ORDER NO. KM79712177C3

Service Manual

PERSONAL FACSIMILE

KX-FT31BX

(for Asia, Middle Near East and Other Areas)

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians.
Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

Panasonic

When you note the serial number, write down all 11 digits. The serial number may be found on the bottom of the unit.

TABLE OF CONTENTS

CIRCUIT OPERATIONS

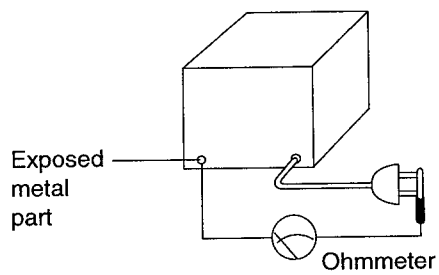
INTRODUCTION

SAFETY PRECAUTIONS

1. Before servicing, unplug the AC power cord to prevent an electric shock.
2. When replacing parts, use only the manufacturer's recommended components.
3. Check the condition of the power cord. Replace if wear or damage is evident.
4. After servicing, be sure to restore the lead dress, insulation barriers, insulation papers, shields, etc.
5. Before returning the serviced equipment to the customer, be sure to perform the following insulation resistance test to prevent the customer from being exposed to shock hazards.

INSULATION RESISTANCE TEST

1. Unplug the power cord and short the two prongs of the plug with a jumper wire.
2. Turn on the power switch.
3. Measure the resistance value with an ohmmeter between the jumpered AC plug and each exposed metal cabinet part (screwheads, control shafts, bottom frame, etc.).
   Note: Some exposed parts may be isolated from the chassis by design. These will read infinity.
4. If the measurement is outside the specified limits, there is a possibility of a shock hazard.
   The equipment should be repaired and rechecked before it is returned to the customer.



Resistance = more than 1MΩ
(at DC 500 V)

FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.
When repairing, the following precautions will help prevent recurring malfunctions.

1) Cover the plastic part's boxes with aluminum foil.
2) Ground the soldering irons.
3) Use a conductive mat on the worktable.
4) Do not touch the IC or LSI pins with bare fingers.

BATTERY CAUTION

CAUTION

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacture. Dispose of used batteries according to the manufacturer's instructions.

AC CAUTION

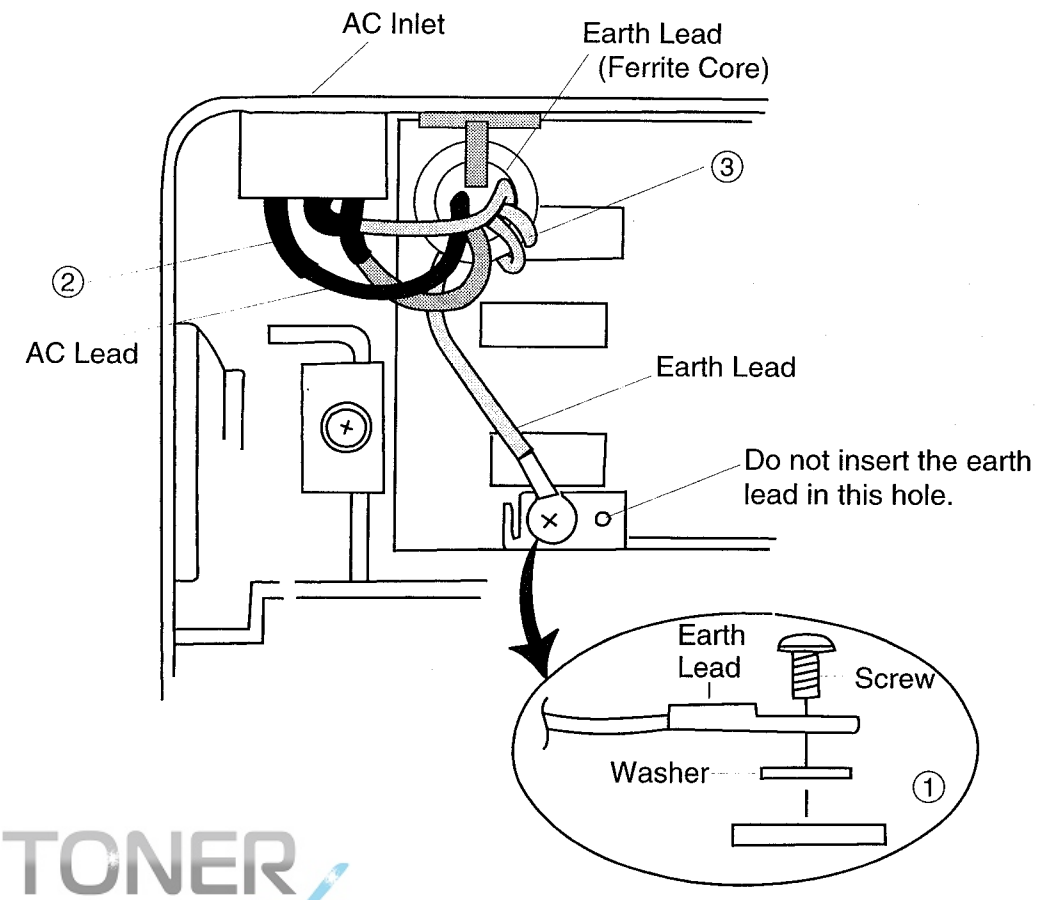
For safety, before closing the lower cabinet, please make sure of the following precautions.

① The earth lead is fixed with the screw.

② The AC connector is connected properly.

③ Wrap the AC lead around the core 3 times.

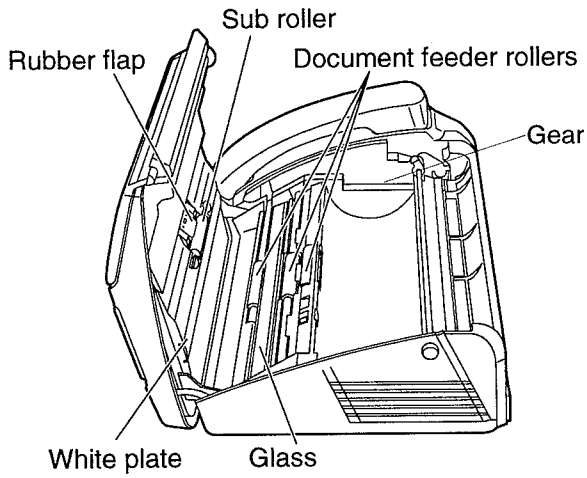
(BOTTOM VIEW)



PERSONAL SAFETY PRECAUTIONS

1. MOVING SECTIONS OF THE UNIT

Be careful not to let your hair, clothes, fingers, accessories, etc., become caught in any moving sections of the unit. The moving sections of the unit are the rollers and a gear. There is a separation roller and a document feed roller which are rotated by the document feed motor. A gear rotates the two rollers. Be careful not to touch them with your hands, especially when the unit is operating.

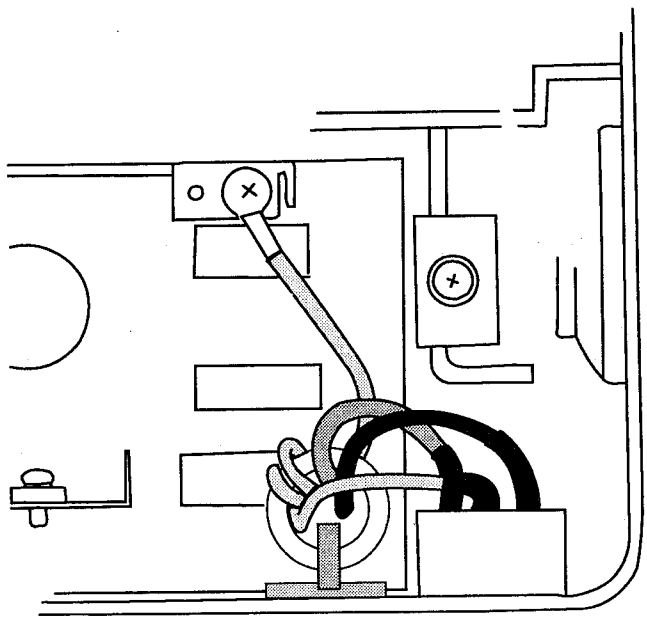


2. LIVE ELECTRICAL SECTIONS

All the electrical sections of the unit supplied with AC power by the AC power cord are live. Never disassemble the unit for service with the AC power supply plugged in.

AC voltage is supplied to the primary side of the power supply unit.
Therefore, always unplug the AC power cord before disassembling for service.

Be careful of "High Voltage" in this area.



(Bottom view)

SPECIFICATIONS

Applicable Lines:	Public Switched Telephone Network
Document Size:	Max. 216 mm (8½") in width Max. 600 mm (23⅝") in length
Effective Scanning Width:	208 mm (8³⁄₁₆")
Recording Paper Size:	216×30 m (8½"×98")
Effective Printing Width:	208 mm (8³⁄₁₆")
Transmission Time*:	Approx. 15 sec./page (Original mode) Approx. 30 sec./page (G3 Normal mode)
Scanning Density:	Horizontal: 8 pels/mm (203 pels/inch) Vertical: 3.85 lines/mm (98 lines/inch)—Standard mode 7.7 lines/mm (196 lines/inch)—Fine/Halftone mode 15.4 lines/mm (392 lines/inch)–Super Fine mode
Halftone Level:	64-level
Scanner Type:	Contact Image Sensor
Printer Type:	Thermal Printing
Data Compression System:	Modified Huffman (MH), Modified READ (MR)
Modem Speed:	9,600/7,200/4,800/2,400 bps; Automatic Fallback
Operating Environment:	5–35°C (41–95°F), 45–85 % RH(Relative Humidity)
Dimensions (H×W×D):	135×323×229 mm (5⁶⁄₁₆"×12²³⁄₃₂"×9")
Mass (Weight):	Approx. 2.9 kg (6.4 lb.)
Power Consumption:	Transmission: Approx. 17 W / Reception: Approx. 40 W Copy: Approx. 40 W / Standby: Approx. 6.5 W Maximum: Approx. 125 W
Power Supply:	220-240 V AC, 50/60 Hz

*Transmission speed depends upon the contents of the pages, resolution, telephone line conditions and capability of the receiving unit.
The 15 second speed is based upon CCITT No.1 Test Chart. (Refer to the next page.)

Note:
- Any details given in these instructions are subject to change without notice.
- The pictures and illustrations in these instructions may vary slightly from actual product.

OPTIONAL ACCESSORIES

Parts No.	Description	Comment
KX-A106	Standard thermal recording paper	216 mm × 30 m (8 ½"×98') roll,with 25 mm (1") core
KX-A125	Super thermal recording paper (Like plain paper)	216 mm × 30 m (8 ½"×98') roll, with 25 mm (1") core

CCITT NO. 1 TEST CHART (Actual size)

THE SLEREXE COMPANY LIMITED

SAPORS LANE - BOOLE - DORSET - BH 25 8 ER

TELEPHONE BOOLE (945 13) 51617 - TELEX 123456

Our Ref. 350/PJC/EAC

18th January, 1972.

Dr. P.N. Cundall,
Mining Surveys Ltd.,
Holroyd Road,
Reading,
Berks.

Dear Pete,

Permit me to introduce you to the facility of facsimile transmission.

In facsimile a photocell is caused to perform a raster scan over the subject copy. The variations of print density on the document cause the photocell to generate an analogous electrical video signal. This signal is used to modulate a carrier, which is transmitted to a remote destination over a radio or cable communications link.

At the remote terminal, demodulation reconstructs the video signal, which is used to modulate the density of print produced by a printing device. This device is scanning in a raster scan synchronised with that at the transmitting terminal. As a result, a facsimile copy of the subject document is produced.

Probably you have uses for this facility in your organisation.

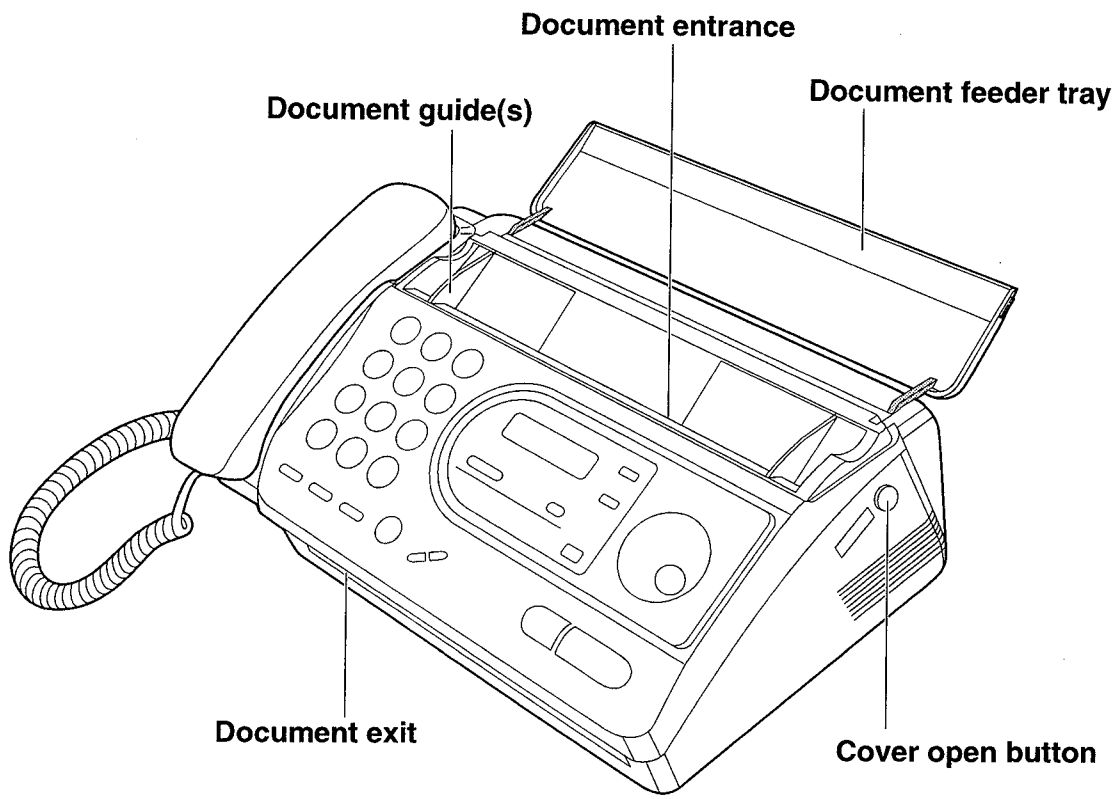
Yours sincerely,

Phil.

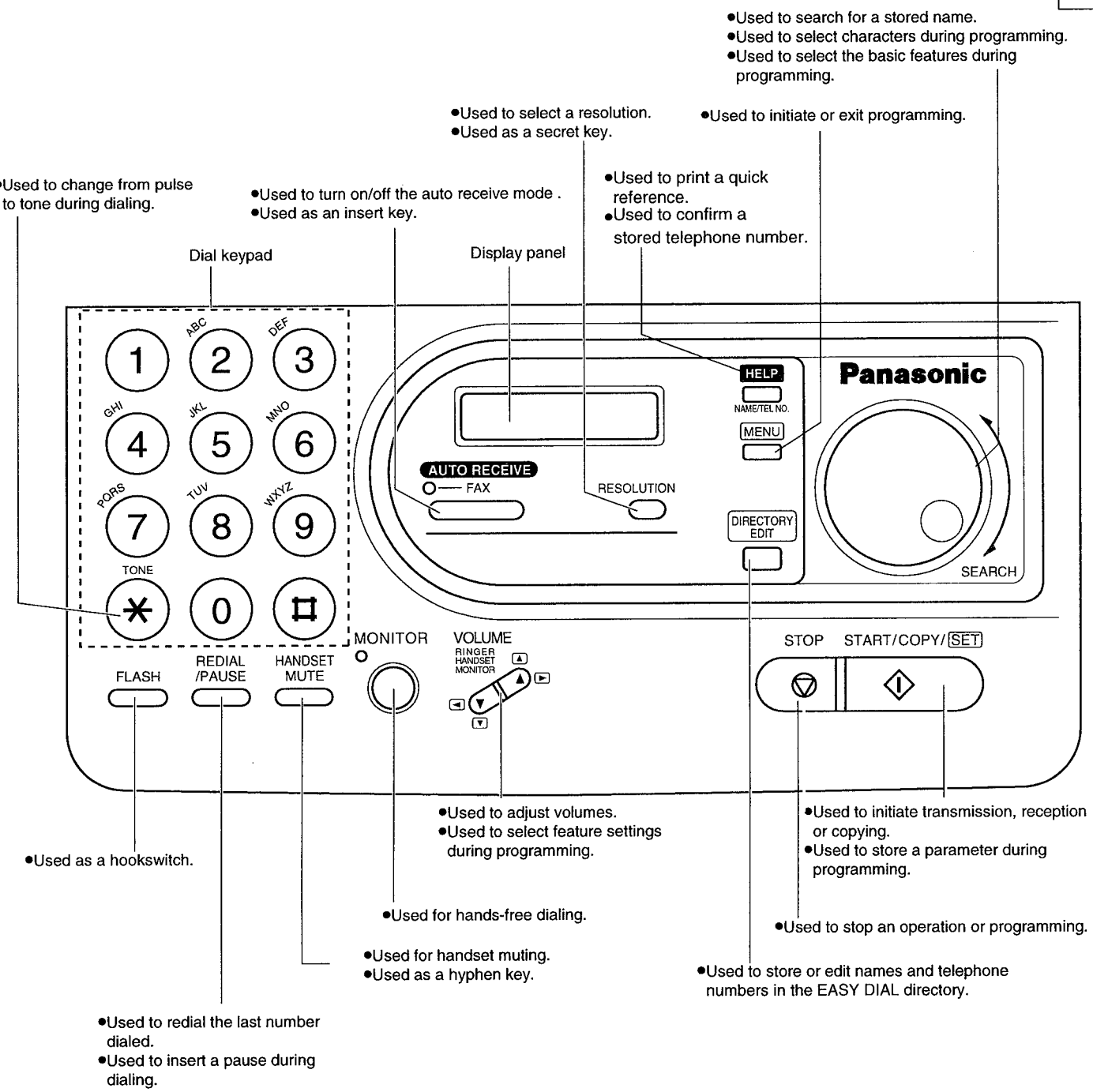
P.J. CROSS
Group Leader - Facsimile Research

LOCATION OF CONTROLS

1.OVERVIEW



2. CONTROL PANEL



FEATURES

General

- *Desktop type*
- *LCD (Liquid Crystal Display) readout*
- *Help function*
- *Copier function*
- *TAM (Telephone answering machine) interface*

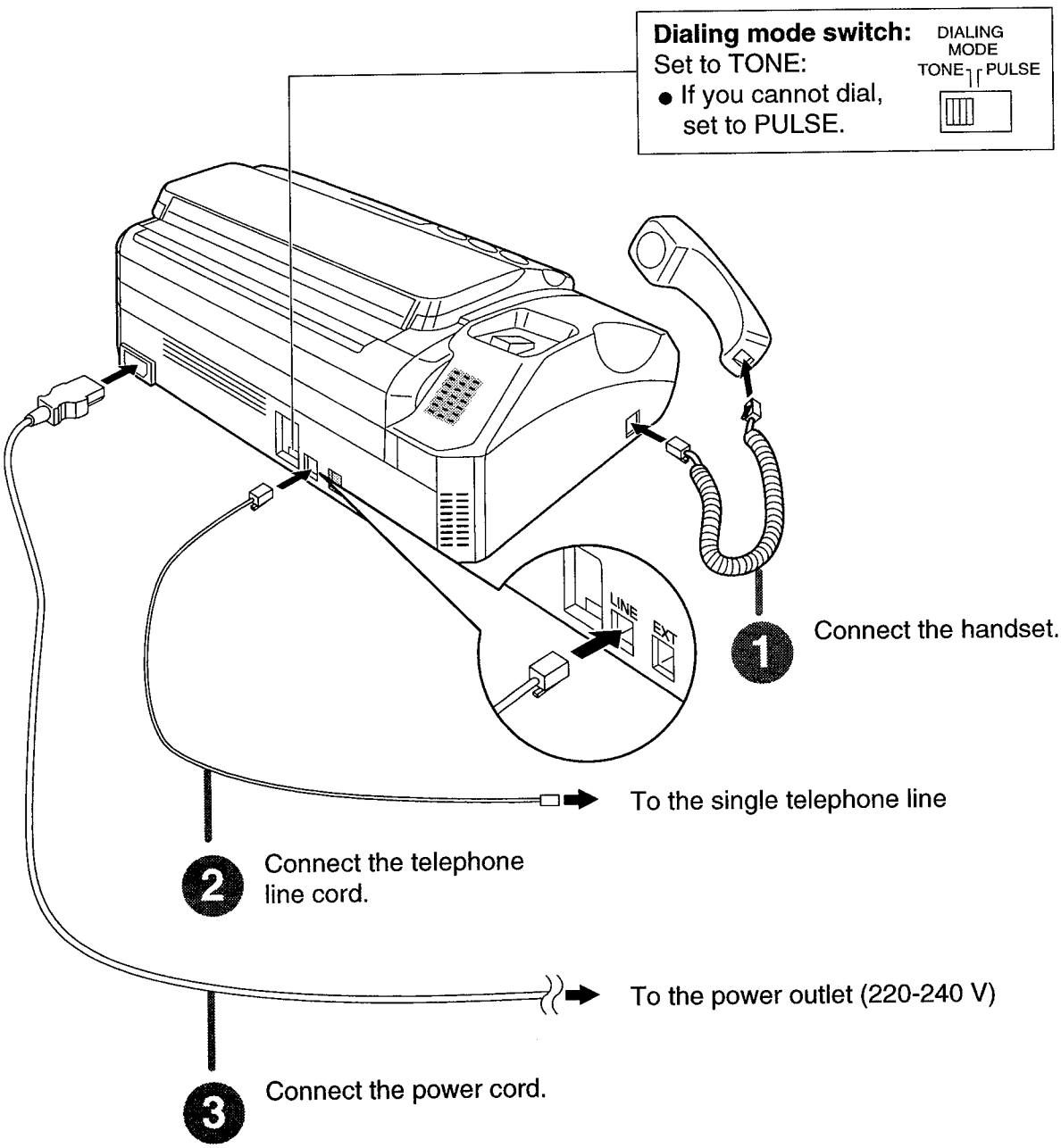
Integrated telephone system

- *Easy Dial Operation*
- *Telephone Directory (100 Stations)*
- *Electric Volume Control*
- *Answering Machine Interface*

Facsimile

- *Space Saving Compact Design*
- *Resolution: standard/fine/super fine/halftone*
- *Copier Function*
- *Automatic Document Feeder (5 Sheets)*
- *Help Printout*
- *Easy-to-view LCD (15 Characters)*
- *Super Thermal Paper*
- *FAX Pager Alert*

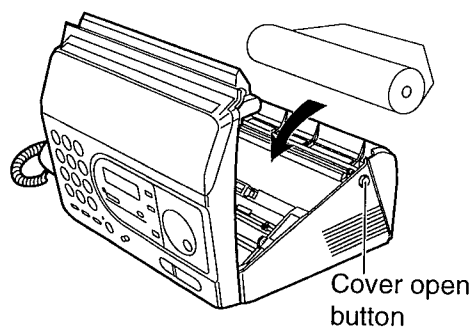
CONNECTIONS



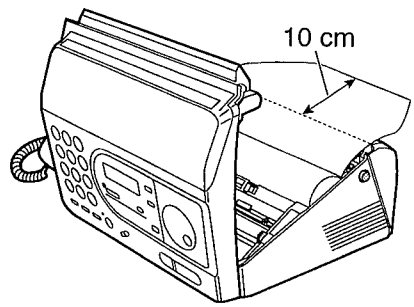
INSTALLATION

3. INSTALLING THE RECORDING PAPER

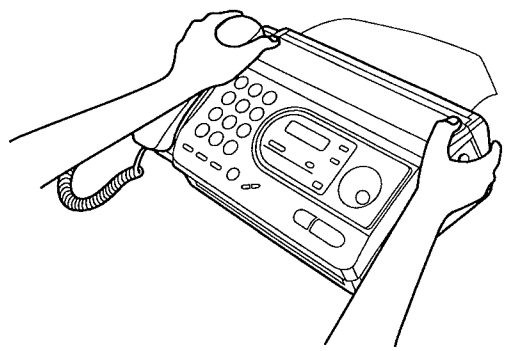
1 Open the cover by pressing the cover open button and install the recording paper roll.
- If the paper is secured with glue or tape, cut approximately 15 cm (6 inches) from the beginning of the roll.



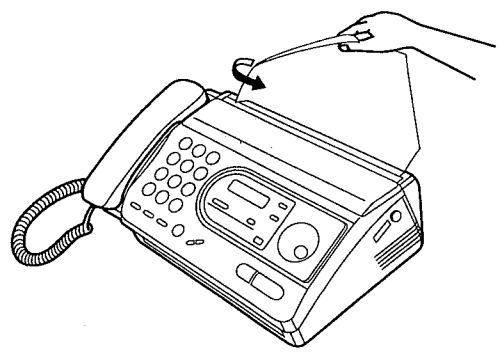
2 Pull the leading edge of the paper approximately 10 cm (4 inches) out of the unit.
- Make sure that the shiny side of the paper is facing down and there is no slack.



3 Close the cover securely by pushing down on both corners.



4 Tear off the excess paper by pulling it towards you



Note:
- Only use the included roll of paper or specified recording paper, or else the print quality may be affected and/or excessive thermal head wear may occur.
- To order recording paper, see page 8.
- When the power cord is connected, everytime you close the cover a message will be printed. If the recording paper is set to the wrong side, a message will not be printed. Install the paper correctly.

4. SETTING YOUR LOGO

The logo can be a company, division or personal name.

(1) Press **MENU**.

Display: `1.SYSTEM SET UP`

(2) Press **#**, then **0** **2**.

`YOUR LOGO`

(3) Press **START/COPY/SET**.

`LOGO=`

(4) Enter your logo, up to 30 characters, by following the instructions on the next page.

Example (using the dial keypad): Bill

1. Press **2** twice.

   `LOGO=B`

2. Press **4** six times.

   `LOGO=Bi`

3. Press **5** six times.

   `LOGO=Bil`

4. Press ► (**VOLUME**) to remove the cursor and press **5** six times.

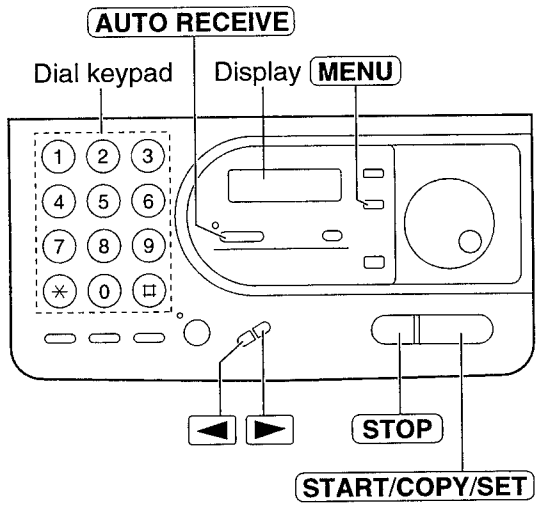
   `LOGO=Bill`

- To enter the same number key continuously, move the cursor to the next space.

(5) Press **START/COPY/SET**.

`SYSTEM SET UP [ ]`

(6) Press **MENU**.



To correct a mistake

- Use ◄ or ► to move the cursor to the incorrect character, then make the corrections.

To delete a character

- Move the cursor to the character you want to delete and press **STOP**.

To insert a character

1. Press ◄ or ► to move the cursor to the position to the right of where you want to insert the character.
2. Press **AUTO RECEIVE** to insert a space and enter the character.

Selecting characters with the dial keypad

Pressing the dial keys will select a character as shown below.

Keys	Characters
(1)	1 [ ] { } + – / = , . _ ' : ; ? |
(2)	A B C a b c 2
(3)	D E F d e f 3
(4)	G H I g h i 4
(5)	J K L j k l 5
(6)	M N O m n o 6
(7)	P Q R S p q r s 7
(8)	T U V t u v 8
(9)	W X Y Z w x y z 9
(0)	0 ( ) < > ! " # $ % & ¥ * @ ^ ' →
AUTO RECEIVE	Insert key (Used to insert a space.)
VOLUME ▼	◄ key (Used to move the cursor to the left.)
VOLUME ▲	► key (Used to move the cursor to the right.) To enter the same number key continuously, move the cursor to the next space.

MAINTENANCE ITEMS AND COMPONENT LOCATIONS

1. OUTLINE

MAINTENANCE AND REPAIRS ARE PERFORMED USING THE FOLLOWING STEPS.

1) Periodic maintenance
Inspect the equipment periodically and if necessary, clean any contaminated parts.

2) Check for breakdowns
Look for problems and consider how they arose.
If the equipment can be still used, perform copying, self testing or communication testing.

3) Check equipment
Perform copying, self testing and communication testing to determine if the problem originates from the transmitter, receiver or the telephone line.

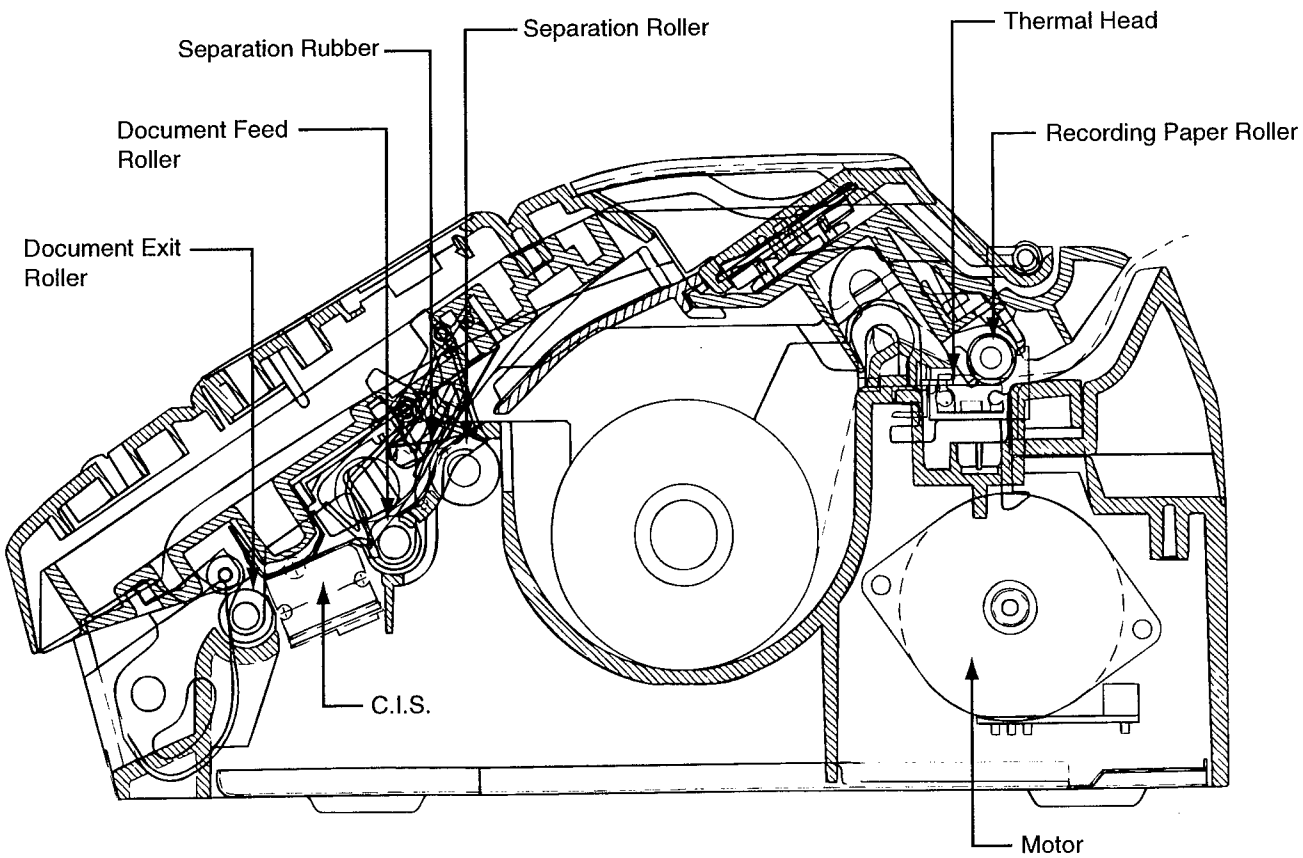
4) Determine causes
Determine the causes of equipment problem by troubleshooting.

5) Equipment repairs
Repair or replace the defective parts and take appropriate measures at this stage to ensure that the problem will not recur.

6) Confirm normal operation of the equipment
After completing the repairs, conduct copying, self testing and communication testing to confirm that the equipment operates normally.

7) Record keeping
Make a record of the measures taken to rectify the problem for future reference.

2. MAINTENANCE CHECK ITEMS/COMPONENT LOCATIONS



2.1 MAINTENANCE LIST

NO.	OPERATION	CHECK	REMARKS
1	Document Path	Remove any foreign matter such as paper.	———
2	Rollers	If the roller is dirty, clean it with a damp cloth then dry thoroughly.	See page 19.
3	Thermal Head	If the thermal head is dirty, clean the printing surface with a cloth moistened with denatured alcohol (alcohol without water), then dry thoroughly.	See pages 20 and 99.
4	Glass	If the glass is dirty, clean the glass with a dry soft cloth.	See page 19.
5	Sensors	Document sensor (PS1), Read position sensor (PS2), cover open sensor (PS3)	See page 78.
6	Abnormal, wear and tear or loose parts	Exchange the part. Check if the screws are tight on all parts.	———

2.2 MAINTENANCE CYCLE

No.	Item	Cleaning		Replacement	
		Cycle	Procedure	Cycle	Procedure
1	Separation Roller (Ref. No. 89)	3 months	See p. 19.	7 years (100,000 documents)	See p. 98.
2	Separation Rubber (Ref. No. 85)	3 months	See p. 19.	7 years (100,000 documents)	See p. 97.
3	Feed Rollers (Ref. No. 65)	3 months	See p. 19.	7 years (100,000 documents)	See p. 98.
4	Thermal Head (Ref. No. 55)	3 months	See p. 20.	7 years (100,000 documents)	See p. 99.

These values are only standard ones and may vary depending on usage conditions.

3. MAINTENANCE

3.1 CLEANING THE DOCUMENT FEEDER UNIT

1 Disconnect the power cord and telephone line cord.

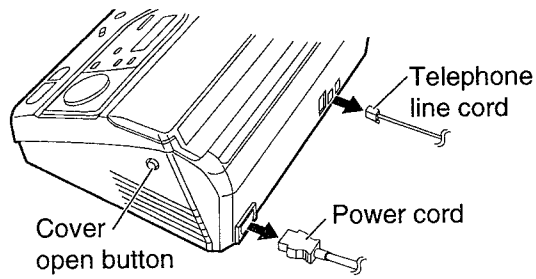
2 Open the cover by pressing the cover open button.

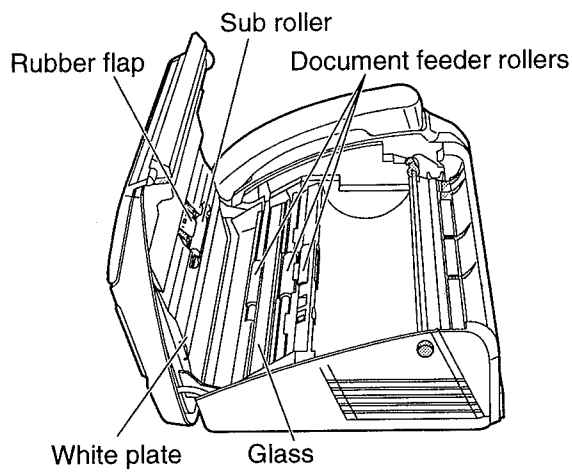
3 Clean the document feeder rollers, sub roller and rubber flap with a cloth moistened with isopropyl rubbing alcohol, and let all parts dry thoroughly.

4 Clean the white plate and glass with a soft dry cloth.

5 Close the cover securely by pushing down on both corners.

6 Connect the power cord and the telephone line cord.





Caution:

- **Do not use paper products, such as paper towels or tissues, to clean the inside of the unit.**

3.2 CLEANING THE THERMAL HEAD

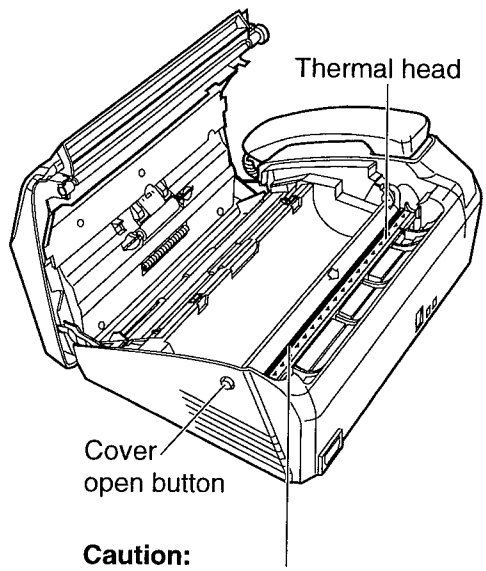
1 **Disconnect the power cord and telephone line cord.**

2 Open the cover by pressing the cover open button.

3 Clean the thermal head with a cloth moistened with isopropyl rubbing alcohol, and let it dry thoroughly.

4 Close the cover securely by pushing down on both corners.

5 Connect the power cord and the telephone line cord.



Caution:

- **To prevent a malfunction due to static electricity, do not use a dry cloth and do not touch the thermal head directly with your fingers.**

Caution:

- **Do not push on the black cover.**

3.3 CLEANING THE PICK UP ROLLER .....Refer to page 98.

Caution:
•To prevent malfunction due to static electricity, do not use a dry cloth and do not touch the thermal head directly with your finger.

TROUBLESHOOTING GUIDE

1. TROUBLESHOOTING SUMMARY

1-1. TROUBLESHOOTING

After confirming the problem by asking the user, troubleshoot according to the instructions and observe the following precautions.

1-2. PRECAUTIONS

1) If there is trouble with the print quality or the paper feed, first check if the installation space and the print paper meets the specifications, the paper selection lever/paper thickness lever is set correctly, and the paper is set correctly without any slack.
2) Before troubleshooting, first check that the connectors and cables are connected correctly (not loose). If the problem occurs randomly, check it very carefully.
3) When connecting the AC power cord with the unit case and checking the operation, exercise utmost care when handling electric parts in order to avoid electric shock and short-circuits.
4) After troubleshooting, double check that you have not forgotten any connectors, left any loose screws, etc.
5) Always test to verify that the unit is working normally.

2. USER RECOVERABLE ERRORS

If the unit detects a problem, the following messages will appear on the display.

DISPLAY MESSAGE	CAUSE AND REMEDY
CALL SERVICE	● There is something wrong with the unit.
CHECK COVER	● The back lid is open. Close it.
CHECK DOCUMENT	● The document is not fed into the unit properly. Reinsert the document. If misfeeding occurs frequently, clean the document feeder rollers inside the unit. If the problem remains, adjust the feeder pressure.
CHECK MEMORY	● Memory (phone numbers, parameters, etc.) has been erased. Re-program.
NO RESPONSE	● The receiving unit is busy or ran out of recording paper. Try again.
OUT OF PAPER	● The unit ran out of recording paper. Install a new recording paper roll.
POLLING ERROR	● The other fax machine does not have the polling function. Check with the other party.
REDIAL TIME OUT	● The receiving unit is busy or ran out of recording paper. Try again.
REMOVE DOCUMENT	● The document is jammed. Remove the jammed document. ● Attempted to transmit a document longer than 600 mm ($23\frac{5}{8}$"). Press the STOP button and remove the document. Divide the document into two or more sheets and try again.
TRANSMIT ERROR	● A transmission error occurred. Try again.
UNIT OVERHEATED	● The unit is too hot. Let the unit cool down.

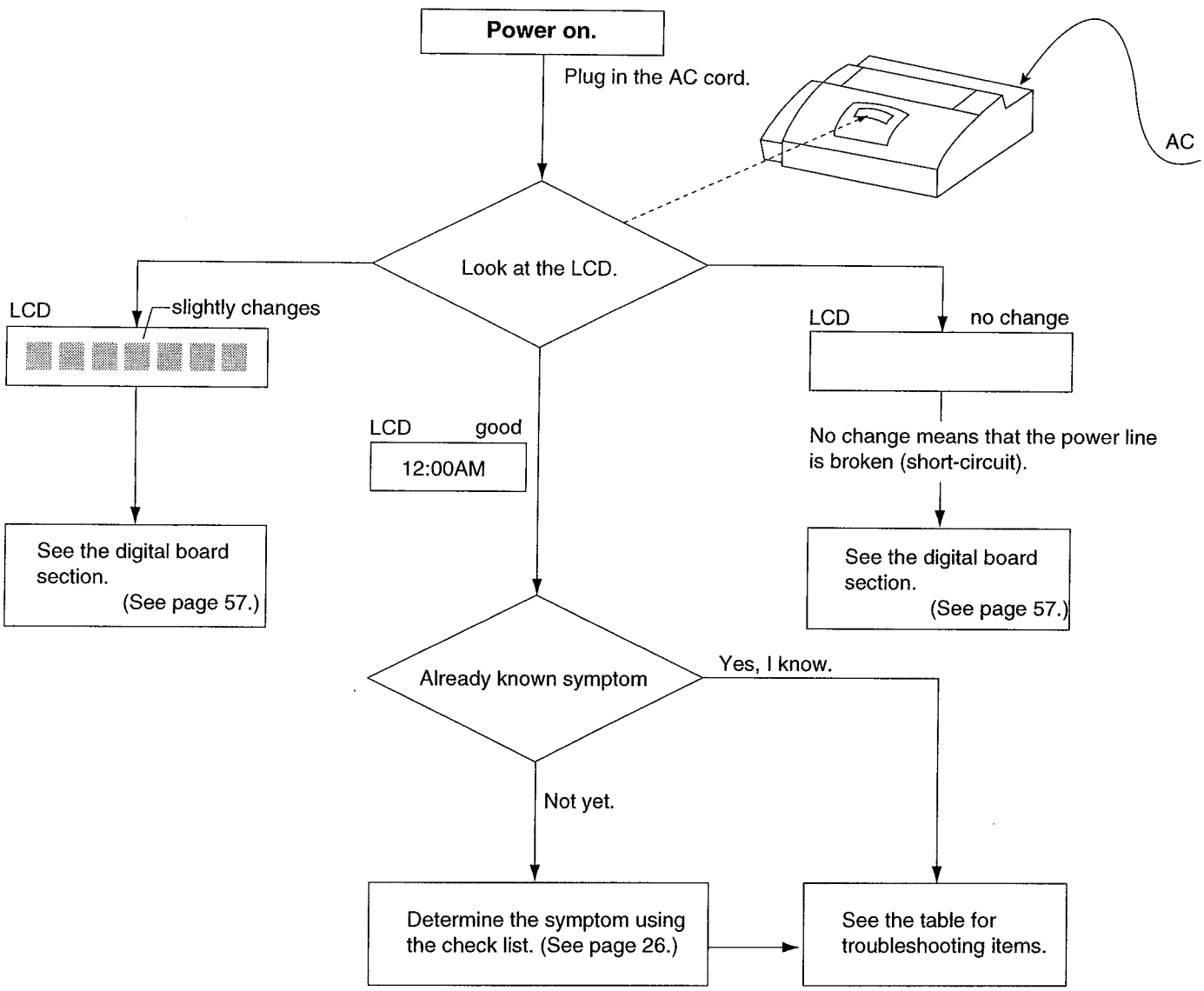
3. TROUBLESHOOTING DETAILS

3-1. OUTLINE

Troubleshooting is for recovering quality and reliability by determining the broken component and replacing, adjusting or cleaning it as required. First, determine the problem then decide the troubleshooting method. If you have difficulty finding the broken part, determine which board is broken. (For example; the Digital PCB, Analog PCB, etc.) The claim tag from a customer or dealer may use different expressions for the same problem, as they are not a technician or engineer. Using your experience, test the problem area corresponding to the claim. Also, returns from a customer or dealer often have a claim tag. For this case as well, you need to determine the problem. Test the unit using the simple check list on page 26. Difficult problems may be hard to determine, so repeated testing is necessary.

3-2. STARTING TROUBLESHOOTING

- Determine the symptom and troubleshooting method.



3-3. TABLE OF TROUBLESHOOTING ITEMS

FUNCTION	SYMPTOM	SEE THIS PAGE.
Printing	Skewed receiving image Expanded print Image is distorted. Black or White vertical lines appear.	33 33 31 32
ADF (Auto Document Feeder)	No feed Paper jam Multiple feed Skew	27 28 29 30
Paper feed	No feed Paper jam Multiple feed Skew	27 28 29 30
Abnormal mechanical sound	Abnormal sound from the product	34
Power supply	Voltage output is abnormal.	73
Operation panel	Keys are not accepted.	77
Sensor	●If the electric circuit is the cause, "REMOVE DOCUMENT" will be displayed.	78
Communication FAX, TEL (Analog/Digital board)	Cannot communicate by fax. Error code is displayed. Cannot talk. DTMF tone doesn't work. Handset/Monitor sound, volume	36 36 69 69 69

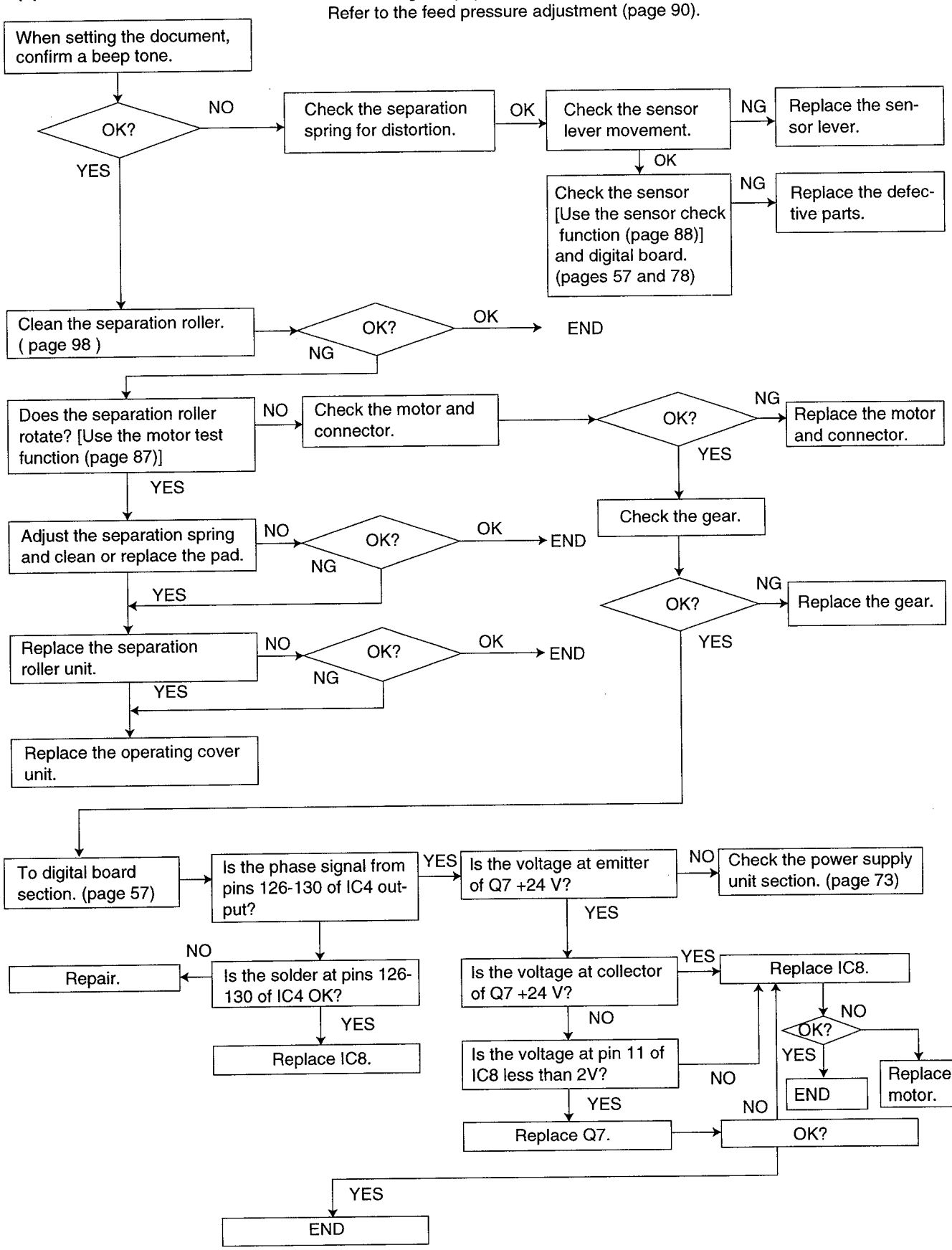
3-4. SIMPLE CHECK LIST

FUNCTION		JUDGEMENT	REFERENCE
FAX operation	Transmission	OK ／ NG	
	Receiving	OK ／ NG	
Copy operation	FINE mode	OK ／ NG	
	HALF TONE mode	OK ／ NG	
Telephone operation	Handset transceiver / receive	OK ／ NG	
	Monitor sound	OK ／ NG	
	Ringer sound	OK ／ NG	
	Dial operation	OK ／ NG	
	Volume operation	OK ／ NG	
	VOX detection	OK ／ NG	SERVICE CODE 815 (monitor LED)
Operation panel	Key check	OK ／ NG	SERVICE CODE 561
	LED check	OK ／ NG	SERVICE CODE 557
	LCD check	OK ／ NG	SERVICE CODE 558
Sensor	Sensor check	OK ／ NG	SERVICE CODE 815
Clock		OK ／ NG	Is the time kept correctly? Check with another clock.
External TAM	Handset transceiver/receiver	OK ／ NG	
	Remote control	OK ／ NG	Change to FAX receiving by pressing ＊ 9. (Refer to user mode #41 on page 55.)

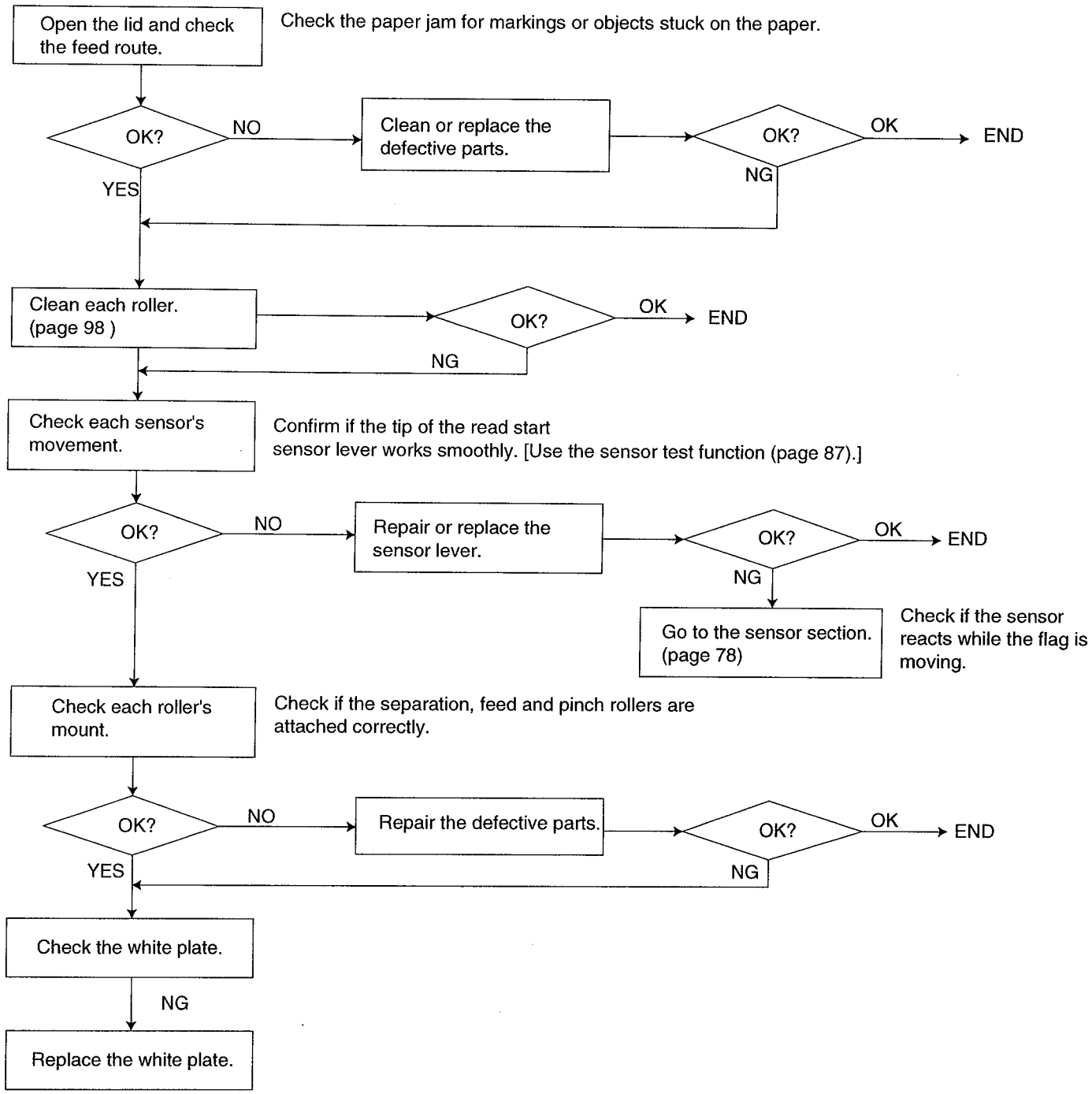
3-5. ADF (Auto document feed) SECTION

(1) No document feed

※ When using thin paper etc., sometimes the document will not feed.
Refer to the feed pressure adjustment (page 90).

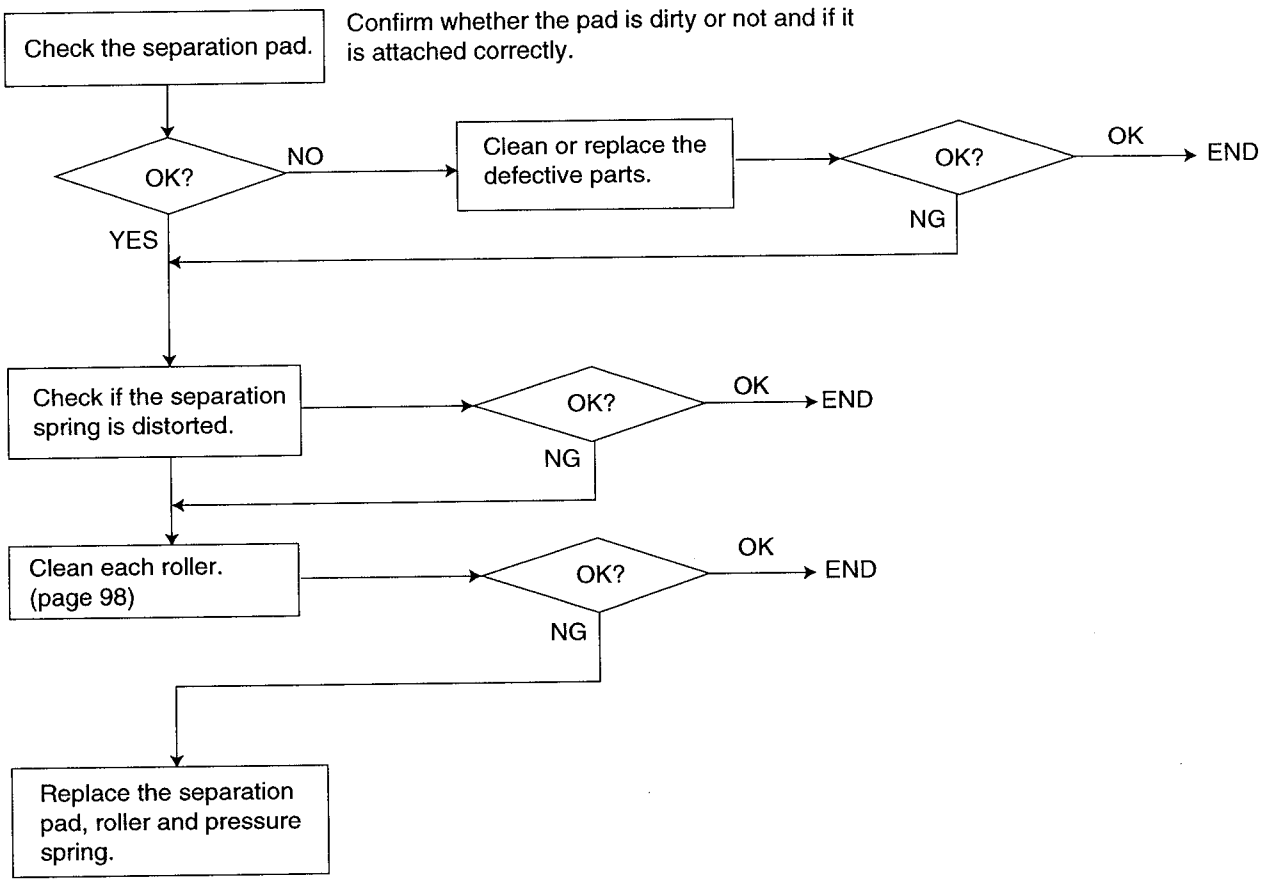


(2) Paper JAM

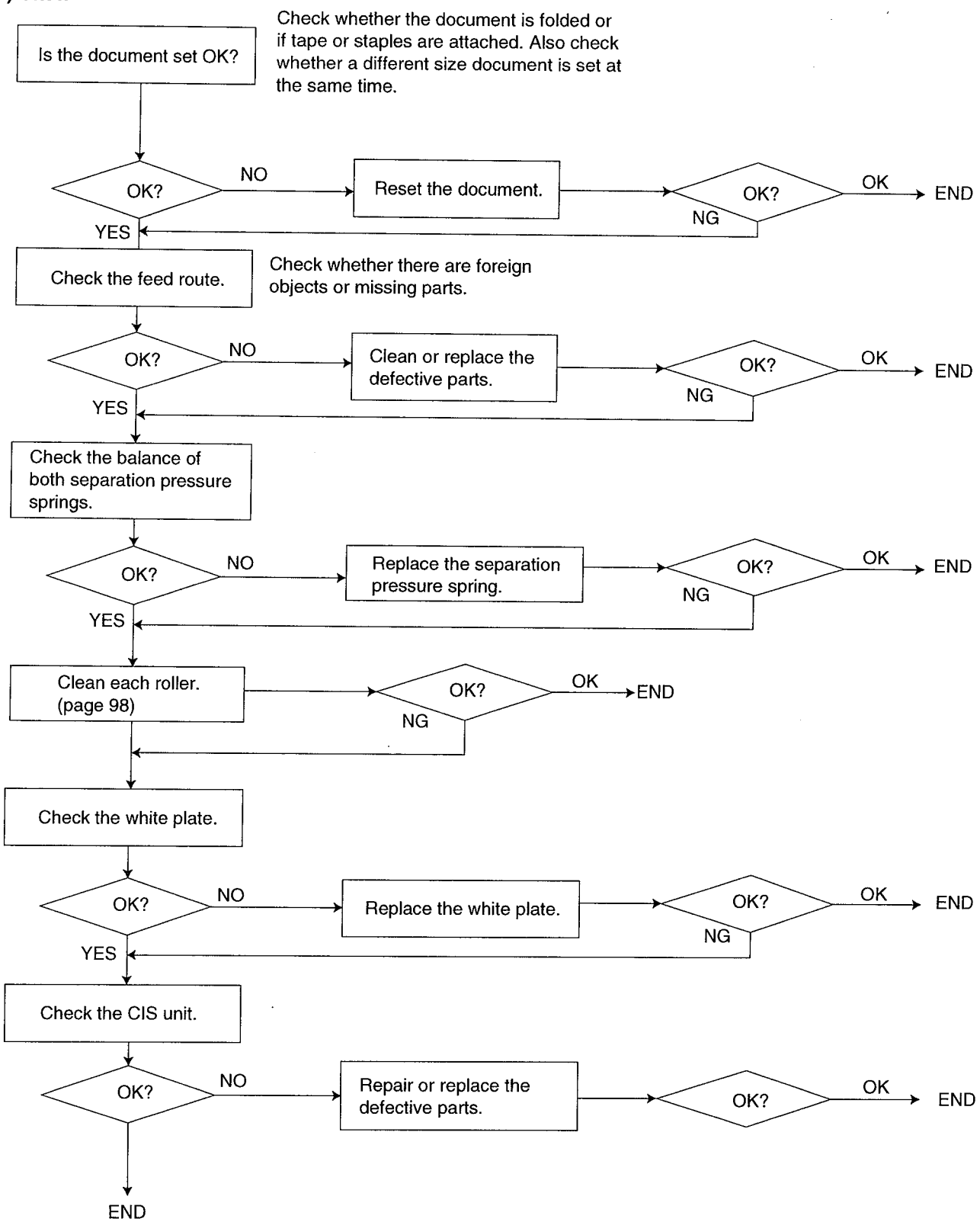


(3) Multiple feed

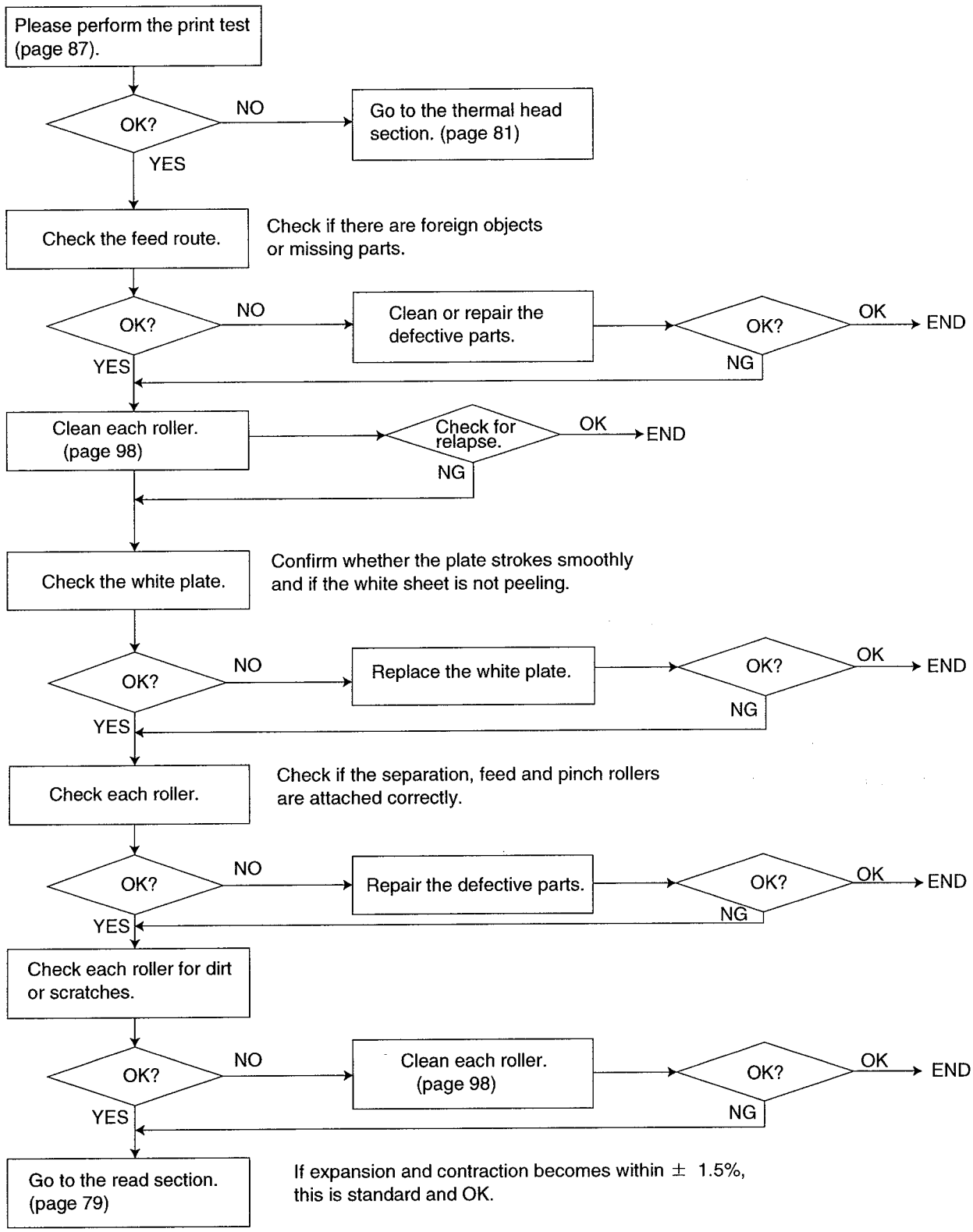
- When using thick paper, etc., sometimes the document will not feed. Refer to the feed pressure adjustment (page 90).



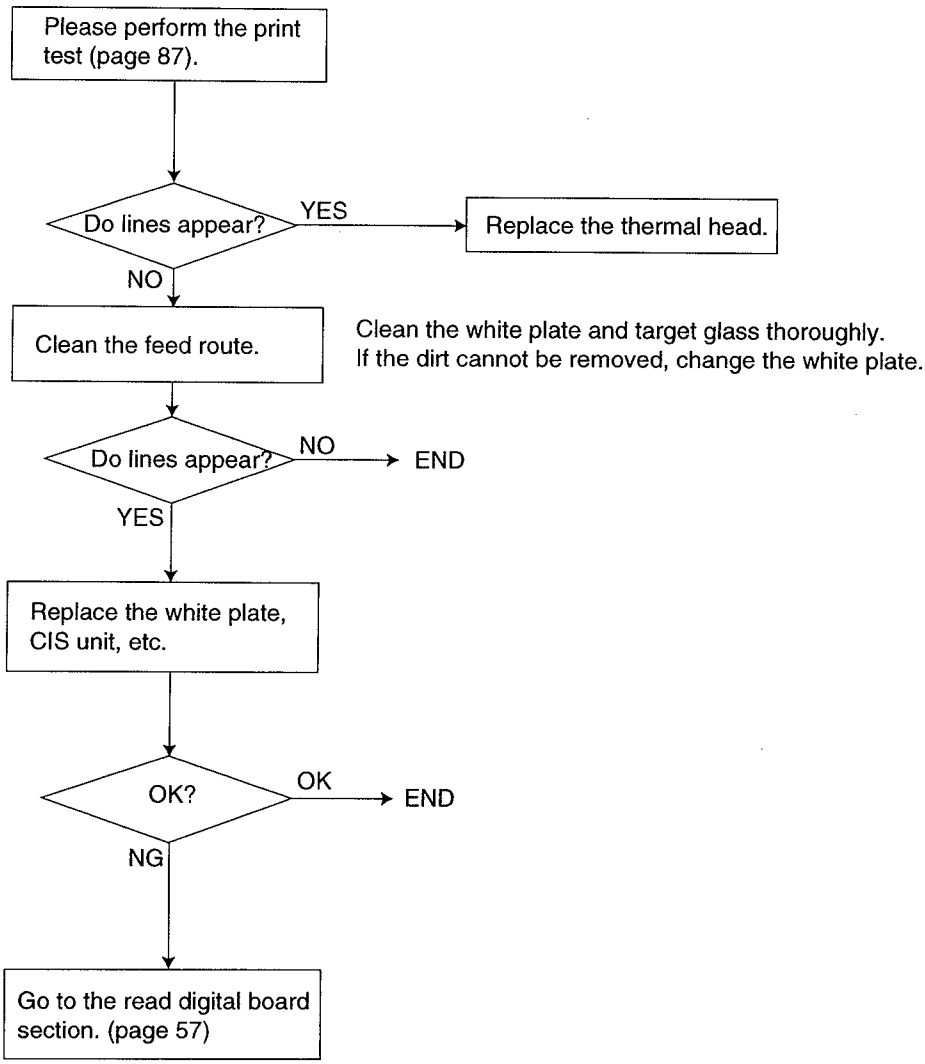
(4) Skew



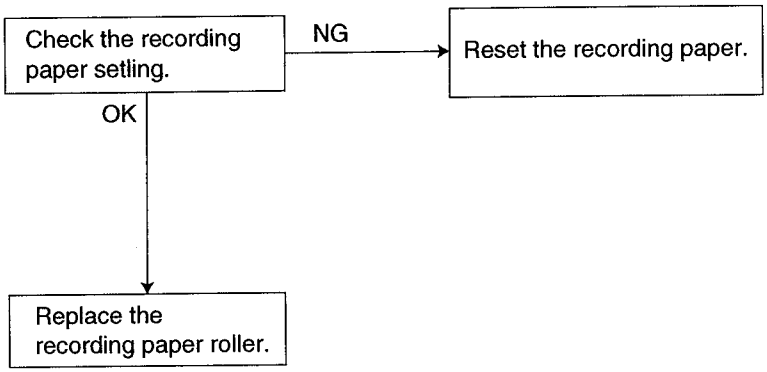
(5) Image is distorted (When printing)



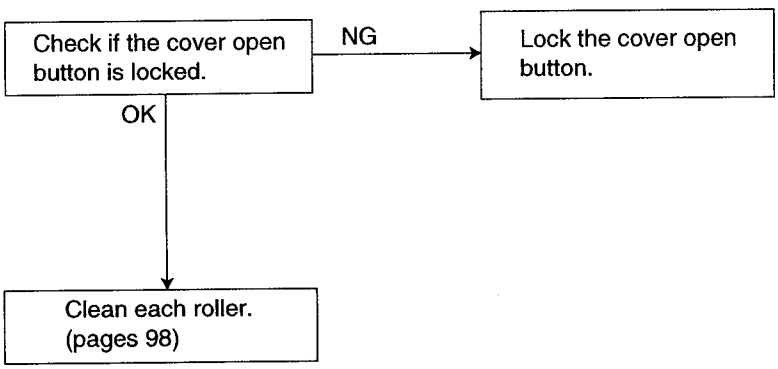
(6) Black or white vertical lines appear.



