turns OFF.
The motor rotates clockwise and the CAM1 goes to the print position (P).
The motor rotates counterclockwise and the recording paper is ejected.
The motor rotates clockwise and the CAM1 goes to the cutter position (C).
The motor rotates counterclockwise and moves cutter.
The motor rotates clockwise and the CAM1 goes to the print position (P).
The motor rotates counterclockwise and the recording paper is ejected.
The motor rotates clockwise and the CAM1 goes to the read position (R).
The motor rotates counterclockwise and the document is ejected.
END

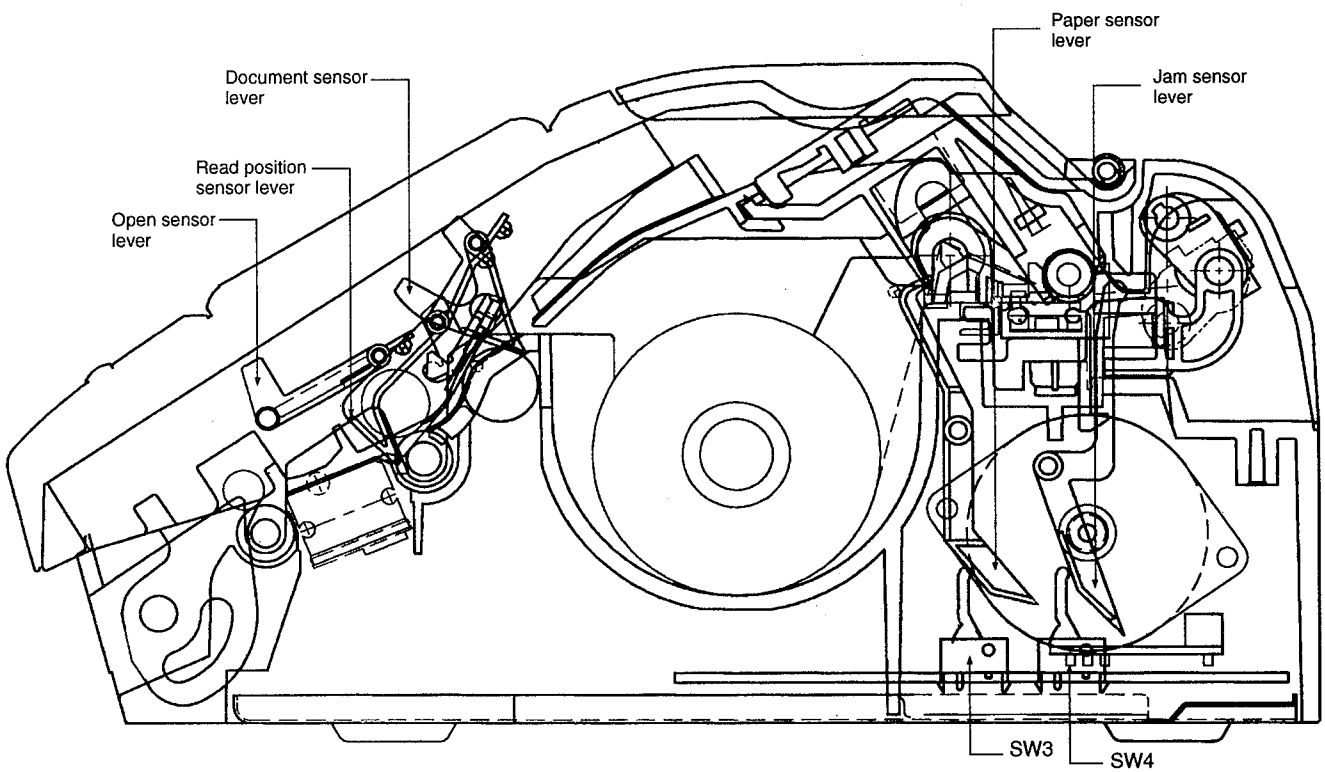
4.6 SENSORS AND SWITCHES

All of the sensor and switches are shown below.

