Service Manual

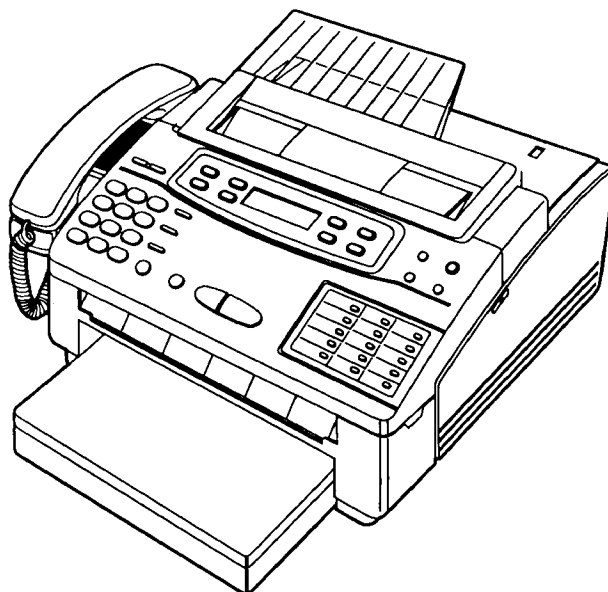## and Technical Guide

PLAIN PAPER FAX WITH 2-LINE
DIGITAL ANSWERING SYSTEM

KX-F1200

(for U.S.A.)

⚠ 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 mention the serial number, write down the 11 digits. The serial number may be found on the bottom of the unit.

TABLE OF CONTENTS (General)

SAFETY PRECAUTIONS

1. Before servicing, unplug the 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, handle brackets, 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.

Exposed metal part

Ohmmeter

Resistance = more than 1M Ω
(at DC 500 V)
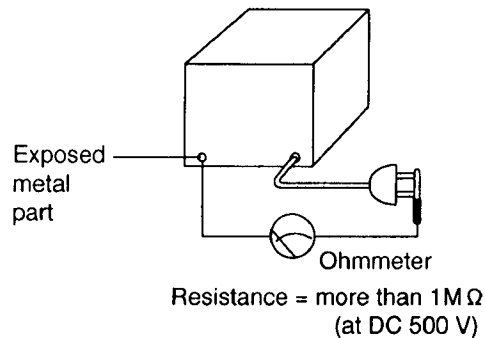
FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.
When repairing, the following precautions will help prevent recurring malfunctions.
1) Cover the plastic parts boxes with aluminum foil.
2) Ground the soldering irons.
3) Use a conductive mat on the worktable.
4) Do not touch IC or LSI pins with bare fingers.

SPECIFICATIONS

> This specifications is for U.S.A. version only.
> Refer to the simplified manual (cover) for other areas.

1. Applicable Lines:	Public Switched Telephone Network
2. Document Size:	Max.216 mm (8 ½') in width Max.600 mm (23 ⅝') in length
3. Effective Scanning Width:	208 mm(8 ³/₁₆')
4. Recording Paper Size:	Letter : 216×279 mm (8 ½' ×11') Legal : 216×356 mm (8 ½' ×14')
5. Effective Printing Width:	208 mm (8³/₁₆')
6. Transmission Time*:	Approx.15 sec/page (Original mode) Approx.30 sec/page (G3 Normal mode)
7. Fax Auto Redial:	Up to 5 times
8. Telephone Auto Redial:	Up to 14 times
9. Scanning Density:	Horizontal : 8 pels/mm (203 pels/inch) Vertical : 3.85 lines/mm (98 lines/inch) -Standard 7.7 lines/mm (196 lines/inch) -Fine/Halftone
10. Halftone Level:	64-level
11. Scanner Type:	CCD Image Sensor
12. Printer Type:	Thermal Transfer
13. Data Compression System:	Modified Huffman (MH), Modified READ (MR)
14. Modem Speed:	9600/7200/4800/2400 bps; Automatic Fallback
15. Operating Environment:	5-35℃ (41-95 °F), 20-80 % RH
16. Dimensions(H×W×D):	237×420×389 mm (9 ⁵/₁₆' ×16 ⁹/₁₆' ×15 ⁵/₁₆')
17. Mass(Weight):	Approx. 9.0Kg (19.8 lb.)
18. Power Consumption:	Transmission:Approx. 17W /Reception: Approx. 40W Copy: Approx. 50W /Standby: Approx. 5W Maximum: Approx. 140W
19. Power Supply:	120 V AC, 60Hz

*Transmission Time: Transmission times apply to text data using the ITU-T (CCITT) test chart, between the same machine models at maximum modem speed. The transmission time does not include call setup, ringing, handshaking and sign off. Transmission times may vary.

Design and specifications are subject to change without notice.

OPTIONAL ACCESSORIES

Parts No.	Description	Comment
KX-FA132	Film cartridge	1 cartridge & 1 film : 216 mm ×200m (8 ½' ×656') roll
KX-FA133	Replacement film(1set)	216mm×200m(8 ½' ×656')roll
KX-FA134	Replacement film(2sets)	216mm×200m(8 ½' ×656')roll

CONNECTION

Handset

Handset cord

Connect to
LINE1/LINE2

Power cord

GREEN
PLUG

■Dialing mode switch:
Set to TONE.
– If you cannot dial,
set to PULSE.

DIALING MODE

TONE ⌐⌐ PULSE

Two-line telephone jack (RJ14C)

4-wired telephone line cord
with GREEN plugs

Surge protector

Power outlet
(120V, 60Hz)
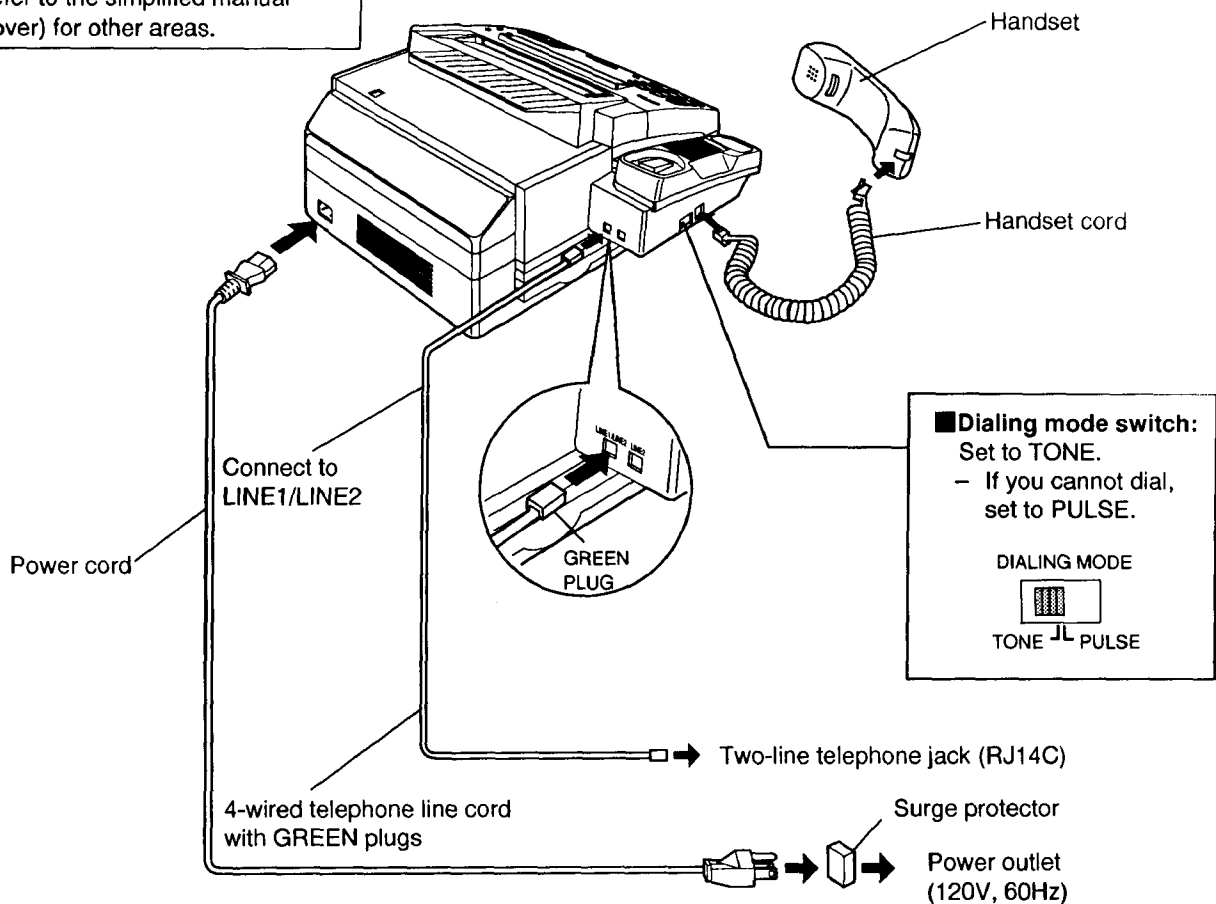
Note:
•We recommend the use of an exclusive power outlet to avoid interference from other equipment.
•When you operate this product, the power outlet should be near the product and easily accessible.
•The unit will not function during a power failure.
•For additional equipment protection, we recommend the use of a surge protector. The following types are available;
  TELESPIKE BLOK MODEL TSB(TRIPPE MFG.CO.),SPIKE BLOK MODEL SK6-0(TRIPPE MFG.CO.),SUPER MAX
  (PANAMAX)or MP1(ITW LINX).
•If the unit connected to the same line as other extensions, do not use other extensions during fax transmission and reception. Image quality will be affected.

Helpful hint:
•If assistance is needed, press the HELP button. The unit will print a quick reference.

HELP
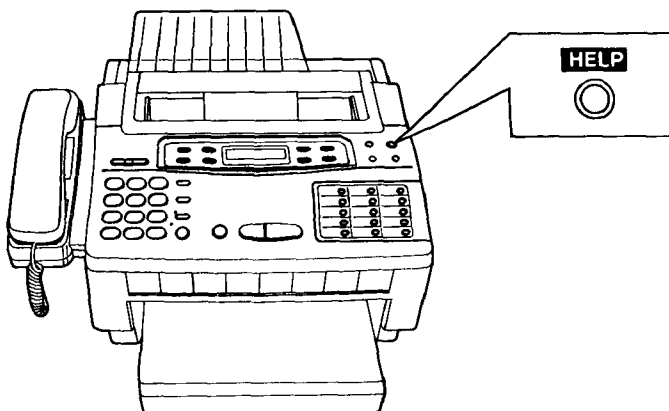
LOCATION OF CONTROLS

Front view

Document entrance

Document feeder tray

Speaker

Document guide(s)
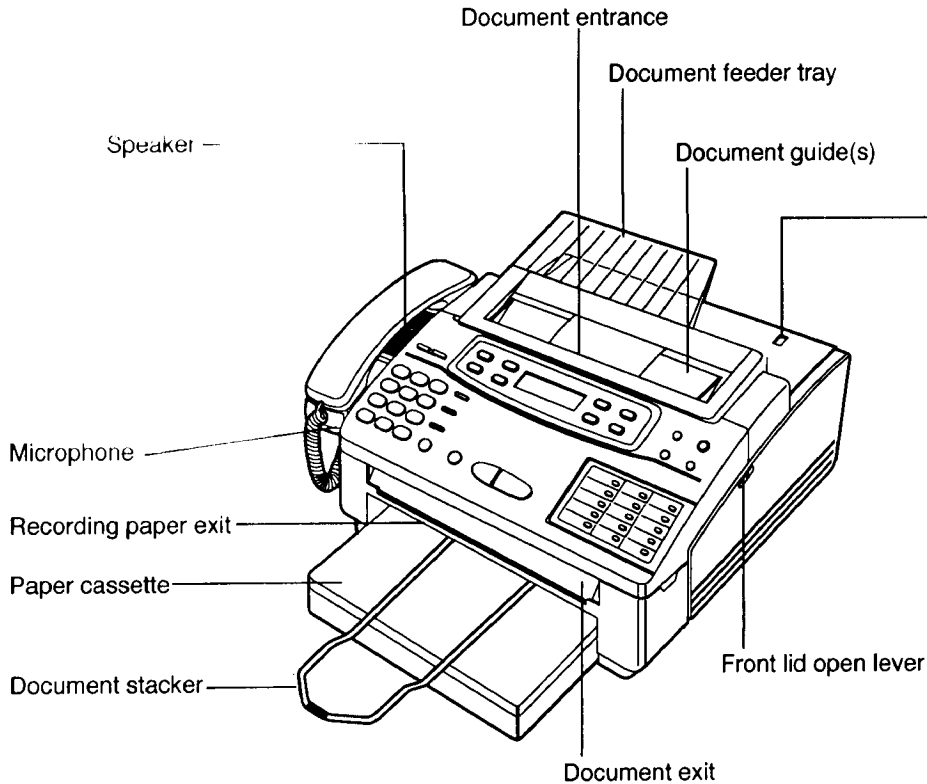
Visual film indicator: shows the approximate amount of remaining film.

FULL ◄ FILM INDICATOR

▼

EMPTY ◄ FILM INDICATOR

Microphone

Recording paper exit

Paper cassette

Document stacker

Front lid open lever
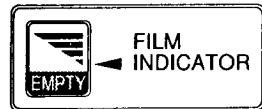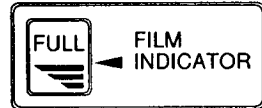
When the film indicator points to the position in the illustration above, the remaining film produces approx. 70 letter size documents. Prepare a new film or film cartridge for replacement.

Document exit

Note:
• The visual film indicator will show "FULL" when a new 200 meter film is installed. When the included film cartridge(30 meter roll film) is installed, the indicator will not show "FULL".

Rear view

Power socket

Line jack

Dialing mode selector

Control panel

VOLUME buttons

LINE 2 button

LINE 1 button

HOLD button

CONF button

Display panel

RECEIVE MODE LINE 1 button

NEW MESSAGES button

RECEIVE MODE LINE 2 button

ERASE button

RESOLUTION button

MENU button

DIRECTORY button

HELP button

Dial keypad

STOP button

START/SET button

MAIL BOX button

LOWER button

TONE button

FLASH button
REDIAL/PAUSE button
MUTE button
SP-PHONE button

COPY button

Direct call stations

FILM/PAPER SAVE button

SELECT button

RINGER-LINE 1 button

REC button

RINGER-LINE 2 button

CHECK button

SKIP button

REPEAT button

ALL MESSAGES button

MEMO/2WAY REC button

INSTALLATION

1. INSTALLING THE FILM CARTRIDGE

Top cover
Head unit
Green button
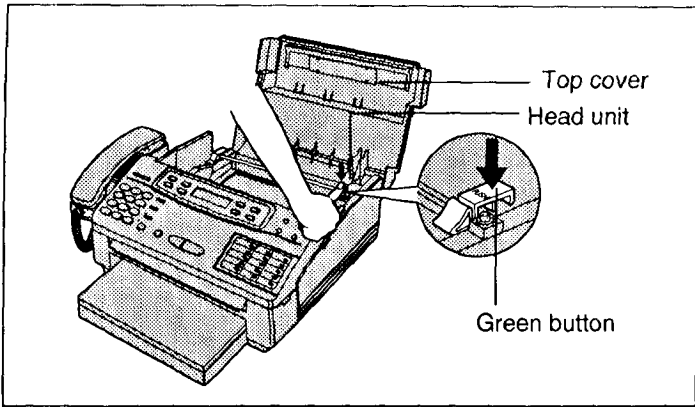
(1) Open the top cover.

(2) Press the green button on the right marked "PUSH" and lift the head unit.
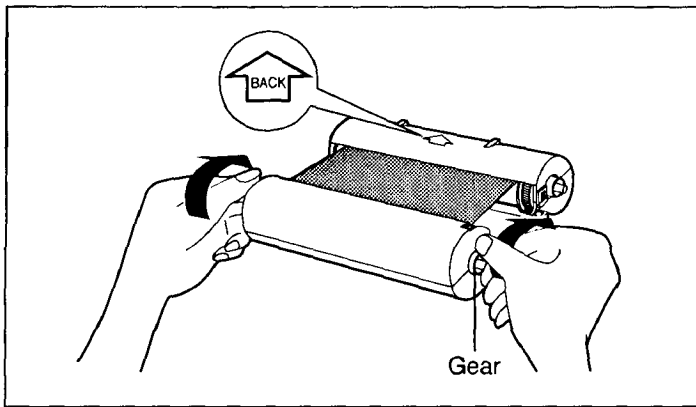
BACK

Gear

(3) Place the cartridge with the "BACK" indicator facing up. If the film is slack, tighten it by winding the gears.
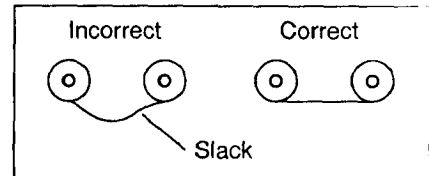
Incorrect		Correct	

Slack

— Because the length of the included film is 30 meters, it is recommended to purchase 200 meter length film for replacement soon.

BACK

Green gear
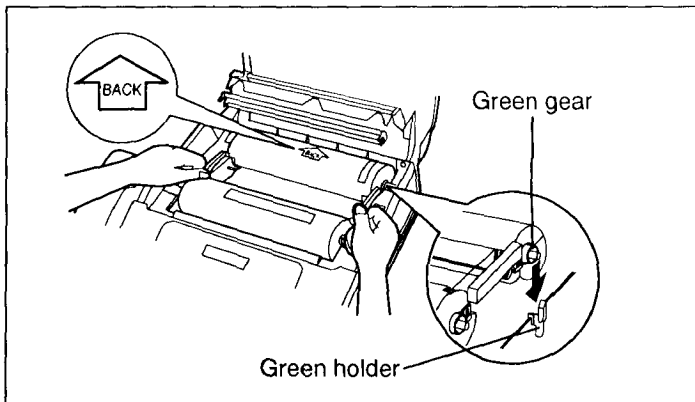
Green holder

(4) Referring to the illustration on the left, place the "BACK" side of the cartridge into the unit, by inserting the pins on the sides of the green gears into the green holders. Then lower the front of the cartridge into place.

PUSH TO LOCK
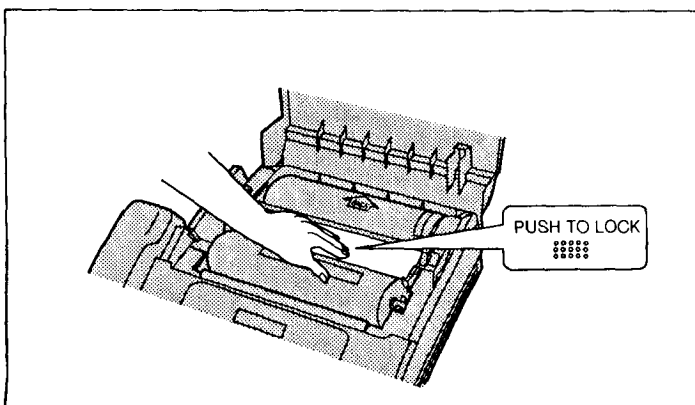
(5) Press the head unit down firmly until it clicks into place.

(6) Close the top cover securely by pushing down on both sides.

Note:
Because the length of the included film is 30 meters, it is recommended to purchase 200 meter length film for replacement soon. See page 4.

2. REPLACING THE FILM OR FILM CARTRIDGE

When the unit detects the end of the film, the following message will be displayed.

| FILM EMPTY |

Replace the film or film cartridge with new one.
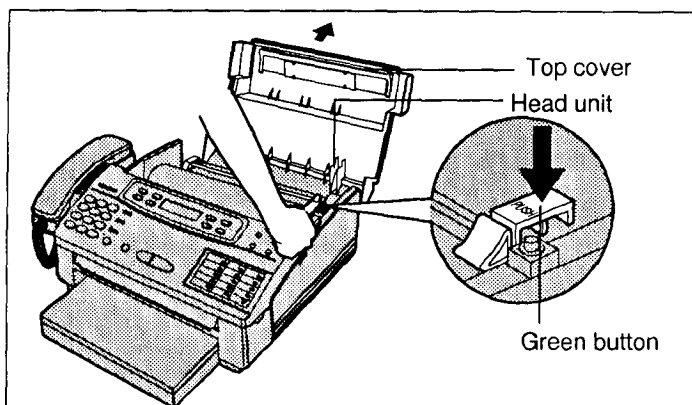
Top cover
Head unit
Green button

(1) Open the top cover.

(2) Press the green button on the right marked "PUSH" and lift up the head unit.
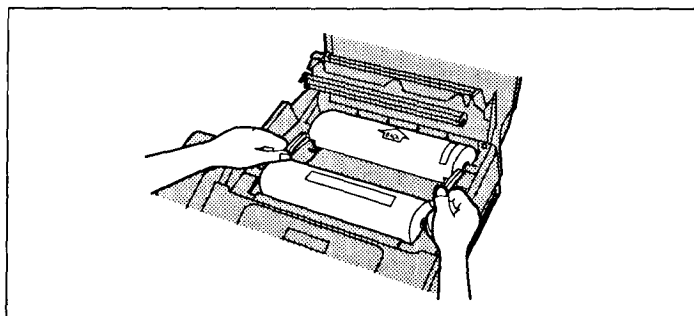
(3) Take out the cartridge.
   —If you purchase a film cartridge (Model no. KX-FA132) for replacement, skip to step 11.
   —To replace only the film, go to step 4.

Tab
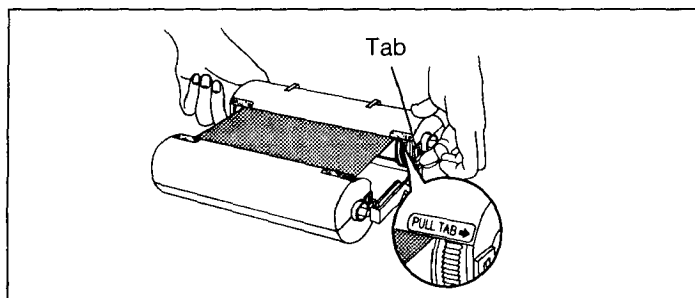
PULL TAB

(4) Turn over the cartridge so that the "PULL TAB" mark is facing up.

(5) Unlock the tabs of the cartridge, open the covers of the cartridge and take out the used film.
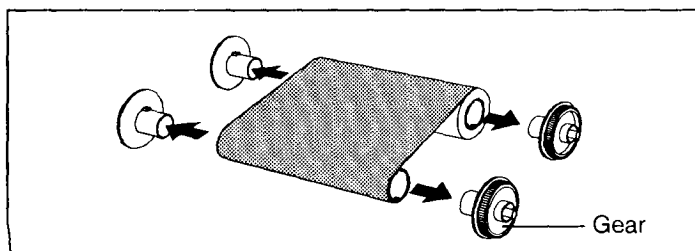
(6) Pull out the four gears from the used film cores.
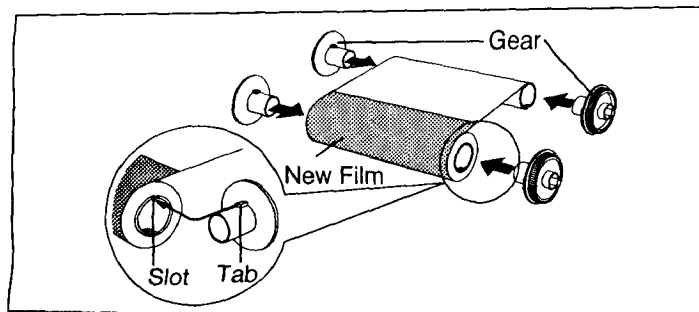
Gear

(7) Insert the four gears into the new film cores so that the tab of each gear fits into the slot of the film core.

Gear

New Film

Slot   Tab

Unused spool

FILM SUPPLY

Gears

Blue leader

Tabs

BACK

Green gear

Green holder
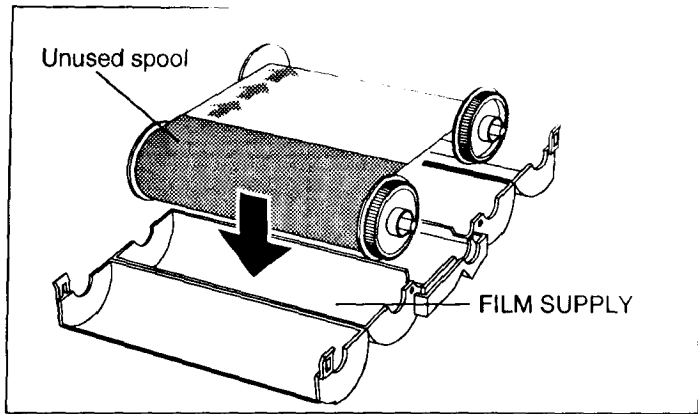
(8) Insert the film into the cartridge so that the arrow on the cartridge points in the same direction as that on the film.
— If you insert a film which was used halfway, insert the unused spool of the film on the "FILM SUPPLY" mark of the cartridge.

Insert the film cores correctly referring to the illustration to the right.

Incorrect

Correct
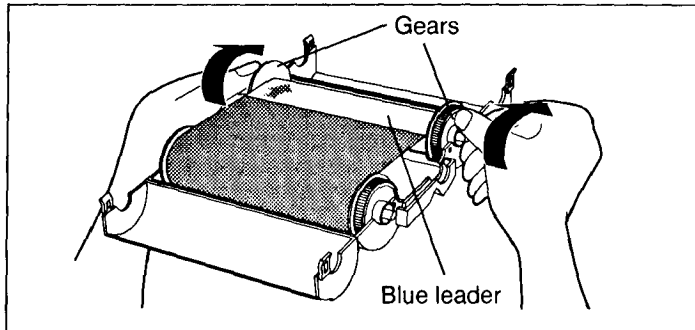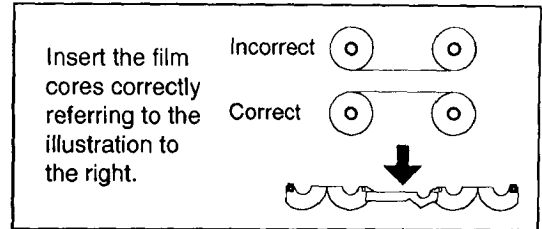
(9) Roll the blue leader of the film by winding the gears of the core until the leader is no longer visible.
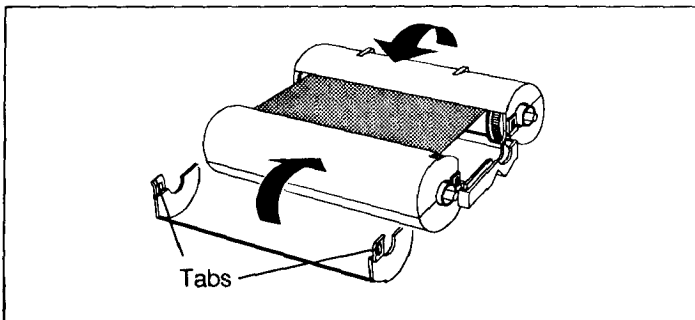
(10) Close the covers of the cartridge by locking the four tabs.
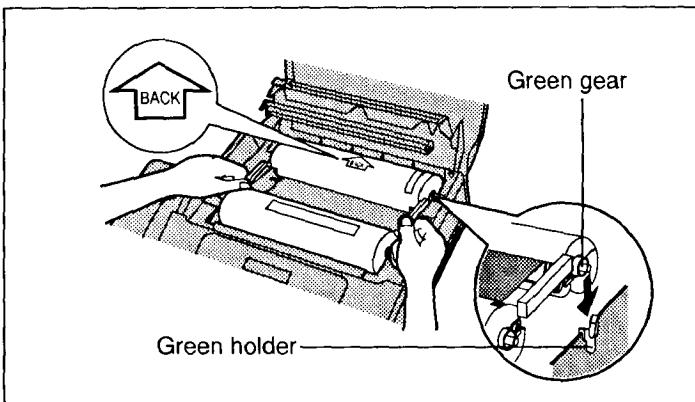
(11) Turn over the cartridge and referring to the illustration on the left, place the "BACK" side of the cartridge into the unit, by inserting the pins on the sides of the green gears into the green holders. Then lower the front of the cartridge into place.

(12) Press the head unit down firmly until it clicks into place.

(13) Close the top cover securely by pushing down on both sides.
— If the blue leader of the film is not wound completely, the unit will automatically advance it and the following massage will be displayed.

LOADING FILM

— If the following message is displayed, the film is not inserted in the cartridge correctly.

CHECK FILM

Reinsert it correctly by referring to step 8 on this page.

MAINTENANCE ITEM

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 signs of trouble and consider how the problems arose.

If the equipment can still be used, perform a copying, self testing or communications testing.

3) Check equipment

Perform a copying, self testing and communications testing to determine if the problem originates from the transmitter, the receiver or the telephone line.

4) Determine causes

Determine the causes of equipment trouble by troubleshooting.

5) Equipment repairs

Repair or replace the defective parts and take appropriate measures at this stage to ensure that the problem does not recur.

6) Confirm normal operation of the equipment

After completing the repairs, conduct copying, self testing and communications 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
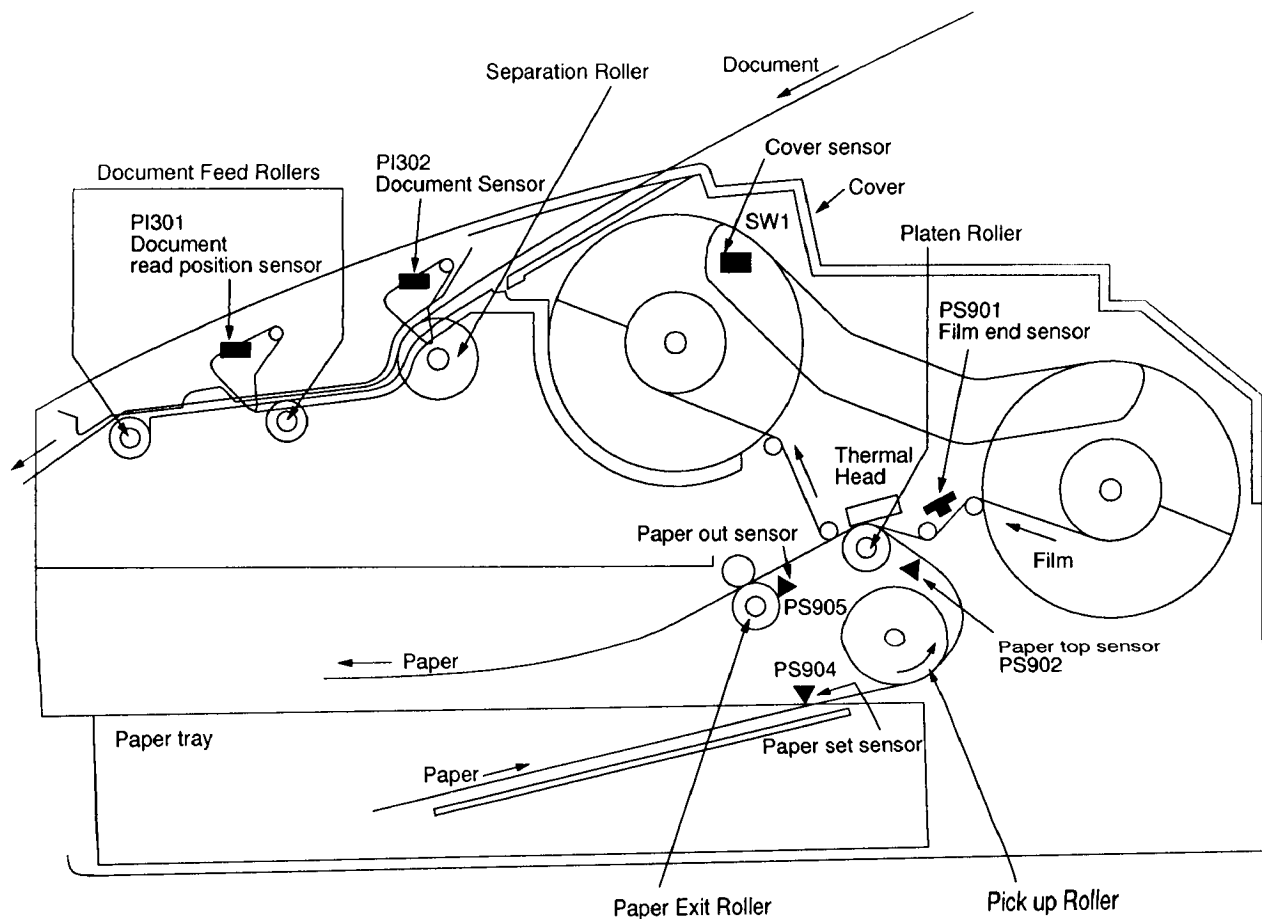
2-1. MAINTENANCE LIST

NO.	OPERATION	CHECK ITEM	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 13.
3	Platen Roller	If the platen is dirty, clean it with a damp cloth then dry thoroughly. Remove the paper before cleaning.	———
4	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 13,68.
5	LED Array	If the LED array is dirty, clean the glass with a dry soft cloth.	See page 13.
6	Sensors	Paper sensor (PS904), Document sensor (PI302), Read position sensor (PI301), Cover sensor (SW1), Paper top sensor (PS902), Paper out sensor (PS905), Film end sensor (PS901). Confirm operation of sensors.	See pages 47~49.
7	Mirrors and Lens	If the mirror and lens are dirty, clean it with a dry soft cloth.	———
8	Abnormal, wear and tear or looseness of parts	Exchange the part. Check the tightness of screws on all parts.	———

2-2. MAINTENANCE CYCLE

No.	Items	Cleaning		Replacement		Remarks
		Cycle	Procedure	Cycle	Procedure	
1	Separation Roller (Ref. No. 98)	3 months	See P. 13.	7 years (100,000 documents)	See P. 74.	
2	Separation Rubber (Ref. No. 48)	3 months	See P. 13.	7 years (100,000 documents)	See P. 65.	
3	Feed Roller (Ref. No. 97,178)	3 months	See P. 13.	7 years (100,000 documents)	See P. 71.	
4	Target Glass (Ref. No. 307)	3 months	See P. 13.	7 years (100,000 documents)	- - - -	
5	Thermal Head (Ref. No. 75)	3 months	See P. 13.	7 years (100,000 documents)	See P. 68.	
6	Platen Roller (Ref. No. 142)	3 months	See P. 71.	7 years (100,000 documents)	See P. 71.	