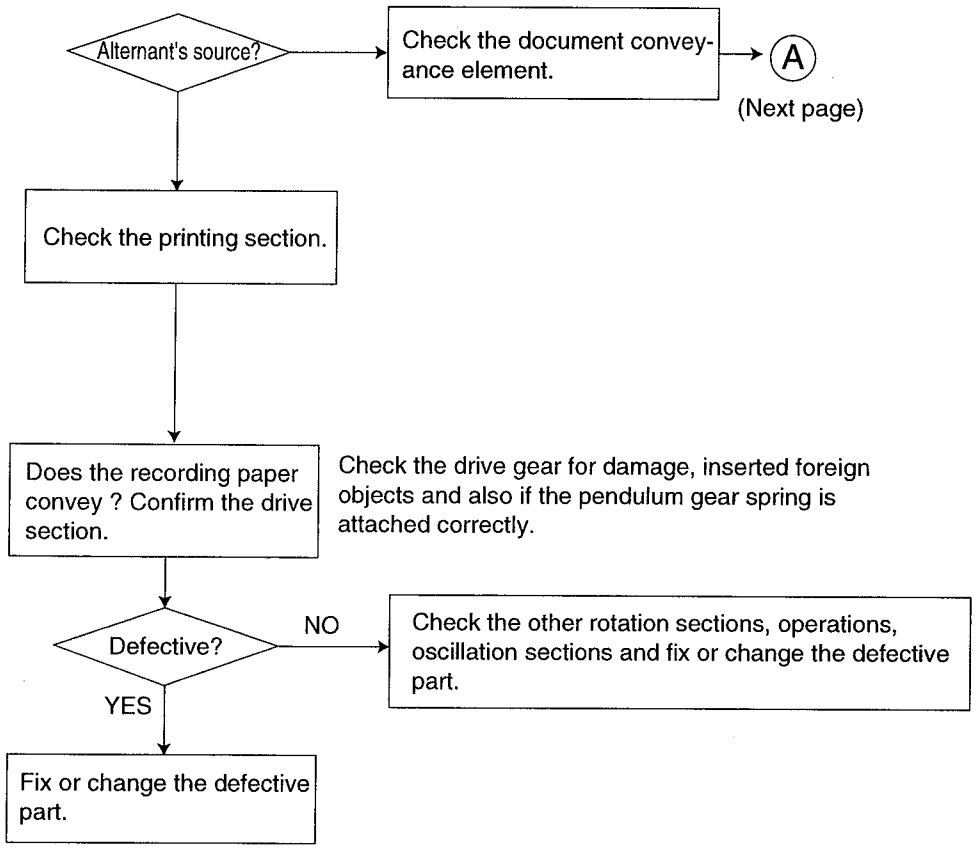
(7) Skewed receiving image

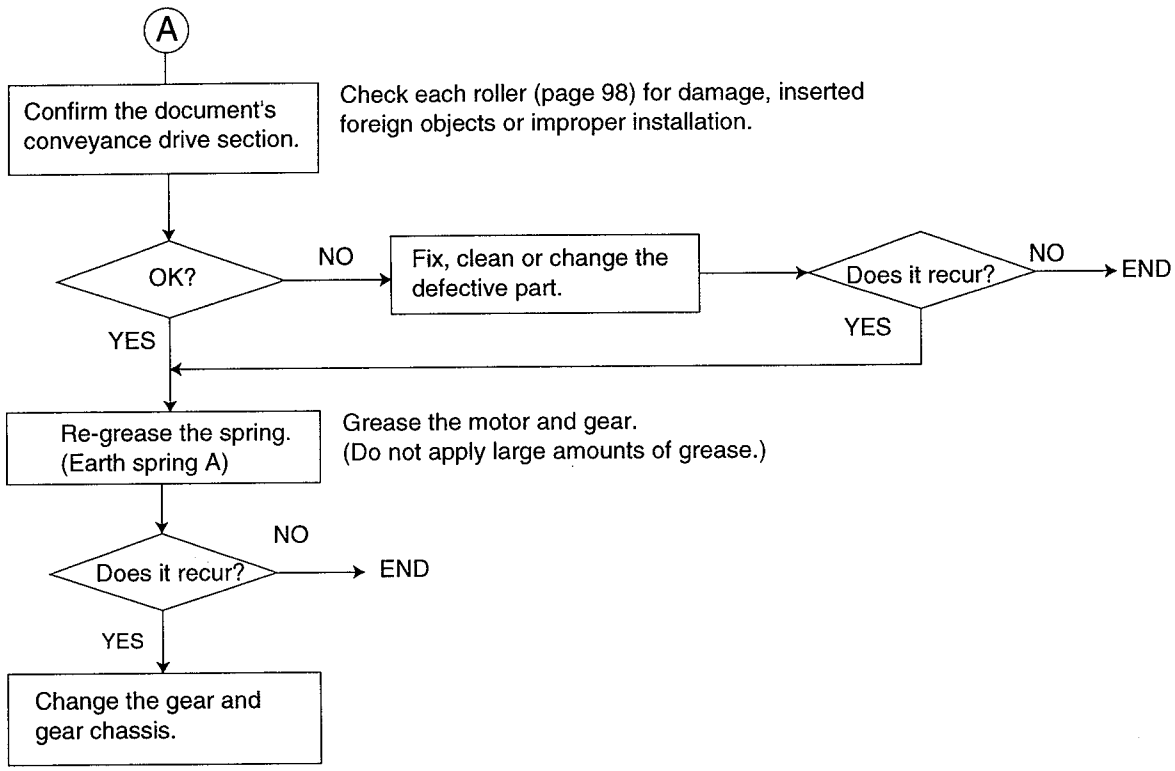


(8) Expanded print (When printing)



(9) When copying or printing, an abnormal sound is heard from the unit.





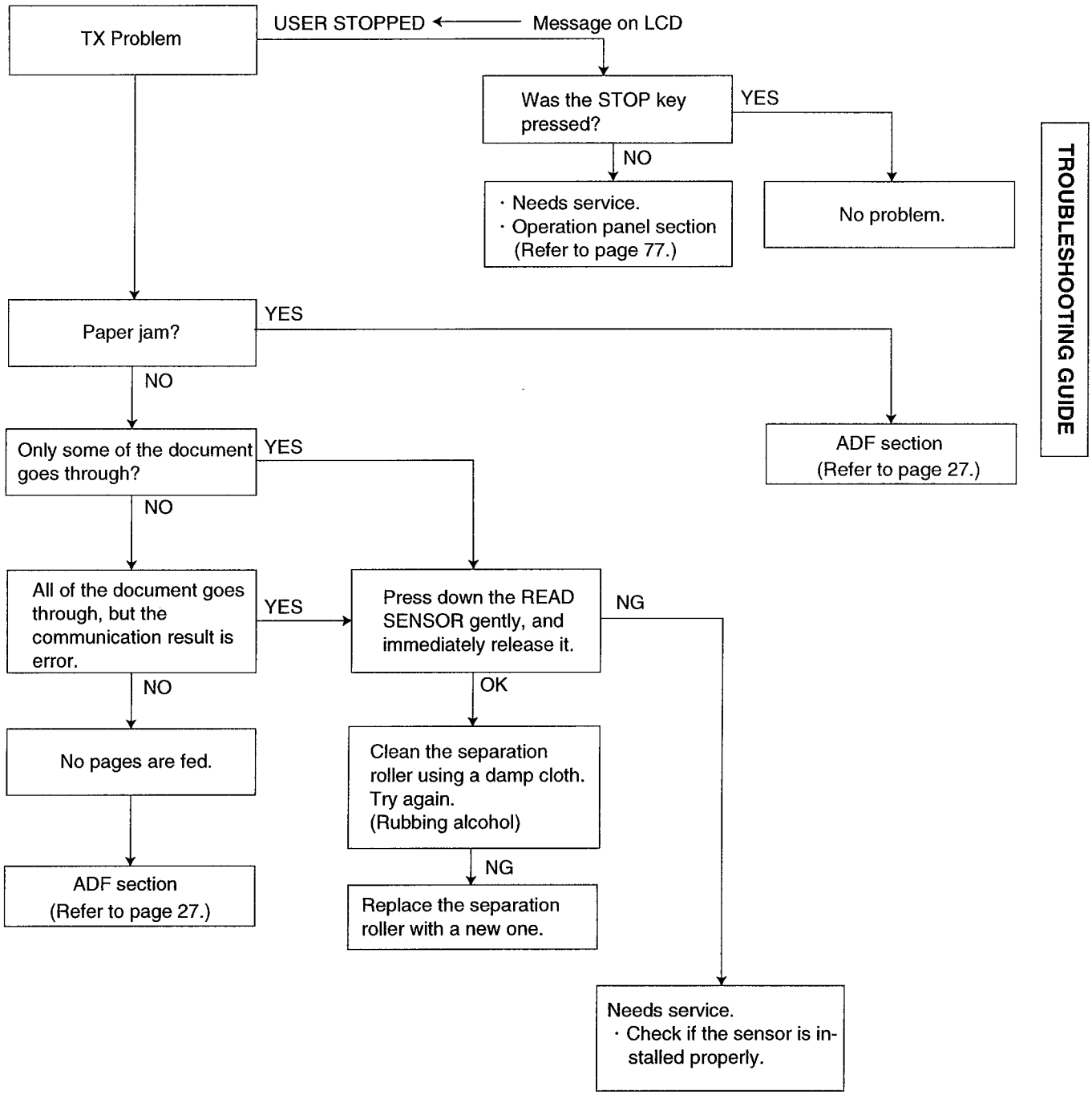
3-6 COMMUNICATION SECTION

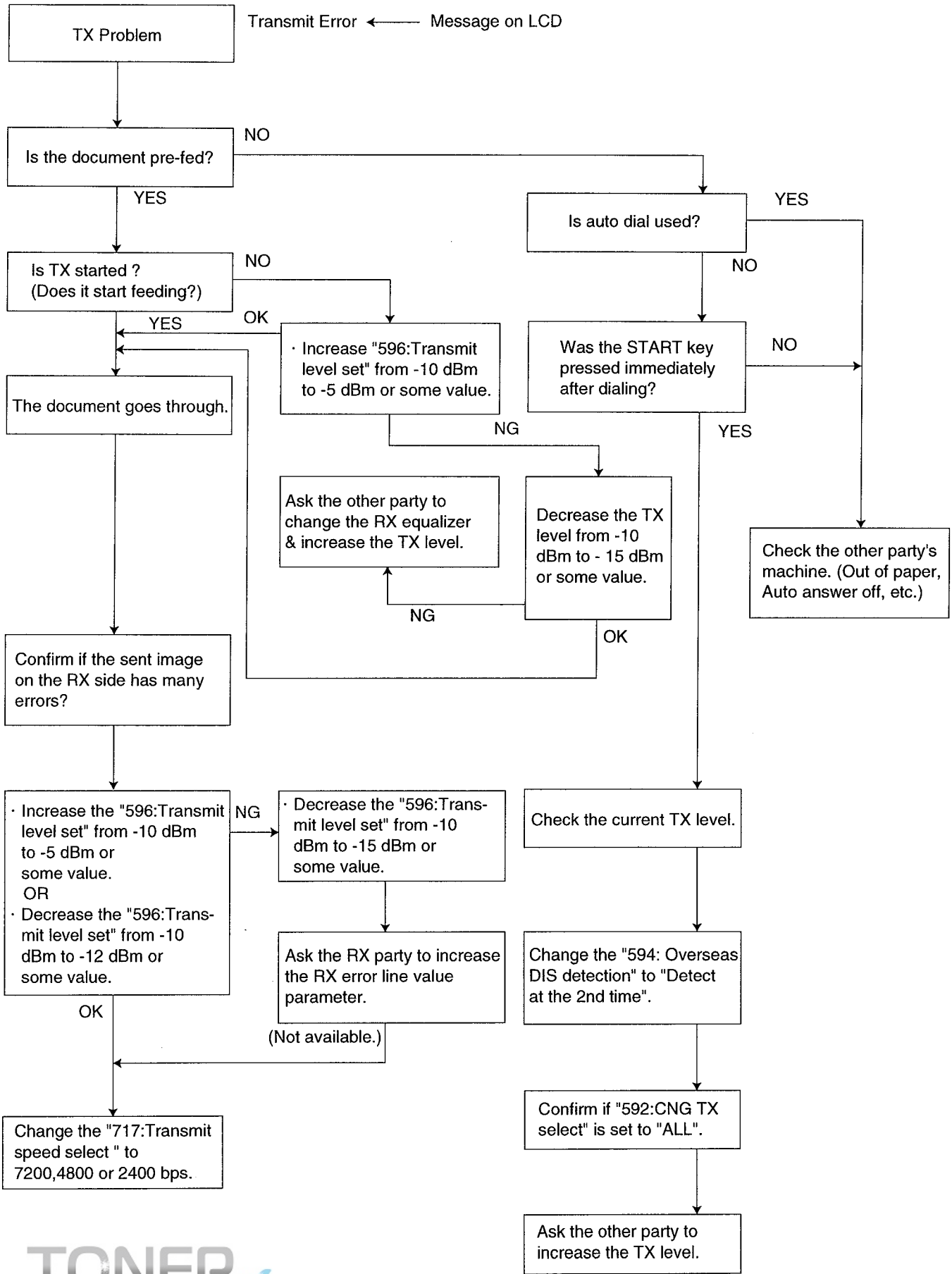
Find the problem in the table shown below, and refer to the corresponding troubleshooting procedure in the reference pages (pages 37-52).

No.	Symptom	Ref. page	Content	Possible cause
1	The paper does not feed properly when faxing. (Copying is also not possible.)	37	Troubleshooting	Problem with the feeding mechanism.
2	The fax transmits successfully one time and fails another. (Copying is possible.)	38	Troubleshooting	Problem with the service line or the receiver's fax.
3	The fax receives successfully one time and fails another. (Copying is possible.)	39	Troubleshooting	Problem with the service line or the transmitter's fax.
4	The fax completely fails to transmit or receive. (Copying is possible.)	40	Troubleshooting	Problem with an electric circuit.
5	The fax fails either to transmit or receive when making a long distance or international call. (Copying is possible.)	41-43	Detailed description of the possible causes (Similar to troubleshooting items No.2 and No.3.)	Problem with the service line.
6	No.1-No.5	44-52	Troubleshooting procedure for each error code printed on the communication result report.	

(1) Defective facsimile section

① Transmit problem

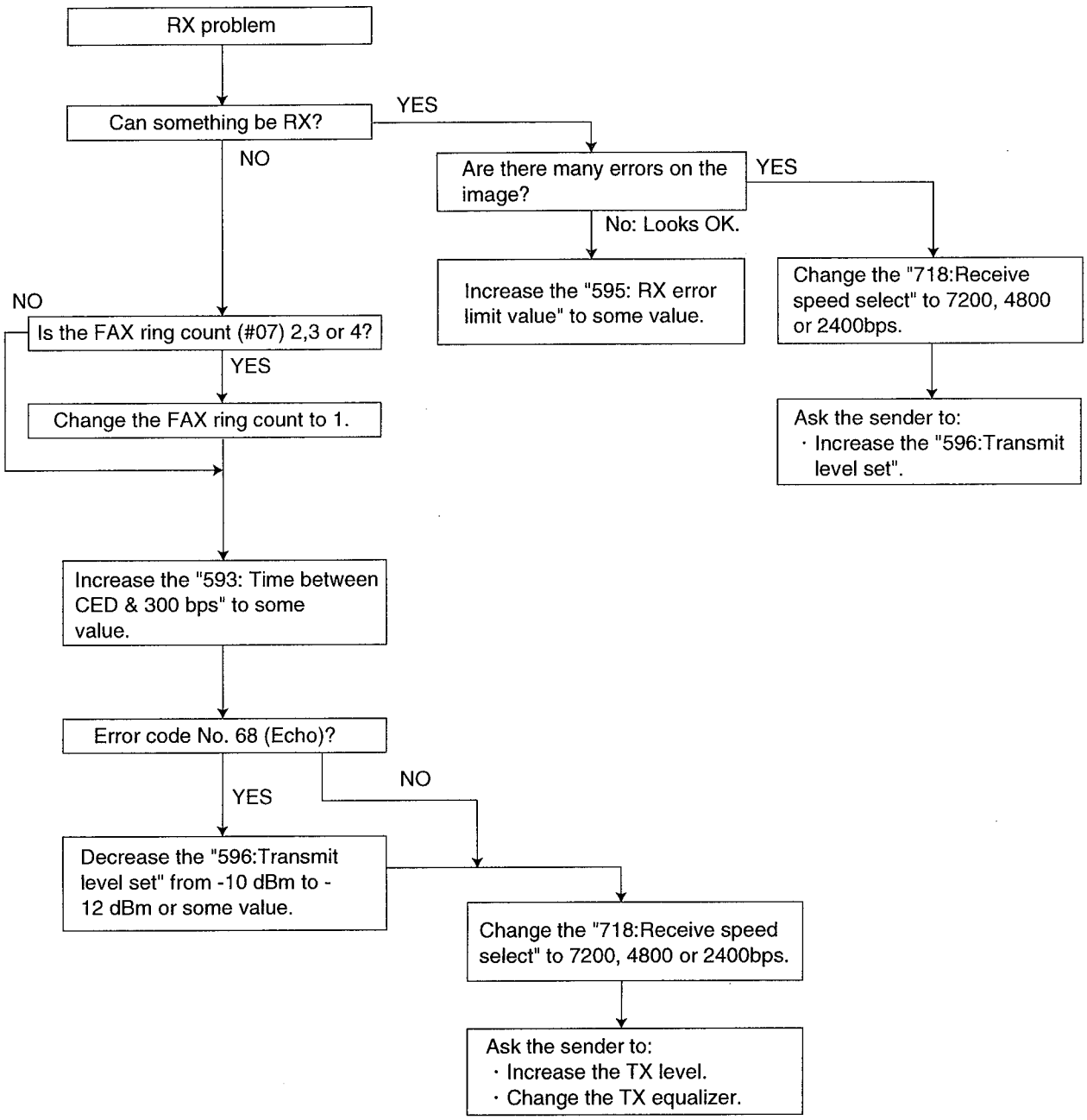




② Receive problem

Confirm the following before starting troubleshooting.

· Is the recording paper installed properly?

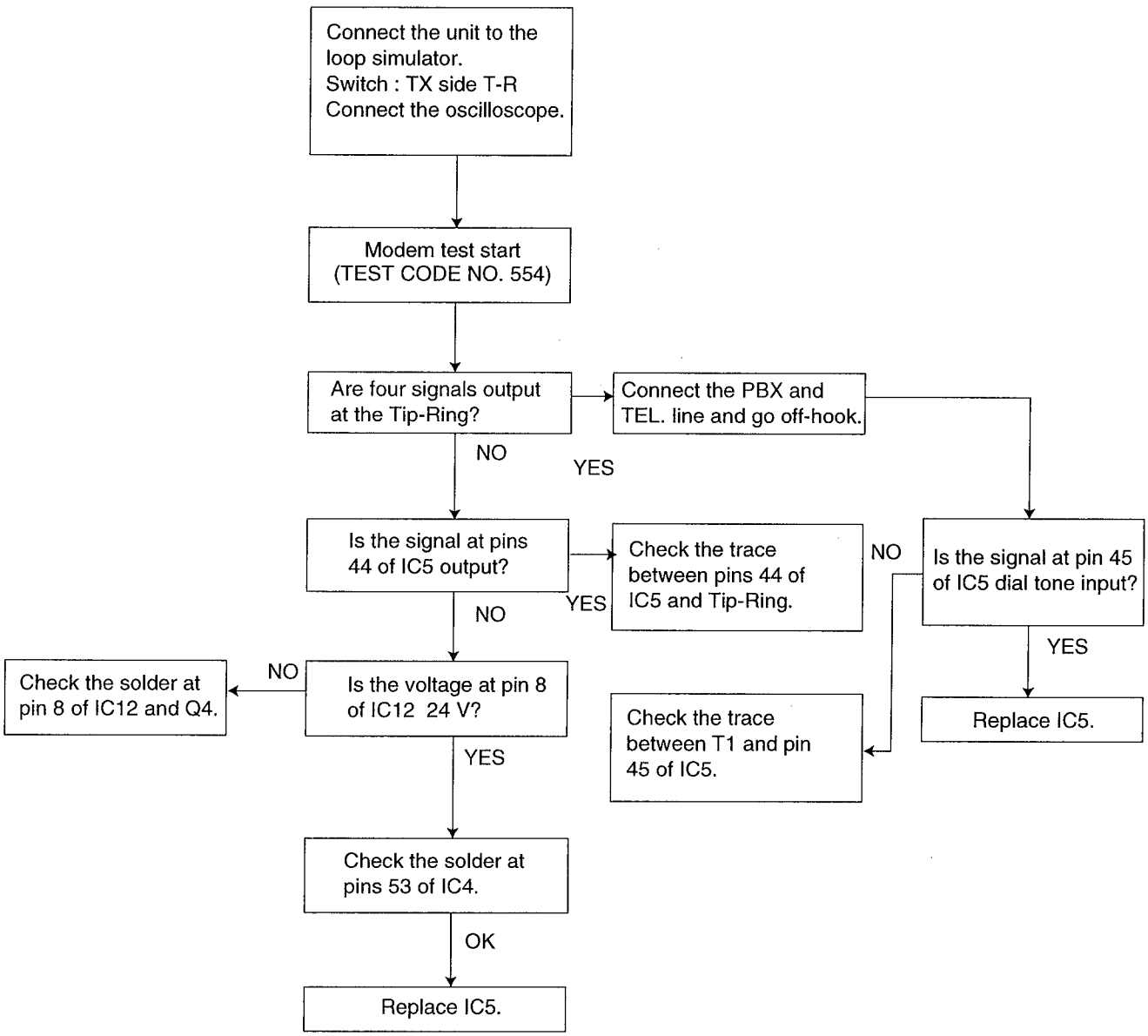


Confirm the following before starting troubleshooting.

CHECK THERMAL PAPER
CHECK THE COVER
OVERHEATED (If it doesn't return automatically, COVER OPEN, etc., reset the unit.)
DOCUMENT JAM

Please refer to "2. User Recoverable Errors" (page 23) for the above items.
Also, when a hardware deformity occurs, please check each sensor.

③ The unit can copy, but cannot transmit/receive.

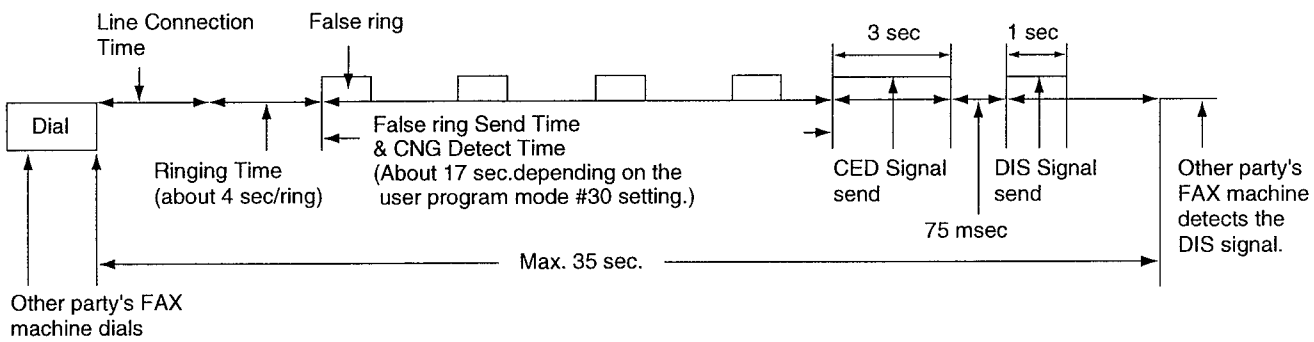


④ Unit can copy, but cannot transmit/receive long distance or international communications.

The following 2 causes can be considered for this.

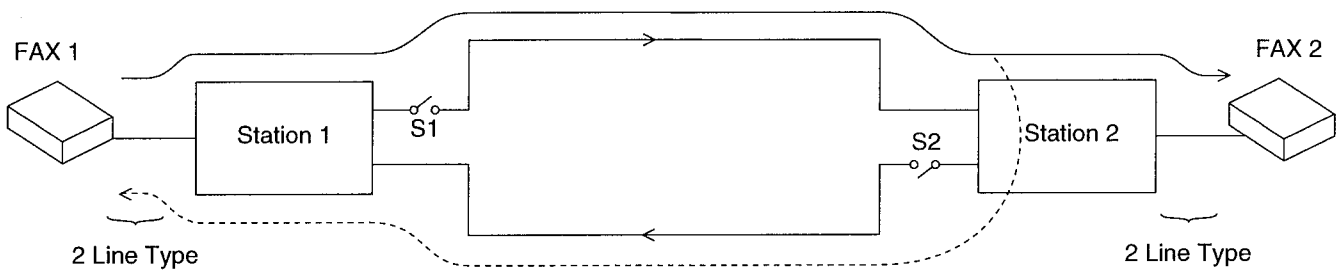
Cause 1:
The other party is executing automatic dialing, the call has been received by this unit, and the CED or DIS signal response time is too long. (In most cases, this unit detects the CNG signal and can respond to the CED or DIS.) (According to the ITU-T standard, the communication procedure is stopped when there is no response from the other party within 35 sec, so that the other party releases the line.)

(Response time)



(Cause and Countermeasure)
As shown in the chart above, the total handshaking time must be reduced, but because of the long distance connection and linking of several stations, the line connection time cannot be reduced. Accordingly, the following countermeasures should be attempted.
(A) The TEL/FAX DELAYED RING count should be 1. (User parameter: code No. 09)
(B) As the 35 sec. count starts directly after dialing or directly after the START button has been pressed for models with a START button, the other party should be called manually, if possible.
Another possibility is entering two pauses at the end of the auto dial number on the transmission side. Then the count start time will be delayed for 2 pauses (about 10 sec.).

Cause 2:
Erroneous detection due to an echo or echo canceler.



The sea bottom cable or satellite communication path (4 Line Type)

(Echo/Echo Canceler)
The signal from FAX1 reaches FAX2 via the stations 1 and 2, but the reflection signal at station 2 also returns via station 1 (echo). As the distance between station 1 and station 2 is far, the echo returns to FAX 1 a max. of 600 msec after transmission. There is a possibility that this signal is detected erroneously as the signal from FAX2. For a normal call, there is a possibility that the echo of their own voice will make the call difficult to understand. For this reason, each station (station 1, station 2) attaches echo cancelers (S1, S2) for international lines or long distance lines. For the echo canceler, the level of the transmission signal from FAX 1 is compared with the level of the reception signal from FAX2. When the transmission signal is larger, S1 is closed while S2 is opened when it is smaller. In other words, for transmission from FAX1, S1 is closed and S2 is open, so that the echo does not return to FAX1.

(Cause and Countermeasure)
(Cause A)
When a training signal is transmitted from FAX1 during the communication procedure at the time of transmission from FAX1 to FAX2, there is a delay until the echo canceler operates. S1 is closed so that a part of the head of the training signal may drop out. Normal reception by FAX2 may not be possible, and transmission may not be started.
(Countermeasure A)
When the international line mode is ON in the service mode (code No. 521), a dummy signal is attached to the head of the training signal to prevent this problem. As this normally is ON, it is necessary to reconfirm that this has not become OFF. When the international mode is switched OFF, the transmission side will try the training signal three times at each speed (9600BPS, 4800BPS and 2400BPS). If NG, it will drop the speed by one rank (fall-back). When the international mode is switched ON, each speed will be tried only twice. In other words, the slower speed with fewer errors can be accessed more easily. This is done because the line conditions may deteriorate and the picture may be affected more easily during communication for international lines or long distance communication, even when the training is OK. The default value is ON as preference is given to clearer pictures rather than speed.

(Cause B)
The echo canceler operation is stopped with a 2100Hz signal (i.e. S1 and S2 become ON).
Accordingly, when FAX1 has executed automatic reception, a CED signal is output. If this signal is 2100Hz, S1 and S2 will become ON. Then the echo of the DIS signal output afterwards may be received and FAX1 may execute an erroneous operation, preventing communication from starting.
(Countermeasure B)
In the service mode, the CED signal frequency is set to 1100 Hz (code No.520.). Or, the time setting between the CED signal and the DIS signal is set from 75 msec to 500 msec in the service mode (code No.593). This is because the echo canceler operation stop mode is canceled by an interval of 250 msec or more.

(Cause C)
This model is FAX1 and the other party is FAX2.
For transmission from this model to FAX2, FAX2 executes automatic reception and transmits a CED signal (2100 Hz) followed by a DIS signal. As the echo cancelers stops as described in cause B, the echo of the DIS signal returns to FAX2. On the other hand, this model detects the DIS signal and transmits a DCS signal. In other words, it is possible that the echo of the DIS signal and the DCS signal transmitted from this model reach FAX2 one after the other. FAX2 detects an error and communication is not started.
(Countermeasure C)
When the international DIS detection setting is set in the service mode (code No.594), this model does not respond to the first DIS signal and returns a DCS signal only for the second DIS signal.
In other words, there is an interval of 250 msec between transmission of first and second DIS signal so that the echo cancelers operation recovers. An echo is not generated for the second DIS signal.
Note:
When the other FAX does not respond with a DCS signal after DIS signal transmission, the DIS signal is transmitted three times for trial.

Summary:
Long distance and international communication operation

SYMPTOM	COUNTERMEASURE
Does not receive in the automatic mode.	1. The TEL/FAX DELAYED RING count should be 1. (User parameter: code No. 09) 2. If possible, manual transmission should be made from the transmission side. 3. If possible, two pauses should be inserted at the end of the auto dial number on the transmission side. 4. If possible, the Function Selector Switch should be switched to FAX.
Does not transmit.	1. Confirm the international line mode is ON. (Service mode: code No. 521) 2. Enable the International DIS detection setting. (Service mode: code No. 594)
Does not receive.	1. Set the time setting between the CED signal and the DIS signal to 500 msec. (Service mode: code No. 593) 2. Set the CED frequency to 1100Hz. (Service mode: code No. 520)

⑤ The unit can copy, but the transmission and reception image is incorrect. (Long distance or international communication operation)

This depends widely on the transmission and reception capability of the other FAX unit and the line conditions. The countermeasures for this unit are shown below.

Transmission Operation:
Set the transmitting speed to 4800BPS (service mode: code No. 717) or select the overseas mode.

Reception Operation:
If 80% or more of the reception is incorrect, set the receiving speed to 4800BPS. (Service mode: code No. 718)

(2) Communication error functions

① **Operation:**

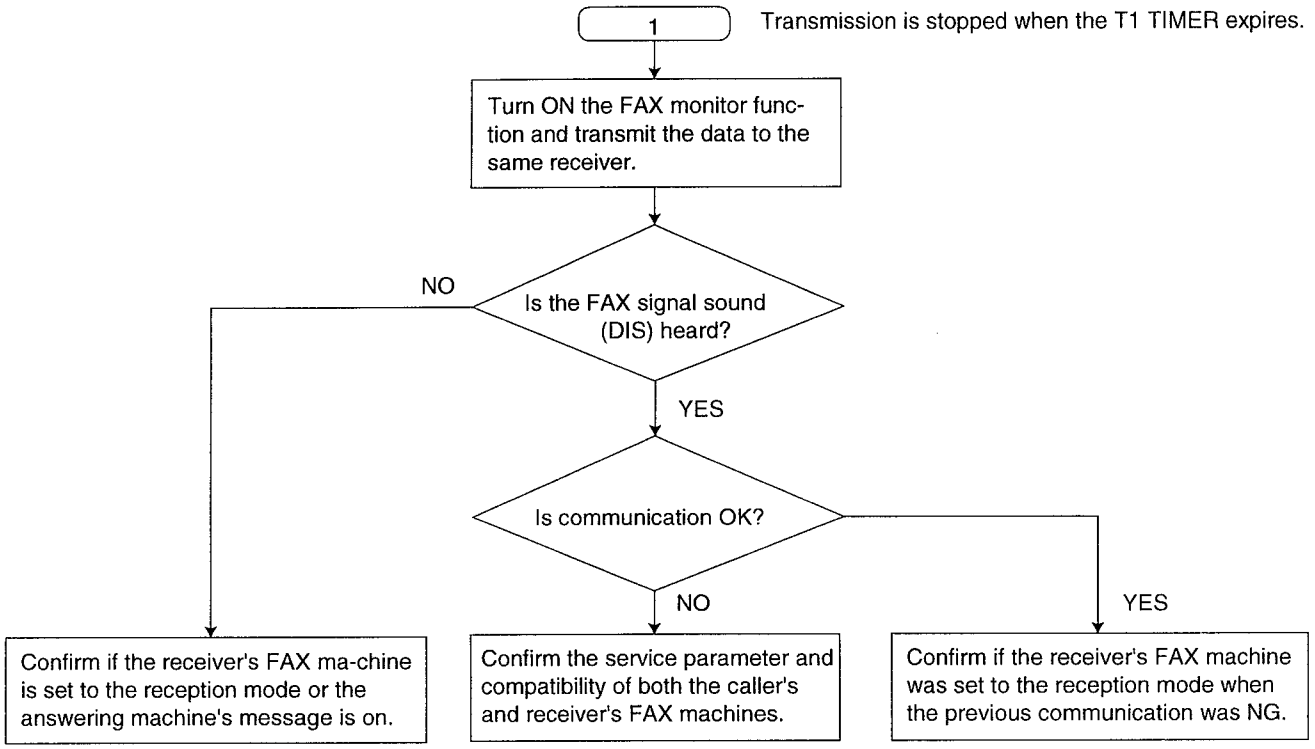
1. Press the MENU button 2 times.
2. Press the START/SET button and then ▼ button 1 time.
3. Press the START/SET button.
4. All of the error lists will print out.

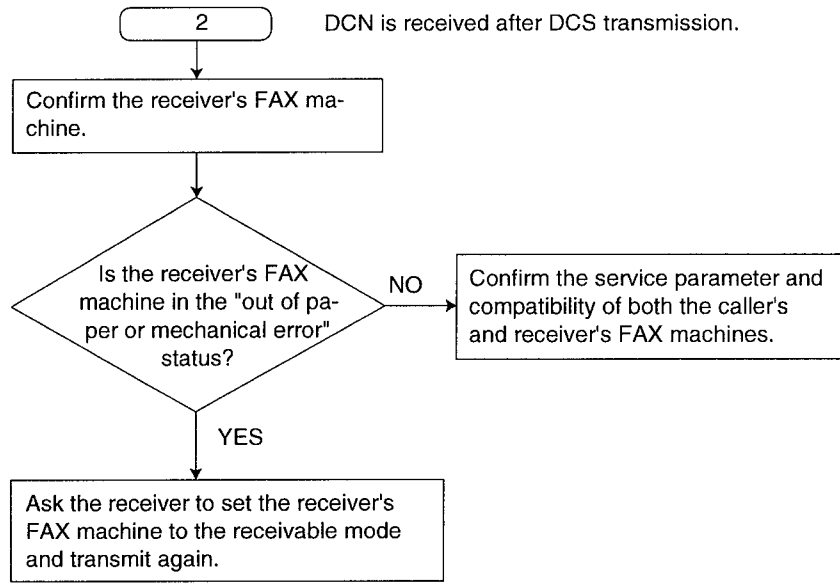
② **Error code table:**

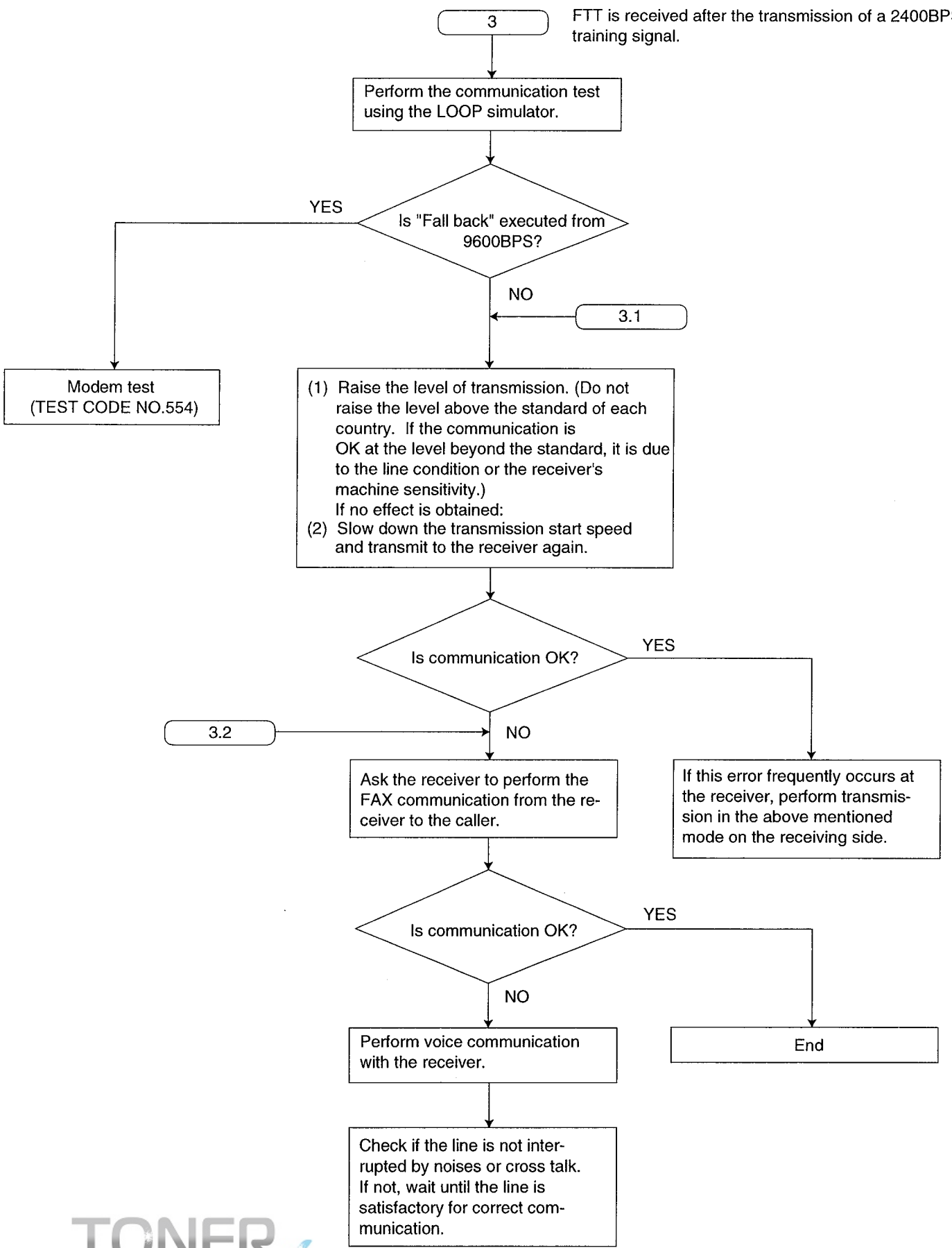
CODE	RESULT	MODE	SYMPTOM	Counter-measure
	PRESSED THE STOP KEY	SND & RCV	Communication was interrupted by the STOP button.	
	DOCUMENT JAMMED	SND	The document paper is jammed.	
	NO DOCUMENT	SND	No document paper.	
	PRINTER OVERHEATED	RCV	The thermal head is overheated.	
	PAPER OUT	RCV	Out of thermal paper.	
	THE COVER WAS OPENED	SND & RCV	The cover is open.	
40	OTHER FAX NOT RESPOND	SND	Transmission is stopped when the T1 TIMER expires.	
41	COMMUNICATION ERROR	SND	DCN is received after DCS transmission.	1
42	COMMUNICATION ERROR	SND	FTT is received after transmission of 2400BSP training signal.	2
43	COMMUNICATION ERROR	SND	No response after post message is transmitted three times.	3
44	COMMUNICATION ERROR	SND	RTN and PIN are received.	4
46	COMMUNICATION ERROR	RCV	No response after FTT is transmitted.	5
48	COMMUNICATION ERROR	RCV	No post message.	6
49	COMMUNICATION ERROR	RCV	RTN is transmitted.	7
50	COMMUNICATION ERROR	RCV	PIN is transmitted (to PRI-Q).	8
51	COMMUNICATION ERROR	RCV	PIN is transmitted.	8
52	OTHER FAX NOT RESPOND	RCV	Reception is stopped when the T1 TIMER expires.	8
53	ERROR-NOT YOUR UNIT	SND	DCN is received after transmission of NSC and DTC.	9
54	ERROR-NOT YOUR UNIT	RCV	DCN is received after DIS transmission.	10
57	COMMUNICATION ERROR	SND	300BPS error	11
58	COMMUNICATION ERROR	RCV	DCN is received after FTT transmission.	12
59	ERROR-NOT YOUR UNIT	SND	DCN responds to a post message.	13
64	COMMUNICATION ERROR	SND	Polling is not possible.	14
68	COMMUNICATION ERROR	RCV	No response at the other party after MCF or CFR is transmitted.	15
70	ERROR-NOT YOUR UNIT	RCV	DCN is received after CFR transmission.	13
72	COMMUNICATION ERROR	RCV	The carrier is cut when the image signal is received.	13
FF	COMMUNICATION ERROR	SND & RCV	Modem error.	16
				12

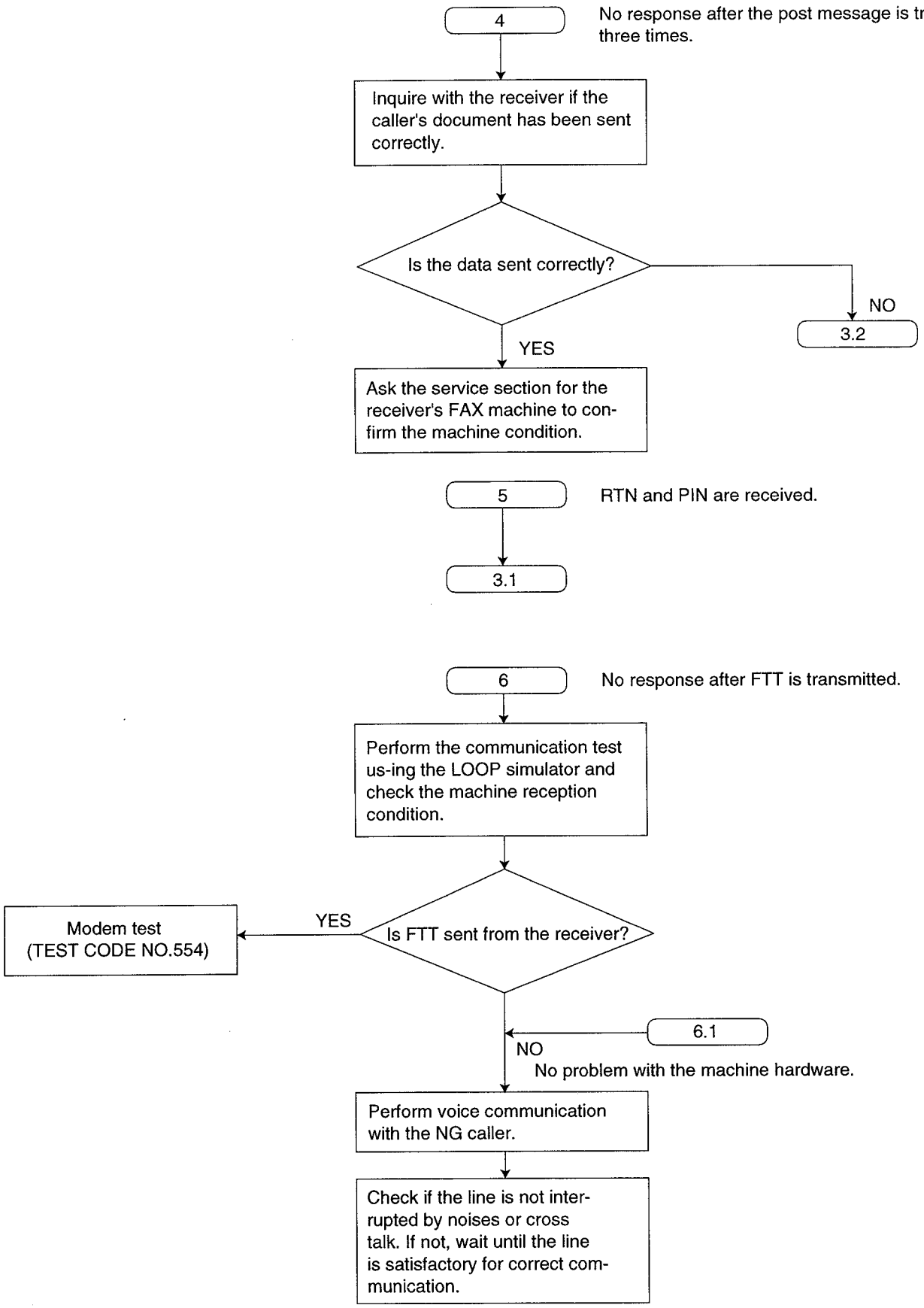
SND=TRANSMISSION RCV=RECEPTION

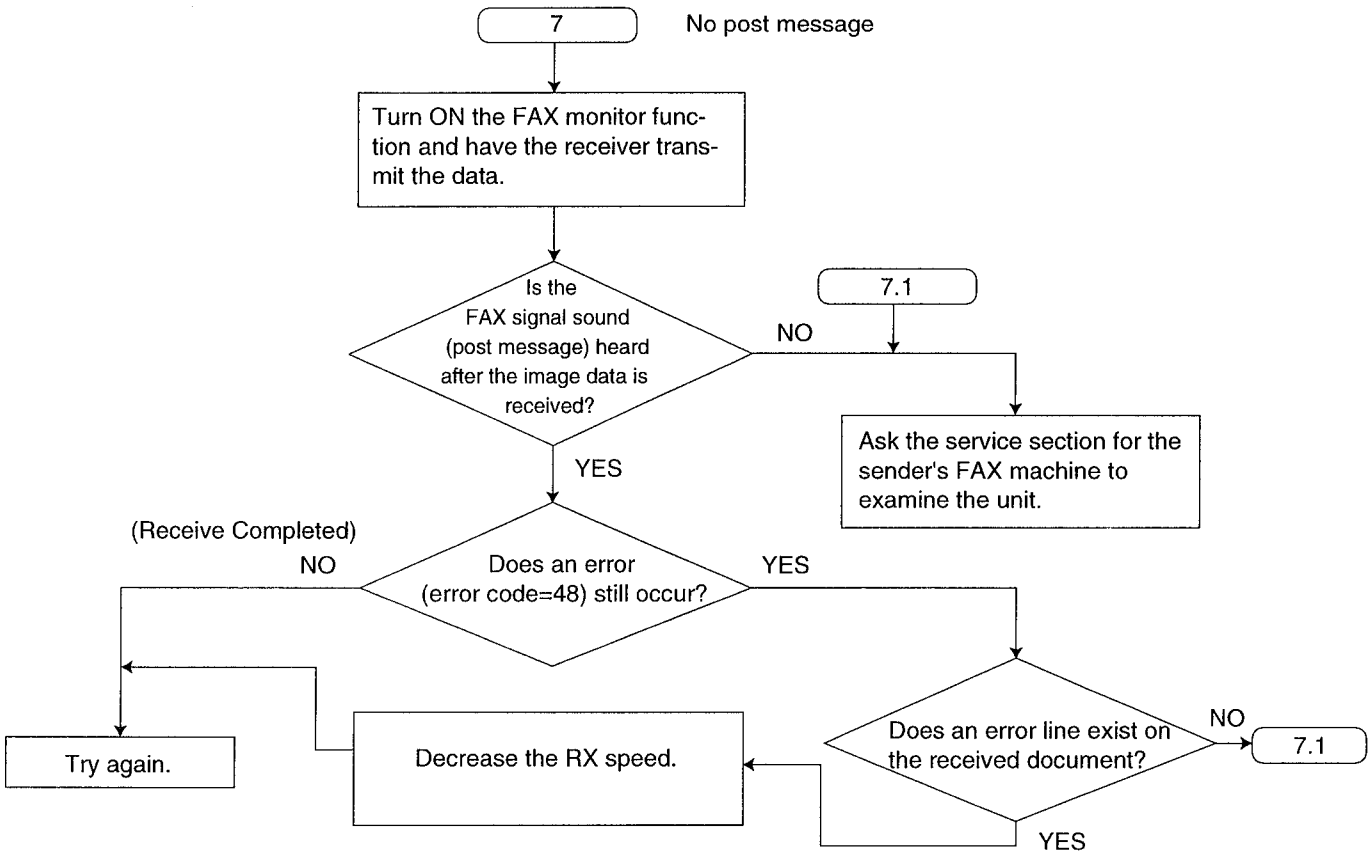
③ Countermeasure

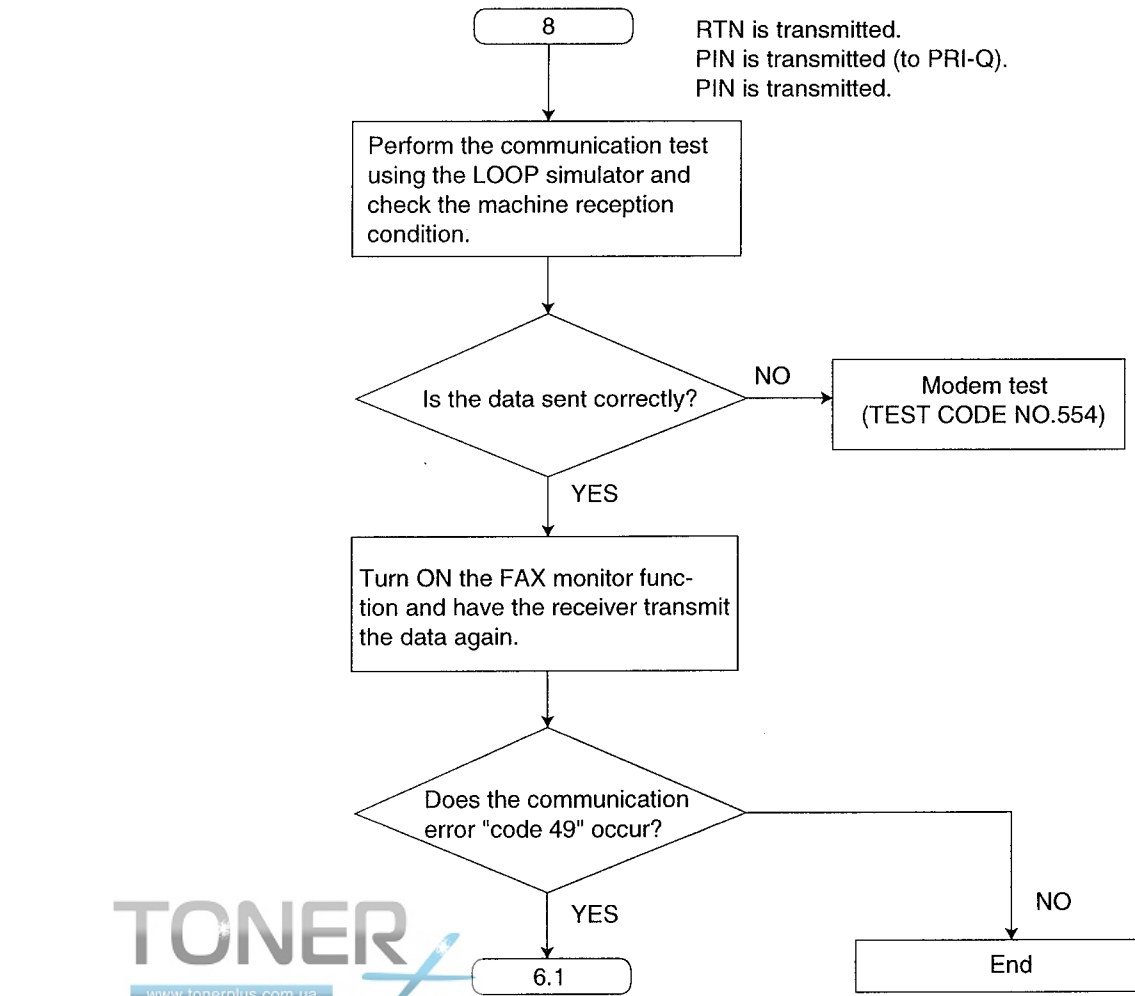


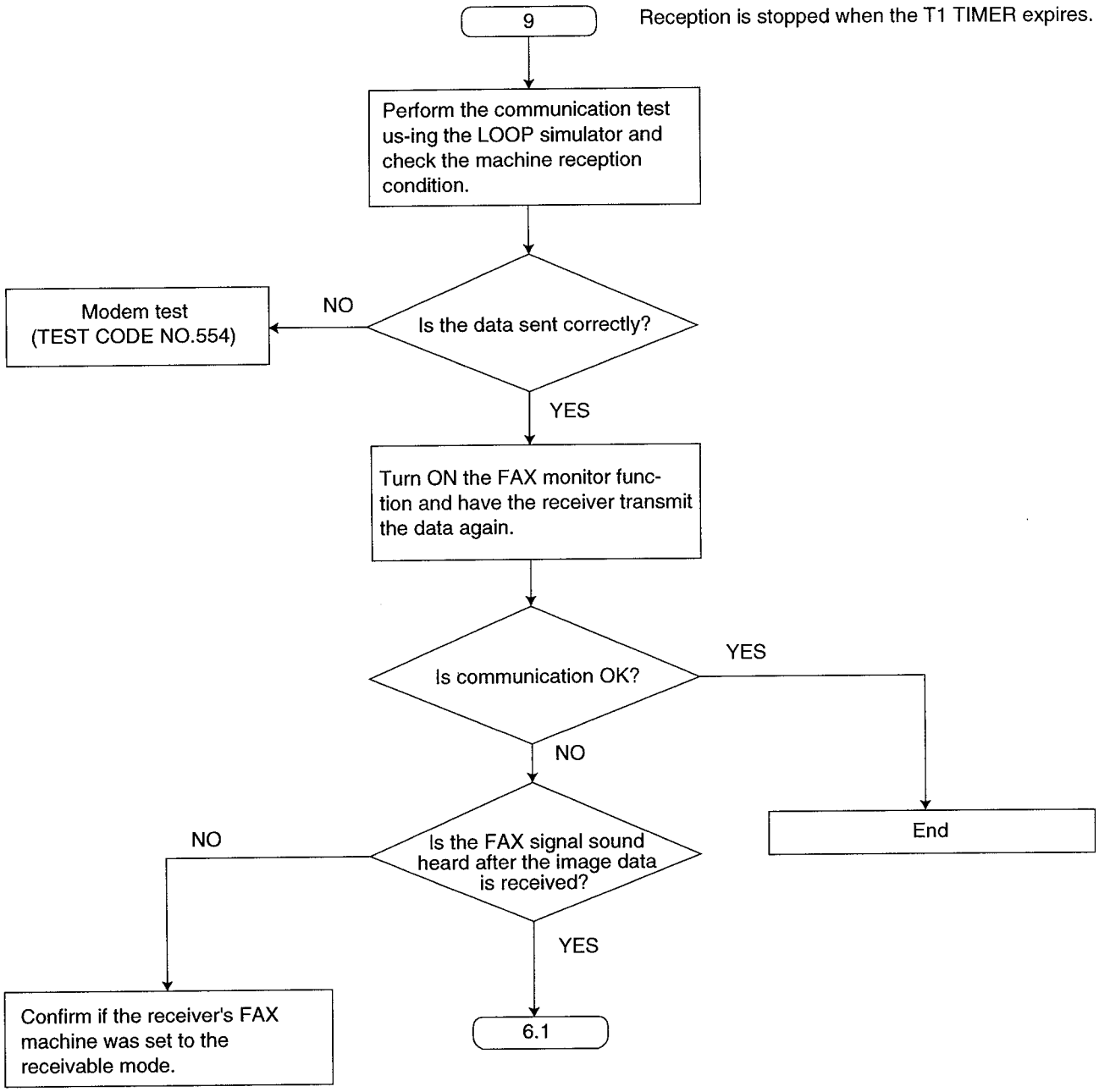


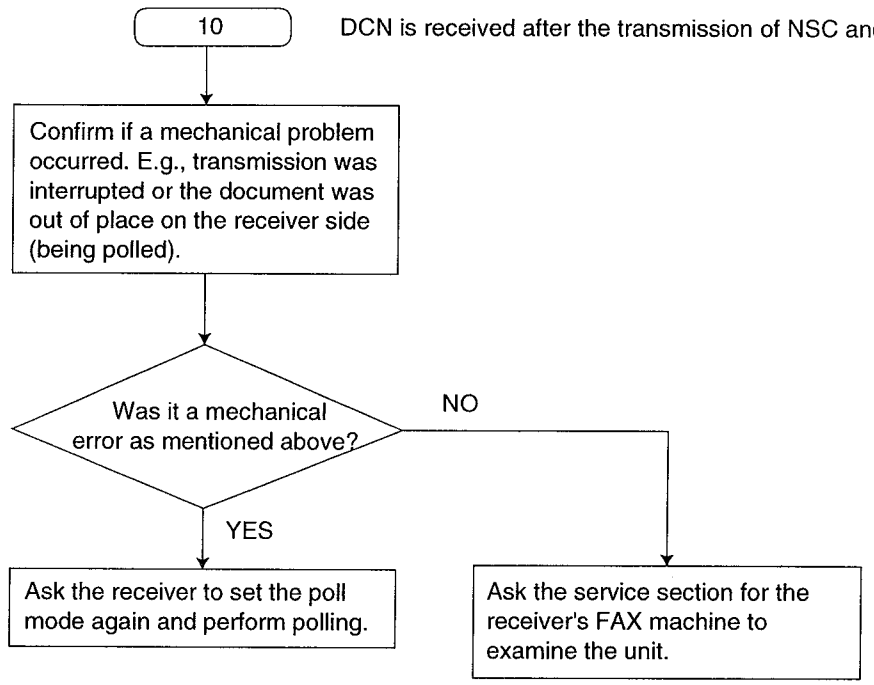


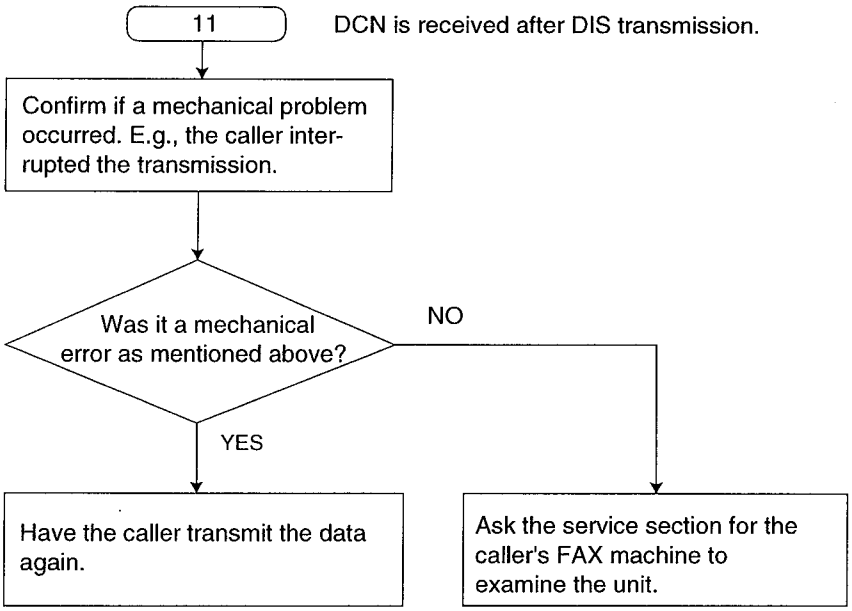


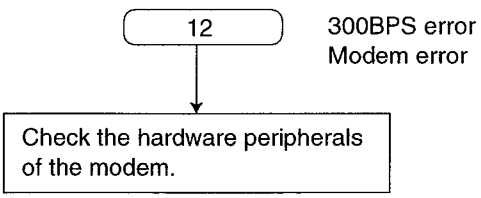


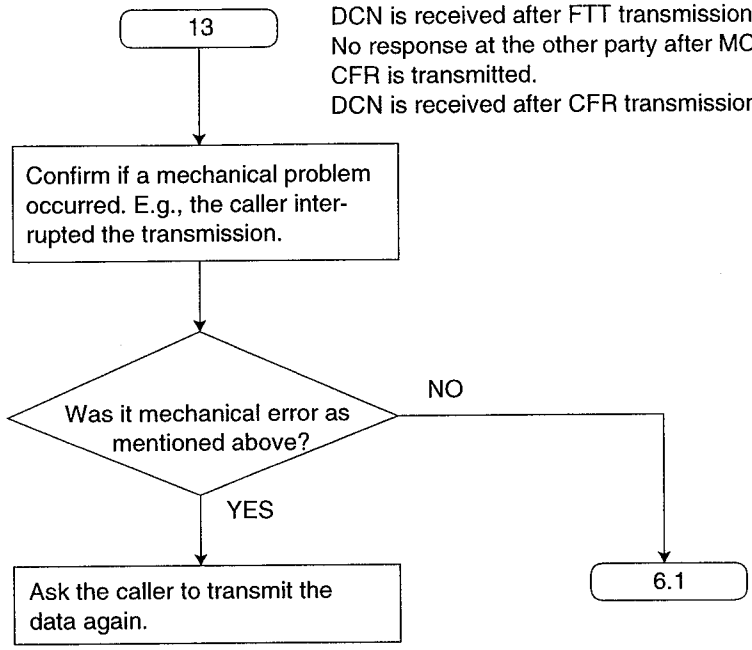


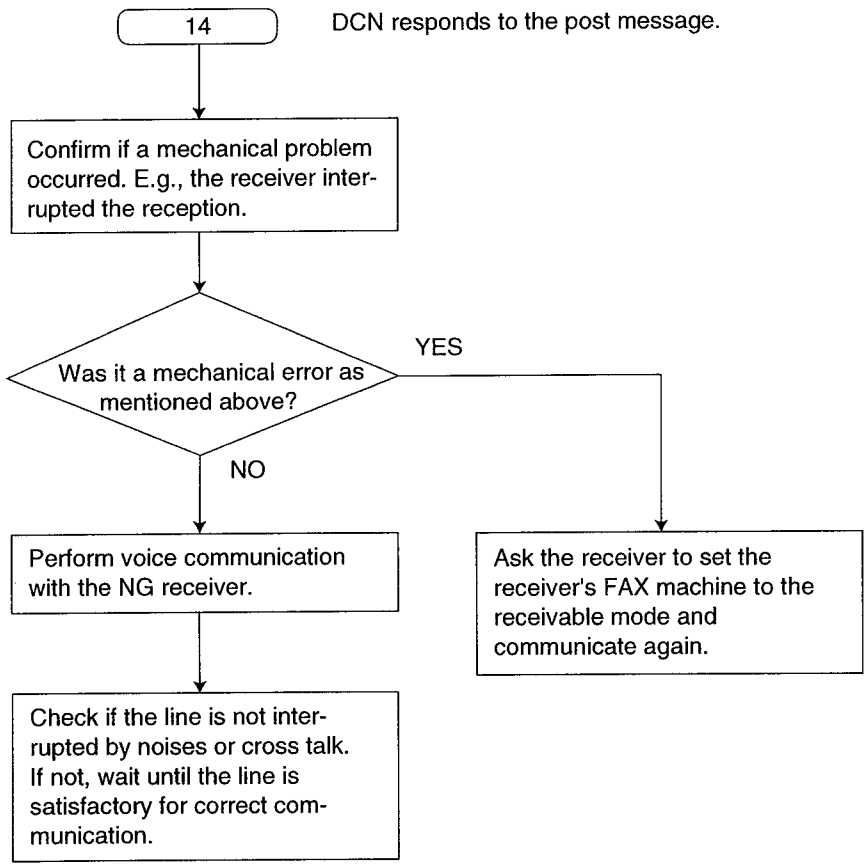


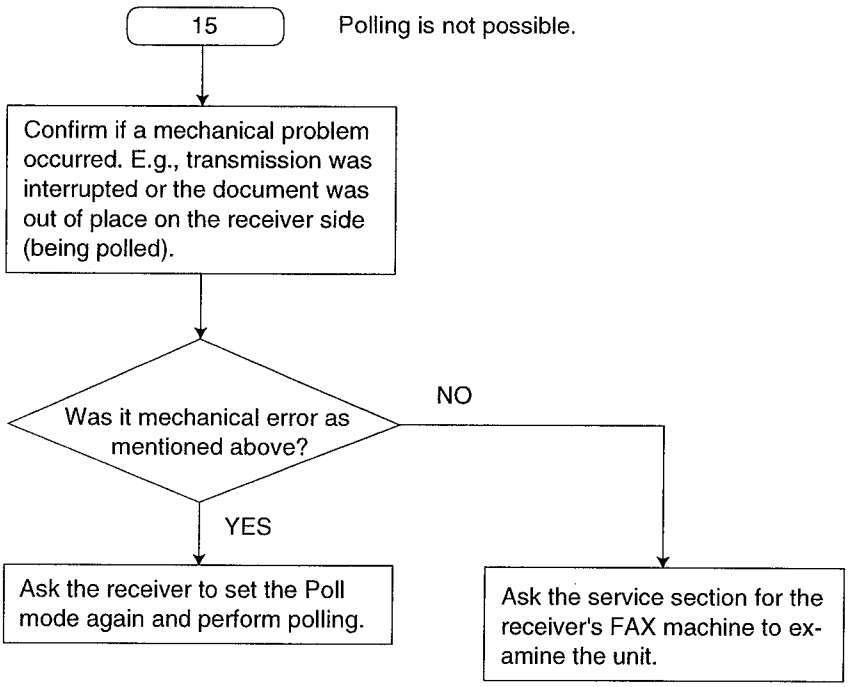


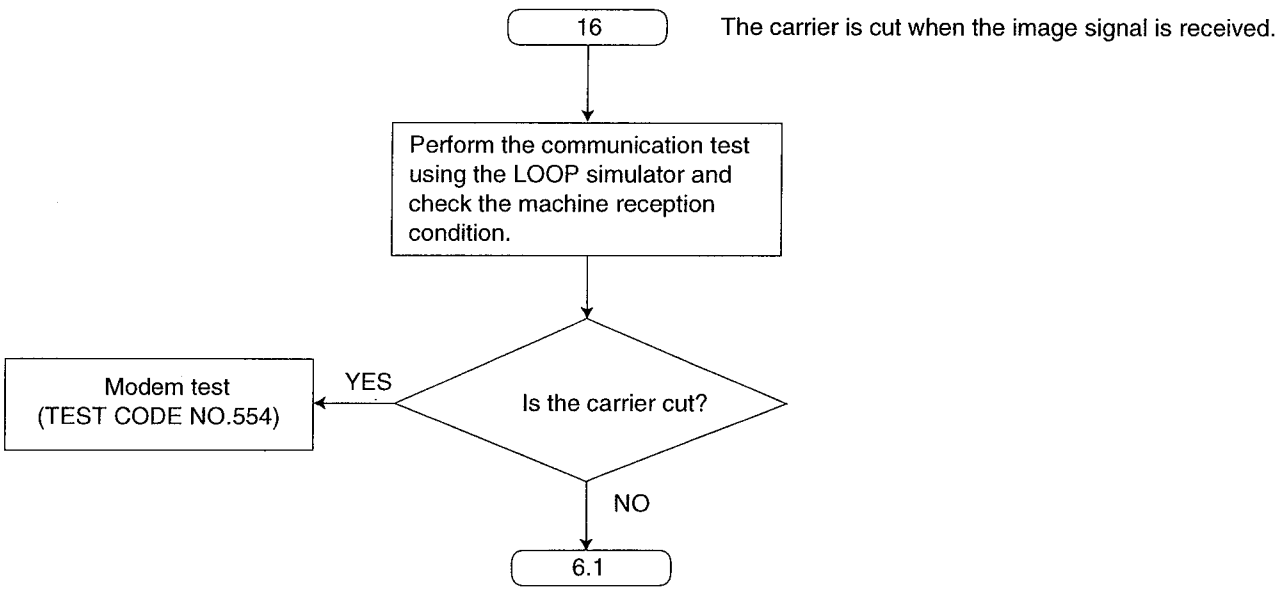












(3) Remote programming

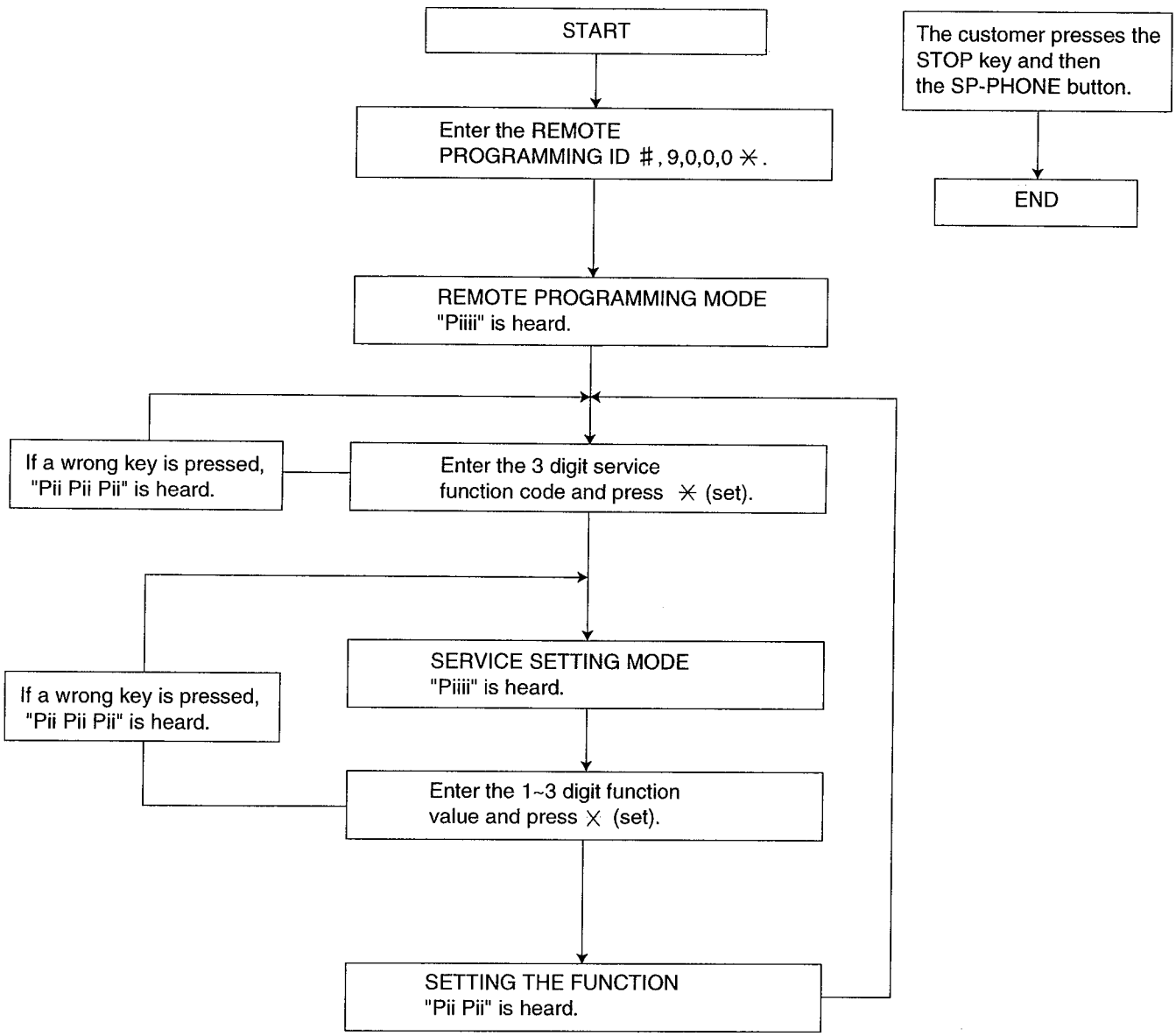
While a user is talking on the phone, a technician can set the function parameters of customer's unit from the service center.