Sensor Circuit Location	Sensor	Sensor or Switch name	Mainly LCD Error Sensor error message	Remark
Operation Panel	PS2	Read Position	[REMOVE DOCUMENT]	※
	PS1	Document	[CHECK DOCUMENT]	※
	PS3	Cover Open	[CHECK COVER]	※
	SW50	JOG sensor	----------	page 165
Analog PCB	SW3	Paper Set	[OUT OF PAPER]	※
	SW4	JAM	[PAPER JAMMED]	※
Motor Block	SW1	Motor Position	----------	page 169
	SW2	Motor Position	----------	page 169
Handset PCB	SW5	Handset switch	----------	page 166

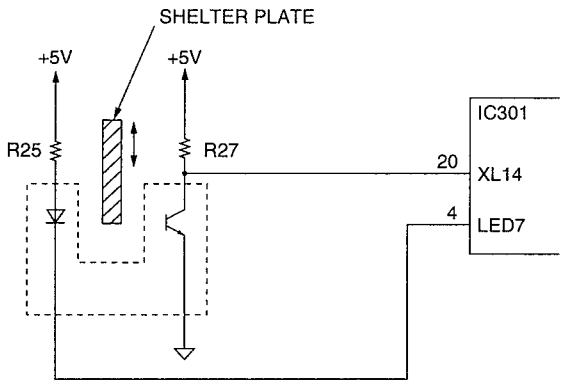
※ See the TEST FUNCTION - SENSOR CHECK SECTION for the sensor test.
(#815 of Service Mode test Refer to page 89.)

Sensor Locations



[Read Position Sensor (xPS2)]

When a document is brought to the read position, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of the IC1-20 pin (Operation) becomes a low level. When there is no document at the read position, the shelter plate closes the sensor light, the phototransistor becomes OFF, and the input signal of the IC1-20 pin (Operation) becomes a high level. (When checking this sensor, the IC1-4 pin becomes a low level).

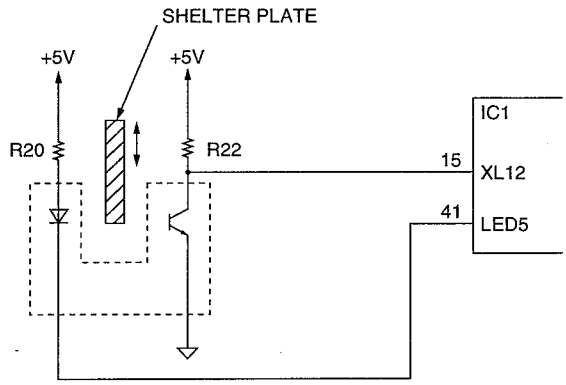


Operation Board

	Phototransistor	Signal (IC1-20 Pin)
Out of the Read Position	OFF	High level
At the Read Position	ON	Low level

[Document Sensor (PS1)]

When a document is set, the shelter plate closes the sensor light, the phototransistor becomes OFF, and the input signal of the IC1-15 pin (Operation) becomes a high level. When there is no document, the shelter plate is lifted, the phototransistor becomes ON, and the input signal of the IC1-15 pin (Operation) becomes a low level.
(When checking this sensor, the IC1-41 pin becomes a low level.)

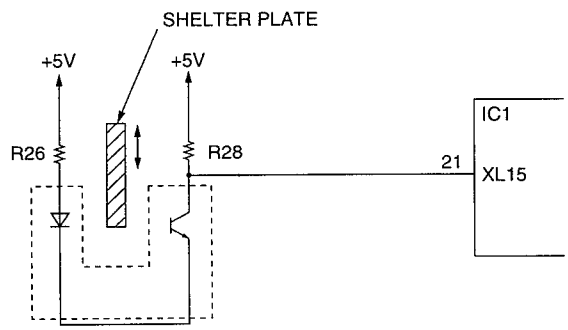


Operation Board

	Phototransistor	Signal (IC1-15 Pin)
No document	ON	Low level
Set document	OFF	High level

[Cover Open Sensor (PS3)]

When the upper cabinet is closed, the shelter plate stops the sensor light and the phototransistor becomes off.
The input of pin 21 of IC1 (Operation panel) becomes a high level. When the cover is opened, the sensor light passes and the phototransistor becomes on. The input of pin 21 of IC1 (Operation panel) becomes a low level.