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

3. MAINTENANCE

3-1. CLEANING THE DOCUMENT FEEDER UNIT

When misfeeding occurs frequently or when dirty patterns or black bands appear on a copied or transmitted document, clean the feeder rollers, sub roller, rubber flap, white plate and glass.
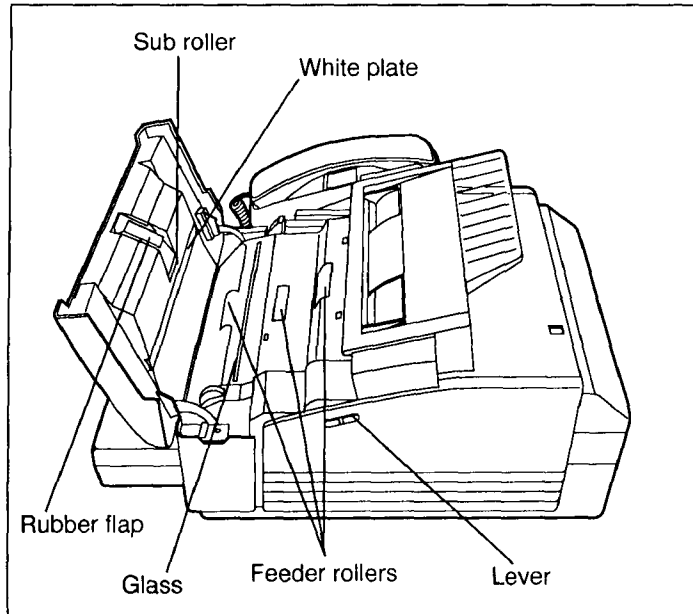
(1) Disconnect the power cord and the telephone line cord.

(2) Slide the lever to open the front lid.

(3) Clean the feeder rollers, sub roller and rubber flap with a cloth moistened with isopropyl rubbing alcohol, then dry thoroughly.

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

(5) Close the lid surely by pushing down on both ends.

(6) Connect the power cord and telephone line cord.

3-2. CLEANING THE THERMAL HEAD

If dirty patterns or black bands appear on a copied or received document, clean the thermal head.

Do not push the black cover.
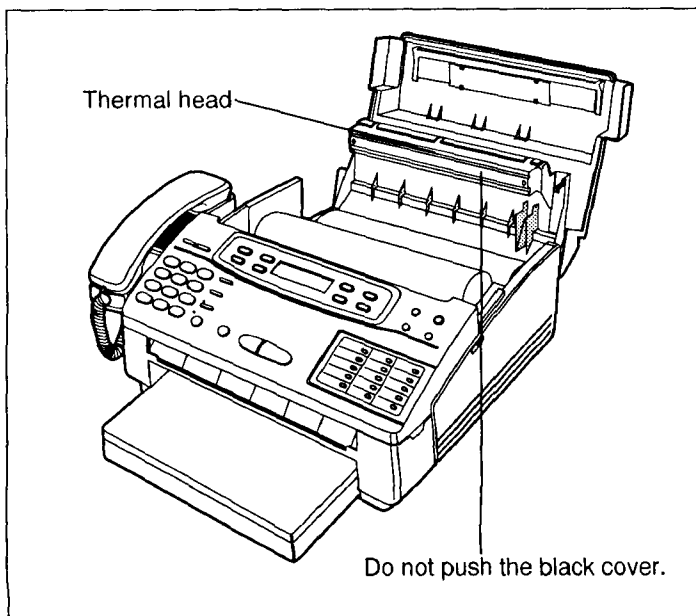
(1) Disconnect the power cord and the telephone line cord.

(2) Open the top cover.

(3) Press the green button on the right marked "PUSH" and lift up the head unit.

(4) Clean the thermal head with a cloth moistened with isopropyl rubbing alcohol, then dry thoroughly.

(5) Press the head unit down firmly until clicks into place.

(6) Close the top cover surely by pushing down on both ends.

(7) Connect the power cord and telephone line cord.

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

TABLE OF CONTENTS

1. PROGRAMMING

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.

1-1. 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 the special programs. The normal programs are those listed in the Operating instructions and available to the user. The special programs are those listed only here and not displayed to the user. In both User and Service Mode, 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 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.

1-2. OPERATION FLOW
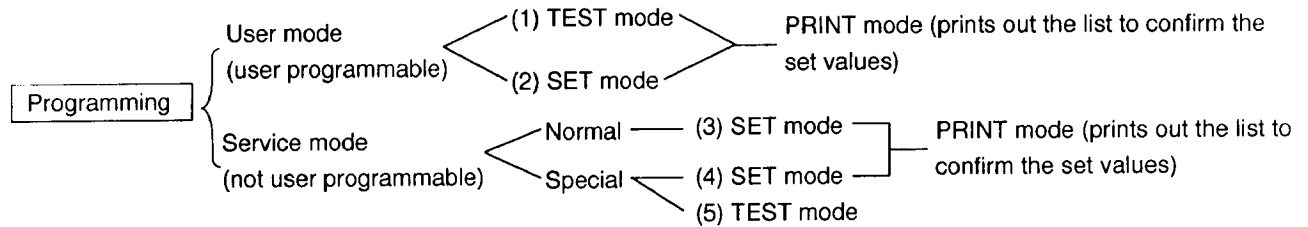
Operating Procedure

– 15 –
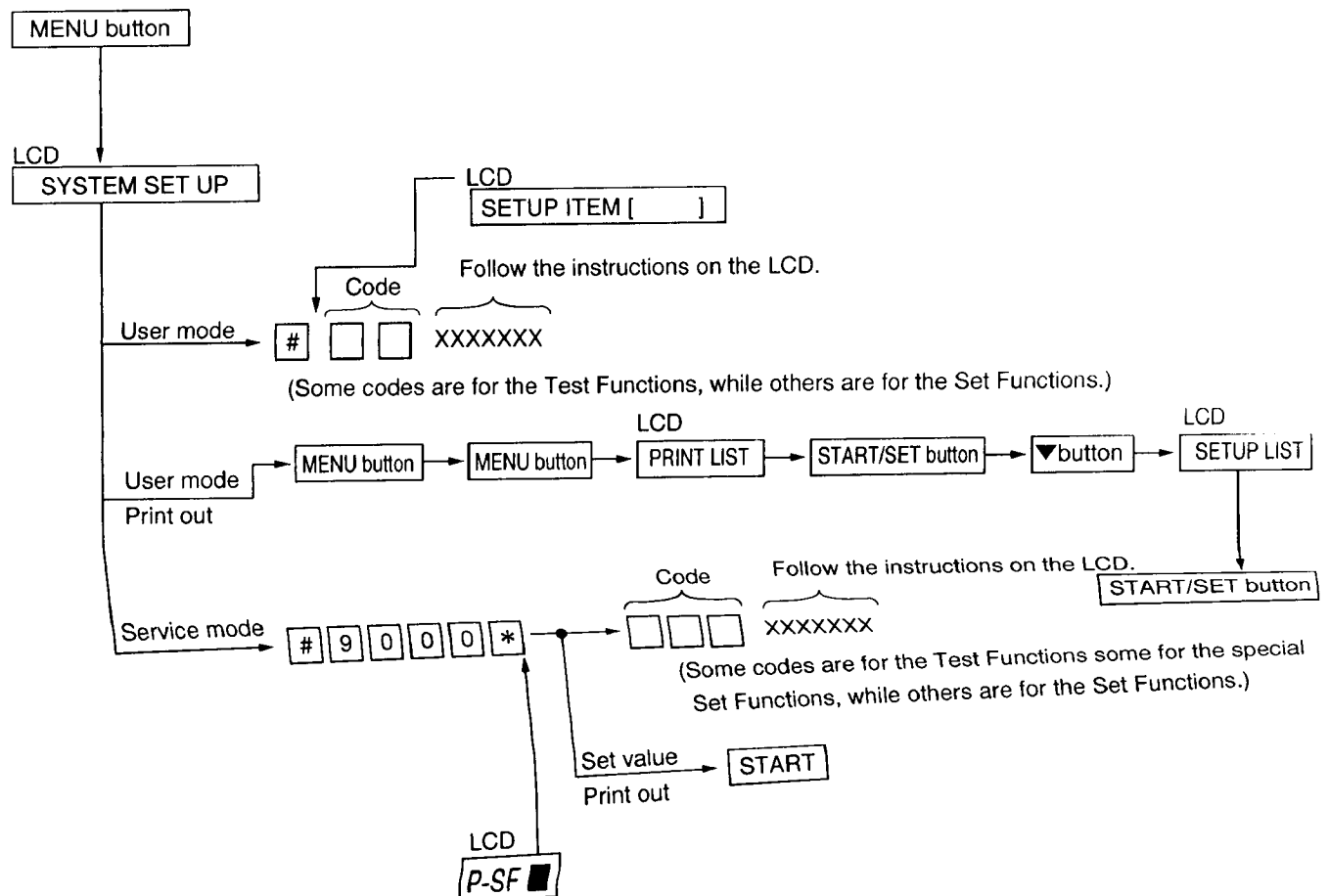
1-3. USER MODE (The list below is an example of the SYSTEM SETUP LIST the unit prints out.)

| SETUP LIST |

[BASIC FEATURE LIST]

	NO.	FEATURE		CURRENT SETTING
	#01	SET DATE & TIME		Jan. 01 1995 12:00AM
	#02	YOUR LOGO		Panasonic FAX SYSTEM
Code	#03	YOUR TELEPHONE NUMBER	LINE1 =	
			LINE2 =	
	#04	PRINT TRANSMISSION REPORT		OFF [ERROR,ON,OFF]
	#07	FAX RING COUNT		1 [1...4]
	#08	ANS/FAX RING COUNT		1 [1...4,TOLL SAVER,RINGER OFF]
	#09	RECORDING TIME		VOX [VOX,1MIN]
	#10	REMOTE ANS ID	ID =	111

Set Value

[ADVANCED FEATURE LIST]

	NO.	FEATURE		CURRENT SETTING
	#21	LOGO POSITION		OUT [OUT,IN,OFF]
	#22	JOURNAL AUTO PRINT		ON [ON,OFF]
Code	#23	OVERSEAS MODE		OFF [ON,OFF]
	#24	JUNK MAIL PROHIBITOR		OFF [ON,OFF]
			ID =	22
	#25	DELAYED TRANSMISSION		OFF [ON,OFF]
			DESTINATION =	
			START TIME =	12:00AM
	#26	LINE SELECTION		AUTO [AUTO,LINE1,LINE2]
	#27	FAX SELECTION		AUTO [AUTO,LINE1,LINE2]
	#28	LINE MODE	LINE1 =	CO [CO,PBX]
			LINE2 =	CO [CO,PBX]
	#29	C.O.L SELECTION	LINE1 =	ON [ON,OFF]
			LINE2 =	ON [ON,OFF]
	#31	RING DETECTION	LINE1 =	OFF [OFF,A,B,C,D]
			LINE2 =	OFF [OFF,A,B,C,D]
	#34	EXTENSION COPY		
	#35	COPY REDUCTION		OFF [92,72,OFF]
	#36	RX REDUCTION		92% [92,86,72,OFF]
	#39	LCD CONTRAST		NORMAL [NORMAL,LIGHT,DARKER]
	#41	REMOTE FAX ACTIVATION CODE	=	**
	#42	MESSAGE ALERT		OFF [ON,OFF]
	#43	REC. TIME ALERT		OFF [ON,OFF]
	#45	BUSY MESSAGE		ON [ON,OFF]
	#46	RINGER MODE		ON [ON,OFF]
	#50	MAIL BOX ALERT		OFF [ON,OFF]
	#51	BOX1 PASSWORD		
	#52	BOX2 PASSWORD		
	#53	BOX3 PASSWORD		
	#60	COMMON PAGER		OFF [ON,OFF]
			DESTINATION =	
	#61	MAIL BOX1 PAGER		OFF [ON,OFF]
			DESTINATION =	
	#62	MAIL BOX2 PAGER		OFF [ON,OFF]
			DESTINATION =	
	#63	MAIL BOX3 PAGER		OFF [ON,OFF]
			DESTINATION =	
	#70	FAX PAGER		OFF [ON,OFF]
			DESTINATION =	
	#80	SET DEFAULT		

Set Value

Note:
The above values are default

-16-

I-4. SERVICE FUNCTION TABLE

Code	Function	Set Value	Effective Range	Default	Remarks
501	Pause time set	×100 ms.	001~600	050	
502	Flash time set	×10 ms.	01~99	70	
503	Dial speed select	1..10 PPS 2..20 PPS	1, 2	1	
510	VOX time select	1..6sec 2..4sec	1, 2	1	
520	CED frequency select	1.. 2100 Hz 2.. 1100 Hz	1, 2	1	
521	International mode select	1..On 2..Off	1, 2	1	
522	Auto standby select	1..On 2..Off	1, 2	1	
523	Receive equalizer select	1..On 2..Off	1, 2	2	
532	Security mode of erasing mailbox	1..On 2..Off	1, 2	2	
550	Memory clear				"START" input
551	ROM check				"START" input
552	DTMF single tone transmit select	1..On 2..Off	1, 2	2	
553	Monitor on FAX communication select	1..Off 2..Phase B 3..All phases	1~3	1	
554	Modem test				"START" input
555	Scanner test				"START" input
556	Motor test	See page 20		00	"START" input
557	LED test				"START" input
558	LCD test				"START" input
559	Paper jam detection select	1..On 2..Off	1, 2	1	
561	KEY test				"START" input
563	CCD position adjustment value set	× 1 mm	00~30	–	
564	CCD auto position adjustment				"START" input

Code	Function	Set Value	Effective Range	Default	Remarks
570	BREAK % select	1..61% 2..67%	1, 2	1	
571	ITS auto redial time set	✕ number of times	00~99	14	
572	ITS auto redial line disconnection time set	✕ second	001~999	030	
573	Remote turn-on ring number set	✕ number of rings	01~99	15	
574	Dial Tone Detection set	1..On 2..Off	1, 2	2	
575	Remote turn-on for line 2	✕ time	00~99	15	
579	Auto disconnect cancel time	1..350msec 2..180msec 3..Off	1~3	1	Time of the detection of auto disconnect.
580	TAM continuous time select	1..On 2..Off	1, 2	1	
582	2 way record	1..On 2..Off	1, 2	1	
583	2 way beep time	✕ msec	000~999	000	
586	White line skip 1 select	1..On 2..Off	1, 2	1	
587	White line skip 2 select	1..On 2..Off	1, 2	1	
590	FAX auto redial time set	✕ number of times	00~99	05	
591	FAX auto redial lime disconnection time set	✕ second	001~999	045	
592	CNG transmit select	1..Off 2..All 3..Auto	1~3	2	
593	Time between CED and 300 bps	1..75 ms 2..500 ms 3..1 sec	1, 2, 3	1	
594	Overseas DIS detection select	1..detects at the 1st time 2..detects at the 2nd time	1, 2	1	
595	Receive error limit value set	✕ number of times	001~999	100	
596	Transmit level set	✕ dBm	−15~00	10	The values entered without "minus sing" will be regarded as negative.
597	Transmit speed 2400 BPS fixed mode select	1..On 2..Off	1, 2	2	

Code	Function	Set Value	Effective Range	Default	Remarks
705	OGM recording time (Ring detection=A-D)	✕ sec	00~99	16	
706	OGM recording time (Ring detection=OFF)	✕ sec	00~99	16	
717	Transmit speed select	1..9600BPS 2..7200BPS 3..4800BPS 4..2400BPS	1~4	1	The fall back starts from each speed.
718	Receive speed select	1..9600BPS 2..7200BPS 3..4800BPS 4..2400BPS	1~4	1	The fall back starts from each speed.
720	Manual tone detect	1..On 2..Off	1, 2	2	Sets the tone detection mode after dialing manually.
721	Pause tone detect	1..On 2..Off	1, 2	1	Sets the tone mode in pause.
722	Redial tone detect	1..On 2..Off	1, 2	1	Sets the tone detection mode after redialing.
731	CPC mode	1..A 2..B	1, 2	1	
745	Power ON film feed	1..On 2..Off	1, 2	1	
771	T1 Timer	1..35sec 2..60sec	1, 2	1	
815	Sensor & VOX check				"START" input
851	Printer feed test				"START" input
852	Print test pattern				"START" input
853	Top margin		1~9	—	
854	Left margin		1~8	—	
861	A4 size set	1..On 2..Off	1, 2	2	

DTMF single tone transmit select

When set to ON (=1), the 12 keys and transmission frequencies are as shown.

key	Frequency (Hz)	Key	Frequency (Hz)
"1"	697	"5"	1209
"2"	770	"6"	1336
"3"	852	"7"	1477
"4"	941		

When set to OFF (=2), the 12 keys and transmission frequencies are as shown.

High (Hz) Low (Hz)	1209	1336	1477
697	"1"	"2"	"3"
770	"4"	"5"	"6"
852	"7"	"8"	"9"
941	✳	"0"	"#"

– 19 –

1-5. 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...39]*10ms
503  DIAL SPEED      =  10pps          [1=10      2=20]pps
510  VOX TIME        =  6sec           [1=6       2=4]sec
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  RX EQL.         =  OFF            [1=ON      2=OFF]
853  TOP MARGIN      =  5              [1...9]
854  LEFT MARGIN     =  5              [1...8]
```

[SPECIAL SERVICE SETTINGS]

532	552	553	559	563	570	571	572	573	574	575	579	580
2	2	1	1	15	1	14	030	15	2	15	1	1

Code —— Set Value

582	583	586	587	590	591	592	593	594	595	596	597	705
1	000	1	1	05	045	2	1	1	100	10	2	16

706	717	718	720	721	722	731	745	771	861
16	1	1	2	1	1	1	1	1	2

Note:
The above values are default

2. TEST FUNCTIONS

Test mode	Type of Mode	● Code ▢▢ ● Operation after code input.	Function
PRINT TEST	User mode	8 5 START	Print a test pattern and check the thermal head for abnormalities (missing dots, etc.), and also check the operation of the reception motor.
MOTOR TEST	Service Mode	Operation: 1) Idle mode: Press the MENU,#,9,0,0,0, ✱ ,5,5,6 buttons 2) LCD P-SF▢▢ 3) Input the 2 digits (Input code) 00..Stop, 10..Forward RX motor, 01..Forward TX motor, 11..Forward RX,TX motor, 20..Backward RX motor, 02..Backward TX motor, 22..Backward RX, TX motor 4) Press the start button (Stop: press the stop button)	Rotate the transmission and reception motors to check the operation of the motors.
MODEM TEST	Service Mode	5 5 4 START	Send four kinds of FAX signals to check the sending function of the modem. 1) OFF　　2) 9600bps　3) 7200bps　4) 4800bps 5) 2400bps　6) 300bps　7) 2100Hz　8) 1100Hz
ROM CHECK	Service Mode	5 5 1 START	Indicate the version and check sum of the ROM.
SCAN CHECK	Service Mode	5 5 5 START	Turn on the LEDs of the image sensor and operate the read system.
LCD CHECK	Service Mode	5 5 8 START	Check the LCD indication. Illuminate all dots to check if they are normal.

DTMF SINGLE TEST	Service Mode	⑤⑤② 1..On 2..Off	Output the DTMF by single tone.
LED TEST	Service Mode	⑤⑤⑦ START	All LEDs flashes on and off, or is illuminated.
KEY CHECK	Service Mode	⑤⑥① START {any key}	Check the operation button. Indicate the button code at LCD while the button is pressed.
FACTORY SET	Service Mode	⑤⑤⓪ START	Clear the memory in which the user can store data.
CCD AUTO POSITION ADJUSTMENT	Service Mode	⑤⑥④ START	
SENSOR CHECK & VOX CHECK	Service Mode	⑧①⑤ START	CHECK SENSOR OPERATION Do Sn Co Po Pa Pt Ri : LCD DISPLAY Do: Document Set Sensor : Paper inserted Sn:Read Position Sensor : at the read Position Co: Cover Open Sensor : Cover Open Po: Paper Cut Sensor : Sensor On Pa: Recording Paper Sensor : Set Recording Paper Pt: Paper Top Sensor : Sensor On Ri: Ribbon Sensor : Sensor On MONITOR The Vox Signal When there is sound from LINE or EXT-TEL, Mute, LED lights ON.
PRINTER FEED TEST	Service Mode	⑧⑤① START	
PRINT TEST PATTERN	Service Mode	⑧⑤② START	

2-1. BUTTON CODE TABLE

Code	Button Name	Code	Button Name	Code	Button Name	Code	Button Name
02	RESOLUTION	22	HELP	35	5	64	STATION 1
04	START/SET	24	DIRECTORY	36	6	65	STATION 2
05	LOWER	25	∧ VOLUME	37	7	66	STATION 3
06	COPY	26	∨ VOLUME	38	8	67	STATION 4
07	PAPER SAVE	31	1	39	9	68	STATION 5
08	SP-PHONE	32	2	3A	0	69	STATION 6
0A	MUTE	33	3	3B	*	6A	STATION 7
0C	LINE 2 RCV MODE	34	4	3C	#	6B	STATION 8
0D	LINE 1 RCV MODE			3D	REDIAL/PAUSE	6C	STATION 9
16	ERASE			3E	FLASH	6D	STATION 10
18	NEW MESSAGES					6E	STATION 11
19	MAIL BOX					6F	STATION 12
20	MENU					EA	LINE 1
						EB	LINE 2
						EC	HOLD
						ED	CONF

3. COMMUNICATION ERROR FUNCTIONS

3-1. OPERATION
1. Press the MENU button 3 times.
2. press the START/SET button and REDIAL/PAUSE button 4 times.
3. Press the START/SET button.
4. Print out.

3-2. ERROR CORD TABLE

CODE	RESULT	MODE	SYMPTOM	Counter-measure
	PRESSED THE STOP KEY	TX & RX	Communication was interrupted with the STOP button	
	DOCUMENT JAMMED	TX	Document paper is jammed	
	NO DOCUMENT	TX	No document paper	
	PRINTER OVERHEATED	RX	Thermal head is overheated	
	PAPER OUT	RX	Out of thermal paper	
	THE COVER WAS OPENED	TX & RX	Cover is open	
	PAPER JAMMED	RX	Recording paper is jammed	
40	NO RESPONSE	TX	Transmission is finished when T1 TIMER is expired	1
41	COMMUNICATION ERROR	TX	DCN is received after DCS transmission	2
42	COMMUNICATION ERROR	TX	FTT is received after transmission of 2400BSP training signal	3
43	COMMUNICATION ERROR	TX	No response after post message is transmitted three times	4
44	COMMUNICATION ERROR	TX	RTN and PIN are received	5
46	COMMUNICATION ERROR	RX	No response after FTT is transmitted	6
48	COMMUNICATION ERROR	RX	No post message	7
49	COMMUNICATION ERROR	RX	RTN is transmitted	8
50	COMMUNICATION ERROR	RX	PIN is transmitted (to PRI-Q)	8
51	COMMUNICATION ERROR	RX	PIN is transmitted	8
52	NO RESPONSE	RX	Reception is finished when T1 TIME is expired	9
53	COMMUNICATION ERROR	TX	DCN is received after transmission of NSC and DTC	10
54	COMMUNICATION ERROR	RX	DCN is received after DIS transmission	11
57	COMMUNICATION ERROR	TX	300BPS error	12
58	COMMUNICATION ERROR	RX	DCN is received after FTT transmission	13
59	COMMUNICATION ERROR	TX	DCN responds to post message	14
64	COMMUNICATION ERROR	TX	Polling is not possible	15
68	COMMUNICATION ERROR	RX	No response at the other party after MCF or CFR is transmitted	13
70	COMMUNICATION ERROR	RX	DCN is received after CFR transmission	13
72	COMMUNICATION ERROR	RX	Carrier is cut when image signal is received	16
	FILM EMPTY	RX	Film is Empty	
FF	COMMUNICATION ERROR	TX & RX	Modem error	12

TX=TRANSMISSION RX=RECEPTION

※Most fax communication problems can be resolved by the following steps.
     1) Change the transmit level.
     2) Change the TX speed/RX speed.

If not resolved, see the next page.

3-3. COUNTERMEASURE

(1) Transmission is finished when T1 TIMER is expired.

Turn ON the FAX monitor function and transmit the data to the same receiver.

↓

Is FAX signal sound (DIS) heard? — NO →

↓ YES

Is communication OK?

NO → **Confirm service parameter and compatibility of both caller's and receiver's FAX machines.**

YES → **Confirm the receiver's FAX machine was set to the reception mode when the previous communication was NG.**

(NO branch from DIS) **Confirm if the receiver's FAX machine is set to the reception mode or answering machine's message is on.**

(2) DCN is received after DCS transmission.

Confirm the receiver's FAX machine.

↓

Is it the same brand as our products? — NO →

↓ YES

Is the password check mode set? (Have the receiver's parameter list printed.) — NO →

↓ YES

Ask the receiver to cancel password of the receiver's FAX machine or set the caller's password corresponding to the receiver's and transmit the data again.

NO → **Confirm service parameter and compatibility of both caller's and receiver's FAX machines.**

(NO branches) **Is the receiver's FAX machine is the "out of paper or mechanical error" status?**

YES → **Ask the receiver to set the receiver's FAX machine to the receivable mode and transmit again.**

```
        ( 3 )          FTT is received after transmission of 2400BPS
                       training signal.
                          ( 3.1 )
```

(1) Raise the level of transmission. (Do not raise the level above the standard of each country. If the communication should be OK at the level beyond the standard, it is attributable to line condition or the receiver's machine sensitivity condition.) If no effect is obtained.
(2) Slow down the transmission start speed and transmit to the receiver again.

Try again.

Is communication OK?   YES

(3.2)   NO

Ask the receiver to perform FAX communication from the receiver to the caller.

END

Check if the line is not interrupted by noises or in the cross talk. If it is not, wait until the line is satisfactory for correct communication.