1. A call is received at the service center.
2. A technician gets a claim from a customer.
3. He asks to the customer to "Please press the MENU button and wait for a moment".
4. The technician dials '#,9,0,0,0,*' from his telephone.
   The customer's unit is set to the REMOTE PROGRAMMING MODE and generates a remote beep sound.
   The technician hears "Piiii" (one long beep).
5. The technician enters a 3 digit code service function written in the service manual by the dial keypad. (See page 55.)
   Then presses * (set).
   The customer's unit receives the service code.
   He hears "Piiii" (one long beep).
6. The technician presses the 1~3 digit function value written in the service manual by the dial keypad.
   Then presses * (set).
   The customer's unit receives the service value.
   He hears "Pii Pii" (two short beeps).
7. Then the technician can repeat from step 5.
8. When a technician wishes to end the REMOTE PROGRAMMING MODE, ask the customer to "Please press the STOP button to exit the REMOTE PROGRAMMING MODE. And then hang up the handset".

Note:

1) Entering the REMOTE PROGRAMMING MODE is necessary in step 3. This is because the unit cannot easily enter the REMOTE PROGRAMMING with the DTMF signal from the other party.
2) If a wrong button is pressed in step 5 or 6, "Pii Pii Pii" (three short beeps) will be heard.
   The same step can be repeated.
3) When the customer's unit finishes transmitting a list (No. 991,992, 994,999), he can have a voice conversation.
   Then he can continue the REMOTE PROGRAMMING MODE.
4) When the customer's unit starts transmitting a list (No. 991,992, 994,999), he will not hear "Pii Pii" (two short beeps).
   The unit will generate a CNG sound.

① Summary of the remote programming mode



② **Program mode table**

Code	Function	Set Value	Default	Remote setting
001	Set the date and time	mm/dd/yy hh:mm	---------	NG
002	Your logo	---------	---------	NG
003	Your telephone number	---------	---------	NG
004	Print transmission report	1:ERROR 2:ON 3:OFF	ERROR	OK
005	Auto receive mode	1: FAX 2: EXT TAM	FAX	OK
007	FAX ring count	2 to 9 rings	2 ring	OK
008	Manual receive mode	1:TEL 2:TEL/FAX	TEL	OK
009	TEL/FAX delayed ring	2 to 9 rings	2 ring	OK
012	Remote TAM activation code	1:ON 2:OFF	OFF/ID=11	NG
022	Journal auto print	1:ON 2:OFF	ON	OK
023	Overseas mode	1:ON 2:OFF	OFF	OK
025	Delayed send	ON/OFF	OFF	NG
030	Silent FAX recognition ring	3 to 9 rings	3 rings	OK
031	Ring detection	0:OFF 1:ON	OFF	OK
039	LCD contrast	NORMAL/LIGHT/DARK	NORMAL	NG
040	Silent Detection	1:ON 2:OFF	ON	OK
041	FAX activation code	ON/OFF	ON/ID=＊9	NG
046	Friendly reception	1:ON 2:OFF	ON	OK
070	FAX pager	ON/OFF	OFF	NG
080	Set the default	YES/NO	NO	NG
501	Pause time set	001~600 X 100 msec	030	OK
502	Recall time set	01~90 X 10 msec	10	OK
503	Dial speed set	1:10pps 2:20 pps	10	OK
520	CED frequency select	1:2100Hz 2:1100Hz	2100	OK
521	International mode select	1:ON 2:OFF	ON	OK
522	Auto standby select	1:ON 2:OFF	ON	OK
523	Receive equalizer select	1:ON 2:OFF	OFF	OK
544	Document feed position adjustment value set	01~99 step	---------	OK
550	Memory clear	Press "START".	---------	NG
551	ROM check	Press "START".	---------	NG
553	Monitor on FAX communication select	1:OFF 2:P-B 3:ALL	OFF	OK
554	Modem test	Press "START".	---------	NG
555	Scanner test	Press "START".	---------	NG
556	Motor test	Press "START".	---------	NG
557	LED test	Press "START".	---------	NG
558	LCD test	Press "START".	---------	NG
559	Document jam detection select	1:ON 2:OFF	ON	OK
561	Key test	Press any key.	---------	NG
563	CCD position adjustment value set	00~30 mm	---------	OK
570	Break % select	1:61% 2:67%	61%	OK
571	ITS auto redial time set	00~99	014	OK
572	ITS auto redial line disconnection time set	001~999 set	030	OK
573	Remote turn-on ring number set	01~99	15	OK

Code	Function	Set Value	Default	Remote setting
590	FAX auto redial time set	00~99	05	OK
591	FAX auto redial line disconnection time set	001~999	045	OK
592	CNG transmit select	1:OFF/2:ALL/3:AUTO	ALL	OK
593	Time between CED and 300 bps	1:75/2:500/3:1s	75 ms	OK
594	Overseas DIS detection select	1:1st/2:2nd	1st	OK
595	Receive error limit value set	001~999	100	OK
596	Transmit level set	15~00dBm	-10	OK
700	Ext. TAM OGM time	01~99 sec.	10	OK
701	Silent detect time	01~99 X 100 msec	50	OK
702	Ext. TAM ring count	0~9	5	OK
717	Transmit speed select	1:9600/2:7200/3:4800/4:2400bps	9600bps	OK
718	Receive speed select	1:9600/2:7200/3:4800/4:2400bps	9600bps	OK
719	Ringer off in TEL/FAX mode	1:ON/2:OFF	ON	OK
721	Pause tone detect	1:ON/2:OFF	ON	OK
722	Redial tone detect	1:ON/2:OFF	ON	OK
732	Auto disconnect cancel time	1:350 msec/2:1800 msec/3:OFF	350 msec	OK
763	Friendly reception CNG detection select	1:10S/2:20S/3:30S	20S	OK
771	T1 timer	1:35 sec/2:60 sec	35 sec	OK
815	Sensor check	Press "START".	---------	NG
844	Original setting	1:NORMAL/2:LIGHT/3:DARKER	NORMAL	OK
991	Transmit basic list	1: START	---------	OK
992	Transmit advanced list	1: START	---------	OK
994	Transmit journal report	1: START	---------	OK
999	Transmit service list	1: START	---------	OK

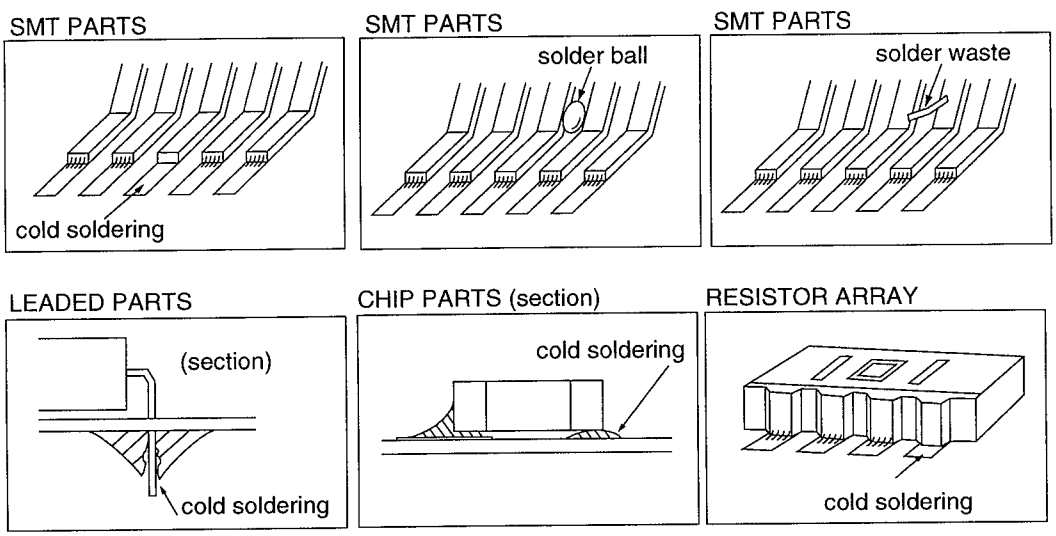
OK : Can set the value by the remote programming feature or print a list.
NG : Cannot set the value.

3-7. Digital board section

One of most difficult problems to deal with is when the system will not boot up.

The symptom: No response when the power is turned on. (No LCD display, keys are not accepted.)

Then first thing to do is check the power source, If there is no problem with the power supply unit, then there is a problem with the digital unit (main board).
As there are many potential causes in this case (ASIC, etc.), it may be difficult to specify what you should check first. If a mistake is made in the order of checks, a normal part may be determined faulty, wasting both time and money.
Although the tendency is to regard the problem as a serious one (IC malfunction, etc.), usually most cases are caused by solder faults (poor contact due to a tunnel in the solder, signal short circuit due to solder waste).



Note:

1. Electrical continuity may have existed at the factory check, but a faulty contact occurred as a result of vibration, etc., during transport.
2. Solder waste remaining on the board may get caught under the IC during transport, causing a short circuit.

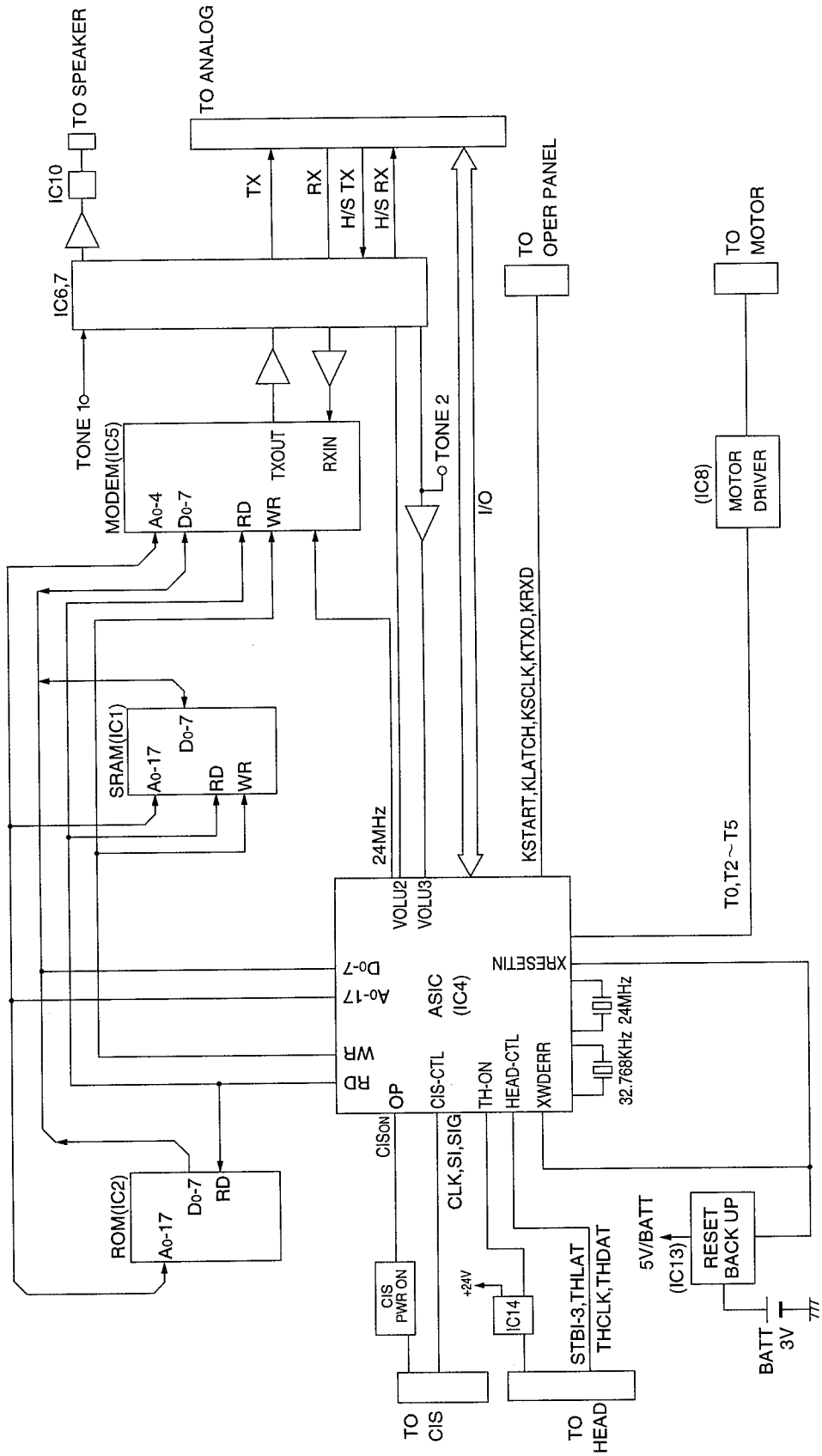
Before we begin mass production, several hundred trial units are produced at the plant, various tests are applied and any malfunctions are analyzed. (In past experiences, digital IC (especially SRAM and ROM) malfunctions are extremely rare after installation in the product.)
This may be repaired by replacing the IC, (ASIC etc.). However, the real cause may not have been an IC malfunction but a soldering fault instead.
Soldering faults which are difficult to detect with the naked eye are common, particularly for an ASIC and RA (Resistor Array). But if you have an oscilloscope, you can easily determine the problem site or IC malfunction by checking the main signal lines.
Even if you don't have such a measuring instrument, by checking each main signal line and resoldering it, in many cases the problem will be resolved.
An explanation of the main signals (for booting up the unit) is below.

> Don't exchange ICs or stop repairing until checking the signal lines.
> An IC malfunction rarely occurs. (By understanding the necessary signals for booting up the unit, the "Not Boot up" display is not a serious problem.)

What are the main signals for booting up the unit?

Please refer to the Block diagram.
The ASIC (including the CPU) (IC4) controls all the other digital ICs. When the power is turned on, the ASIC (CPU) retrieves the operation code stored in the ROM (IC2), then follows the instructions for controlling each IC. All ICs have some inner registers that are assigned to a certain address.
It is the address bus by which the ASIC (CPU) designates the location inside each IC. And the data bus reads or writes the data in order to transmit the instructions from the ASIC (CPU) to the ICs.
These signal lines are all controlled by voltages of 5V (H) or 0V (L).

Digital Block Diagram



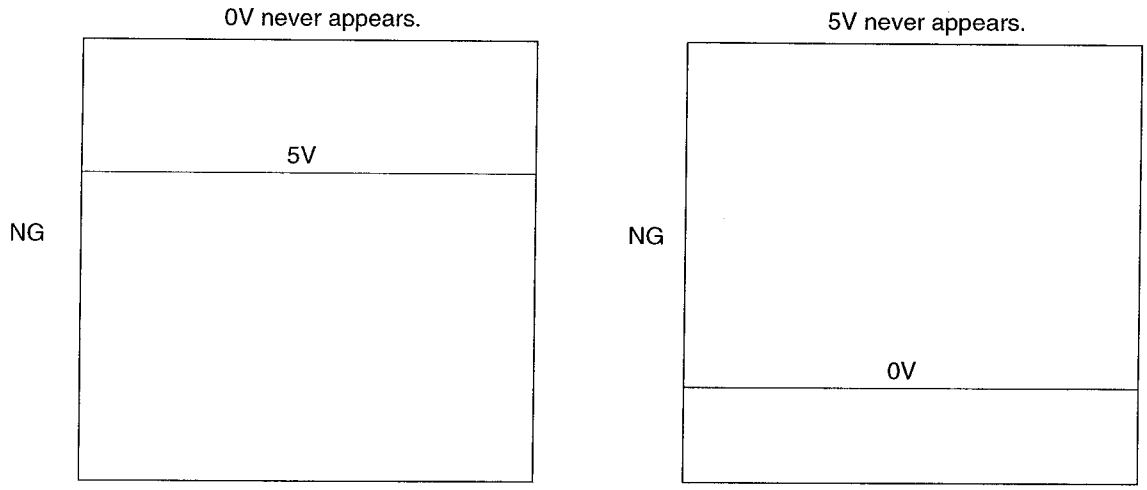
The signal lines that must be normal for the system to boot up are listed here [List 1].
For signal lines other than these, even if they malfunction they do not directly affect booting up the system.

[List 1]

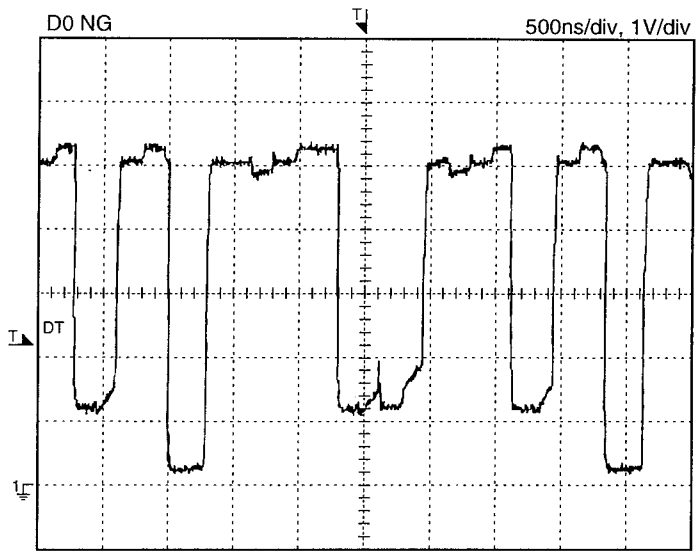
① D0~D7	(Address/Data Bus)
② A0~A16	(Address Bus)
③ $\overline{RD}$	(Read Signal)
$\overline{ROMCS}$	(ROM Select Signal)
$\overline{WR}$	(Write Signal)
$\overline{RAMCS}$	(SRAM Select Signal)

If these signals are normal, once the power is turned on, each IC repeatedly outputs 5V (H) and 0V (L). The following page shows NG and normal wave patterns.

NG Wave pattern



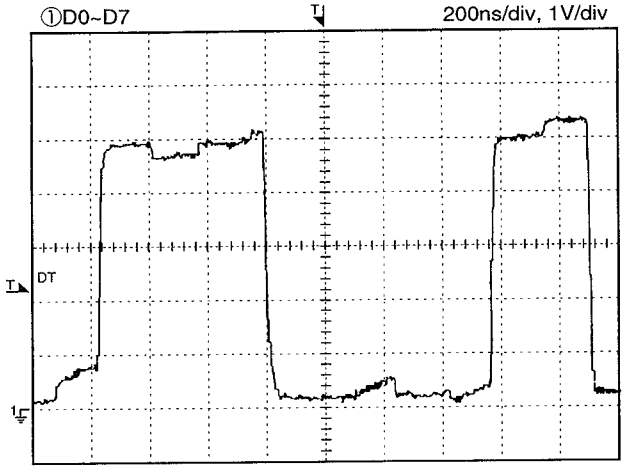
For a short between D0 and D1



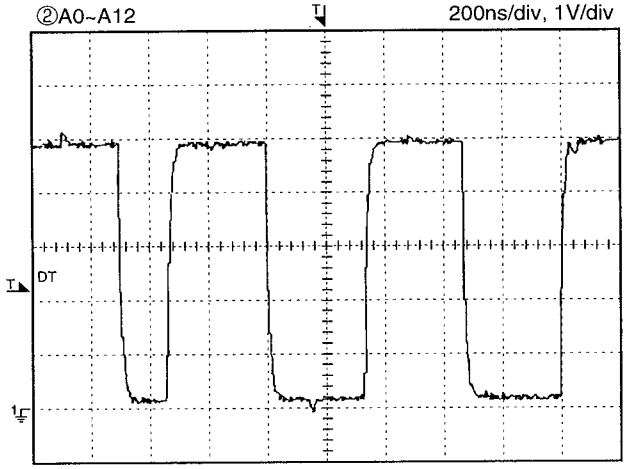
Normal Wave patterns

OK

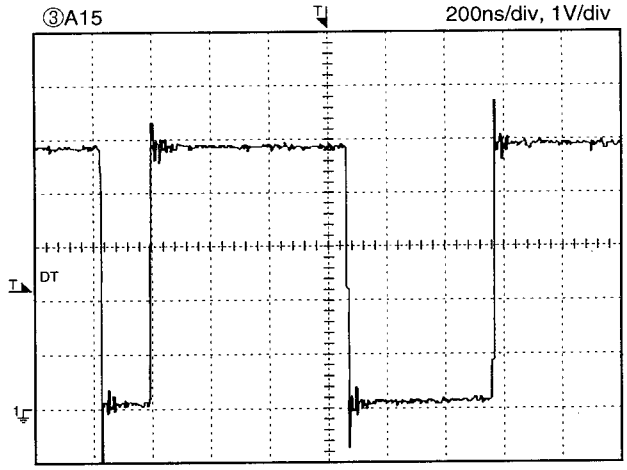
①D0~D7 200ns/div, 1V/div



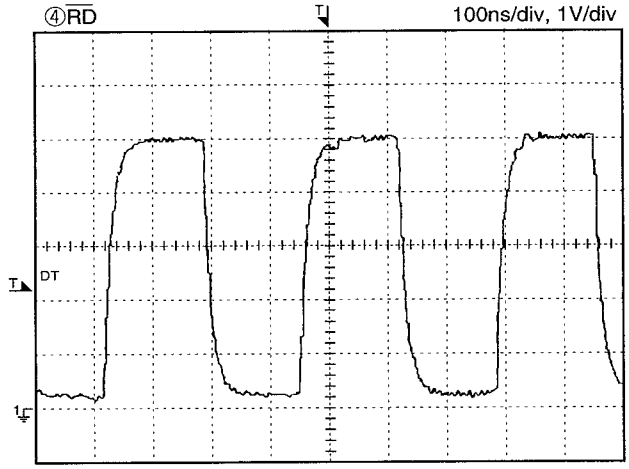
②A0~A12 200ns/div, 1V/div



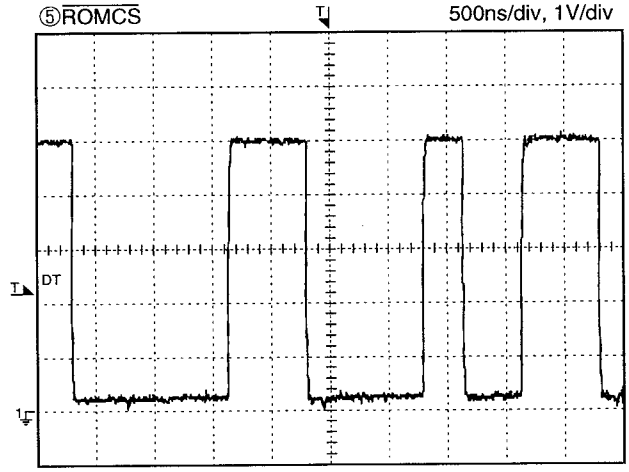
③A15 200ns/div, 1V/div



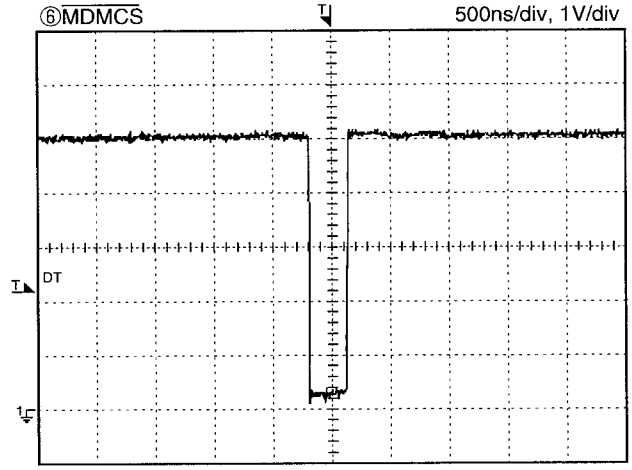
④$\overline{RD}$ 100ns/div, 1V/div



⑤$\overline{ROMCS}$ 500ns/div, 1V/div



⑥$\overline{MDMCS}$ 500ns/div, 1V/div

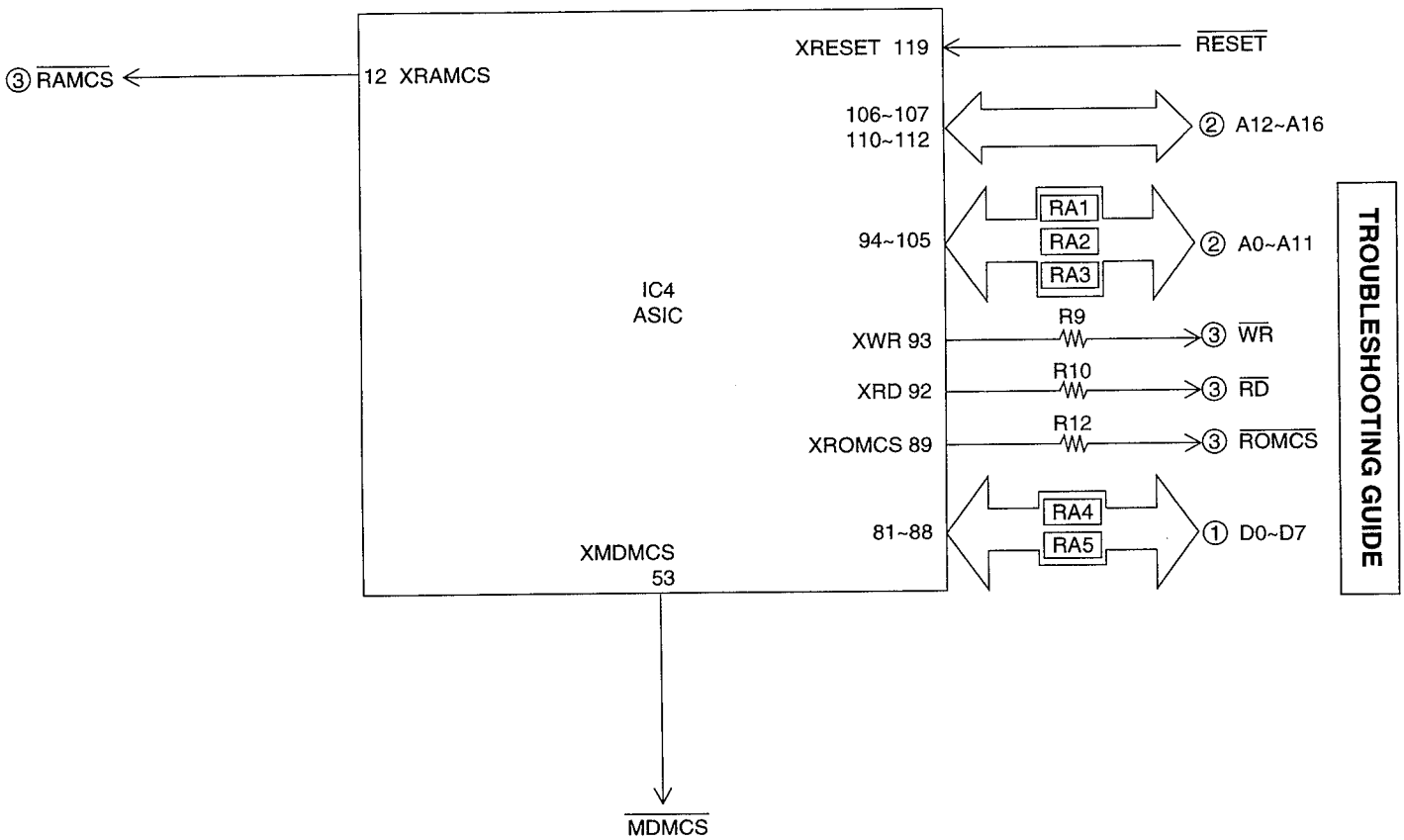


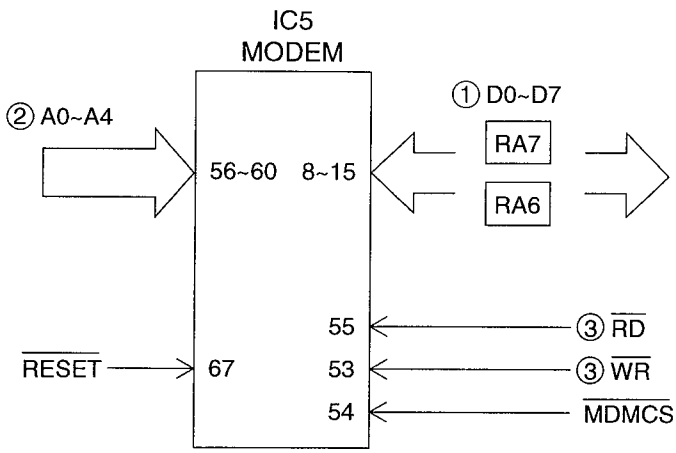
For these reasons and the software sequence to boot up the unit, if you use an oscilloscope to judge whether a signal is OK or NG, you must check in the same order as in [List 1]. (If the ASIC (CPU) failed to access the ROM, the ASIC cannot access the SRAM or DRAM normally.)

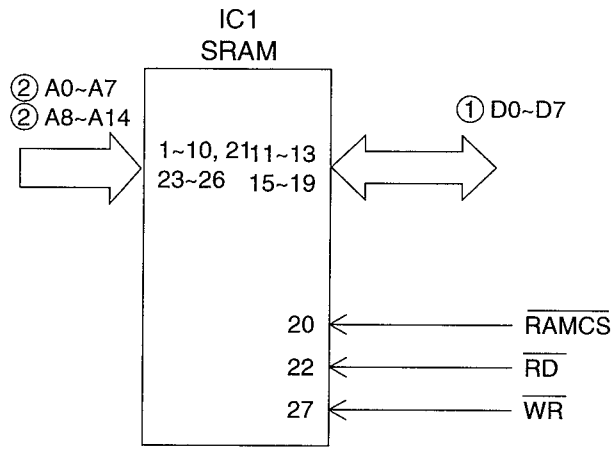
The digital circuit actually operates according to the timing combinations of these signals. So, if the timing of these signals is even slightly off, the circuit will not operate normally. Even of the IC did malfunction, the output voltage level may become abnormal but the timing is accurate according to the specifications. (If oscillation is provided accurately.)
Accordingly, the problem presented here is whether each IC outputs the correct signal. (See the I/O direction diagram on the next page.) In other words, is it constantly switching between 5V (H) and 0V (L) as described earlier.

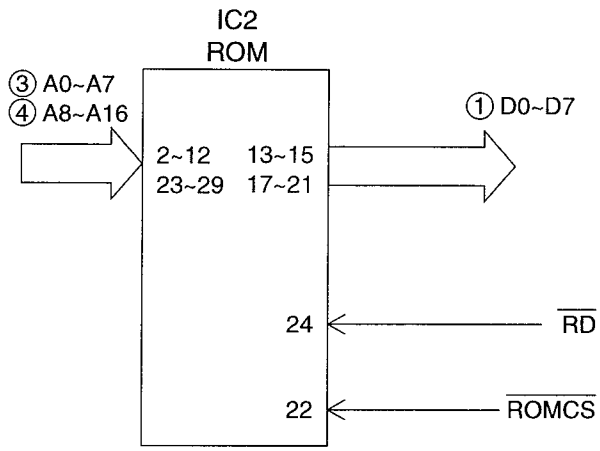
All you have to do is check that the IC repeatedly outputs (H) 5V and (L) 0V.

I/O and Pin No. Diagram

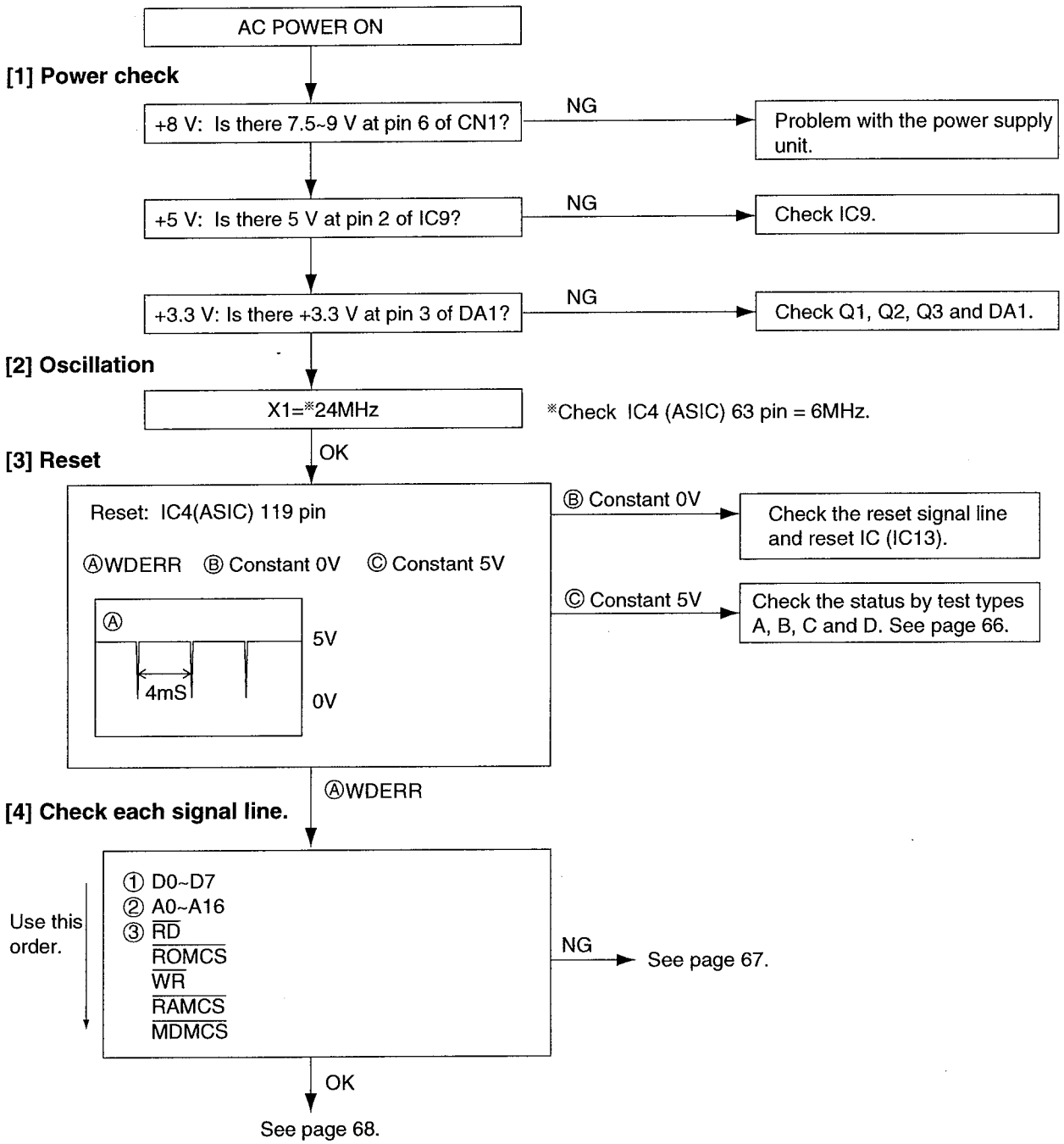






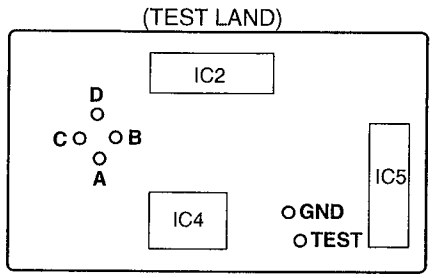


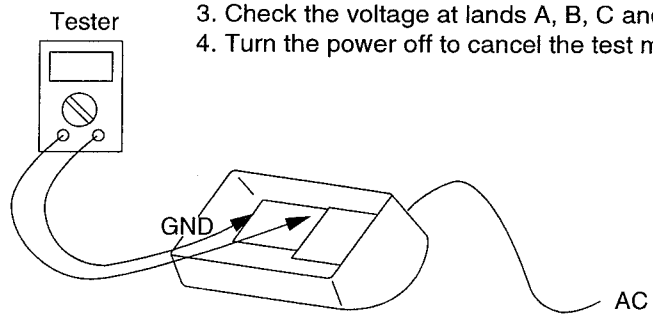
After the power is turned on, the ASIC(CPU) initializes and checks each IC.
The ROM, SRAM, and Modem are checked.
If initialization fails for the ICs, the system will not boot up.



Put the unit in the test mode and check the voltage at lands A, B, C and D.

1. Turn the power off.
2. Short the test and GND land and turn the power on (puts the unit in the test mode.)
3. Check the voltage at lands A, B, C and D.
4. Turn the power off to cancel the test mode.





•Turn off the power supply.
•Short using a metallic object, such as tweezers, between the test and GND land, and turn on the AC power.
•Check the following voltages by using an oscilloscope or tester.
•To cancel the status check mode, turn off the AC power.

Item	Check point voltage				Check points
	A	B	C	D	
CLOCK(IC4)	5V	0V	0V	0V	IC4
MODEM(IC6)	0V	5V	0V	0V	R16, IC5 (54 pin), RA6, RA7, IC4 (53 pin), IC5
S-RAM(IC5)	0V	0V	5V	0V	IC1 (20 pin), IC4 (12 pin), IC1
ASIC(IC4)	0V	0V	0V	5V	RA1~RA5, R9~12, IC4 (81~113 pins)
ALL OK	5V	5V	0V	0V	

•This indicates that the Add/Data Bus, RAM, ROM, MODEM, and ASIC are all completely connected to the CPU and that control from the CPU is possible.

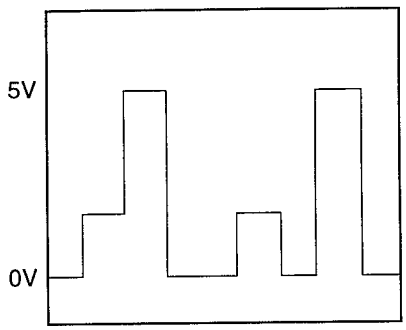
Please check the soldering and conduction of these components.
If there is no problem, replace the ICs.

If you still have a problem with the digital board, please see "checking details". (Refer to page 60.)

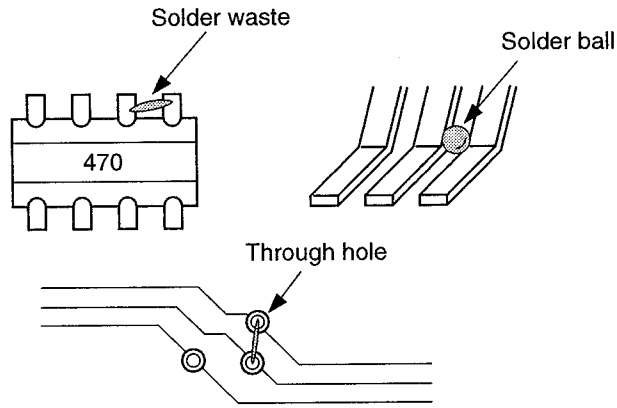
•To cancel the status check mode, turn off the AC power.

NG Example

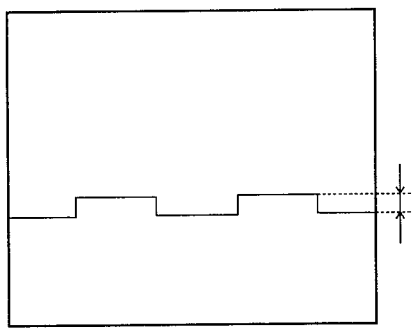
1.



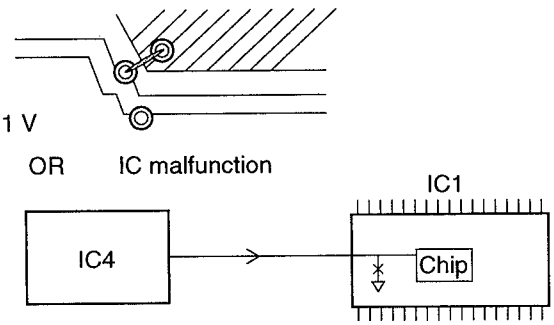
Short circuit from the adjacent signal wires.
Check for a short circuit in the RA and IC leads and the signal wire at the through hole.



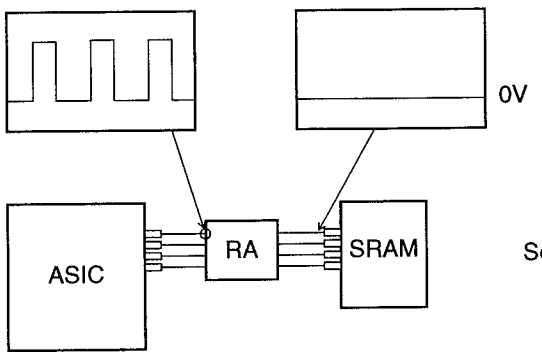
2.



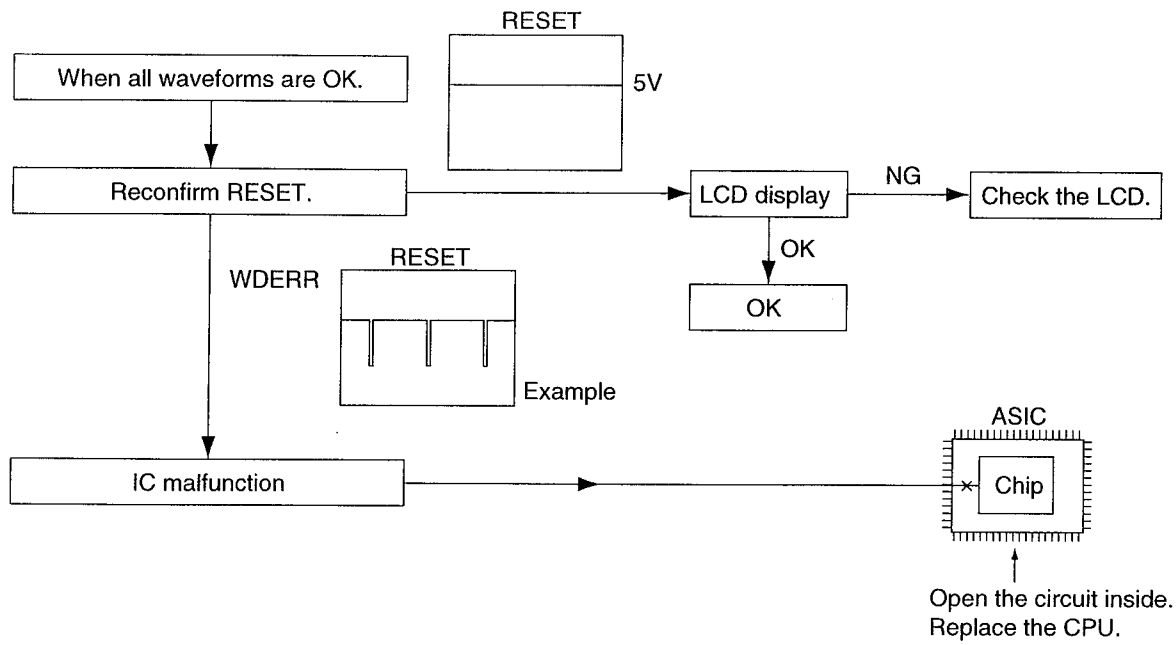
Short between the signal line and GND.



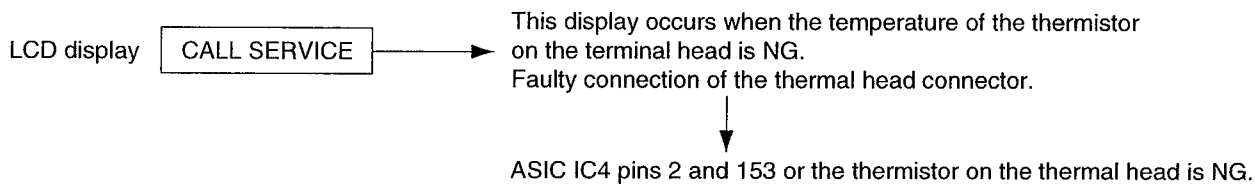
3.



Solder fault on RA.



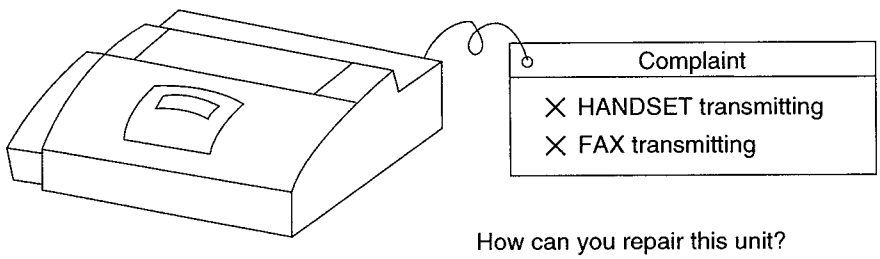
Other NG examples while the power is ON and the LCD displays the following.



3-8. ANALOG BOARD SECTION

For example:

The return from the customer has 2 defects.



How can you repair this unit?

We usually check the signal flow with the circuit schematic diagram. (If only one item is defective, we check only one of the signal routes. Maybe something is defective on that route.)

If there is more than one defect, you need to check some of the routes. First, you should check the area where there are common components on these signal routes.

Please see the check sheet (next page).

CHECK SHEET

(SYMPTOM) ITEMS TO CHECK	IN —signal→ ROUTE → OUT
MONITOR	TEL LINE-T1-R30-C24-R34-IC2(2-1)-C30-R37-C90-CN6(8)-{CN6(8)-IC7(1-2)-C63-R52-IC11(6-7)-C95-R98-IC4(38-37)-IC7(8-9)-C87-R91-IC11(3-1)-C89-R87-IC10(4-5)}-SPEAKER
Handset Tx	MIC-L9-C55-R74-IC5(2-1)-C60-R82-C62-R91-IC5(6-7)-C91-C92-R110-CN6(9)-{CN6(9)-C69-IC6(4-3) / L6-C56-R75 / CN6(7)}-CN6(7)-C23-R31-IC2(6-7)-C13-R23-R22-T1-TEL LINE
Handset Rx	TEL LINE-T1-R30-C24-R34-IC2(2-1)-C30-R37-C90-CN6(8)-{CN6(8)-IC7(1-2)-C63-R52-IC11(6-7)-C95-R98-IC4(38-37)-IC7(10-11)-CN6(10)}-JP15-C65-R92-Q13-R88-Q10-C50-L7-SPEAKER / R87-C61-C59-R79
DTMF monitor — Speaker	{IC5(44)-C47-R42-IC12(6-7)-C60-IC7(3-4)-C62-R51-IC11(6-7)-C95-R98-IC4(38-37)-IC7(8-9)-C87-R91-IC11(3-1)-C89-R87-IC10(4-5)}-SPEAKER
DTMF monitor — Handset	{IC5(44)-C47-R42-IC12(6-7)-C60-IC7(3-4)-C62-R51-IC11(6-7)-C95-R98-IC4(38-37)-IC7(10-11)-CN6(10)}-CN6(10)-JP15-C65-R92-Q13-R88-Q10-C50-L7-SPEAKER / R87-C61-C59-R79
DTMF for TEL LINE / FAX Tx	{IC5(44)-C47-R42-IC12(6-7)-C60-IC6(2-1)-CN6(7)}-CN6(7)-C23-R31-IC2(6-7)-C13-R23-R22-T1-TEL LINE
Dummy Ring Back tone	{IC4(34)-R36-Q5-R47-C58-CN6(7)}-CN6(7)-C23-R31-IC2(6-7)-C13-R23-R22-T1-TEL LINE
Ringing	{IC4(35)-R35-Q6-R46-C61-R50-IC11(6-7)-C95-R98-IC4(38-37)-IC7(8-9)-C87-R91-IC11(3-1)-C89-R87-IC10(4-5)}-SPEAKER
Alarm/Beep/Key tone	{IC4(35)-R35-Q6-R46-C61-R50-IC11(6-7)-C95-R98-IC4(38-37)-IC7(8-9)-C87-R91-IC11(3-1)-C89-R87-IC10(4-5)}-SPEAKER
CNG detection (OFF HOOK) / FAX Rx	TEL LINE-T1-R30-C24-R34-IC2(2-1)-C30-R37-C90-CN6(8)-{CN6(8)-IC6(11-10)-C64-R49-IC12(2-1)-C52-R33-IC5(45)}
VOX detection ・Unit:ON HOOK ・EXT TEL:OFF HOOK	TEL LINE-T2-C36-IC1(11-10)-C38-R53-IC4(2-1)-C42-R56-IC4(6-7)-C44-D19-R58-IC3(2-1)-CN7(12)
DTMF detection (ON-HOOK)	TEL LINE-T2-C36-IC1[DTMF](3-4)-C39-R54-IC4(2-1)-R114-CN6(11)
CNG ・Unit:ON HOOK ・EXT TEL:OFF HOOK	TEL LINE-T2-C36-IC1(11-10)-C38-R53-IC4(2-1)-R114-CN6(11)

Note:

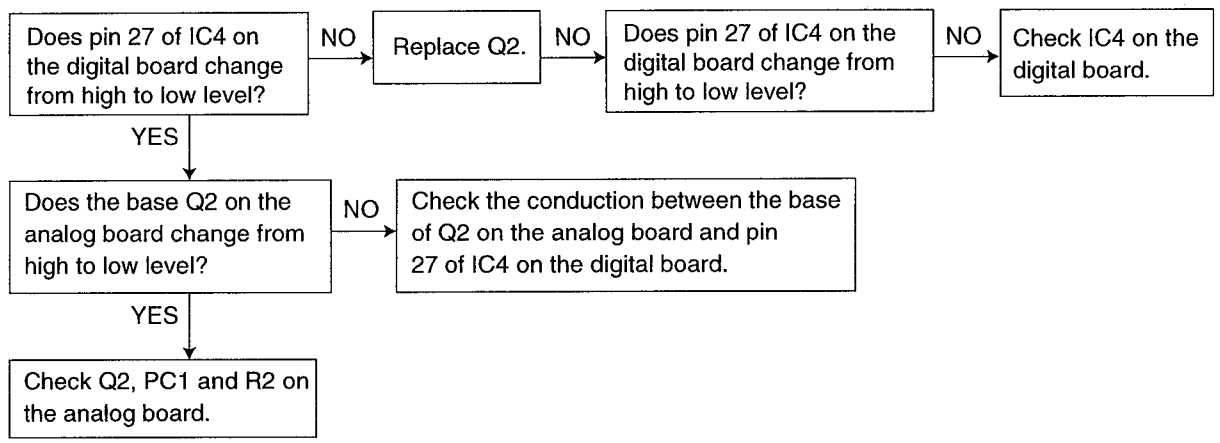
{ }: digital board

(1) Defective ITS (Integrated telephone system) section

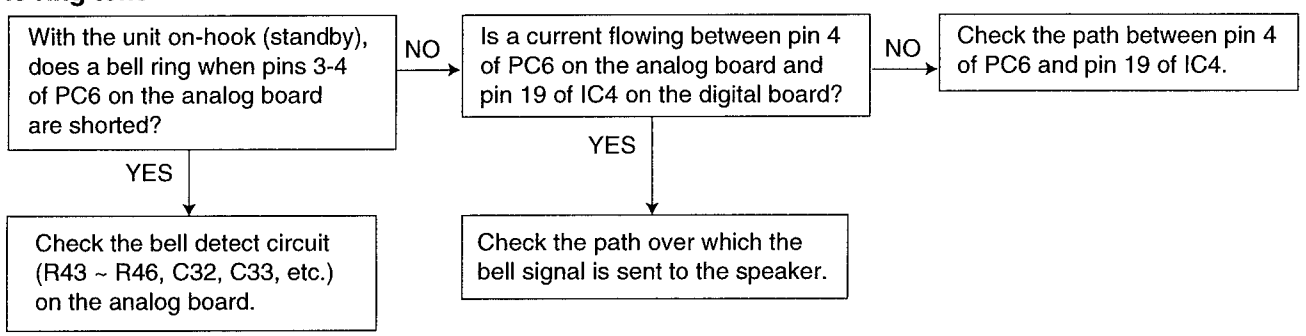
① No handset and monitor transmission/reception

Following the ITS section or NCU section, search for the route between the microphone and the telephone line (sending) or between the telephone line and the speaker (receiving) where the signal disappears. Check the components at that point.

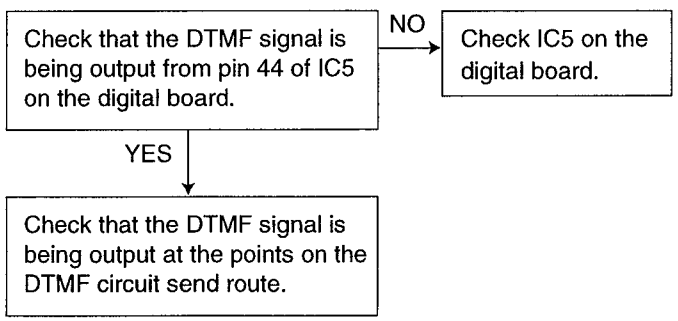
② No pulse dialing



③ No ring tone

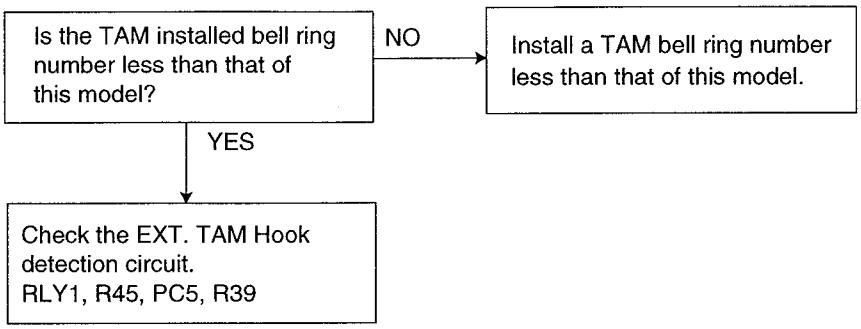


④ No tone dialing

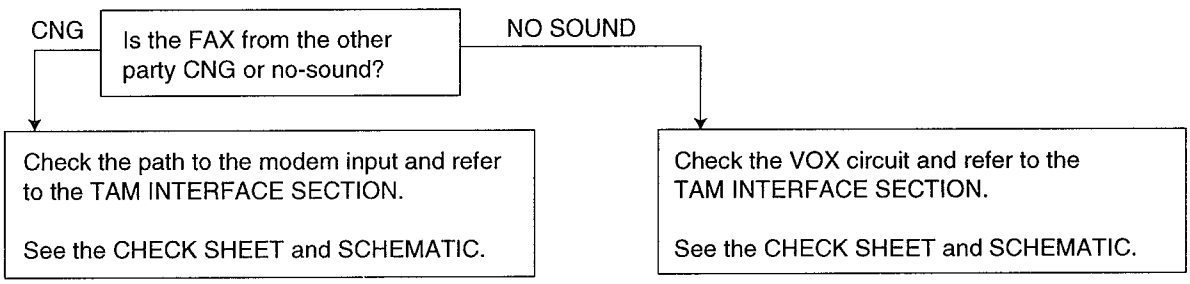


(2) Defective TAM interface section

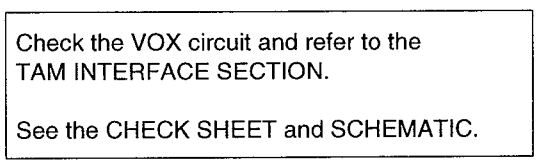
① The FAX turns on, but does not arrive through TAM.



② A FAX is received but the unit won't switch from TAM to FAX.



③ A voice is coming in but the unit switches to FAX.



3-9. POWER SUPPLY SECTION

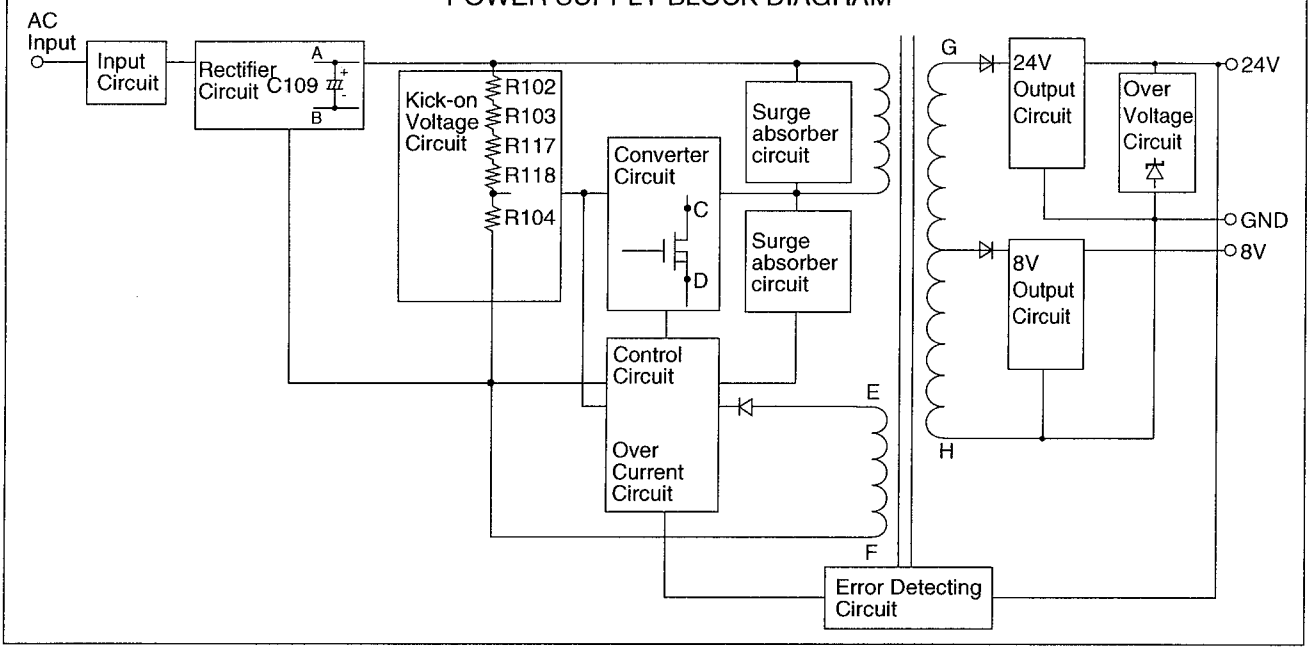
(1) Key components for troubleshooting

The following components have been known to break frequently :
F101, D101-D104, C109, Q101, PC101, ZD203, R302.
This comes from our experience with experimental tests. For example : power supply, lightning surge voltage test, withstanding voltage test, intentional short circuit test, etc.

Caution:
If you find a melted fuse in the unit, don't turn the power on without repairing the unit first. (Except for the fuse.)
If you do, the fuse will melt again and the unit has not been repaired. The problem exists somewhere else.

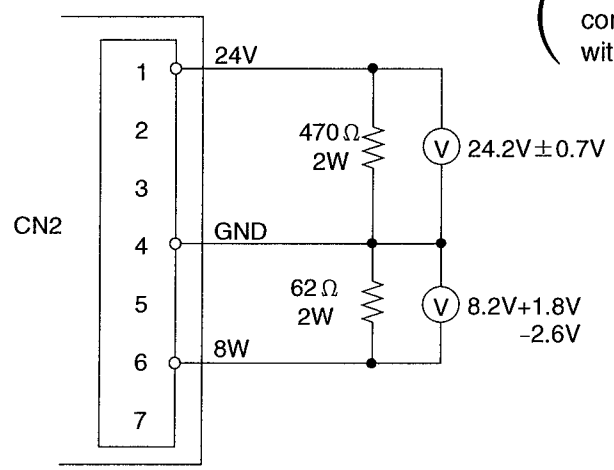
In most cases, (our experience) the symptom is that nothing is output.
There is a high possibility in the primary side more than the secondary side.

POWER SUPPLY BLOCK DIAGRAM



DUMMY LOAD to check voltage

(If there is no dummy load, connect the main P.C.B. with the analog P.C.B.)



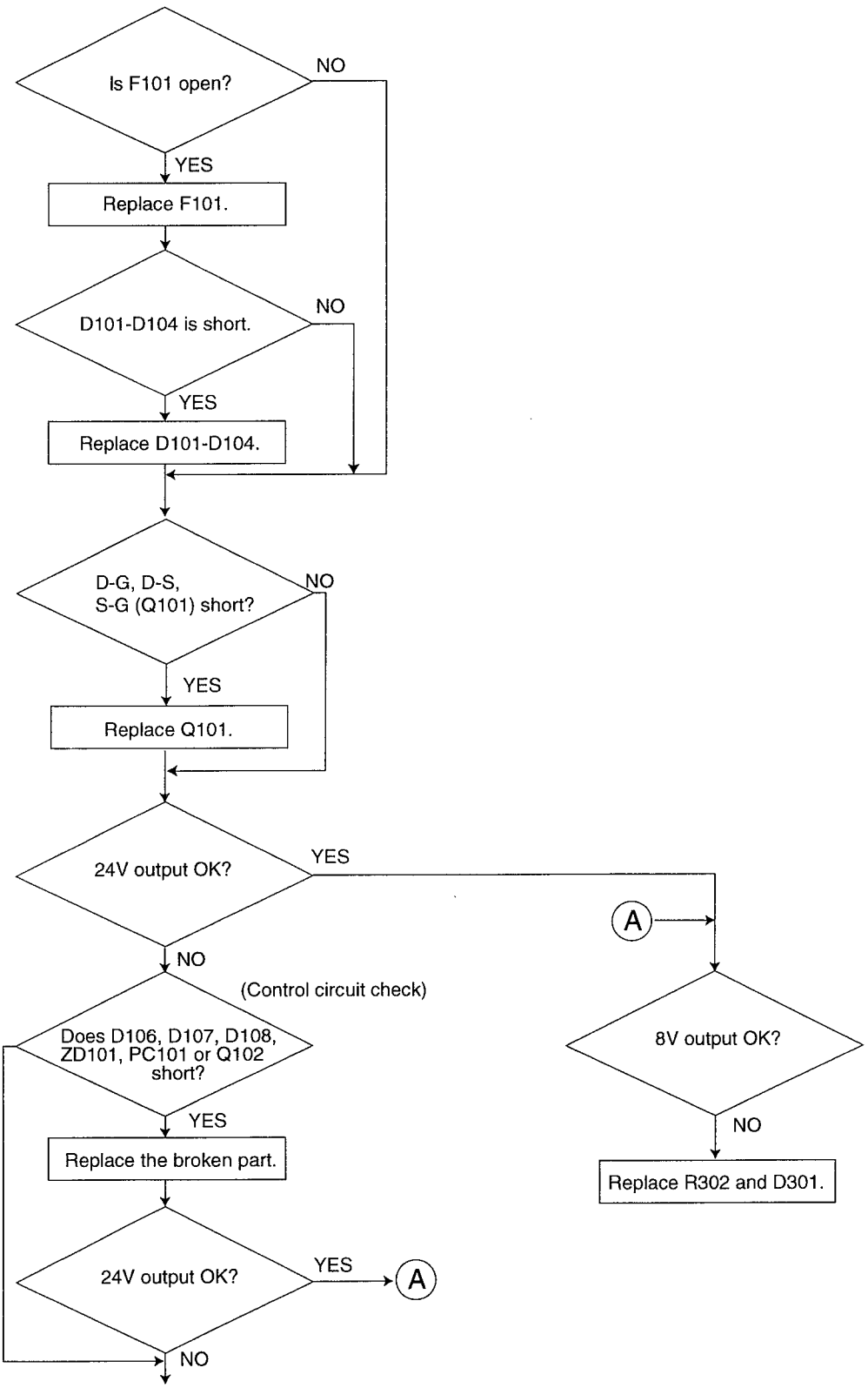
V : Voltage Meter

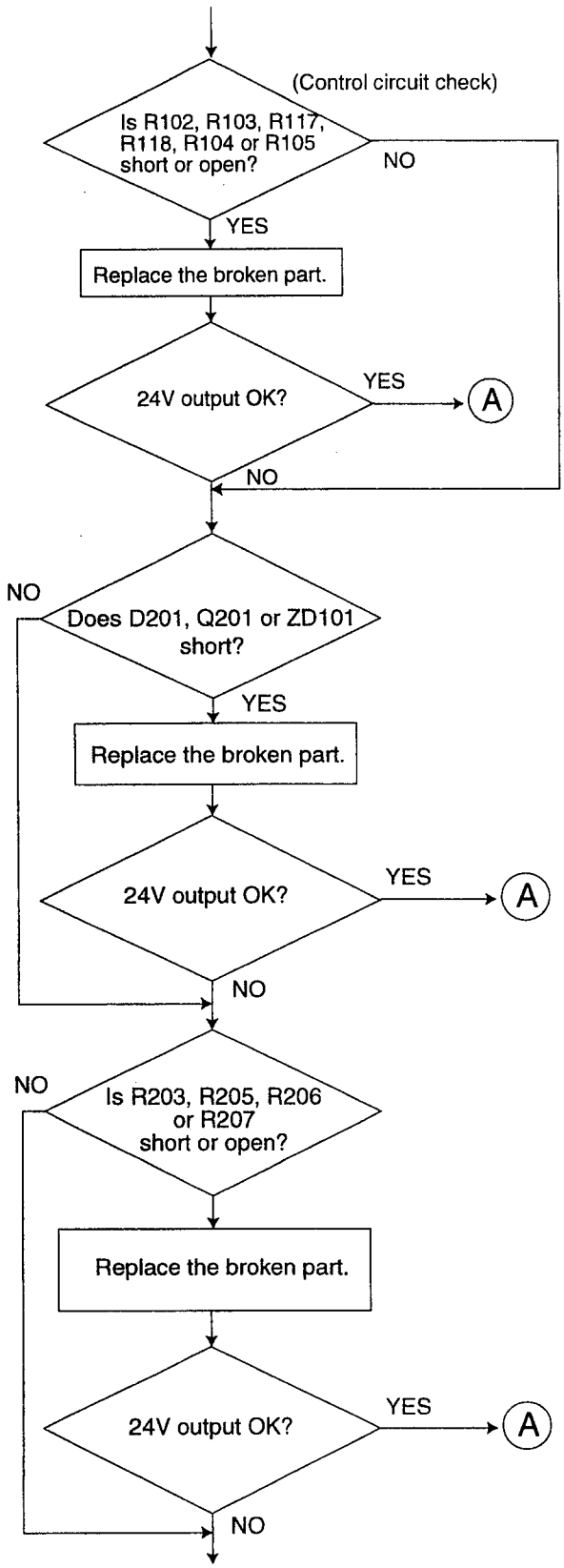
(2) Troubleshooting flow chart

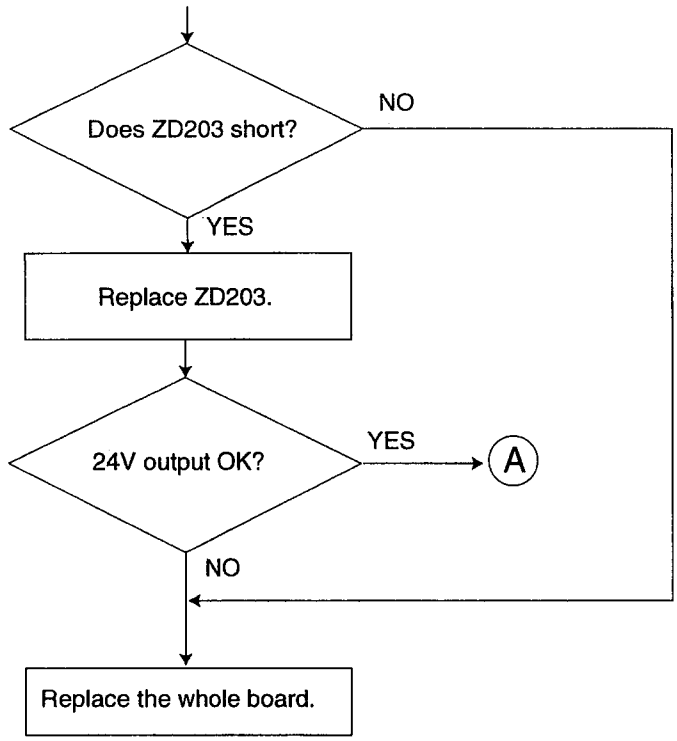
Our recommendation for troubleshooting is as follows.

This procedure comes from our experience of troubleshooting in our lab.

※ Before turning on the power supply, you should check F101.







(3) Broken parts repair details

(D101, D102, D103, D104)

Check for a short-circuit in terminal 4. If D101, D102, D103 and D104 are short-circuited, F101 will melt (open). In this case, replace all of the parts (D101, D102, D103, D104, F101).

(Q101)

The worst case of Q101 is a short-circuit between the Drain and Gate because damage expands to the peripheral circuit of Q101.
This is due to a very high voltage through the Gate circuit which is composed of R105, Q102 and D106.
You should change all of the parts listed as follows.

F101, Q101, R105, Q102, D106

(D201)

If D201 is broken, the oscillation circuit in the power supply cannot operate. Check it with an electric tester.

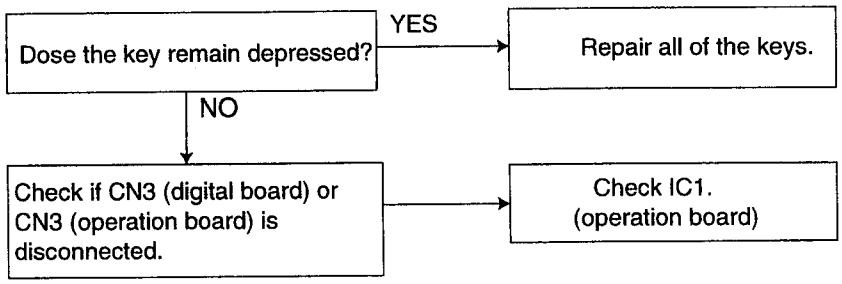
(ZD203)

If ZD203 shorts, the voltage feedback circuit is almost always the cause.
Replace the following parts if this happens.