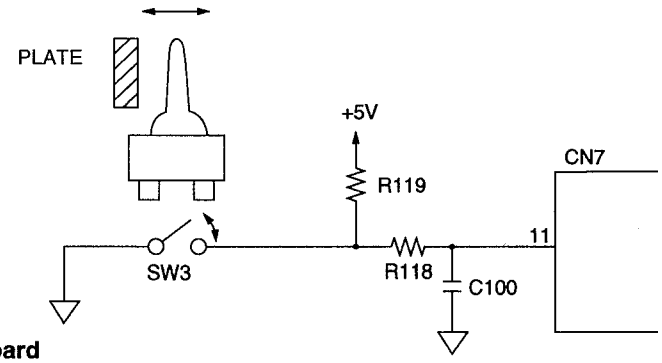


Operation Board

	Phototransistor	Signal (IC1-21 Pin)
Close	OFF	High level
Open	ON	Low level

[Recording Paper Sensor (SW3)]

When there is no recording paper, the plate is separated from the switch lever and the switch turns off.
Pin 11 of CN7 (Analog board) becomes a high level.
When there is recording paper, the plate pushes the switch lever and the switch turns ON.
Pin 11 of CN7 (Analog board) becomes a low level.

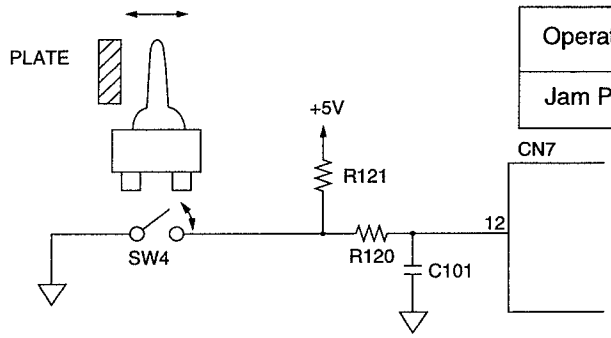


Analog Board

	Signal (CN7-11 Pin)
Paper	Low level
No paper	High level

[JAM Sensor (SW4)]

The JAM sensor is a detection switch for determining whether the recording paper edge is in the correct position or not. If the recording paper cannot be detected correctly at the JAM sensor position even when recording paper is present, then JAM is displayed. If the recording paper is at the sensor position, then the switch turns on the CN7-12 pin (Analog) switches to a low level.