```
        ┌─────────┐        No response after post message is transmitted
        (    4    )        three times.
        └────┬────┘
             ▼
  ┌────────────────────────┐
  │ Inquire the receiver if the │
  │ caller's document is facsimiled │
  │ correctly. │
  └────────────┬───────────┘
               ▼
         ◇ Is the data facsimiled ◇ ────────────┐
         ◇      correctly?        ◇         NO  ▼
                    │ YES                    ┌───────┐
                    ▼                        ( 3.2  )
  ┌────────────────────────┐                 └───────┘
  │ Ask the service section of the │
  │ receiver's FAX machine to con- │
  │ firm the machine condition. │
  └────────────────────────┘
```

```
        ┌─────────┐        RTN and PIN are received.
        (    5    )
        └────┬────┘
             ▼
        ┌─────────┐
        (   3.1   )
        └─────────┘
```

```
        ┌─────────┐        No response after FTT is transmitted.
        (    6    )
        └────┬────┘
             ▼
  ┌────────────────────────┐
  │ Perform communication test us- │
  │ ing the LOOP simulator and │
  │ check the machine reception │
  │ condition. │
  └────────────┬───────────┘
               ▼
                                YES
┌──────────────────────────┐ ◄──────── ◇ Is FTT sent from the receiver? ◇
│ Modem test (Refer to page 20.) │
└──────────────────────────┘
                                             │
                                    ┌────────┴─── ( 6.1 )
                                  NO ▼
                          : No problem on the machine hardware.
  ┌────────────────────────┐
  │ Perform voice communication │
  │ with the NG caller. │
  └────────────┬───────────┘
               ▼
  ┌────────────────────────┐
  │ Check if the line is not inter- │
  │ rupted by noises or in the cross │
  │ talk, If it is not, wait until the line │
  │ is satisfactory for correct com- │
  │ munication. │
  └────────────────────────┘
```

(7)　　　No post message

Turn ON the FAX monitor function and have the receiver transmit the data.

Is FAX signal sound (post message) heard after the image data is received? ── **NO** ──→ (7.1)

Ask the service section of the sender's FAX machine for examination.

YES

(Receive Complete)

NO ←── Does an error (error code=48) occur still? ──→ **YES**

Try again.

Decrease the RX speed.

Does an error lines exist on received document? ── **NO** ──→ (7.1)

YES

---

(8)　　　RTN is transmitted.
PIN is transmitted (to PRI-Q).
PIN is transmitted.

Slow down the reception start speed and receive again.

Does the communication error "code 49" occur?

YES ──→ (6.1)

NO ──→ END

(9)   Reception is finished when 11 TIME is expired.

Is ring count set to 2, 3 or 4?   NO

Change the ring count to "1".

YES

Turn ON the FAX monitor function and have the receiver in question transmit the data again.

Is communication OK?   YES → END

NO

Is FAX signal sound heard after the image data is received?

NO

YES

Confirm if the receiver's FAX machine was set to receivable mode.

6.1

(10)   DCN is received after transmission of NSC and DTC.

Confirm if a mechanical trouble occurred, e.g. transmission was interrupted or document was out of place, on the receiver side (being polled).

Was it a mechanical error as mentioned above?

NO

YES

Ask the receiver to set the poll mode again and perform polling.

Ask the service section of the receiver's FAX machine for examination.

(11)   DCN is received after DIS transmission.

Confirm if a mechanical trouble occurred, e.g. the caller interrupted the transmission.

Was it a mechanical error as mentioned above?

NO

YES

Have the caller transmit the data again.

Ask the service section of the caller's FAX machine for examination.

(12)   300BPS error
Modem error

Check the hardware of the peripherals of the modem.

(13)　DCN is received after FTT transmission.
No response at the other party after MCF or
CFR is transmitted.
DCN is received after CFR transmission.

Confirm if a mechanical trouble occurred, e.g. the caller interrupted the transmission.

Was it mechanical error as mentioned above?

YES

Ask the caller to transmit the data again.

NO

(6.1)

(14)　DCN responds to post message.

Confirm if a mechanical trouble occurred, e.g. the receiver interrupted the reception.

Was it a mechanical error as mentioned above?

NO

Perform voice communication with the NG receiver.

YES

Ask the receiver to set the receiver's FAX machine to the receivable mode and communicate again.

Check if the line is not interrupted by noises or in the cross talk. If it is not, wait until the line is satisfactory for correct communication.

(15)   Polling is not possible.

Confirm if a mechanical trouble
occurred, e.g. transmission was
interrupted or document was out
of place, on the receiver side
(being polled).

Was it a mechanical error as
mentioned above?

YES   NO

Ask the receiver to set the Poll   Ask the service section of the
mode again and perform polling.   receiver's FAX machine for ex-
                                        amination.

(16)   Carrier is cut when image signal is received.

Perform communication test us-
ing the LOOP simulator and
check the machine reception
condition.

Modem test   YES
(Refer to page 20.) ←———— Is carrier cut?

                              NO

                        (6.1)

4. REMOTE PROGRAMMING

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

1. A call comes in service center.
2. A technician gets a claim from a customer.
3. He says to the customer "please press MENU button and wait for a moment".
4. The technician dial '9,0,0,0, ✳' from his telephone.
   The customer's unit is set REMOTE PROGRAMMING MODE and generates remote beep sound.
   He hears "Piiii" (one long beep).
5. He presses 3 digits code of service function written in service manual by dial keypad.
   And presses ✳ (set).
   The customer's unit receives the service code.
   He hears "Piiii" (one long beep).
6. He presses 1~3 digits value of function written in service manual by dial keypad.
   And presses ✳ (set).
   The customer's unit receives the service value.
   He hears "Pii Pii" (double short beeps).
7. Then he can repeat from step 5.
8. When he wishes to end the REMOTE PROGRAMMING MODE, he replaces the handset on the cradle or the customer presses the STOP button.

NOTE:
1) To enter the REMOTE PROGRAMMING MODE is necessary in Step 3. Because the unit can not easily enter the REMOTE PROGRAMMING by DTMF signal from the other party.
2) If he presses wrong buttons when his operation is in step 5 or 6. he hears "Pii Pii Pii" (triple short beeps). Then he can repeat from the same step.
3) When customer's unit finishes transmitting a list (No. 911,994,999), he can have a voice conversation.
   And he can continue the REMOTE PROGRAMMING MODE.
4) When customer's unit start transmitting a list (No. 991,994,999), he does not hear "Pii Pii" (double short beeps).
   The unit generate CNG sound.

4-1. SUMMARY OF REMOTE PROGRAMMING MODE

```
                    ┌─────────────────────────┐        ┌───────────────────────────┐
                    │         START           │        │  Replace the handset on   │
                    └─────────────────────────┘        │  the cradle or customer   │
                               │                        │  press STOP key           │
                               ▼                        └───────────────────────────┘
                    ┌─────────────────────────┐                      │
                    │  Enter the REMOTE       │                      ▼
                    │  PROGRAMMING ID 9,0,0,0 ✶│        ┌───────────────────────────┐
                    └─────────────────────────┘        │           END             │
                               │                        └───────────────────────────┘
                               ▼
                    ┌─────────────────────────┐
                    │  REMOTE PROGRAMMING     │
                    │  MODE "Piiii"           │
                    └─────────────────────────┘
                               │
  ┌──────────────────────┐    ▼
  │ Press mistaken key "Pii│  ┌─────────────────────────┐
  │ Pii Pii"               │──│  Press 3 digits code of service │
  └──────────────────────┘    │  function and then press ✶ (set)│
                              └─────────────────────────┘
                                         │
  ┌──────────────────────┐               ▼
  │ Press mistaken key "Pii│  ┌─────────────────────────┐
  │ Pii Pii"               │  │  SERVICE SETTING MODE   │
  └──────────────────────┘    │  "Piiii"                │
                              └─────────────────────────┘
                                         │
                                         ▼
                              ┌─────────────────────────┐
                              │  Press 1~3 digits value of func-│
                              │  tion and then press ✶ (set)    │
                              └─────────────────────────┘
                                         │
                                         ▼
                              ┌─────────────────────────┐
                              │  SETTING THE FUNCTION "Pii│
                              │  Pii"                     │
                              └─────────────────────────┘
```
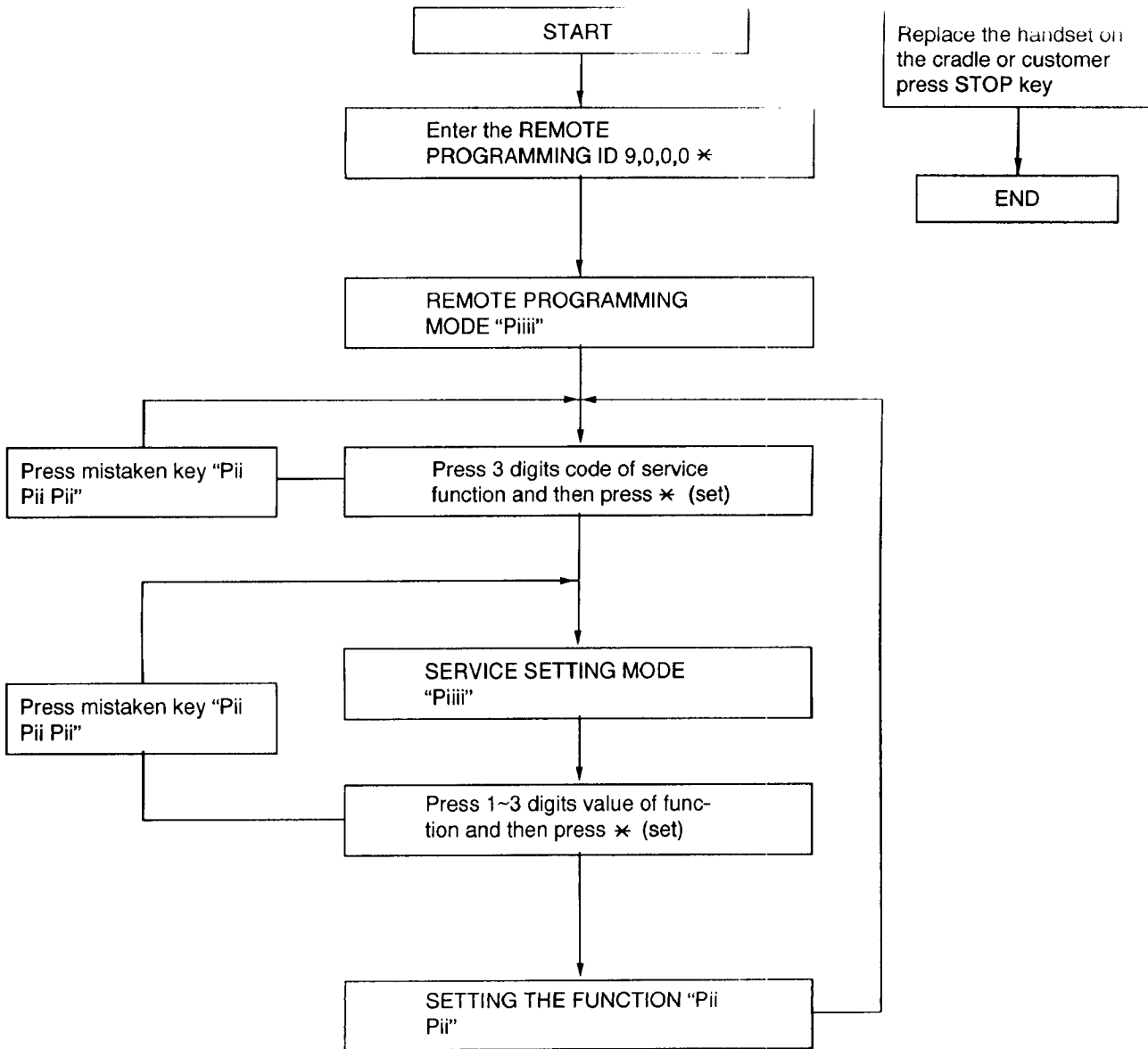
4-2. PROGRAM MODE TABLE

Code	Function	Set Value	Default	Remote setting
#01	Set date and time	mm/dd/yy hh:mm	(Jan/01/95)	NG
#02	Your logo	up to 30 digits	PANASO	NG
#03	Your telephone number	up to 20 digits	(NONE)	NG
#04	Print transmission report	ERROR/ON/OFF	OFF	OK
#07	FAX ring count	1 to 4 rings	1	OK
#08	ANS/FAX ring count	1/2/3/4 rings/TOLL SAVER/RINGER OFF	1 ring	OK
#09	Recording time	VOX/1 MIN	VOX	OK
#10	Remote ANS ID	- - - - -	ID=111	NG
#21	Logo position	OUT/IN/OFF	OUT	OK
#22	Journal auto print	ON/OFF	ON	OK
#23	Overseas mode	ON/OFF	OFF	NG
#24	Junk mail prohibitor	ON/OFF	OFF/ID=22	NG
#25	Delayed transmission	ON/OFF	OFF	NG
#26	Line selection	AUTO/LINE 1/LINE 2	AUTO	NG
#27	FAX selection	AUTO/LINE 1/LINE 2	AUTO	NG
#28	Line mode	CO/PBX	LINE 1=CO, LINE 2=CO	NG
#29	C. O. L selection	ON/OFF	LINE 1=ON, LINE 2=ON	NG
#31	Ring detection	OFF/A/B/C/D	OFF	OK
#34	Extension copy	- - - - -	- - - - -	NG
#35	Copy reduction	92%/72%/OFF	OFF	NG
#36	RX reduction	92%/86%/72%/OFF	92%	OK
#39	LCD contrast	NORMAL/LIGHT/DARKER	NORMAL	OK
#41	Remote FAX activation code	- - - - -	**	NG
#42	Message alert	ON/OFF	OFF	OK
#43	Recording time alert	ON/OFF	OFF	OK
#45	Busy message	ON/OFF	ON	NG
#46	Ringer mode	ON/OFF	ON	NG
#50	Mail box alert	ON/OFF	OFF	OK
#51	BOX 1 password	- - - - -	555	NG
#52	BOX 2 password	- - - - -	555	NG
#53	BOX 3 password	- - - - -	555	NG
#60	Common pager	ON/OFF	OFF	NG
#61	Mail box 1 pager	ON/OFF	OFF	NG
#62	Mail box 2 pager	ON/OFF	OFF	NG
#63	Mail box 3 pager	ON/OFF	OFF	NG
#70	FAX pager	ON/OFF	OFF	NG
#80	Set default	YES/NO	NO	NG
501	Pause time set	001~600×100msec	050	OK
502	Flash time set	01~99×10msec	70	OK
503	Dial speed set	1:10/2:20pps	10	OK
510	VOX time select	1:6 sec/2:4 sec	6 sec	OK
520	CED frequency select	1:2100/2:1100Hz	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
532	Security mode of erasing mail box	1:ON/2:OFF	OFF	OK
550	Memory clear	"START" push	- - - - -	NG
551	ROM check	"START" push	- - - - -	NG
552	DTMF signal tone transmit select	1:ON / 2:OFF	OFF	NG
553	Monitor on FAX communication select	1:OFF/2:P-B/3:ALL	OFF	OK
554	Modem test	"START" push	- - - - -	NG
555	Scanner test	"START" push	- - - - -	NG
556	Motor test	"START" push	- - - - -	NG
557	LED test	"START" push	- - - - -	NG
558	LCD test	"START" push	- - - - -	NG
559	Paper jam detection select	1:ON/2:OFF	ON	OK
561	Key test	"START" push	- - - - -	NG
563	CCD position adjustment value set	00~30	- - - - -	OK
564	CCD auto position adjustment	- - - - -	- - - - -	OK
570	Break % select	1:61/2:67%	61%	NG

Code	Function	Set Value	Default	Remote setting
571	ITS auto redial time set	00~99	14	OK
572	ITS auto redial line disconnection time set	001~999	030	OK
573	Remote turn-on ring number set (LINE 1)	01~99	15	OK
574	Dial tone detection set	1:ON/2:OFF	OFF	OK
575	Remote turn-on ring number set (LINE 2)	01~99	15	OK
579	Auto disconnect cancel time	1:350msec/2:180msec/3:OFF	350msec	OK
580	TAM continuous time select	1:ON/2:OFF	ON	OK
582	2 way record	1:ON/2:OFF	ON	OK
583	2 way beep time	0~999 msec	0	OK
586	White line skip 2 select	1:ON/2:OFF	ON	OK
587	White line skip 2 select	1:ON/2:OFF	ON	OK
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	75ms	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
597	Transmit speed 2400bps fixed mode select	1:ON/2:OFF	OFF	OK
705	OGM recording time (Ring detection=A-D)	0~99 sec	16 sec	OK
706	OGM recording time (Ring detection=OFF)	0~99 sec	16 sec	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
720	Manual tone detect	1:ON/2:OFF	OFF	OK
721	Pause tone detect	1:ON/2:OFF	ON	OK
722	Redial tone detect	1:ON/2:OFF	ON	OK
731	CPC mode	1:A/2:B	A	OK
745	Power ON film feed	1:ON/2:OFF	ON	OK
771	T1 timer	1:35sec/2:60sec	35sec	OK
805	Busy message out (Speaker)	-----	-----	NG
806	Busy message out (LINE 1)	-----	-----	NG
815	Sensor & VOX check	"START" push	-----	NG
851	Printer feed test	"START" push	-----	NG
852	Print test pattern print	"START" push	-----	NG
853	Top margin	1~9	-----	OK
854	Left margin	1~8	-----	OK
861	A4 size set	1:ON/2:OFF	OFF	OK
991	Set up list	1:Start	-----	OK
994	Journal list	1:Start	-----	OK
999	Service list	1:Start	-----	OK

5. SERVICE HINTS

SYMPTOM	CURE
1. Defective general ITS operation	Defective solder IC1 on analog board or check for solder short.
2. Other defective operation	Defective solder on IC404 or IC405, check for solder short. (Refer to page 41.)

6. GENERAL

6-1. UNIT DOES NOT WORK (NO FUNCTION AT ALL)

```
┌─────────────────────────┐   NO      ┌─────────────────────────┐
│ Does the LCD indicate   │──────────▶│ Check power supply.     │
│ any charactors ?        │  Display  │ (Refer to page 37.)     │
└─────────────────────────┘           └─────────────────────────┘
          │  Erroneous Display
          ▼
┌─────────────────────────┐
│ Check reset circuit.    │
│ (Refer to page 38.)     │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐
│ Check clock pulse.      │
│ (Refer to page 39.)     │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐
│ Check bus line.         │
│ (Refer to page 40.)     │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐
│ Check key scan and input.│
│ (Refer to page 40.)     │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐
│ Check IC404.            │
│ (Refer to page 41.)     │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐
│ Check IC405.            │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐
│ Replace IC401 or IC402 or IC403. │
└─────────────────────────┘
```

Note 1) Check power supply

```
┌─────────────────────────────┐   NG   ┌─────────────────────────────┐
│ Check the voltage between    │ ·····> │ Check switching power supply │
│ pin 4 and pin 5 on CN401     │        │ section. (Refer to page 63.) │
│ (Digital board).             │        └─────────────────────────────┘
│                              │
│   4.85 (V) ≤V≤5.35 (V)       │
└─────────────────────────────┘
              │ OK
              ▼
┌─────────────────────────────┐   NG   ┌─────────────────────────────┐
│ Check connection between     │ ─────> │ Insert the connector and     │
│ CN401,402,403 (Digital board)│        │ cable exactly into           │
│ and CN4 (Analog board).      │        │ CN401,402,403 and CN4        │
└─────────────────────────────┘        └─────────────────────────────┘
              │ OK
              ▼
┌─────────────────────────────┐   NG   ┌─────────────────────────────┐
│ Check the voltage between    │ ─────> │ Replace the connector cable  │
│ pin 3 and 4 of CN4           │        │ for CN4 (Analog board).      │
│ (Analog board).              │        └─────────────────────────────┘
│                              │
│   4.85 (V) ≤V≤5.35 (V)       │
└─────────────────────────────┘
              │ OK
              ▼
┌─────────────────────────────┐
│ Go to next page (Check reset │
│ circuit).                    │
└─────────────────────────────┘
```

Note 2) Check reset circuit

Is the voltage at pin 3 of IC409 4~5 V? — NO →

↓ YES

Replace IC409.

Is the voltage at pin 8 of IC401 4~5 V? — NO →

↓ YES

Replace IC401

Is the voltage at pin 36 of IC417 4~5 V? — NO →

↓ YES

Is the voltage at pin 66 of IC404 4~5 V? — NO → Replace IC404.

Replace IC417.

↓ YES

Is the voltage at pin 67 of IC405 4~5 V? — NO → Replace IC405.

↓ YES

Is the voltage at pin 5 of IC408 4~5 V? — NO → Replace IC408.

↓ YES

END

Note 3) Check clock pulse

Is the voltage at pins 72,22, of IC405 4~5 V? —NO→ Replace LC501,LC502

↓ YES

Is the frequency at pin 68 of IC405 24 MHz?

3~4 Vp-p

—NO→ Replace R593 or C526,LC502,C434,R635.

↓

Check the frequency at pin 68 of IC405 again. —NG→ Replace IC405.

OK →

↓ YES

Is the frequency at pin 81 of IC404 12 MHz?

5 Vp-p

—NO→ Check the frequency at pin 56 of IC404 3~5 V. 24 MHz —NG→ Replace IC404.

OK ↓ END

↓ YES

Is the frequency at pin 28 of IC401 16 MHz?

4~5 Vp-p

↓ YES

END

NO→ Replace R748, R747, X404, C751, C752, IC404.

Note 4) Check bus line

```
┌─────────────────────────────────┐  NO   ┌─────────────────────────────────────┐
│ Is the amplitude at pins 9-15,  │ ────→ │ Check the short pins of              │
│ 17-24 and 30-37 of              │       │ IC401,IC402,IC403,IC404,IC405,IC417, │
│ IC401 4~5 Vp-p?                 │       │ (Digital board)                      │
│                                 │       │ and IC1 (Analog board). Or replace   │
│                                 │       │ some of these ICs.                   │
└─────────────────────────────────┘       └─────────────────────────────────────┘
         │ YES
         ▼
┌─────────────────┐
│       END       │
└─────────────────┘
```

Note 5) Check key scan and input


```
┌─────────────────────────────────┐  NO   ┌─────────────────────────────────────┐  NG
│ Is the waveform at pins          │ ────→ │ Check connection between CN404      │ ───
│ 1,3,7,8,11~14,43,44 of           │       │ (Digital board) and CN301           │
│ IC301 (Operation board)          │       │ (Operation board).                  │
│ shown below?                     │       │                                     │
│                                  │       └─────────────────────────────────────┘
│   ⎍⎍⎍⎍  4~5 Vp-p                 │              │ OK
│                                  │              │
└─────────────────────────────────┘              │
         │ YES                                    │
         ▼                                        ▼
┌─────────────────┐              ┌─────────────────────────────┐   ┌─────────────────────────┐
│       END       │              │ Check the solder at pins    │   │ Insert the cable exactly │
└─────────────────┘              │ 132~136 of IC404.           │   │ into CN301.              │
                                 └─────────────────────────────┘   └─────────────────────────┘
                                         │ OK
                                         ▼
                                 ┌─────────────────────────────┐
                                 │      Replace IC404.         │
                                 └─────────────────────────────┘
```

Note 6) Check IC404 (Digital Board)

Bus

| Is the amplitude at pins 84~89, 92~99, 101~104 of IC404 4~5 Vp-p? | →NO→ | Check the solder of pins 84~89,92~99,101~104 of IC404. |

YES ↓

Reset

| Is the voltage at a pin 66 of IC404 4~5 V? | →NO→ | Check the solder of these pins. |

YES ↓

| Is the voltage at pins 37,38,64,65 of IC404 0V? | →NO→ | Check the solder of these pins. |

YES ↓

| END |

7. DEFECTIVE FACSIMILE SECTION

7-1. TRANSMIT PROBLEM

```
                                    USER STOPPED ◄──     Message on LCD
┌──────────────┐
│  TX Problem  │                              ┌─────────────────────┐   YES
└──────┬───────┘                              │ STOP key was pressed?├──────
                                              └──────────┬──────────┘
                                                         │ NO
                                              ┌─────────────────────┐   ┌──────────────┐
                                              │   Need to service   │   │  No problem  │
                                              └─────────────────────┘   └──────────────┘

┌──────────────┐   YES
│ Document jam?├────────────────────────────────────────────────────┐
└──────┬───────┘                                                     │
       │ NO                                                          │
┌────────────────────┐  YES                                    ┌──────────────────────┐
│ Only some of document├────────────┐                          │ No obstacle such as a │
│ go through?          │            │                          │ piece of plastic in paper│
└──────┬─────────────┘              │                          │ path area?            │
       │ NO                         │                          └───────────┬──────────┘
┌────────────────────┐  YES  ┌────────────────────┐  NG                   │
│ All of document go  ├──────►│ Press down READ SEN-│──────                ┌──────────────────────┐
│ through, but communica-│    │ SOR gently, and release│                   │ If using curl document│
│ tion result is error.│      │ it to be come up immedi-│                  │ such as thermal paper,│
└──────┬─────────────┘        │ ately.              │                      │ make a straight or use│
       │ NO                   └──────────┬─────────┘                        │ carrier sheet.        │
                                         │ OK                               └──────────────────────┘
┌────────────────────┐        ┌────────────────────┐
│ No feed at all even one│     │ Clean up separation │
│ page.                │      │ roller using dump    │
└──────┬─────────────┘        │ clothes.             │
                              │ (Rubbing alcohol)    │
                              └──────────┬─────────┘
┌────────────────────┐        ┌────────────────────┐
│ Check motor, gears, one-│   │ Replace separation roller│
│ way clutch and E ring for│  │ with new one.        │
│ one-way clutch.      │      └────────────────────┘
└──────┬─────────────┘
                                         ┌──────────────────────┐
┌────────────────────┐                   │ Need to service       │
│ Check separation rubber│                │ • Check, sensor is in-│
│ and separation spring.│                 │   stalled properly?   │
└────────────────────┘                   └──────────────────────┘
```

Transmit Error ←— Message on LCD

```
┌──────────────┐
│  TX Problem  │
└──────┬───────┘
       │
┌──────▼────────────┐      NO
│ Pre-Feeding of    ├──────────────────────────────┐
│ document?         │                               │
└──────┬────────────┘                               │
       │ YES                              ┌──────────▼─────────┐   YES
       │                                  │ Using auto dial to ├────────┐
┌──────▼────────────┐  NO                 │ send?              │        │
│ Doesn't start TX  ├──────┐              └──────────┬─────────┘        │
│ (Doesn't start    │      │                         │ NO               │
│ feeding?)         │      │                         │                  │
└──────┬────────────┘      │                         │                  │
   YES │    OK             ▼                ┌─────────▼────────┐  NO  ┌──▼──────────────┐
       ◄──────── ┌──────────────────┐      │ Do you press     ├─────►│ Check other     │
       │         │ • Increase "596: │      │ START key        │      │ party's machine.│
┌──────▼──────┐  │ Transmit level   │      │ immediately after│      │ (Paper out, Auto│
│ Document    │  │ set" from -10 dBm│      │ dialing?         │      │ answer off..etc)│
│ goes through│  │ to -5 dBm or some│      └─────────┬────────┘      └─────────────────┘
└──────┬──────┘  └────────┬─────────┘           YES  │
       │              NG  │
       │         ┌────────▼─────────┐  ┌──────────────┐
       │         │ Ask other party, │  │ Decrease TX  │
       │         │ changing RX      │  │ level from   │
       │         │ equalizer & in-  │◄─┤ -10 dBm to   │
       │         │ creasing TX level│NG│ -15 dBm or   │
       │         └──────────────────┘  │ some.        │ OK
       │                               └──────┬───────┘
┌──────▼────────────┐                         │
│ Confirm sent image│◄────────────────────────┘
│ on RX side has    │
│ many errors?      │
└──────┬────────────┘
       │
┌──────▼──────────┐  NG  ┌────────────────┐   ┌──────────────────┐
│ • Increase "596:│─────►│• Decrease "596:│   │ Check modem TX   │
│ Transmit level  │      │Transmit level  │   │ level.           │
│ set" from -10   │      │set" from -10   │   └────────┬─────────┘
│ dBm to -5 dBm   │      │dBm to -15 dBm  │            │
│ or some. or     │      │or some.        │   ┌────────▼─────────┐
│ • Decrease "596:│      └────────┬───────┘   │ Change "594:     │
│ Transmit level  │               │           │ Oversea DIS      │
│ set" from -10   │      ┌────────▼───────┐   │ detection" to    │
│ dBm to -12 dBm  │      │ Ask RX party,  │   │ "Detect at the   │
│ or some.        │      │ increase a     │   │ 2nd time".       │
└──────┬──────────┘      │ parameter of RX│   └────────┬─────────┘
    OK │                 │ error line     │            │
       │                 │ value to more  │   ┌────────▼─────────┐
       │      (No avail) │ than.          │   │ Confirm "592:    │
       ◄─────────────────└────────────────┘   │ CNG TX select"   │
┌──────▼──────────┐                            │ to "ALL".        │
│ Change "717:    │                            └────────┬─────────┘
│ Transmit speed  │                            ┌────────▼─────────┐
│ select" to 7200,│                            │ Ask other party, │
│ 4800 or 2400bps │                            │ increasing TX    │
└─────────────────┘                            │ level.           │
                                               └──────────────────┘
```

7-2. RECEIVE PROBLEM

Confirm below before starting troubleshooting.
· Recording paper is installed properly?

```
┌─────────────────────┐
│     RX problem      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐   YES
│ Can RX something    │────────────────────────┐
│ anyway?             │                         │
└─────────────────────┘                         ▼
          │ NO                        ┌─────────────────────┐   YES
          │                           │ Many errors on      │───────────┐
          │                           │ image?              │           │
          │                           └─────────────────────┘           │
          │                              │ NO: Looks OK                  │
          │                              ▼                               ▼
          │                    ┌─────────────────────┐   ┌─────────────────────────┐
          │                    │ Increase "595: RX   │   │ Change "718:Receive     │
          │                    │ error limit value"  │   │ speed select" to 7200,  │
          │                    │ to some.            │   │ 4800 or 2400 bps.       │
          │                    └─────────────────────┘   └─────────────────────────┘
          │                                                         │
          │                                                         ▼
          │                                              ┌─────────────────────────┐
          │                                              │ Ask sender below change.│
          │                                              │ • Increase "596:Transmit│
          │                                              │   level set"            │
          │                                              └─────────────────────────┘
          ▼
┌─────────────────────┐──────────────────────────────────────────────────┐
│    Which mode?      │                                                    │
└─────────────────────┘                                                    │
     │         │                                                           │
     ▼         ▼                                                           ▼
┌──────────┐ ┌──────────┐                                      ┌──────────────────┐
│ TEL mode.│ │ FAX mode.│                                      │ ANS/FAX mode.    │
└──────────┘ └──────────┘                                      └──────────────────┘
     │         │                                                           │
     │         ▼                                                           ▼
     │   ┌──────────────────────┐  NO                      NO  ┌──────────────────────────┐
     │   │ FAX ring count is    │◄─┐                       ┌──►│ ANS/FAX ring count is    │
     │   │ 2, 3 or 4.           │  │                       │   │ 2, 3 or 4?               │
     │   └──────────────────────┘  │                       │   └──────────────────────────┘
     │         │ YES               │                       │         │ YES
     │         ▼                   │                       │         ▼
     │   ┌──────────────────────┐  │                       │   ┌──────────────────────────┐
     │   │ Change FAX ring      │──┘                       │   │ Change ANS/FAX ring      │
     │   │ count to 1.          │                          │   │ count to 1.              │
     │   └──────────────────────┘                          │   └──────────────────────────┘
     │         │                                           │
     ▼         ▼                                           ▼
┌─────────────────────────┐◄──────────────────────────────┘
│ Increase "593: time     │
│ between CED & 300bps"   │
│ to some value.          │
└─────────────────────────┘
          │
          ▼
┌─────────────────────────┐   NO
│ Error code No. 68       │──────────┐
│ (Echo)?                 │          │
└─────────────────────────┘          │
          │ YES                       │
          ▼                           │
┌─────────────────────────┐          │
│ Decrease "596: Transmit │          │
│ level set" from -10dBm  │          │
│ to -12dBm or some.      │          │
└─────────────────────────┘          │
          │                           │
          ▼                           │
┌─────────────────────────┐   ┌─────────────────────────┐
│ Change "718: Receive    │──►│ Ask sender below change.│
│ speed select" to 7200,  │   │ • Increase "596:        │
│ 4800 or 2400 bps.       │   │   Transmit level set".  │
└─────────────────────────┘   └─────────────────────────┘
```

Confirm below before starting troubleshooting.
· Recording paper is installed properly?