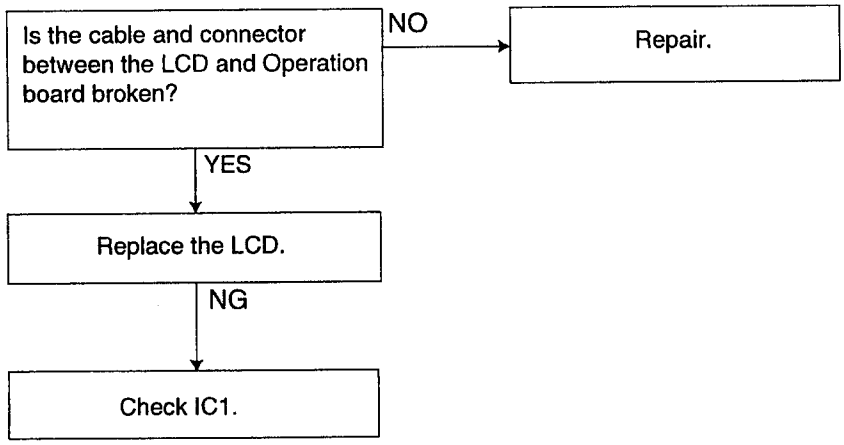
PC101, Q102, ZD201, D107, ZD101, D106

3-10. OPERATION BOARD SECTION

(1) No key operation

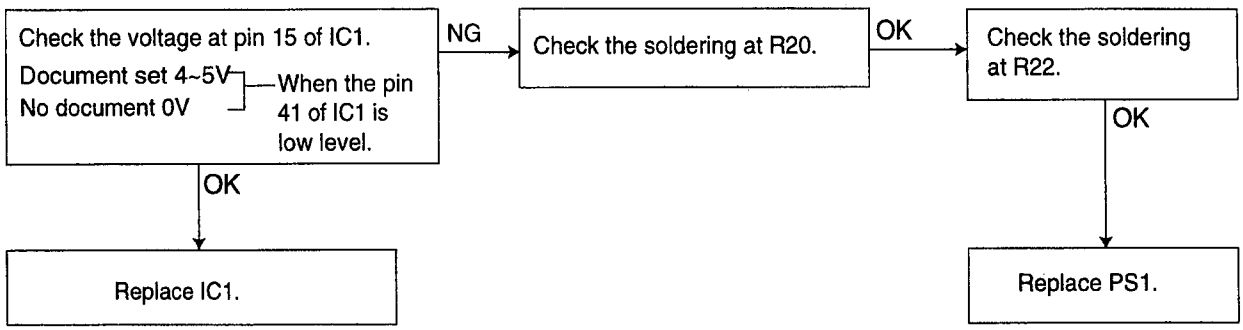


(2) No LCD indication

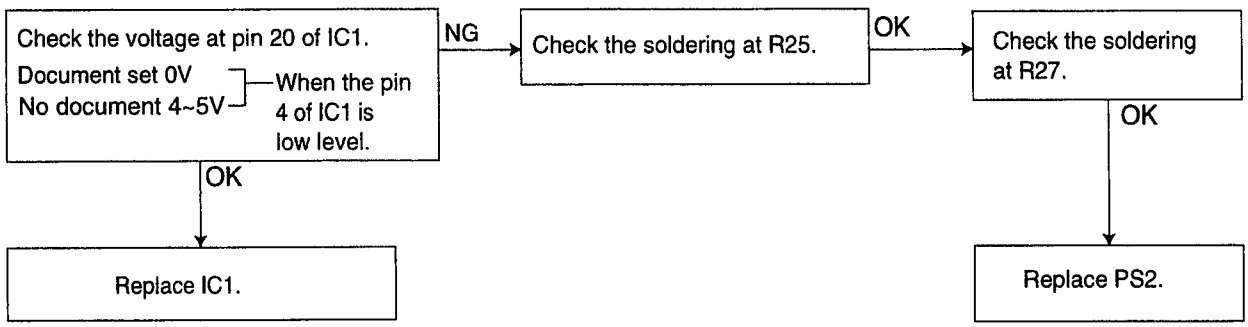


3-11. SENSOR SECTION

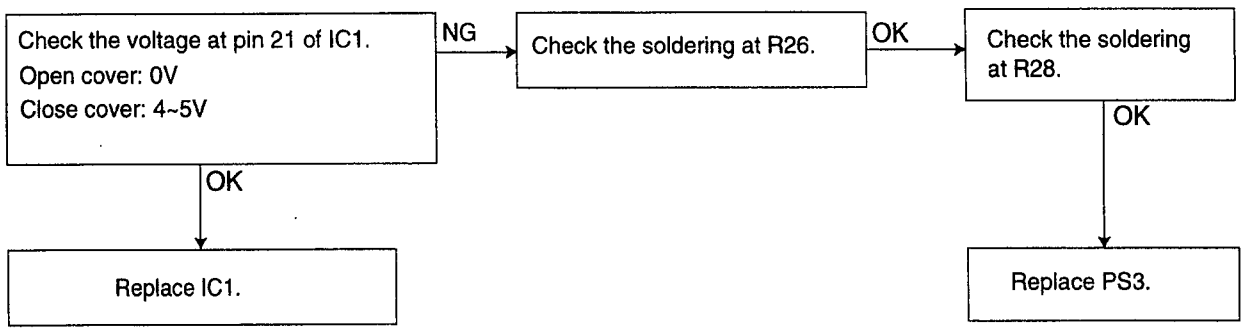
(1) Check the document sensor (PS1)



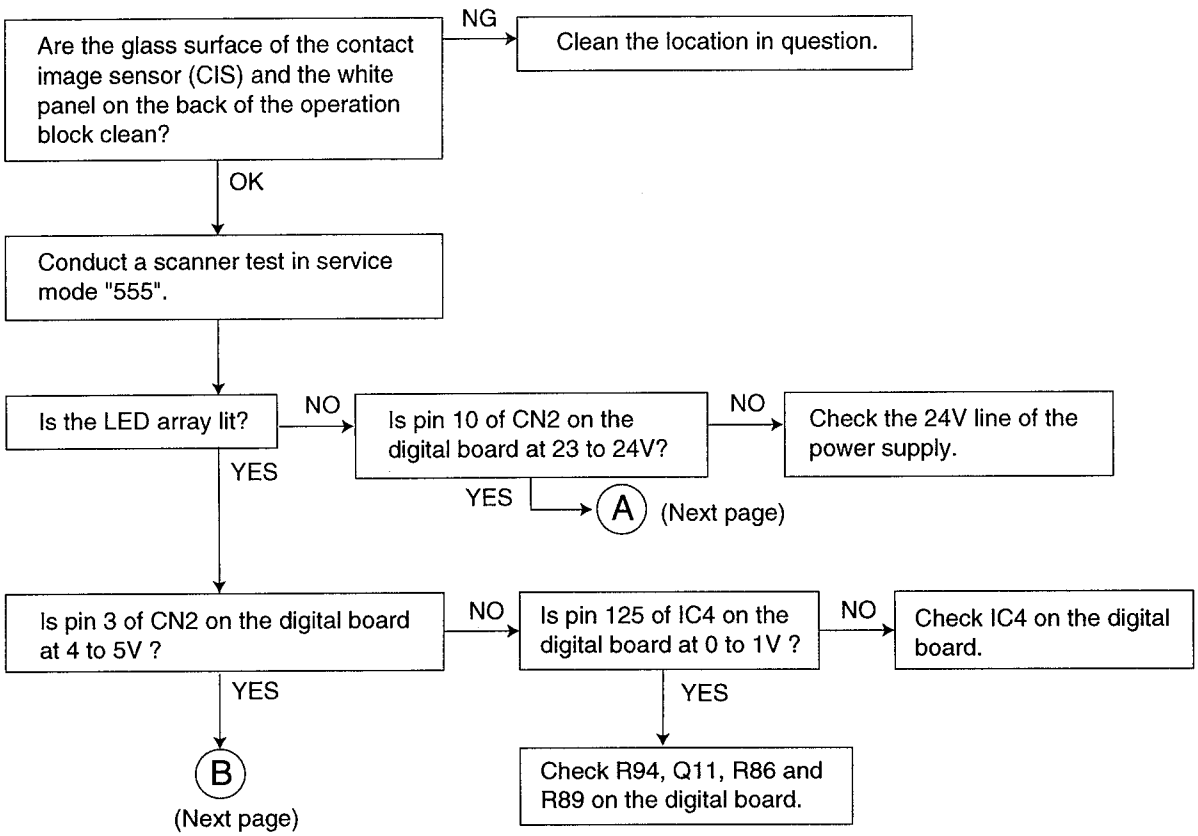
(2) Check the read position sensor (PS2)

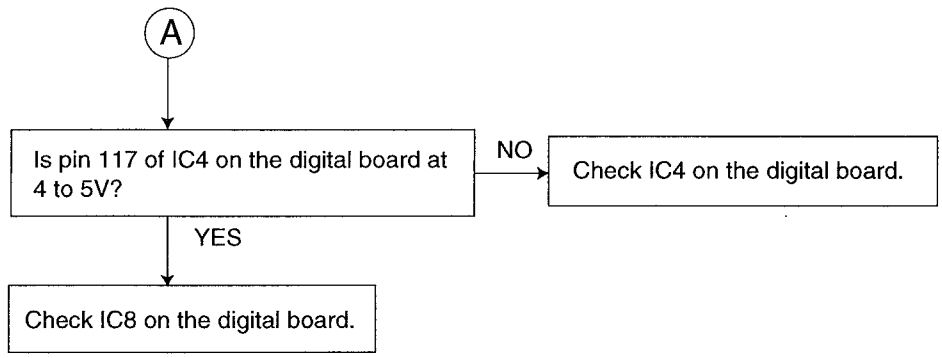


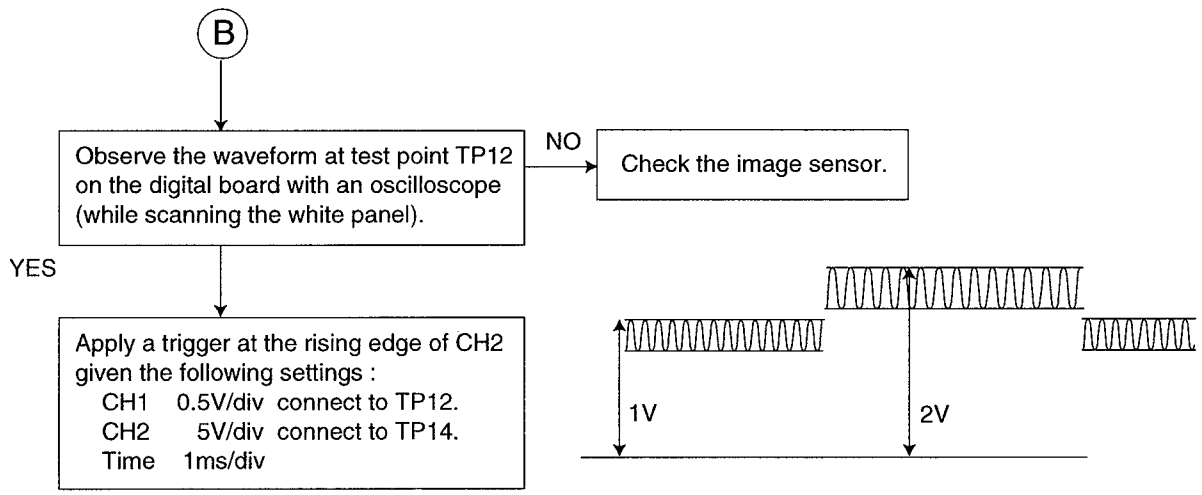
(3) Check the cover open sensor(PS3)



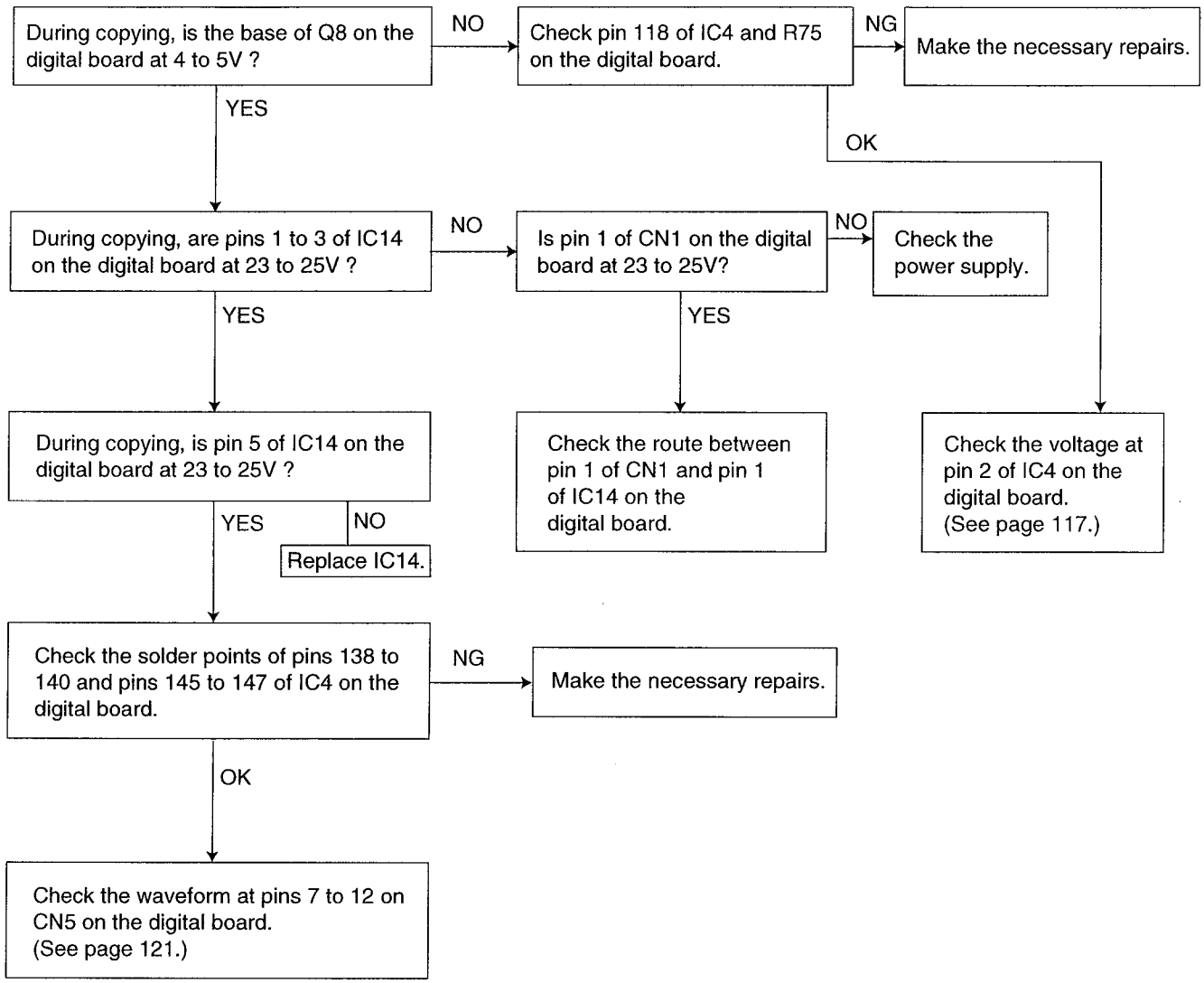
3-12. READ SECTION







3-13. THERMAL HEAD SECTION



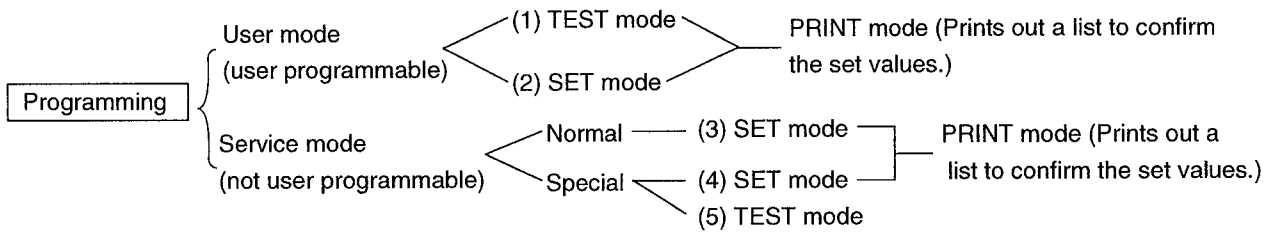
4. PROGRAMMING AND LISTS

The programming functions are used to program the various features and functions of the machine, and to test the machine. Programming can be done in both the on-hook and off-hook conditions. This facilitates communication between the user and the service while programming the machine.

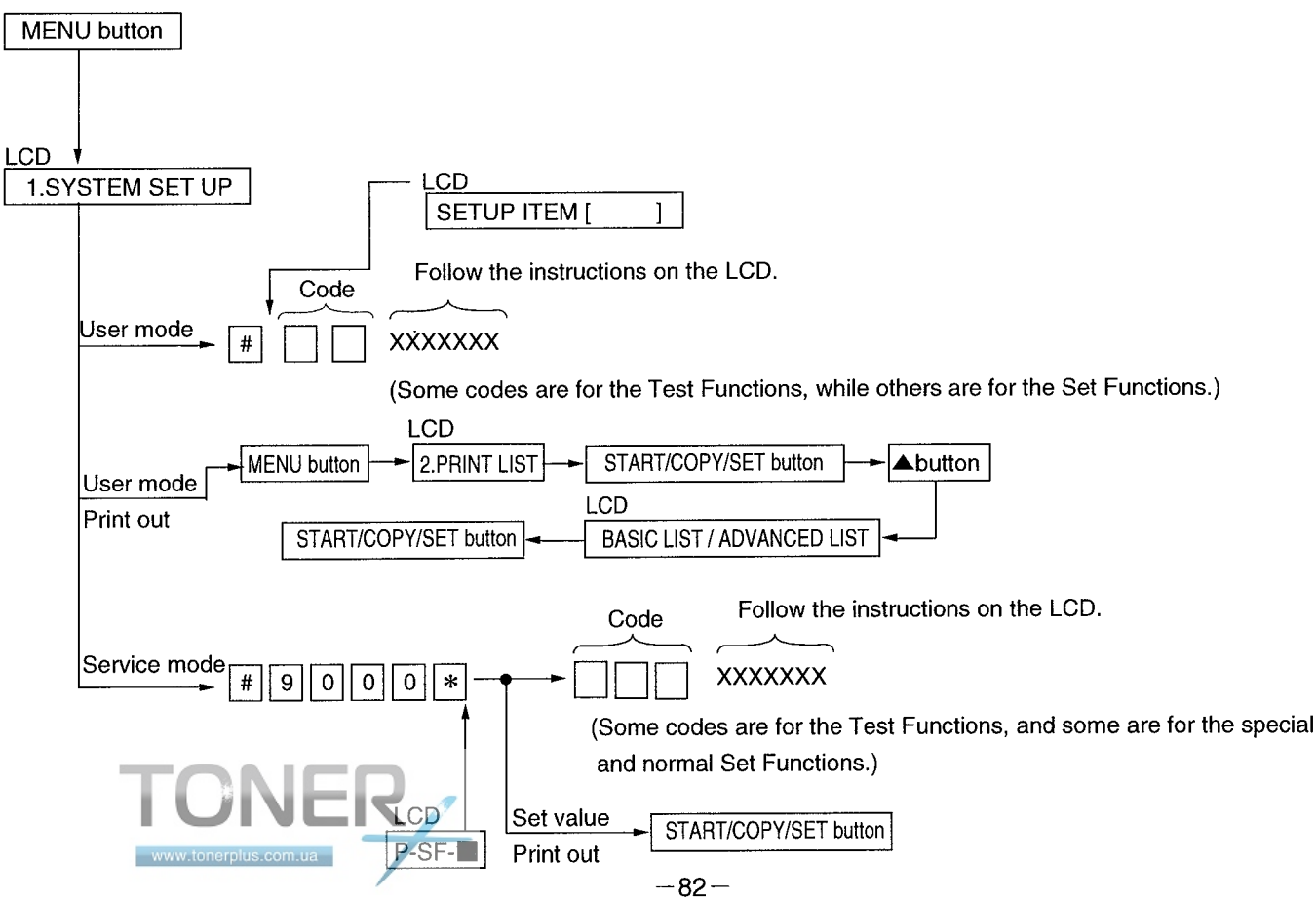
4-1. OPERATION

There are 2 basic categories of programming functions, the User Mode and the Service Mode. The Service Mode is further broken down into the normal and special programs. The normal programs are those listed in the Operating Instructions and are available to the user. The special programs are only those listed here and not displayed to the user. In both the User and Service Modes, there are Set Functions and Test Functions. The Set Functions are used to program various features and functions, and the Test Functions are used to test the various functions .
The Set Functions are accessed by entering their code, changing the appropriate value, then pressing the SET key.
The Test Functions are accessed by entering their code and pressing the key listed on the menu. While programming, to cancel any entry, press the STOP key.

4-2. OPERATION FLOW



Operating Procedure



4-3. USER MODE (The list below is an example of the SYSTEM SETUP LIST the unit prints out.)

BASIC FEATURE LIST

NO.	FEATURE	CURRENT SETTING	
#01	SET DATE & TIME	JAN. 01 1998 12:56AM	
#02	YOUR LOGO		
#03	YOUR TELEPHONE NUMBER		
#04	PRINT TRANSMISSION REPORT	ERROR	[ERROR,ON,OFF]
#05	AUTO RECEIVE MODE	FAX ONLY	[FAX ONLY,EXT.TAM]
#07	FAX RING COUNT	1	[1...4]
#08	MANUAL RECEIVE MODE	TEL	[TEL,TEL/FAX]
#09	TEL/FAX DELAYED RING	1	[1...4]
#12	REMOTE TAM ACTIVATION CODE	OFF	[ON,OFF]
	ID =	11	

Code

Set Value

ADVANCED FEATURE LIST

NO.	FEATURE	CURRENT SETTING	
#22	JOURNAL AUTO PRINT	ON	[ON,OFF]
#23	OVERSEAS MODE	OFF	[ON,OFF]
#25	DELAYED SEND	OFF	[ON,OFF]
	DESTINATION =		
	START TIME =	12:00AM	
#30	SILENT FAX RECOGNITION RING	3	[3...9]
#31	RING DETECTION	OFF	[A,B,C,D,OFF]
#39	LCD CONTRAST	NORMAL	[NORMAL,LIGHT,DARKER]
#40	SILENT DETECTION	ON	[ON,OFF]
#41	FAX ACTIVATION CODE	ON	[ON,OFF]
	CODE =	*9	
#46	FRIENDLY RECEPTION	ON	[ON,OFF]
#70	FAX PAGER	OFF	[ON,OFF]
	DESTINATION =		
#80	SET DEFAULT		

Code

Set Value

Note:

The above values are the default values.

4-4. SERVICE FUNCTION TABLE

Code	Function	Set Value	Effective Range	Default	Remarks
501	Setting the pause time	001~600 X 100 msec	001~600	05000 msec	Selects the pause time in 100 msec steps.
502	Setting the flash recall time	01~99 X 10 msec	01~99	700 msec	Selects the line break time during flashing in 10 msec steps.
503	Setting the pulse dial speed	1:10pps 2:20pps	1, 2	10 pps	Sets the pulse dial speed.
520	Setting the CED frequency	1:2100Hz 2:1100Hz	1, 2	2100 Hz	When international communications cannot be performed smoothly, select 1100 Hz.
521	Setting the international line mode	1:ON 2:OFF	1, 2	ON	Selects the international line mode during FAX communication.
522	Setting the return to default mode	1:ON 2:OFF	1, 2	ON	Sets the resolution and contrast conditions for FAX or copy to the default settings.
523	Setting the reception equalizer	1:ON 2:OFF	1, 2	OFF	When the telephone station is far from the unit or reception cannot be performed correctly, set to "ON".
544	Selecting the document feed position	01~99 step	00~99	the	When the ADF function is incorrect, adjust the feed position. (8 step = 1mm)
550	Memory clear				Press "START/COPY/SET".
551	ROM version and sum check				Press "START/COPY/SET".
553	Setting the FAX monitor function	1: OFF 2:PHASE B 3:ALL	1, 2, 3	OFF	Sets whether to monitor the line signal with the unit's speaker during FAX communication or not.
554	Modem test				Press "START".
555	Scanner test				Press "START".
556	Motor test				Press "START".
557	LED test				Press "START".
558	LCD test				Press "START".
559	Setting the document jam detection	1:ON 2:OFF	1, 2	ON	Selects the jam detection of a document during FAX transmission/copying.
561	KEY test				Press any key.
563	CCD position adjustment value set	00~30 X 1 mm	00~30	-----	Lets you select the correction value for the main scanning direction of the dislocated scanner.
570	Setting the % break	1:61% 2:67%	1, 2	61%	Sets the % break of pulse dialing.

Code	Function	Set Value	Effective Range	Default	Remarks
571	Setting the number of times that ITS is redialed	00~99	00~99	14 times	Selects the number of times that ITS is redialed (not including the first dial).
572	Setting the ITS redial interval	001~999 sec	001~999	030 sec	Sets the interval of ITS redialing.
573	Setting of number of time that REMOTE TURN ON BELL sound	01~99	01~99	15 times	Sets the number of times that the unit starts to receive a document in the TEL mode.
590	Setting the number of FAX redial times	00~99	00~99	5 times	Selects the number of redial times during FAX communication (not including the first dial).
591	Setting the FAX redial interval	001~999 sec	001~999	045 sec	Sets the FAX redial interval during FAX communication.
592	Designation of CNG sending	1: OFF 2: ALL 3: AUTO	1, 2, 3	ALL	Lets you select the CNG output during FAX transmission. ALL: CNG is output at phase A. AUTO: CNG is output only when automatic dialing is performed. OFF: CNG is not output at phase A.
593	Setting the interval between CED and the 300 bps signal	1: 75 msec 2:500 msec 3:1000 msec	1, 2, 3	75 msec	Sets the interval between the CED signal and subsequent 300 bps signal.
594	Setting the overseas DIS detection	1: Detects on the 1st time. 2: Detects on the 2nd time.	1, 2	Detects on the 1st time.	Sets the recognition format of the DIS signal. 1:Detects the first DIS signal sent from the receiver during FAX transmission. 2:Ignores the first DIS signal sent from the receiver during FAX transmission.
595	Setting an acceptable reception error value	001~999 X number of times	001~999	100	Sets the number of acceptable error lines when the FAX reconstructs the received data.
596	Setting the transmit level	- 15~00	- 15~00	- 10 dBm	Selects the FAX transmission level. (Increase the level when the telephone line condition is poor.)
700	EXT TAM OGM time	X second	01~99	10 sec	Sets the start time of silent detection.
701	Silent detection time	X 100 ms	01~99	50 ms	Sets the silent call confirmation detection time.
702	EXT TAM ring count	X number of rings	0~9	5 times	Sets the number of rings when the unit starts to receive a document in the EXT-TAM mode.
717	Transmit speed select	1:9600BPS 2:7200BPS 3:4800BPS 4:2400BPS	1~4	9600 BPS	Adjusts the speed to start training during FAX transmission.
718	Receive speed select	1:9600BPS 2:7200BPS 3:4800BPS 4:2400BPS	1~4	9600 BPS	Adjusts the speed to start training during FAX reception.

KX-FT31BX

Function	Set Value	Effective Range	Default	Remarks
Ringer off in TEL/FAX mode	1:ON 2:OFF	1, 2	ON	Sets the ringer switch off when a call is received in the TEL/FAX mode.
Pause tone detect	1:ON 2:OFF	1, 2	ON	Selects the tone detection for pauses in dialing.
Redial tone detect	1:ON 2:OFF	1, 2	ON	Selects the tone detection mode after redialing.
AUTO disconnect	1:350 ms 2:1.8 sec 3:OFF	1, 2, 3	350 ms	Selects the start time detection of auto disconnect.
CNG detect time	1:10 sec 2:20 sec 3:30 sec	1, 2, 3	20 sec	Selects the CNG detection time of friendly reception.
T1 timer	1:35 sec 2:60 sec	1, 2	35 sec	Sets a higher value when the response from the other party needs more time during FAX transmission.
Sensor check				Press "START".
Original setting	1:NORMAL 2:LIGHT 3:DARKER	1, 2, 3	NORMAL	Use this feature when you need to transmit and copy a document with very faint writing or very dark writing.

4-5. SERVICE MODE SETTING VALUES (Example of a printed out list)

SERVICE DATA LIST

(Code / Set Value)

```
501 PAUSE TIME                = 050*100ms        [001...600]*100ms
502 FLASH TIME                = 70*10ms          [01...99]*10ms
503 DIAL SPEED                = 10pps            [1=10    2=20]pps
520 CED FREQ.                 = 2100Hz           [1=2100  2=1100]Hz
521 INTL. MODE                = ON               [1=ON    2=OFF]
522 AUTO STANDBY              = ON               [1=ON    2=OFF]
523 RCV EQL.                  = OFF              [1=ON    2=OFF]
700 EXT. TAM OGM TIME         = 10sec            [01...99]sec
701 SILENT DETECT TIME        = 50*100msec       [01...99]*100msec
702 EXT. TAM RING COUNT       = 5                [0...9]
```

SPECIAL SERVICE SETTING

(Code / Set Value)

544	553	559	563	570	571	572	573	590	591	592	593	594
50	1	1	15	1	14	030	15	05	045	2	1	1

595	596	717	718	719	721	722	732	763	771	844
100	10	1	1	1	1	1	1	2	1	1

Note:
The above values are the default values.

5. TEST FUNCTIONS

Test mode	Type of Mode	• Code □□ • Operation after code input.	Function
PRINT TEST	User mode	[8] [5] START	Prints a test pattern and checks the thermal head for abnormalities (missing dots, etc.), and also checks the operation of the reception motor.
MOTOR TEST	Service Mode	[5] [5] [6] START	Rotates the transmission and reception motors to check the operation of the motors. 11.....Forward TX motor 14.....Backward RX motor 12.....Forward RX and TX motor 13.....Forward RX motor • Press the STOP button to cancel.
MODEM TEST	Service Mode	[5] [5] [4] START	Sends four kinds of FAX signals to check the sending function of the modem. 1) 1100 Hz: Consecutive signal of EOM for tonal 2) 2100 Hz: G2 carrier signal Consecutive of CED signal 3) G3, V29 training signal [modulation wave of carrier signal (1700 Hz)]
ROM CHECK	Service Mode	[5] [5] [1] START	Indicates the version and checks the sum of the ROM.
SCAN CHECK	Service Mode	[5] [5] [5] START	Turns on the LEDs of the image sensor and operates the read systems.
LCD CHECK	Service Mode	[5] [5] [8] START	Checks the LCD indication. Illuminates all the dots to check if they are normal.

4-5. SERVICE MODE SETTING VALUES (Example of a printed out list)

SERVICE DATA LIST

(Code / Set Value)

```
501 PAUSE TIME                = 050*100ms        [001...600]*100ms
502 FLASH TIME                = 70*10ms          [01...99]*10ms
503 DIAL SPEED                = 10pps            [1=10    2=20]pps
520 CED FREQ.                 = 2100Hz           [1=2100  2=1100]Hz
521 INTL. MODE                = ON               [1=ON    2=OFF]
522 AUTO STANDBY              = ON               [1=ON    2=OFF]
523 RCV EQL.                  = OFF              [1=ON    2=OFF]
700 EXT. TAM OGM TIME         = 10sec            [01...99]sec
701 SILENT DETECT TIME        = 50*100msec       [01...99]*100msec
702 EXT. TAM RING COUNT       = 5                [0...9]
```

SPECIAL SERVICE SETTING

(Code / Set Value)

544	553	559	563	570	571	572	573	590	591	592	593	594
50	1	1	15	1	14	030	15	05	045	2	1	1

595	596	717	718	719	721	722	732	763	771	844
100	10	1	1	1	1	1	1	2	1	1

Note:
The above values are the default values.

5. TEST FUNCTIONS

Test mode	Type of Mode	• Code □□ • Operation after code input.	Function
PRINT TEST	User mode	[8] [5] START	Prints a test pattern and checks the thermal head for abnormalities (missing dots, etc.), and also checks the operation of the reception motor.
MOTOR TEST	Service Mode	[5] [5] [6] START	Rotates the transmission and reception motors to check the operation of the motors. 11.....Forward TX motor 14.....Backward RX motor 12.....Forward RX and TX motor 13.....Forward RX motor • Press the STOP button to cancel.
MODEM TEST	Service Mode	[5] [5] [4] START	Sends four kinds of FAX signals to check the sending function of the modem. 1) 1100 Hz: Consecutive signal of EOM for tonal 2) 2100 Hz: G2 carrier signal Consecutive of CED signal 3) G3, V29 training signal [modulation wave of carrier signal (1700 Hz)]
ROM CHECK	Service Mode	[5] [5] [1] START	Indicates the version and checks the sum of the ROM.
SCAN CHECK	Service Mode	[5] [5] [5] START	Turns on the LEDs of the image sensor and operates the read systems.
LCD CHECK	Service Mode	[5] [5] [8] START	Checks the LCD indication. Illuminates all the dots to check if they are normal.

DTMF SINGLE TEST	Service Mode	[5][5][2] 1..On 2..Off	Outputs the DTMF with a single tone.
LED TEST	Service Mode	[5][5][7] START	All LEDs flash on and off, or are illuminated.
KEY CHECK	Service Mode	[5][6][1] {any key}	Checks the operation button. Indicates the button code on the LCD while the button is pressed.
FACTORY SET	Service Mode	[5][5][0] START	Clears the memory where the users can store data.
SENSOR CHECK	Service Mode	[8][1][5] START	CHECKS THE SENSOR OPERATION After entering this mode, perform the copy operation. [Do Sn Co Pa] : LCD DISPLAY Do : Document Sensor : Paper inserted Sn : Read Position Sensor : at the read Position Co : Cover Open Sensor : Cover Open Pa : Recording Paper Sensor : Set Recording Paper

5-1. BUTTON CODE TABLE

Code	Button Name	Code	Button Name	Code	Button Name
02	RESOLUTION	0E	∨ VOLUME	38	8
03	AUTO RECEIVE			39	9
04	START/COPY/SET	31	1	3A	0
05	MENU	32	2	3B	✳
07	HELP	33	3	3C	#
08	MONITOR	34	4	3D	REDIAL/PAUSE
0A	MUTE	35	5	3E	FLASH
0C	DIRECTORY EDIT	36	6	20	SEARCH DIAL (turn to the right)
0D	∧ VOLUME	37	7	21	SEARCH DIAL (turn to the left)

ADJUSTMENTS

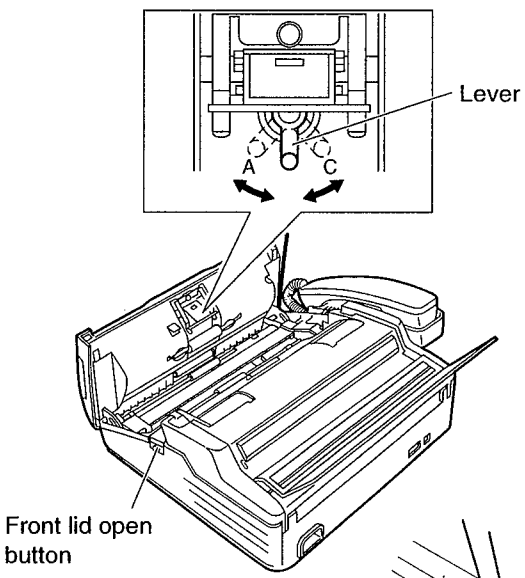
KX-FT31BX

1. TABLE OF TEST EQUIPMENT AND TOOLS

No.	Test Equipment and Jig Name	Jig No.
1	Spring Height Tool	PFZZFT31BX

2. ADJUSTING THE FEEDER PRESSURE

If misfeeding of a document, such as multiple feeding or no feeding occurs frequently, try to adjust the feeder pressure by following the steps below.

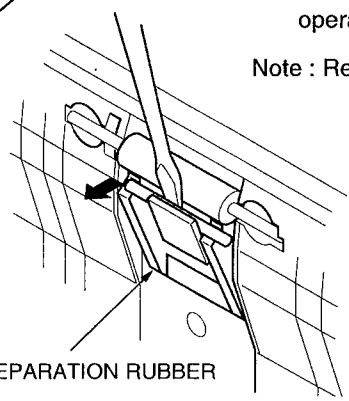


(1) Open the front lid by pressing the front lid open.
(2) Shift the position of the lever by using an instrument with a pointed end, like a clip or ball-point pen.
Position A: Select this when documents do not feed.
Position B: Standard position (pre-selected)
Position C: Select this when documents multiple feed.
(3) Close the front lid by gently pressing down on both ends.

3. CONFIRMING THE SEPARATION SPRING

1. Open the operation grill.
2. Check the highest level of the separation spring with the spring height tool (PFZZFT31BX). Please make sure that the separation spring does not touch the tool during this operation. (Both right and left) (See Fig. 1.)
3. Check the lowest level of the separation spring with the opposite side of the spring height tool. Please make sure that the separation spring touches the tool during this operation. (Both right and left) (See Fig. 2.)

Note : Remove the separation rubber first.



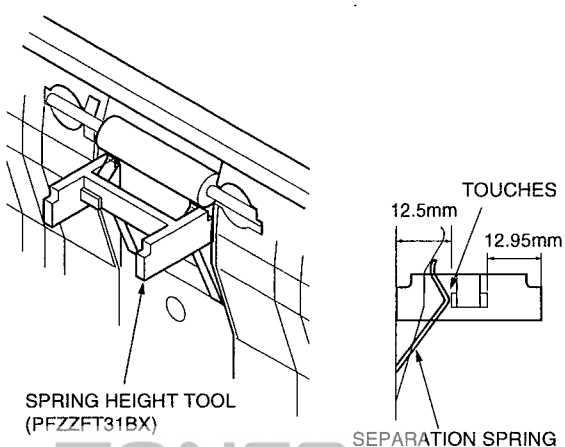


Fig. 1

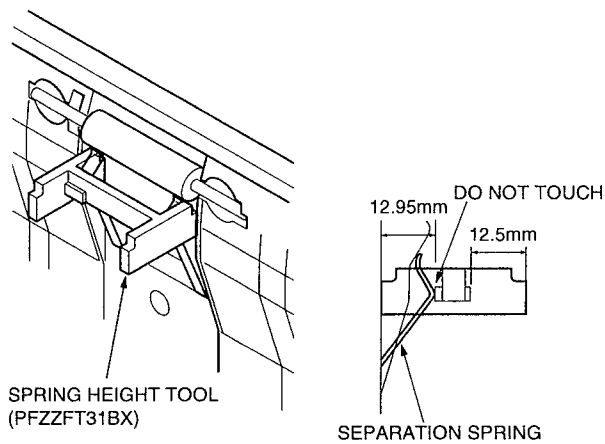


Fig. 2

DISASSEMBLY INSTRUCTIONS

Ref. No. 1	HOW TO REMOVE THE HANDSET CRADLE CABINET
Procedure 1	

1) Push the front lid open button to open the operation block.
2) Remove the 2 screws (A).
3) Remove the handset cradle cabinet. (See Fig. A.)

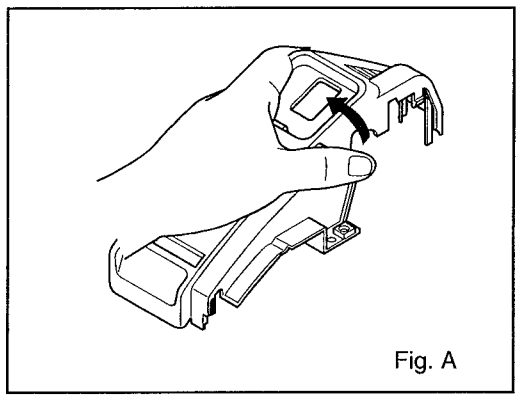
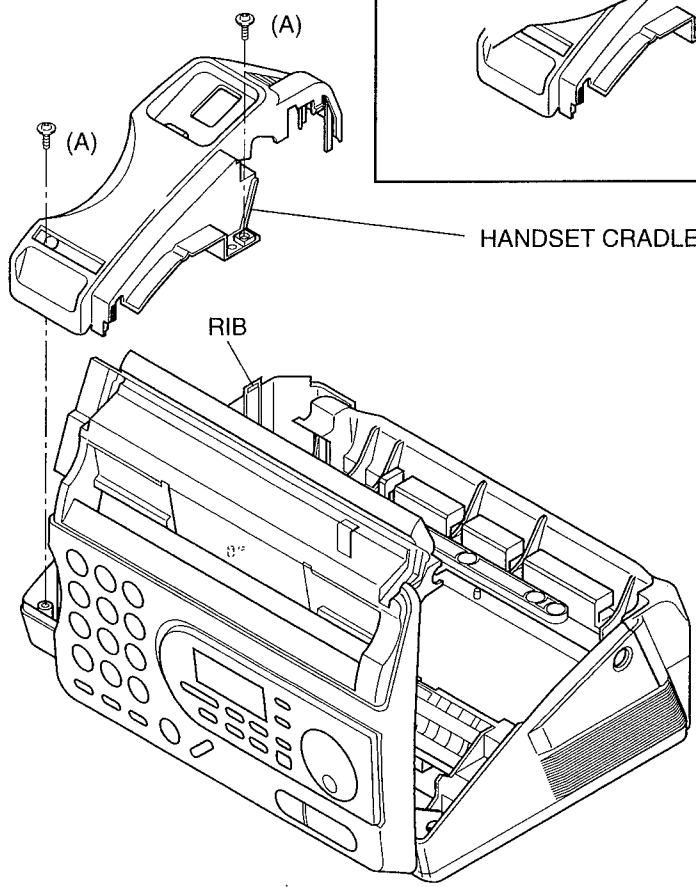


Fig. A

Caution: If you try to remove the handset cradle in the opposite direction, the rib will break.



●HOW TO ATTACH THE HANDSET CRADLE CABINET

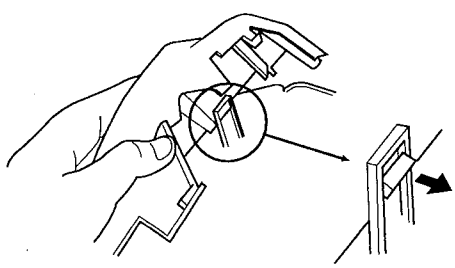


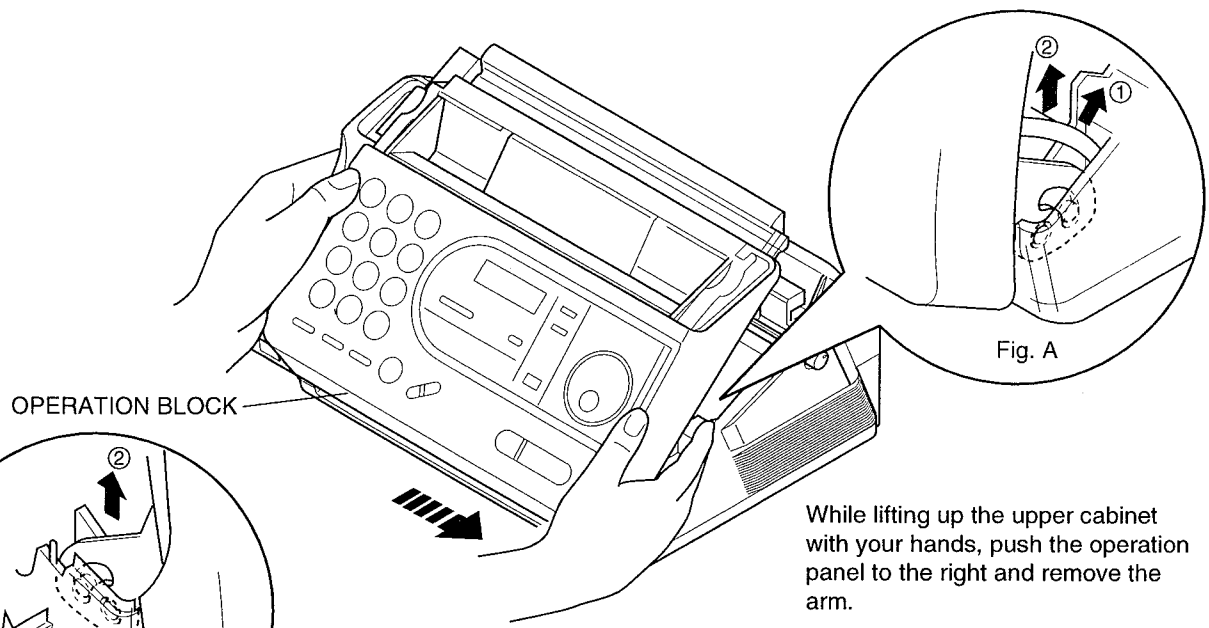
Fig. B

1) Insert the handset cabinet into the side of the unit.(See Fig.B.)
2) Be careful not to bend the cabinet.

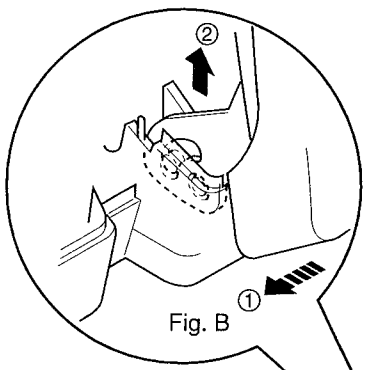
Ref. No. 2	HOW TO REMOVE THE OPERATION BLOCK
Procedure 2	

1) Push the front lid open button in the direction of the arrow to open the operation block.
2) Lift up the lead and remove the arm (See Fig. A.)
3) Remove the arm.(See Fig. B.)
4) Lift up the operation block.

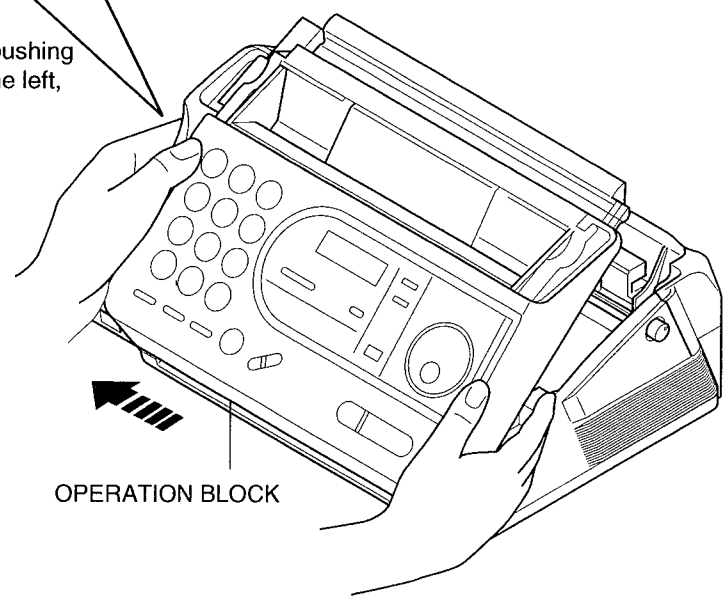
Note: The arm cannot be removed if the operation panel is opened all the way. Open the operation panel approximately at a 45° to 60°angle to remove the arm.



While lifting up the upper cabinet with your hands, push the operation panel to the right and remove the arm.

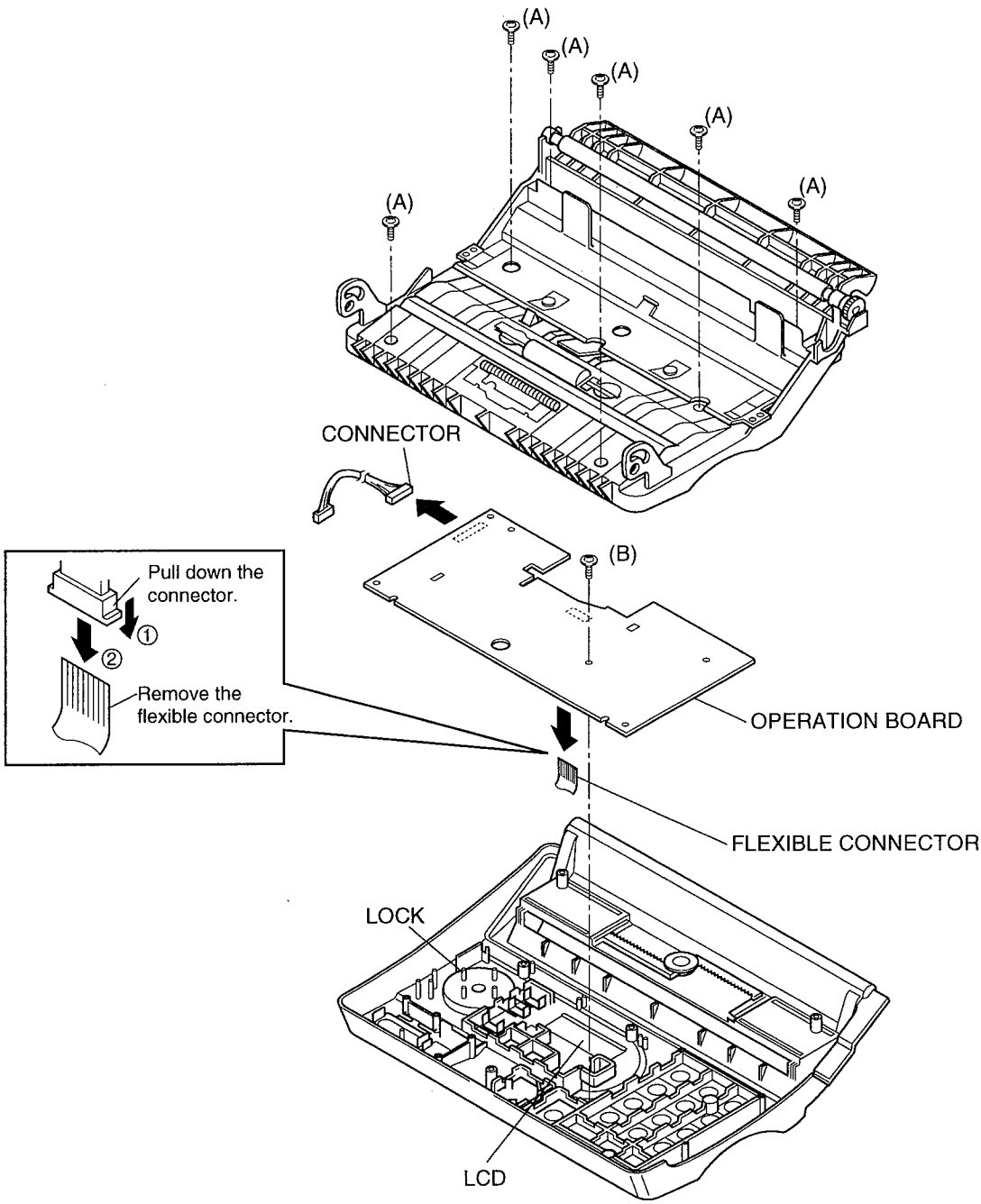


Remove the arm while pushing the operation panel to the left, as in Fig. A.



Ref. No. 3	HOW TO REMOVE THE OPERATION BOARD AND LCD
Procedure 2→3	

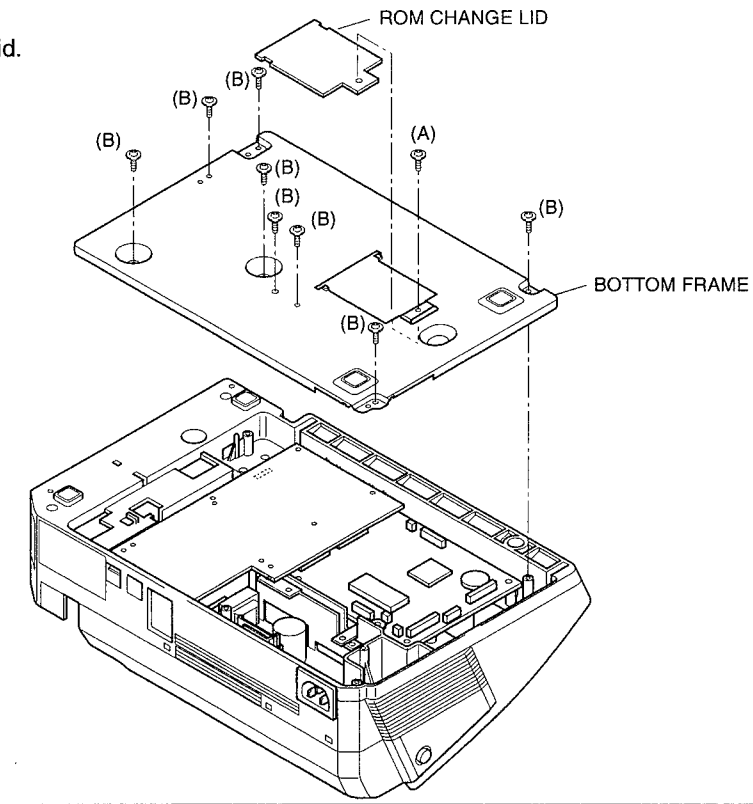
1) Remove the 6 screws (A) and the operation block cover.
2) Remove the 1 screw (B).
3) Remove the lock of the operation panel
4) Pull out the connector and remove the flexible connector.
5) Remove the operation board.
6) Remove the LCD.



Ref. No. 4	HOW TO REMOVE THE BOTTOM FRAME

Procedure 4

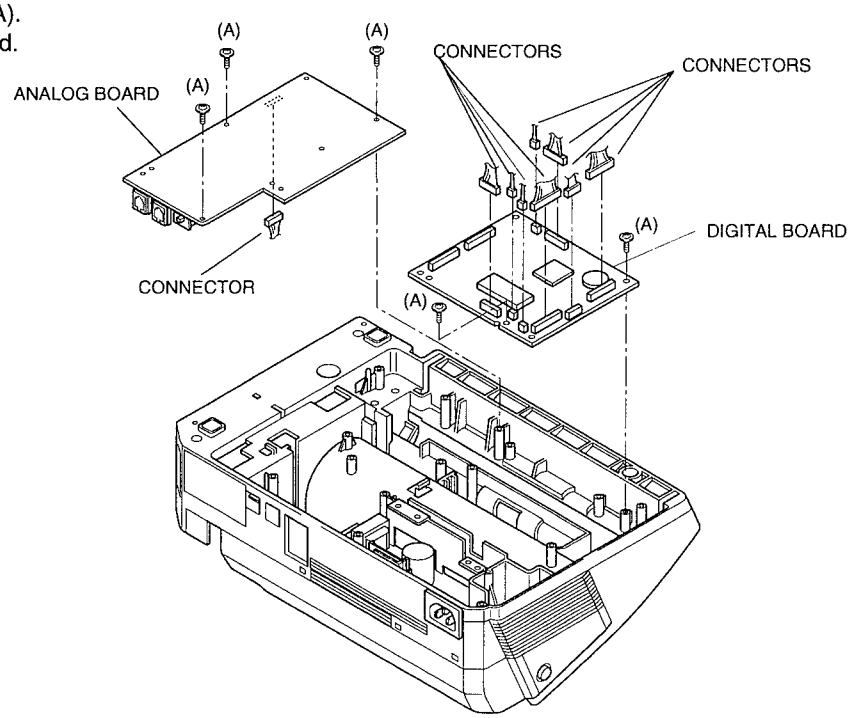
1) Remove the screw (A).
2) Remove the ROM change lid.
2) Remove the 8 screws (B).
3) Remove the bottom frame.



Ref. No. 5	HOW TO REMOVE THE ANALOG BOARD AND DIGITAL BOARD

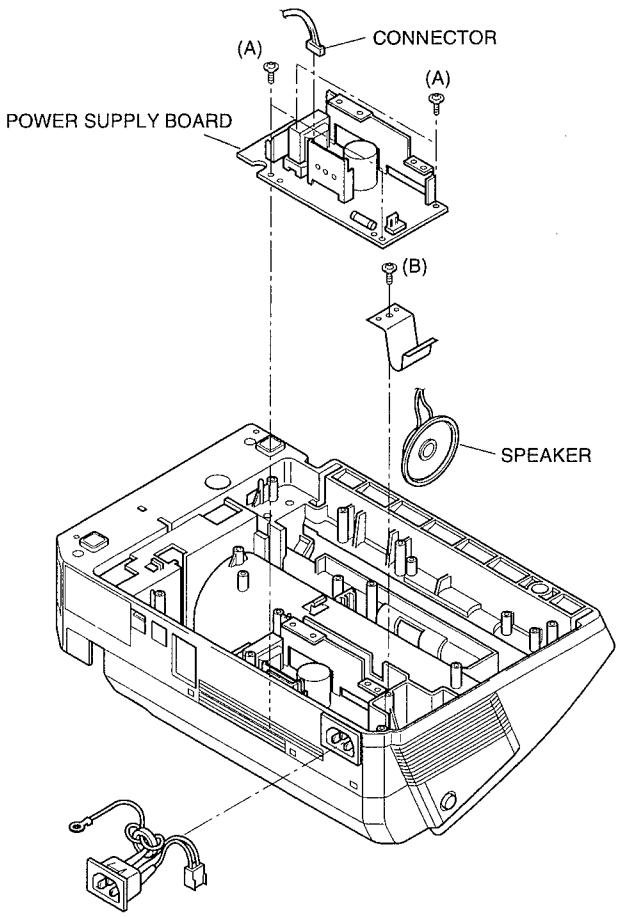
Procedure 4→5

1) Remove the 3 screws (A).
2) Remove the 1 connector.
3) Remove the analog board.
4) Remove the 7 connectors.
5) Remove the 2 screws (A).
6) Remove the digital board.



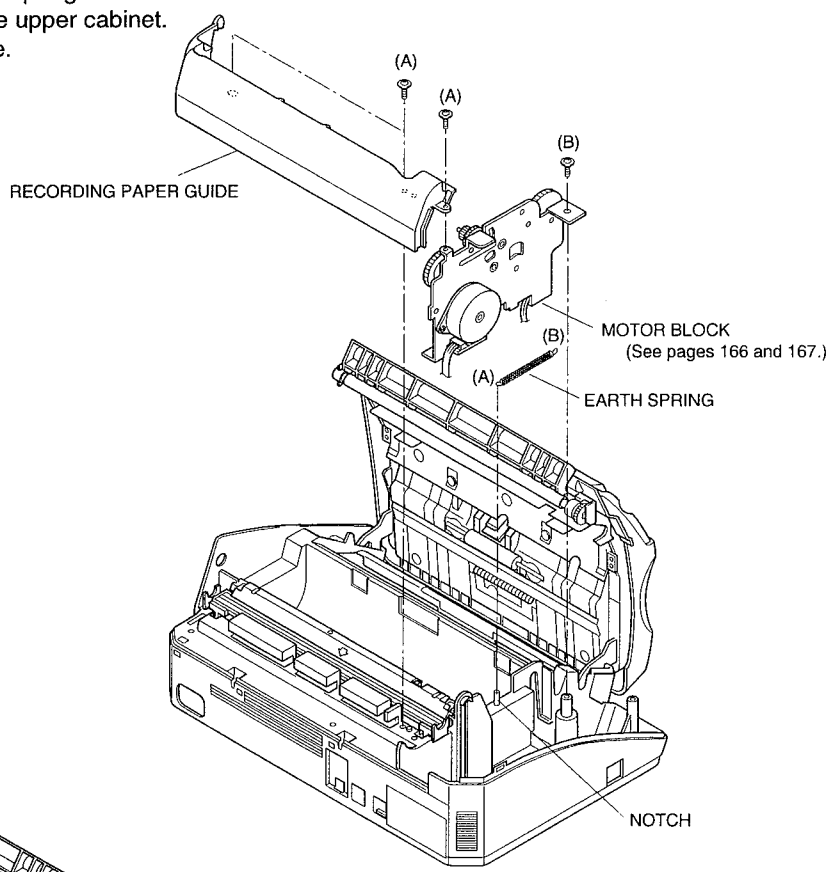
Ref. No. 6	HOW TO REMOVE THE POWER SUPPLY BOARD,SPEAKER AND AC INLET
Procedure 4→5→6	

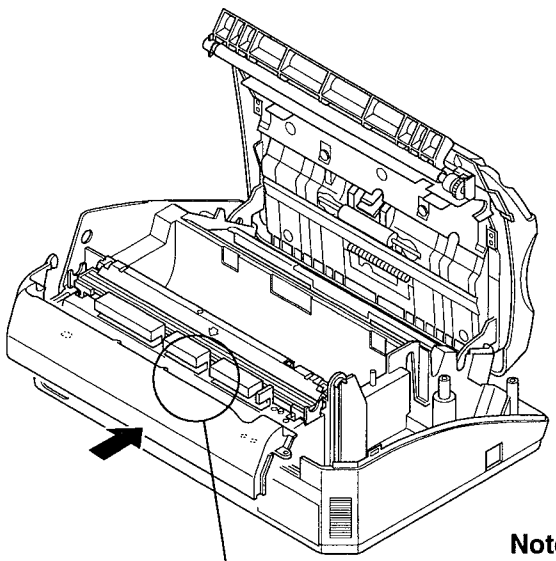
1) Remove the 4 screws (A) and remove the power supply board.
2) Remove the 1 screw (B).
3) Remove the AC inlet.



Ref. No.7	HOW TO REMOVE THE RECORDING PAPER GUIDE AND THE MOTOR BLOCK
Procedure 1→7	

1) Remove the 3 screws (A).
2) Remove the recording paper guide.
3) Remove the 1 screw (B).
4) Remove the (A) side of the spring and attach it to the notch on the upper cabinet. Do not remove the (B) side.
5) Remove the motor block.





Note: Insert the recording paper guide so that it pushes the spring down. (See Fig. A.)

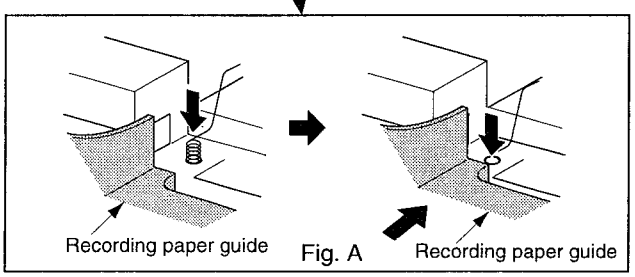
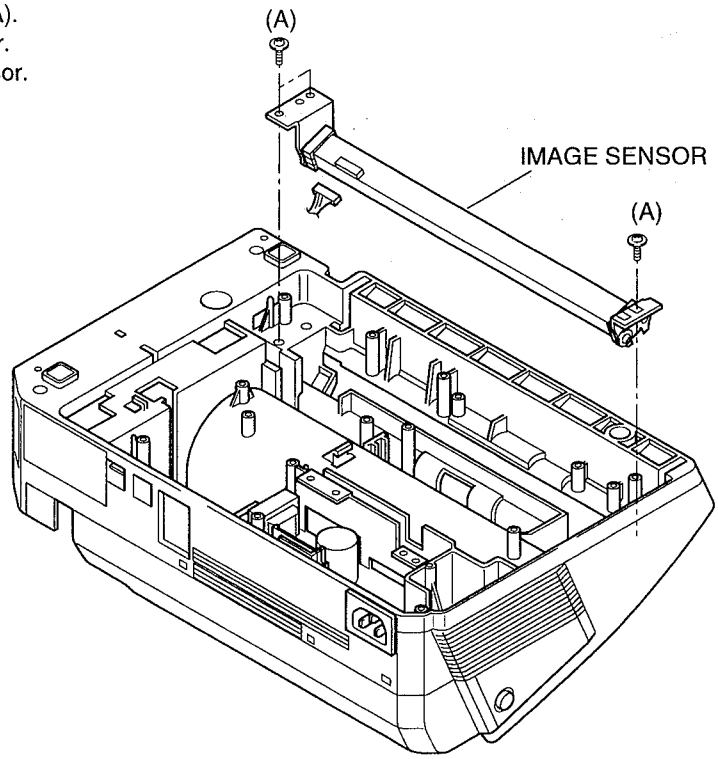


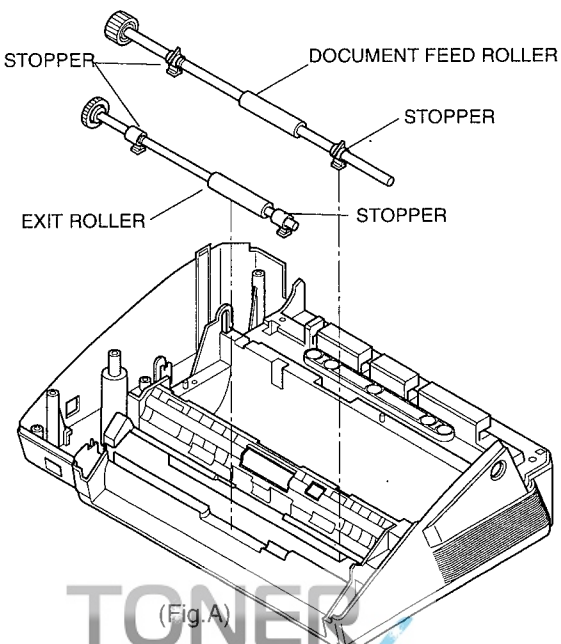
Fig. A

DISASSEMBLY INSTRUCTIONS

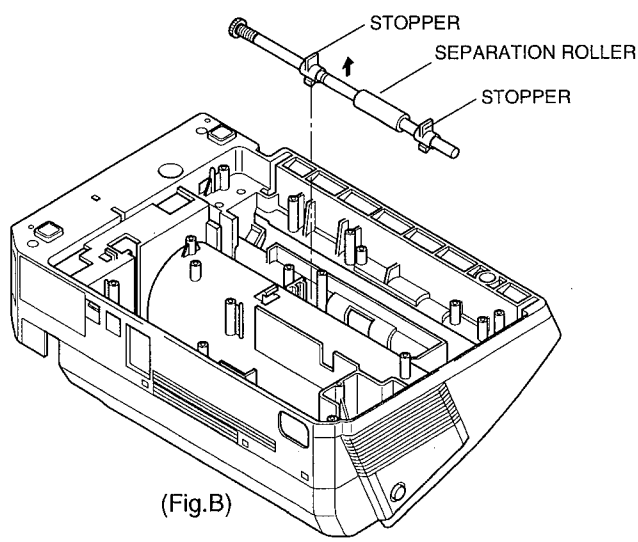
Ref. No. 8	HOW TO REMOVE THE IMAGE SENSOR
Procedure 4→5→8	1) Remove the 3 screws (A). 2) Remove the 1 connector. 3) Remove the image sensor.



Ref. No. 9	HOW TO REMOVE THE ROLLERS
Procedure 1→4→5 →8→9	(Fig.A) 1) Remove the recording paper guide and the motor block.(See Ref. 7.) 2) Remove the stopper with a flathead screwdriver. 3) Remove the rollers. 2) Remove the stoppers from the roller shaft and replace the roller. (Fig.B) 1) Remove the analog board and digital board.(See Ref. 5.) 2) Remove the roller. 3) Remove the stoppers from the roller shaft and replace the roller.



(Fig.A)



(Fig.B)

Ref. No. 10	HOW TO REMOVE THE THERMAL HEAD ROLLER
Procedure 10	1) Push the front lid open button in the direction of the arrow to open the operation block. 2) Remove the recording paper guide.(See Ref. 7.) 3) Remove the lock lever shaft with a screwdriver as shown in Fig. A. 4) Remove the head cover. 5) Remove the 1 connector. 6) Remove the thermal head.

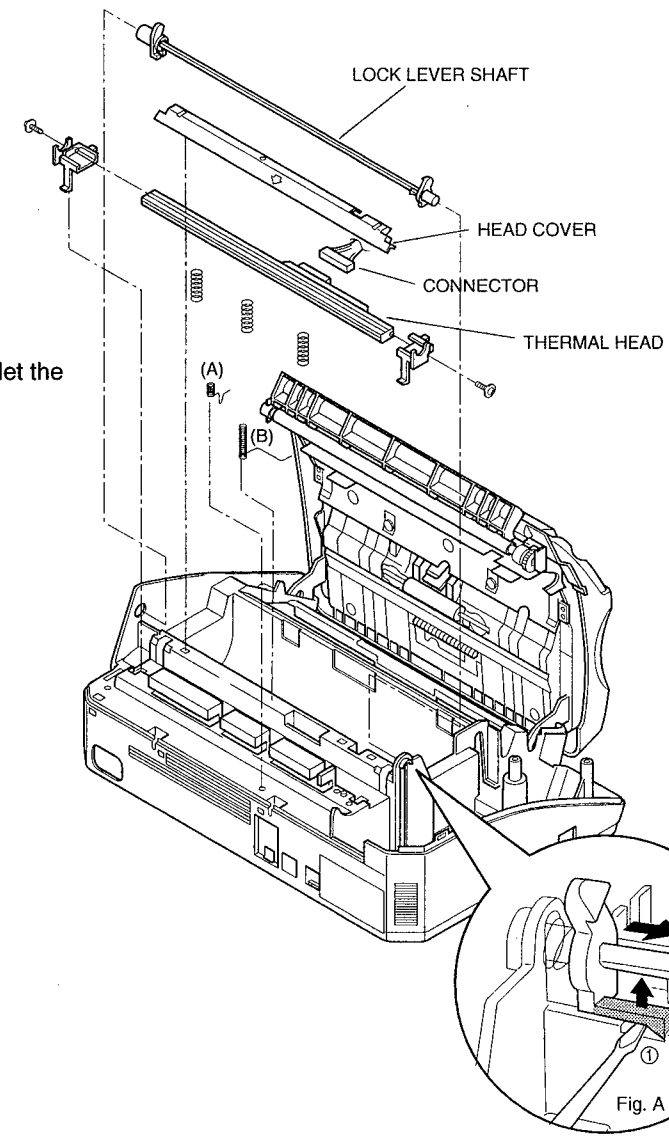
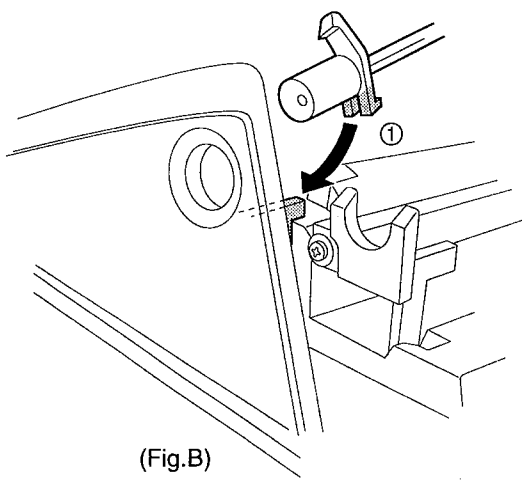


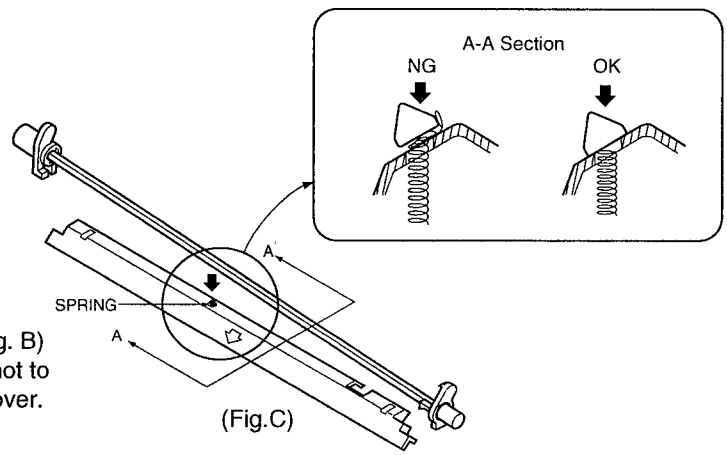
Fig. A

Note : When connecting the thermal head, do not let the connector plug touch the spring (A).