Jam sensor port when the cutter operated

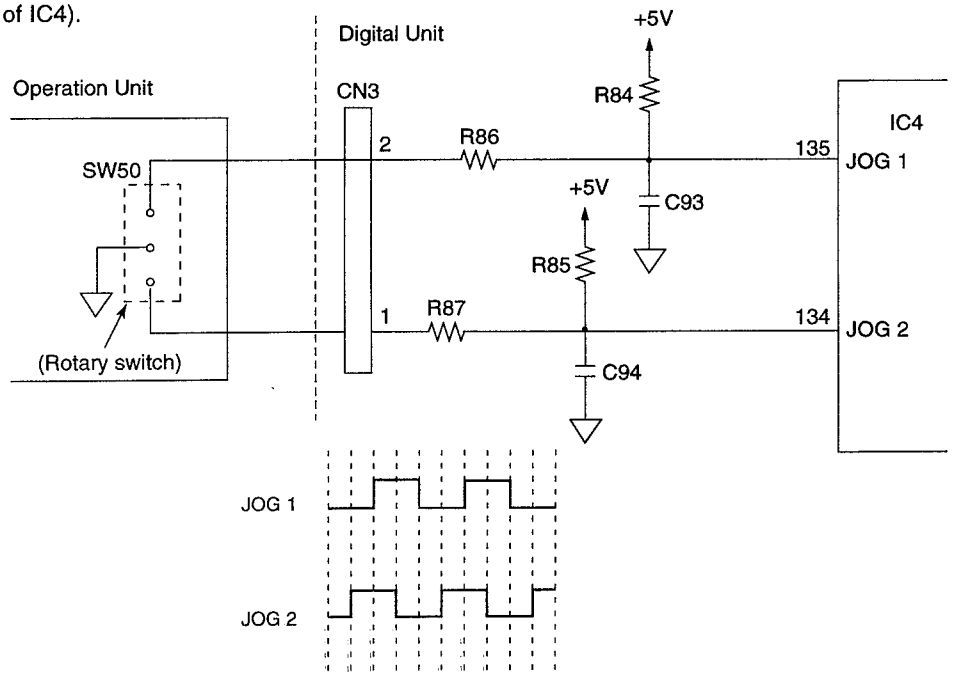
Operation	Set document (Feeding)	Cutter in operation (Rewinding)	Feed recording paper (Standby)
Jam Port	L	H	L

Analog Board

	Signal (CN7-12 Pin)
Paper	Low level
No paper	High level

[Jog Sensor (SW50)]

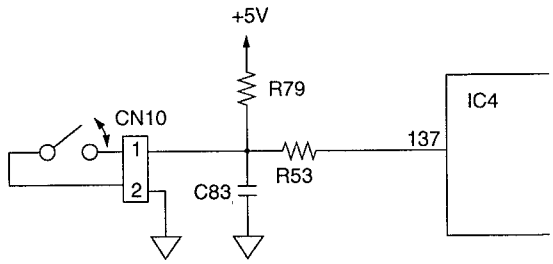
This sensor detects the speed and direction of the jog dial rotation based on variations in the potential of JOG1 (pin 135 of IC4) and JOG2 (pin 134 of IC4).



Variations in Potential During Jog Dial Rotation

[Motor Position Sensor (Switch 1)]

This sensor is a detection switch for recording the position of the Lower Cam 1.

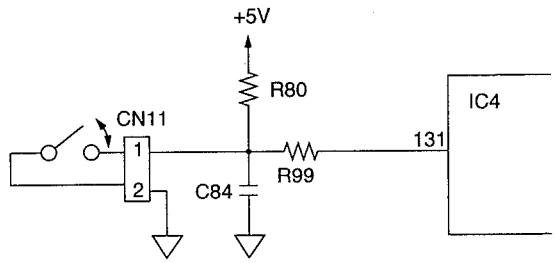


Digital Board

	Signal (IC4-137 Pin)
Home position	Low level
Other	High level

[Motor Position Sensor (Switch 2)]

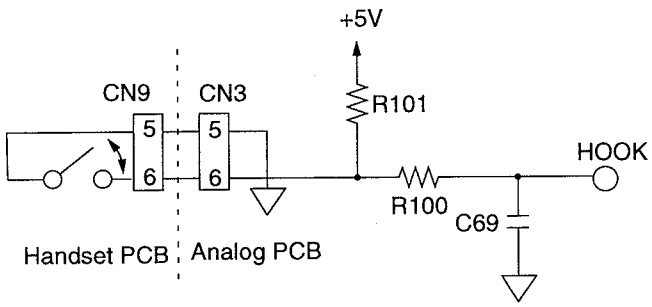
This sensor is a detection switch for recording the position of the Outer Gear of G11.



Digital Board

	Signal (IC4-131 Pin)
Home position	Low level
Other	High level

[Handset PCB (Switch 5)



Analog Board

	Signal (CN3-6 Pin)
Handset ON-HOOK	High level
Handset OFF-HOOK	Low level