```
┌─────────────────┐   (PAPER JAM) LCD message
│   RX problem    │──────────────────────────────────────────────┐
└─────────────────┘                                               │
    │         │
LCD message   │ (CHECK COVER) LCD massage
(OUT OF       │
PAPER)        │
    │         │                                                   │
    ▼         ▼                                                   ▼
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│Even paper is     │   │Even Top cover is │   │Even no jamming,  │
│installed prop-   │   │closed.           │   │LCD               │
│erly.             │   │                  │   │                  │
└──────────────────┘   └──────────────────┘   └──────────────────┘
    │                       │                       │
    ▼                       ▼                       ▼
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│• Check paper     │   │• Check the platen│   │ Check sensor     │
│  sensor.         │   │  roller and shaft│   │ lever            │
│                  │   │  holders are     │   │                  │
└──────────────────┘   │  installed       │   └──────────────────┘
                       │  properly.       │       │
                       │• Check cover     │       ▼
                       │  switch & a fin  │   ┌──────────────────┐
                       │  to press down   │   │Check sensor on   │
                       │  the cover       │   │sensor board      │
                       │  switch.         │   │(Replace sensor)  │
                       └──────────────────┘   └──────────────────┘
```

7-3. DOES NOT COPY OR COPY IMAGE IS INCORRECT

```
┌────────────────────────────┐              ┌────────────────────────────┐      NG
│   Check recording paper.   │              │   Check film cartridge     │────────────────┐
└────────────────────────────┘              └────────────────────────────┘                │
              │                                            │ OK                             │
              │                                            │        ┌────────────────────────────┐
              │                                            │◄───────│     Set film cartridge     │
              │                              ┌────────────────────────────┐
              │                              │  Check film end sensor     │
              │                              │  (PS901)                   │
              │                              └────────────────────────────┘
              │                                            │ OK
              │◄───────────────────────────────────────────┘
              ▼
   ┌────────────────────────────────┐      NO
   │  Does any Error message display? │────────────────────────────────────────┐
   └────────────────────────────────┘                                          │
              │ YES                                                             │
              ▼                                                                 │
   ┌────────────────────────────────┐                                          │
   │  Check cover open sensor. (SW1) │                                         │
   └────────────────────────────────┘                                          │
              │ OK                                                              │
              ▼                                                                 │
   ┌────────────────────────────────┐      NO                                  │
   │  Is the recording paper jammed?  │──────────────┐                         │
   └────────────────────────────────┘               │                          │
              │ YES                                  │                          │
              ▼                                      │                          │
   ┌────────────────────────────────┐               │                          │
   │  Remove the jammed recording paper. │──────────┘                          │
   └────────────────────────────────┘                                          │
              │◄──────────────────────────────────────────────────────────────┘
              ▼
   ┌────────────────────────────────┐      NO      ┌────────────────────────────────┐
   │  Is a beep tone emitted when a docu- │─────────►│  Check document sensor (PI302).  │
   │  ment is inserted?               │              │     (Refer to page 48.)          │
   └────────────────────────────────┘              └────────────────────────────────┘
              │ YES
              ▼
   ┌────────────────────────────────┐
   │       Press Copy button.        │
   └────────────────────────────────┘
              │
              ▼
   ┌────────────────────────────────┐
   │       Continued to *2.          │
   └────────────────────────────────┘
```

*2

Does the paper out? — NO

YES

Check paper sensor
(PS904).
(Refer to page49.)

Is the paper feed OK? — NO → Check motor drive operation.
(Refer to page 50.) → Check paper top sensor
(PS902)
Check paper out sensor
(PS905)

YES

Copy OK? — NO → Perform the printer test. — NG

YES | OK

END

Check read section.
(Refer to page 51.)

Check thermal head.
(Refer to page 55.)

Note 1) Check cover open sensor (SW1)

Is the voltage at pin 47 of IC401
4~5 V when cover close, and 0 V
when cover open? — NO → Check the solder at pin 47 of
IC401

YES | OK | NG

Check the motion of sensor lever. — NG

OK

END

Replace lever.

Replace SW1.

NG

Replace IC401.

– 47 –

Note 2) Check document sensor (PI302) (Operation Board)

| Check the voltage at pin 19 of IC301 (4~5 V when document set, 0 V when no document set.) | —NG→ | Check the solder at Q303. | —OK→ | Check the solder at PI302. |

(Check the voltage at pin 19...) │ OK ↓

Replace IC301.

(Check the solder at PI302.) │ OK ↓

Replace PI302.

Note 3) Check read position sensor (PI301) (Operation Board)

| Check the voltage at pin 15 of IC301 (4~5 V) when document set, 0 V when no document set. | —NG→ | Check the solder at Q303. | —NG→ | Repair. |

(Check the voltage at pin 15...) │ OK ↓

Replace IC301.

(Check the solder at Q303.) │ OK ↓

Check the solder at PI301.

Note 4) Check paper sensor (PS904)

```
┌─────────────────────────────────┐        ┌─────────────────────────────────┐
│ Check the voltage at pin 2 of   │  NG    │ Check the connection between     │
│ CN414.                          │───────▶│ CN414 and CN904.                │
│ (0 V when recording paper set,  │        │                                 │
│ 4~5 V when recording paper out.)│        └─────────────────────────────────┘
└─────────────────────────────────┘                      │ OK
             │ OK                                         ▼
             ▼                                 ┌─────────────────────────┐
┌─────────────────────────────────┐           │     Replace PS904.      │
│ Check the voltage at pin 45 of  │  NG       └─────────────────────────┘
│ IC401.                          │───────┐
│ (0 V when recording paper set,  │       ▼
│ 4~5 V when recording paper out.)│   ┌─────────────────────────────────┐
└─────────────────────────────────┘   │ Check the solder at pin 45 of   │
             │ OK                      │ IC401 and R564,R510,C580.       │
             ▼                         └─────────────────────────────────┘
   ┌─────────────────────┐                        │ OK
   │    Check IC401.     │                        ▼
   └─────────────────────┘              ┌─────────────────────────┐
                                         │     Replace IC401.      │
                                         └─────────────────────────┘
```

Note 5) Check motor drive operation

```
┌─────────────────┐
│ Motor test start │
│ (Refer to page   │
│ 20.)             │
└─────────────────┘
         │
         ▼
┌─────────────────┐   NO      ┌─────────────────┐
│ Does the platen │──────────▶│ Check recep-    │
│ rotate?         │           │ tion motor sec- │
└─────────────────┘           │ tion.           │
         │ YES                └─────────────────┘
         ▼                             │
┌─────────────────┐   YES   ┌─────┐    │
│ Does the docu-  │────────▶│ END │    │
│ ment roller ro- │         └─────┘    │
│ tate?           │                    ▼
└─────────────────┘           ┌─────────────────┐   YES    ┌─────────┐
         │ NO                 │ Is the connec-  │─────────▶│ Repair. │
         ▼                    │ tor (CN409)     │          └─────────┘
┌─────────────────┐           │ loose?          │                │
│ Check trans-    │           └─────────────────┘            NO   ▼
│ mission motor   │                  │ NO          ┌─────────┐  YES  ┌─────┐
│ section.        │                  │◀────────────│   OK?   │──────▶│ END │
└─────────────────┘                  ▼             └─────────┘       └─────┘
         │                   ┌─────────────────┐   NO
         │                   │ Does the motor  │──────────────────────┐
         │                   │ rotate?         │                      │
         │                   └─────────────────┘                      ▼
         │                          │ YES         ┌─────────┐  ┌─────────────────┐
         │                          ▼             │ Repair. │  │ Is the phase    │
         │                   ┌─────────────────┐  └─────────┘  │ signal from     │
         │                   │ Check foreign   │       ▲       │ pins 16,17,     │
         │                   │ matter in gear, │    NO │       │ 20~22 of IC404  │
         │                   │ damaged gear    │  ┌─────────────────┐ output?     │
         │                   │ and motor.      │  │ Is the solder at│◀─┤ NO        │
         │                   └─────────────────┘  │ pins            │  └───────────┘
         │                                        │ 16,17,20~22     │       │ YES
         │                                        │ of IC404 OK?    │       ▼
         │                                        └─────────────────┘  ┌─────────────────┐
         │                                             │ YES           │ Is the voltage  │
         │                                             ▼               │ at pin 8 of     │
         │                                      ┌──────────────┐       │ IC407.          │
         │                                      │ Replace IC406.│      └─────────────────┘
         │                                      └──────────────┘       YES │   │ NO
         │                                                                 │   ▼
         │                                                                 │ ┌─────────────────┐
         │                                                                 │ │ Check switching │
         │                                                                 │ │ power supply    │
         │                                                                 │ │ section. (Refer │
         │                                                                 │ │ to page 63.)    │
         │                                                                 │ └─────────────────┘
```

```
                  ┌─────┐  YES  ┌──────────────┐
                  │ END │◀──────│    OK?       │─── NO ──┐
                  └─────┘       └──────────────┘         ▼
                                       ▲           ┌──────────────┐
                                       │           │ Replace IC407.│◀──────┐
                                ┌──────────────┐   └──────────────┘       │
                                │ Replace Q410.│                          │
                                └──────────────┘                    YES   │
                                       ▲                     ┌─────────────────┐
┌─────────────────┐  YES  ┌─────────┐  │                     │ Check the       │
│ Is the connec-  │──────▶│ Repair. │  │                     │ connection      │
│ tor (CN408)     │       └─────────┘  │                     │ of IC407.       │
│ loose?          │            │       │                     └─────────────────┘
└─────────────────┘            ▼       │          NO              NO │
      │ NO        ┌─────────┐ YES       │  ┌─────────────────┐       ▼
      │◀──── NO ──│   OK?   │──────┐    │◀─│ Is the voltage  │
      │           └─────────┘      ▼    │  │ at pin 1 of     │
      ▼                       ┌─────┐   │  │ IC407 less than │
┌─────────────────┐  NO       │ END │   │  │ 2 V?            │
│ Does the motor  │───┐       └─────┘   │  └─────────────────┘
│ rotate?         │   │                 │        YES │
└─────────────────┘   │                 │            │
      │ YES           ▼                  └────────────┘
      ▼        ┌─────────────────┐  YES  ┌─────────────────┐  NO  ┌─────────────────┐
┌─────────────────┐│ Is the phase │──────▶│ Is the voltage  │────▶│ Check switching │
│ Check foreign   ││ signal from  │       │ at emitter of   │     │ power supply    │
│ matter in gear, ││ pins 23~27 of│       │ Q403. +24 V?    │     │ section. (Refer │
│ damaged gear    ││ IC404        │       └─────────────────┘     │ to page 63.)    │
│ and motor.      ││ output?      │             │ YES             └─────────────────┘
└─────────────────┘└─────────────┘             ▼
                         │ NO          ┌─────────────────┐  YES  ┌──────────────┐
              ┌─────────┐│             │ Is the voltage  │──────▶│ Replace IC406.│
       NO     │ Repair. ││             │ at collector of │       └──────────────┘
     ┌────────│         ││             │ Q403 +24 V?     │            ▲    ▲
     │        └─────────┘▼             └─────────────────┘            │    │
     │       ┌─────────────────┐            │ NO                      │    │
     │       │ Is the solder at│            ▼                         │    │
     │       │ pins 23~27 of   │    ┌─────────────────┐               │    │
     │       │ IC404 OK?       │    │ Is the voltage  │  NO           │    │
     │       └─────────────────┘    │ at pin 11 of    │───────────────┘    │
     │            │ YES             │ IC406 less than │                    │
     │            ▼                 │ 2 V?            │                    │
     │     ┌──────────────┐         └─────────────────┘                    │
     │     │ Replace IC406.│             │ YES                             │
     │     └──────────────┘             ▼                                  │
     │                          ┌──────────────┐  ┌─────────┐   NO         │
     │                          │ Replace Q403.│  │   OK?   │──────────────┘
     │                          └──────────────┘  └─────────┘
     │                                  YES │          ▲
     │                                      ▼          │
     │                                   ┌─────┐       │
     └──────────────────────────────────│ END │───────┘
                                         └─────┘
```

Note 6) Check read section

Is the glass surface of reading section clean? — **NO** → Clean the surface of the glass.

↓ **YES**

Perform the scanner test.

Clean the surface of the glass. ↓ Copy a document.

Copy a document. — **NG** → (back to top)

↓ **OK**

END

LED lamp of the read section light?

↓ **YES**

Continued to *3.

LED lamp of the read section light? — **NO** → Check the connection between CN406 and LED lamp.

↓ **OK**

Is the voltage at pin 1 of CN406 +24 V?

↓ **OK**

Replace LED lamp.

Is the voltage at pin 4 or IC401 4~5V? — **NG** (from above)

↓ **YES**

Is the voltage at base of Q401 0.6~0.7 V?

Is the voltage at pin 4 or IC401 4~5V? — **NO** → Replace IC401.

↓ **YES**

Is the voltage at base of Q401 0.6~0.7 V? — **NO** → Check the solder of R411,R412.

↓ **OK**

Replace Q401.

Is the voltage at collector of Q401. 0 V?

↓ **YES**

Is the voltage at collector of Q401. 0 V? — **NO** → Replace Q401.

Check the pattern between Q401 and CN406. — **NO** → Repair the connection.

```
                    *3
                     │
                     ▼
┌──────────────────────────────┐     NO      ┌──────────────────────────────┐  NG
│ Is the amplitude at pins 2~5  │────────────▶│ Take out cable from CN405, and │──────┐
│ of CN405 4~5 Vp-p?            │             │ check the amplitude at pins 2~5 │      │
└──────────────────────────────┘             │ of CN405 (4~5 Vp-p).           │      │
           │                                  └──────────────────────────────┘      │
           │ YES                                         │                           │
           ▼                                             │ OK                        │
┌──────────────────────────────┐     NO                  ▼                           │
│ Is the voltage at pin 1 of    │──────┐       ┌──────────────────────────────┐      │
│ CN405 +12 V?                  │      │       │ Check CCD board.              │      │
└──────────────────────────────┘      │       │ (Refer to page 56)            │      │
           │                           │       └──────────────────────────────┘      │
           │ YES                       ▼                                              │
           │              ┌──────────────────────────┐                               │
           │              │ Check switching           │                               │
           │              │ power supply section.     │       ┌───────────────────────────────┐
           │              │ (Refer to page 63.)       │       │ Check the solder at pins 12~15 of │
           │              └──────────────────────────┘       │ IC404.                         │◀┘
           ▼                                                  └───────────────────────────────┘
┌──────────────────────────────┐                                        │
│ Check the waveform of CCD      │                                        │ OK
│ and read section.             │                                        ▼
│ (Refer to page 53.)           │                             ┌───────────────────┐
└──────────────────────────────┘                             │ Replace IC404.     │
                                                              └───────────────────┘
```

waveform of read section

① CCD

about 2.0 Vp-p

CH1 GND

5Vp-p

CH2 GND

② GATE

Oscilloscope setting

V: CH1 0.5 V/div
   CH2 5 V/div
   DC couple, CHOP mode

H: 1 msec / div

Trigger: CH2 SLOPE (+)

Probe point: GND Test point "AG"
             CH1 Test point "VID"
             CH2 Test point "FTG"

Waveform: ① CH1: CCD signal
          ② CH2 FTG: GATE signal (trigger)

Note: This waveform will be shown when the CCD reads
      the white plate of document cover.

③-1

0.5 V/div
AC couple

about
0.2 Vp-p

③-2

0.5 V/div
AC couple

about
1 Vp-p

④

1 V/div
DC couple

about
3.6 V

1.8V

GND

No.	CH1 probe point
③-1	IC801 pin 1 (CCD Board)
③-2	CN801 pin 7 (CCD Board)
④	IC404 pin 3 (AMON) (Digital Board)

Note 7) Check the thermal head

```
┌─────────────────────────────────┐   NO
│ Is the voltage at pin 10 of CN4  │──────────┐
│ (Analog Board) 0 V? (When copying)│         │
└─────────────────────────────────┘          │
              │ YES                           │
              ▼                                │
┌─────────────────────────────────┐   NO      │
│ Is the voltage at pins           │──────┐    │
│ 1, 2 of CN301 23~24 V? (Power unit)│     │    │
└─────────────────────────────────┘      │    │
              │ YES                       │    │
              ▼                           ▼    │
┌─────────────────────────────────┐  ┌────────────────┐
│ Is the amplitude at pins         │  │ Check switching│
│ 1, 4~7 of CN407                  │  │ power supply   │
│ 4~5 Vp-p?                        │──│ section.       │
└─────────────────────────────────┘NO│ (Refer to      │
              │ YES                   │ page 63.)      │
              ▼                       └────────────────┘
```

Box: Is the voltage at pin 6 of IC401 4~5 V?
- NO → Replace IC401.
- YES → Check the solder at pin 6 of IC401 and Q407.

```
┌─────────────────────────┐  NO
│ Is the amplitude at pins │──────┐
│ 2, 3 of CN407 4~5 Vp-p?  │      │
└─────────────────────────┘      │
         │ YES                    │
         ▼                        │
┌─────────────────────────┐      │
│ Check the pin 8 of       │      │
│ CN407                    │      │
│ 25℃ = 2.8V               │──────┤ NO
│ 40℃ = 2.1V               │      │
│ 80℃ = 0.7V               │      │
└─────────────────────────┘      │
         │ YES                    │
         ▼                        │
┌─────────────────────────┐      │
│ Check the cable of       │      │
│ CN407 and CN301.         │      │
└─────────────────────────┘      │
         │ OK                     │
         ▼                        ▼
┌─────────────────────────┐
│ Replace thermal head.    │
└─────────────────────────┘
```

Box: Take out CN407 and check the amplitude again.
- OK → (to Check the solder R420...)
- NG → Check the solder at pins 29~32 of IC404 and pin 34 of IC417.
  - OK →
  - NG → Replace IC404 or IC417.

Box: Check the solder R420 R421 C405 R422, C406, C407 and pin 2 of IC404.

Box: Take out CN407 and check the amplitude again.
- OK → Replace thermal head.
- NG → Check the solder at pin 35 of IC417 and pin 34 of IC404.

Note 8) Check CCD board

Perform the scanner test. (Refer to page 20.)

↓

Is the amplitude at pins 2~5 of CN801 (CCD board) 4~5 Vp-p? — NO → Take out CN801 (CCD board), and check the amplitude at pins 2~5 of CN401 (Digital board). (4~5 Vp-p) — NG →

YES ↓

Check the waveform at pin 7 of CN801 (CCD board). (Refer to page 54.) — NG →

OK ↓

END

Check the waveform at pin 1 of IC801 (CCD board). (Refer to page 54.) — NG →

OK ↓

Replace Q801, Q802 (CCD board), or perform CCD adjust.

OK (from CN401 path) ↓

Check the short at pins 2~5 of CN801. (CCD board)

OK ↓

Check R801~804.

NG (from CN401 path) ↓

Check the solder at pins 12~15 of IC404 (Digital board).

OK ↓

Replace IC404.

Check R801~804. — NG → Replace R801~R804. (CCD board).

OK ↓

Replace IC801 (CCD board).

7-4. UNIT CAN COPY, BUT CAN NOT TRANSMIT / RECEIVE

Connect the unit to
the loop simulator.
Switch : TX side T-R
: Connect oscillo-
scope

↓

Modem test start
(Refer to page 20.)

↓

Is the four signal at
Tip-Ring output ? — YES → Select 462Hz. → Disconnect loop
simulator.

NO ↓

Is the signal at pin
44 of IC405 output ? → Check the trace
between pin 44 of
IC405 and Tip-Ring. — NO → Is the siganl at pin 48
of IC405 462Hz
input ?

YES

NO ↓   YES

Check solder at the
pins 18,48,49 of
IC405 and R505,
C515,C514. ← NO — Is the voltage at pin 5
of IC413 2.5 V ?

Check the trace
between pin 1 of T1
and pin 48 of IC405.

Replace IC405.

YES ↓

Check the solder at
pin 73 of IC404.

OK ↓

Replace IC405.

7-5. UNIT CAN COPY, BUT CAN NOT TRANSMIT / RECEIVE LONG DISTANCE OR INTERNATIONAL COMMUNICATION

The following 2 causes can be considered for this.

1) Cause 1
The other party is executing automatic calling, the call has been received by this unit, and this time until response with a CED or DIS signal has been too long. (In almost case, this unit detects CNG signal and can respond to CED or DIS.) (According to the ITU-T (CCITT) standard, the communication procedure is stopped when there is no response from the other party within 35sec, so that the other party releases the line.)
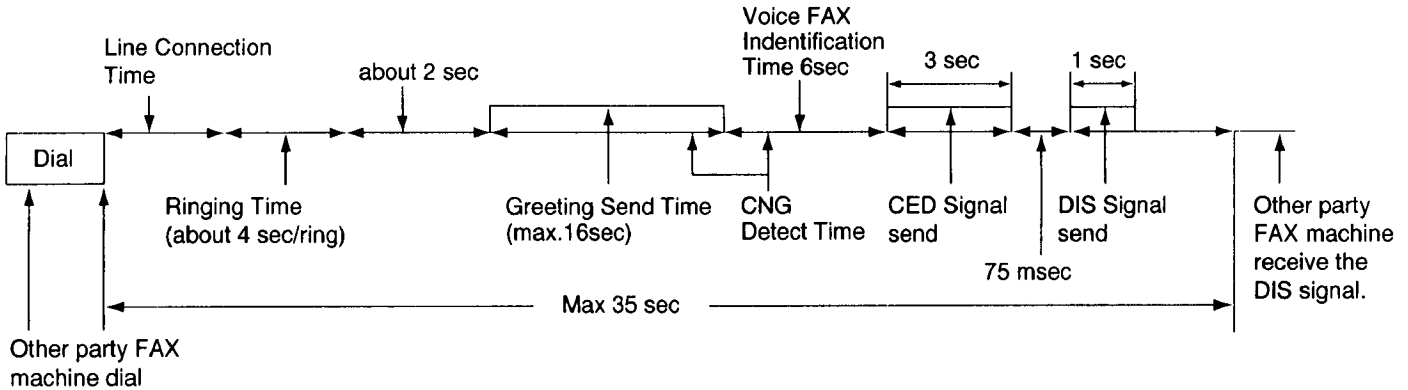
(Cause and Countermeasure)
As shown in the above chart, the total handshaking time must be reduced, but because of the long distance connection and linking of several stations, the line connection time can not be reduced. Accordingly, the following countermeasures should be tried.
(A) The automatic reception bell number should be 1. (user parameter: code No. 8)
(B) The greeting recording time should be made as short as possible. (if possible, 8sec or less)
(C) As the count of 35sec is started directly after dialing or directly after the START button has been pushed for models with a START button, the other party should be called manually, if possible, this unit be switched to FAX by ✱ button when the greeting is heard, and then the START button should be pushed for FAX communication.
Another possibility is entry of two pauses at the end of the auto dial number of the transmission side, in this way, the start time for the count can be delayed by 2 pauses (about 10sec).
(Note) For short greeting recording, the greeting button must be pushed to end the greeting recording.

2) Cause 2
Erroneous detection because of echo or erroneous detection because of an echo canceler.
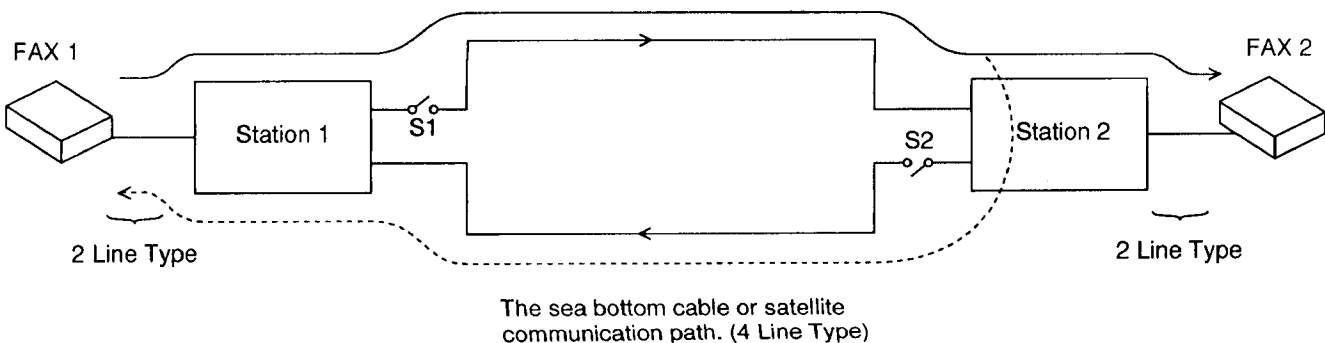
(Echo/Echo Canceler)
The signal from FAX1 reaches FAX2 via the stations 1 and 2, but the reflection signal at station 2 also returns via station 1 (echo). As the distance between station 1 and station 2 is long, the echo returns to FAX 1 max. 600msec after transmission, so than there is the possibility that this signal is detected erroneously as the signal from FAX2 and that trouble is caused. In the case of a normal call, there is also the possibility that the echo of the own voice will make the call difficult to understand. For this reason, each station (station 1, station 2) attaches echo cancelers (S1, S2) in case of 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 the FAX2, and when transmission signal is larger, S1 is closed, while S2 is opened when it is smaller. In other words, with 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 the 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 and 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 becomes ON 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 becomes 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), and in case of 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 are reached more easily. This is done as the line conditions may deteriorate and the picture may be disturbed more easily during communication in case of international lines or long distance communication, even when the training has been 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 signal of 2100Hz (i.e. S1 and S2 become ON).
Accordingly, when FAX1 has executed automatic reception, a CED signal is output, and if this signal should be 2100Hz, S1 and S2 will become ON. Then the echo of the DIS signal output afterwards may be received and FAX1 may execute erroneous operation, preventing start of communication.

(Countermeasure B)

In 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 75msec to 500msec in service mode (code No.593). This is done because the echo canceler operation stop mode is cancelled with an interval of 250msec or more.

(Cause C)

KX-F1200 shall be assumed for FAX1 and a set of a different company shall be assumed for FAX2.
In case of transmission from the KX-F1200 to FAX2, FAX2 executes automatic reception and transmits a CED signal (2100 Hz), followed by a DIS signal. As here the echo cancelers stops as described in cause B, the echo of the DIS signal returns to FAX2. On the other hand, the KX-F1200 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 the KX-F1200 reach FAX2 one after the other, FAX2 executes erroneous detection, and communication are not started.

(Countermeasure C)

When international DIS detection setting is made effective in service mode (code No.594), the KX-F1200 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 250msec between transmission of the first and the second DIS signal, so that the echo cancelers operation recovers and no echo is 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.

3) Summary

Long distance and international communication operation

SYMPTOM	COUNTERMEASURE
Does not receive in automatic mode.	1. The automatic reception ring count should be made 1. (user parameter: code No. 8) 2. The greeting message recording time should be made as short as possible. (if possible, 8 sec or less) 3. If possible, manual transmission should be made from the transmission side. 4. If possible, two pauses should be inserted at the end of the auto dial number of the transmission side. 5. If possible, the Function Selector Switch should be switched from ANS/FAX to FAX.
Does not transmit.	1. Confirm the international line mode ON. (service mode: code No. 521) 2. International DIS detection setting is made effective. (service mode: code No. 594)
Does not receive.	1. The time setting between the CED signal and the DIS signal is set to 500msec. (service mode: code No. 593) 2. The CED frequency is set to 1100Hz. (service mode: code No. 520)

7-6. 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 set and the line conditions.
The countermeasures for this set are shown below.

1) Transmission Operation

The transmitting speed is set to 4800BPS (service mode: code No. 717) or select overseas mode. (Individual correspondence according to the other set is desirable.)

2) Reception Operation

If 80% or more of the reception should be incorrect, set the receiving speed to 4800BPS. (service mode: code No. 718)

8. DEFFECTIVE ATAS (Automatic Telephone Answering System) SECTION

8-1. NO AUTOMATIC RECEPTION

Is there a low logic level at pin 76 or pin 77 of IC1 when receiving a ring signal ? — NO → Check telephone cord and ring detection circuit. (PC1, C1, R1, R16, PC5, C31, R31, R46)

↓ YES

After receiving a ring signal, is the set OFF-HOOK automatically ? — NO → Check PULSE DIAL CIRCUIT. (Q1,R2, R3, PC2, R13, Q4, R32, R33, PC6, R43)

↓ YES

Check AUTO DISCONNECT CIRCUIT. (See page 126.)

8-2. DOES NOT RECORD

| Does a voice signal appear at pin 3 of CN9 ? | YES → | Check Digital TAM UNIT. (IC701 ~ IC703) |

↓ NO

| Does a voice signal appear at pin 1 of IC14 ? | YES → | Check IC5, IC8 and pin 55 of IC1. |

↓ NO

| Check MIC or NCU section. (See page 125.) |

8-3. DOES NOT PLAYBACK

| Does a voice signal appear at pin 5 of CN9 ? | NO → | Check Digital TAM UNIT. (IC701 ~ IC703) |

↓ YES

| Does a voice signal appear at pin 1 of IC20 ? | NO → | Check IC20, IC21, Q18, IC10 and IC1. |

↓ YES

| Check IC12 and Speaker. |

8-4. ICM CONTINUES TO RECORD AFTER THE CALLER ON-HOOK

When the caller on-hook, this unit can detect the following 4 signal types.
A. CPC pulse
B. Dial tone or other continuous tones
C. Silence
D. Cyclic signals

    A. Check CPC DETECTION CIRCUIT.
    B. C.,D.
       Check VOX DETECTION CIRCUIT.

8-5. REMOTE CONTROL DOES NOT WORK/RESPONSE IS POOR

The following are considered as the cause of no remote reception:
A. Is the ID code the same as set on the unit ?
B. The send signal interferes with the remote signal, causing the remote signal at the line output from circuit to be distored.
C. Excessive loss in telephone line.

    A. Check the ID code of the unit.
    B. Check NCU section.
    C. Test on known telephone line to be working properly.

• If all of the above check are N.G., check the remote signal detection circuit.

9. DEFECTIVE ITS (Integrated Telephone System) SECTION

9-1. NO HANDSET and SPEAKERPHONE TRANSMISSION / RECEPTION

Following the ITS section (Refer to page 131.) or NCU section (Refer to page 125.), search for the point in the route between the handset microphone and the telephone line (sending) or between the telephone line and the handset speaker (receiving) or between the microphone and the telephone line (sending) or between the telephone line and the speaker (receiving) where the signal disappears, and check the components at that point.

9-2. NO PULSE DIAL

```
Is the voltage at          NO         Remove PC2 or PC6.
pin 97 or pin 98 of  ─────────────────►
IC1 change between                             │
high level/low level?                          ▼
        │                          Is the voltage at        YES      Replace PC2,
        │ YES                      pin 97 or 98 of IC1   ──────────►  R13 or PC6,
        │                          change between                    R43.
        ▼                          high level/low level?
Check pulse dial                           │
circuit.                                   │ NO
(Refer to page 125.)                       └──────────────────────►  Check IC1.
```

9-3. NO RING TONE

```
Check bell detection ◄──────┐
circuit.                    │
(Refer to page 125.)        │
        │                   │
        ▼                   │
Is the bell detection   NO  │
circuit OK?         ────────┘
        │
        │ YES
        ▼
Does a ring tone     NO
signal appear at  ─────────►  Replace IC404.
pin 44 of IC404
(Digital Board)?
        │
        │ YES
        ▼
Following the ITS section
[Monitor circuit refer to page 130.],
search for the point in the route be-
tween the gate array (IC404) and
speaker where the signal disappears,
and check the components at that point.
```

9-4. NO TONE DIALING

```
Does a DTMF signal
appear at pin 44 of
IC405 (Digital   ─────────►  Replace IC405.
board)?
        │
        │ YES
        ▼
Following the NCU section
and ITS section (Refer to
pages 125, 131.), search for
the point in the route between
the IC405 (pin 44) and
telephone jack (Tip/Ring)
where the signal disappears,
and check the components at
that point.
```

10. DEFECTIVE OPERATION GRILLE SECTION

10-1. NO KEY OPERATION

```
┌──────────────────┐  YES   ┌──────────────────┐
│ Is the button    │───────▶│ Repair the button.│
│ always pressed?  │        └──────────────────┘
└──────────────────┘
        │ NO
        ▼
┌──────────────────┐        ┌──────────────────┐
│ Check            │───────▶│ Check IC301.     │
│ disconnection of │        │ (Operation board).│
│ CN404(Digital brd)│       └──────────────────┘
└──────────────────┘
```

10-2. NO LCD INDICATION

```
┌─────────────────────────────────┐  NO   ┌────────┐
│ Is the disconnection of cable    │──────▶│ Repair.│
│ and connector between LCD and    │       └────────┘
│ Operation board OK?              │
└─────────────────────────────────┘
        │ YES
        ▼
┌────────────┐    ┌─────┐ YES  ┌─────┐
│ Replace LCD│───▶│ OK? │─────▶│ END │
└────────────┘    └─────┘      └─────┘
                     │ NO
                     ▼
                ┌──────────────┐
                │ Check IC301. │
                └──────────────┘
```
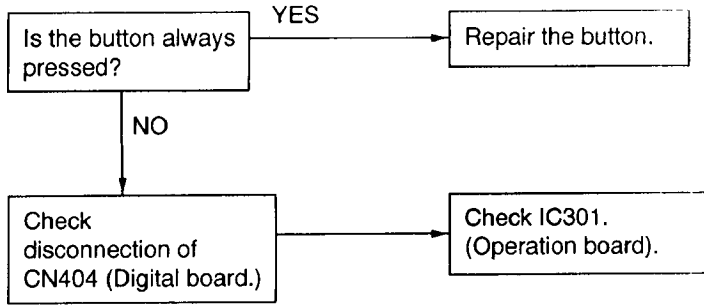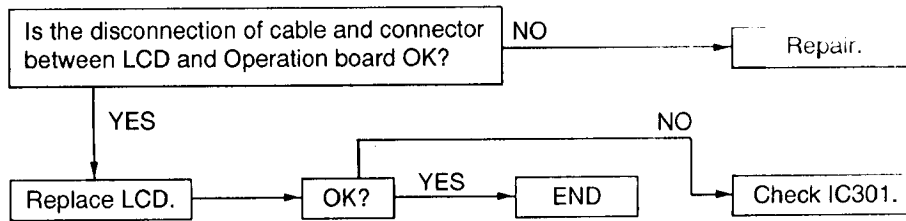
11. DEFECTIVE SWITCHING POWER SUPPLY SECTION

11-1. NO OPERATION It is necessary that power supply is connected to analog board and digital board to test the power supply.