●HOW TO ATTACH THE LOCK LEVER SHAFT



(Fig.B)

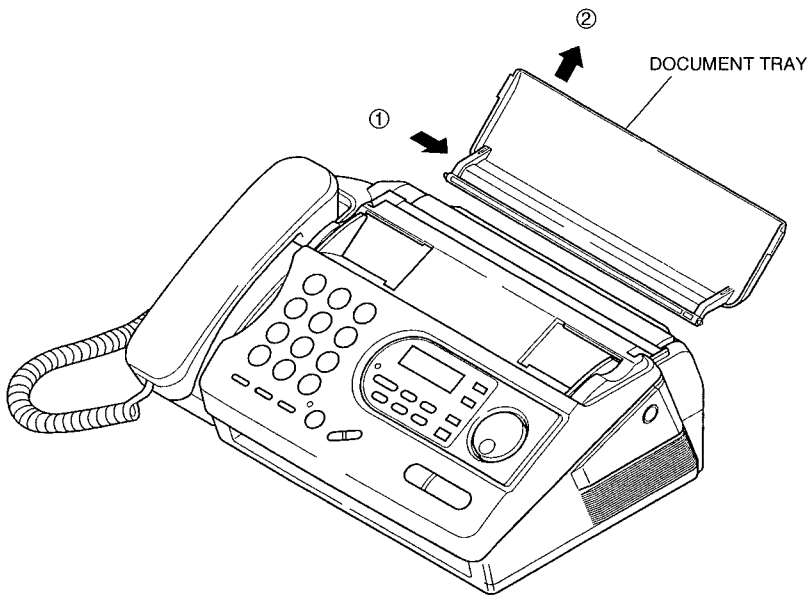


(Fig.C)

Note 1 : Attach the lock lever shaft to the gray area and then insert the shaft through the hole. (Fig. B)

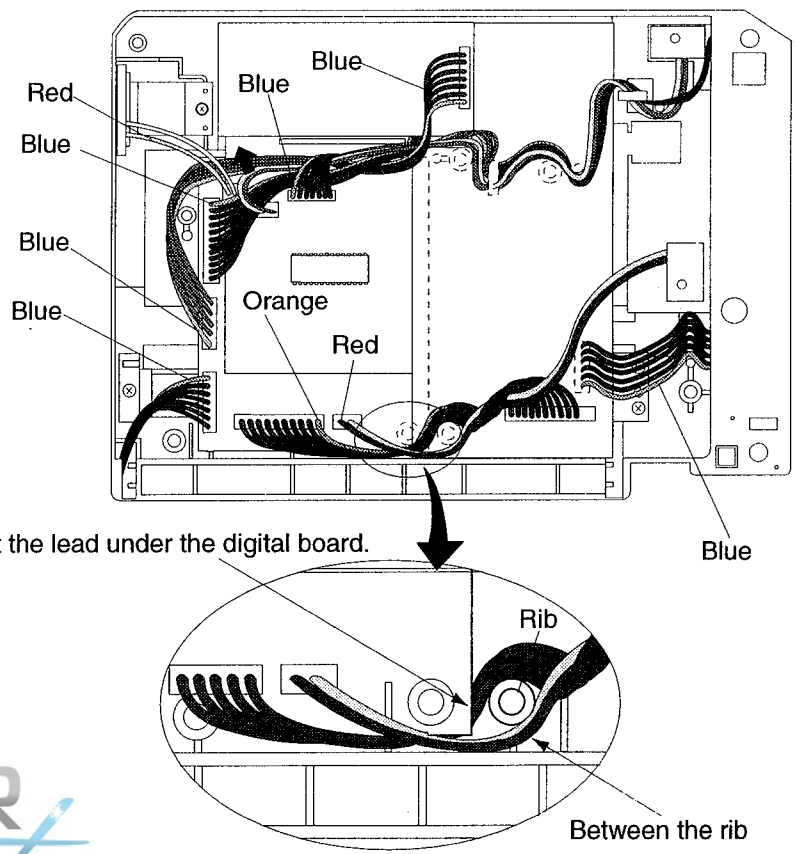
Note 2 : When attaching the lock lever shaft, be sure not to bend the spring (B) exposed from the head cover. (Fig. C)

Ref. No. 11	HOW TO REMOVE THE DOCUMENT TRAY
Procedure 11	1) Push the bottom of the tray in the direction of the arrows.



[(Ref. No.5) for page 95]

Lead installation position



HOW TO REPLACE THE FLAT PACKAGE IC

If you do not have the special tools (for example: SPOT HEATER) to remove the SPOT HEATER'S Flat IC, if you have solder (large amount), a soldering iron, and a cutter knife, you can easily remove the ICs even if there are more than 100 pins.

1. PREPARATION

· SOLDER - - - - - - - - Sparkle Solder 115A-1, 115B-1
OR
Almit Solder KR-19, KR-19RMA

· Soldering iron - - - - - - Recommended power consumption is between 30 W to 40 W.
Temperature of Copper Rod 662 ± 50 °F (350 ±10℃)

(An expert may handle a 60~80 W iron, but a beginner might damage the foil by overheating.)

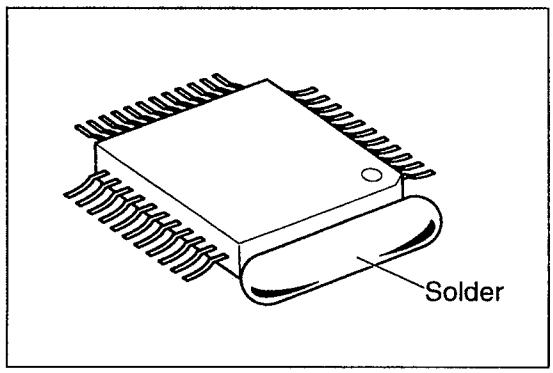
· Flux - - - - - - - - - - - - HI115 Specific gravity 0.863

(Original flux should be replaced daily.)

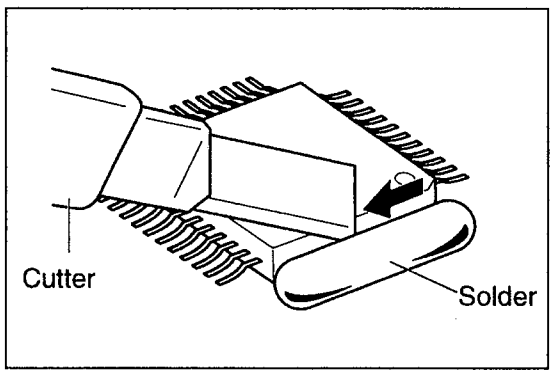
2. FLAT PACKAGE IC REMOVAL PROCEDURE

1) When all of the IC lead cannot been seen at the standard degree, fill with large quantities of solder.

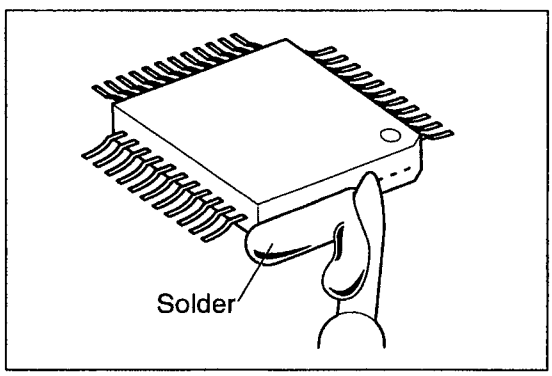
Note:
If you do not fill with solder and directly cut the IC lead with the cutter, stress may build up directly in the P.C. board's pattern. If you do not fill with large quantities of solder as in step 1, the P.C. board pattern may be removed.



2) Using a cutter, cut the lead at the source.
(Cut the contents with a cutter lightly, 5 or 6 times.)



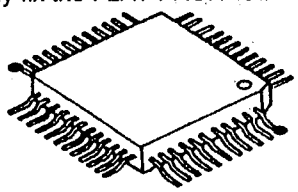
3) Remove when the solder melts.
(Remove the lead at the same time.)



After removing the Flat IC and when attaching a new IC, remove any of the excess solder on the land using the soldering wire, etc. If the excess solder is not removed from the land, the IC will slip and not be attached properly.

3. FLAT PACKAGE IC INSTALLATION PROCEDURE

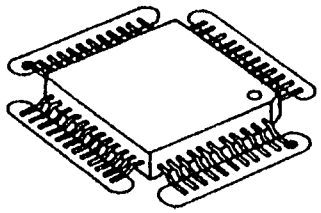
1) Temporarily fix the FLAT PACKAGE IC by soldering on the two marked pins.



●- - - - - -Temporary soldering point.

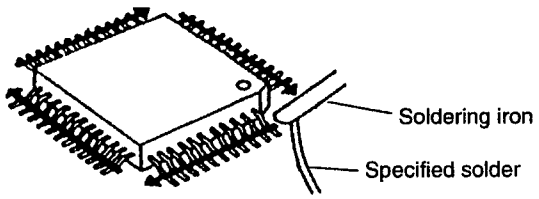
*Check the accuracy of the IC setting with the corresponding soldering foil.

2) Apply flux to all pins of the FLAT PACKAGE IC.



- - - - - Flux

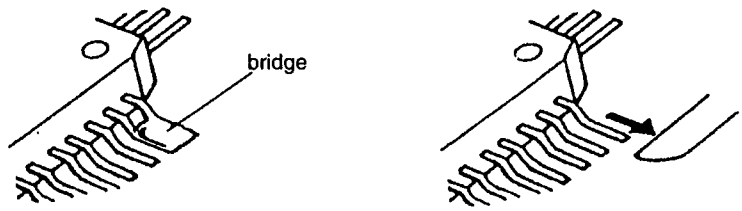
3) Solder using the specified solder, in the direction of the arrow, by sliding the soldering iron.



4. BRIDGE MODIFICATION PROCEDURE

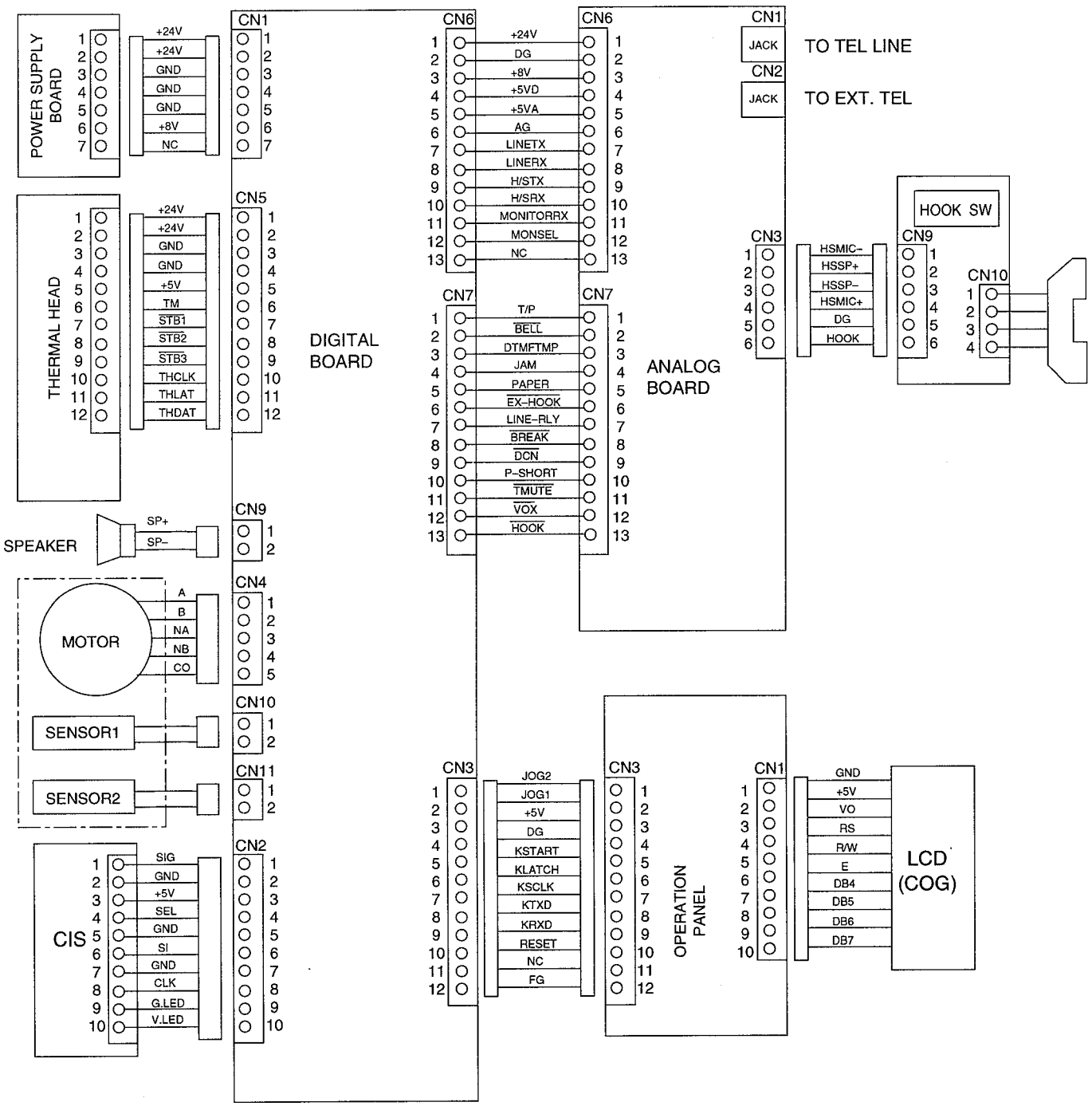
1) Lightly re-solder the bridged portion.

2) Remove the remaining solder along the pins using a soldering iron as shown in the figure below.



CIRCUIT OPERATIONS

1. CONNECTION DIAGRAM



2. GENERAL BLOCK DIAGRAM

The control section will be explained as shown in the block diagram.

(1) ASIC (IC4) ..... Composed mainly of an address decoder, modem control section, CPU and RTC.
Controls the general FAX operations.
Controls the operation panel I/F.
Controls the thermal head I/F and CIS I/F.
Executes image processing.
Monitors the H/S volume.
I/O ports

(2) ROM (IC2) ..... Contains all of the program instructions for unit operations.

(3) Static RAM (IC1) ..... This memory is used mainly for the parameter working storage area.

(4) MODEM (IC5) ..... Executes modulation and demodulation for the FAX.

(5) Read section ..... Contact Image Sensor(CIS) to read transmitting documents.

(6) Thermal Head ..... Contains heating elements for dot matrix image printing.

(7) Motor driver (IC8) ..... Drives the motor and CIS LED.

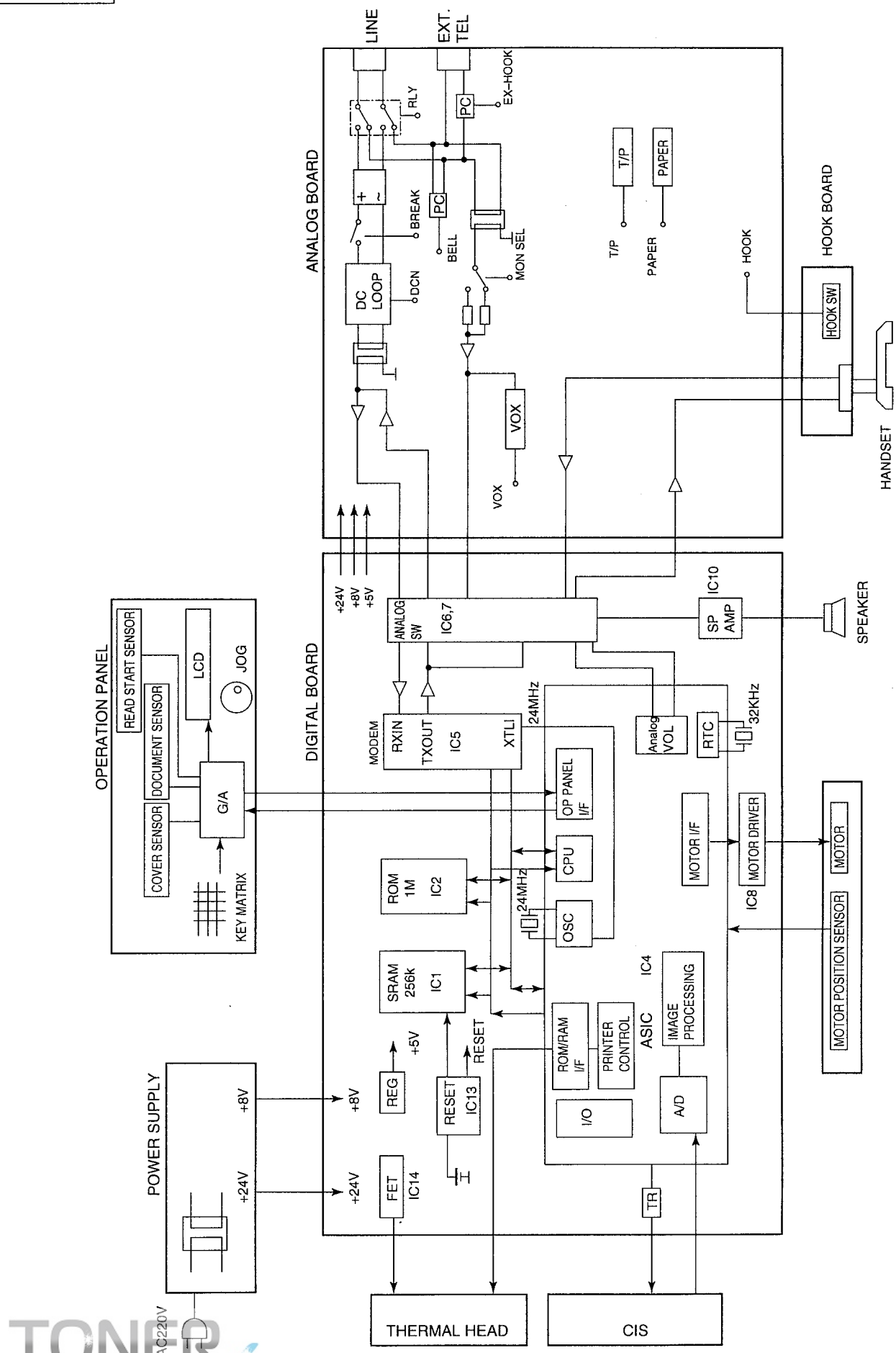
(8) Reset circuit (IC13) ..... Provides a reset pulse to each of the major ICs.

(9) Analog board ..... Composed of an ITS circuit and NCU circuit.

(10) Sensor section ..... Composed of a cover open sensor, document sensor, recording paper sensor, motor position sensors, read position sensor.

(11) Power supply ..... Supplies +8V and +24V to the unit.
switching board section

General Block Diagram



3. CONTROL SECTION

① ASIC (IC4)

This custom IC is used for general FAX operations.

(1) CPU: This model uses a Z80 equivalent CPU operating at 6MHz.
Many of the peripheral functions are handled by custom designed LSIS.
As a result, the CPU only needs to process the result.

(2) RTC: Real time clock.

(3) DECODER: Decodes the address.

(4) ROM/RAM I/F: Controls the SELECT signal of ROM or RAM and bank switching.

(5) CIS I/F: Controls document reading.

(6) IMAGE DATA RAM: This is inside the ASIC and has 8KB which is used for image processing.

(7) THERMAL HEAD I/F: Transmits the recorded data to the thermal head.

(8) MOTOR I/F: Controls the motor which feeds the document and feeds the reading document.

(9) OPERATION PANEL I/F: Serial interface with Operation Panel.

(10) I/O PORT: I/O Port Interface (for analog board port control).

(11) ANALOG UNIT: Electronic volume for the handset and monitor.
Sends beep tones, etc.

Explanation of the Pin Distribution (IC4)

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
1	AIN1	AI	3.3V	ANALOG IMAGE SIGNAL INPUT
2	AIN2	AI	3.3V	THERMISTOR TEMPERATURE DETECTION INPUT
3	AMON	AO	3.3V	ANALOG MONITOR
4	VSSB		GND	GROUND FOR ANALOG IMAGE PROCESS
5	VDDB		3.3V	POWER SOURCE FOR ANALOG IMAGE PROCESS
6	3.3V/BATT		3.3V/BATT	BACKUP POWER SOURCE FOR RTC
7	X32OUT	O	3.3V/BATT	32.768k OSCILLATOR FOR RTC
8	X32IN	I	3.3V/BATT	32.768k OSCILLATOR FOR RTC
9	VSS		GND	GROUND
10	XBACKEN	I	5V	BACKUP ENABLE
11	5V/BATT		5V/BATT	RAMCS BUFFER/BACKUP POWER SOURCE FOR RESET
12	XRAMCS	O	5V/BATT	SRAM CHIP SELECT
13	FTG	O	5V	SH SIGNAL OUTPUT FOR CIS
14	F1	O	5V	SIGNAL OUTPUT FOR CIS
15	F2/OP50	O	5V	B-ENABLE (NOT USED)
16	FR/OP51	O	5V	RESETN (NOT USED)
17	VIDRST/IOP20	I/O	5V	SP-MUTE (SPEAKER MUTE)
18	SPHCLK/IOP21	I/O	5V	T/P (TONE/PULSE SWITCHING)
19	DARKON/IOP22	I/O	5V	BELL (BELL DETECTION)
20	ADSEL2/IOP23	I/O	5V	PAPER (RECORDING PAPER DETECTION)
21	CPC	I	5V	JAM (NOT USED)
22	BELL/OP	O/Z	5V	EX-HOOK (EXTERNAL TEL DETECTION)
23	5V		5V	POWER SOURCE FOR BUFFER
24	VSS		GND	GROUND
25	RVN	I	5V	DCN (NOT USED)

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
26	TXD/IOP30	I/O	5V	LINE-RLY (LINE RELAY CONTROL)
27	RXD/IOP31	I/O	5V	BREAK (LINE CATCHING CONTROL)
28	XRTS/IOP32	I/O	5V	DTMFIMP (NOT USED)
29	XCTS/IOP33	I/O	5V	P-SHORT (NOT USED)
30	XDSR/IOP34	I/O	5V	TMUTE (BAND SET TRANSMISSION MUTE)
31	DCD/IOP35	I/O	5V	VOX (VOICE DETECTION)
32	XDTR/IOP36	I/O	5V	HOOK (HANDSET HOOK DETECTION)
33	RI/CLK/IOP37	I/O	5V	HSEN (ANALOG SIGNAL ROUTE CONTROL)
34	TONE1	AO	3.3V	TONE1 (DUMMY RING BACK TONE TRANSMISSION)
35	TONE2	AO	3.3V	TONE2 (ALARM, KEY TONE, BELL TRANSMISSION)
36	VOLU1		3.3V	ELECTRONIC VOLUME FOR SPEAKER (REF. VOLTAGE)
37	VOLU2		3.3V	ELECTRONIC VOLUME FOR SPEAKER
38	VOLU3		3.3V	ELECTRONIC VOLUME FOR SPEAKER
39	MIDAT/IOP45	I/O	5V	MONEN (ANALOG SIGNAL ROUTE CONTROL)
40	MICLK/IOP46	I/O	5V	MTXEN (ANALOG SIGNAL ROUTE CONTROL)
41	MILAT/IOP47	I/O	5V	MTX (ANALOG SIGNAL ROUTE CONTROL)
42	XRESCS1	O	5V	CHIP SELECT1 (NOT USED)
43	XRESCS2	O	5V	CHIP SELECT2 (NOT USED)
44	VSS		GND	GROUND
45	5V		5V	POWER SOURCE FOR BUFFER
46	XNMI	I	5V	NMI INPUT (FIXED 5V)
47	CBUSY2	O	5V	CBUSY2 (NOT USED)
48	CSO	O	5V	CSO (NOT USED)
49	CBUSY1	I	5V	CBUSY1 (NOT USED)
50	CCLK	I	5V	CCLK (NOT USED)
51	CSI	I	5V	CSI (NOT USED)
52	XMDMINT	I	5V	MODEM INSERTING
53	XMDMCS	O	5V	MODEM CHIP SELECT
54	XRESCS3/OP52	O	5V	OPRES (OPERATION PANEL RESET)
55	20KOSC/IOP56	I/O	5V	DTMFEN (ANALOG SIGNAL ROUTE CONTROL)
56	XHOLDAK	O	5V	NOT USED
57	3.3V		3.3V	POWER SOURCE FOR INSIDE LOGIC
58	XOUT	O	3.3V	24MHz OSCILLATOR
59	XIN	I	3.3V	24MHz OSCILLATOR
60	VSS		GND	GROUND
61	5V		5V	POWER SOURCE FOR BUFFER
62	XTEST	O	5V	24MHz CLOCK OUTPUT (FOR MODEM)
63	CPUCK	O	5V	CPU CLOCK (6MHz) OUTPUT
64	TEST1	I	5V	TEST PIN, FIXED HIGH
65	TEST2	I	5V	TEST PIN, FIXED HIGH
66	TEST3	I	5V	TEST PIN, FIXED HIGH
67	TEST4	I	5V	TEST PIN, FIXED HIGH
68	XWAIT/IP60	I	5V	FIXED GND
69	XHOLD/IP61	I	5V	FIXED GND
70	VSS		GND	GROUND
71	3.3V		3.3V	POWER SOURCE FOR INSIDE LOGIC
72	XHSTRD/IOP40	I/O	5V	MTXEN (ANALOG SIGNAL ROUTE CONTROL)
73	XHSTWR/IOP41	I/O	5V	SPEN (ANALOG SIGNAL ROUTE CONTROL)
74	XOPRBE MUX/OP53	O	5V	NOT USED

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
75	ADR15	O	5V	ADDRESS PIN FOR DEBUG
76	ADR14	O	5V	ADDRESS PIN FOR DEBUG
77	ADR13	O	5V	ADDRESS PIN FOR DEBUG
78	XRAS/IOP42	I/O	5V	TONE 1 SEL (ANALOG SIGNAL ROUTE CONTROL)
79	XCAS1/IOP43	I/O	5V	TONE 2 SEL (ANALOG SIGNAL ROUTE CONTROL)
80	XCAS2/IOP44	I/O	5V	MONSEL (ANALOG SIGNAL ROUTE CONTROL)
81	DB3	I/O	5V	DATA BUS D3
82	DB2	I/O	5V	DATA BUS D2
83	DB4	I/O	5V	DATA BUS D4
84	DB1	I/O	5V	DATA BUS D1
85	DB5	I/O	5V	DATA BUS D5
86	DB0	I/O	5V	DATA BUS D0
87	DB6	I/O	5V	DATA BUS D6
88	DB7	I/O	5V	DATA BUS D7
89	XROMCS	O	5V	ROM CHIP SELECT
90	VSS		GND	GROUND
91	5V		5V	POWER SOURCE FOR BUFFER
92	XRD	O	5V	READ SIGNAL OUTPUT
93	XWR	O	5V	WRITE SIGNAL OUTPUT
94	ADR0	O	5V	ADDRESS BUS A0
95	ADR1	O	5V	ADDRESS BUS A1
96	ADR2	O	5V	ADDRESS BUS A2
97	ADR3	O	5V	ADDRESS BUS A3
98	ADR4	O	5V	ADDRESS BUS A4
99	ADR5	O	5V	ADDRESS BUS A5
100	ADR6	O	5V	ADDRESS BUS A6
101	ADR7	O	5V	ADDRESS BUS A7
102	ADR8	O	5V	ADDRESS BUS A8
103	ADR9	O	5V	ADDRESS BUS A9
104	ADR10	O	5V	ADDRESS BUS A10
105	ADR11	O	5V	ADDRESS BUS A11
106	ADR12	O	5V	ADDRESS BUS A12
107	RBA0	O	5V	ADDRESS BUS A13
108	VSS		GND	GROUND
109	5V		5V	POWER SOURCE FOR BUFFER
110	RBA1	O	5V	BANK ADDRESS A14
111	RBA2	O	5V	BANK ADDRESS A15
112	RBA3	O	5V	BANK ADDRESS A16
113	RBA4	O	5V	BANK ADDRESS A17
114	RBA5/OP	O	5V	NOT USED
115	FMEMCS/IOP27	I/O	5V	MDRES (MODEM RESET)
116	FMEMDO/IOP26	I/O	5V	NOT USED
117	FMEMDI/IOP25	I/O	5V	LEDON (CIS LED CONTROL)
118	FMEMCLK/IOP24	I/O	5V	THON (THERMAL HEAD 24V POWER SOURCE CONTROL)
119	XRESET	I	5V	XRESET (RESET INPUT)
120	XORESET	O	5V/BATT	
121	XRESET1	I	5V/BATT	
122	5V		5V	POWER SOURCE FOR BUFFER
123	VSS		GND	GROUND
124	XWDERR	O	5V	WATCH DOG ERROR
125	IOP57	I/O	5V	CISON (CIS 5V POWER SOURCE CONTROL)
126	RM0/IOP00	I/O	5V	T5 (MOTOR A PHASE)
127	RM1/IOP01	I/O	5V	T4 (MOTOR B PHASE)
128	RM2/IOP02	I/O	5V	T3 (MOTOR A PHASE)

NO.	SIGNAL	I/O	POWER SUPPLIED VOLTAGE	EXPLANATION
129	RM3/IOP03	I/O	5V	T2 (MOTOR B PHASE)
130	RXE/IP14	I/O	5V	T0 (MOTOR ENABLE CONTROL)
131	TM0/IOP10	I/O	5V	SEN2 (MOTOR POSITION SENSOR 2)
132	3.3V		3.3V	POWER SOURCE FOR INSIDE LOGIC
133	VSS		GND	GROUND
134	TM1/IOP11	I/O	5V	JOG 2 (JOG DIAL PORT)
135	TM2/IOP12	I/O	5V	JOG 1 (JOG DIAL PORT)
136	TM3/IOP13	I/O	5V	HSTXE (ANALOG SIGNAL ROUTE CONTROL)
137	TXE/IP14	I/O	5V	SEN 1 (MOTOR POSITION SENSOR 1)
138	STB1	O	5V	THERMAL HEAD STROBE 1
139	STB2	O	5V	THERMAL HEAD STROBE 2
140	STB3	O	5V	THERMAL HEAD STROBE 3
141	STB4	O	5V	NOT USED
142	5V		5V	POWER SOURCE FOR BUFFER
143	VSS		GND	GROUND
144	STBNP	I	5V	CISSEL (CIS CONTROL)
145	THDAT	O	5V	THERMAL HEAD DATA
146	THCLK	O	5V	THERMAL HEAD CLOCK
147	THLAT	O	5V	THERMAL HEAD LATCH
148	KSTART	O	5V	OPERATION PANEL I/F
149	KLATCH	O	5V	OPERATION PANEL I/F (FOR OUTPUT PORT)
150	KSCLK	O	5V	OPERATION PANEL I/F
151	KTXD	O	5V	OPERATION PANEL I/F
152	KRXD	I	5V	OPERATION PANEL I/F
153	ADSEL1	O	5V	THERMAL HEAD TEMPERATURE DETECTION TRIGGER
154	VSSC		GND	ANALOG IMAGE PROCESS GROUND
155	VDDC		3.3V	POWER SOURCE FOR ANALOG IMAGE PROCESS
156	VSSA		GND	GROUND FOR ANALOG IMAGE PROCESS
157	VDDA		3.3V	POWER SOURCE FOR ANALOG IMAGE PROCESS
158	VREFB	AO	ANALOG	A/D REFERENCE
159	VCL	AO	ANALOG	CLAMP LEVEL
160	VREFT	AO	ANALOG	NOT USED

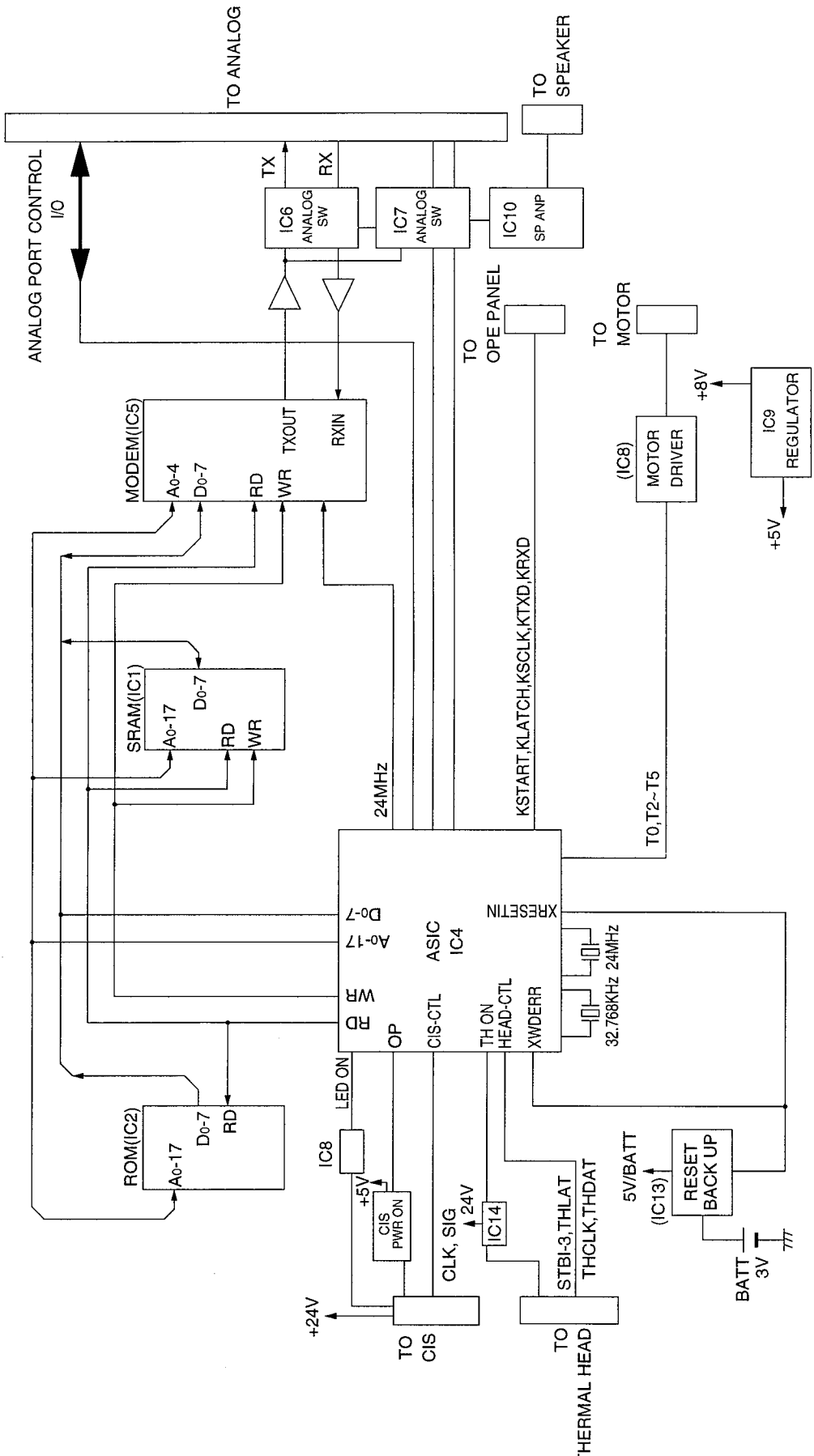
② ROM (IC2)

This 128 KB ROM (EPROM or MASKROM) has 32 KB of common area and bank area (BK4~BK15).
The capacity of each bank is 8 KB.
The addresses of the common area are from 0000H to 7FFFH, and addresses 8000H to 9FFFH are for the bank area.

③ RAM (IC1)

This 32 KB RAM has 8 KB of common area and bank area (BK0, BK1).
The capacity of each bank is 12 KB.
The addresses of the common area are from D000H to EFFFH, and addresses A000H to CFFFH are for the bank area.

3-1. BLOCK DIAGRAM

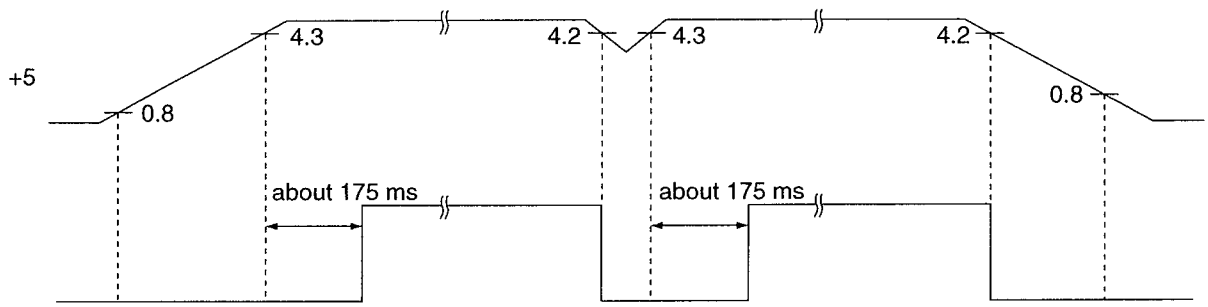


3-2. RESET CIRCUIT

The output from pin 3 of the Reset IC (IC13) resets the gate array (IC4), and via IC4 resets the modem (IC5) and the gate array on the operating board (IC1).

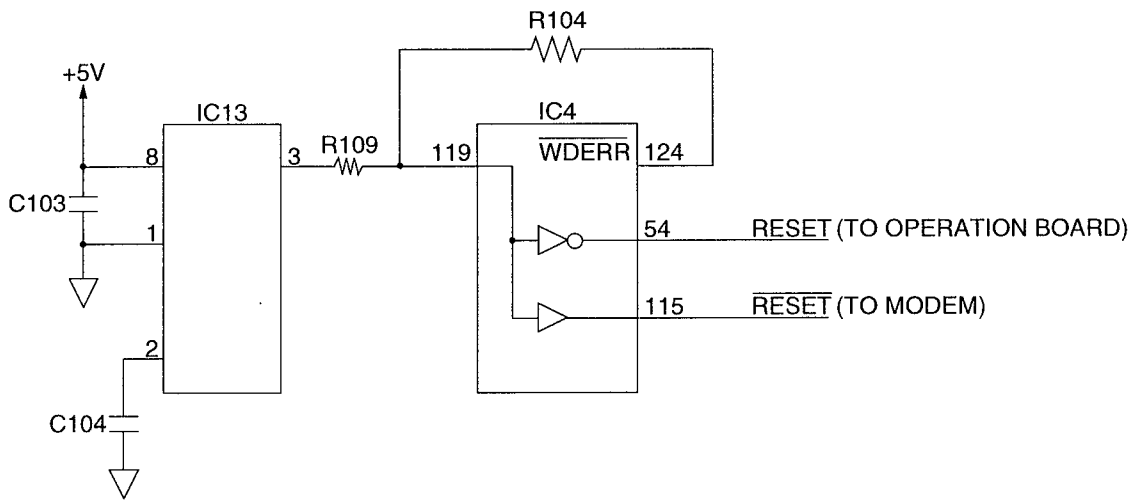
(1) During a power surge, a positive reset pulse of 175 msec or more is generated and the system is reset completely.
This is done to prevent partial resetting and system runaway during a power fluctuation.

Timing Chart



(2) When pin 3 of IC13 becomes low, it will prohibit the RAM (IC1) from changing data.
The RAM (IC1) will go into the backup mode, when it is backed up by a lithium battery.

Circuit Diagram



(3) The watch dog timer, built-in the gate array (IC4), is initialized about every 1.5 ms.
When a watch dog error occurs, pin 124 of the gate array (IC4) becomes low.
The terminal of the WDERR signal is connected to the reset line so the WDERR signal works as the reset signal.

3-3. SRAM and RTC BACK UP CIRCUIT

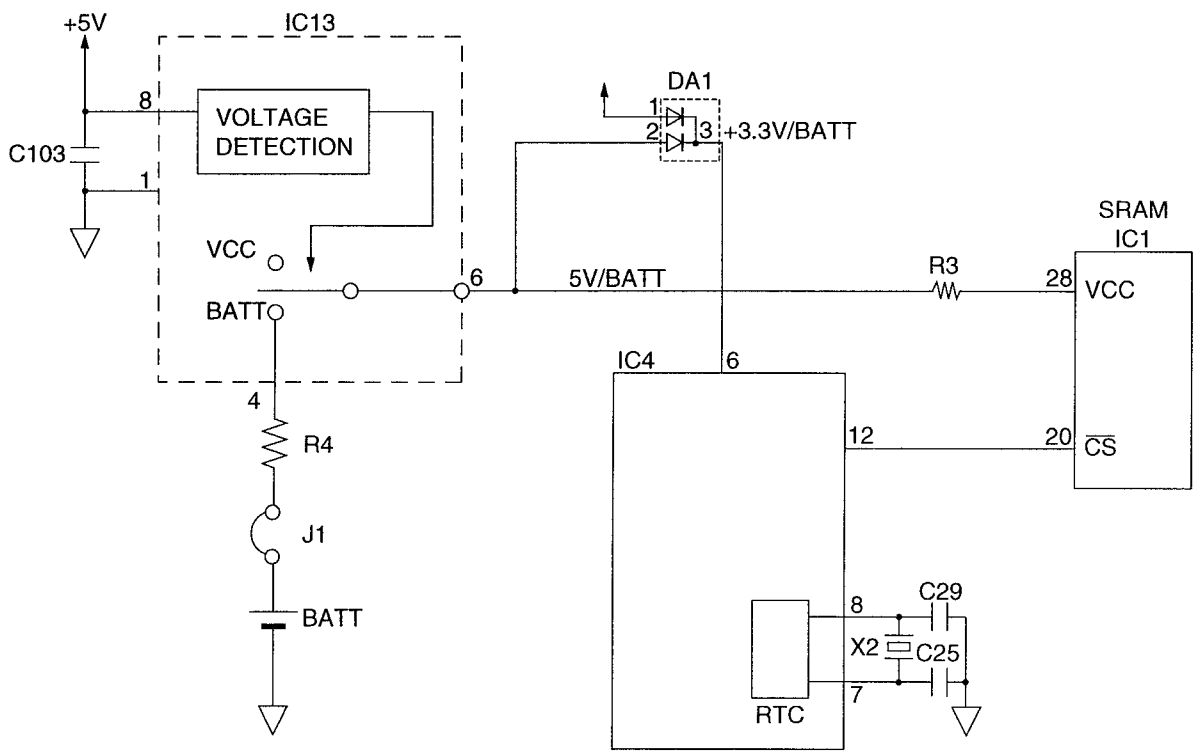
(1) Function

This unit has a lithium battery (BATT) which works for the RAM (IC1) and Real Time Clock IC (RTC,Integrated into ASIC:IC4).
The user parameter for autodial numbers, the transmission ID, the system setup date and so on are stored in the RAM (IC1).
The RTC continues functioning, even when the power switch is OFF, backed up by a lithium battery.

(2) Circuit Operation

When the power switch is turned ON, power is supplied through IC13 to RAM (IC1) and RTC.
At this time, the voltage at pin 28 of RAM is +5V and pin 6 of RTC (IC4) is +3.3V. When the power switch is turned OFF, the BATT supplies the power to RAM and RTC through J1, R4 and IC13. At that time, the voltage at pin 28 of RAM and pin 6 of RTC are about +2.5V. When the power switch is OFF and the +5V and +3.3V voltages decrease, the Reset IC (IC13) outputs the reset signals. Pin 28 of RAM (IC1) and pin 6 of RTC become low, then RAM and RTC go into the back up mode, when the power consumption is lower.

Circuit Diagram



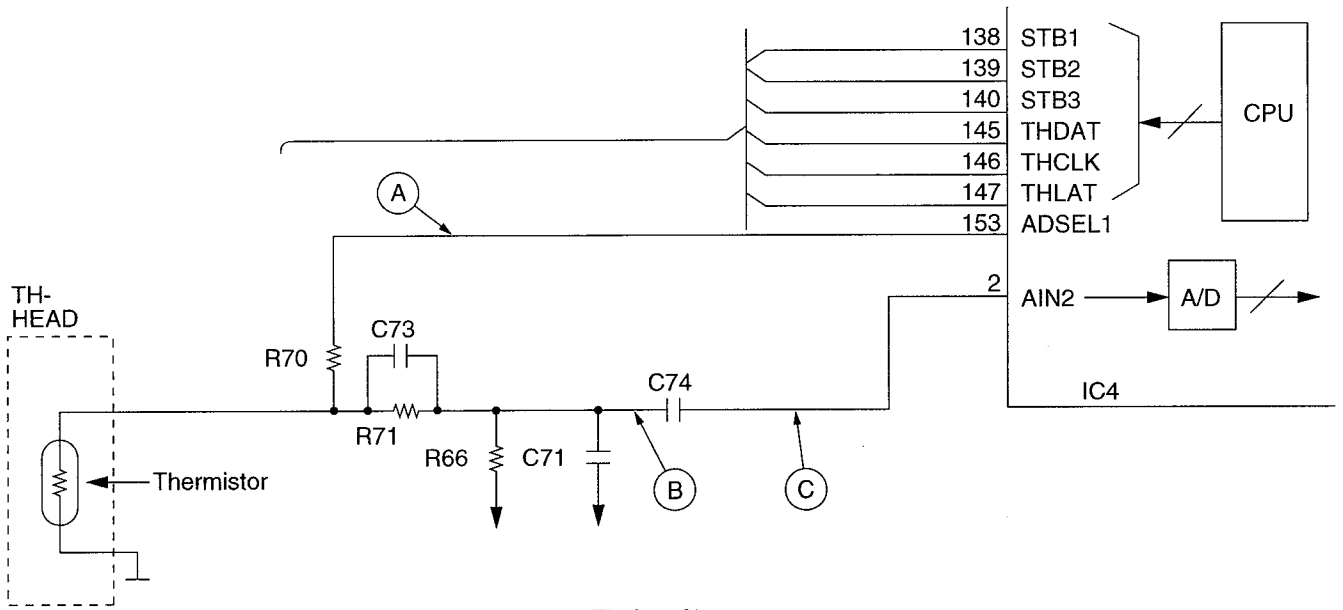
3-4. SUPERVISION CIRCUIT FOR THE THERMAL HEAD TEMPERATURE

(1) Function

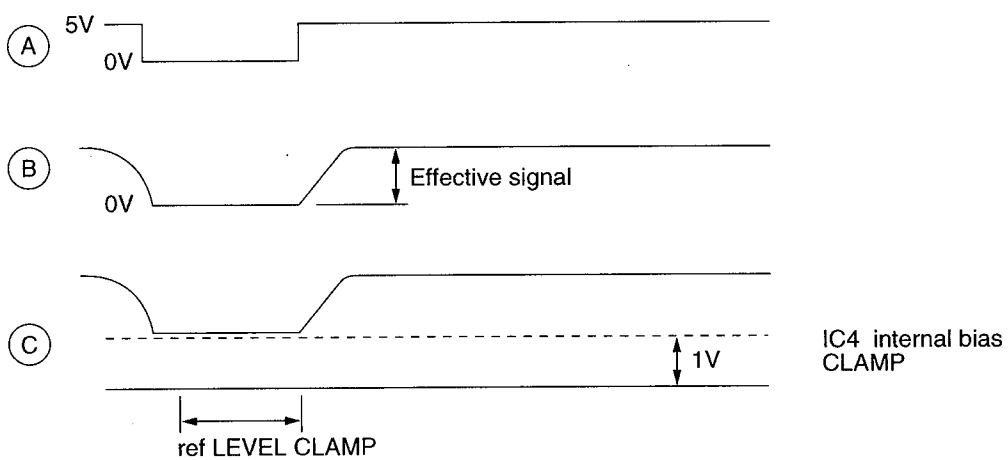
The thermistor changes the resistor according to the temperature and uses the thermistor's characteristics.
The output of pin 153 of IC4 becomes a low level.
Then when it becomes a high level, it triggers point Ⓐ .
In point Ⓒ ,according to the voltage output time, the thermal head's temperature is detected.

After the thermal head temperature is converted to voltage in Ⓑ,it is then changed to digital data in the A/D converter inside IC4. The CPU decides the strobe width of the thermal head according to this value. Therefore, this circuit can keep the thermal head at an even temperature in order to stabilize the printing density and prevent the head from being overheated.

Circuit Diagram



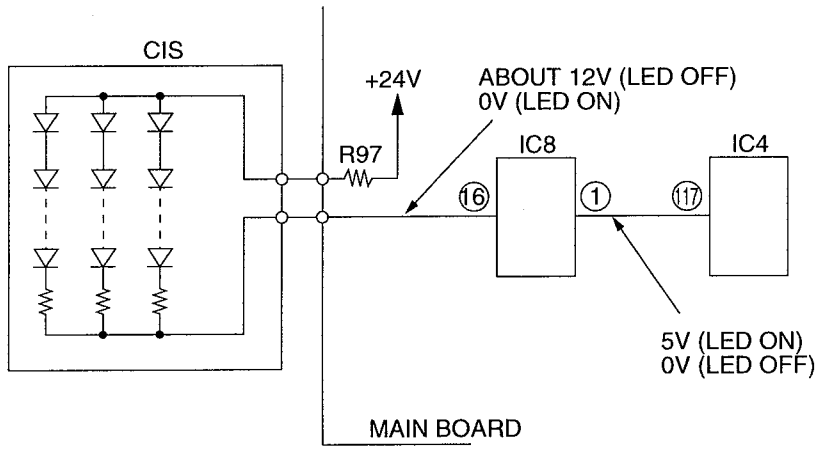
Timing Chart



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.

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.

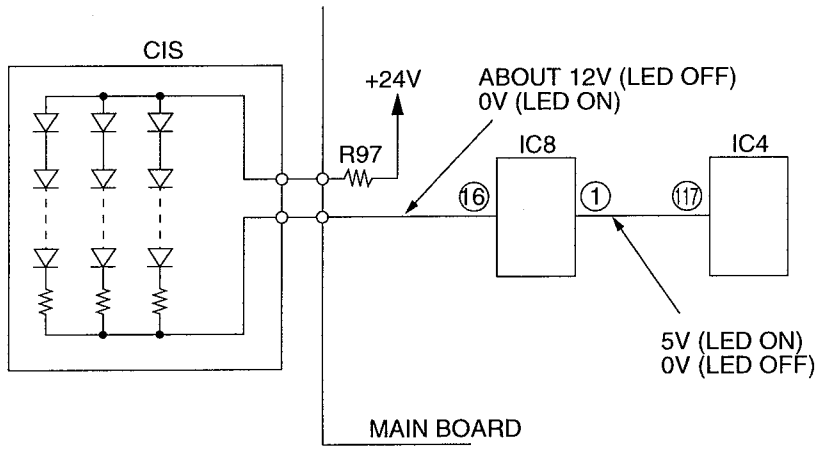
Reception

(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).

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.

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.

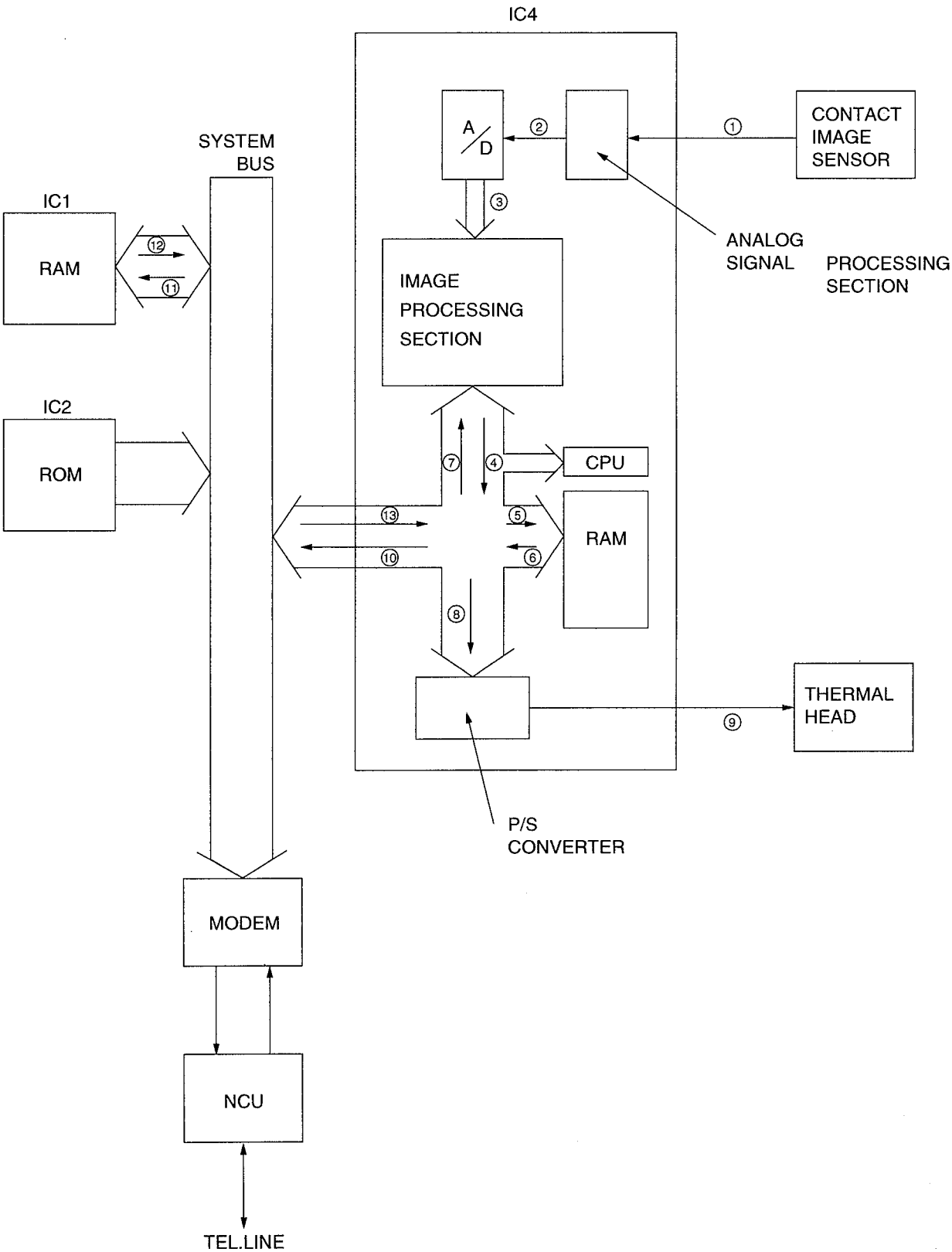
Transmission

(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

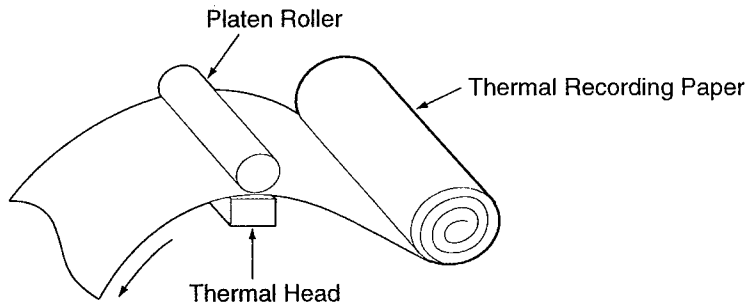


4-2. THERMAL HEAD

(1) Function

This unit utilizes 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 momentarily, 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)

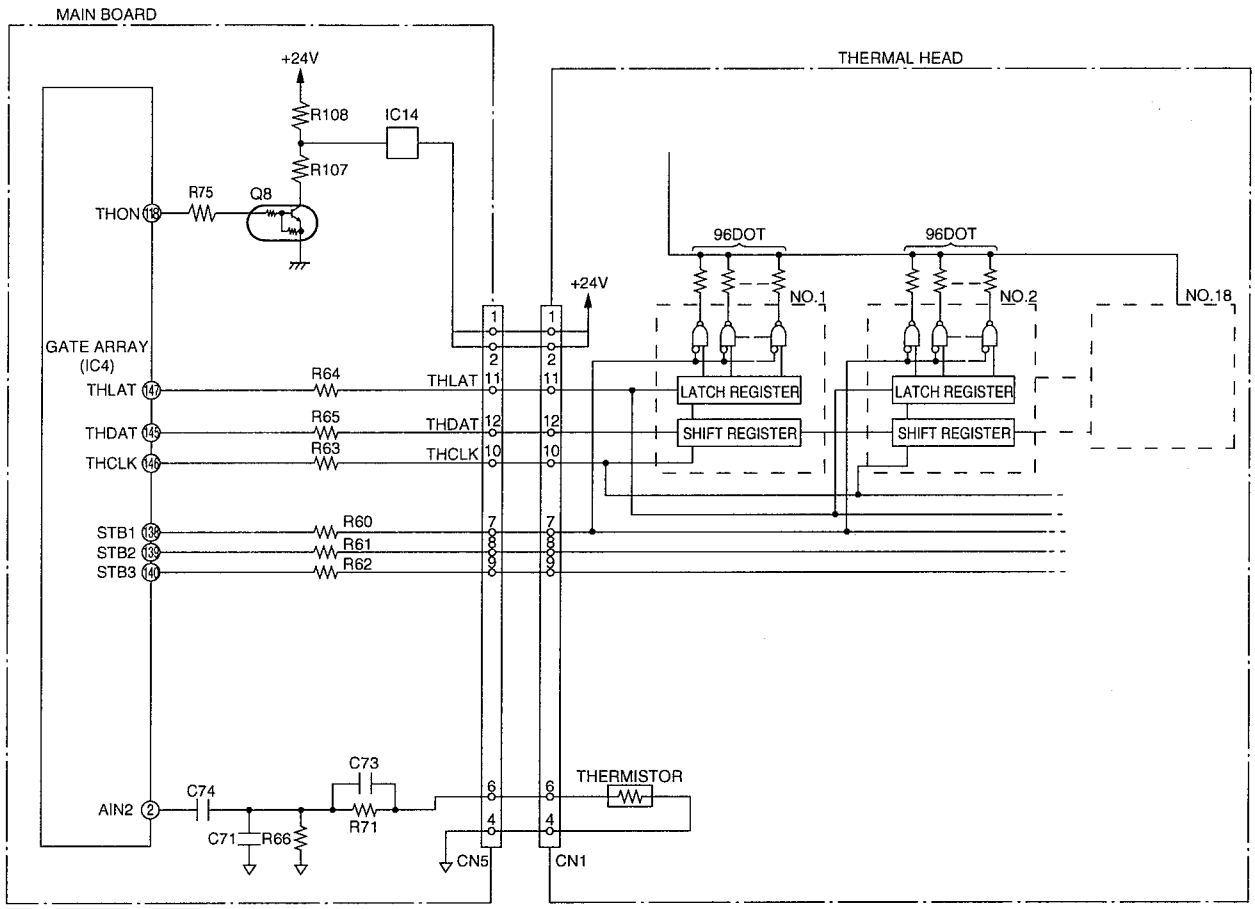


(2) Circuit Operation

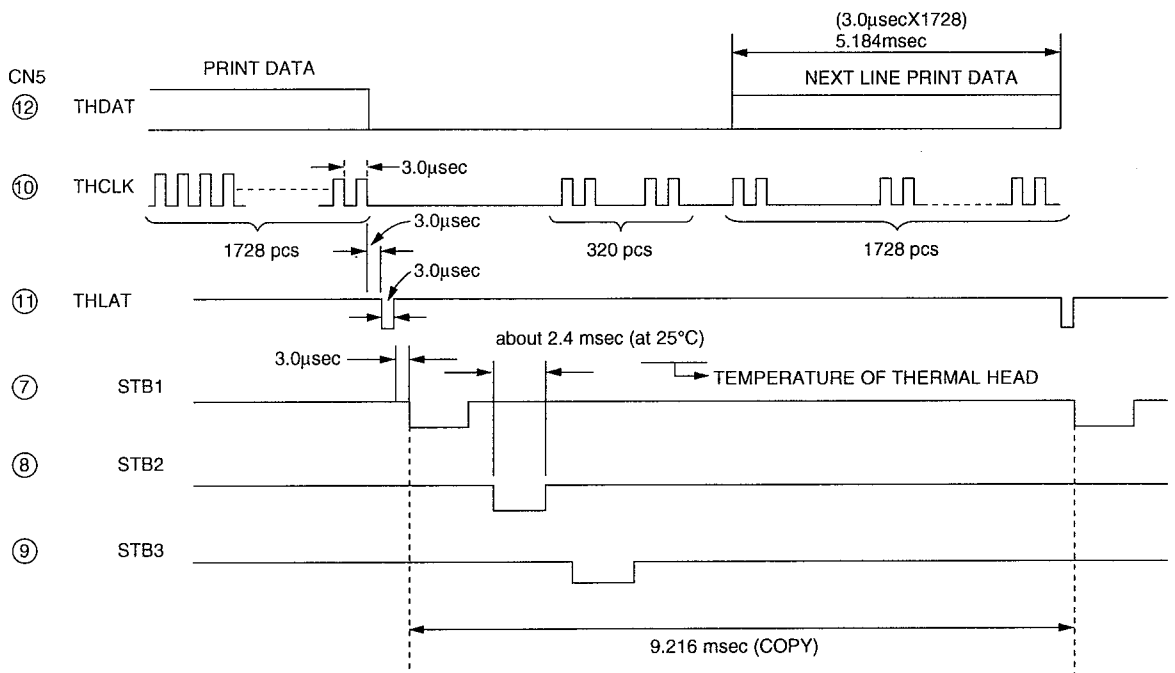
There are 18 driver ICs aligned horizontally on the thermal head and each one of these ICs can drive 96 heat emitting registers. This means that one line is at a density of 96×18=1728 dots=(8 dots/mm).
White/Black (white=0, black=1) data in one line increments is synchronized at IC4 pin 146 (THCLK), 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 (118, THON) becomes low, Q8 turns OFF, IC14 turns OFF, and the +24 V power supply for the thermal head driver is not impressed to protect the IC.

Circuit Diagram



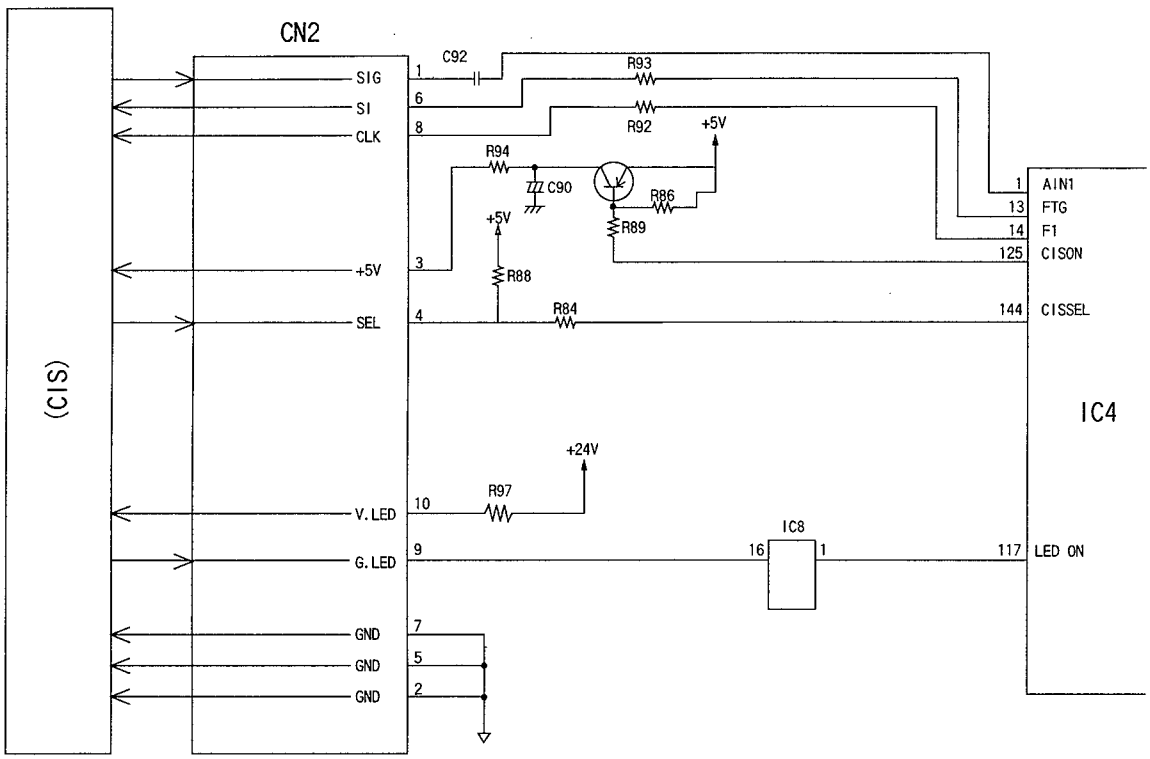
Timing Chart



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, and photoelectric conversion elements.

Circuit Diagram



When an original 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 Q11 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 (AIN). The analog image signal is input to the system LSI (IC4) on ANA1 (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

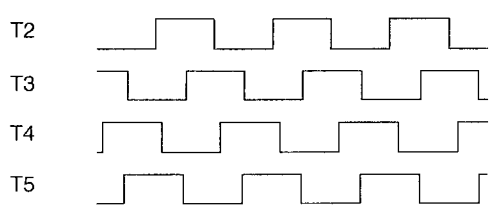
(1) Function

One individual stepping motor is used for transmission and reception. It feeds the document or recording paper synchronized for reading or printing.

(2) Circuit Operation

During motor drive, gate array IC4 pin 130 becomes a high level, and Q7 go ON as a result. +24 V is supplied to the motor coil. Stepping pulses are output from gate array 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 below.

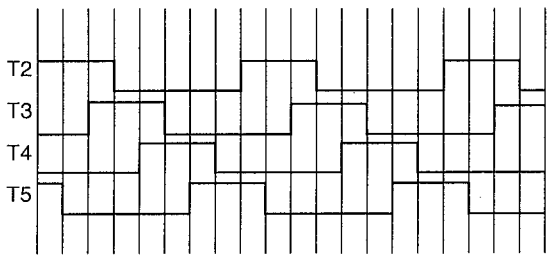
Timing Chart (2 Phase)



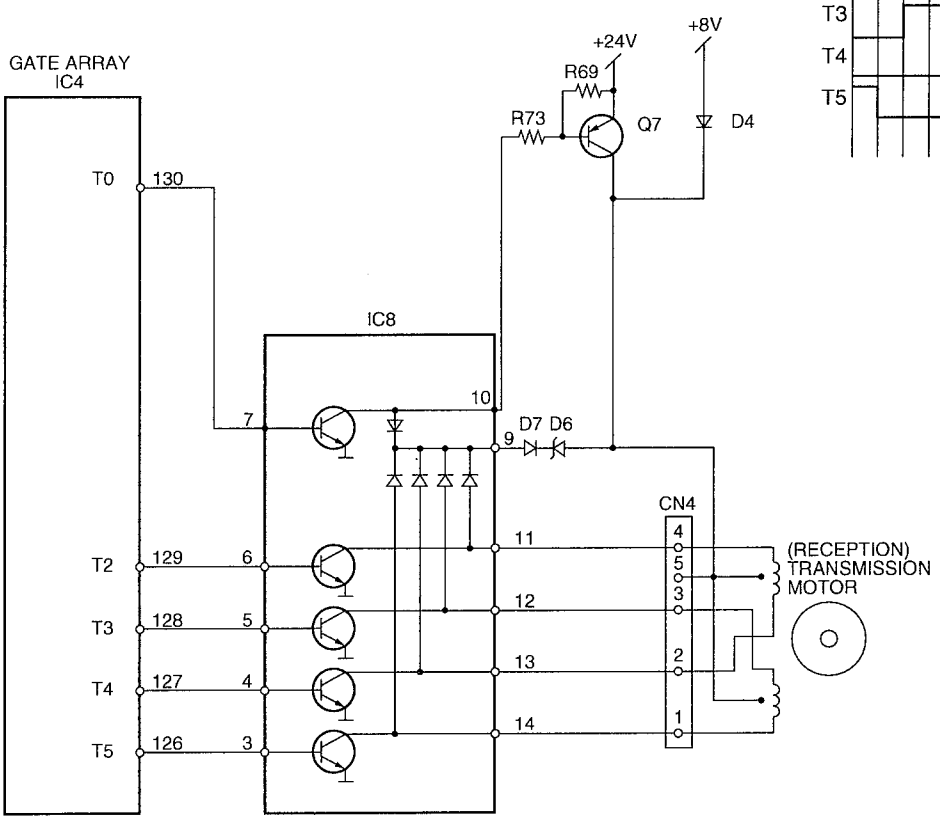
Stepping Motor Phase Pattern

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 T2-T5, output)



Circuit Diagram



When the motor is OFF, gate array IC4 pin 130 becomes a low level and Q7 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 unit has one driver motor mechanism for copying, printing a received FAX, and reading a document.

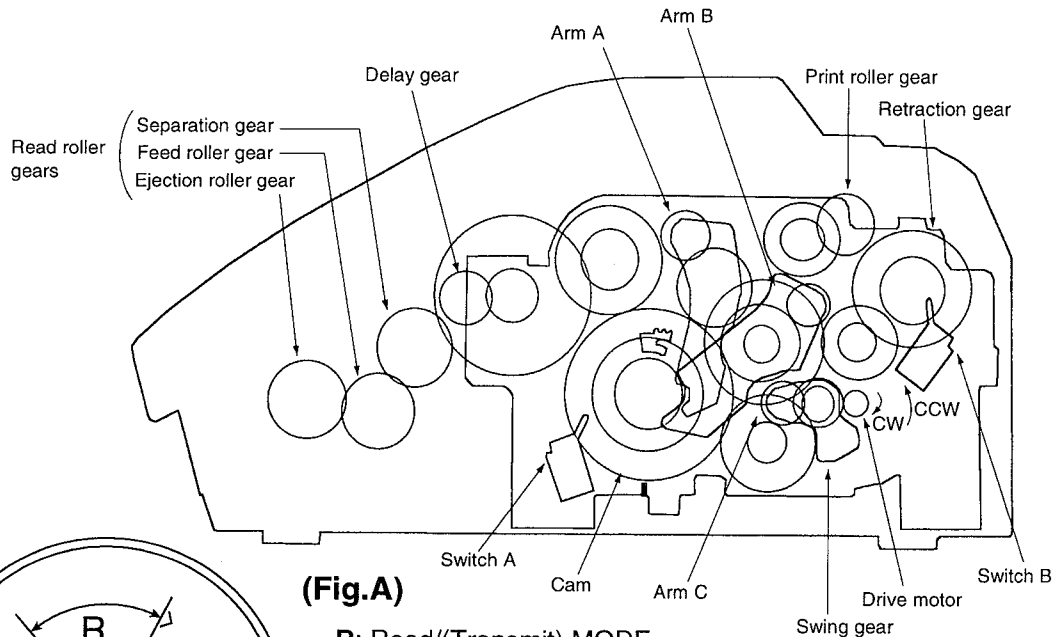
(2) Operation

The gear block has a cam which selects the mode of the area to be moved by the driver motor.
The cam has 4 positions (R,C,P,RP) which are decided by the mode as follows.
R: The read mode transmits a FAX. It reads the document.
C: The retraction mode determines the correct paper length to pull back the recording paper before printing out.
P: The print mode receives a FAX. It prints out the document.
RP: The Read/Print mode is the copy mode.