```
┌───────┐
│ Start │
└───────┘
    │
    ▼
┌───────────┐  NO
│Is F101 open?│──────────────────────────────┐
└───────────┘                                 │
    │ YES                                      ▼
    │                                   ┌──────────────┐ NO  ┌──────────────────┐
    ├──▶ Is Q101 short? ──YES──┐        │Is D201 shorted?│───▶│The thermal function│
    │                          │        └──────────────┘     │may operate.       │
    ├──▶ Is D101 short? ──YES──┤          │ YES              │Check loading side.│
    │                          │          ├──▶Is PC101 shorted?──YES──┐
    ├──▶ Is D103 short? ──YES──┤          │                           ▼
    │                          │          └──▶Is IC201 shorted?──YES──▶ Replace each part.
    └──▶ Is R115 open? ──YES──┤
                               ▼
                  ┌──────────────────────┐
                  │Replace F101, Q101,   │
                  │D101, D103, R115.     │
                  └──────────────────────┘
```
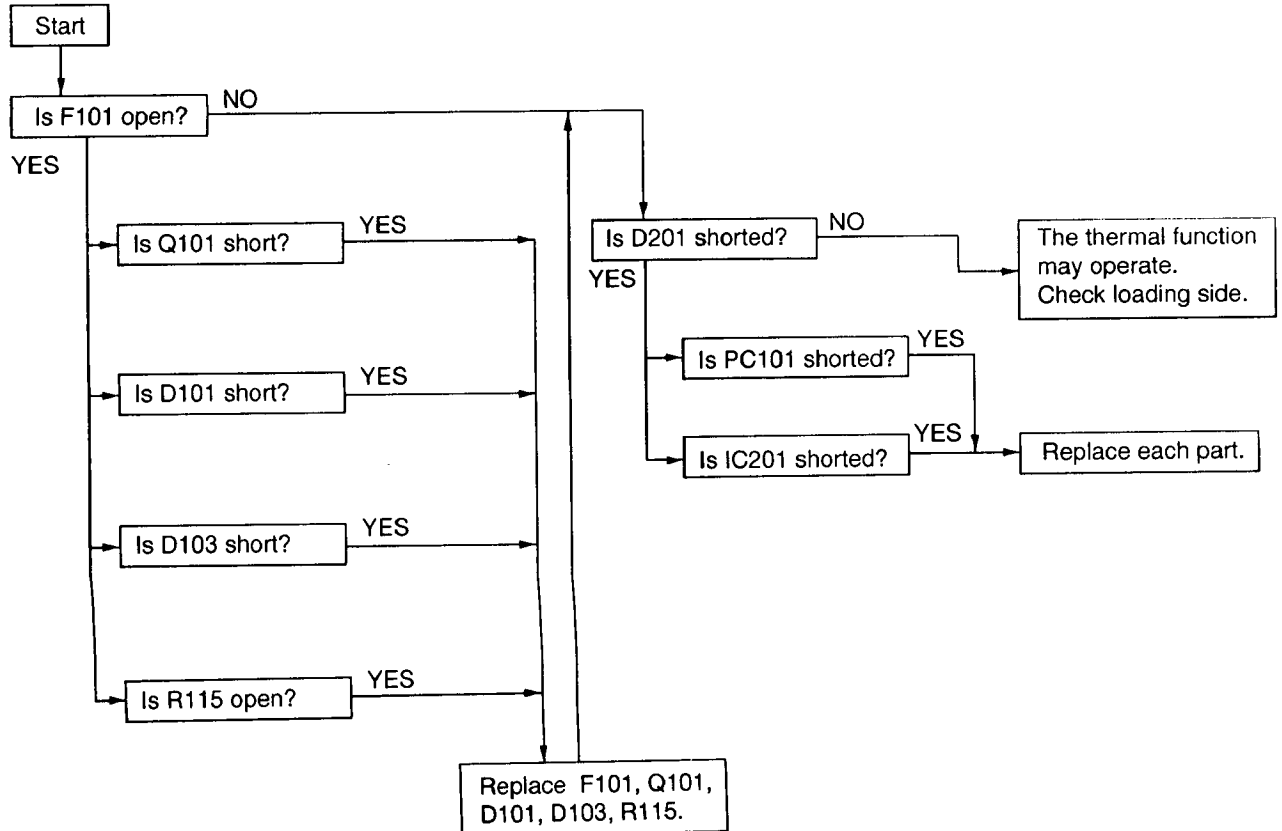
11-2. THE CORRECT VOLTAGE IS OUTPUT FROM THE 24 V SYSTEM BUT 5 V, 12 V AND -12 V ARE NOT OUTPUT

```
┌──────────────────────┐
│ Is R204, R206 open?  │
│ or                   │        YES                    ┌──────────────────┐   YES
│ 5, +12, -12 V not    │ ───────────────────────────►  │ Is Q202 shorted? │ ──────►
│ output?              │                                └──────────────────┘
└──────────────────────┘
        │ NO                                            ┌──────────────────┐   YES
        │                            ───────────────►   │ Is Q203 shorted? │ ──────►
        │                                               └──────────────────┘
        │
        │                            ───────────────►   ┌──────────────────┐   YES
        │                                               │ Is D207 shorted? │ ──────►
        │                                               └──────────────────┘
        ▼
┌──────────────────┐    YES                             ┌──────────────────┐   YES
│ +12 V not output?│ ──────────────────────────────►    │ Is D204 shorted? │ ──────►
└──────────────────┘                                    └──────────────────┘
        │ NO
        ▼
┌──────────────────┐    YES                             ┌──────────────────┐   YES
│ 5 V not output?  │ ──────────────────────────────►    │ Is D205 shorted? │ ──────►
└──────────────────┘                                    └──────────────────┘
        │ NO
        ▼
┌──────────────────┐    YES                             ┌──────────────────┐   YES
│ -12 V not output?│ ──────────────────────────────►    │ Is D206 shorted? │ ──────►
└──────────────────┘                                    └──────────────────┘