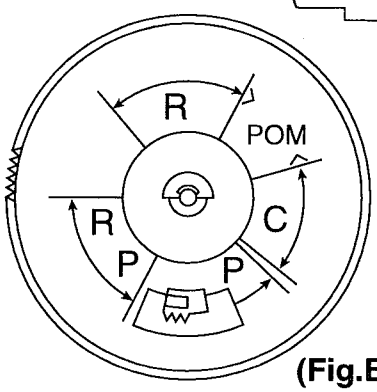
(3) Movements

Before explaining each of the movements, the gear block parts are explained below.

Item	Function	Remarks
Arm C	This arm is for transmitting the power of the motor to each gear, such as the read roller gears or printing gear.	
Arm B	When the cam is in the P or RP position,this arm connects to the section for the print roller gear. When in the C position, this gear connects the retraction gear. The other mode is not connected.	**Fig.A**
Arm A	When the cam is in the R or RP position, this arm connects to the read roller gear section. The other modes are not connected.	**Fig.A**
Read roller gears	These gears are connected to the rollers for feeding the document.	
Print roller gear	This gear is connected to the platen for feeding the recording paper.	
Retraction gear	This gear is connected to the platen roller to pull back the recording paper.	
CAM	This cam is for changing the mode. For example, the read mode or print mode.	**Fig.B**
Swing gear	This gear is swung by the rotation of the driver motor. When counterclockwise(CCW), the direction of this gear drives the gear for each roller.When clockwise(CW), it moves the cam determined by the motor power.	
Driver motor	This is for the driver.	
SW Switch 1	This is for recognizing the position of the cam.	**Refer to page 126.**
SW Switch 2	This is for recognizing the position of the retraction gear.	



(Fig.A)

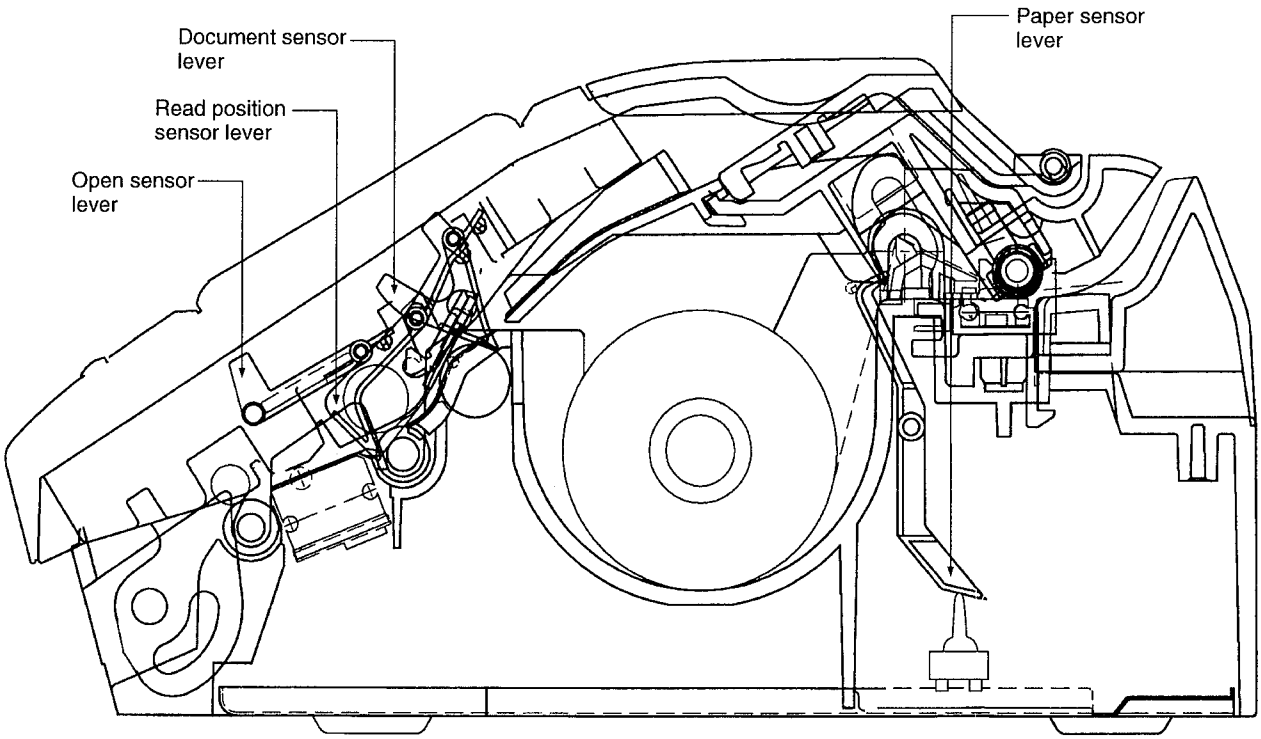


(Fig.B)

R: Read/(Transmit) MODE
C: Retraction operation/(Reverse) MODE
P: Print/Receive MODE
RP: Read, Print/(Copy) MODE

An explanation of each mode is shown on the next page.

Operation divisions according to the cam positions

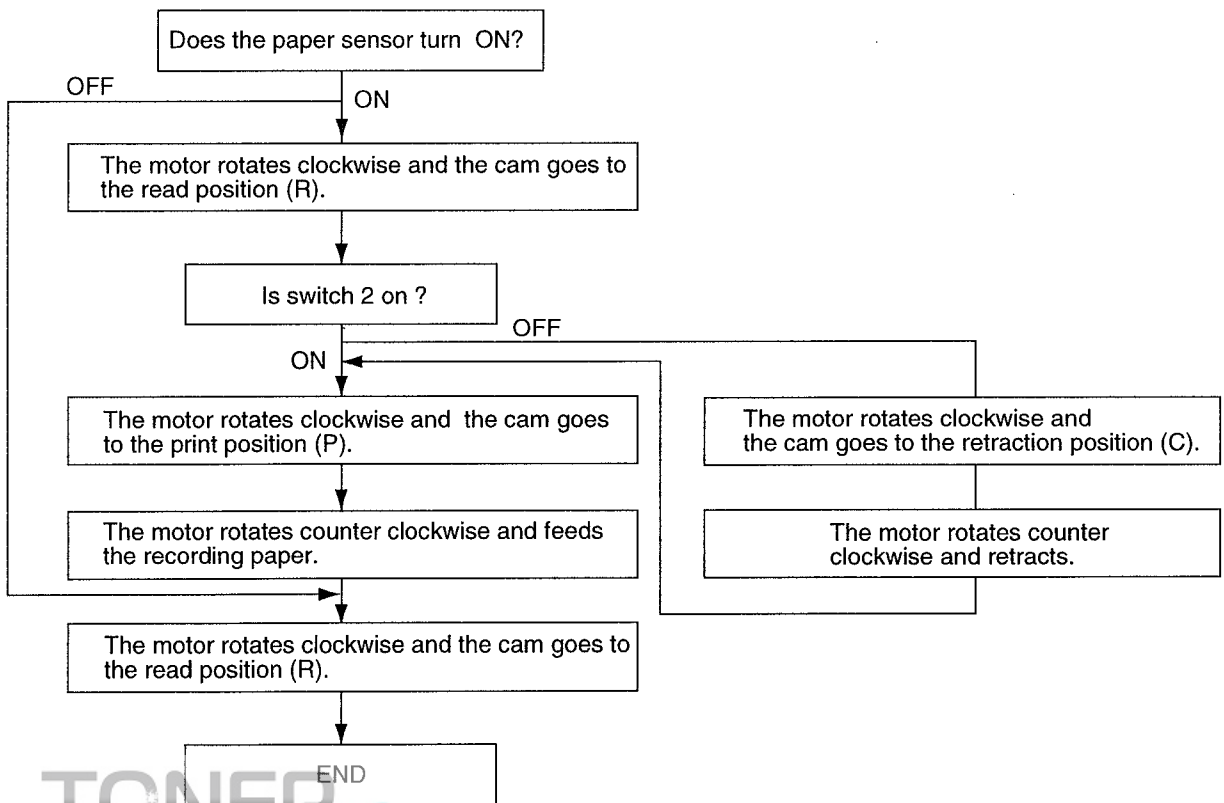


• For the sensor operation, refer to the Sensor and SW Section.
(See page 125.)

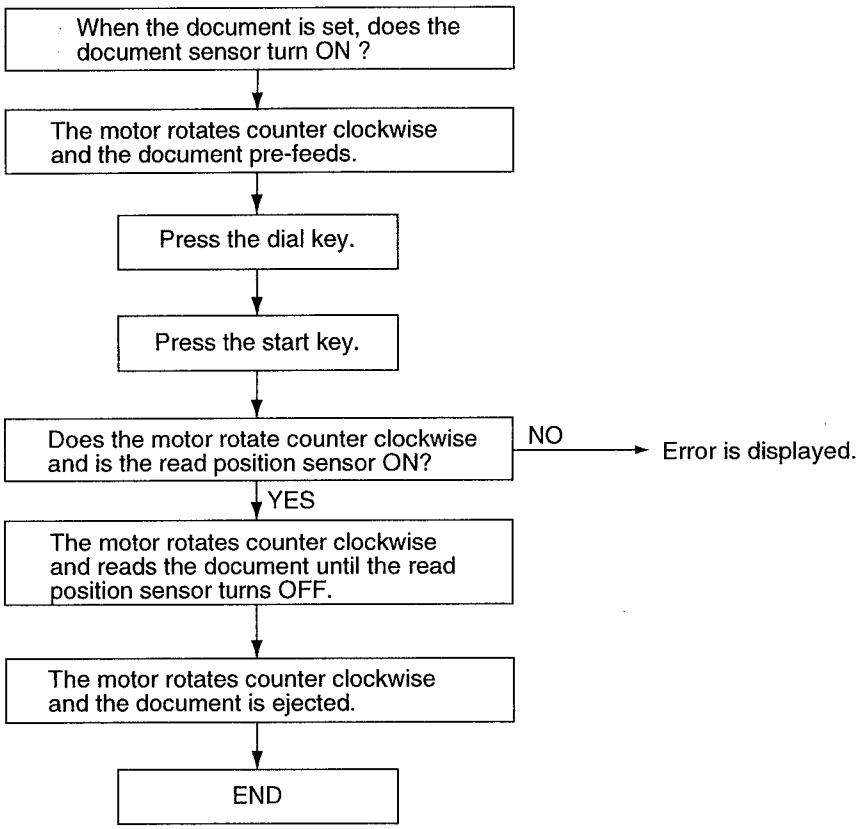
(3)-1 Idle mode

After turning on the unit, the position of each gear, SW and cam are as shown in Fig.A.

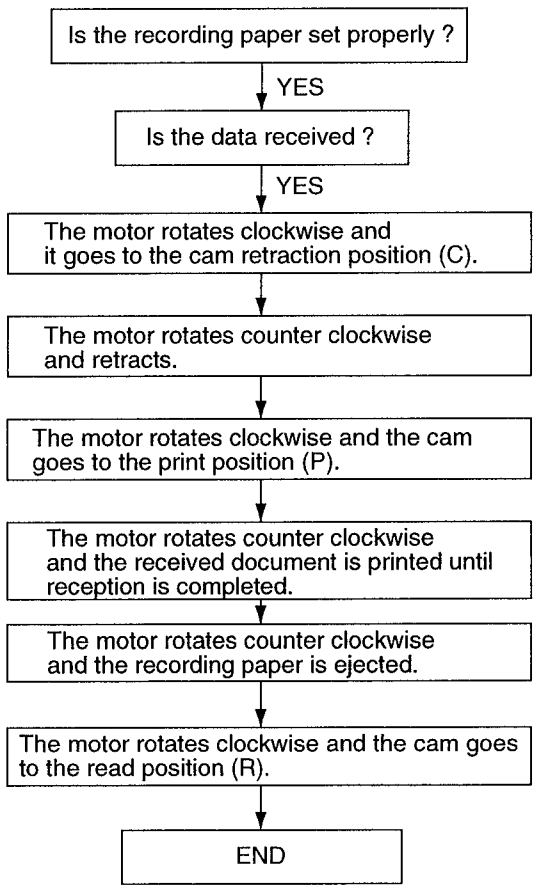
The unit will operate as follows:



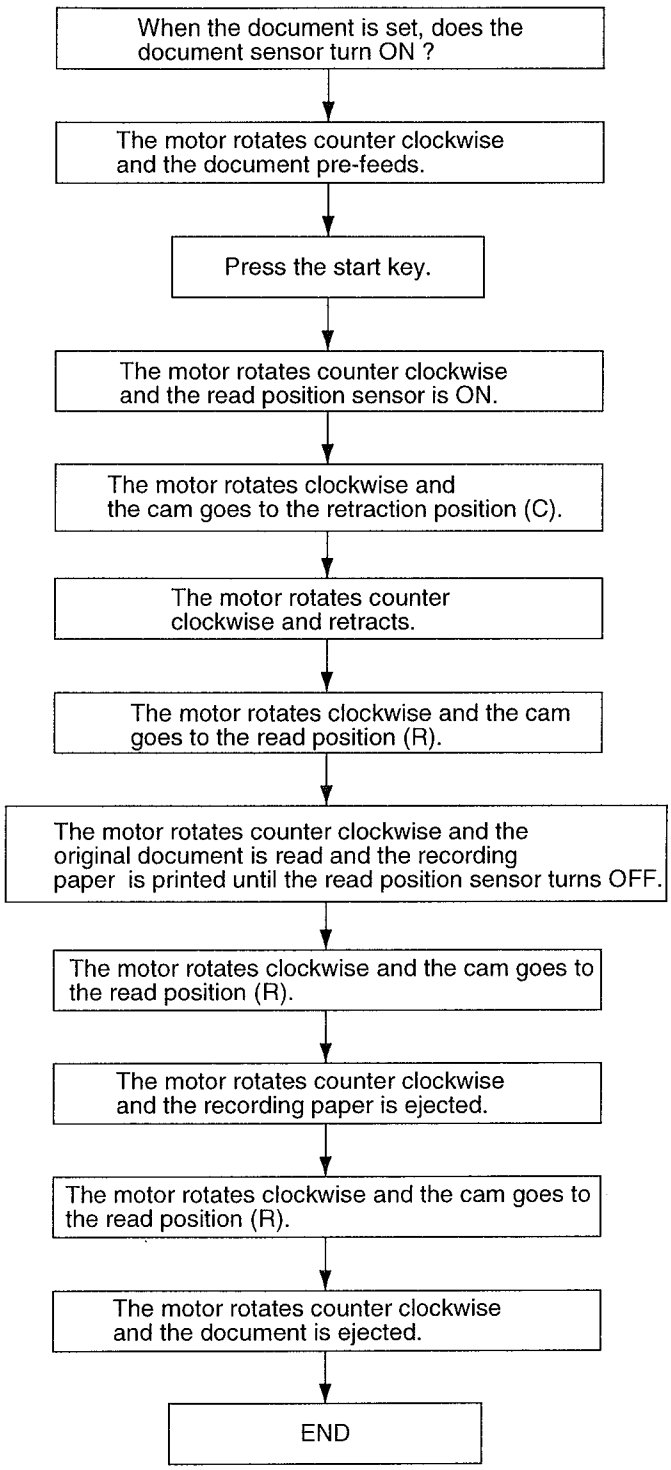
(3)-2 Recording paper



(3)-3 Printing



(3)-4 Copying



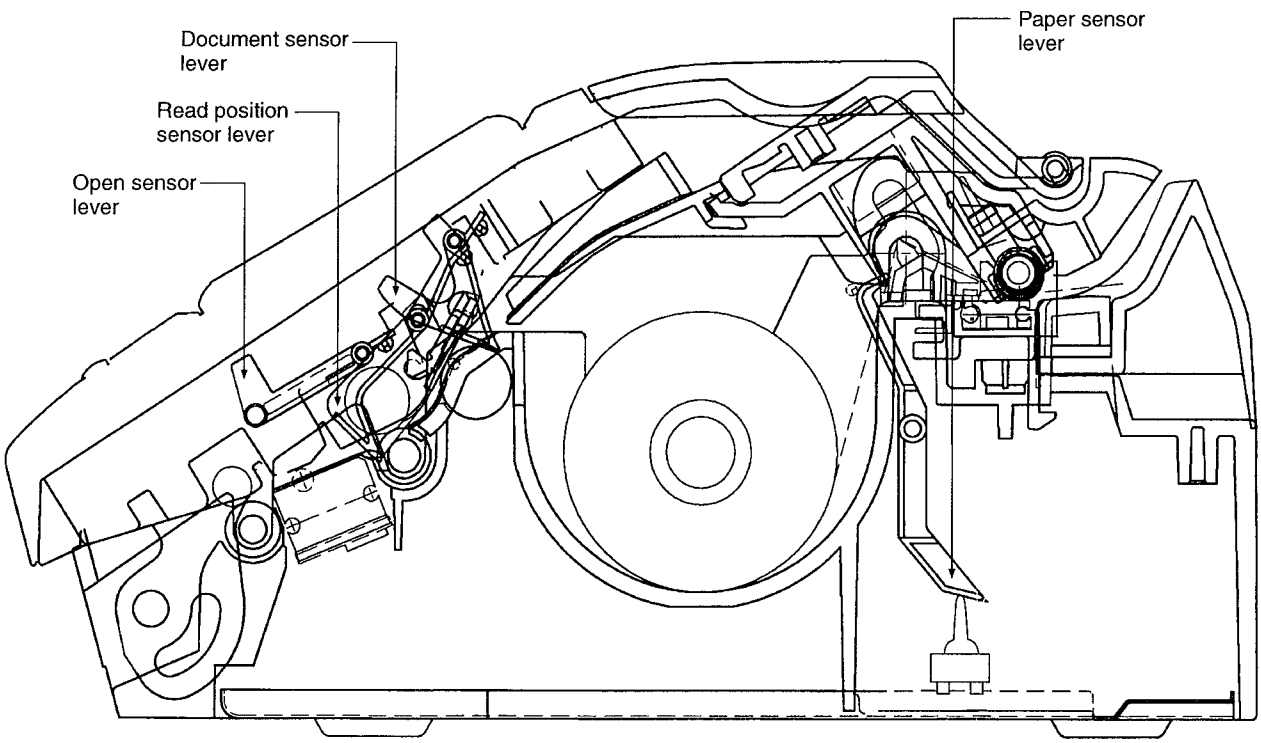
4.6 SENSORS AND SWITCHES

All of the sensor and switches are shown below.

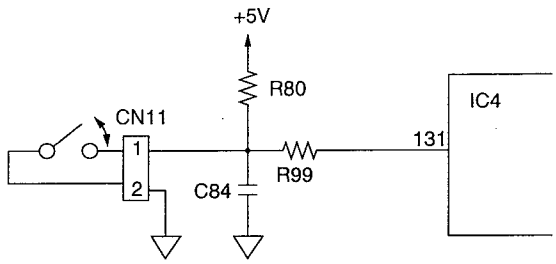
Sensor Circuit Location	Sensor	Sensor or Switch name	Mainly LCD Error Sensor error message
Operation Panel	PS2	Document Read Position	「REMOVE DOCUMENT」
	PS1	Document	「CHECK DOCUMENT」
	PS3	Cover Open	「CHECK COVER」
Analog PCB	SW3	Paper Set	「OUT OF PAPER」

※ See the TEST FUNCTION - SENSOR CHECK SECTION for the sensor test.
(#815 of Service Mode test Refer to page 88.)

Sensor Locations



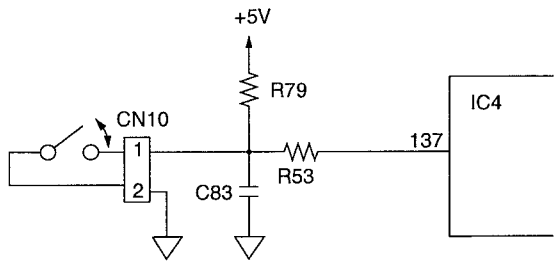
[Motor Position Sensor (SW2)]



Digital Board

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

[Motor Position Sensor (SW1)]

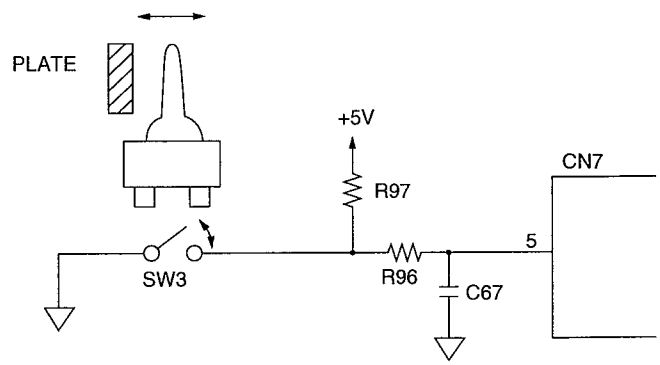


Digital Board

	Signal (IC4-137 Pin)
Home position	Low level
Other	High 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 5 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 5 of CN7 (Analog board) becomes a low level.

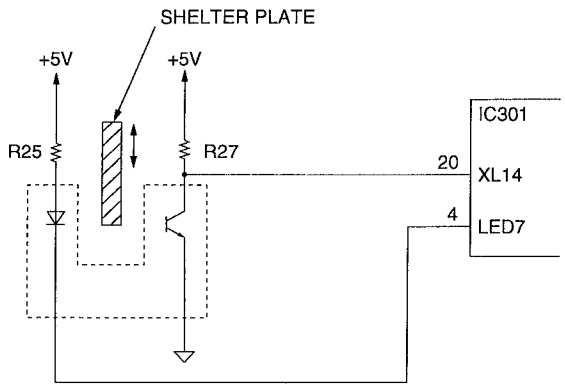


Analog Board

	Signal (CN7-5 Pin)
Paper	High level
No paper	Low level

[Read Position Sensor (PS2)]

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).

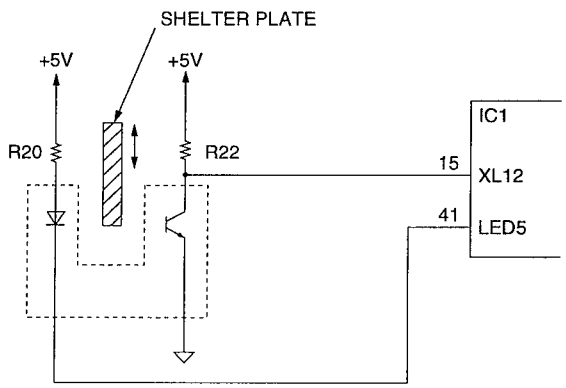


Operation Board

	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 passes the sensor light, 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.)

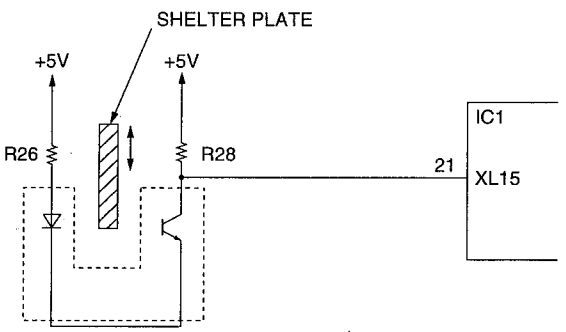


Operation Board

	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.

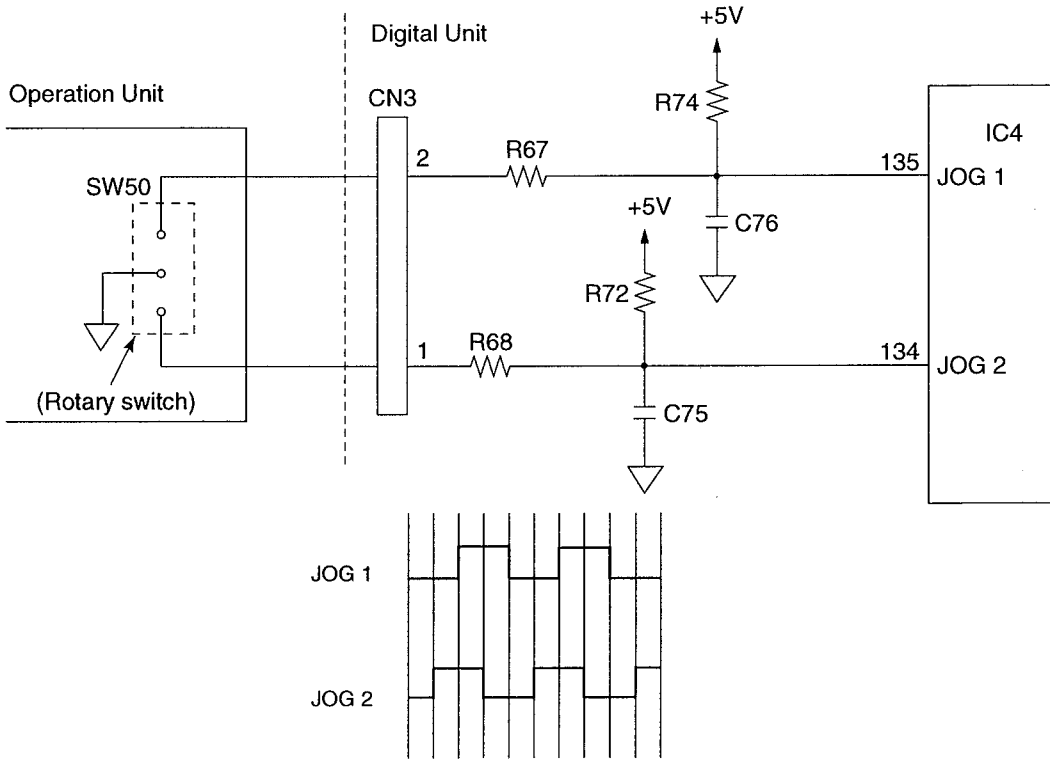


Operation Board

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

[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

5. MODEM SECTION

5-1. FUNCTION

The unit uses a 1 chip modem (IC11), enabling it to act as an interface between the control section for FAX sending and receiving, and the telephone line. During a sending operation, the digital image signals are modulated and sent to the telephone line. During a receiving operation, the analog image signals which are received via the telephone line are demodulated and converted into digital image signals. The communication format and procedures for FAX communication are standardized by ITU-T. This 1 chip modem (IC11) has hardware which sends and detects all of the necessary signals for FAX communication and DTMF.
It can be controlled by writing commands from the ASIC (IC1) to the register in the modem (IC11).
This modem (IC11) also sends DTMF signals, generates a call tone (from the speaker), and detects busy tones, dial tones and DTMF.

Overview of Facsimile Communication Procedures (ITU-T Recommendation):

(1) ON ITU-T (International Telecommunications' Union.)

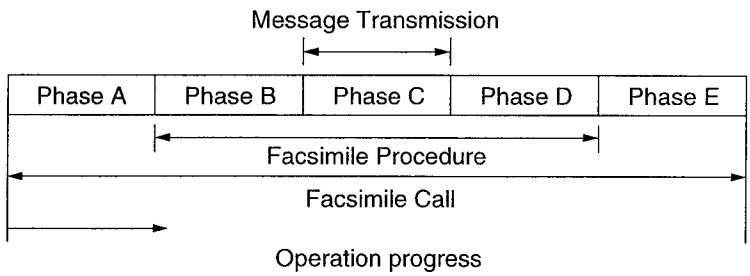
The No. XIV Group of ITU-T, one of the four permanent organizations of the International Telecommunications Union (ITU), investigates and make recommendations on international standards for facsimiles.

(2) Definition of Each Group

- Group I (G1)
  A-4 size documents without using formats which reduce the band width of a signal sent over telephone lines.
  Determined in 1968.
  Transmission for about 6 minutes at scanning line density of 3.85 lines/mm.
- Group II (G2)
  Using reduction technology in the modulation/demodulation format, an A-4 size document is sent at an official scanning line density of 3.85 lines/mm for about 3 minutes.
  Methods to suppress redundancy are not used.
  Determined in 1976.
- Group III (G3)
  A method of suppressing redundancy in the image signal prior to modulation is used. An A-4 size document is sent within about one minute.
  Determined in 1980.
- Group IV (G4)
  Transmission is via the data network. A method is provided for suppressing redundancy in signals prior to transmission, and error-free reception of transmission is possible.
  The scope of these facsimile applications is not limited simply to transmission of written statements. Through symbiotic linkages with other communication methods, it can be expected to expand to include integrated services.

(3) Facsimile Call Time Series

As shown in the following diagram, the facsimile call time series is divided into five phases.



Phase A : Call setting
Call setting can be manual/automatic.
Phase B : Pre-message procedure
Phase B is a pre-processing procedure and sequence for confirming the status of the terminal, transmission route, etc. and for terminal control. It implements the terminal preparation status, determines and displays terminal constants, confirms synchronization status, etc. and prepares for transmission of facsimile messages.
Phase C : Message transmission
Phase C is the procedure for transmitting facsimile messages.
Phase D : Post message procedure
Phase D is the procedure for confirming that the message is completed and received. For continuous transmission, phase B or phase C are repeated for transmission.
Phase E : Call retrieval
Phase E is the procedure for call retrieval, that is for circuit disconnection.

(4) Concerning Transmission Time

Transmission Time = Control Time + Image Transmission Time + Hold Time

Transmission time consists of the following.

Control time : This is time at the start of transmission when the functions at the sending and receiving sides are confirmed, the transmission mode is established, and transmission and reception are synchronized.

Image transmission time: This is the time required for the transmission of document contents (image data). In general, this time is recorded in the catalog, etc.

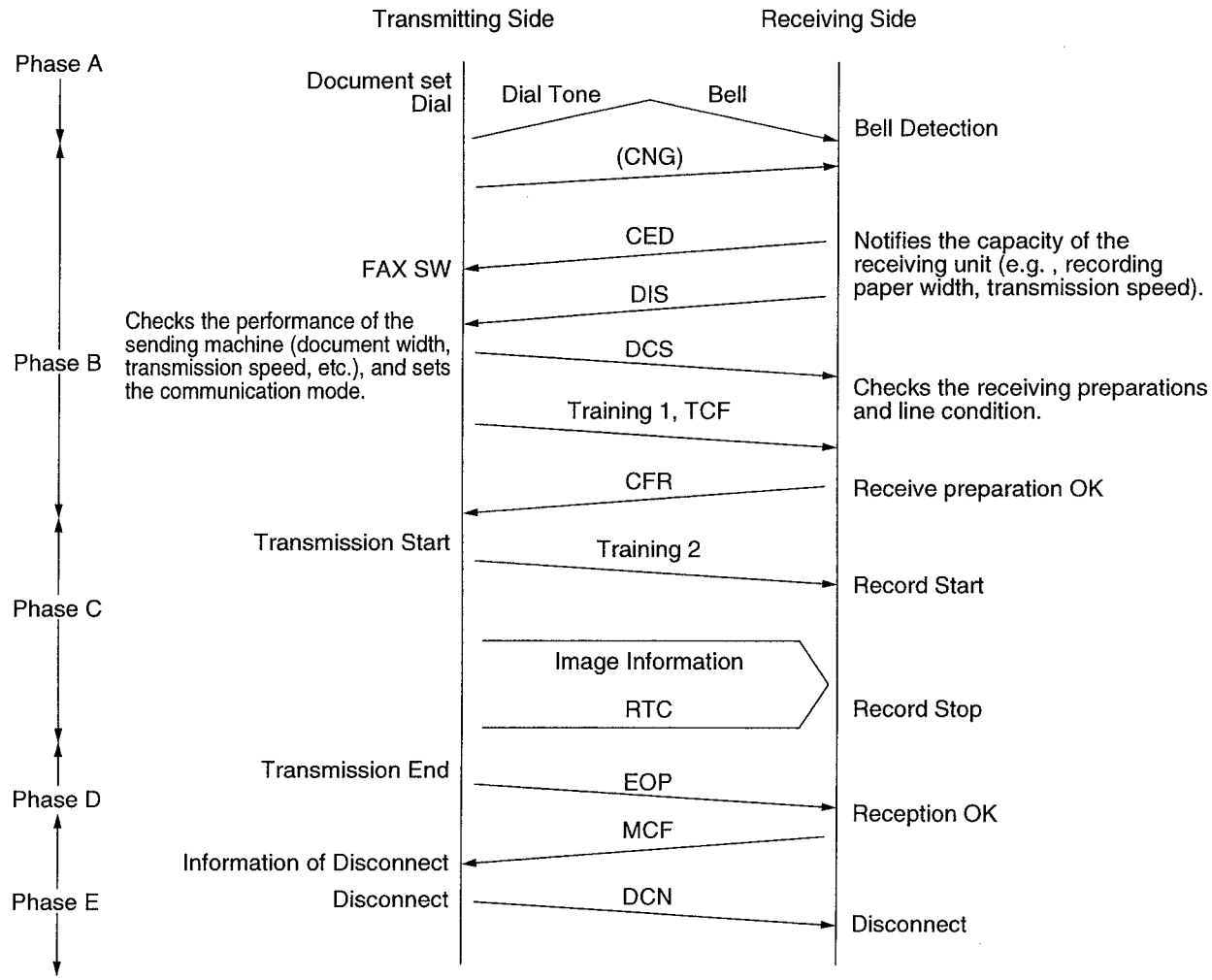
Hold time: This is the time required after the document contents have been sent to confirm that the document was in fact sent, and to check for telephone reservations and/or the existence of continuous transmission.

(5) Facsimile Standards

Item	Telephone Network Facsimile
	G3 Machine
Connection Control Mode	Telephone Network Signal Mode
Terminal Control Mode	T. 30 Binary
Facsimile Signal Format	Digital
Modulation Mode	PSK (V. 27 ter) or QAM (V. 29)
Transmission Speed	300 bps (control Signal) 2400, 4800, 7200, 9600 bps (FAX Signal)
Redundancy Compression Process (Coding Mode)	1 dimension : MH Mode 2 dimension : MR Mode (K=2.4)
Resolution	Main Scan : 8 pel/mm Sub Scan : 3.85, 7.7l/mm
Line Synchronization Signal	EOL Signal
1 Line Transmission Time [ms/line]	Depends on the degree of data reduction. Minimum Value : 10, 20 Can be recognized in 40ms.

(6) Explanation of Technology

① G3 Communication Signals (T. 30 Binary Process)
For G3 facsimile communication, this is the procedure for exchanging control signals between the sending and receiving machines both before and after transmission of image signals.
Control signals at 300 bps FSK are: 1850 Hz...0, 1650Hz...1.
An example of the binary process in G3 communication is shown below.



Explanation of Signals
Control signals are comprised mainly of 8-bit identification signals and of the data signals added to them. Data signals are added to DIS and DCS signals.

Signal.....DIS (Digital Identification Signal)

Identification Signal Format.....00000001

Function:
Notifies the capacity of the receiving unit.
The added data signals are as follows.

(Example)

Bit No.	DIS/DTC	DCS
1	Transmitter - T. 2 operation	
2	Receiver - T. 2 operation	Receiver - T. 2 operation
3	T.2 IOC = 176	T. 2 IOC = 176
4	Transmitter - T. 3 operation	
5	Receiver - T. 3 operation	Receiver - T. 3 operation
6	Reserved for future T. 3 operation features.	

Bit No.	DIS/DTC	DCS
7	Reserved for future T.3 operation features.	
8	Reserved for future T.3 operation features.	
9	Transmitter - T.4 operation	
10	Receiver - T.4 operation	Receiver - T.4 operation
11, 12	Data signaling rate	Data signaling rate
(0, 0)	V.27 ter fallback mode	2400 bit/s V.27 ter
(0, 1)	V.27 ter	4800 bit/s V.27 ter
(1, 0)	V.29	9600 bit/s V.29
(1, 1)	V.27 ter and V.29	7200 bit/s V.29
13	Reserved for the new modulation system.	
14	Reserved for the new modulation system.	
15	Vertical resolution = 7.7 line/mm	Vertical resolution = 7.7 line/mm
16	Two-dimensional coding capability	Two-dimensional coding
17, 18	Recording width capabilities	Recording width
(0, 0)	1728 picture elements along a scan line length of 215 mm ± 1%	1728 picture elements along a scan line length of 215 mm ± 1%
(0, 1)	1728 picture elements along a scan line length of 215 mm ± 1% and 2048 picture elements along a scan line length of 255 mm ± 1% and 2432 picture elements along a scan line length of 303 mm ± 1%	2432 picture elements along a scan line length of 303 mm ± 1%
(1, 0)	1728 picture elements along a scan line length of 215 mm ± 1% and 2048 picture elements along a scan line length of 255 mm ± 1%	2048 picture elements along scan line length of 255 mm ± 1%
(1, 1)	Invalid (See Note 7.)	Invalid
19, 20	Maximum recording length capability	Maximum recording length
(0, 0)	A4 (297 mm)	A4 (297 mm)
(0, 1)	Unlimited	Unlimited
(1, 0)	A4 (297 mm) and B4 (364 mm)	B4 (364 mm)
(1, 1)	Invalid	Invalid

Signal.....DCS (Digital Command Signal)

Identification Signal Format.....X1000001

(Example)

Function:
Notifies the capacity of the receiving machine obtained at DIS and announces the transmission mode of the sender. The added data signals are as follows.

Bit No.	DIS/DTC	Standard setting	DCS
21, 22, 23	Minimum scan line time capability of the receiver		Minimum scan line time
(0, 0, 0)	20 ms at 3.851/mm: T7.7=T3.85		20 ms
(0, 0, 1)	40 ms at 3.851/mm: T7.7=T3.85		40 ms
(0, 1, 0)	10 ms at 3.851/mm: T7.7=T3.85		10ms
(1, 0, 0)	5 ms at 3.851/mm: T7.7=T3.85		5ms
(0, 1, 1)	10 ms at 3.851/mm: T7.7=1/2 T3.85		
(1, 1, 0)	20 ms at 3.851/mm: T7.7=1/2 T3.85		
(1, 0, 1)	40 ms at 3.851/mm: T7.7=1/2 T3.85		
(1, 1, 1)	0 ms at 3.851/mm: T7.7=T3.85		0ms

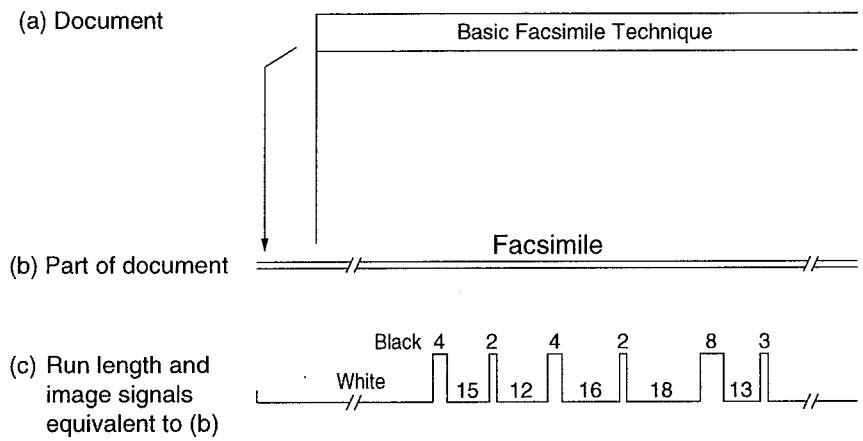
Bit No.	DIS/DTC	Standard setting	DCS
24	Extend field	1	Extend field
25	2400 bit/s handshaking	0	2400 bit/s handshaking
26	Uncompressed mode	0	Uncompressed mode
27	Error correction mode	0	Error correction mode
28	Set to "0"	0	Frame size 0 = 256 octets 1 = 64 octets
29	Error limiting mode	0	Error limiting mode
30	Reserved for G4 capability on PSTN	0	Reserved for G4 capability on PSTN
31	Unassigned	0	
32	Extend field	1	Extend field
33 (0) (1)	Validity of bits 17,18 Bits 17,18 are valid Bits 17,18 are invalid	0	Recording width Recording width indicated by bits 17,18 Recording width indicated by this field bit information
34	Recording width capability of 1216 picture elements along a scan line length of 151 mm ± 1%	0	Middle 1216 elements of 1728 picture elements
35	Recording width capability of 864 picture elements along a scan line length of 107 mm ± 1%	0	Middle 864 elements of 1728 picture elements
36	Recording width capability of 1728 picture elements along a scan line length of 151 mm ± 1%	0	Invalid
37	Recording width capability of 1728 picture elements along a scan line length of 107 mm ± 1%	0	Invalid
38	Reserved for future recording width capabilities.	0	
39	Reserved for future recording width capabilities.	0	
40	Extend field	1	Extend field
41	Semi super time / mm	1	
42	Semi super time / inch	0	
43	Super time	0	
44	inch	0	
45	mm	1	
46	MSC/SF	0	
47	Select polling	0	
48	EXT	0	

Note 1 - Standard facsimile units conforming to T.2 must have the following capability : Index of cooperation (IOC)=264.
Note 2 - Standard facsimile units conforming to T.3 must have the following capability : Index of cooperation (IOC)=264.
Note 1 - Standard facsimile units conforming to T.4 must have the following capability : Paper length=297 mm.

Signal	Identification Signal Format	Function
Training 1	————	A fixed pattern is transmitted to the receiving side at a speed (2400 to 9600 bps) designated by DCS, and the receiving side optimizes the automatic equalizer, etc., according to this signal.
TCF (Training Check)	————	Sends 0 continuously for 1.5 seconds at the same speed as the training signal.
CFR (Confirmation to Receive)	X0100001	Notifies the sending side that TCF has been properly received. If TCF is not properly received, FTT (Failure To Train) X0100010 is relayed to the sender. The sender then reduces the transmission speed by one stage and initiates training once again.
Training 2	————	Used for reconfirming the receiving side like training 1.

Signal	Identification Signal Format	Function
Image Signal	Refer to the next page.	————
RTC (Return to Control)	————	Sends 12 bits (0...01 × 6 times) to the receiver at the same speed as the image signal and notifies completion of the first sheet.
EOP (End of Procedure)	X1110100	End of one communication
MCF (Message Confirmation)	X0110001	End of 1 page reception
DCN (Disconnect)	X1011111	Phase E starts.
MPS (Multi-Page Signal)	X1110010	Completion of transmission of 1 page. If there are still more documents to be sent, they are output instead of EOP. After MCF reception, the sender transmits an image signal of the second sheet.
PRI-EOP (Procedural Interrupt-EOP)	X1111100	If there is an operator call from the sender, it is output after RTC.
PIP (Procedural Interrupt Positive)	X0110101	This is output when an operator call is received.

② Redundancy Compression Process Coding Mode
This unit uses one-dimensional MH format.



Modified Huffman (MH) Code		
Run length	Code for White Line	Code for Black Line
0	00110101	000011011
1	000111	010
2	0111	11
3	1000	10
4	1011	011
5	1100	0011
6	1110	0010
7	1111	00011
8	10011	000101
9	10100	000100
10	00111	0000100
11	01000	0000101
12	001000	0000111
13	000011	00000100
14	110100	00000111
15	110101	000011000
16	101010	0000010111
17	101011	0000011000
18	0100111	0000001000

(d) Codification of (c) according to MH formula

00110111101010 (White 400) 011 (Black 4) 110101 (White 15) 11 (Black 2) 001000 (White 12) 011 (Black 4) 101010 (White 16)

11 (Black 2) 0100111 (White 18) 000101 (Black 8) 000011 (White 13) 10 (Black 3)

(c) Total bit number before MH codification (497 bit)
(d) Total bit number after MH codification (63 bit)

5-2.MODEM CIRCUIT OPERATION

The modem (IC5) has all the hardware satisfying the ITU-T standards mentioned previously.
When the gate array IC4 (52) is brought to a low level, the modem (IC5) is chip-selected and the resistors inside IC are selected by the select signals from ASIC (IC4) A0-A4. The commands are written through the data bus, and all the processing is controlled by the ASIC (IC4) according to ITU-T procedures. The $\overline{INT}$ signal dispatched from $\overline{IRQ}$ (pin 2 of IC5) to ASIC (IC4) when the transmission data is accepted and the received data is demodulated, the ASIC (IC4) implements post processing.This modem (IC5) has an automatic application equalizer. With training signal 1 or 2 during G3 reception, it can automatically establish the optimum equalizer. The modem (IC5) operates using the 24.00014 MHz clock obtained from pin 62 of ASIC (IC4).

(1) Facsimile Transmission/DTMF Line Send

The digital image data on the data bus is modulated in the modem (IC5), and sent from pin 44 via amplifier IC12 (6 → 7), IC6, and the NCU section to the telephone line.

[IC5 (44) → C47 → R42 → IC12(6-7) → C60 → IC6(2-1) → CN6(7)] → CN6(7) → C23 → R31 → IC2(6-7) → C13 → R23 → R22 → T1 → TEL LINE.

[ ] : Digital section

(2) Facsimile Reception

The analog image data which is received from the telephone line passes through the NCU section and enters pin 45 of the modem (IC5). The signals that enter pin 45 of the modem (IC5) are demodulated in the board to digital image signals, then placed on the data bus.
In this case, the image signals from the telephone line are transmitted serially. Hence, they are placed on the bus in 8 bit units. Here, the internal equalizer circuit reduces the image signals to a long-distance receiving level.
This is designed to correct the characteristics of the frequency band centered about 3 kHz and maintain a constant receiving sensitivity. It can be set in the service mode.

TEL.Line → T1 → R30 → C24 → R34 → IC2(2-1) → C30 → R37 → C90 → CN6(8) → [CN6(8) → IC6(11-10) → C64 → R49 → IC12(2-1) → C52 → R33 → IC5(45)]

[ ] : Digital section

(3) DTMF Transmission (Monitor tone)

The DTMF signal generated in the modem (IC5) is output from pin 44, and is then sent to the circuit on the same route as used for facsimile transmission.

(DTMF Monitor Tone)

IC5(44) → C47 →R42 → IC12(6-7) → C60 → IC7(3-4) → C62 → R51 → IC11(6-7) → C95 → R98 → IC4(38-37) → IC7(8-9) → C87 → R91 → IC11(3-1) → C89 → R87 → IC10(4-5) → CN9 → Speaker

(4) Call Tone Transmission

This is the call signal which is generated in the ASIC (IC4) and sent to the speaker.

IC4(35) → R35 → Q6 → R46 → C61 → R50 → IC11(6-7) → C95 → R98 → IC4(38-37) → IC7(8-9) → C87 → R91 → IC11(3-1) → C89 → R87 → IC10(4-5) → CN9 → Speaker Speaker

(5) Busy/Dial Tone Detection

The path is the same as FAX receiving. When it is detected, the carrier detect bit of the resistor in the modem (IC5) becomes 1, and this status is monitored by the ASIC (IC4).

6. EXPLANATION OF THE ANALOG SECTION BLOCK DIAGRAM

(1) Function

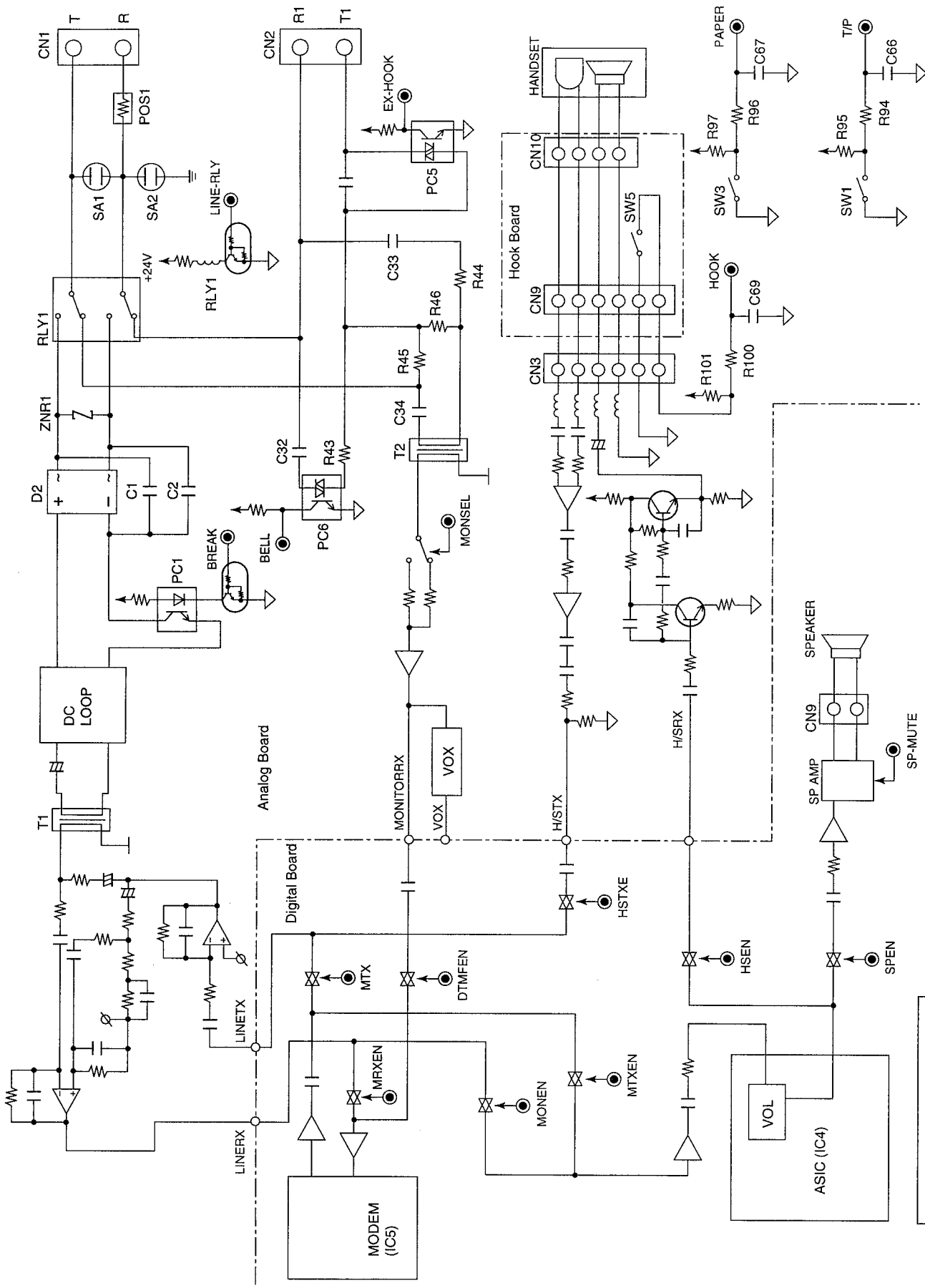
The analog section serves as an interface between the telephone line. The digital board (IC5) for transmission and reception of FAX signals, switches between the MODEM (IC5) and other sections by means of a multiplexer (IC6, 7) on the digital board. The control signals to the individual analog sections are output mainly from ASIC IC4, and the status information for the various sections is also held in ASIC IC4.
Simple explanations for the various sections are given below.

(2) Circuit Operation

[NCU Section]
This is the interface between the telephone line and external telephone. This is composed of a bell detection circuit, pulse dial generation circuit, EXT.TAM OFF-HOOK detect circuit, vox circuit, amplifier circuit for line transmission and reception, sidetone circuit, etc. See the next page for details.

[Modem (IC5)]
This is used for FAX signal tone modulation and DTMF signal transmission.
The DTMF signal is placed into the TX system.

Analog Unit Block Diagram



7. NCU Section

7-1. GENERAL

This section is the interface between the telephone line and external telephone. It is composed of an EXT. TEL Line relay (RLY1), bell detection circuit, pulse dial circuit, TAM Interface circuit, line amplifier, sidetone circuits and multiplexer.

7-2. EXT. TEL. line relay (RLY1)

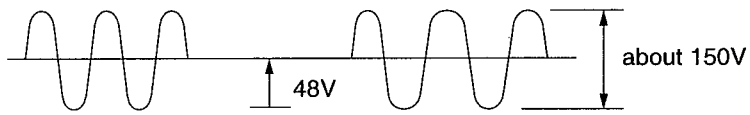
(1) Circuit Operation
Normally, this relay switches to the external telephone side (break) and switches to the open side (make) when the unit starts facsimile communication.

[IC4(26) High Level → CN7⑦] → CN7⑦ → Q1 ON → RLY1 (make)

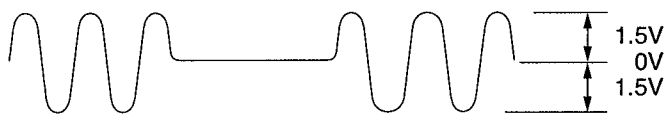
7-3. BELL DETECTION CIRCUIT

(1) Circuit Operation
The signal waveform for each section is indicated below. The signal (low level section) input to pin 19 of ASIC IC4 on the digital board is read.

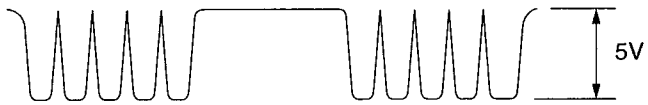
Between the Tip and Ring



Between PC6(1) and (2)



PC6(4)/Gate Array IC4(19)



TEL LINE → PC6(1,2-4) → IC4(19)

7-4. PULSE DIAL CIRCUIT

(1) Circuit Operation
While OFF-HOOK, Q2 is ON. The photocoupler PC1 pin (2) is a low level by IC4 pin (27) and PC1 (3) and (4) are shorted. During a pulse dial operation, PC1 pin (2) becomes a high level by IC4 pin (27), so that PC1 pin (3) and (4) are opened. The line turns OFF. ON/OFF, controlled by IC4 pin (27), makes the pulse dial operation possible.

IC4 (27) Low Level → CN7 (8) → Q2 OFF → PC1 (2) High level → PC1 (3)(4) OFF → Telephone Line

CN7(8)

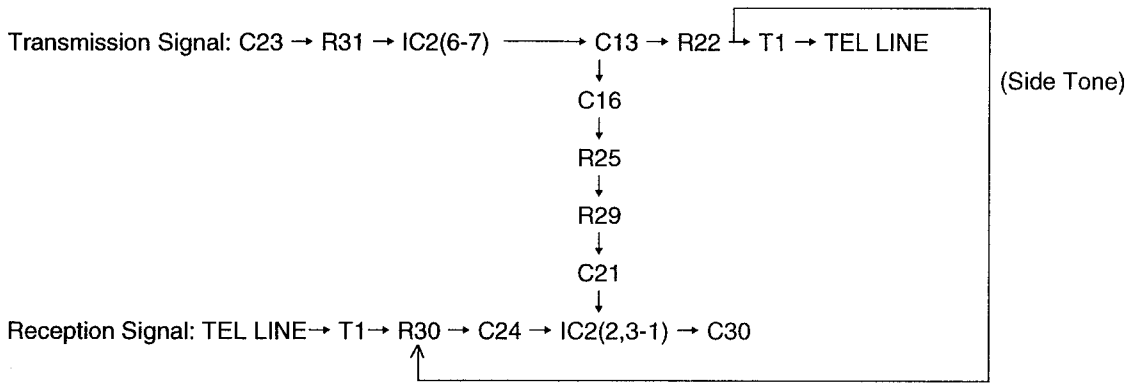
7-6. TAM INTERFACE CIRCUIT

This circuit is for automatically switching between FAX receiving and the external TAM's message recording.
This circuit consists of an EXT. TAM OFF-HOOK detect circuit, Monitor Transformer, Multiplexer, Amplifier, and VOX detect circuit.
For details, please refer to page 137. (TAM INTERFACE SECTION)

7-7. LINE AMPLIFIER AND SIDE TONE CIRCUITS

(1) Circuit Operation

The reception signal received as output from line transformer T1 is given as input to R30, C24 and IC2 pin (2). Then it is input to the reception system at an amplifier gain of 5.9 dB from pin 1.
The transmission signal given as input to IC2 pin (6) via R31, and C23 is amplified to about 9.6 dB. It is output from pin 7 of IC2 and is transmittted to T1 via R22, C13 and T1. Without a side tone circuit, the transmission signal would return to the reception amplifier via R22 and C13. Here, the signal output from IC2 pin (7) passes through C16, R25, R29 and C21 and enters the amplifier IC1 pin (3). This is used to cancel the return portion of the transmission signal. This is the side tone circuit.



8. ITS (Integrated telephone System) and MONITOR SECTION

8-1. GENERAL

During the monitor operation, the speaker output passes through the power amplifier (IC10) [Digital board].
The DTMF signal is output from the modem (IC5: digital board). The alarm tone, the key tone,bell tone, and beep are output from gate array IC4 (digital board). During a pulse dial operation, the monitor tone is output from gate array IC4.

8-2. MONITOR CIRCUIT

(1) Function

This is the function when you are not holding the handset and can hear the caller's voice from the line.

(2) Circuit Operation

(Monitor Signal Path)
Signals received from the telephone line are output through at the speaker via the following path.
TEL LINE → T1 → R30 → C24 → R34 → IC2(2-1) → C30 → R37 → C90 → CN7(8) → [CN7(8) → IC7(1-2) → C63 → R52 → IC11 (6-7) → C95 → R98 → IC4 (38-37) →IC7 (8-9) → C87 → R91 → IC11 (3-1) → C89 → R87 → IC10 (4-5,8)] → SPEAKER

[ ] : Digital section

8-3. HANDSET CIRCUIT

(1) Transmission signal
Handset MIC CN3(1,4) → L9 → C55 → R74 → IC5(2,3-1) → C60 → R82 → C62 → R91 →
L6 → C56 → R75 →
IC5(6-7) → C91 → C92 → R110 → CN6(9) → [CN6(9) → C69 → IC6(4-3) → CN6(7)] → CN6(7) → C23 → R31 →
IC2(6-7) → C13 → R23 → R22 → T1 → LINE

(2) Reception Signal
TEL LINE → T1 → R30 → C24 → R34 → IC2(2-1) → C30 → R37 → C90 → CN6(8) → [CN6(8) → IC7(1-2) → C63 → R52
→ IC11(6-7) → C95 → R98 → IC4(38-37) → IC7(10-11) → CN6(10)] → CN6(10) → JP15 → C65 → R92 → Q13 → R88
→ Q10 → C50 → L8 → Handset Speaker
L7

8-4. MONITOR CIRCUIT

(1) DTMF Monitor
(Speaker Operation)
IC5 (44) → C47 → R42 → IC12(6-7) → C60 → IC7(3-4) → C62 → R51 → IC11(6-7) → C95 → R98
→ IC4(38-37) → IC7(8-9) → C87 → R91 → IC11(3,1) → C89 → R87 → IC10(4-5,8) → Speaker

(Handset Operation)
[IC5 (44) → C47 → R42 → IC12(6-7) → C60 → IC7(3-4) → C62 → R51 → IC11(6-7) → C95 → R98
→ IC4(38-37) → IC7(10-11) → CN6(10)] → CN6(10) → JP15 → C65 → R92 → Q13 → R88
→ Q10 → C50 → L8 → Handset Speaker
R77 → L7

(2) Alarm/Beep/Key tone/Bell
[IC4(35) → R35 → Q6 → R46 → C61 → R50 → IC11(6-7) → C95 → R98 →
IC4(38-37) → IC7(8-9) → C87 → R91 → IC11(3-1) → C89 → R87 → IC10(4-5,8)] → Speaker

(3) Dummy Ring Back Tone
[IC4(34) → R36 → Q5 → R47 → C58 → CN6(7)] → CN6(7) → C23 → R31 → IC2(6-7) → C13 → R23
→ R22 → T1 → LINE

[ ] : Digital section

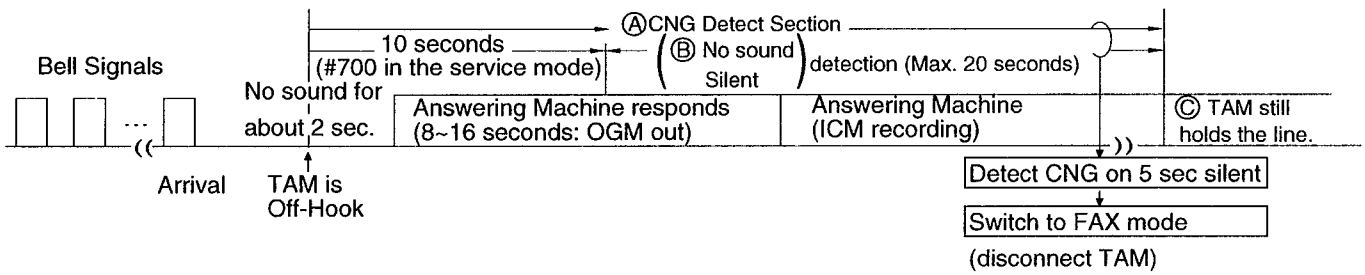
9. TAM INTERFACE SECTION

9-1. FUNCTION

If EXT. TAM is selected in the Receive mode, the unit receives documents for FAX calls or the external TAM records a voice message automatically.

To switch between the answering machine and facsimile in the EXT. TAM Mode.

#	OPERATION OF THE EXTERNAL TAM	OPERATION OF THE UNIT
1	When bell signal rings as many times as the number installed in the connected answering machine (TAM), the answering machine seizes the line and the answering message is sent out to the line. (OGM out for 8 ~ 16 sec.)	The length of the answering message should be 8~16 seconds. While the message is being played, the unit starts to detect the CNG signal.(Ⓐ) If the unit detect the CNG signal, the unit switches to FAX receiving and disconnect the external TAM automatically.
2	After sending the OGM, the answering machine starts to record the message of the other party (ICM recording).	After the OGM of the external TAM is finished, the unit starts to detect approximately 5 seconds of no sound detection. (Ⓑ) If no sound is detected, the unit will switch to FAX receiving and disconnect the external TAM automatically. If the unit cannot detect the CNG signal or no sound for about 30 seconds, the unit will not hold the line. (Ⓒ)



Attention 1: No sound detection lasts 20 seconds after the telephone call is received at the answering machine. If there is no sound for more than 5 seconds (#701 in the service mode), it switches to the facsimile.

Attention 2: When the answering machine cannot answer the telephone call because of disconnection or the recording tape is full, the unit picks up the call after 5 rings (#702 in the service mode). Then it switches to the facsimile.

9-2. CIRCUIT OPERATION

The TAM INTERFACE circuit consists of an EXT. TAM HOOK detection circuit, CNG signal from the other party's detection circuit, VOX detection circuit (to judge sound/no-sound) and RLY1 (to separate EXT. TAM).

(1) EXT. TAM HOOK detection circuit
A bell is received at the EXT. TAM and EXT. TAM seizes the line, making a DC LOOP. PC5 detects this voltage. During detection, PC5 (4) becomes low.

(DC LOOP)
CN1 → Tip(a) → F1 → L2 → RLY1(3 → 2) → R45 → PC5(2-1) → L5 → CN2(a) → (EXT.TAM) → CN2(b) → L4 → RLY1(7-6) → L3 → POS1 → CN1 → Ring(b)
R45 → R40 → L5

(2) CNG signal detection circuit
The CNG signal from the other party's FAX is detected in MODEM IC5 (digital board).

(Signal path)
TEL LINE → C34 → T2 → C36 → IC1 (11-10) → C38 → R53 → IC4 (2-1) → R114 → CN6(11) →
[CN6 (11) → IC6 (8-9) → C64 → R49 → IC12 (2-1) → C52 → R33 → IC5(45)]

(3) VOX
The VOX circuit detects if there is a signal or voice on the line. This is why the VOX circuit reacts to the OGM of the EXT.TAM and ICM from the other party.

(Signal path)
TEL LINE → C34 → T2 → C36 → IC1(11-10) → C38 → R53 → IC4(2-1) → C42 → R56
→ IC4(6-7) → C44 → D19 → R58 → IC3(2-1) → CN7(12) → [CN7(12)→ IC4(31)]
EXT.TEL Line → R45

(4) RLY1
Normally, this relay switches to the external telephone side (break) and switches to the open side (make) when the unit changes to facsimile communication from the EXT.TAM operation.

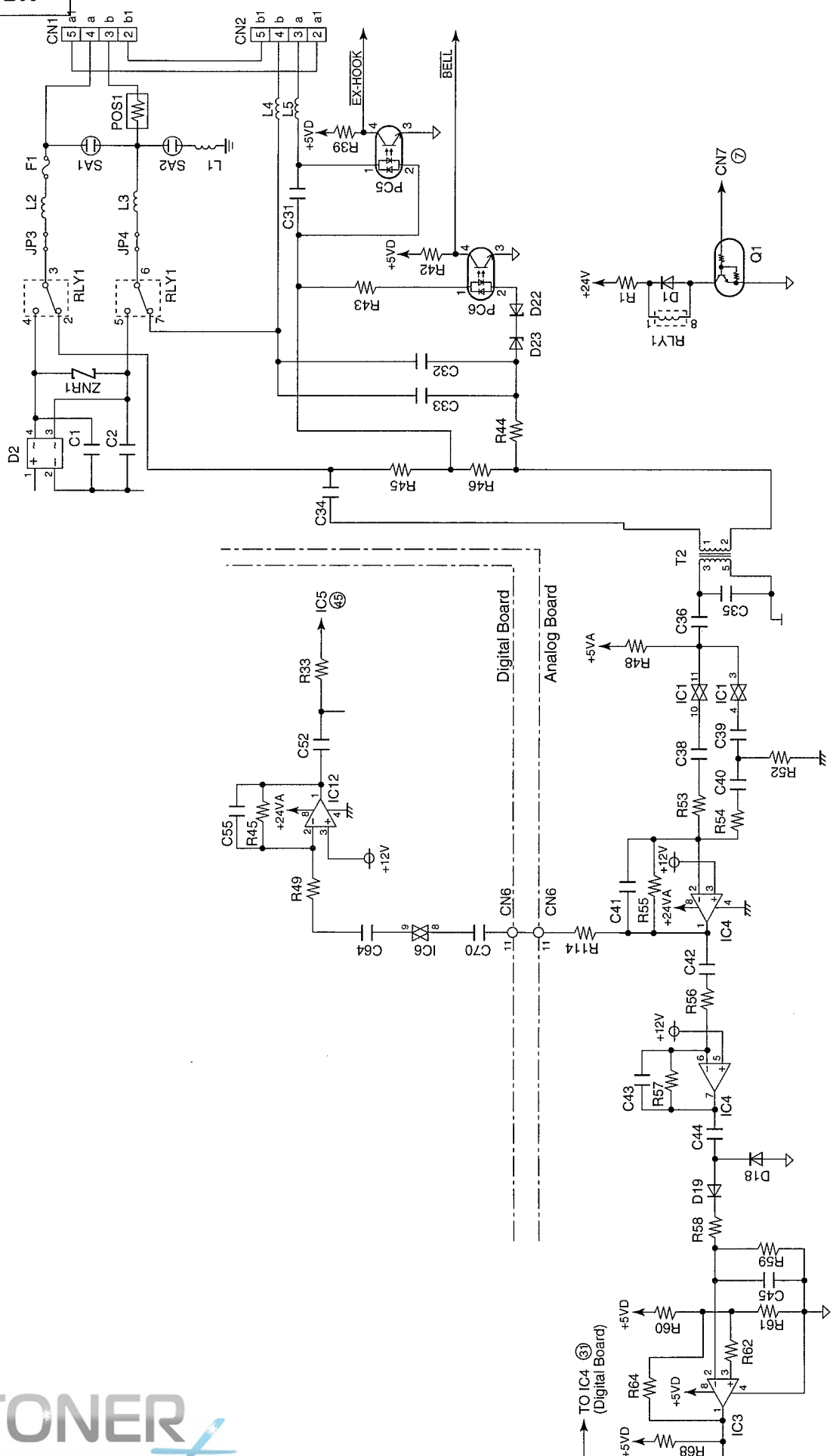
CN7(7) High Level → Q1 → ON → RLY1(make)
CN7(7) Low Level → Q1 → OFF → RLY1(break)

(5) Remote receiving
This is the parallel connection DTMF signal for the TEL or EXT.TEL mode between T and R. When the other party is a FAX, the unit changes to FAX receiving.

(Signal Path)
TEL LINE → C34 → T2 → C36 → IC1(3-4) → C39 → C40 → R54 → IC4(2-1) → R114 → CN6(11) → [CN6(11) → IC6(8-9) → C64 → R49 → IC12(2-1) → C52 → R33 → IC5(45)]

[ ] : Digital section

Circuit Diagram



10. OPERATION PANEL

The unit consists of a LCD (Liquid crystal display), KEYs and LEDs (light-emitting diode). They are controlled by the Gate Array (IC1) and ASIC (IC4: on the DIGITAL BOARD). (Fig.a)
The key matrix table is shown below.

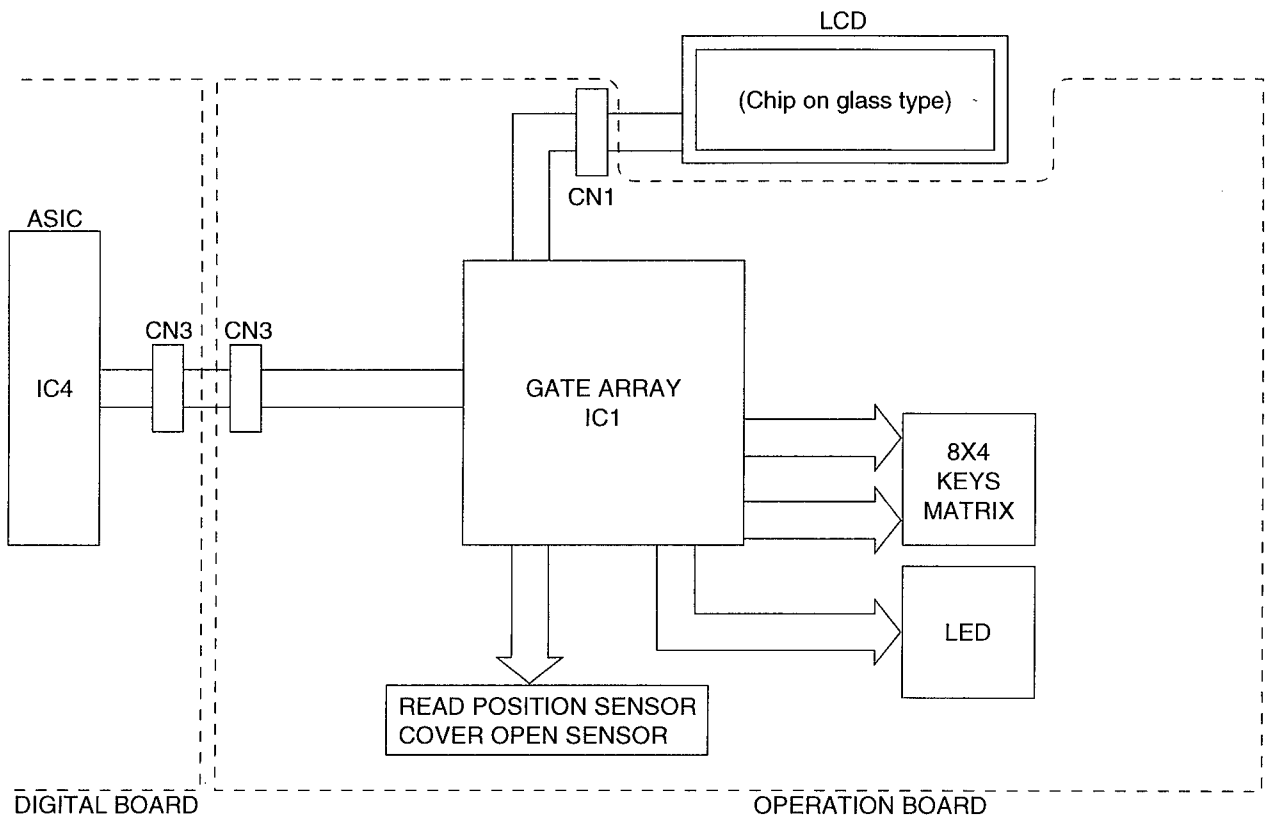


Fig .a.

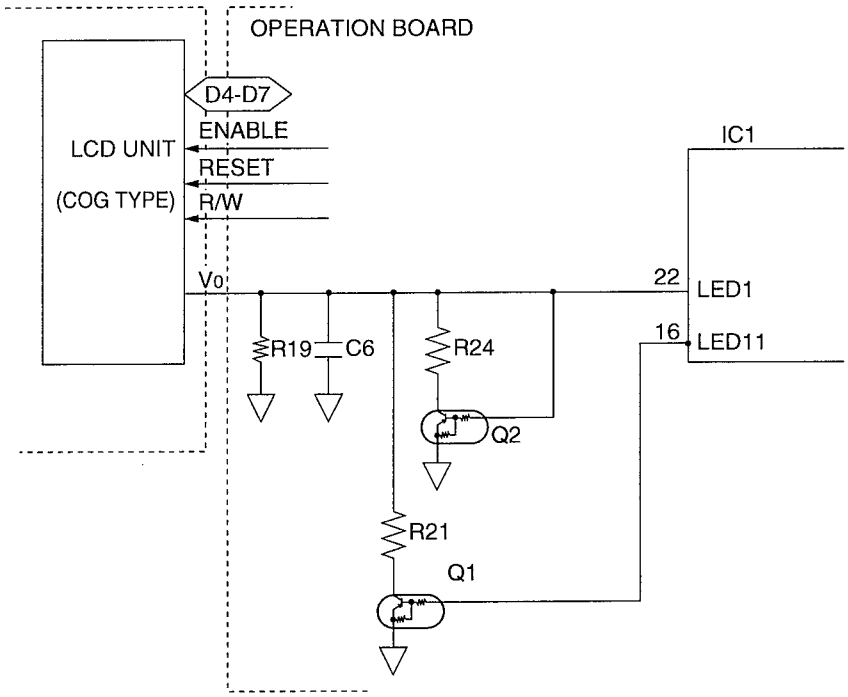
Key Matrix

I / O	KIN 0	KIN 1	KIN 2	KIN 3	KIN 4	KIN 5	KIN 6	KIN 7
KSL0		REDIAL/ PAUSE (SW25)	FLASH (SW21)	✳ (SW17)	7 (SW13)	4 (SW9)	1 (SW5)	2 (SW1)
KSL1		# (SW26)	0 (SW22)	9 (SW18)	8 (SW14)	6 (SW10)	5 (SW6)	3 (SW2)
KSL2	SET/START /COPY (SW29)	MUTE (SW27)	MONITOR (SW23)	VOLUME ∨ (SW19)	VOLUME ∧ (SW15)			AUTO RECEIVE (SW3)
KSL3	STOP (SW30)	HELP (SW28)	MENU (SW24)				DIRECTORY EDIT (SW8)	RESOLUTION (SW4)

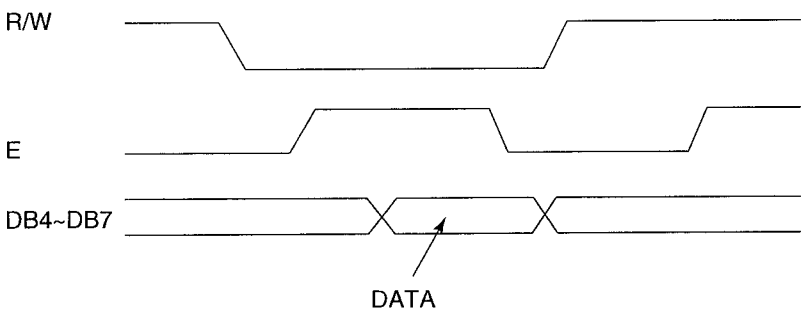
11. LCD COG TYPE

The Gate Array (IC1) only needs to write the ASCII code from the data bus (D4~D7). Vo is the power supply for the crystal drive.
R19,R21 and R24 are the density control resistors, and Q1 and Q2 are the density control transistors.
Consequently, this time setting (positive clock) is generated by the LCD interface circuitry in the gate array (IC1).

Circuit Diagram



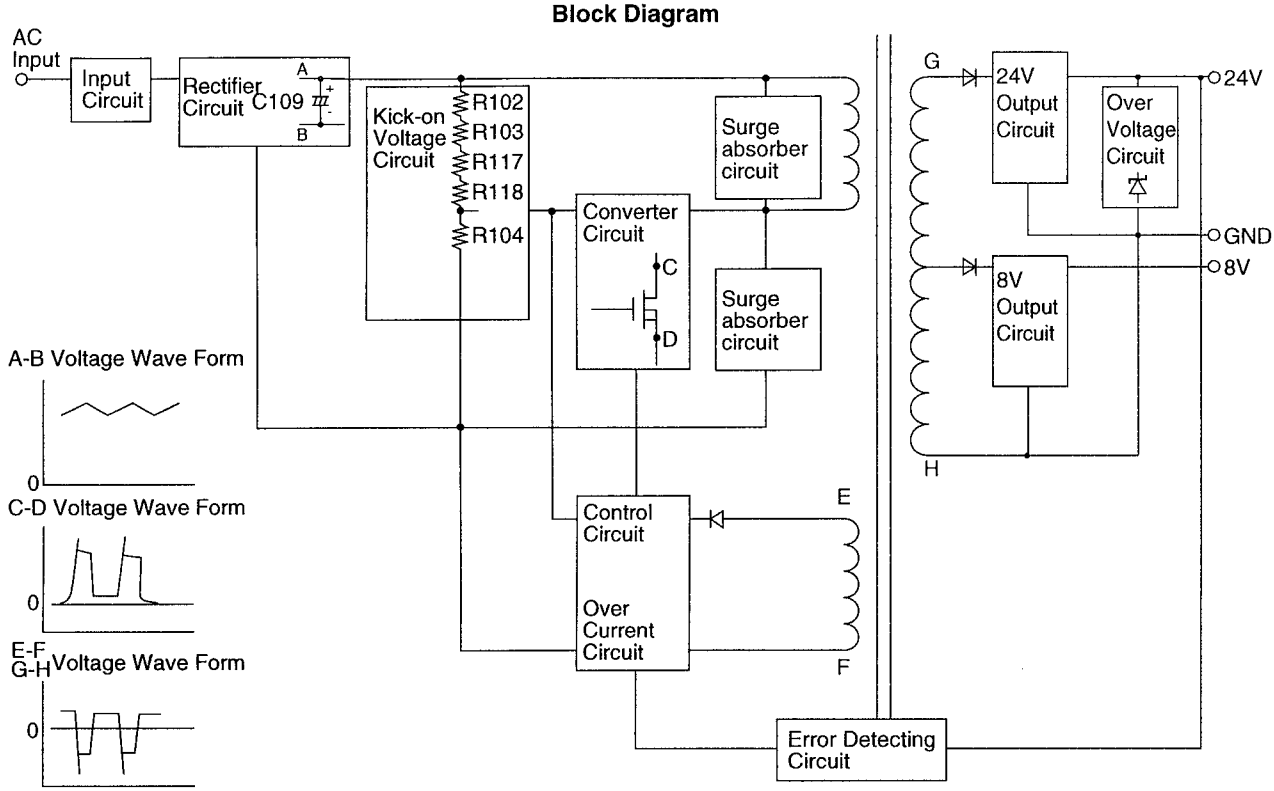
Timing Chart



Density	Light	Normal	Dark
LED 1 (IC1-22 pin)	L	L	H
LED 11 (IC1-16 pin)	L	H	H

12. POWER SUPPLY SWITCHING BOARD SECTION

Block Diagram



[Input Circuit]
The input current goes into the input rectifier circuit through the filter circuit. The filter circuit decreases the noise voltage and noise electric field strength.

[Rectifier Circuit]
The input current is rectified by D101,D102,D103 and D104 and charge C109 to make DC voltage. Then it supplies power to the converter circuit. The inrush current is limited by the thermistor TH101.

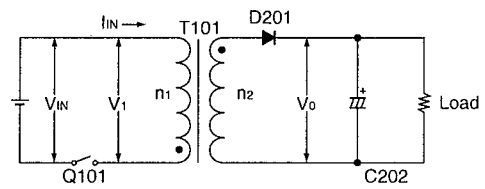
[Kick-on voltage circuit]
Bias is applied to the Q101 gate via this circuit when the AC power is turned on and Q101 begins operating.

[Convertor circuit]

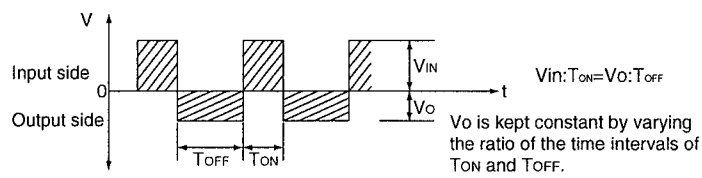
RCC Method of the Constant Voltage Control Mechanism

• Response to Variations in Input Voltage

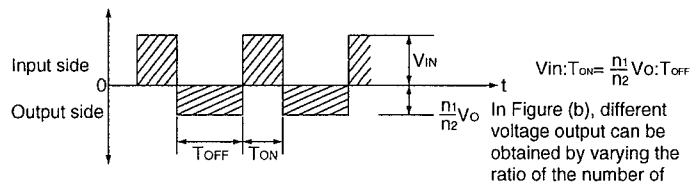
Figure A(a) illustrates the principle of RCC. Assuming TON while Q101 in the circuit diagram is ON, and TOFF while it is OFF, the voltage generated by the primary winding can be represented by figures A(b) and (c).
When the winding ratio is one-to-one, the circuit functions to make the product of TON and the input voltage constant with the product of TOFF and the output voltage.



(a) Principle of the RCC method



(b) When the number of transformer windings is one-to-one



(c) When the ratio of the number of transformer windings is n1:n2

〈Fig. A〉

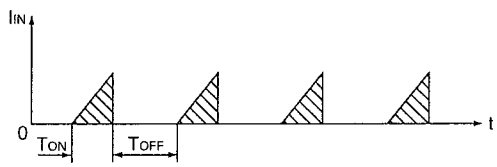
CIRCUIT OPERATIONS

Using a different winding ratio results in the voltage function given by the formula in figure (c).
As you can see, it is possible to keep V_O constant by changing the ratio of T_{ON} and T_{OFF} in response to variations in input voltage.

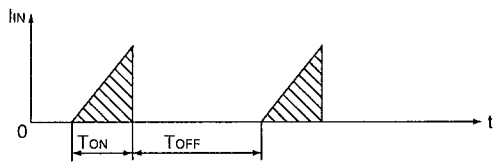
• Response to Variations in Output Current

In this case, V_O is kept constant by controlling only T_{ON} without changing the ratio between T_{ON} and T_{OFF} in response to variations in output current. Figure B (a) and (b) shows how T_{ON} varies in response to variations in output current.
The input current must be increased as output current increases, making T_{ON} longer. The value obtained by dividing the surface area of the sawtooth waves in this figure by the time interval gives the average input current.

Principle of Constant Voltage Operation Given Variations
in the Output Current Under the RCC Method



(a) An input current I_{IN} waveform when output current is low



(b) An input current I_{IN} waveform when output current is high

<Figure B>

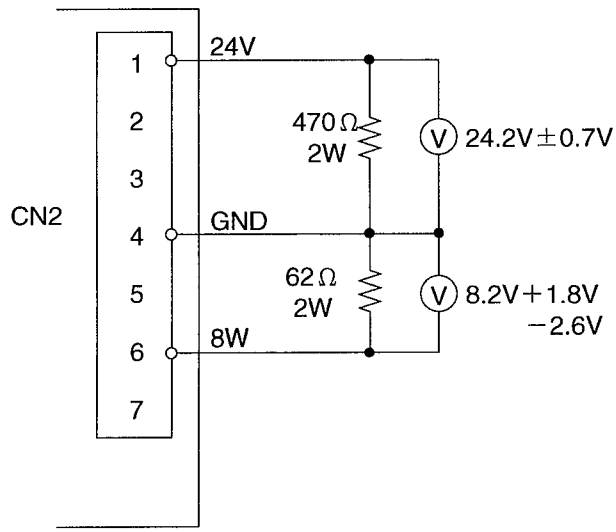
[Surge Absorber Circuit]
This circuit is for absorbing surge voltage generated by the transformer.

[Control Circuit and Detecting Circuit]
The control circuit amplifies the output with increased voltage detected in the error detecting circuit. Then it drives the main transistor.
In this power supply, the duty ratio is defined by changing the ON period of the main transistor.
This is shown as follows.
When the output voltage of the 24V circuit increases, the current of the photo coupler PC101 increases, the pulse width of the output control IC becomes narrower and the ON period of Q101 becomes shorter.

[Over Current Limiter (O.C.L)]
The highest T_{on} (while Q101 is ON) is limited by a limiter circuit (control Circuit) of 24V. The 24V output is limited by this circuit.

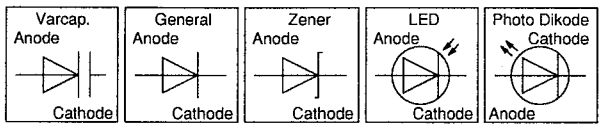
[Over Voltage Circuit]
If the 24V output increases because the error detecting circuit or control circuit is broken, ZD203 will short causing the 24V output to go to 0 V.

Dummy load method (to quickly check the power supply output)



■ FOR THE SCHEMATIC DIAGRAM

1. DC voltage measurements are taken with an oscilloscope or a tester with a ground .
2. The schematic diagram and circuit board may be modified at any time with the development of new technology.

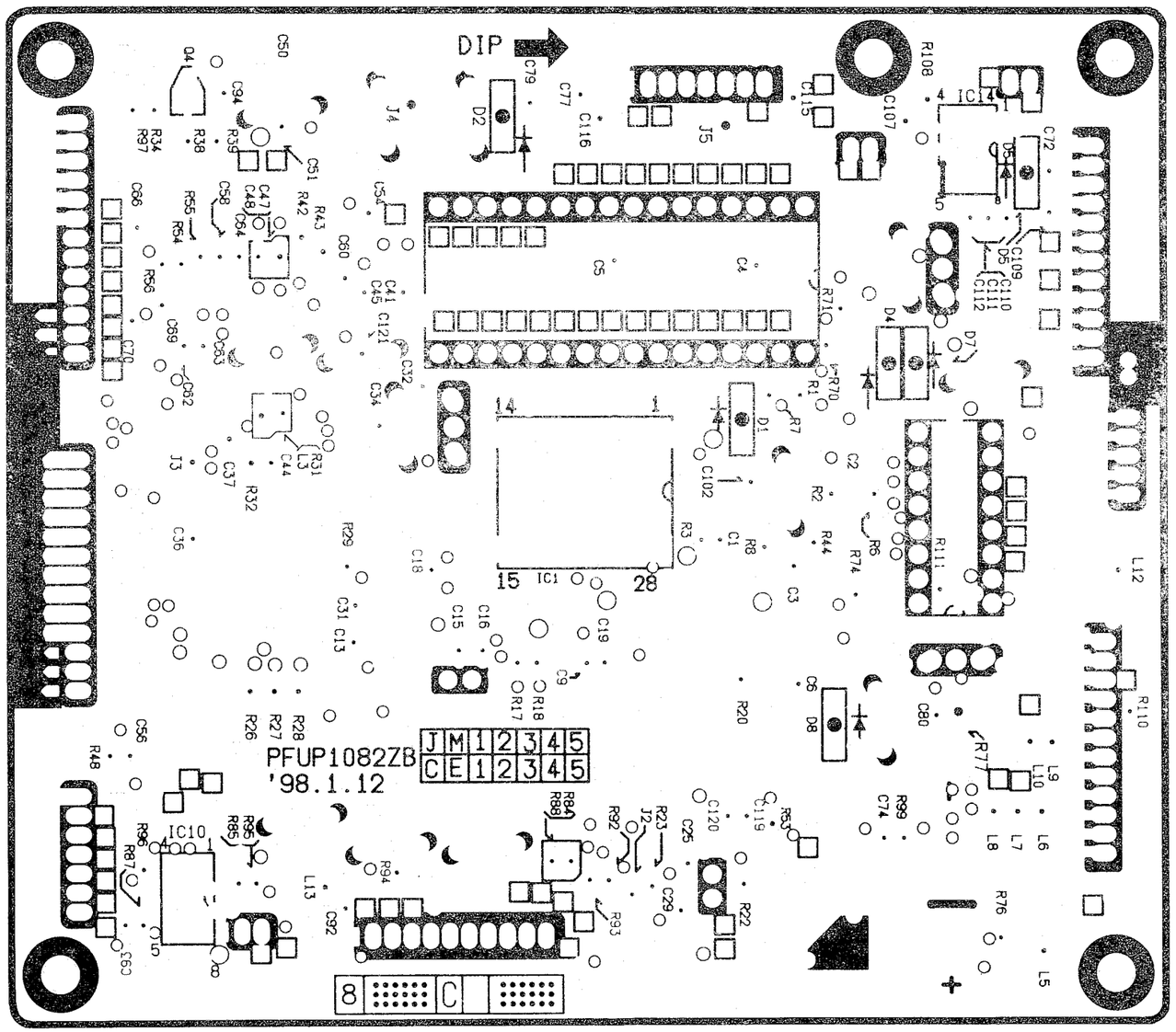


Important safety notice

Components identified by a ⚠ mark have special characteristics important for safety. When replacing any of these components, use only the manufacturer's specified parts.

PRINTED CIRCUIT BOARD (DIGITAL BOARD)

(BOTTOM VIEW)



Notes:

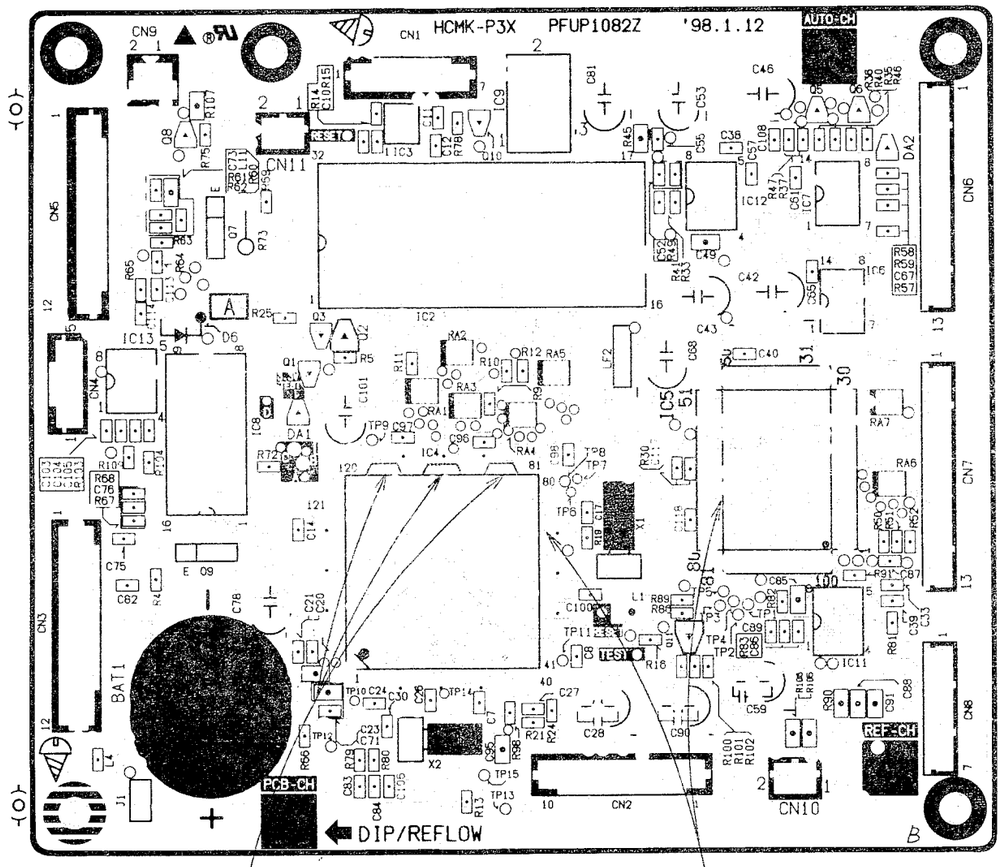
1. The circuit shown in ▭ on the conductor indicates printed circuit on the back side of the printed circuit board.

Notes:

1. The circuit shown in ▭ on the conductor indicates printed circuit on the front side of the printed circuit board.

PRINTED CIRCUIT DIAGRAM (DIGITAL BOARD)

(COMPONENT VIEW)



PIN NO.	WAVEFORM
81 ~ 88 94 ~ 107 110 ~ 113	5V 0V

PIN NO.	WAVEFORM
IC4 - 62 IC5 - 68	24V

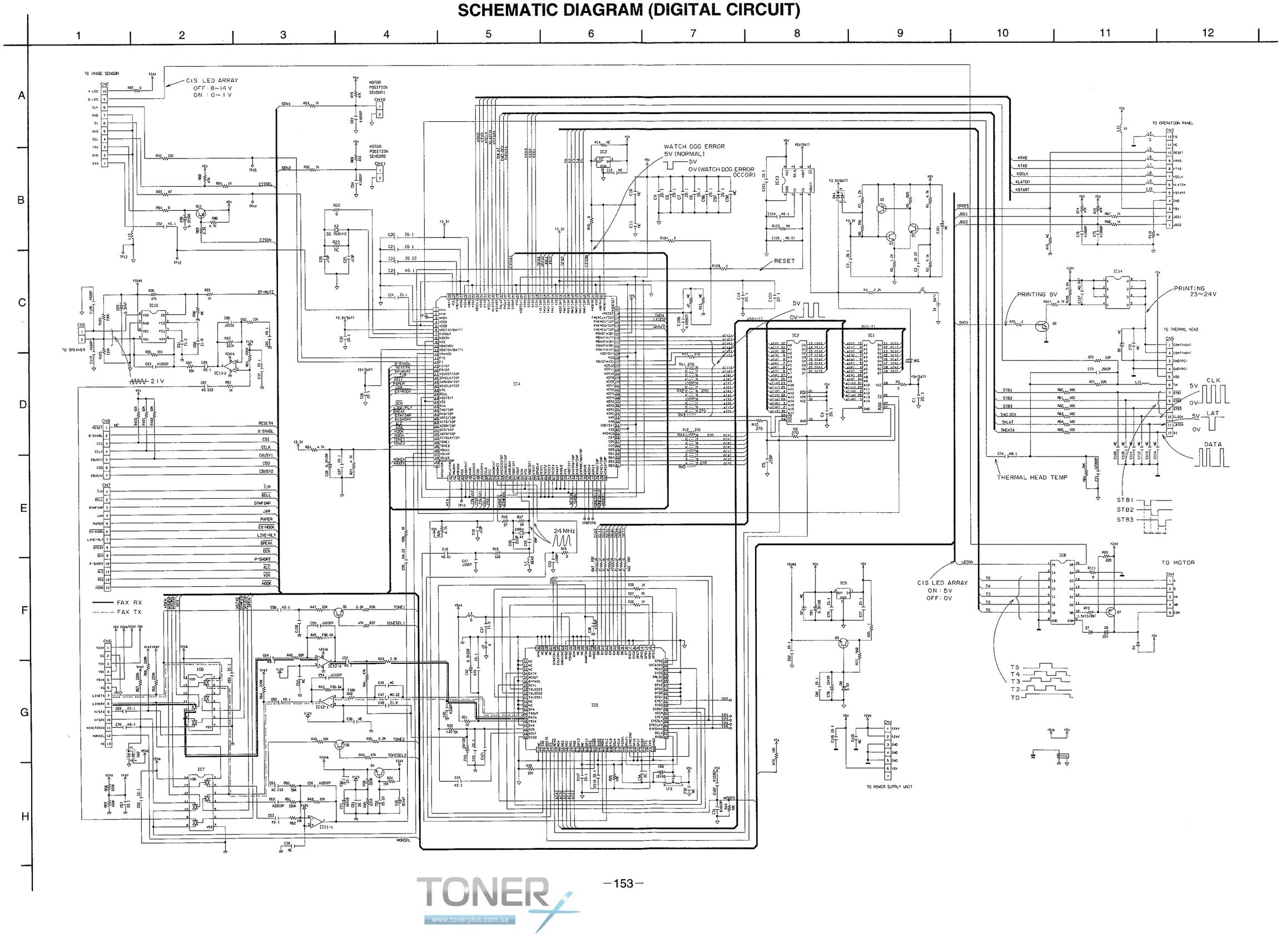
Notes:

1. The circuit shown in ▭ on the conductor indicates printed circuit on the back side of the printed circuit board.

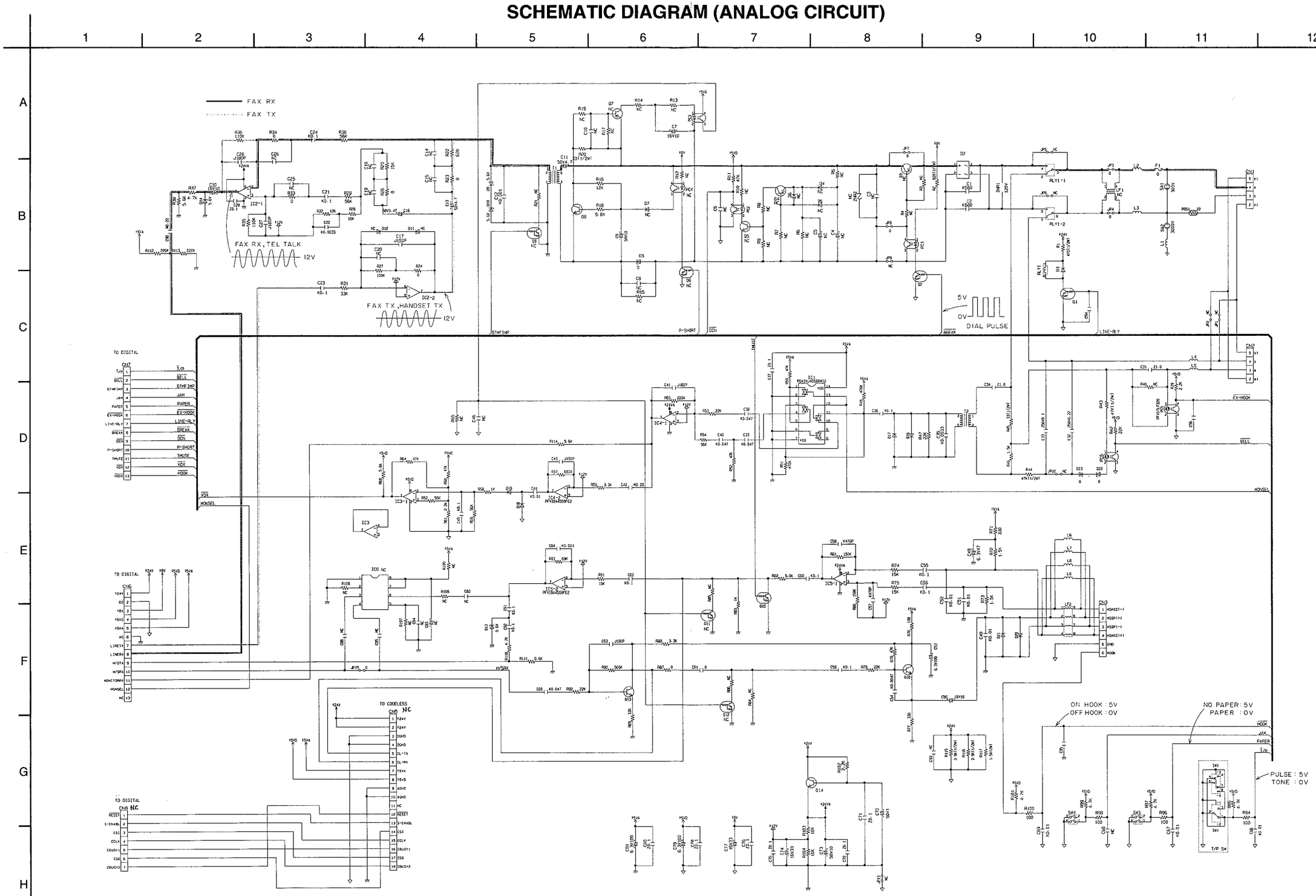
Notes:

1. The circuit shown in ▭ on the conductor indicates printed circuit on the front side of the printed circuit board.

SCHEMATIC DIAGRAM (DIGITAL CIRCUIT)

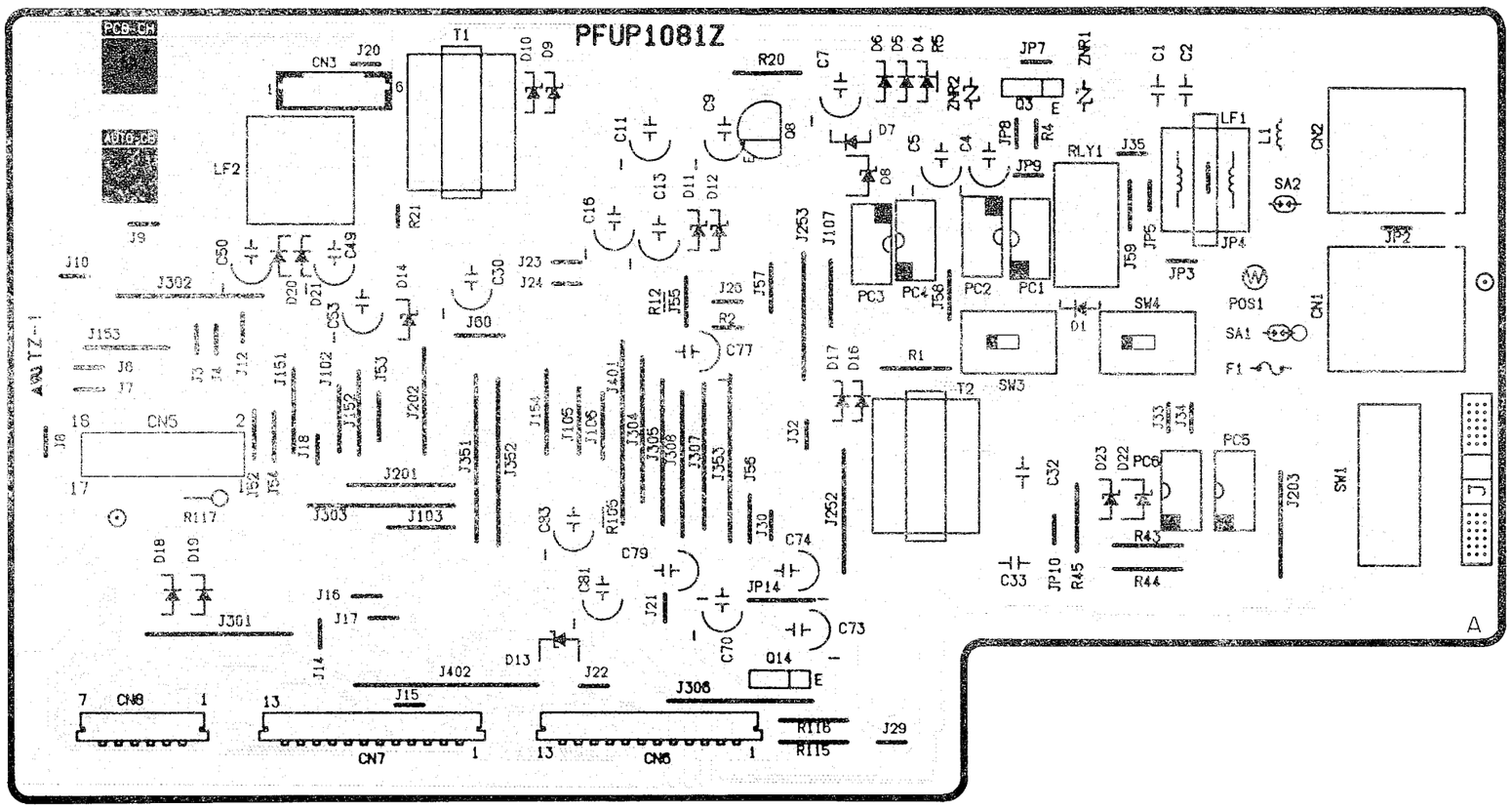


SCHEMATIC DIAGRAM (ANALOG CIRCUIT)



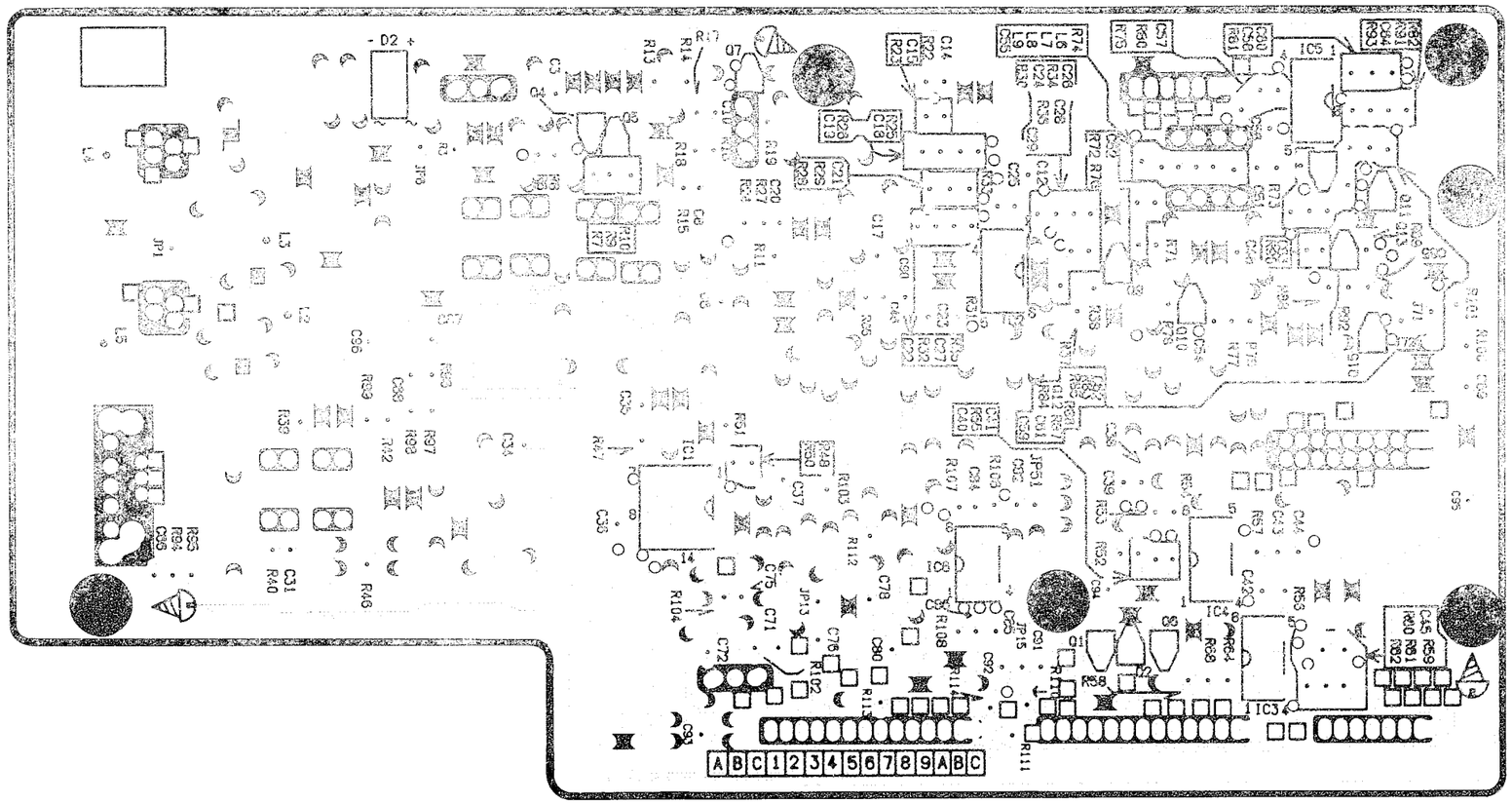
PRINTED CIRCUIT BOARD (ANALOG BOARD)

(COMPONENT VIEW)



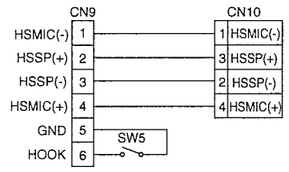
PRINTED CIRCUIT BOARD (ANALOG BOARD)

(BOTTOM VIEW)



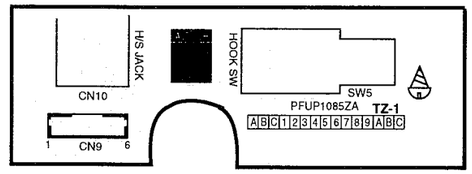
SCHEMATIC DIAGRAM AND PRINTED CIRCUIT BOARD (HANDSET)

HANDSET CIRCUIT



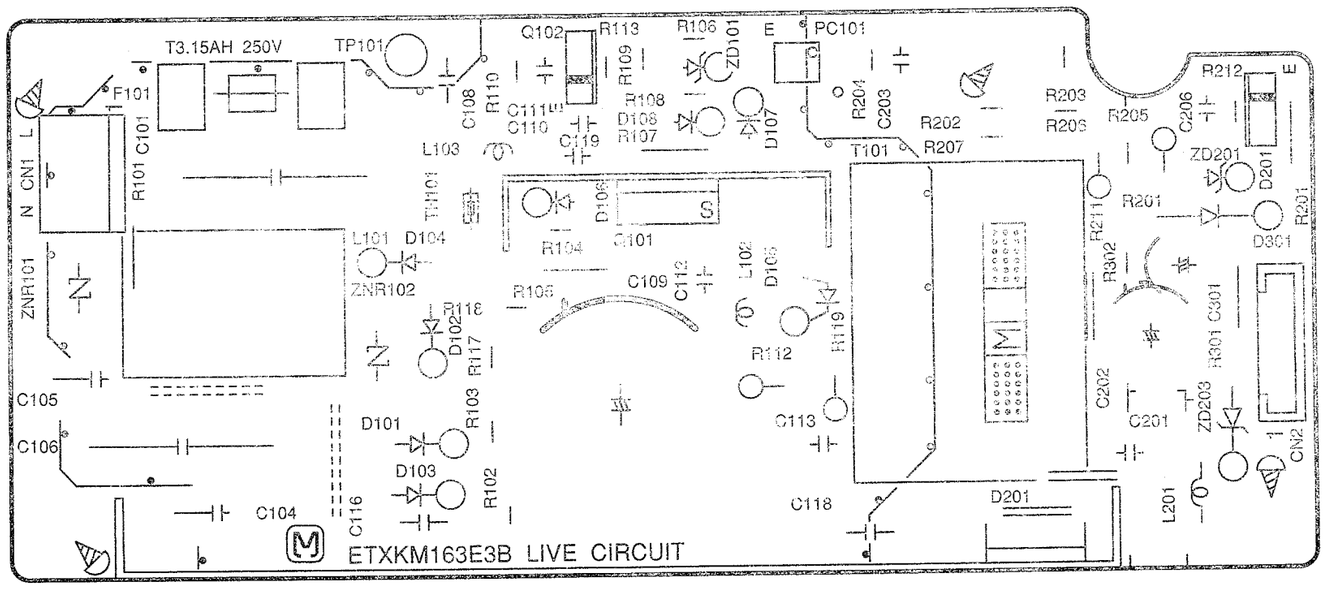
HANDSET BOARD

(COMPONENT VIEW)

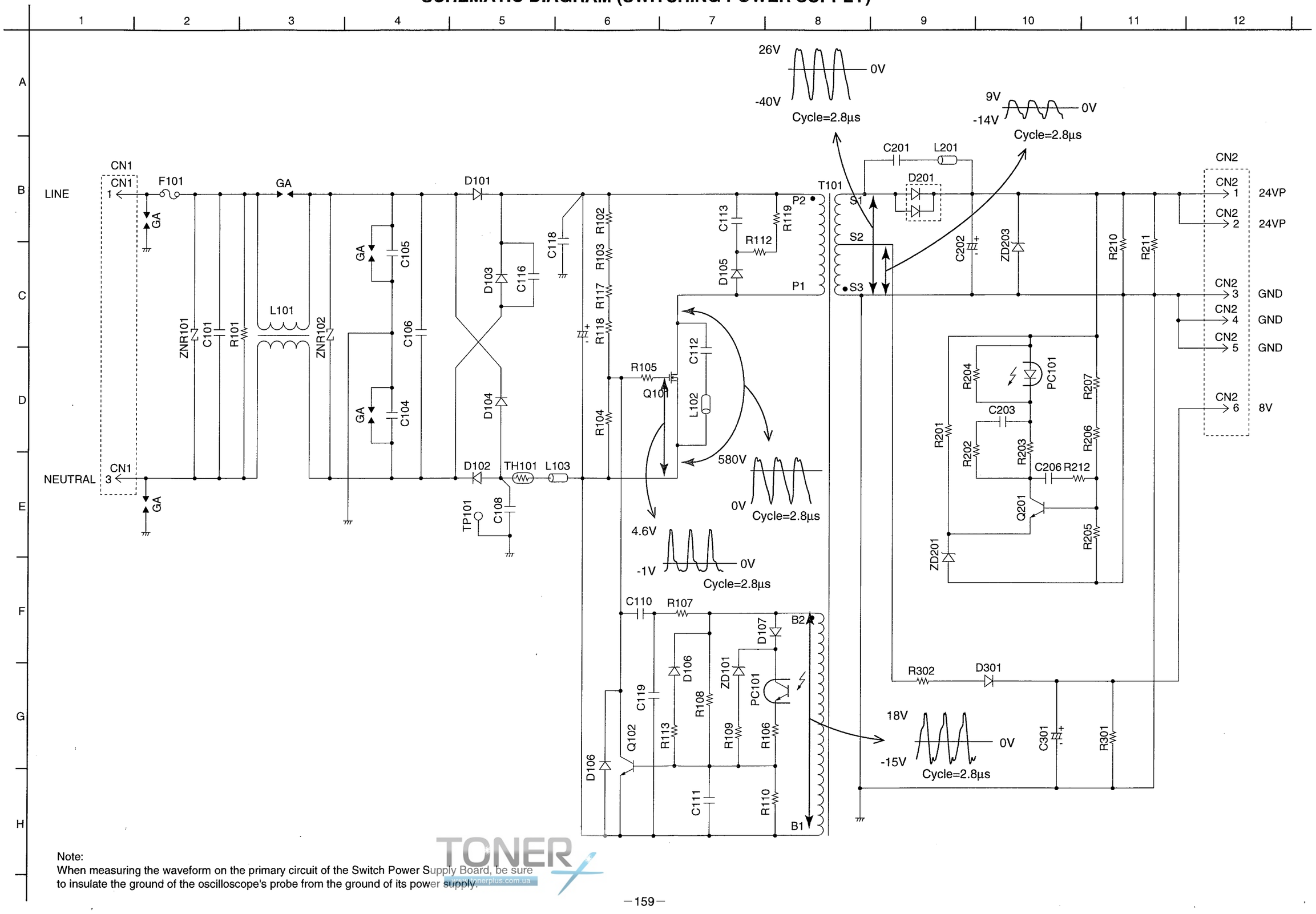


PRINTED CIRCUIT BOARD (SWITCHING POWER SUPPLY)

(COMPONENT VIEW)



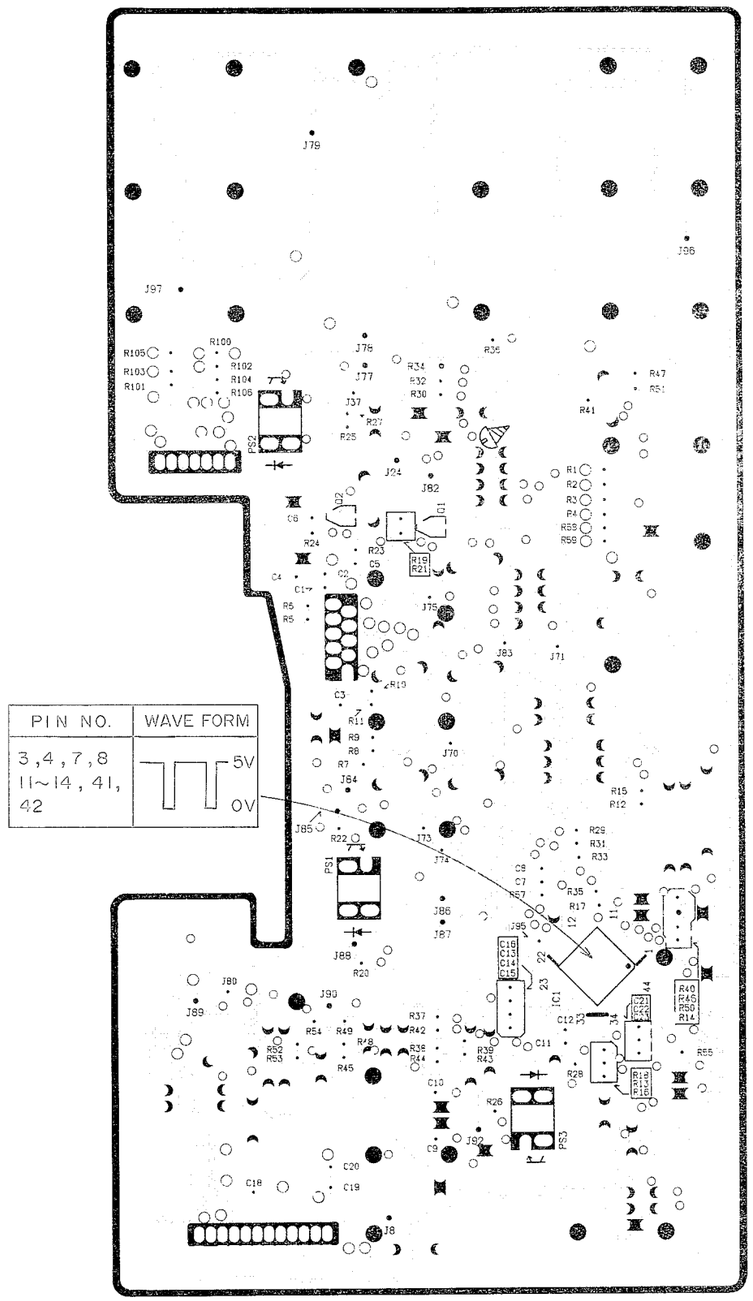
SCHEMATIC DIAGRAM (SWITCHING POWER SUPPLY)



Note:
When measuring the waveform on the primary circuit of the Switch Power Supply Board, be sure to insulate the ground of the oscilloscope's probe from the ground of its power supply.

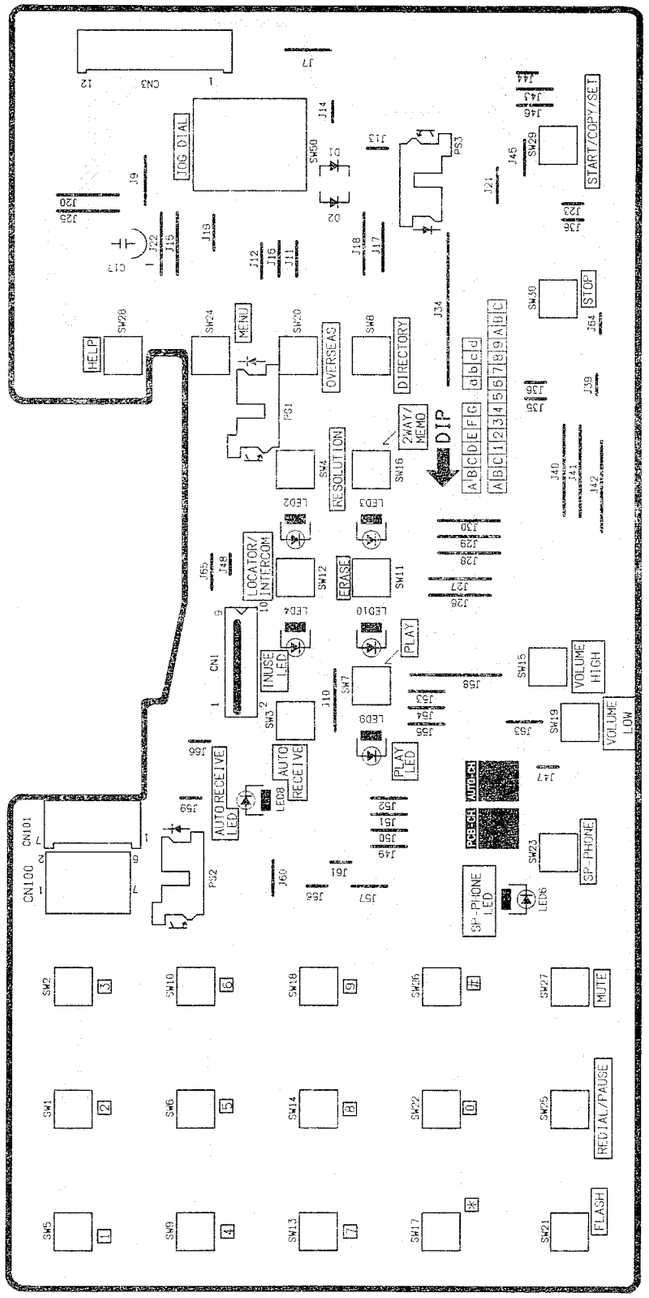
PRINTED CIRCUIT BOARD (OPERATION BOARD)

(BOTTOM VIEW)

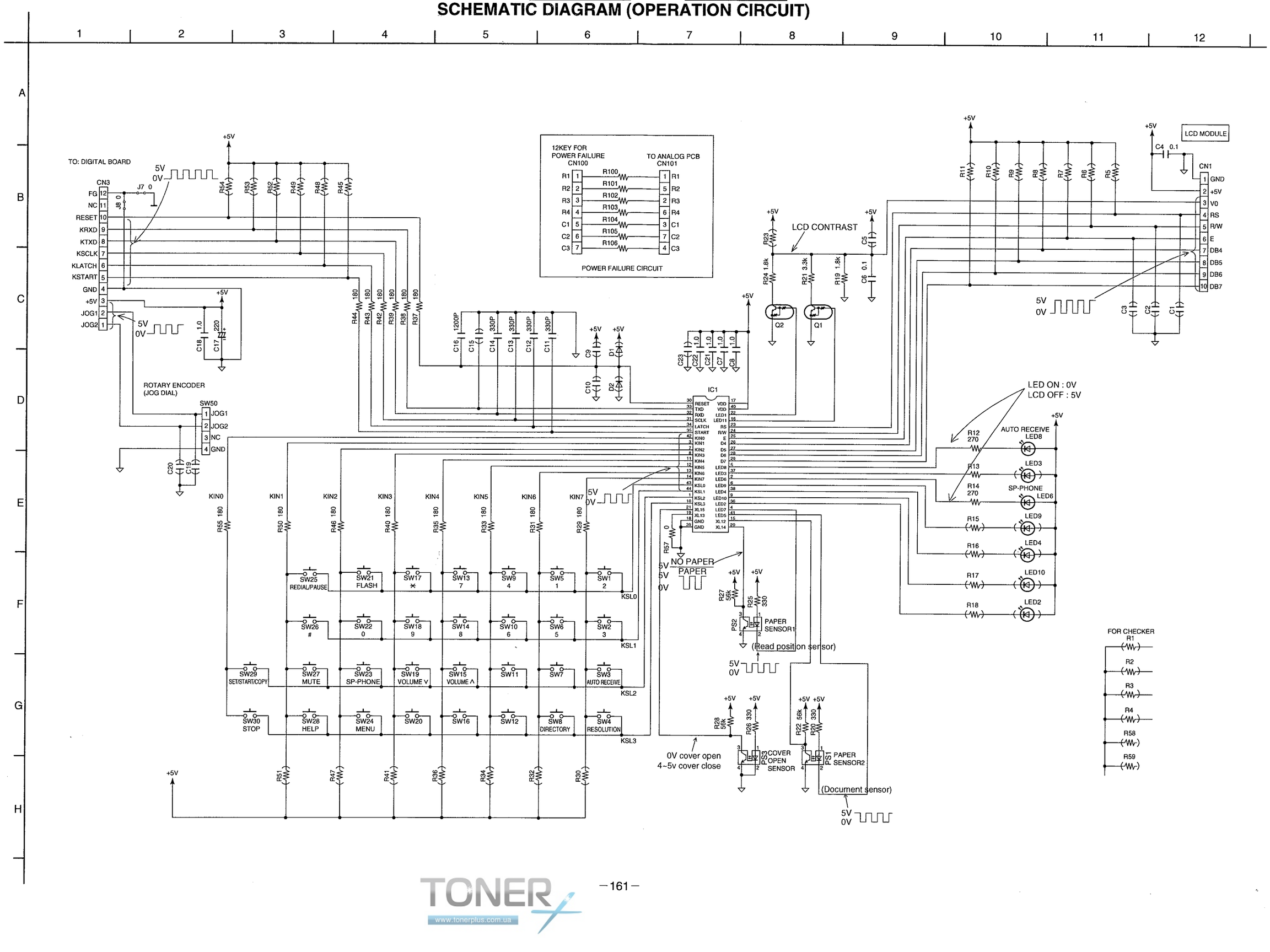


PIN NO.	WAVE FORM
3,4,7,8 11~14,41, 42	5V 0V

(COMPONENT VIEW)

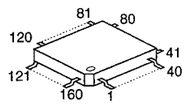
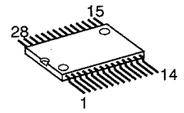
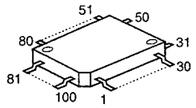
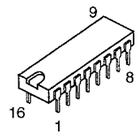
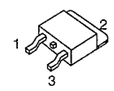
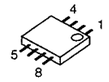
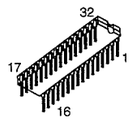
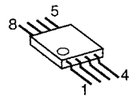
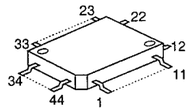
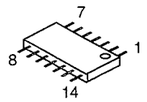
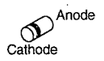
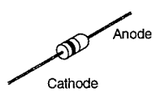
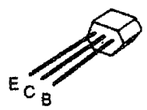
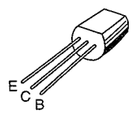
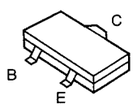
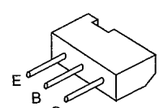
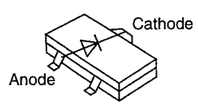
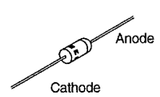
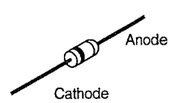
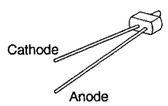
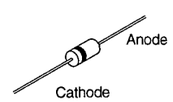
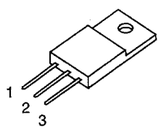
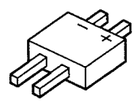
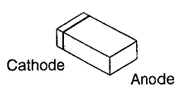
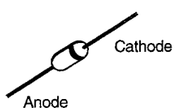
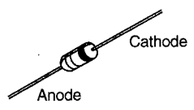
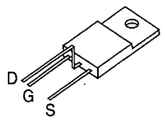


SCHEMATIC DIAGRAM (OPERATION CIRCUIT)

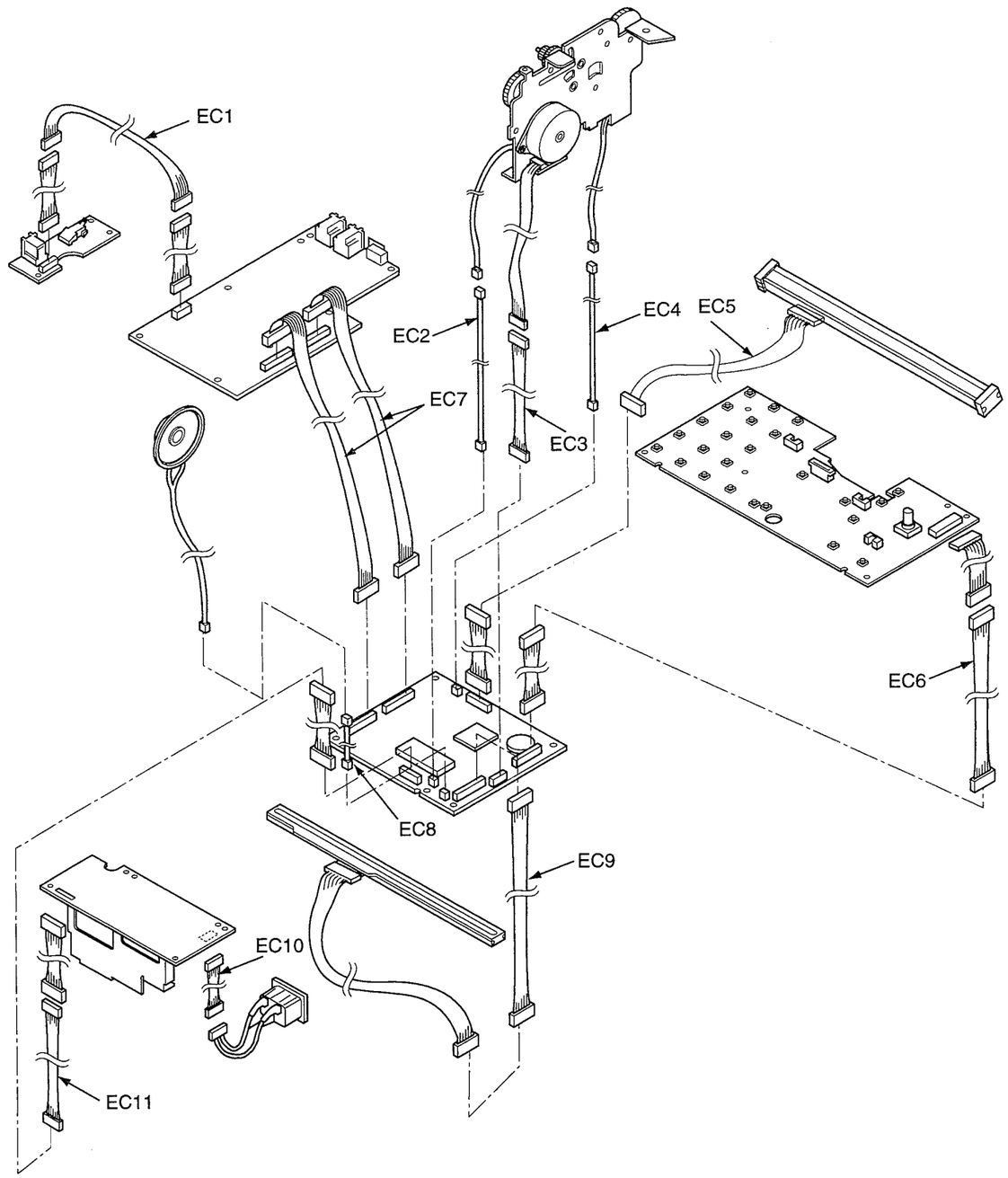


KX-FT31BX

TERMINAL GUIDE OF IC'S TRANSISTORS ANS DIODES

 PFVIM66390M2	 PQVICX58257C	 PQVIR96DFXL	 PQVIBA12003	 PQVIPQ05SZ5
 PFVTSI4431DY	 PFWIFT31BX1	 PQVIMC34119M PQVINJM4558M PQVINJM2903M PQVIMM1245BF	 MN53007QAF	 PQVITC4066BF PFVIBU4066BF
 PFVDRMRLS245	 MA7270B	 2SC3311	 2SD1423	 2SC2235
 PQVTDTC143E PQVTDTC114EU 2SB1197K, 2SD1819A	 2SD1994A 2SB1322, 2SD1921Q	 MA141WA	 PQVD21DQ04	 MA7200
 PQVDR325CA47	 PQVDERA1506 PQVDERA2208 MA165	 MA6D49	 PQVDS1ZB40F1	 MA143
 PQVDRLZ5R6, 1SS131	 MA4056 MA4051, MA4062	 2SK2700		

FIXTURES AND TOOLS



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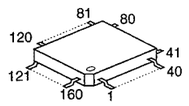
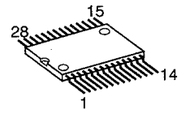
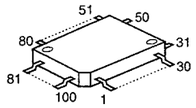
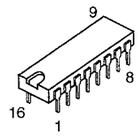
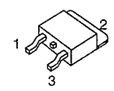
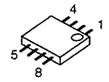
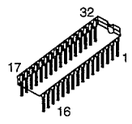
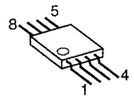
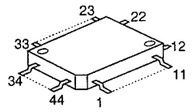
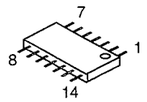
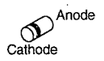
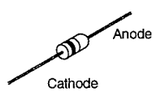
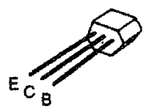
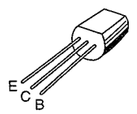
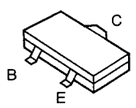
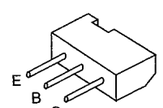
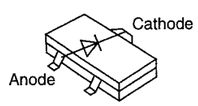
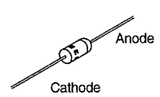
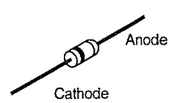
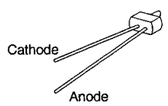
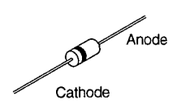
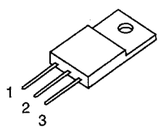
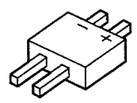
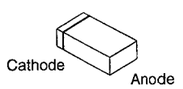
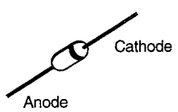
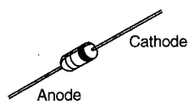
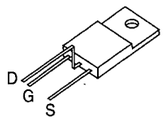
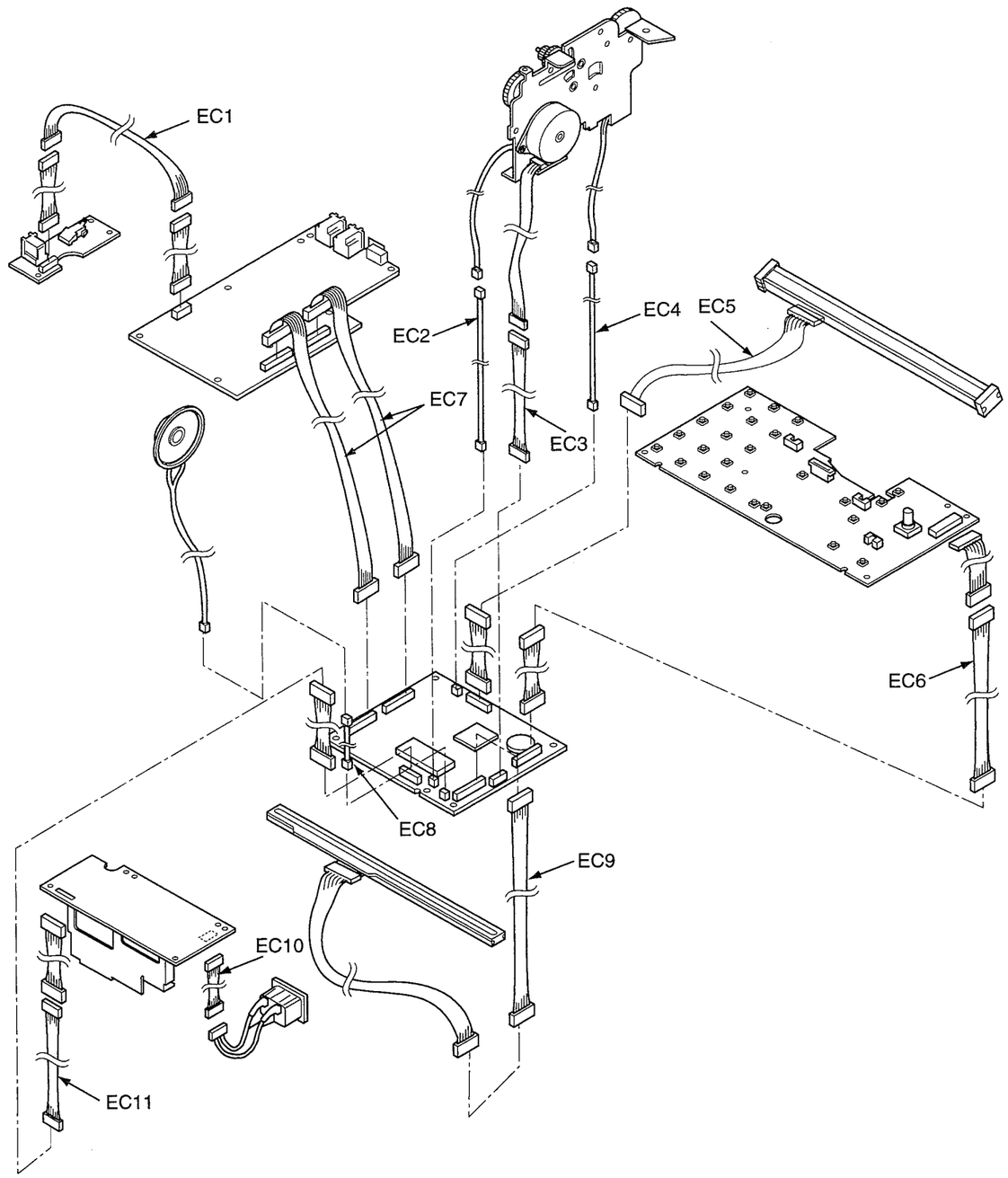
TERMINAL GUIDE OF IC'S TRANSISTORS ANS DIODES

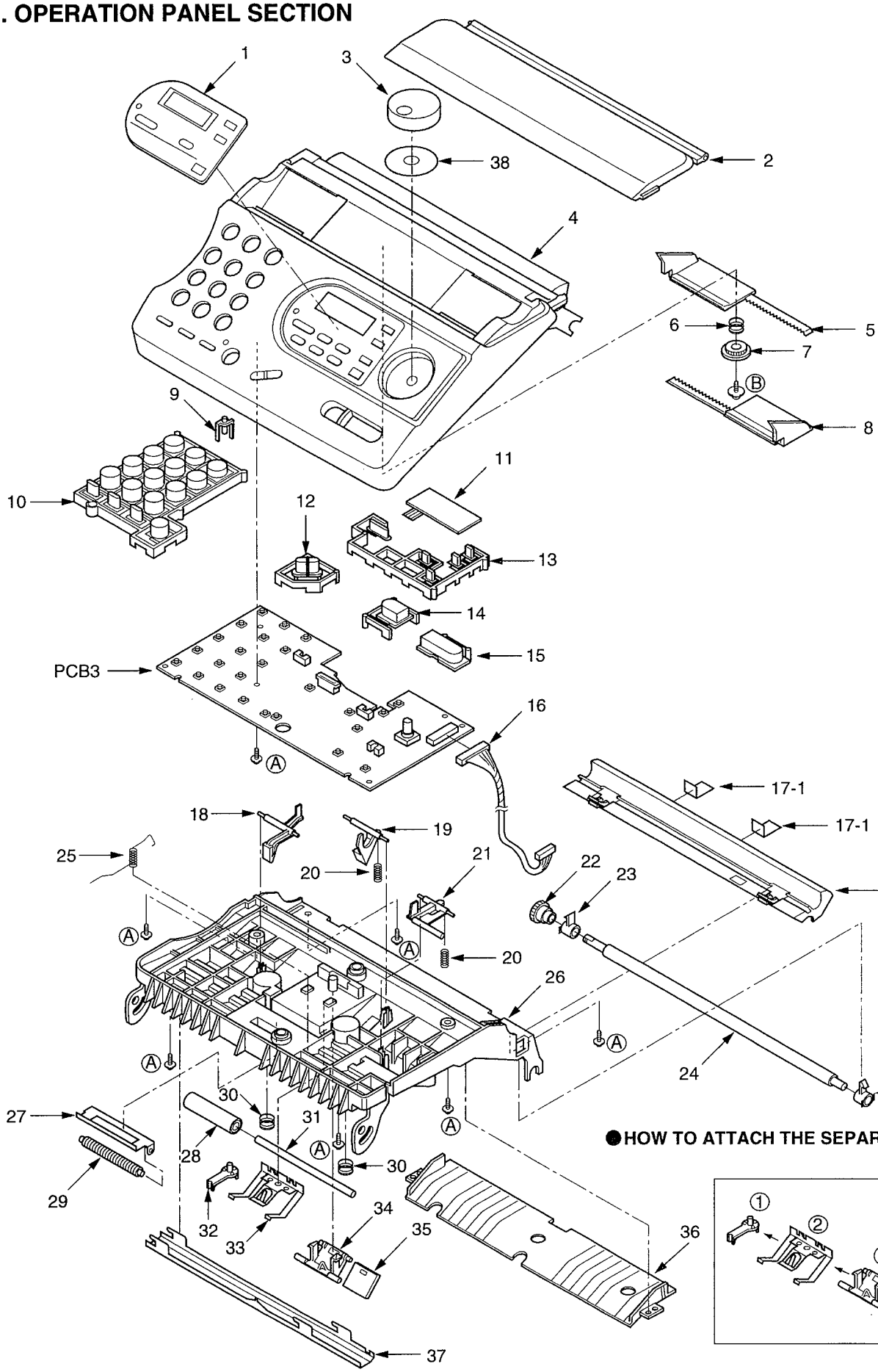
 PFVIM66390M2	 PQVICX58257C	 PQVIR96DFXL	 PQVIBA12003	 PQVIPQ05SZ5
 PFVTSI4431DY	 PFWIFT31BX1	 PQVIMC34119M PQVINJM4558M PQVINJM2903M PQVIMM1245BF	 MN53007QAF	 PQVITC4066BF PFVIBU4066BF
 PFVDRMRLS245	 MA7270B	 2SC3311	 2SD1423	 2SC2235
 PQVTDTC143E PQVTDTC114EU 2SB1197K, 2SD1819A	 2SD1994A 2SB1322, 2SD1921Q	 MA141WA	 PQVD21DQ04	 MA7200
 PQVDR325CA47	 PQVDERA1506 PQVDERA2208 MA165	 MA6D49	 PQVDS1ZB40F1	 MA143
 PQVDRLZ5R6, 1SS131	 MA4056 MA4051, MA4062	 2SK2700		