                                        ┌────────────────────┐
                                        │ Replace each part. │
                                        └────────────────────┘
```
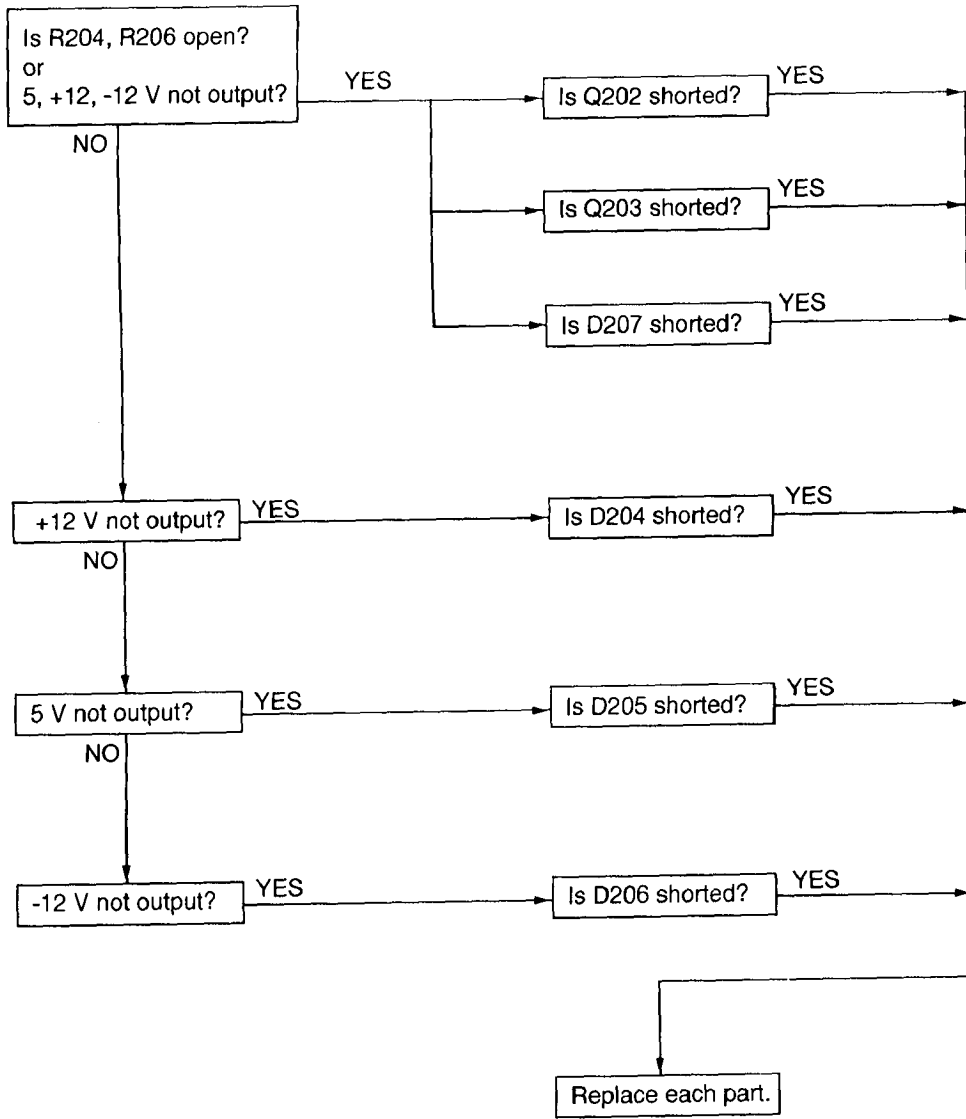
DISASSEMBLY INSTRUCTIONS

Ref. No. 1	HOW TO REMOVE THE OPERATION BOARD AND LCD

Procedure 1	

1) Push the front lid open lever in the direction of the arrow to open the operation panel.
2) Remove the 2 screws (A) and remove the operation panel block.
3) Remove the 7 screws (B) and remove the operation panel cover.
4) Remove the 5 screws (C).
5) Pull out the 1 connector and remove the operation board.
6) Remove the LCD.

Operation Panel Block

Front Lid Open Lever

Reading Plate

Separation Rubber

Operation Panel Cover

Connector

LCD

Operation Board
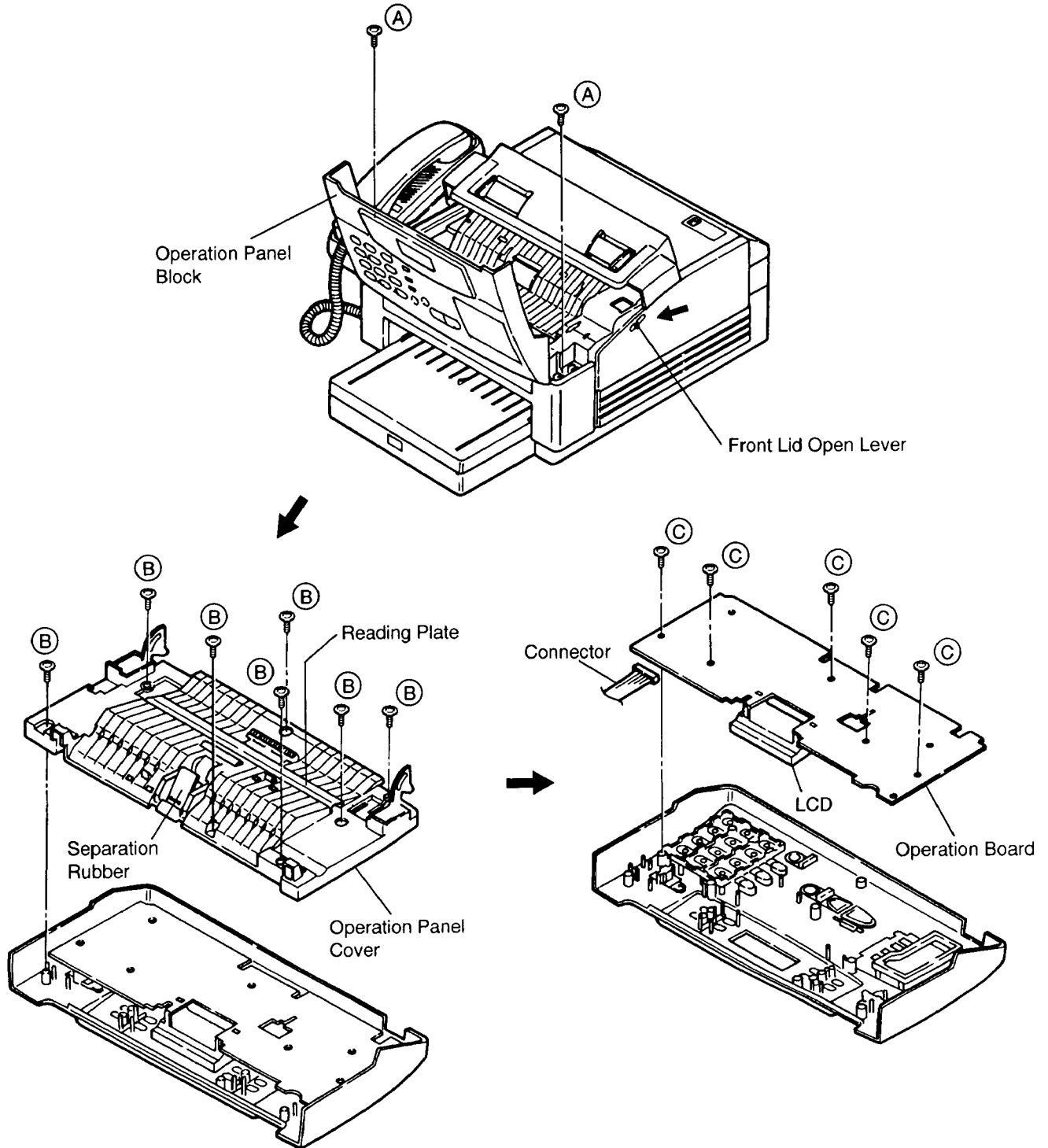
HOW TO CLEAN:
Clean the reading plate with cloth soaking in alcohol.

Ref. No. 2	**HOW TO REMOVE THE TOP COVER**
Procedure 2	

1) Remove the 2 screws (A).
2) Push the installing section in the direction of the arrow to remove the top cover.

Top Cover

A
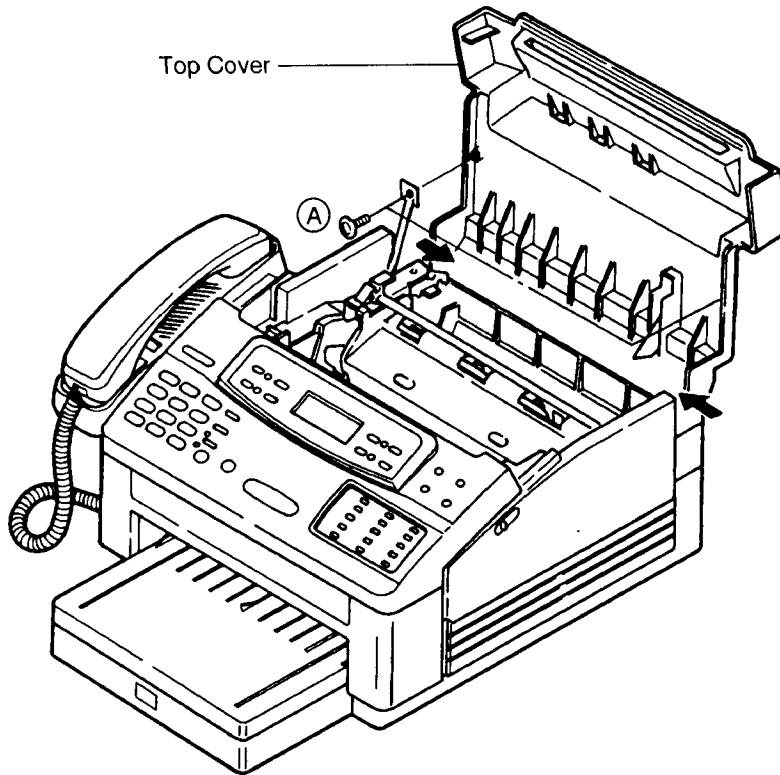
Ref. No. 3	**HOW TO REMOVE THE HANDSET CRADLE CABINET AND SPEAKER**
Procedure 3	

1) Push the front lid open lever to open the operation panel.
2) Open the top cover.
3) Remove the TEL. No. Card.
4) Remove the 3 screws (A).
5) Remove the handset cradle cabinet.
6) Remove the 3 screws (B).
7) Pull out the speaker connector.
8) Remove the speaker.

TEL. No. Card

Handset Cradle Cabinet

Top Cover

Speaker

Connector

Operation Panel

Front Lid Open Lever
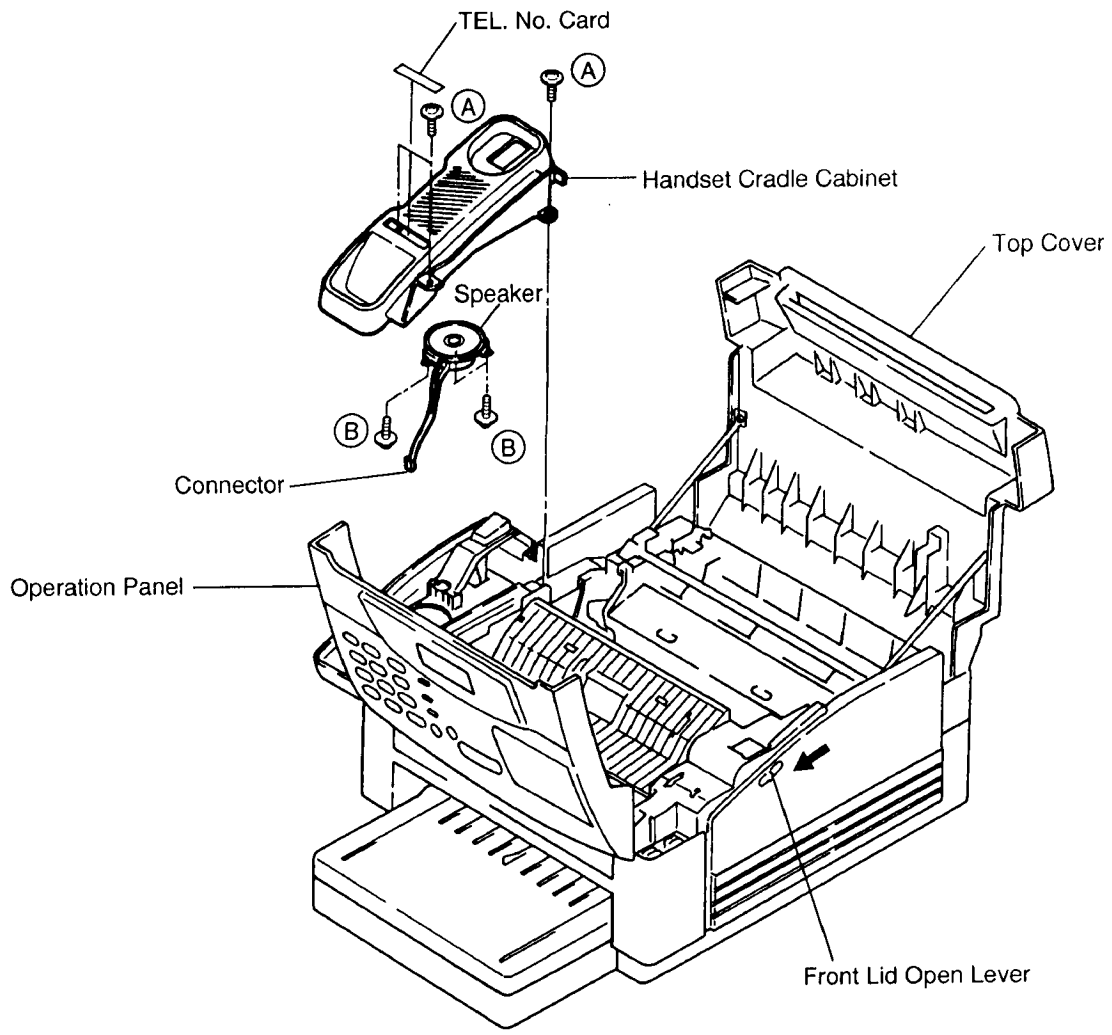
Ref. No. 4	**HOW TO REMOVE THE THERMAL HEAD AND FILM SENSOR BOARD**
Procedure 4	

1) Open the top cover.
2) Push the green button on the right marked "PUSH" and lift up the thermal head block.
3) Remove the 2 screws (A) and remove the thermal head cover.
4) Pull out the 2 connectors.
5) Remove the thermal head block.
6) Remove the shaft.
7) Remove the film sensor board.
8) Remove the angle from the thermal head.
9) Remove the 2 screws (B) of thermal head and remove the guides.
10) Replace the thermal head.

Top Cover

Green Button

Thermal Head Block

Ⓐ

Ⓐ

Thermal Head Cover

Ⓑ

Guide-L

Connector

Film Sensor Board

Angle Ⓑ

Ⓒ

Guide-R

Connector

Thermal Head

Shaft

HOW TO CLEAN:
Clean the printing surface of thermal head with cloth soaking in alcohol.
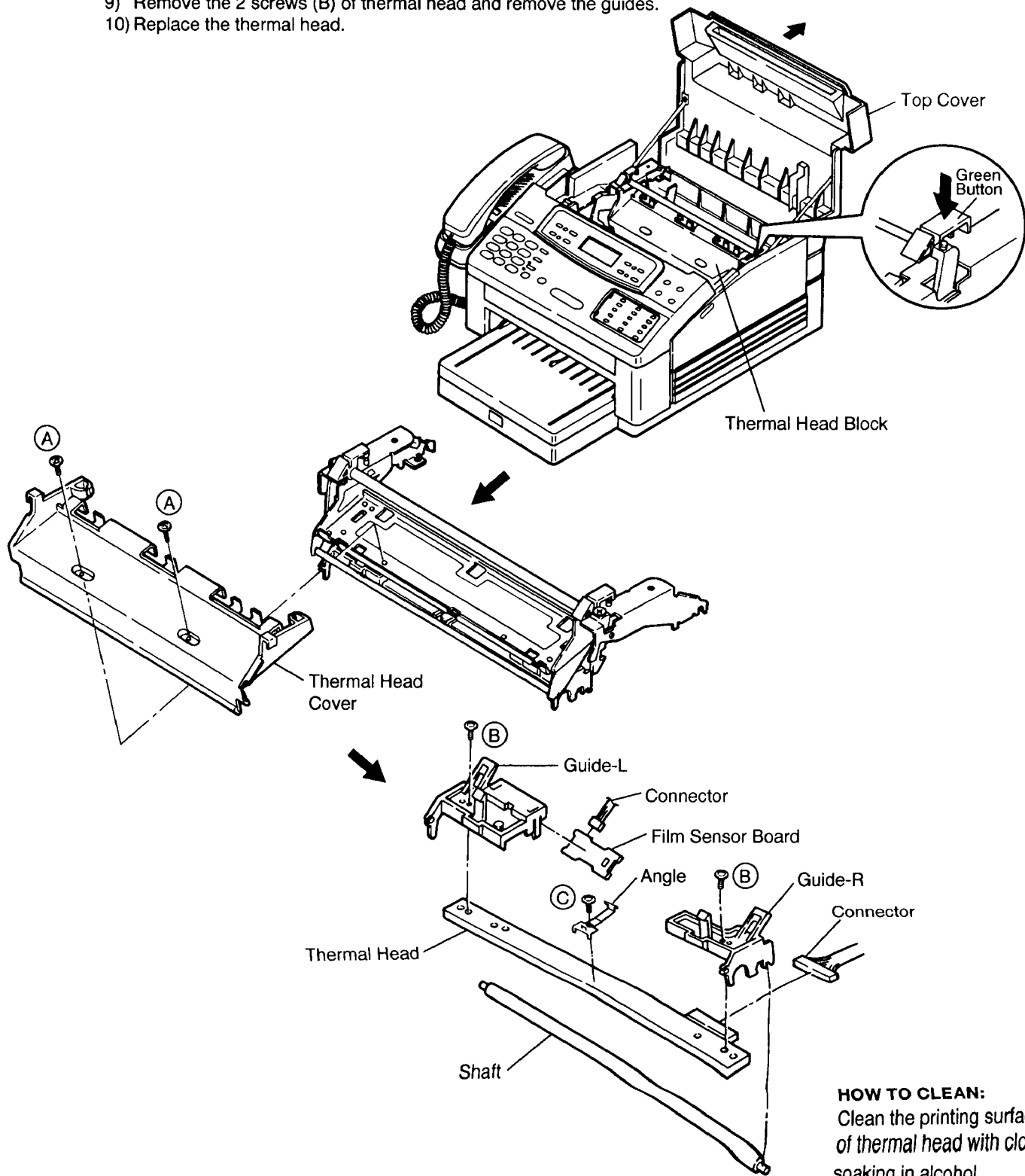
Ref. No. 5	**HOW TO REMOVE THE PAPER SET/OUT SENSOR BOARD**
Procedure 5	

1) Remove the 2 screws (A).
2) Pull out the connector.
3) Remove the paper set/out sensor board.

Ⓐ

Connector

Paper Set/Out
Sensor Board
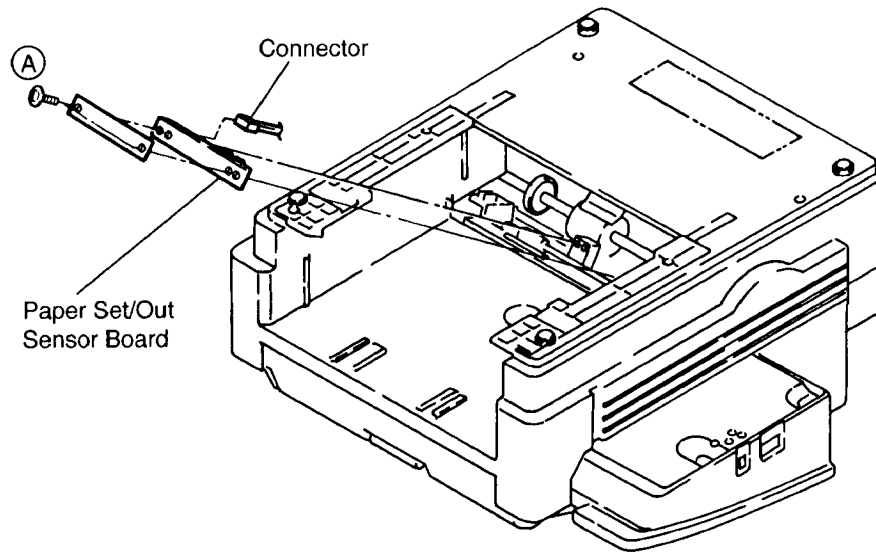
Ref. No. 6	HOW TO REMOVE THE LOWER CABINET
Procedure 6	1) Remove the 5 screws (A). 2) Remove the lower cabinet. Lower Cabinet
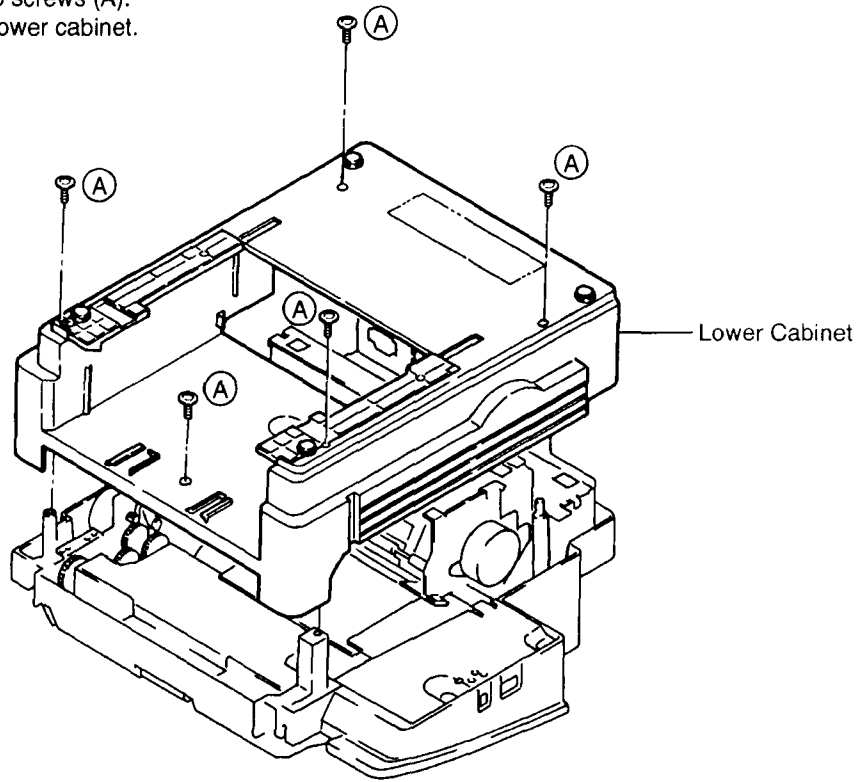
Ref. No. 7	HOW TO REMOVE THE POWER SUPPLY BOARD
Procedure 6→7	1) Pull out the 3 connectors. 2) Remove the 5 screws (A). 3) Remove the 1 screws (B). 4) Remove the 2 screws (C). 5) Remove the power supply board. Connector Power Supply Board Connector Connector
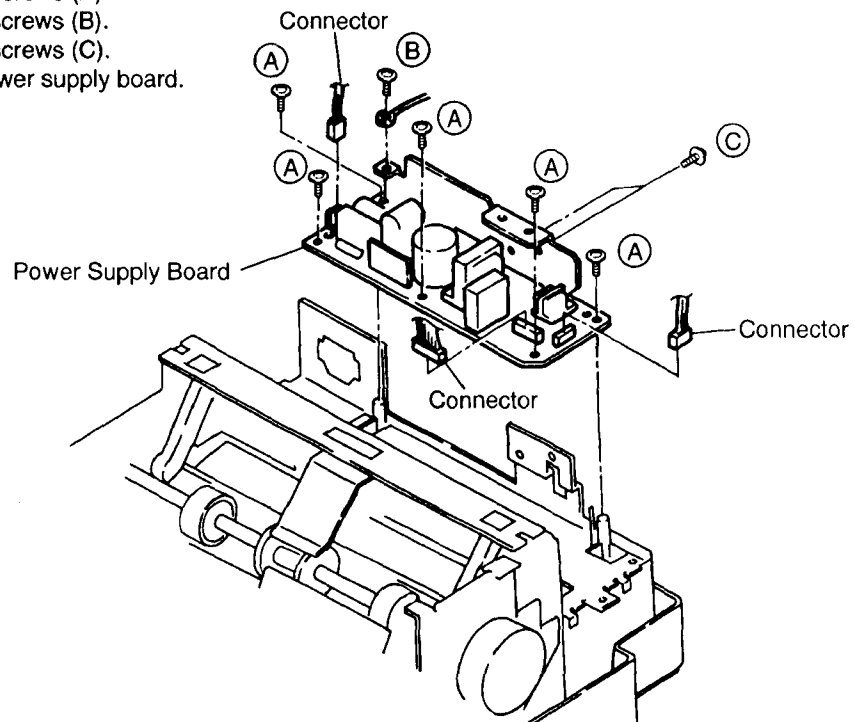
Ref. No. 8	**HOW TO REMOVE THE TRANSMISSION MOTOR BLOCK**

Procedure 6→8	

1) Remove the 3 screws (A).
2) Remove the transmission motor block.

Transmission Motor Block
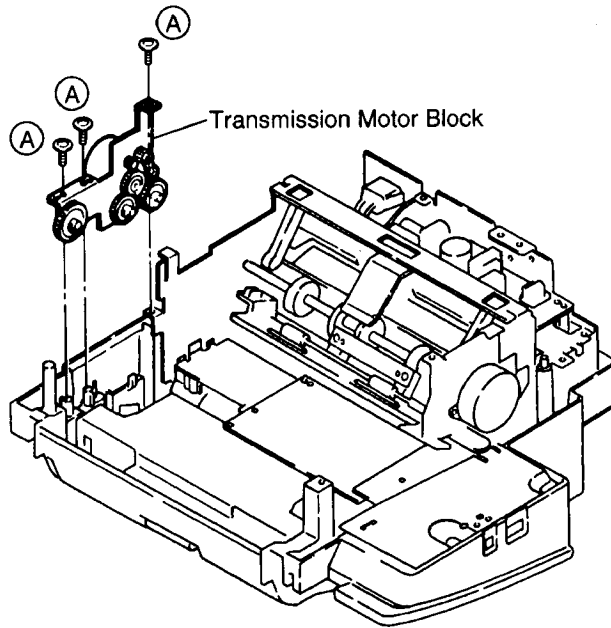
Ref. No. 9	**HOW TO REMOVE THE RECEPTION MOTOR BLOCK**

Procedure 6→9	

1) Remove the 3 screws (A).
2) Remove the cover.
3) Pull out the 3 connectors.
4) Remove the 3 red screws (B).
5) Remove the reception motor block.

Reception Motor Block

Cover
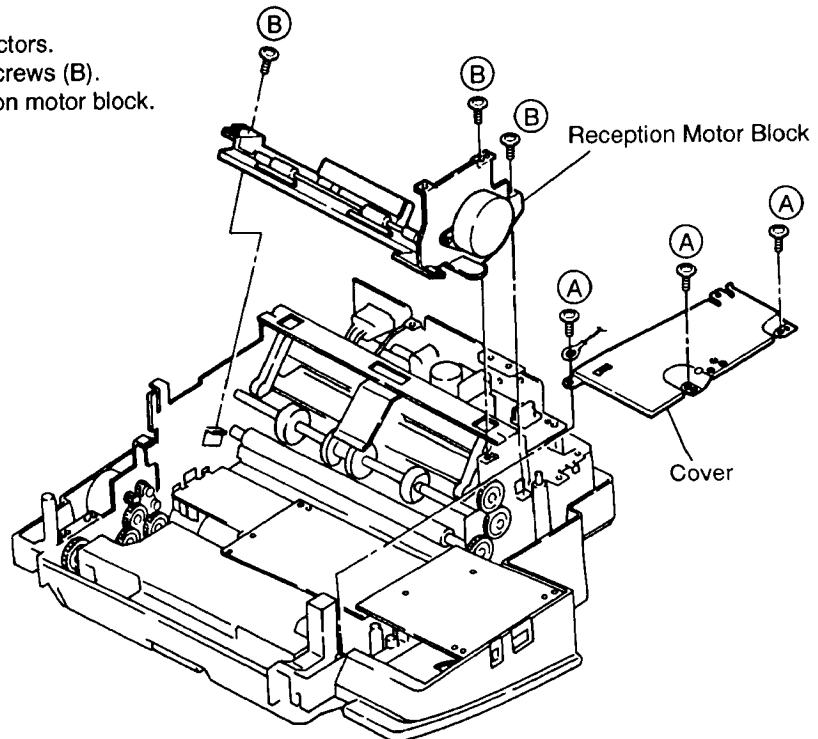
Ref. No. 10	HOW TO REMOVE THE ANALOG AND DIGITAL BOARDS
Procedure 6→9→10	

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

Connectors

Connector

Analog Board

Connectors

Digital Board
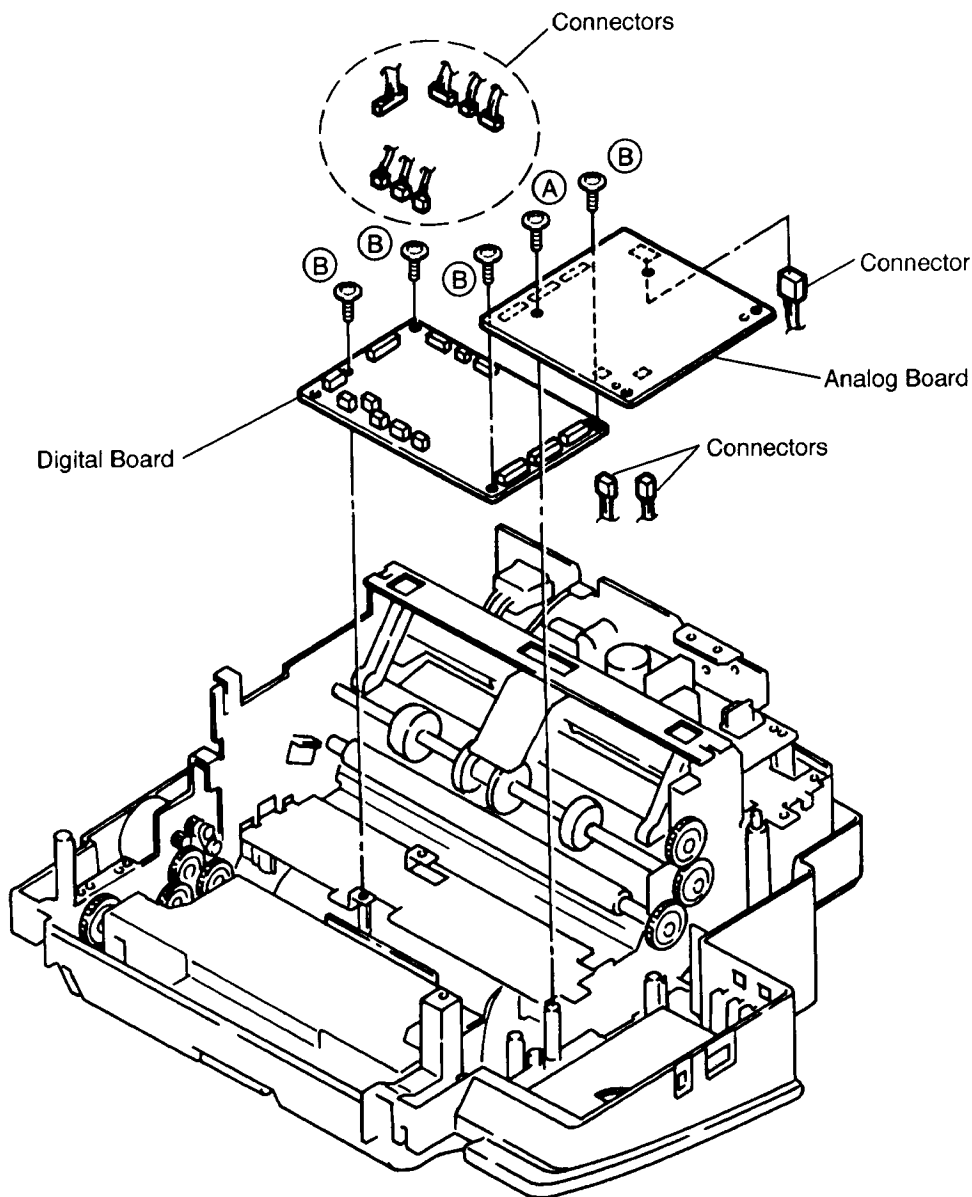
Ref. No. 11	HOW TO REMOVE THE CCD UNIT.
Procedure 6→9→10→11	1) Remove the 2 screws (A). 2) Remove the CCD unit.

Ⓐ

CCD Unit

Ⓐ
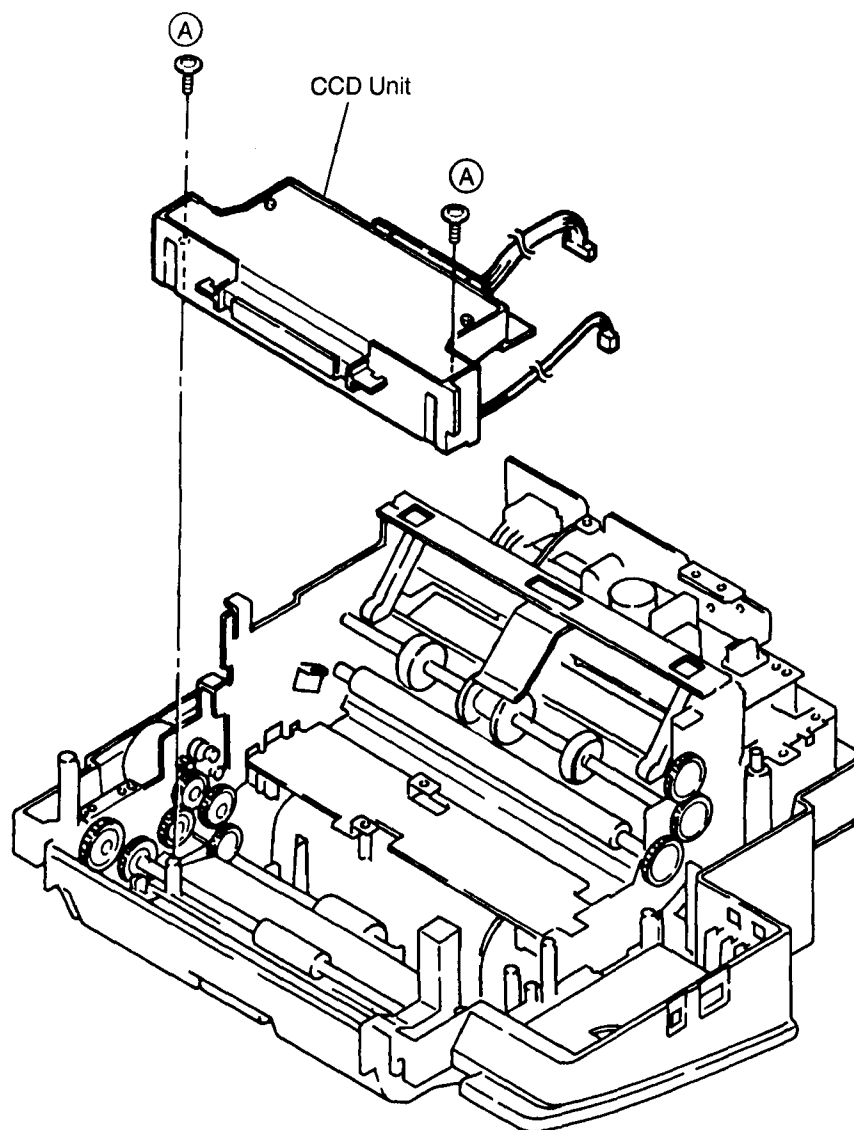
HOW TO CLEAN:
Clean the glass of CCD unit with cloth soaking in alcohol.

Ref. No. 12	HOW TO REMOVE THE ROLLERS

Procedure 6→9→10 →11→12	1) Remove the 3 screws (A). 2) Remove the transmission motor block. 3) Remove the spacer with minus screwdriver (small size) as shown in following Fig. A. 4) Remove the roller. 5) Remove the gear and spacer from roller shaft and replace roller.

Gear

Gear

Gear

Gear

Spacer

Separation Roller

Spacer

Spacer

Spacer

Document Feed Rollers

Spacer

Spacer

(A)

(A)

(A)

Transmission Motor Block

Spacer

Screwdriver
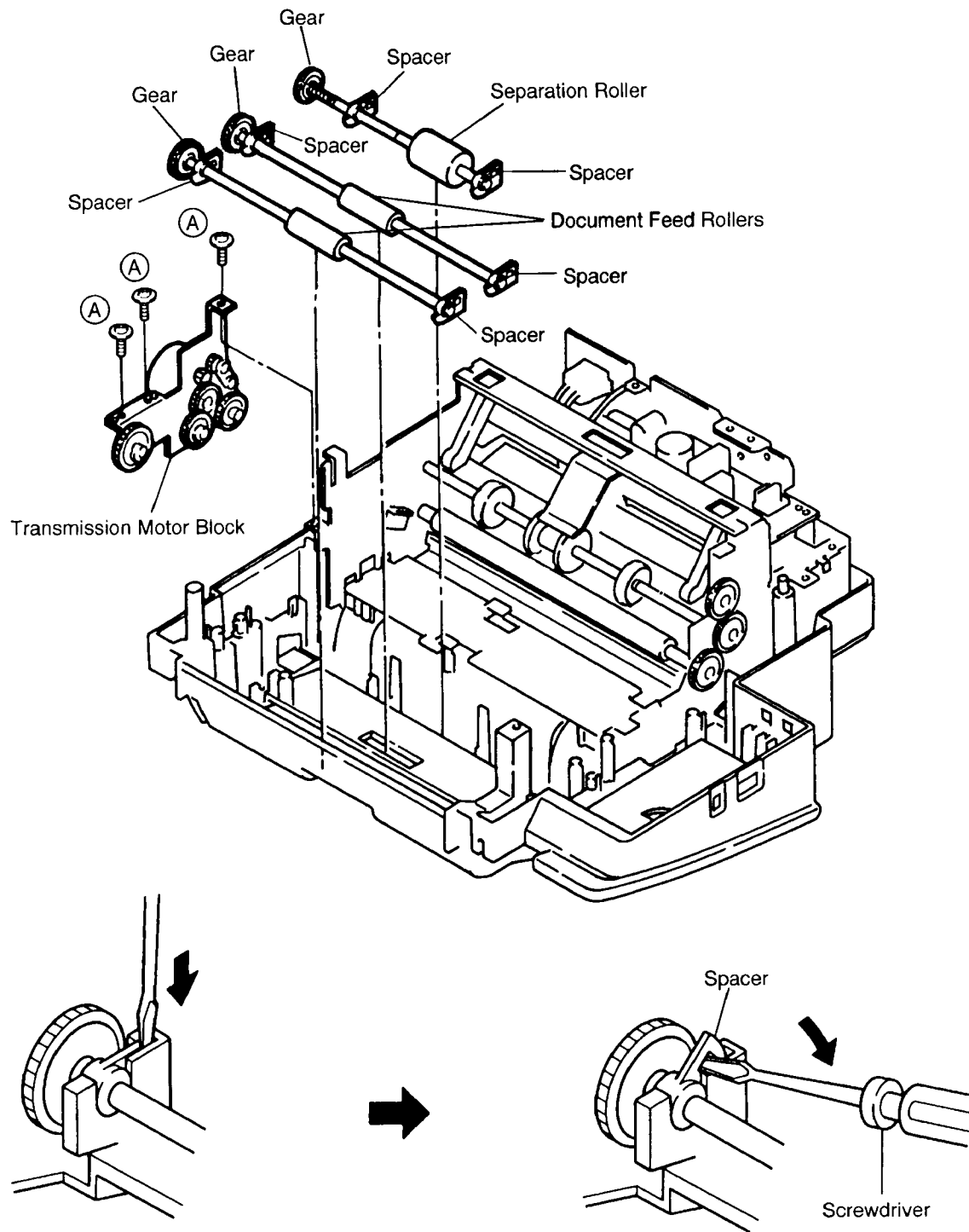
Fig. A

Ref. No. 13	HOW TO REMOVE THE MECHANICAL CHASSIS.
Procedure 6→9→10 →8→7→13	1) Remove the 8 screws (A). 2) Remove the mechanical chassis.

Mechanical Chassis
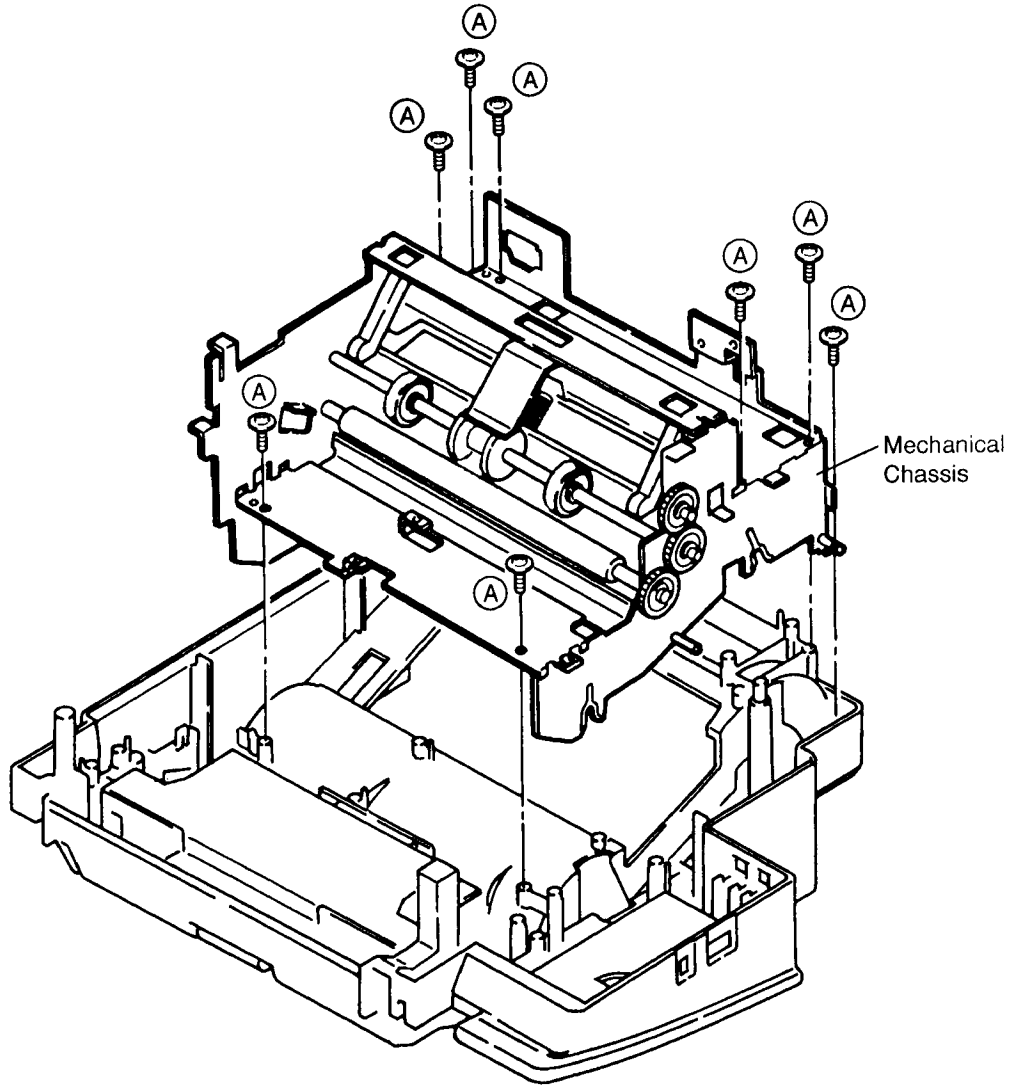
HOW TO REPLACE FLAT PACKAGE IC

■ **PREPARATION**

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

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

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

- Flux .... HI115   Specific gravity 0.863
(Original flux will be replaced daily.)

■ **PROCEDURE**

1. Temporarily fix the FLAT PACKAGE IC by Soldering on two marked pins.
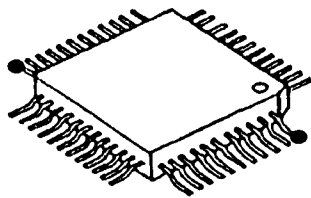
● .... Temporary soldering point.

*Accurate setting of the IC to the corresponding soldering foil is vital.

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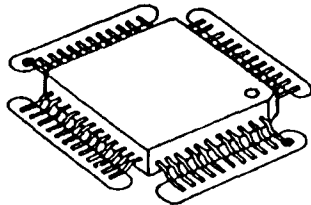
.... Flux

3. Solder the specified solder in the direction of the arrow, while slide the soldering iron.

Soldering iron

Specified solder
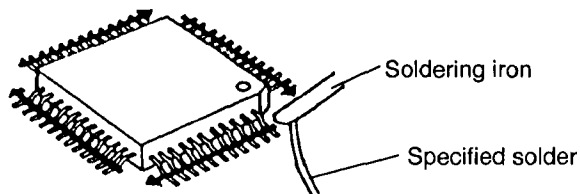
■ **MODIFICATION PROCEDURE OF BRIDGE**

1. Re-solder slightly on bridged portion.

2. Remove any remaining solder along the pins using soldering iron as shown below.

bridge
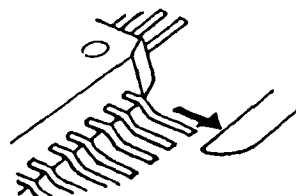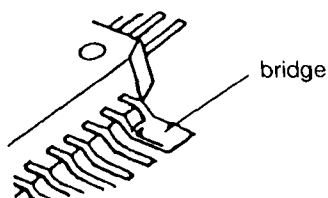
ADJUSTMENTS

1. TABLE OF TEST EQUIPMENTS AND TOOL

No.	Test Equipment and Jig Name	Jig No.
1	Oscilloscope	———
2	CCD Tool	PQZZF500M
3	Extension Cord	PQZZ2K12Z, PQZZ8K18Z
4	Spring Height Tool	PQZZ2F500M

2. ADJUSTING THE FEEDER PRESSURE

If misfeeding of document, such a multiple feeding or no feeding, occurs frequently, try to adjust the feeder pressure by following steps below.
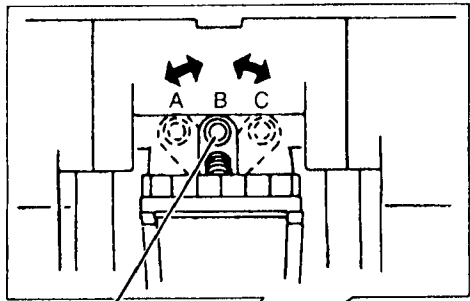
(1) Slide the lever to open the front lid.
(2) Shift the position of the lever by using an instrument with a pointed end, like a clip or ball-point pen.
Position A: Case of no feeding
Position B: Standard position
Position C: Case of multiple feeding
(3) Close the lid surely by pressing down on both ends.
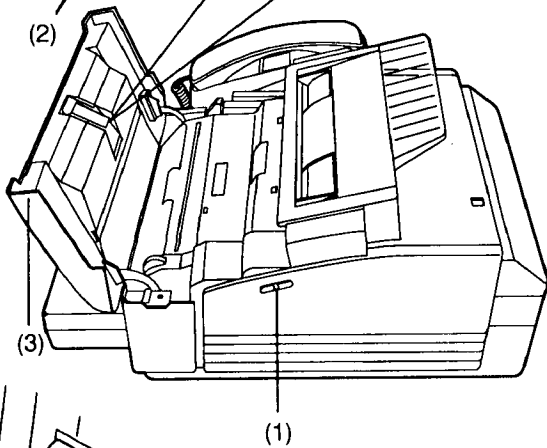
3. CONFIRMATION OF SEPARATION SPRING

1. Open the operation grille.
2. Check the highest level of the separation spring with the spring height tool (PQZZ2F500M). 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).

SPRING HEIGHT TOOL
(PQZZ2F500M)

NO TOUCH

SEPARATION SPRING

Fig. 1

SPRING HEIGHT TOOL
(PQZZ2F500M)

TOUCH

SEPARATION SPRING
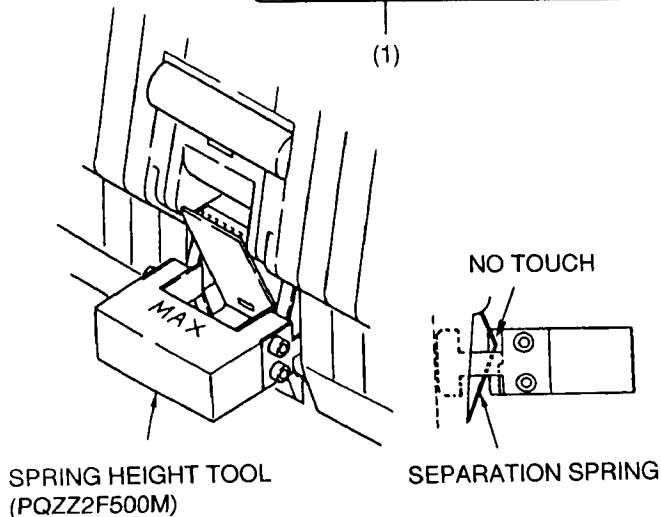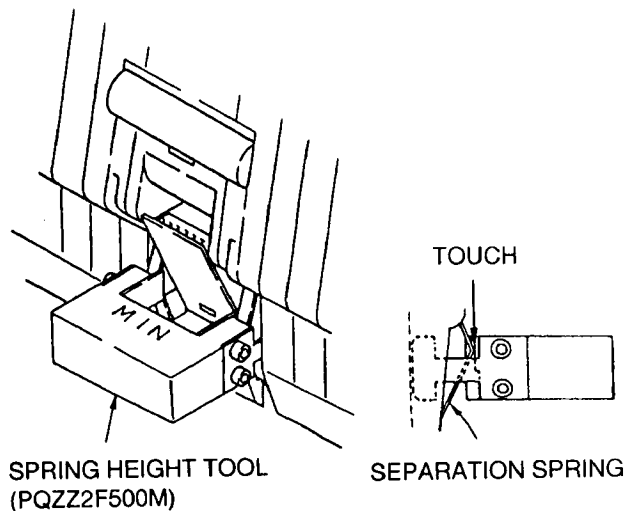
Fig. 2

4. CCD ADJUSTMENTS

Perform the following adjustment after replacing lens and CCD board.

PREPARATION:
1) Remove the CCD unit from set. (Refer to page 73)
2) Make oscilloscope connections as shown in next page.
3) Attach the CCD TOOL on the CCD unit.
4) Connect between CCD unit and digital board with extension cord (Part No. PQZZ8K18Z). (Refer to next page).
5) Connect between LED array and digital board with extension cord (Part No. PQZZ2K12Z). (Refer to next page).
6) Connect AC cord.
7) Press the MENU button.
8) Press the #,9,0,0,0, and ✳ buttons.
9) Press the 5,5 and 5 buttons.

Notes:
1) When replacing the lens, pay attention to the markings on the lens are white and yellow.
   The number of the CCD spacers to use differs depending on the marking as follows.
   * Refer to page 180 for the location of the CCD spacer.

2) Install the lens so that the marking (White or Yellow) on it is upper side.
3) Do not touch the glass face of the lens with the bare hands.
   Cleaning:
   If the lens is dirty, clean it with a dry soft cloth.

Marking on the lens	Number of CCD Spacer
White	0 (not used)
Yellow	1
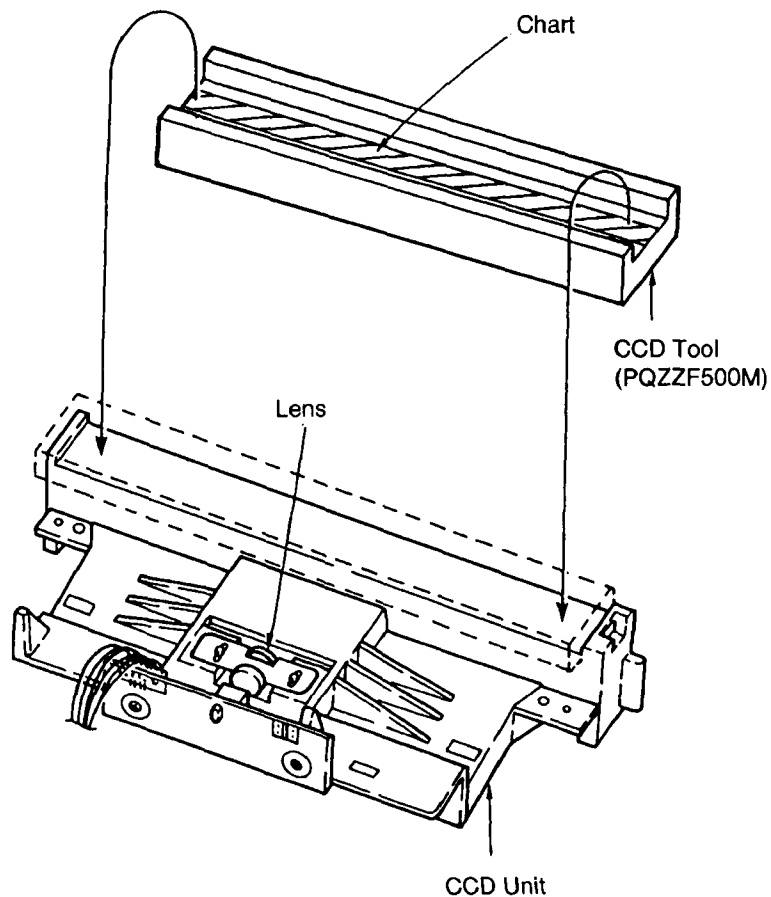
Note:
Please adjust with covering topside of the lens by hands in order not to let in outdoor daylight.

ADJUSTMENT:

| LENS AND CCD READ POSITION ADJUSTMENT |

1) Loosen the lens fixing screw and CCD board fixing screw.
2) Adjust the position of the lens and CCD board so that the waveform appears as shown in the figure below.
3) Fix the lens fixing screw and CCD board fixing screw.

Oscilloscope setting
CH1 .... 0.5 V/div
CH2 .... 2 V/div
TIME .... 1 ms
Trigger CH2
Mode .... AC

OSCILLOSCOPE

CH2   CH1

To point "FTG".
To point "VID".

*Never connect land "AMON"

CN405

AMON

To CCD board

FTG

Extension Cord
(Part No. PQZZ8K18Z)

VID

AG

DG

CN406

To LED array for CCD Unit.

(DIGITAL BOARD)

Extension cord (Part No. PQZZ2K12Z)

Lens fixing screws

WAVEFORM

Lens

MAX.
(for Lens)

MAX.
(for CCD Board)

CCD board fixing screws
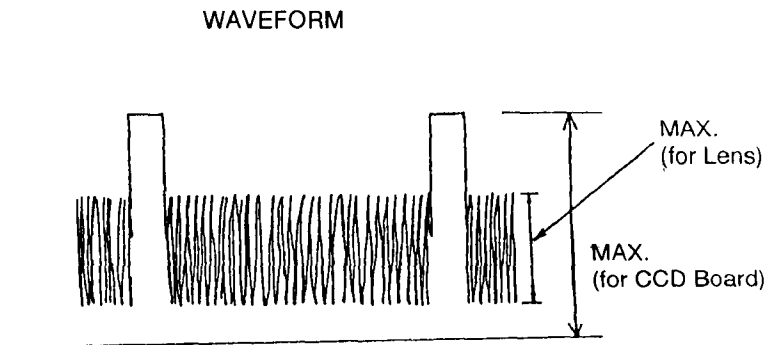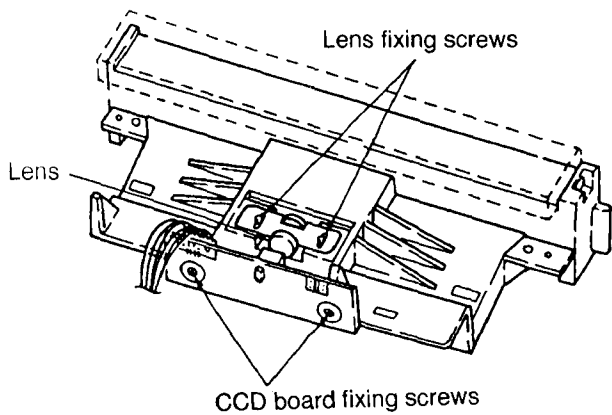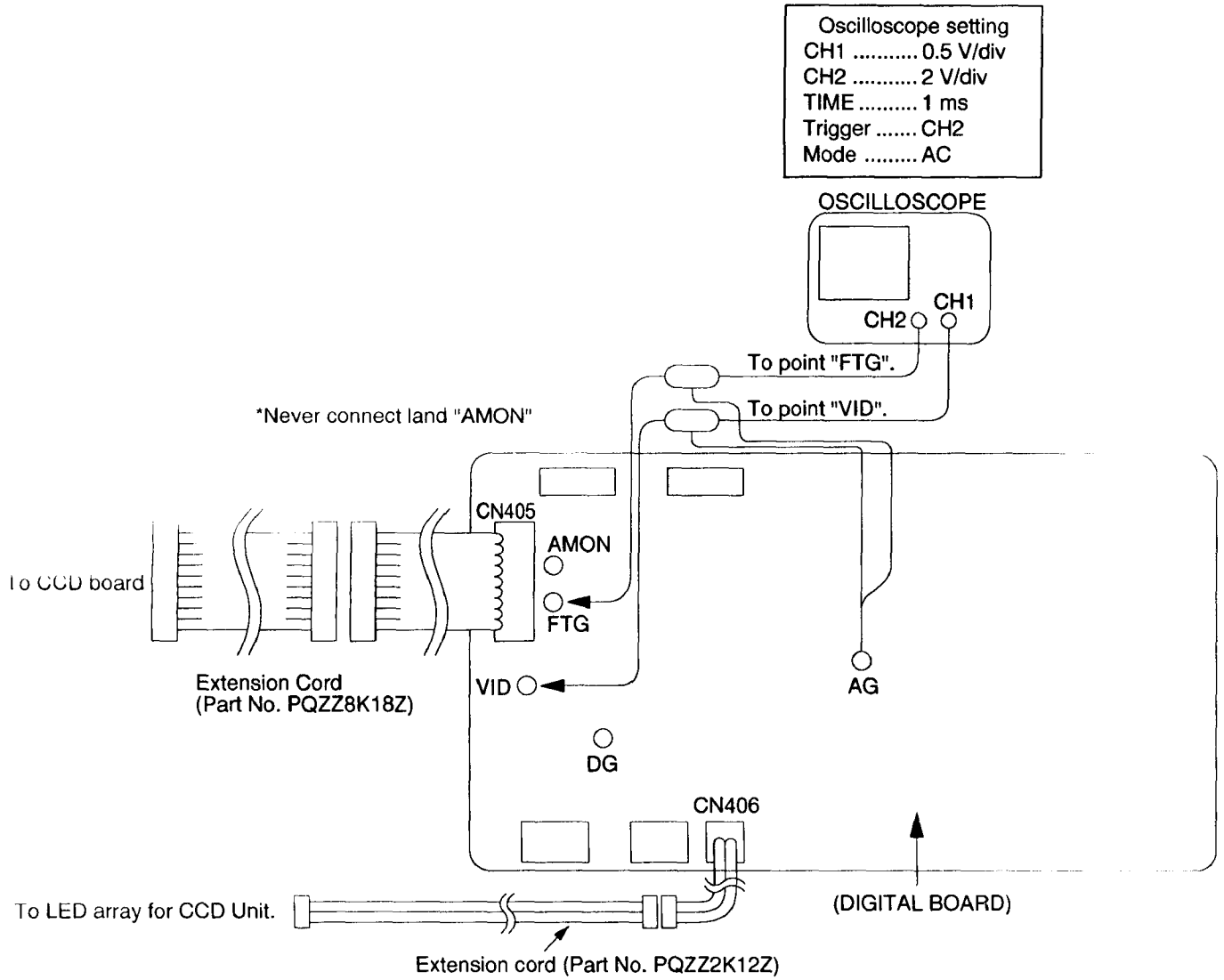
WHITE LEVEL ADJUSTMENT

1) Remove the CCD TOOL from CCD unit.
2) Attach the white paper on the CCD unit.
3) Attach the CCD TOOL on the CCD unit.
4) Adjust VR801 on the CCD board so that the waveform becomes 1.2± 0.2V.

Notes:1. After the adjustment is finished, assemble the unit by reversing above procedure.
2. Please adjust with covering topside of the lens by hands in order not to let in outdoor daylight.
3. If you have no instrument to repair, trim off the chart on next page, then attach on the target glass.
(This is a temporary treatment. You should use an instrument for this adjustment purpose, if you require an accurate repairment.)

CCD Tool
(PQZZF500M)

White Paper
(ex. PPC Paper)

WAVEFORM

1.2±0.2V
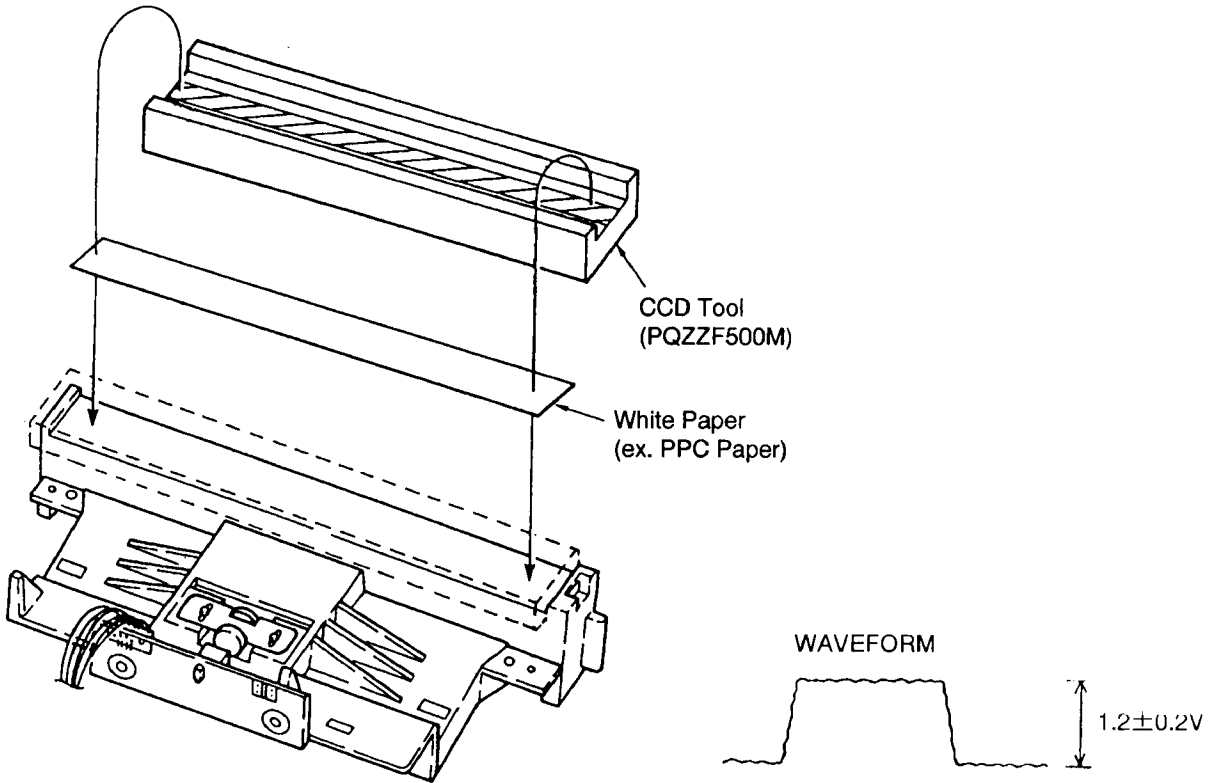
5. DOCUMENT READ START POSITION ADJUSTMENT

1) Connect AC cord.
2) Copy the document, and confirm the read start position of the document.
3) If get out of position, adjust the read position.
4) Press the MENU button.
5) Press the #, 9, 0, 0, 0, ✳ and 5, 6, 3 buttons.
6) Press the □,□, SET and MENU buttons.
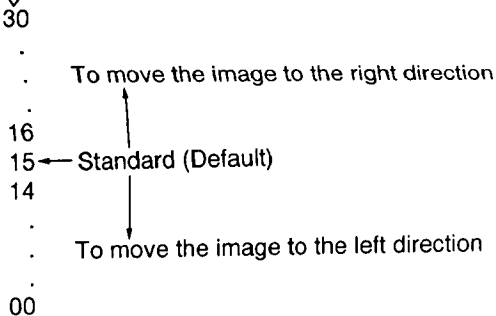
30
.
.   To move the image to the right direction
.
16
15 ← Standard (Default)
14
.
.   To move the image to the left direction
.
00
The starting position of reading shifts 1 mm as number of changes.

(for white level adjustment)　　　(for lens and CCD read position adjustment)

Ⓡ

LED Array → Side

← edge of the glass

The edge of glass and chart should be put together, then fix with tape.

② Tape

② Tape

① Reverse

Make sure the position of Ⓛ and Ⓑ .

Ⓛ
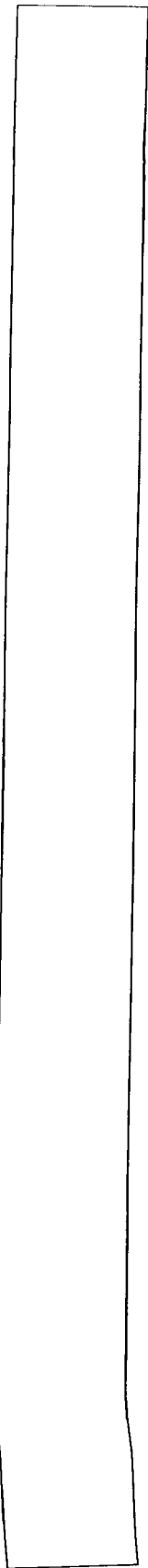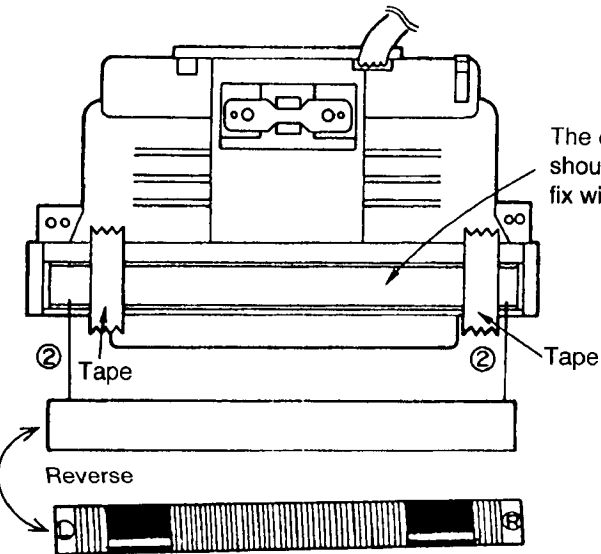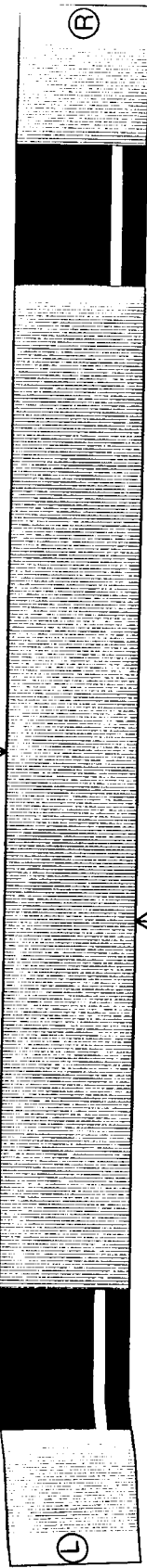
CIRCUIT OPERATIONS

1. GENERAL BLOCK DIAGRAM

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

1) CPU (IC401) .... The CPU fetchs and executes instructions from ROM, writes (reads) data to (from) RAM, writes commands to the ASIC and reads status information from ASIC.

2) ROM (IC402) .... Contains all of the program instructions for unit operations.

3) Static RAM (IC403) .... This memory is used mainly for parameter working storage area.

4) Dynamic RAM (IC415, IC416) .... This memory is used mainly for parameter working storage area.

5) RTC (IC408) .... Real time clock.

6) ASIC (IC404) .... Composed mainly address decoder and modem control section.
Control the general FAX operation.
Control the operation panel I/F.
Control the thermal head I/F and CCD I/F.
Excution image processing.

7) Gate Array (IC417) .... Excution image processing.

8) MODEM (IC405) .... Executes modulation and demodulation for FAX communications.

9) Read Section .... Composed of the LED array light source, CCD image sensor to read transmitting documents.

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

11) Motor Driver (IC406,407) .... Drives the transmission motor and the reception motor.

12) Reset Circuit (IC409) .... Provides reset pulse to each of the major IC's.

13) Analog Board .... Composed of ITS and TAM circuit, NCU circuit.

14) Sensor Section .... Composed of cover open sensor, document sensor, recording paper sensor, read position sensor, paper set sensor, paper out sensor, paper top sensor, ribbon end sensor.

15) Switching Power Supply Section .... Supplies +5 V, +12 V, -12 V and +24 V to the unit.

General Block Diagram
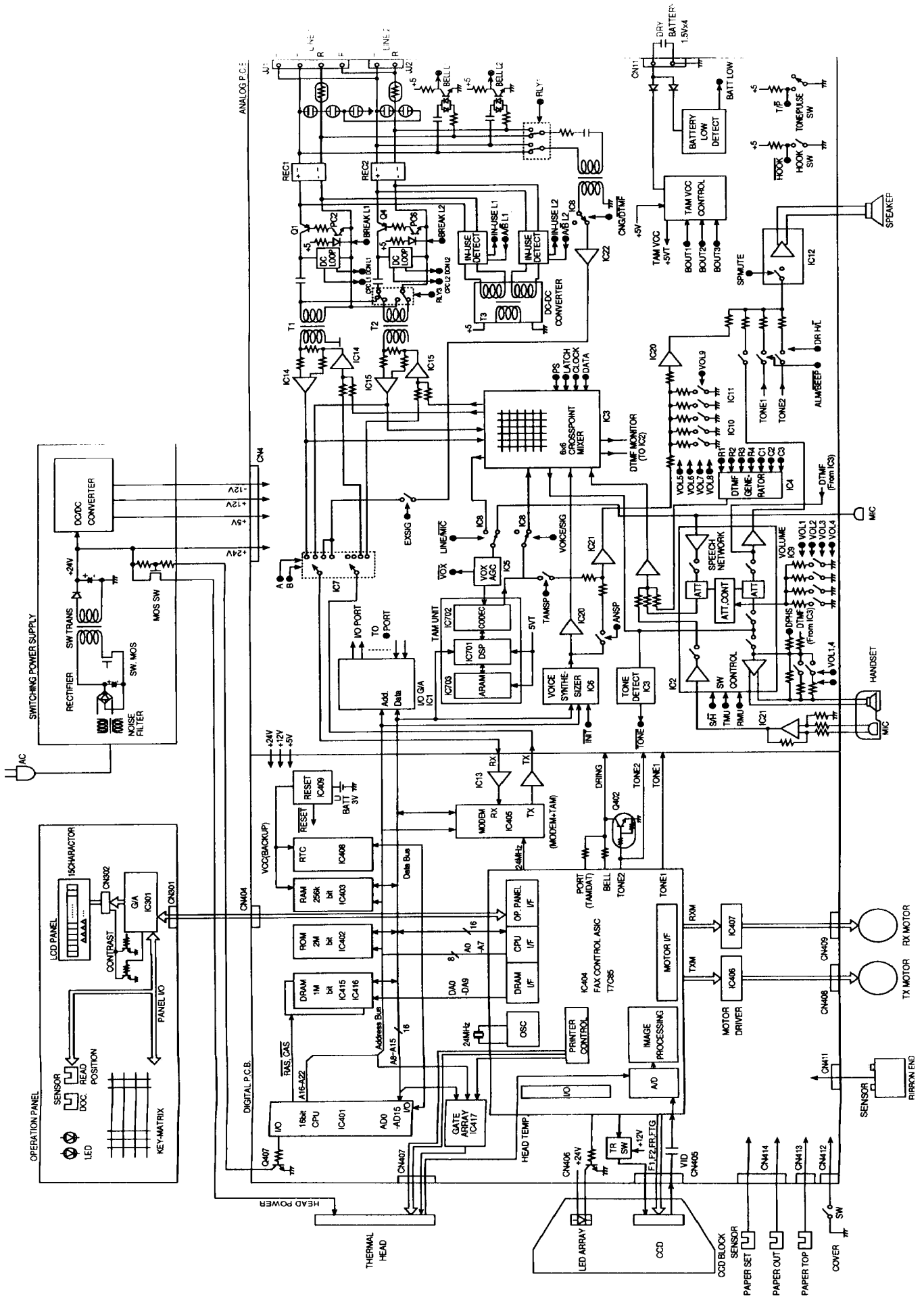
2. CONTROL SECTION

2-1. BLOCK DIAGRAM
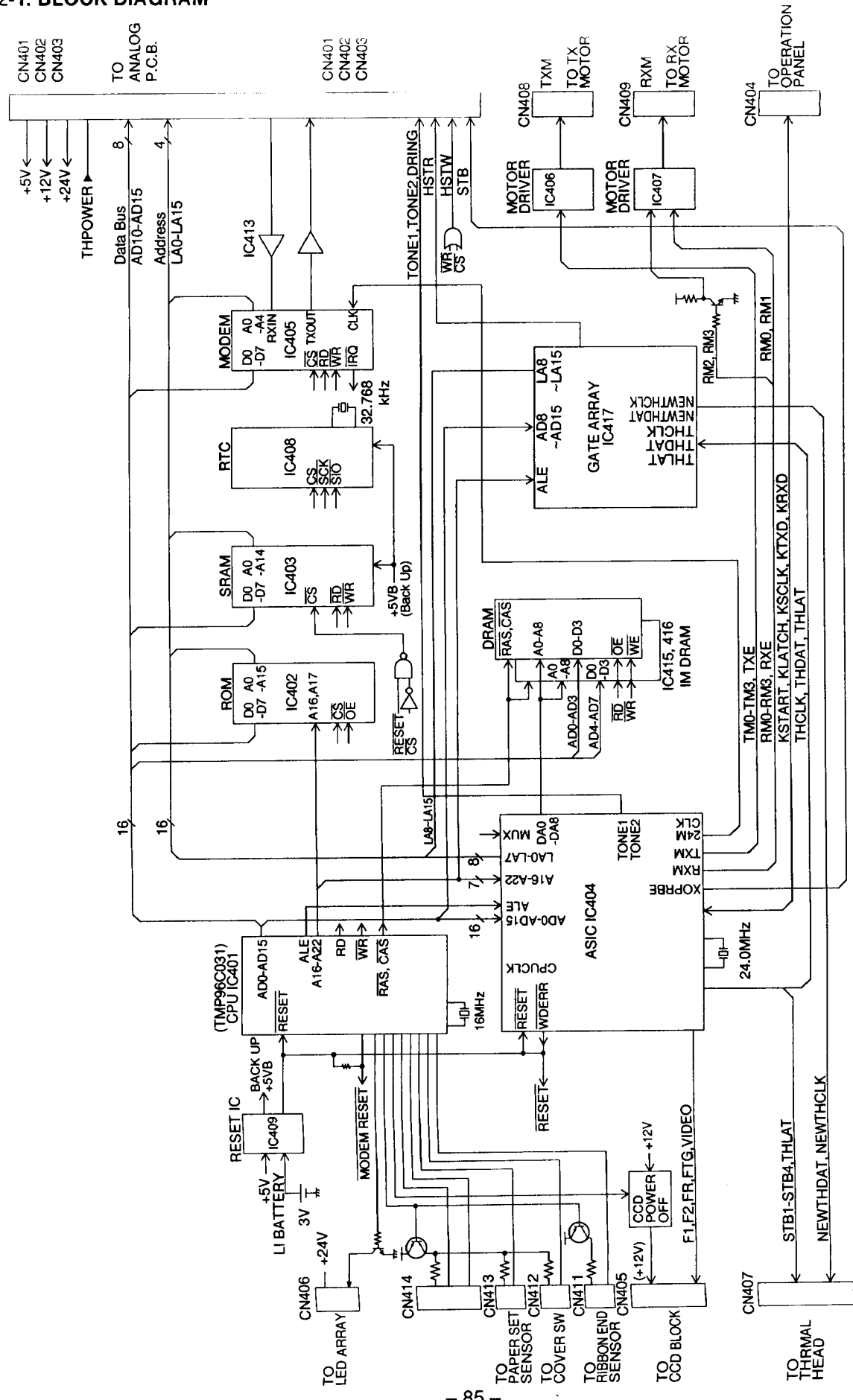
2-2. CPU (IC401)

The KX-F1200 uses a TMP96C031 CPU operating at 16MHz. Read and write cycle timing chart is shown below.
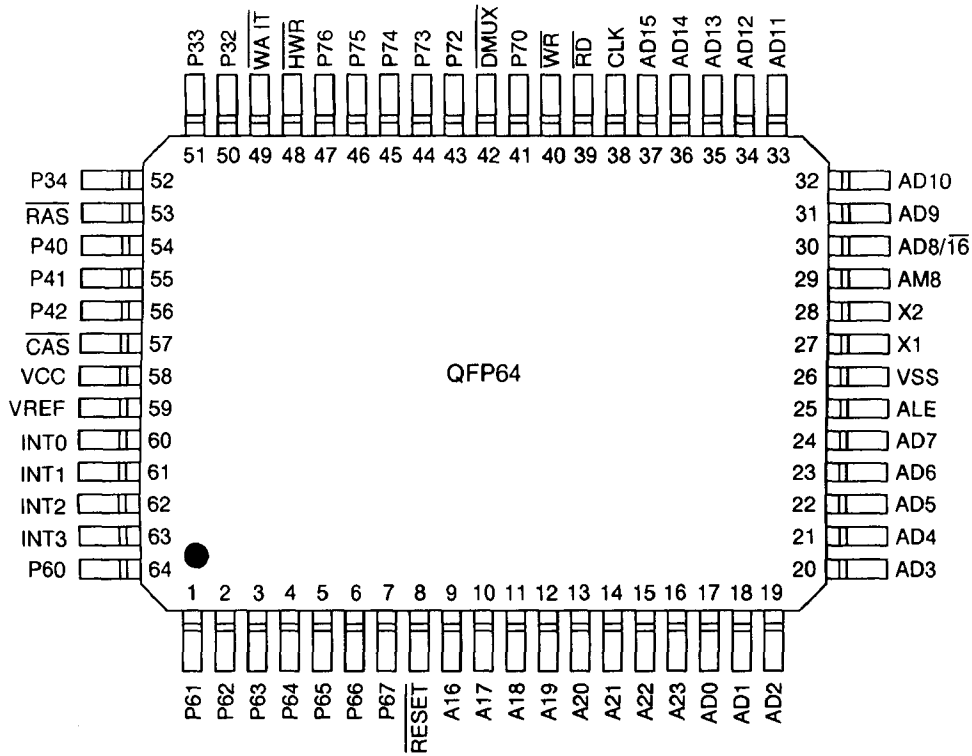
Pin Chip Carrier Pin Assignmets

1) Pin Descriptions

AD0 - AD15   Address/Date Bus (input/output).

A16 - A23   Address Bus (output).

$\overline{RD}$ Read (output, active Low). $\overline{RD}$ indicate that the CPU wants to read date from AD0 - AD15.

$\overline{WR}$ Write (output, active Low). $\overline{WR}$ indicate that the CPU Address/Data bus (AD0 - AD7) holds valid data.

$\overline{HWR}$ Write (output, active Low). $\overline{HWR}$ indicate that the CPU Address/Data bus (AD8 - AD15) holds valid data.

ALE   Address Latch Enable (output, active High). ALE indicate that the CPU Address/Data bus (AD0 - AD15) holds valid address.

$\overline{RESET}$ Reset (input, active Low).

$\overline{RAS}$ Row Address Strove (output, active Low). DRAM interface.

$\overline{CAS}$ Colomn Address Strove (output, active Low). DRAM interface.

$\overline{DMUX}$ DRAM address MU1tipleX (output).

INT1   Interrupt Request (input).

2) CPU Timing

Read Cycle

Xi
(16MHz)

A16-A23   A16-A23

AD0
-AD15   A0-A15   D0-D15

ALE

$\overline{\text{RD}}$

Write Cycle

X1
(16MHz)

A16-A23   A16-A23

AD0
-AD15   A0-A15   D0-D15

ALE

$\overline{\text{WR}}, \overline{\text{HWR}}$

Read, Write Timing

X1

$\overline{\text{RAS}}$

$\overline{\text{CAS}}$

DMVX

DA0-DA9
$\overline{\text{RD}}, \overline{\text{WR}}$
$\overline{\text{HWR}}$

Row Address   Column Address
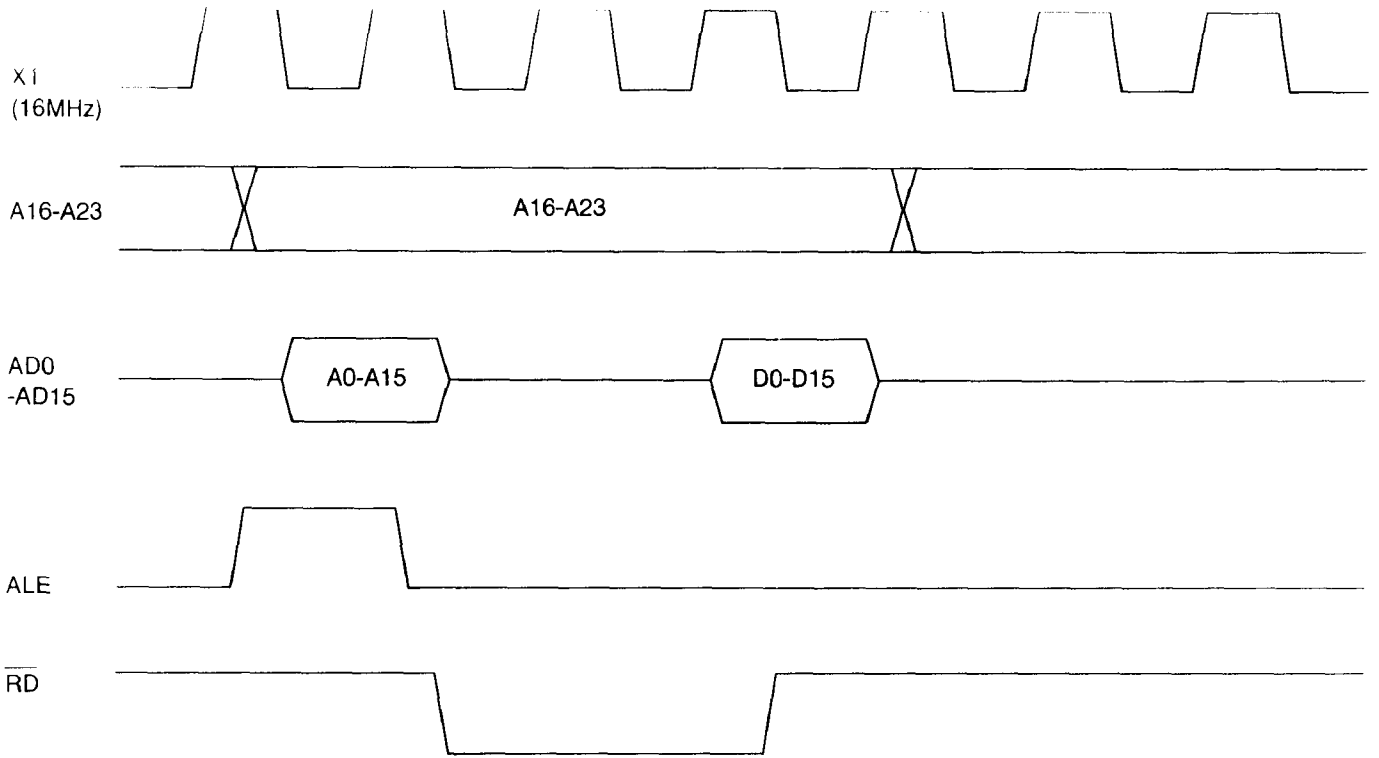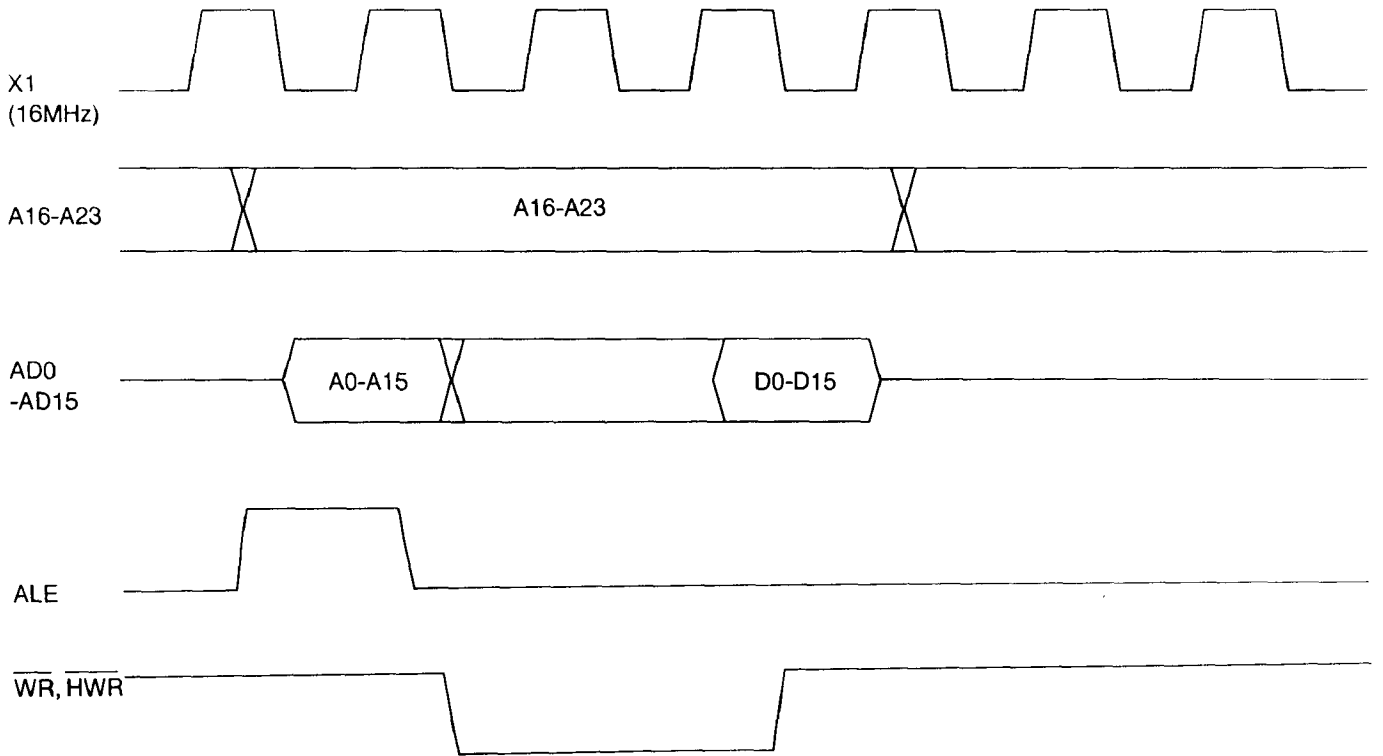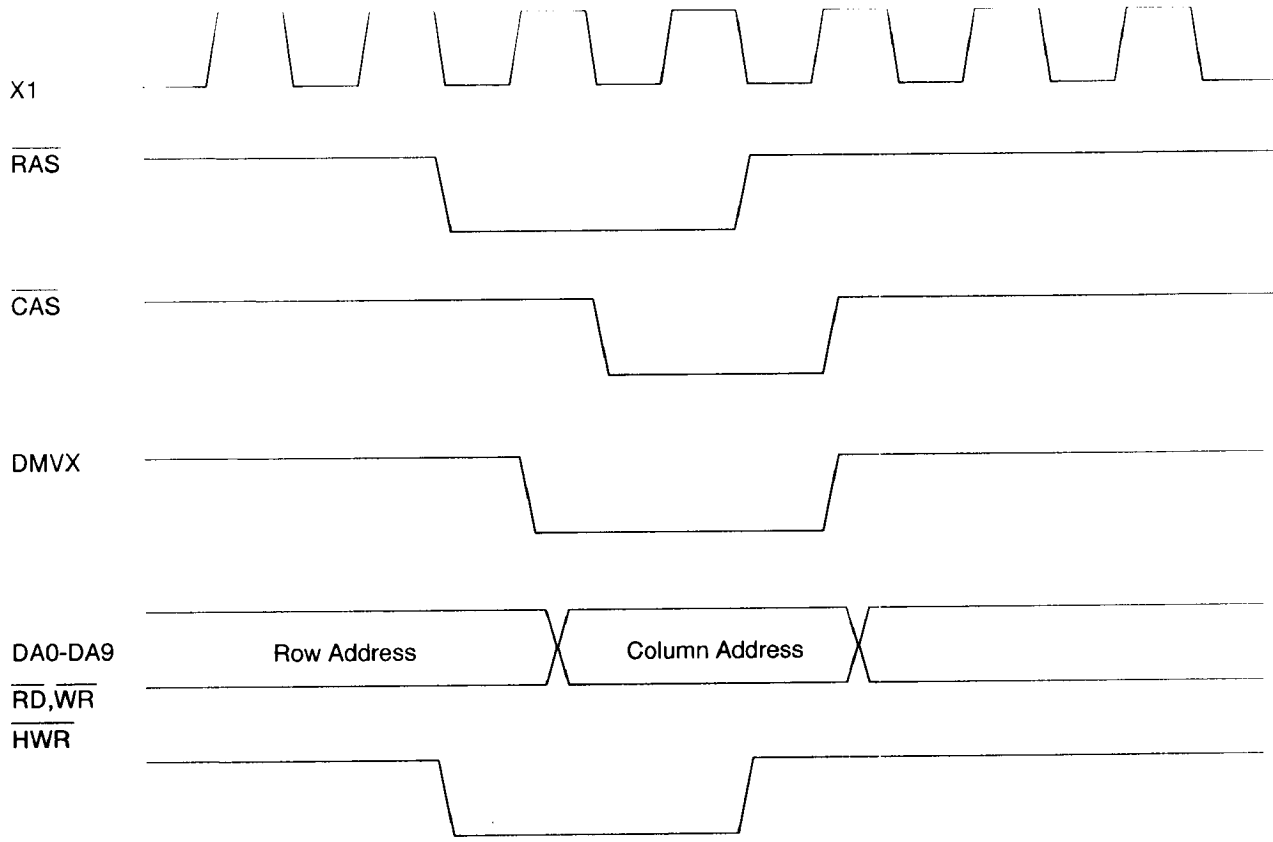
$\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ Refresh Timing

$\overline{\text{RAS}}$

$\overline{\text{CAS}}$

Refresh Cycle

$\overline{\text{RAS}}$

$\overline{\text{CAS}}$

16.2μs

2-3. MEMORY MAP

```
FFFFFFH ┌──────────┐
        │  EMPTY   │              20FFFFH ┌──────────┐
        ├──────────┤ 47FFFF              │  EMPTY   │
        │  DRAM    │            20FE1FH  ├ ─ ─ ─ ─ ─┤
        │  256KB   │                      │  MODEM   │
        │(IC415,416)│ 440000             │ (IC405)  │
        ├──────────┤            20FE00H  ├ ─ ─ ─ ─ ─┤
        │  EMPTY   │                      │  EMPTY   │
307FFFH ├──────────┤            20F20FH  ├ ─ ─ ─ ─ ─┤
        │  SRAM    │                      │  EMPTY   │
        │  32KB    │            20F200H  ├ ─ ─ ─ ─ ─┤
        │ (IC403)  │                      │ ANALOG PORT │
300000H ├──────────┤            20F100H  ├ ─ ─ ─ ─ ─┤
        │          │                      │ ASIC (IC404) │
        │   I/O    │                      │ INTERNAL RESISTOR │
        │          │            20E000H  ├ ─ ─ ─ ─ ─┤
200000H ├──────────┤                      │ SCREEN - │
        │          │                      │ DISPOSITION │
        │  EMPTY   │                      │ SRAM     │
        │          │            20C000H  └──────────┘
03FFFFH ├──────────┤
        │  ROM     │
        │  256KB   │
        │ (IC402)  │
000000H └──────────┘
(CPU ADDRESS)
```
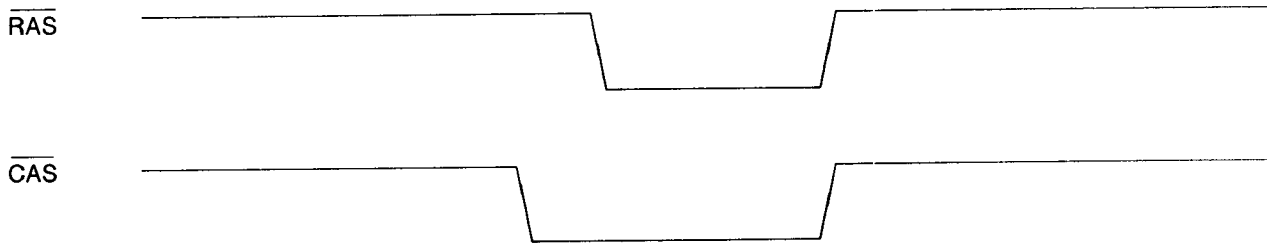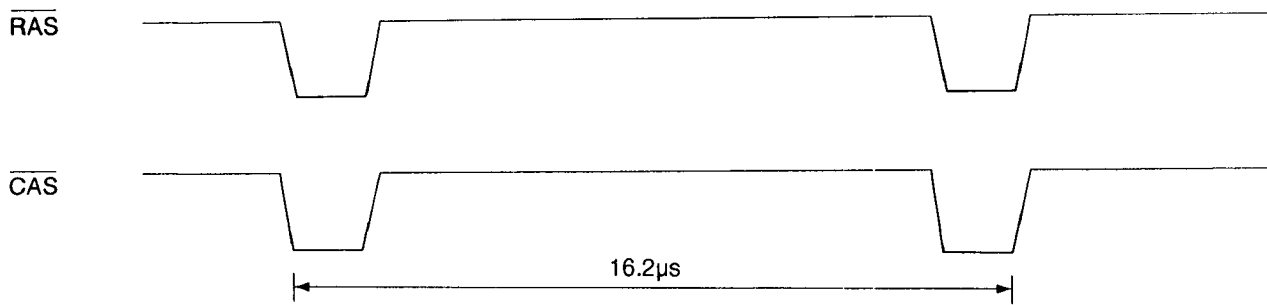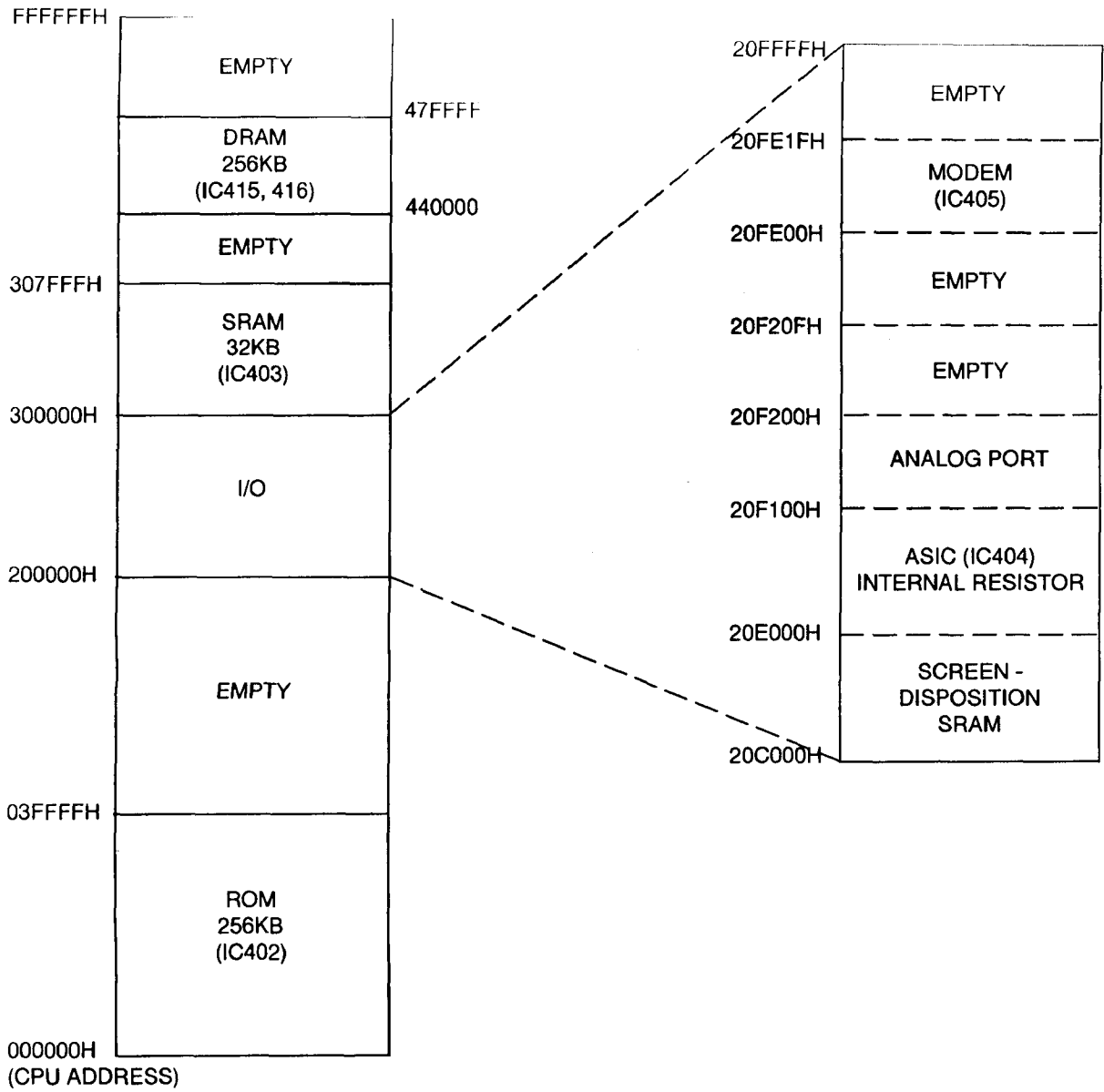
2-4. ROM (IC402)

The 256KB ROM (EPROM or MASKROM) is used to store program. The address is 000000H - 03FFFFH.

2-5. STATIC RAM (IC403)

The 32KB SRAM that is backed up with lithium battery is used. This holds one-touch dial, automatic dial and ID, etc. The address is 300000H - 307FFFH.

2-6. DYNAMIC RAM (IC415, 416)

This DRAM is used for CPU work. The address is 440000H - 47FFFFH.

1) Read, Write, Refresh timing

Refresh is excuted evey 16.2μs.

2-7. ASIC (IC404)

This custom IC is used for general FAX operation.

1) DECODER: Decodes the address of the CPU (IC401) according to the memory map.
2) CPU I/F: Outputs the INTERRUPT signal.
3) ROM/RAM I/F: Controls the SELECT signal of ROM or RAM.
4) CCD I/F: Controls document reading.
5) IMAGE DATA RAM: Inside ASIC and 8KB. Fig. A indicates the mapping which is used image processing.
6) THERMAL HEAD I/F: Transmits the recorded data to the thermal head.
7) TX MOTOR I/F: Controls the transmission motor which feeds the document.
8) RX MOTOR I/F: Controls the receiving motor which feeds the recording paper.
9) OPE. PANEL I/F: Serial Interface with Operation panel
10) I/O PORT: I/O Port Interface (Exa. Sensor etc.)

This memory is built-in to ASIC (IC404) to be used for image processing.
Memory map of Image Data RAM is shown below.