FIXTURES AND TOOLS



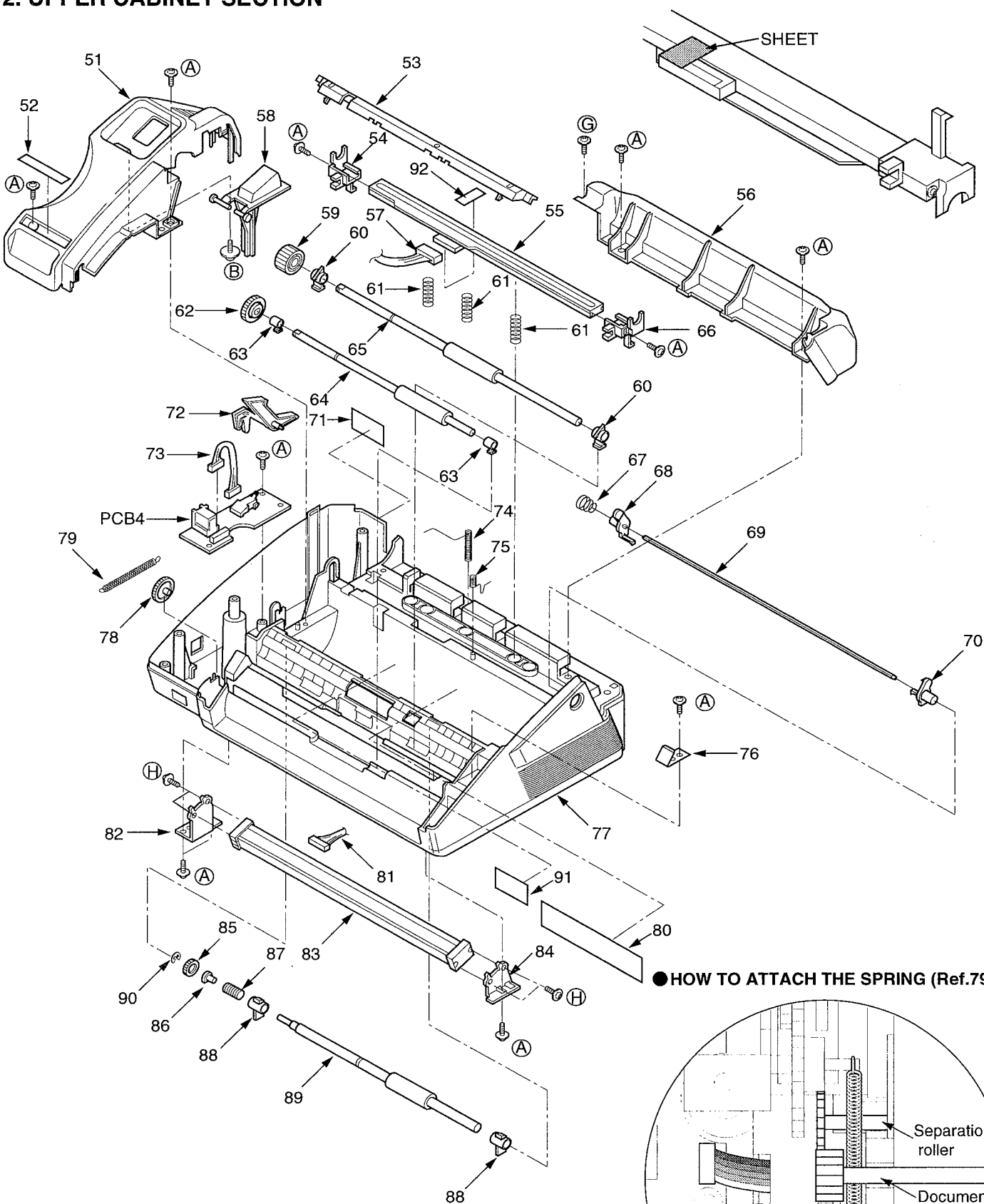
CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION

1. OPERATION PANEL SECTION

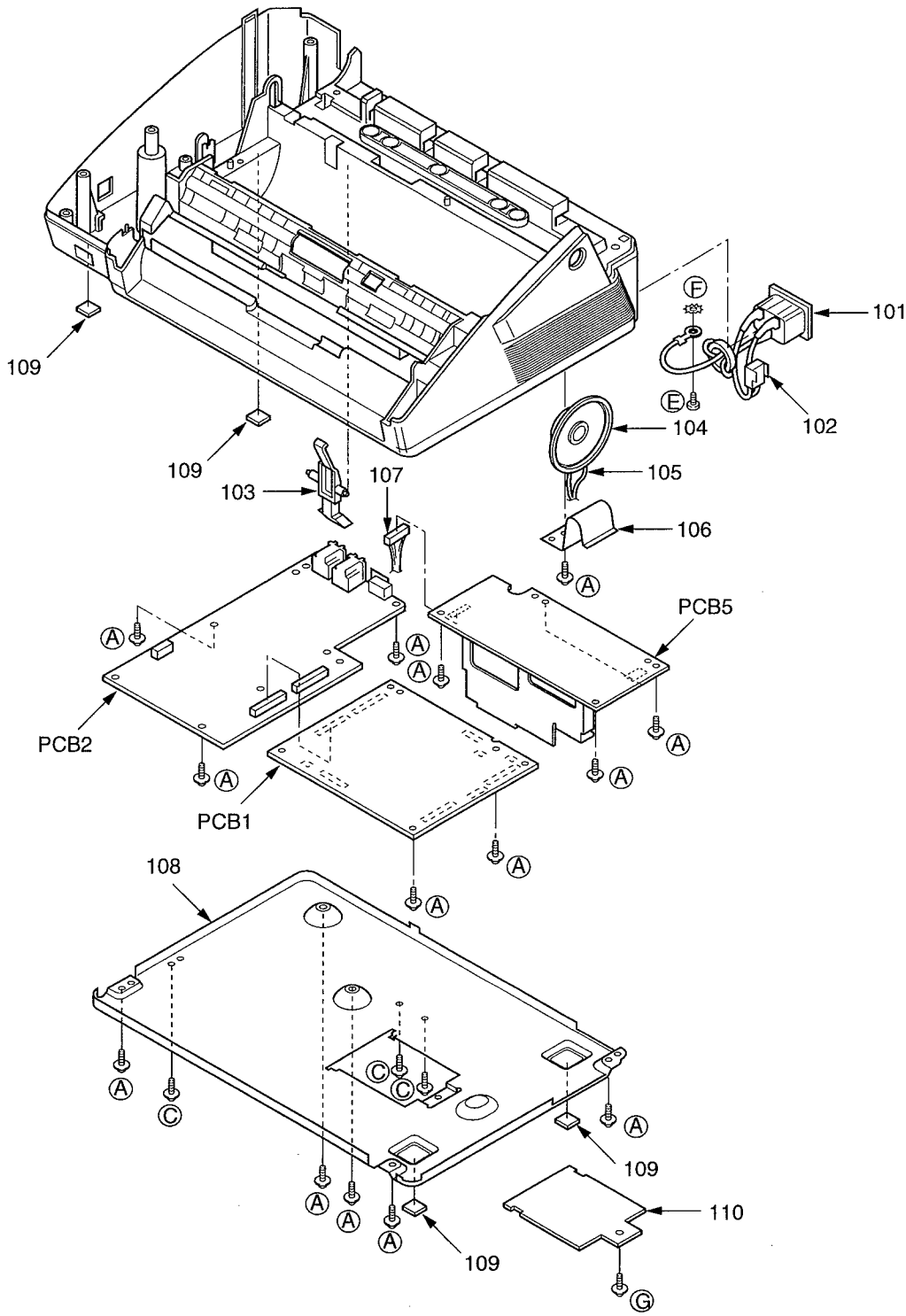


● HOW TO ATTACH THE SEPARATION RUBBER

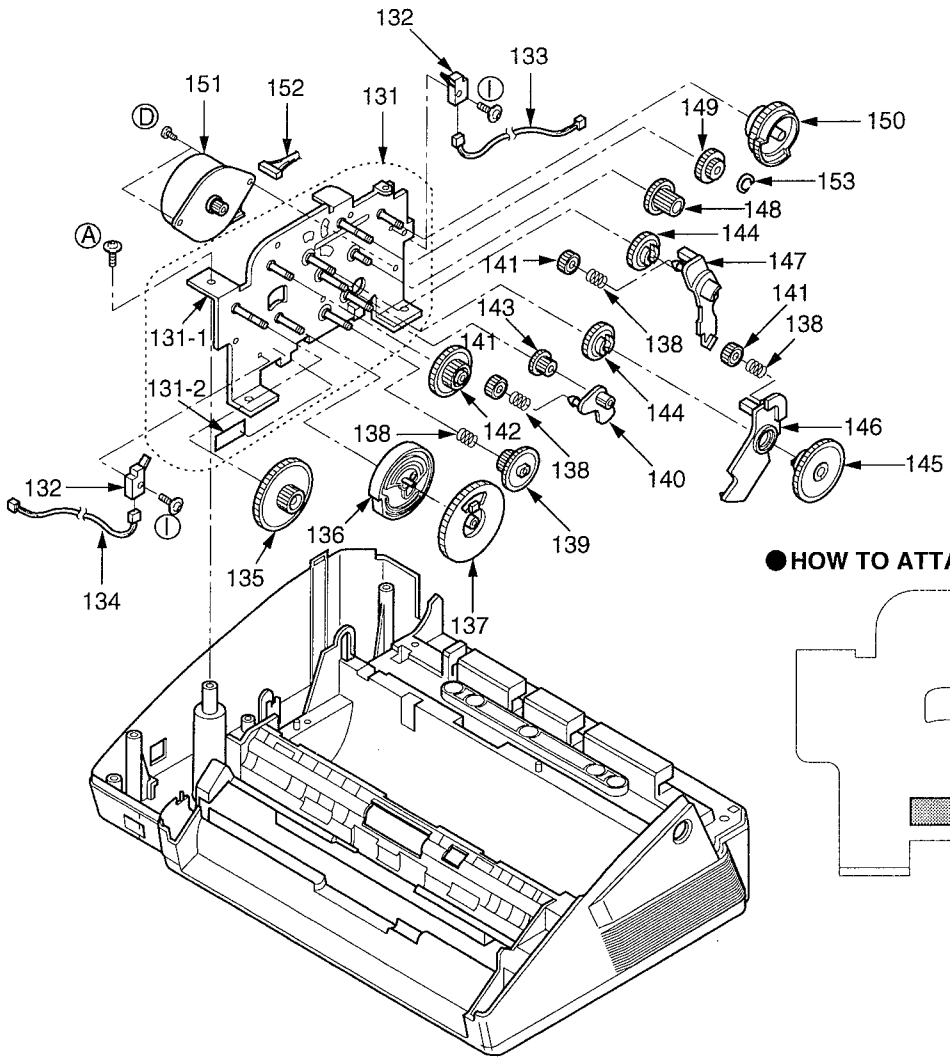
2. UPPER CABINET SECTION



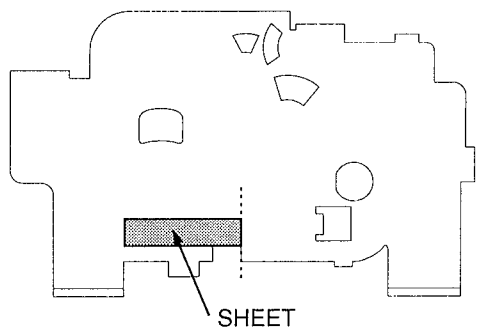
3. LOWER CABINET /P.C.B. SECTION



4. MOTOR SECTION



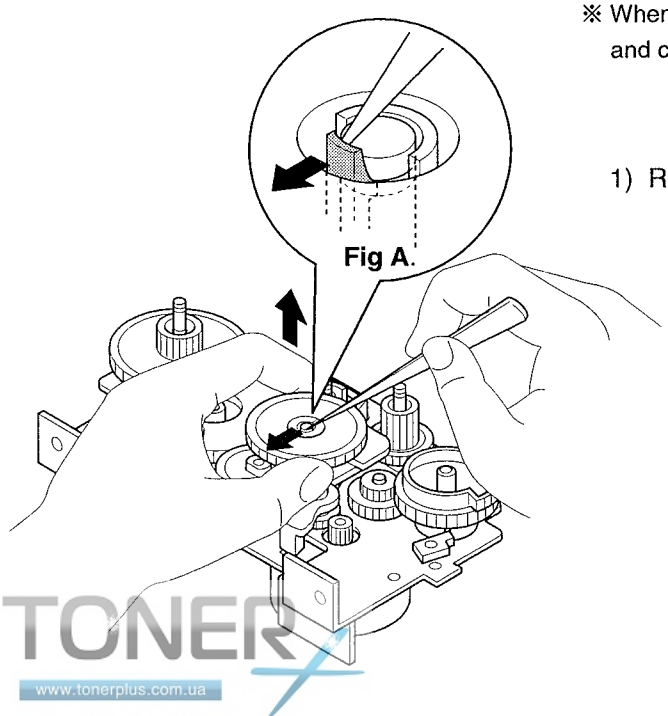
● HOW TO ATTACH THE SHEET (Ref.131-1)

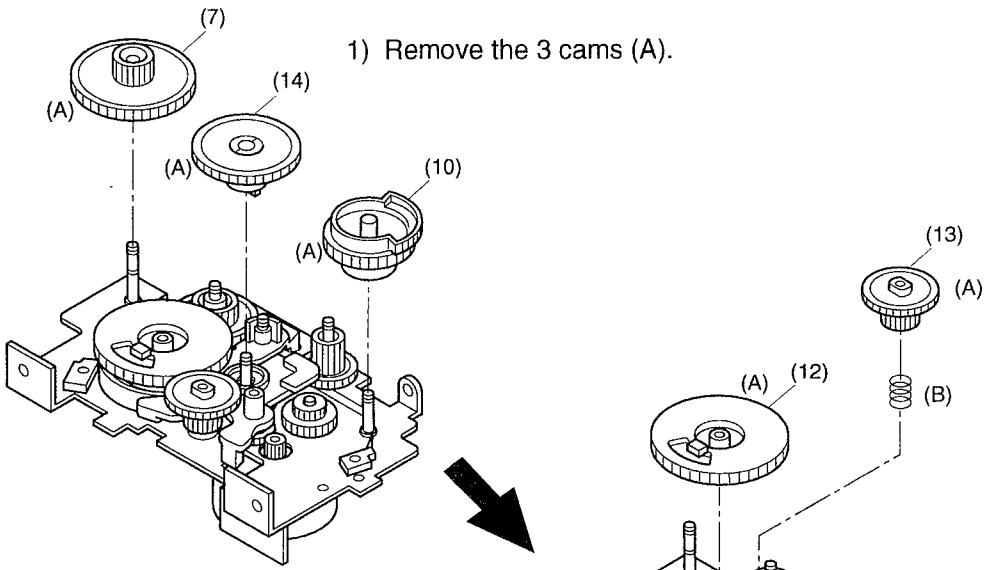


● HOW TO REMOVE THE MOTOR BLOCK

※ When attaching, place it so that the cam number and chassis number match.

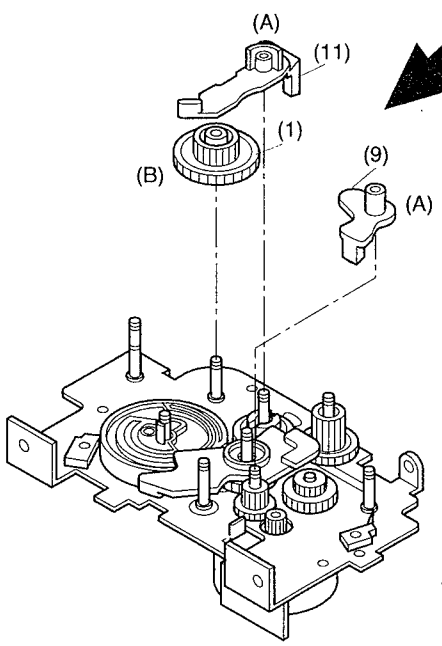
1) Remove the CAM from the gray area.(See Fig A.)



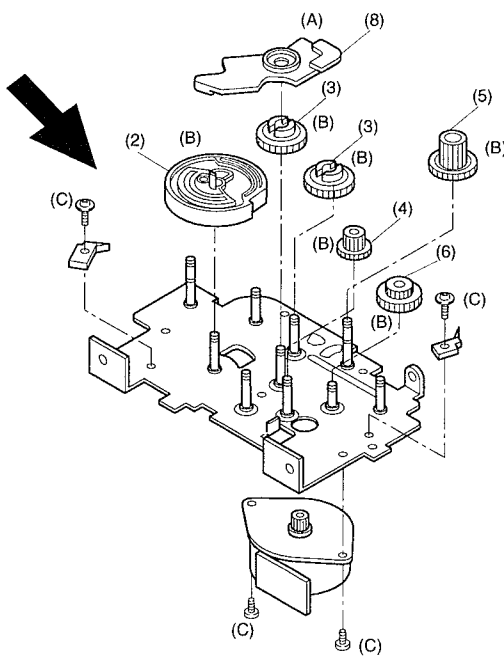


1) Remove the 3 cams (A).

1) Remove the 2 cams (A).
2) Remove the spring (B).



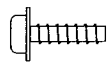
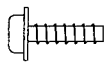
1) Remove the 2 arms (A).
2) Remove the cam (B).



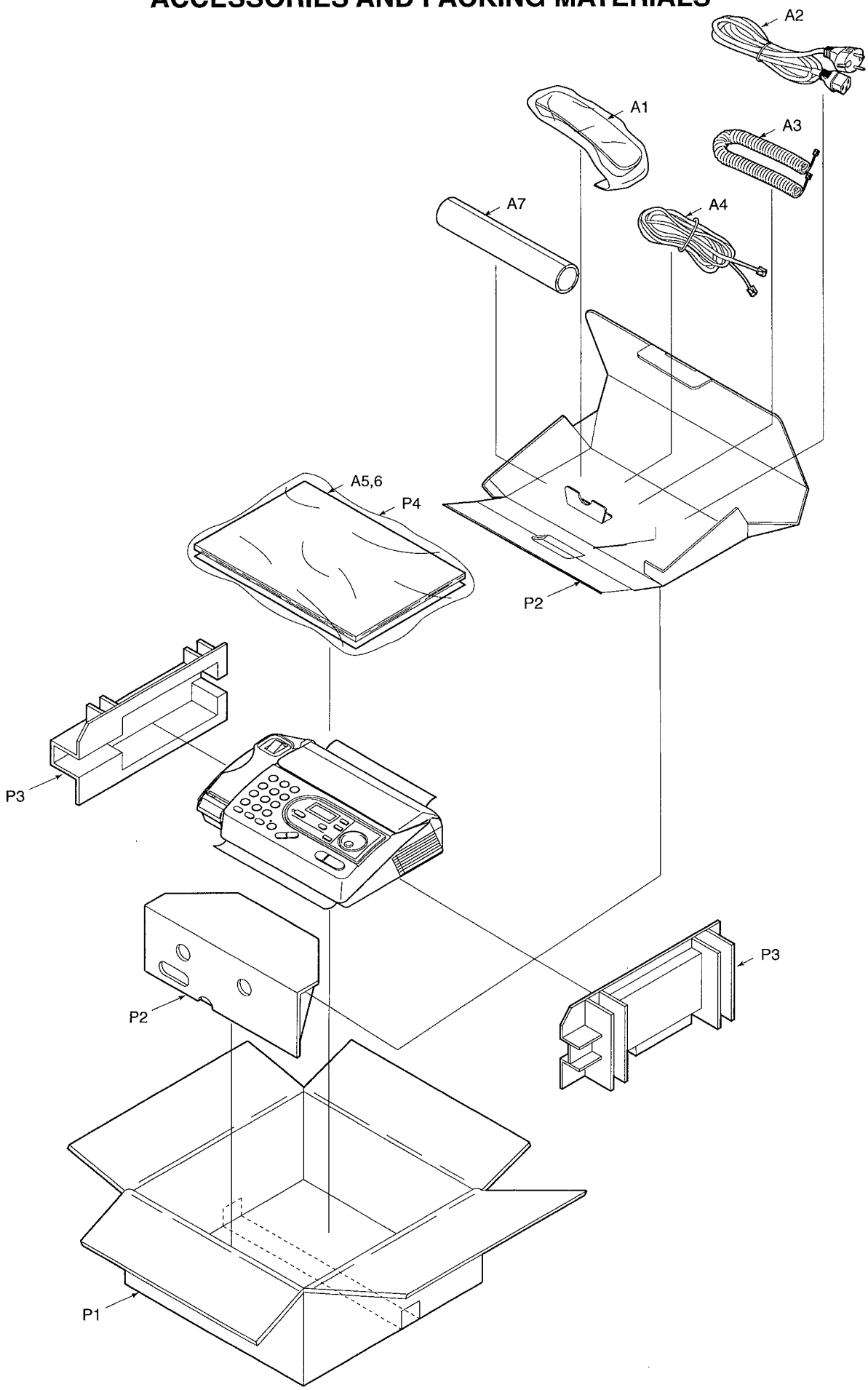
1) Remove the arm (A).
2) Remove the 6 cams (B).
3) Remove the 2 screws (C).
4) Remove the arm and motor.

The ( ) numbers are the numbers marked on the corresponding CAM.

5. ACTUAL SIZE OF SCREWS AND WASHER

	Part No.	Illustration
Ⓐ	XTW3+S10P	
Ⓑ	XTW3+W6P	
Ⓒ	XSN3+W6FZ	
Ⓓ	XYC3+CF6	
Ⓔ	XSB4+6	
Ⓕ	XWC4B	
Ⓖ	XTW3+U6L	
Ⓗ	XTW26+8P	
Ⓘ	XST2+8	

ACCESSORIES AND PACKING MATERIALS



REPLACEMENT PARTS LIST

This replacement parts list is for the KX-FT31BX only.

Model KX-FT31BX

Notes:
1. The marking (RTL) indicates that the Retention Time is limited for this item. After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependent on the type of assembly, and in accordance with the laws governing part and product retention. After the end of this period, the assembly will no longer be available.
2. Important safety notice.
   Components identified by the ⚠ mark special characteristics important for safety.
   When replacing any of these components, use only manufacturer's specified parts.
3. The S mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS
   Unless otherwise specified.
   All resistors are in ohms ( ) k=1000 , M=1000k
   All capacitors are in MICRO FARADS(μF) P= μμF
   *Type &Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQRD:Carbon
ERD:Carbon	ERG:Metal Oxide	PQRQ:Fuse
PQ4R:Chip	ERO:Metal Film	ERF:Wire Wound

Wattage

10,16,18:1/8W	14,25,S2:1/4W	12,50,S1:1/2W	1:1W	2:2W	5:5W

ECFD:Semi-Conductor	ECCD,ECKD,PQCBC,PQVP : Ceramic
ECQS:Styrol	ECQM,ECQV,ECQE,ECQU,ECQB : Polyester
PQCBX,ECUV:Chip	ECEA,ECSZ,ECOS : Electrolytic
ECMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	OF:3.15V	OJ :6.3V	1V :35V
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V
2E:250V	2:200V	1V:35V	1C :16V	1J :63V
2H:500V		OJ:6.3V	1E,25:25V	2A :100V

Ref. No.	Part No.	Part Name & Description	Pcs
		CABINET AND ELECTRICAL PARTS	
		(1.OPERATION PANEL SECTION)	
1	PFGP1060Z	LCD PANEL	1
2	PFKS1016Z1	DOCUMENT TRAY	1
3	PFBE1002Z1	JOG DIAL	1
4	PFGG1016Z1	GRILLE	1
5	PFKR1009Z1	GUIDE, DOCUMENT GUIDE (RIGHT)	1
6	PFUS1034Z	SPRING, DOCUMENT GUIDE	1
7	PFDG1002Z	GEAR, DOCUMENT GUIDE	1
8	PFKR1008Z1	GUIDE, DOCUMENT GUIDE (LEFT)	1
9	PFGE1001Z	LED COVER	1
10	PFBX1030Z1	BUTTON, DIAL	1
11	PFAVJS10100	LIQUID CRYSTAL DISPLAY	1
12	PFBC1012Z1	BUTTON, VOLUME	1
13	PFBX1031Z1	BUTTON, FUNCTION	1
14	PFBC1011Z1	BUTTON, STOP	1
15	PFBC1010Z1	BUTTON, START	1
16	PFJS12R85Z	CONNECTOR, 12 PIN	1
17	PFZEFT31BX	REC. PAPER UPPER GUIDE ASS'Y	1
17-1	PFHX1192Z	COVER, REC. PAPER UPPER GUIDE	2
18	PFDE1054Z	LEVER, READ DETECTION	1
19	PFDE1055Z	LEVER, DOCUMENT DETECTION	1
20	PFUS1027Z	SPRING, DOCUMENT LEVER	2
21	PFDE1060Z	LEVER, OPEN SENSOR	1
22	PFDG1059Z	GEAR, PLATEN	1
23	PFDJ1012Z	SPACER, PLATEN	2
24	PFDN1012Z	ROLLER, PLATEN	1
25	PFUS1095Z	SPRING, OPEN ERATH	1
26	PFUV1010Z	COVER, OPERATION PANEL	1
27	PFUS1093Z	SPRING, SUPPORT ROLLER	1
28	PQDR9685Y	ROLLER, SUPPORT	1
29	PQDR10005Y	ROLLER, SUPPORT EXIT PRINT	1
30	PFUS1025Z	SPRING, ROLLER	2
31	PFDF1005Z	SHAFT, SUPPORT ROLLER	1
32	PFDE1057Z	SPRING, SEPARATION ADJ.	1
33	PFUS1094Z	SPRING, DOCUMENT FEED	1
34	PFDE1056Z	SEPARATION RUBBER HOLDER	1
35	PFHG1038Z	RUBBER, SEPARATION	1
36	PFUV1011Z	DOCUMENT PAPER GUIDE	1
37	PFMH1046Z	SHEIDING PLATE	1
38	PFHX1199Z	JOG SHEET	1
		(2. UPPER CABINET/ THERMAL HEAD SECTION)	
51	PFKM1027Z1	HANDSET CRADLE	1
52	PQHX10241Z	SHEET, TELEPHONE NO.	1
53	PFHR1060Z	COVER, HEAD	1
54	PFDE1052Z	GUIDE, HEAD (LEFT)	1
55	PFJHS011Z	THERMAL HEAD	1
56	PFKV1007Z1	GUIDE, RECORDING PAPER GUID	1
57	PFJS12R84Z	CONNECTOR, 12 PIN	1
58	PFBH1007Z1	BUTTON, HOOK	1
59	PFDG1057Z	GEAR, FEED ROLLER	1
60	PFDJ1014Z	SPACER, SUB ROLLER	2
61	PFUS1042Z	SPRING, THERMAL HEAD	3
62	PFDG1056Z	GEAR, EXIT ROLLER	1
63	PFDJ1006Z	SPACER, ROLLER	2
64	PFDN1015Z	ROLLER, EXIT	1
65	PFDN1014Z	ROLLER, DOCUMENT FEED	1
66	PFDE1053Z	GUIDE, HEAD (RIGHT)	1
67	PFUS1110Z	SPRING,LOOK LEVER	1
68	PFDE1047Z	LEVER, LOOK (RIGHT)	1
69	PFDF1020Z	SHAFT, LOOK LEVER	1
70	PFDE1046Z	LEVER, LOOK (LEFT)	1
71	PFGT1333Z	NAME PLATE	1
72	PFBZ1001Z	ARM, HOOK SWITCH	1
73	PFJS06R89Z	CONNECTOR, 6 PIN	1
74	PFUS1092Z	SPRING, STATIC ELECTRIC (B)	1
75	PFUS1091Z	SPRING, STATIC ELECTRIC (A)	1
76	PFUS1045Z	SPRING, OPERATE OPEN S	1
77	PFKM1026Z1	UPPER CABINET	1
78	PFDG1042Z	GEAR	1
79	PFUS1090Z	SPRING, EARTH	1
80	PFQT1406Z	CAUTION LABEL	1
81	PFJS10R83Z	CONNECTOR, 10 PIN	1
82	PFMH1042Z	FRAME, CIS (LEFT)	1
83	PF0U1010Z	IMAGE SENSOR	1
84	PFMH1043Z	FRAME, CIS (RIGHT)	1
85	PFDG1058Z	GEAR, SEPARATION ROLLER	1
86	PFDE1059Z	DELAY	1
87	PQUS10038Z	SPRING,ONE WAY	1
88	PFDJ1013Z	SPACER, ROLLER	2
89	PFDN1013Z	ROLLER, SEPARATION	1
90	XUC2FY	RETAINING RING	1
91	PFHS1010Z	TAPE, SPEAKER	1
92	PFHX1123Z	SHEET, THERMAL HEAD	1

This replacement parts list is for the KX-FT31BX only.

Ref. No.	Part No.	Part Name & Description	Pcs
		(3. LOWER SECTION)	
101	PQJP03S07Z	AC INLET ⚠	1
102	PQJS02Q59Y	CONNECTOR, 2 PIN	1
103	PFDE1045Z	LEVER, PAPER SENSOR	1
104	PFAS50PTC01Y	SPEAKER	1
105	PFJS02R20Z	CONNECTOR, 2 PIN	1
106	PFUS1089Z	SPRING, SPEAKER	1
107	PFJS07R81Z	CONNECTOR, 7 PIN	1
108	PFMD1024Z	FRAME, BOTTOM	1
109	PFHA1001Z	RUBBER, LEGS	4
110	PQMH10186Z	LID, ROM CHANGE	1
		(4. GEAR CHASSIS SECTION)	
131	PFZMFT31BX	GEAR CHASSIS ASS'Y	1
131-1	PFUA1011Z	GEAR CHASSIS	1
131-2	PFHS1018Z	SHEET, BRAKE	1
132	PQST2A04Z	SEESAW SWITCH	2
133	PFJS02R86Z	CONNECTOR, 2 PIN	1
134	PFJS02R87Z	CONNECTOR, 2 PIN	1
135	PFDG1043Z	GEAR	1
136	PFDG1054Z	CAM	1
137	PFDG1053Z	CAM	1
138	PFUS1111Z	SPRING	4
139	PFDG1049Z	GEAR, CAM	1
140	PFDE1050Z	ARM, CHANGEOVER	1
141	PFDG1047Z	GEAR, CHANGEOVER	3
142	PFDG1044Z	GEAR	1
143	PFDG1055Z	GEAR, CENTER	1
144	PFDG1048Z	GEAR, SUN	2
145	PFDG1050Z	GEAR, INTERVAL	1
146	PFDE1049Y	ARM, RX	1
147	PFDE1048Z	ARM, TX	1
148	PFDG1046Z	GEAR	1
149	PFDG1045Y	GEAR	1
150	PFDG1052Z	GEAR, FEED BACK	1
151	PFJQ1008Z	MOTOR	1
152	PFJS05R82Z	CONNECTOR, 5 PIN	1
153	PQFN51Z	WASHER	1

Ref. No.	Part No.	Part Name & Description & Value	Pcs
		ACCESSORIES AND PACKING MATERIALS	
A1	PFJXE0101Z	HANDSET	1
A2	PQJA10038Y	POWER CORD ⚠	1
A3	PQJA212V	HANDSET CORD	1
A4	PQJA59V	TELEPHONE CORD ⚠ S	1
A5	PFQX1185Z	INSTRUCTION BOOK	1
A6	PFQW1218Z	QUICK REFERENCE GUIDE	1
A7	PQHP10023Z	RECORDING PAPER	1
P1	PFPK1320Z	GIFT BOX	1
P2	PFPN1106Z	ACCESSORY BOX	1
P3	PFPN1109Z	CUSHION	1
P4	PQPP10005Z	BAG, POLYETHYLENE	1
		DIGITAL BOARD PARTS	
PCB1	**PFWP1FT31BX**	**DIGITAL BOARD ASS'Y (RTL)**	**1**
		(ICs)	
IC1	PQVICX58257C	IC S	1
IC2	PFWIFT31BX1	IC (ROM)	1
IC4	PFVIM66390M2	IC	1
IC5	PQVIR96DFXL	IC	1
IC6	PFVIBU4066BF	IC	1
IC7	PFVIBU4066BF	IC	1
IC8	PQVIBA12003	IC S	1
IC9	PQVIPQ05SZ5	IC	1
IC10	PQVIMC34119M	IC S	1
IC11	PQVINJM4558M	IC S	1
IC12	PQVINJM4558M	IC S	1
IC13	PQVIMM1245BF	IC	1
IC14	PFVTSI4431DY	IC	1
		(TRANSISTORS)	
Q1	2SD1819A	TRANSISTOR(SI) S [2SC4155or 2SC4081]	1
Q2	2SB1197K	TRANSISTOR(SI) [or 2SB1051] S	1
Q3	2SD1819A	TRANSISTOR(SI) S [2SC4155or 2SC4081]	1
Q4	2SD1819A	TRANSISTOR(SI) S [2SC4155or 2SC4081]	1
Q5	2SD1819A	TRANSISTOR(SI) S [2SC4155or 2SC4081]	1
Q6	2SD1819A	TRANSISTOR(SI) S [2SC4155or 2SC4081]	1
Q7	2SB1322	TRANSISTOR(SI) S	1
Q8	PQVTDTC114EU	TRANSISTOR(SI) [or UN5211T]	1
Q9	2SD1994A	TRANSISTOR(SI)	1
Q11	2SB1197K	TRANSISTOR(SI) [or 2SB1051] S	1

This replacement parts list is for the KX-FT31BX only.

Ref. No.	Part No.	Part Name & Description & Value		Pcs
		(DIODES)		
D4	PFVDRMRLS245	DIODE(SI)		1
D6	MA7200	DIODE(SI)		1
D7	PFVDRMRLS245	DIODE(SI)		1
D8	PQVDRLZ5R6	DIODE(SI)		1
DA1	MA141WK	DIODE(SI)		1
DA2	MA143	DIODE(SI)		1
		(BATTERY)		
BAT1	PQPCR2032H09	LITHIUM BATTERY	S	1
		(CONNECTORS)		
CN1	PQJP7G30Y	CONNECTOR, 7P		1
CN2	PQJP10G30Y	CONNECTOR,10P		1
CN3	PQJP12G30Y	CONNECTOR, 12P	S	1
CN5	PFJP12A12Z	JACK		1
CN4	PQJP5G30Y	CONNECTOR, 5P		1
CN6	PQJP13A19Z	CONNECTOR, 13P		1
CN7	PQJP13A19Z	CONNECTOR, 13P		1
CN9	PQJP2G100Z	CONNECTOR, 2P		1
CN10	PQJP2G30Y	CONNECTOR, 2P		1
CN11	PFJP02A06Z	CONNECTOR, 2P		1
		(RESISTORS)		
J3	PQ4R10XJ000	0		1
L3	PQ4R10XJ000	0		1
L4	ERJ3GEY0R00	0		1
L11	PQ4R10XJ000	0		1
L12	ERJ3GEY0R00	0		1
R1	ERJ3GEYJ472	4.7K		1
R2	ERJ3GEYJ912	9.1K		1
R3	ERJ3GEY0R00	0		1
R4	ERJ3GEYJ222	2.2K		1
R5	ERJ3GEYJ821	820		1
R6	ERJ3GEYJ122	1.2K		1
R7	ERJ3GEYJ122	1.2K		1
R8	ERJ3GEYJ391	390		1
R9	ERJ3GEYJ271	270		1
R10	ERJ3GEYJ271	270		1
R11	ERJ3GEYJ271	270		1
R12	ERJ3GEYJ271	270		1
R15	ERJ3GEY0R00	0		1
R16	ERJ3GEY0R00	0		1
R17	ERJ3GEYJ105	1M		1
R18	ERJ3GEYJ270	27		1
R19	ERJ3GEYJ121	120		1
R20	ERJ3GEYJ472	4.7K		1
R21	ERJ3GEYJ472	4.7K		1
R22	ERJ3GEY0R00	0		1
R24	ERJ3GEYJ472	4.7K		1
R25	ERJ3GEYJ1R0	1		1

Ref. No.	Part No.	Value		Pcs
R26	PQ4R10XJ102	1K		1
R27	PQ4R10XJ102	1K		1
R28	PQ4R10XJ102	1K		1
R29	ERJ3GEYJ103	10K		1
R30	ERJ3GEYJ103	10K		1
R31	ERJ3GEYJ120	12		1
R32	ERJ6ENF4752	0	S	1
R33	ERJ3GEYJ332	3.3K		1
R34	ERJ3GEYJ103	10K		1
R35	ERJ3GEYJ222	2.2K		1
R36	ERJ3GEYJ222	2.2K		1
R37	ERJ3GEYJ473	47K		1
R38	ERJ3GEYJ224	220K		1
R39	ERJ3GEYJ224	220K		1
R40	ERJ3GEYJ473	47K		1
R41	ERJ3GEYJ473	47K		1
R42	PQ4R10XF1802	18K		1
R43	PQ4R10XF8662	86.6K		1
R44	ERJ3GEYJ103	10K		1
R45	PQ4R10XF8662	86.6K		1
R46	ERJ3GEYJ103	10K		1
R47	ERJ3GEYJ223	22K		1
R48	ERJ3GEYJ103	10K		1
R49	ERJ3GEYJ823	82K		1
R50	ERJ3GEYJ563	56K		1
R51	ERJ3GEYJ334	330K		1
R52	ERJ3GEYJ153	15K		1
R53	PQ4R10XJ102	1K	S	1
R54	ERJ3GEYJ224	220K		1
R55	ERJ3GEYJ224	220K		1
R56	ERJ3GEYJ224	220K		1
R57	ERJ3GEYJ224	220K		1
R58	ERJ3GEYJ104	100K		1
R59	ERJ3GEYJ104	100K		1
R60	ERJ3GEYJ101	100		1
R61	ERJ3GEYJ101	100		1
R62	ERJ3GEYJ101	100		1
R63	ERJ3GEYJ101	100		1
R64	ERJ3GEYJ101	100		1
R65	ERJ3GEYJ101	100		1
R66	ERJ3GEYJ203	20K		1
R67	ERJ3GEYJ102	1K		1
R68	ERJ3GEYJ102	1K		1
R69	ERJ3GEYJ821	820		1
R70	ERJ3GEYJ223	22K		1
R71	ERJ3GEYJ823	82K		1
R72	ERJ3GEYJ473	47K		1
R73	ERDS1VJ152	1.5K		1
R74	ERJ3GEYJ473	47K		1
R75	ERJ3GEY0R00	0		1
R77	PQ4R18XJ561	560	S	1
R78	ERJ3GEYJ103	10K		1
R79	ERJ3GEYJ473	47K		1
R80	ERJ3GEYJ473	47K		1
R81	ERJ3GEYJ224	220K		1
R82	ERJ3GEYJ103	10K		1
R83	ERJ3GEYJ334	330K		1
R84	ERJ3GEYJ102	1K		1
R85	ERJ3GEYJ102	1K		1
R86	ERJ3GEYJ472	4.7K		1
R87	ERJ3GEYJ153	15K		1
R88	ERJ3GEYJ473	47K		1
R89	ERJ3GEYJ222	2.2K		1

This replacement parts list is for the KX-FT31BX only.

Ref. No.	Part No.	Part Name & Description & Value		Pcs
R91	ERJ3GEYJ102	1K		1
R92	ERJ3GEYJ331	330		1
R93	ERJ3GEYJ470	47		1
R94	ERJ3GEY0R00	0		1
R95	ERJ3GEYJ473	47K		1
R96	ERJ3GEYJ103	10K		1
R97	ERJ3GEY0R00	0		1
R98	ERJ3GEYJ102	1K		1
R99	ERJ3GEYJ102	1K		1
R100	ERJ3GEYJ103	10K		1
R101	ERJ3GEYJ103	10K		1
R102	ERJ3GEYJ103	10K		1
R103	ERJ3GEYJ105	1M		1
R104	ERJ3GEY0R00	0		1
R105	PQ4R10XJ114	110K	S	1
R106	PQ4R10XJ154	150K	S	1
R107	PQ4R10XJ472	4.7K	S	1
R108	PQ4R10XJ562	5.6K	S	1
R109	ERJ3GEY0R00	0		1
R110	ERJ3GEY0R00	0		1
R111	ERJ3GEY0R00	0		1
		(CERAMIC FILTER)		
LF2	EXCEMT222D	CERAMIC FILTER		1
		(COILS)		
L1	PQLQR1ET	COIL		1
L5	PQLQR1RM601	COIL		1
L6	PQLQR1RM601	COIL		1
L7	PQLQR1RM601	COIL		1
L8	PQLQR1RM601	COIL		1
L9	PQLQR1RM601	COIL		1
L10	PQLQR1RM601	COIL		1
L13	PQLQR1KT	COIL		1
		(COMPONENTS PARTS)		
RA1	EXRV8V271JV	RESISTOR ARRAY		1
RA2	EXRV8V271JV	RESISTOR ARRAY		1
RA3	EXRV8V271JV	RESISTOR ARRAY		1
RA4	EXRV8V271JV	RESISTOR ARRAY		1
RA5	EXRV8V271JV	RESISTOR ARRAY		1
RA6	EXRV8V101JV	RESISTOR ARRAY		1
RA7	EXRV8V101JV	RESISTOR ARRAY		1
		(CAPACITORS)		
C1	ECUV1H104ZFV	0.1	S	1
C2	PQCUV1C224ZF	0.22		1
C3	ECUV1H104ZFV	0.1	S	1
C4	ECUV1H104ZFV	0.1	S	1
C5	ECUV1H100DCV	10P	S	1
C6	ECUV1H104ZFV	0.1	S	1
C7	ECUV1H104ZFV	0.1	S	1
C8	ECUV1H104ZFV	0.1	S	1
C9	ECUV1H104ZFV	0.1	S	1

Ref. No.	Part No.	Part Name & Description & Value		Pcs
C13	ECUV1H101JCV	100P		1
C14	ECUV1H104ZFV	0.1	S	1
C15	ECUV1H080DCV	8P		1
C16	ECUV1H100DCV	10P		1
C17	ECUV1H101JCV	100P		1
C18	ECUV1H103KBV	0.01		1
C19	ECUV1H330JCV	33P		1
C20	ECUV1H104ZFV	0.1	S	1
C21	ECUV1H104ZFV	0.1	S	1
C22	PQCUV1C224ZF	0.22		1
C23	PQCUV1E104MD	0.1	S	1
C24	ECUV1H104ZFV	0.1	S	1
C25	ECUV1H150JCV	15P		1
C26	ECUV1H104ZFV	0.1	S	1
C27	ECUV1H104ZFV	0.1	S	1
C28	ECEA1CK101	100	S	1
C29	ECUV1H150JCV	15P		1
C30	ECUV1H104ZFV	0.1	S	1
C31	ECUV1H102KBV	0.001		1
C33	ECUV1H104ZFV	0.1	S	1
C34	ECUV1H104ZFV	0.1	S	1
C36	ECUV1H331JCV	330P	S	1
C37	PQCUV1H105JC	1	S	1
C40	ECUV1H104ZFV	0.1	S	1
C41	ECUV1H104ZFV	0.1	S	1
C42	ECEA0JK221	220	S	1
C43	ECEA1CK101	100	S	1
C44	ECUV1C104KBV	0.1		1
C45	ECUV1H331JCV	330P	S	1
C46	ECEA1VKA470	47		1
C47	PQCUV1C224KB	0.22	S	1
C49	PQCUV1H105JC	1	S	1
C50	PQCUV1E224MD	0.22	S	1
C51	ECUV1H104ZFV	0.1	S	1
C52	ECUV1C104KBV	0.1		1
C53	ECEA1HKS100	10	S	1
C54	ECUV1H102KBV	0.001		1
C55	ECUV1H102KBV	0.001		1
C56	ECUV1H222KBV	0.0022		1
C58	ECUV1C104KBV	0.1		1
C59	ECEA1CKS470	47	S	1
C60	ECUV1C104KBV	0.1		1
C61	ECUV1H333KDV	0.033	S	1
C62	ECUV1H222KBV	0.0022		1
C63	ECUV1C104KBV	0.1		1
C64	ECUV1C104KBV	0.1		1
C65	ECUV1H104ZFV	0.1	S	1
C66	ECUV1H104ZFV	0.1	S	1
C67	ECUV1H104ZFV	0.1	S	1
C68	ECEA1CKS100	10	S	1
C69	ECUV1C104KBV	0.1		1
C70	ECUV1C104KBV	0.1		1
C71	ECUV1H222KBV	0.0022		1
C73	ECUV1H561JCV	560P		1
C74	ECUV1C104KBV	0.1		1
C75	ECUV1H102KBV	0.001		1
C76	ECUV1H102KBV	0.001		1
C77	ECUV1H104ZFV	0.1	S	1
C78	ECEA1CKS100	10	S	1
C79	ECUV1H104ZFV	0.1	S	1
C80	ECUV1H104ZFV	0.1	S	1
C81	ECEA1CK101	100	S	1
C82	ECUV1H104ZFV	0.1	S	1

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Ref. No.	Part No.	Part Name & Description & Value		Pcs
C83	ECUV1H102KBV	0.001		1
C84	ECUV1H102KBV	0.001		1
C85	PQCUV1E104MD	0.1	S	1
C86	ECUV1H101JCV	100P		1
C87	ECUV1H333KDV	0.033	S	1
C88	PQCUV1H105JC	1	S	1
C89	ECUV1C104KBV	0.1		1
C90	ECEA1CK101	100	S	1
C91	PQCUV1H105JC	1	S	1
C92	ECUV1C104KBV	0.1		1
C93	ECUV1H102KBV	0.001		1
C94	ECUV1H104ZFV	0.1	S	1
C95	PQCUV1C224KB	0.22		1
C96	ECUV1H104ZFV	0.1	S	1
C97	ECUV1H104ZFV	0.1	S	1
C100	ECUV1H104ZFV	0.1	S	1
C102	ECUV1H102KBV	0.001		1
C103	ECUV1H104ZFV	0.1	S	1
C104	ECUV1C104KBV	0.1		1
C105	ECUV1H103KBV	0.01		1
C106	ECUV1H102KBV	0.001		1
C107	PQCUV1H473MD	0.047		1
C116	PQCUV1H104ZFV	0.1	S	1
C117	ECUV1H104ZFV	0.1	S	1
C118	ECUV1H104ZFV	0.1	S	1
C119	ECUV1H681KBV	680P		1
C120	ECUV1H681KBV	680P		1
		(CRYSTAL OSCILLATORS)		
X1	PFVCCSA24Z	CRYSTAL OSCILLATOR		1
X2	PQVCL3276N6Z	CRYSTAL OSCILLATOR		1

Ref. No.	Part No.	Part Name & Description		Pcs
		ANALOG BOARD PARTS		
PCB2	**PFLP1112BXZ**	**ANALOG BOARD ASS'Y (RTL)** ⚠		**1**
		(ICs)		
IC1	PQVITC4066BF	IC	S	1
IC2	PQVINJM4558M	IC	S	1
IC3	PQVINJM2903M	IC	S	1
IC4	PQVINJM4558M	IC	S	1
IC5	PQVINJM4558M	IC	S	1
		(TRANSISTORS)		
Q1	PQVTDTC143E	TRANSISTOR(SI) [or UN521]		1
Q2	PQVTDTC143E	TRANSISTOR(SI) [or UN521]		1
Q8	2SC2235	TRANSISTOR(SI)		1
Q10	2SD1819A	TRANSISTOR(SI) [or 2SC4155]	S	1
Q13	2SD1819A	TRANSISTOR(SI) [or 2SC4155]	S	1
Q14	2SD1921Q	TRANSISTOR(SI)	S	1
Q15	PQVTDTC143E	TRANSISTOR(SI) [or UN521]		1
		(DIODES)		
D1	1SS131	DIODE(SI)	S	1
D2	PQVDS1ZB40F1	DIODE(SI)		1
D9	MA4056	DIODE(SI)	S	1
D10	MA4056	DIODE(SI)	S	1
D13	MA4056	DIODE(SI)	S	1
D14	MA4056	DIODE(SI)	S	1
D16	1SS131	DIODE(SI)	S	1
D17	1SS131	DIODE(SI)	S	1
D18	1SS131	DIODE(SI)	S	1
D19	1SS131	DIODE(SI)	S	1
D20	1SS131	DIODE(SI)	S	1
D21	1SS131	DIODE(SI)	S	1
		(JACK)		
CN1	PFJJ1T01Z	JACK	S	1
CN2	PFJJ1T01Z	JACK	S	1
		(CONNECTORS)		
CN3	PQJP6G30Y	CONNECTOR, 6P		1
CN6	PQJS13A10Z	CONNECTOR, 13P		1
CN7	PQJS13A10Z	CONNECTOR, 13P		1
		(SWITCHES)		
SW1	PQSS2A27Z	SWITCH		1
SW3	PFSH1A03Z	SWITCH		1

This replacement parts list is for the KX-FT31BX only.

Ref. No.	Part No.	Part Name & Description & Value		Pcs
		(COILS)	S	
L2	PQLQR1E32A07	COIL		1
L3	PQLQR1E32A07	COIL		1
L4	PQLQR1E32A07	COIL		1
L5	PQLQR1E32A07	COIL		1
L6	PQLQR1RM601	COIL	S	1
L7	PQLQR1RM601	COIL	S	1
L8	PQLQR1RM601	COIL	S	1
L9	PQLQR1RM601	COIL	S	1
		(COMPONENTS PARTS)		
L1	EXCELDR35	COMPONENTS PARTS		1
		(PHOTO COUPLERS)		
PC1	PQVIPS2532-1	PHOTO ELECTRIC TRANSDUCER	⚠S	1
PC5	PFVITLP320	PHOTO ELECTRIC TRANSDUCER	⚠	1
PC6	PQVIPC814K	PHOTO ELECTRIC TRANSDUCER	⚠	1
		(TRANSFORMER)		
T1	PFLT8D1A	TRANSFORMER	⚠S	1
T2	PQLT8E6A	TRANSFORMER	⚠	1
		(RELAY)		
RLY1	AHX203	RELAY	⚠	1
		(THERMISTOR)		
POS1	PFRT002	THERMISTOR		1
		(RESISTORS)		
J71	PQ4R10XJ000	0	S	1
J72	PQ4R10XJ000	0	S	1
JP15	PQ4R10XJ000	0	S	1
R1	ERDS1TJ471	470		1
R2	ERDS2TJ821	820		1
R11	PQ4R10XJ473	47K	S	1
R16	PQ4R10XJ123	12K	S	1
R18	PQ4R10XJ562	5.6K	S	1
R20	ERDS1TJ330	33		1
R22	ERJ6GEYJ621	620		1
R23	PQ4R10XJ000	0	S	1
R24	PQ4R10XJ000	0	S	1
R25	PQ4R10XJ153	15K	S	1
R26	PQ4R10XJ000	0	S	1
R27	PQ4R10XJ104	100K	S	1
R28	PQ4R10XJ103	10K	S	1
R29	PQ4R10XJ563	56K	S	1
R30	PQ4R10XJ563	56K	S	1
R31	PQ4R10XJ333	33K	S	1
R32	PQ4R10XJ123	12K	S	1
R33	PQ4R10XJ000	0	S	1

Ref. No.	Part No.	Value		Pcs
R34	PQ4R10XJ000	0		1
R35	PQ4R10XJ114	110K	S	1
R36	PQ4R10XJ114	110K	S	1
R37	PQ4R10XJ472	4.7K	S	1
R38	PQ4R10XJ562	5.6K	S	1
R39	PQ4R10XJ222	2.2K	S	1
R42	PQ4R10XJ223	22K	S	1
R43	ERDS1TJ473	47K		1
R44	ERDS1TJ473	47K		1
R45	ERDS1TJ330	33		1
R46	PQ4R10XJ152	1.5K	S	1
R47	PQ4R10XJ223	22K	S	1
R48	PQ4R10XJ474	470K	S	1
R50	PQ4R10XJ473	47K	S	1
R51	PQ4R10XJ474	470K	S	1
R52	PQ4R10XJ473	47K	S	1
R53	PQ4R10XJ223	22K	S	1
R54	PQ4R10XJ563	56K	S	1
R55	PQ4R10XJ224	220K	S	1
R56	PQ4R10XJ332	3.3K	S	1
R57	PQ4R10XJ684	680K	S	1
R58	PQ4R10XJ102	1K	S	1
R59	PQ4R10XJ563	56K	S	1
R60	PQ4R10XJ473	47K	S	1
R61	PQ4R10XJ222	2.2K	S	1
R62	PQ4R10XJ563	56K	S	1
R64	PQ4R10XJ473	47K	S	1
R68	PQ4R10XJ562	5.6K	S	1
R71	PQ4R10XJ331	330	S	1
R72	PQ4R10XJ152	1.5K	S	1
R73	PQ4R10XJ152	1.5K	S	1
R74	PQ4R10XJ153	15K	S	1
R75	PQ4R10XJ153	15K	S	1
R76	PQ4R10XJ101	100	S	1
R77	PQ4R10XJ331	330	S	1
R78	PQ4R10XJ473	47K	S	1
R79	PQ4R10XJ223	22K	S	1
R80	PQ4R10XJ154	150K	S	1
R81	PQ4R10XJ154	150K	S	1
R82	PQ4R10XJ562	5.6K	S	1
R83	PQ4R10XJ105	1M	S	1
R87	PQ4R10XJ000	0		1
R88	PQ4R10XJ332	3.3K	S	1
R89	PQ4R10XJ331	330	S	1
R90	PQ4R10XJ564	560K	S	1
R91	PQ4R10XJ153	15K	S	1
R92	PQ4R10XJ223	22K	S	1
R93	PQ4R10XJ683	68K	S	1
R94	PQ4R10XJ101	100	S	1
R95	PQ4R10XJ472	4.7K	S	1
R96	PQ4R10XJ101	100	S	1
R97	PQ4R10XJ472	4.7K	S	1
R98	PQ4R10XJ101	100	S	1
R99	PQ4R10XJ472	4.7K	S	1
R100	PQ4R10XJ101	100	S	1
R101	PQ4R10XJ472	4.7K	S	1
R102	PQ4R10XJ222	2.2K	S	1
R103	PQ4R10XJ103	10K	S	1
R104	PQ4R10XJ103	10K	S	1

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Ref. No.	Part No.	Value		Pcs
R110	PQ4R10XJ472	4.7K	S	1
R111	PQ4R10XJ562	5.6K	S	1
R112	PQ4R10XJ224	220K	S	1
R113	PQ4R10XJ224	220K	S	1
R114	PQ4R10XJ562	5.6K	S	1
R115	ERDS1TJ222	2.2K		1
R116	ERDS1TJ222	2.2K		1
R117	ERG2SJ152	1.5K		1
		(CAPACITORS)		
C1	ECKD2H681KB	680P	S	1
C2	ECKD2H681KB	680P	S	1
C3	PQCUV1H472KB	0.0047		1
C9	ECEA1HKS100	10	S	1
C11	ECEA1HKS4R7	4.7	S	1
C12	PQCUV1H102J	0.001	S	1
C13	ECEA1HKS4R7	4.7	S	1
C16	ECEA1HKSR47	0.47	S	1
C17	PQCUV1H151JC	150P		1
C21	PQCUV1E104MD	0.1	S	1
C22	PQCUV1H332KB	0.0033		1
C23	PQCUV1E104MD	0.1	S	1
C24	PQCUV1E104MD	0.1	S	1
C27	PQCUV1H181JC	180P		1
C28	PQCUV1H181JC	180P		1
C29	PQCUV1H104ZF	0.1		1
C30	ECEA1CKS100	10	S	1
C31	PQCUV1H105JC	1	S	1
C32	ECQE2224KF	0.22		1
C33	ECQE2104KF	0.1		1
C34	PQCUV1H105JC	1	S	1
C35	PQCUV1H332KB	0.0033		1
C36	PQCUV1E104MD	0.1	S	1
C37	PQCUV1H104ZF	0.1		1
C38	PQCUV1E473MD	0.047	S	1
C39	PQCUV1E473MD	0.047	S	1
C40	PQCUV1E473MD	0.047	S	1
C41	PQCUV1H181JC	180P		1
C42	PQCUV1C224KB	0.22	S	1
C43	PQCUV1H151JC	150P		1
C44	PQCUV1H103KB	0.01		1
C45	PQCUV1E104MD	0.1	S	1
C48	PQCUV1H103KB	0.01		1
C49	ECEA1EU470	47	S	1
C50	ECEA1CKS100	10	S	1
C51	PQCUV1H103KB	0.01		1
C52	PQCUV1H103KB	0.01		1
C53	ECEA1CK101	100	S	1
C54	PQCUV1H472KB	0.0047		1
C55	PQCUV1E104MD	0.1	S	1
C56	PQCUV1E104MD	0.1	S	1
C57	PQCUV1H471JC	470P	S	1
C58	PQCUV1H471JC	470P	S	1
C59	PQCUV1E104MD	0.1	S	1
C60	PQCUV1E104MD	0.1	S	1
C61	PQ4R10XJ000	0		1
C62	PQCUV1E104MD	0.1	S	1
C63	PQCUV1H181JC	180P		1
C64	PQCUV1H102J	0.001	S	1
C65	PQCUV1E473MD	0.047	S	1

Ref. No.	Part No.	Part Name & Description & Value		Pcs
C66	PQCUV1H103KB	0.01		1
C67	PQCUV1H103KB	0.01		1
C69	PQCUV1H103KB	0.01		1
C70	ECEA1HKS010	1	S	1
C71	PQCUV1H104ZF	0.1		1
C72	PQCUV1H104ZF	0.1		1
C73	ECEA1HKS100	10	S	1
C74	ECEA1EKS330	33	S	1
C75	PQCUV1H104ZF	0.1		1
C76	PQCUV1H104ZF	0.1		1
C77	ECEA1EKS330	33	S	1
C78	PQCUV1H104ZF	0.1		1
C79	ECEA1CK101	100	S	1
C80	PQCUV1H104ZF	0.1		1
C81	ECEA1CK101	100	S	1
C90	PQCUV1C224KB	0.22	S	1
C91	PQCUV1E104MD	0.1	S	1
C92	PQCUV1E104MD	0.1	S	1
		(VARISTORS)		
SA1	PQVDDSS301L	VARISTOR	S	1
SA2	PFVDRA102M	VARISTOR	⚠	1
ZNR1	ERZVA7D121	VARISTOR		1

OPERATION BOARD PARTS

PCB3	**PFLP1110BXZ**	**OPERATION BOARD ASS'Y (RTL)**	**1**
		(IC)	
IC1	MN53007QAF	IC	1
		(TRANSISTORS)	
Q1	PQVTDTC143E	TRANSISTOR(SI) [or UN521]	1
Q2	PQVTDTC143E	TRANSISTOR(SI) [or UN521]	1
		(DIODES)	
LED6	PQVDR325CA47	DIODE(SI) S	1
LED8	PQVDR325CA47	DIODE(SI) S	1
		(CONNECTORS)	
CN1	PQJS10X59Z	CONNECTOR, 10P	1
CN3	PQJP12G43Y	CONNECTOR, 12P S	1

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Ref. No.	Part No.	Part Name & Description & Value		Pcs
		(PHOTO ELECTRIC TRANSDUCERS)		
PS1	CNA1006N	PHOTO ELECTRIC TRANSDUCER	S	1
PS2	CNA1006N	PHOTO ELECTRIC TRANSDUCER	S	1
PS3	CNA1006N	PHOTO ELECTRIC TRANSDUCER	S	1
		(RESISTORS)		
J24	PQ4R18XJ000	0	S	1
J37	PQ4R10XJ000	0	S	1
J70	PQ4R10XJ000	0	S	1
J73	PQ4R10XJ000	0	S	1
J74	PQ4R10XJ000	0	S	1
J75	PQ4R10XJ000	0	S	1
J80	PQ4R10XJ000	0	S	1
J82	PQ4R18XJ000	0	S	1
J84	PQ4R18XJ000	0	S	1
J85	PQ4R18XJ000	0	S	1
J86	PQ4R18XJ000	0	S	1
J87	PQ4R18XJ000	0	S	1
J88	PQ4R18XJ000	0	S	1
J89	PQ4R18XJ000	0	S	1
J90	PQ4R18XJ000	0	S	1
J92	PQ4R18XJ000	0	S	1
J95	PQ4R10XJ000	0	S	1
R1	PQ4R10XJ000	0		1
R12	PQ4R10XJ271	270	S	1
R14	PQ4R10XJ271	270	S	1
R19	PQ4R10XJ182	1.8K	S	1
R20	PQ4R10XJ331	330	S	1
R21	PQ4R10XJ332	3.3K	S	1
R22	PQ4R10XJ563	56K	S	1
R24	PQ4R10XJ182	1.8K	S	1
R25	PQ4R10XJ331	330	S	1
R26	PQ4R10XJ331	330	S	1
R27	PQ4R10XJ563	56K	S	1
R28	PQ4R10XJ563	56K	S	1
R29	PQ4R10XJ181	180	S	1
R31	PQ4R10XJ181	180	S	1
R33	PQ4R10XJ181	180	S	1
R35	PQ4R10XJ181	180	S	1
R37	PQ4R10XJ181	180	S	1
R38	PQ4R10XJ181	180	S	1
R39	PQ4R10XJ181	180	S	1
R40	PQ4R10XJ181	180	S	1
R42	PQ4R10XJ181	180	S	1
R43	PQ4R10XJ181	180	S	1
R44	PQ4R10XJ181	180	S	1
R46	PQ4R18XJ181	180		1
R50	PQ4R10XJ181	180	S	1
R55	PQ4R10XJ181	180	S	1
R57	PQ4R10XJ000	0		1

Ref. No.	Part No.	Part Name & Description & Value		Pcs
		(CAPACITORS)		
C4	PQCUV1E104MD	0.1	S	1
C6	PQCUV1E104MD	0.1	S	1
C7	PQCUV1H105JC	1	S	1
C8	PQCUV1H105JC	1	S	1
C11	PQCUV1H331JC	330P		1
C12	PQCUV1H331JC	330P		1
C13	PQCUV1H331JC	330P		1
C14	PQCUV1H331JC	330P		1
C16	PQCUV1H122KB	0.0012	S	1
C17	ECEA1AKS221	220		1
C18	PQCUV1H105JC	1	S	1
C21	PQCUV1H105JC	1	S	1
C22	PQCUV1H105JC	1	S	1
		(SWITCHES)		
SW1	PQSH1A105Z	SWITCH	S	1
SW2	PQSH1A105Z	SWITCH	S	1
SW3	PQSH1A105Z	SWITCH	S	1
SW4	PQSH1A105Z	SWITCH	S	1
SW5	PQSH1A105Z	SWITCH	S	1
SW6	PQSH1A105Z	SWITCH	S	1
SW8	PQSH1A105Z	SWITCH	S	1
SW9	PQSH1A105Z	SWITCH	S	1
SW10	PQSH1A105Z	SWITCH	S	1
SW13	PQSH1A105Z	SWITCH	S	1
SW14	PQSH1A105Z	SWITCH	S	1
SW15	PQSH1A105Z	SWITCH	S	1
SW17	PQSH1A105Z	SWITCH	S	1
SW18	PQSH1A105Z	SWITCH	S	1
SW19	PQSH1A105Z	SWITCH	S	1
SW21	PQSH1A105Z	SWITCH	S	1
SW22	PQSH1A105Z	SWITCH	S	1
SW23	PQSH1A105Z	SWITCH	S	1
SW24	PQSH1A105Z	SWITCH	S	1
SW25	PQSH1A105Z	SWITCH	S	1
SW26	PQSH1A105Z	SWITCH	S	1
SW27	PQSH1A105Z	SWITCH	S	1
SW28	PQSH1A105Z	SWITCH	S	1
SW29	PQSH1A105Z	SWITCH	S	1
SW30	PQSH1A105Z	SWITCH	S	1
SW50	EVQVEHF1712B	SWITCH	S	1

This replacement parts list is for the KX-FT31BX only.

Ref. No.	Part No.	Part Name & Description & Value	Pcs
		HANDSET BOARD	
PCB4	**PFLP1109BXZ**	**HANDSET BOARD ASS'Y (RTL)**	**1**
		(CONNECTORS)	
CN9	PQJP6G30Y	CONNECTOR, 6P	1
CN10	PQJJ1TB18Z	CONNECTOR, 1P	1
		(SWITCH)	
SW5	ESE14A211	SWITCH	1
		POWER SUPPLY BOARD PARTS	
PCB5	**ETXKM163E3B**	**POWER SUPPLY BOARD ASS'Y (RTL)** ⚠	**1**
		(TRANSISTORS)	
Q101	2SK2700	TRANSISTOR(SI)	1
Q102	2SD1423A-R	TRANSISTOR(SI)	1
Q201	2SC3311A	TRANSISTOR(SI)	1
		(DIODES)	
D101	PQVDERA1506	DIODE(SI)	1
D102	PQVDERA1506	DIODE(SI)	1
D103	PQVDERA1506	DIODE(SI)	1
D104	PQVDERA1506	DIODE(SI)	1
D105	PFVDERA2208	DIODE(SI)	1
D106	MA165	DIODE(SI)	1
D107	MA165	DIODE(SI)	1
D108	MA165	DIODE(SI)	1
D201	MA6D49	DIODE(SI)	1
D301	PFVD21DQ04	DIODE(SI)	1
ZD101	MA4051NM	DIODE(SI)	1
ZD102	MA4062NMHM	DIODE(SI)	1
ZD103	MA7270B	DIODE(SI)	1
		(CONNECTORS)	
CN1	PQJP2D98Z	CONNECTOR, 2P	1
CN2	PQJP7G43Z	CONNECTOR, 7P	1
		(COILS)	
L101	ELF15N006A	COIL	1
L102	PQLE53	COIL	1
L201	PQLE53	COIL	1
		(VARISTORS)	
ZNR101	ERZVGAD751	VARISTOR ⚠	1
ZNR102	ERZVGAD751	VARISTOR ⚠	1

Ref. No.	Part No.	Part Name & Description & Value	Pcs
		(PHOTO COUPLER)	
PC101	0N3171S	PHOTO ELECTRIC TRANSDUCER ⚠	1
		(RESISTORS)	
R101	ERDS1TJ474	470K	1
R102	ERDS2TJ204	200K	1
R103	ERDS2TJ204	200K	1
R104	ERDS2TJ333	33K	1
R105	ERG12SJ470	47	1
R106	ERDS2TJ271	270	1
R107	ERDS1TJ391	390	1
R108	ER0S2TKF8251	8.25K	1
R109	ER0S2TKF1962	19.6K	1
R110	ERDS2TJ223	22K	1
R112	ERG2SJ104	100K	1
R113	ERDS2TJ682	6.8K	1
R117	ERDS2TJ204	200K	1
R118	ERDS2TJ204	200K	1
R119	ERG2SJ104	100K	1
R201	ERDS1TJ272	2.7K	1
R202	ERDS2TJ271	270	1
R203	ERDS2TJ471	470	1
R204	ERDS2TJ562	5.6K	1
R205	ER0S2TKF3321	3.32K	1
R206	ER0S2TKF4221	4.22K	1
R207	ER0S2TKF4221	4.22K	1
R210	ERG2SJ272	2.7K	1
R211	ERG2SJ272	2.7K	1
R212	ERDS2TJ682	6.8K	1
R301	ERDS1TJ561	560	1
R302	ERDS2TAJR51	0.51	1
		(CAPACITORS)	
C101	ECQU2A474MG	0.47 ⚠	1
C104	PFCKDKH222M	0.0022 ⚠	1
C105	PFCKDKH222M	0.0022 ⚠	1
C106	ECQU2A474MG	0.47 ⚠	1
C108	PFCKDKH332M	0.0033 ⚠	1
C109	EETLD2G560B	56	1
C110	ECQB1H123JF	0.012	1
C111	ECQB1H472JF	0.0047	1
C112	PFCKDE2SL470	47P	1
C113	PFCKDE1R102K	0.001	1
C118	PFCKDKH332M	0.0033 ⚠	1
C119	ECQB1H122JF	0.0012	1
C201	PFCKDR5C222K	0.0022	1
C202	EEUFC1V331	330	1
C203	ECQB1H682JF	0.0068	1
C206	ECQB1H101KF	100P	1
C301	EEUFC1C181	180	1
		(OTHERS)	
F101	PFBAHU215315	FUSE ⚠	1
T101	ETB29AC1B8AC	TRANSFORMER ⚠	1
TH101	PFRTCS1138R0	THERMISTOR	1

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Ref. No.	Part No.	Part Name & Description	Pcs
		FIXTURES AND TOOS	
EC1	PQZZ6K7Z	CONNECTOR, 6P	1
EC2	PQZZ2K6Z	CONNECTOR, 2P	1
EC3	PFZZ5K13Z	CONNECTOR, 5P	1
EC4	PQZZ2K6Z	CONNECTOR, 2P	1
EC5	PQZZ2K6Z	CONNECTOR, 2P	1
EC6	PQZZ12K4Z	CONNECTOR, 12P	1
EC7	PFZZ13K1Z	CONNECTOR, 13P	2
EC8	PQZZ2K12Z	CONNECTOR, 2P	1
EC9	PFZZ12K1Z	CONNECTOR, 12P	1
EC10	PQZZ2K13Z	CONNECTOR, 2P	1
EC11	PQZZ7K5Z	CONNECTOR, 7P	1
EC21	PFZZFT31BX	SPRING HEIGHT TOOL	1

Notes:
Tools and Extension Cords are useful for servicing.
(They make servicing easy.)

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