```
20 DFFFH ┌─────────────────────────┐
         │  SHADING                │
         │  DATA                   │
         │  2KB                    │
20 D800H ├─────────────────────────┤
         │  IMAGE PROCESSING       │
         │  WORK 1KB               │
         ├─────────────────────────┤
         │  LINE MEMORY            │
         │  4 LINE 1KB             │
20 D000H ├─────────────────────────┤
         │                         │
         │  n-1/n+1 LINE           │
         │  MEMORY 2KB             │
         │                         │
20 C800H ├─────────────────────────┤
         │                         │
         │  n LINE MEMORY 2KB      │
         │                         │
20 C000H └─────────────────────────┘
(CPU ADDRESS)
```
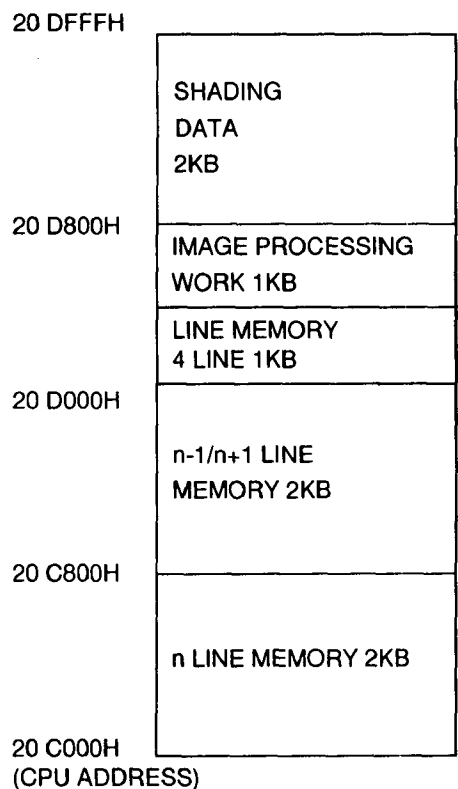
IC404 Block Diagram (Fig. 1)

KX-F1200
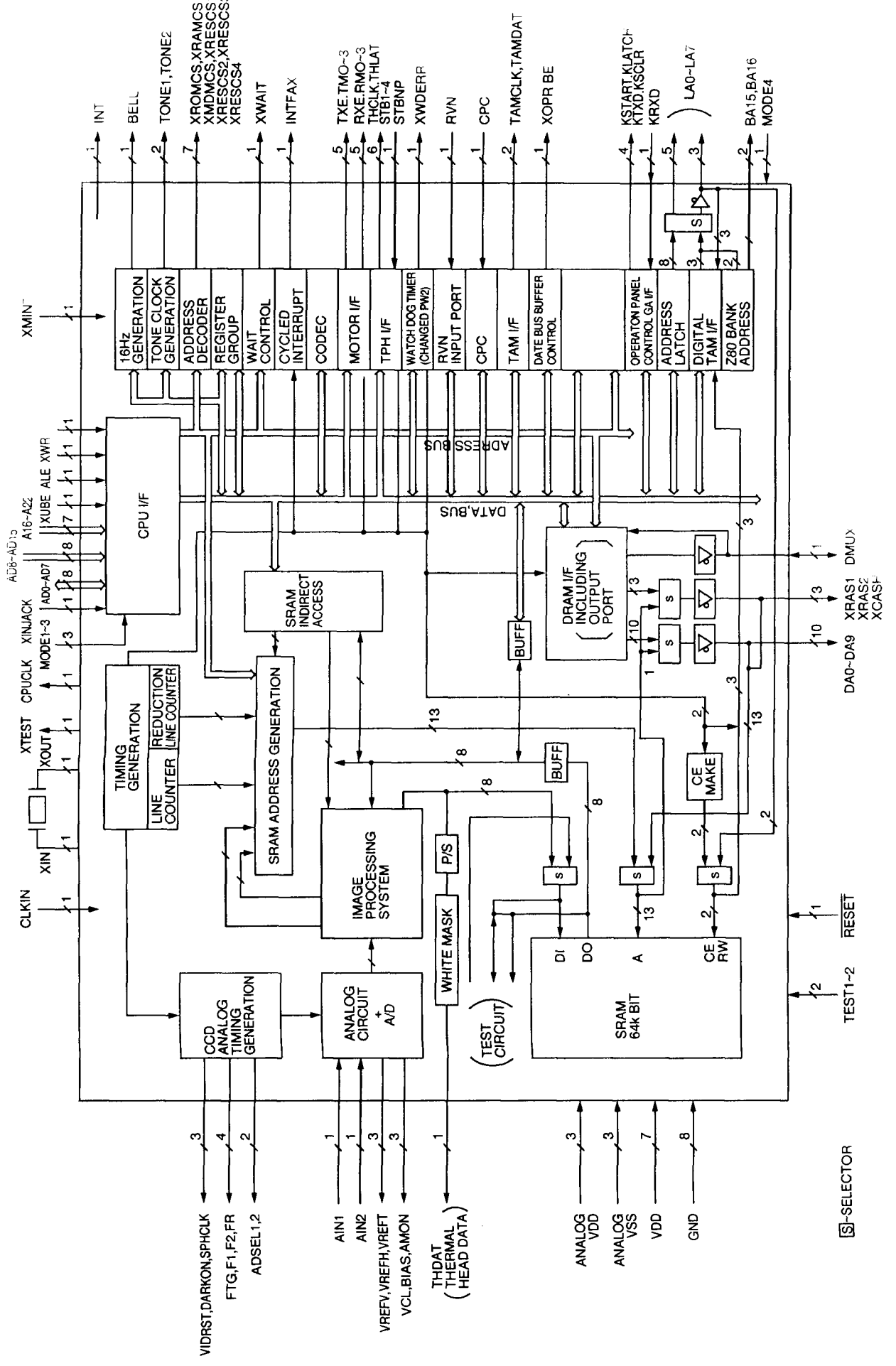
Explanation of Pin Distribution (IC404)

SIGNAL	NO.	I/O	Pu/Pd	Explanation
AD0	104	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD0
AD1	103	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD1
AD2	102	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD2
AD3	101	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD3
AD4	99	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD4
AD5	98	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD5
AD6	97	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD6
AD7	96	I/O	Pu	CPU (IC401) ADDRESS/DATA BUS AD7
AD8	95	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD8
AD9	94	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD9
AD10	93	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD10
AD11	92	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD11
AD12	89	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD12
AD13	88	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD13
AD14	87	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD14
AD15	86	I	Pu	CPU (IC401) ADDRESS/DATA BUS AD15
A16	112	I	Pu	CPU (IC401) ADDRESS BUS A16
A17	111	I	Pu	CPU (IC401) ADDRESS BUS A17
A18	110	I	Pu	CPU (IC401) ADDRESS BUS A18
A19	109	I	Pu	CPU (IC401) ADDRESS BUS A19
A20	107	I	Pu	CPU (IC401) ADDRESS BUS A20
A21	106	I	Pu	CPU (IC401) ADDRESS BUS A21
A22	150	I	Pu	CPU (IC401) ADDRESS BUS A22
XUBE	113	I	Pu	LOW FIXED
ALE	83	I	Pu	CPU (IC401) ALE
XWR	84	I	Pu	CPU (IC401) $\overline{WR}$
XRD	85	I	Pu	CPU (IC401) $\overline{RD}$
XWAIT	80	O		NOT USED
MODE1	37	I		LOW FIXED
MODE2	38	I		LOW FIXED
MODE3	39	I		LOW FIXED
XMINT	72	I		NOT USED
INT	79	O		CPU (IC401) INT1
XINTACK	78	I/O		NOT USED
XIN	57	I		SYSTEM CLOCK (24 MHz) CONNECTION
XOUT	56	O		SYSTEM CLOCK (24 MHz) CONNECTION
XTEST	59	O		NOT USED
CPUCLK	81	O		CPU (IC401) X1 (12 MHz)
CLKIN	60	I		LOW FIXED
DA0	115	I		DRAM (IC415, 416) ADDRESS A0
DA1	116	I		DRAM (IC415, 416) ADDRESS A1
DA2	118	I/O		DRAM (IC415, 416) ADDRESS A2
DA3	119	I/O		DRAM (IC415, 416) ADDRESS A3
DA4	120	I/O		DRAM (IC415, 416) ADDRESS A4
DA5	121	I/O		DRAM (IC415, 416) ADDRESS A5
DA6	122	I/O		DRAM (IC415, 416) ADDRESS A6
DA7	123	I		DRAM (IC415, 416) ADDRESS A7
DA8	124	I		DRAM (IC415, 416) ADDRESS A8
DA9	125	O		DRAM (IC415, 416) ADDRESS A9
XRAS1	129	O		NOT USED
XRAS2	130	O		NOT USED
XCASH	131	O		NOT USED
DMUX	128	I/O		CPU (IC401) $\overline{DMUX}$

SIGNAL	PIN NO	I/O	Pu/Pd	Explanation
FTG	12	O		SH SIGNAL OUTPUT FOR CCD
F1	15	O		01 SIGNAL OUTPUT FOR CCD
F2	14	O		02 SIGNAL OUTPUT FOR CCD
FR	13	O		RS SIGNAL OUTPUT FOR CCD
VIDRST	11	O		CLAMP CONTROL SIGNAL FOR DC PLAY BACK
SPHCLK	10	O		IMAGE SIGNAL S/H CLOCK SIGNAL
DARKON	9	O		S/H CLOCK SIGNAL FOR LIGHT SCHIELD OUTPUT CLAMP
ADSEL1	8	O		CHANNEL SELECT SIGNAL FOR AIN 2 TERMINAL A/D INPUT
ADSEL2	7	O		CHANNEL SELECT SIGNAL FOR AIN 2 TERMINAL A/D INPUT
THDAT	33	O		RECORDED IMAGE OUTPUT TO THERMAL HEAD
THCLK	35	O		CLOCK OUTPUT FOR DATA TRANSFER TO THERMAL HEAD
THLAT	34	O		PULSE OUTPUT FOR DATA LATCH TO THERMAL HEAD
STB1	29	O		STROBE SIGNAL OUTPUT TO THERMAL HEAD
STB2	30	O		STROBE SIGNAL OUTPUT TO THERMAL HEAD
STB3	31	O		STROBE SIGNAL OUTPUT TO THERMAL HEAD
STB4	32	O		STROBE SIGNAL OUTPUT TO THERMAL HEAD
STBNP	28	I		THERMAL HEAD STROBE SIGNALS POLARITY CONTROL SIGNAL
TM0	23	O		TRANSFER MOTOR A PHASE
TM1	24	O		TRANSFER MOTOR B PHASE
TM2	25	O		TRANSFER MOTOR/A PHASE
TM3	26	O		TRANSFER MOTOR/ B PHASE
TXE	27	O		TRANSFER MOTOR ENABLE SIGNAL
RM0 (PS1)	17	O		TRANSFER MOTOR A PHASE
RM1 (PS2)	16	O		TRANSFER MOTOR B PHASE
RM2 (PS3)	20	O		TRANSFER MOTOR/A PHASE
RM3 (PS4)	21	O		TRANSFER MOTOR/ B PHASE
RXE	22	O		TRANSFER MOTOR ENABLE SIGNAL
BELL	42	O		16Hz GENERATES
TONE1	43	O		TONE OUTPUT, FOR BEEP·KEY TONE·ALARM
TONE2	44	O		TONE OUTPUT, FOR BEEP·KEY TONE·ALARM
XROMCS	74	O		ROM (IC402) CHIP SELECT
XRAMCS1	75	O		RAM (IC403) CHIP SELECT
XMDMCS	73	O		MODEM (IC405) CHIP SELECT
XRESCS	70	O		ANALOG BOARD (IC1) CHIP SELECT
XRESCS2	69	O		RTC (IC408) CHIP SELECT
XRESCS3	68	O		CHIP SELECT FOR SPARE (NOT USED)
XRESCS4	67	O		CHIP SELECT FOR SPARE (NOT USED)
XWDERR	114	O		WATCHED ERROR OUTPUT SIGNAL
RVN (PS5)	40	I		NOT USED
CPC	41	I		NOT USED
TAMCLK	62	O		NOT USED
TAMDAT	63	O		
XOPRBE	71	O		NOT USED
KSTART	136	O		OPERATION PANEL CONTROL GAI/F
KLATCH	135	O		OPERATION PANEL CONTROL GAI/F
KXCLK	134	O		OPERATION PANEL CONTROL GAI/F
KTXD	133	O		OPERATION PANEL CONTROL GAI/F
KRXD	132	O		OPERATION PANEL CONTROL GAI/F
LA0	53	O		LATCH ADDRESS LA0
LA1	52	O		LATCH ADDRESS LA1

SIGNAL	PIN NO	I/O	Pu/Pd	Explanation
LA2	51	O		LATCH ADDRESS LA2
LA3	50	O		LATCH ADDRESS LA3
LA4	49	O		LATCH ADDRESS LA4
LA5	48	I/O		LATCH ADDRESS LA5
LA6	47	I/O		LATCH ADDRESS LA6
LA7	46	I/O		LATCH ADDRESS LA7
MODE4	61	I		LOW FIXED
BA15	77	O		NOT USED
BA16	76	O		NOT USED
XRESET	66	I		SYSTEM RESET SIGNAL INPUT
TEST1	64	I		LOW FIXED
TEST2	65	I		LOW FIXED
AIN1	4			CCD IMAGE SIGNAL INPUT
AIN2	2			THERMISTER TEMPARATURE WATCH INPUT
VCL	5			ANALOG PART STANDARD VOLTAGE SIGNAL OUTPUT/INPUT TERMINAL (IN RESISTOR, POSSIBLE TO INPUT.)
AMON	3			ANALOG SIGNAL MONITOR TERMINAL
BIAS	143			A/D CONVERTER'S BIAS VOLTAGE OUTPUT, CONNECT BYPASS CONDENSOR
VREFB	137			A/C CONVERTER'S ZERO STANDART VOLTAGE OUTPUT
VREFH	142			A/D CONVERTER'S 1/2 FULL SCALE VOLTAGE OUTPUT, CONNECT BYPASS CONDENSOR
VREFT	140			A/C CONVERTER'S FULL SCALE VOLTAGE OUTPUT, CONNECT BYPASS CONDENSOR
VDDA	141			A/D CONVERTER VDD (+5V)
VSSA	144			A/D CONVERTER VSS (GND)
VDDB	6			S/H, CLAMP, AGC VDD (+5V)
VSSB	1			S/H, CLAMP, AGC VSS (GND)
VDDC	139			A/D CONVERTER'S VDD (+5V) FOR REFERENCE
VSSC	138			A/D CONVERTER'S VSS (GND) FOR REFERENCE
VDD	18			Power Sorce (+5V)
VDD	45			Power Sorce (+5V)
VDD	54			Power Sorce (+5V)
VDD	82			Power Sorce (+5V)
VDD	90			Power Sorce (+5V)
VDD	117			Power Sorce (+5V)
VDD	126			Power Sorce (+5V)
VSS	19			Power Sorce (GND)
VSS	36			Power Sorce (GND)
VSS	55			Power Sorce (GND)
VSS	58			Power Sorce (GND)
VSS	91			Power Sorce (GND)
VSS	100			Power Sorce (GND)
VSS	108			Power Sorce (GND)
VSS	127			Power Sorce (GND)

2-8. GATE ARRAY (IC417)

This gate array has functions which reducing a image data recorded on the paper, address latching and inserter after being sent to the thermal head.

Reduction rate is possible to be set at about 72%, 86%, 92% and 100% by MODE 0 and 1.

MODE 0	MODE 1	Reduction rate
0	1	100%
0	0	92%
1	0	86%
1	1	72%

The latch latches a address of high-ranking byte AD8-15 in CPU (IC 401) to output LA8-15.
The inverter is used in the reset circuit.

IC417   Block Diagram
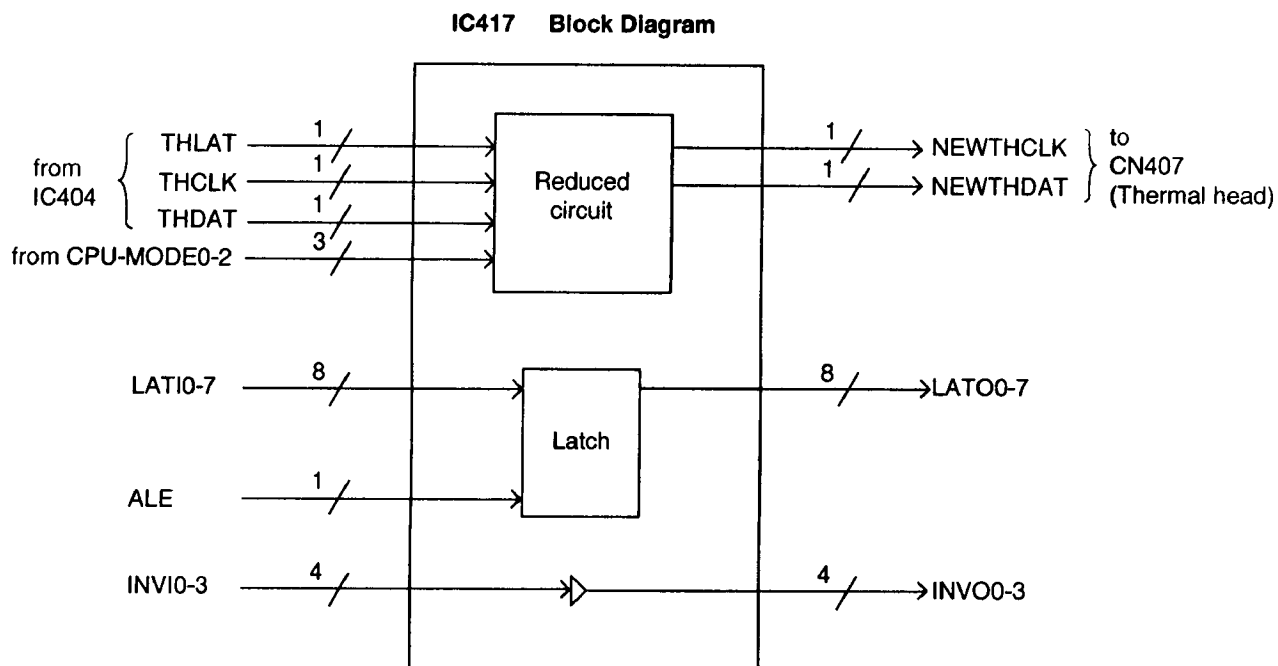
Explanation Pin Distribution (IC417)

Pin No.	NO.	I/O	Pu/Pd	Explanation
XSOFTRST	3	I		Initializing reduced circuit
THCLK	44	I		Clock input
THLAT	43	I		Latch input
THDAT	42	I		Data input
NEWTHCLK	35	O		Reduced clock output
NEWTHDAT	34	O		Reduced data output
MODE0	5	I		Reduction rate setting MODE0=0, MOVE1=1 → 100% MODE0=0, MOVE1=0 → 92%
MODE1	2	I		MODE0=1, MOVE1=0 → 86% MODE0=1, MOVE1=1 → 72%
MODE2	1	I		Mode setting
LATI0	16	I	Pu	Latch input 0
LATI1	15	I	Pu	Latch input 1
LATI2	14	I	Pu	Latch input 2
LATI3	13	I	Pu	Latch input 3
LATI4	11	I	Pu	Latch input 4
LATI5	10	I	Pu	Latch input 5
LATI6	9	I	Pu	Latch input 6
LATI7	8	I	Pu	Latch input 7
ALE	7	I	Pu	Latch gate input
LATO0	28	O		Latch output 0
LATO1	27	O		Latch output 1
LATO2	26	O		Latch output 2
LATO3	25	O		Latch output 3
LATO4	29	O		Latch output 4
LATO5	30	O		Latch output 5
LATO6	31	O		Latch output 6
LATO7	32	O		Latch output 7
INVI0	24	I		Inverter input 0
INVI1	20	I		Inverter input 1
INVI2	22	I		Inverter input 2
INVI3	21	I		Inverter input 3
INVO0	37	O		Inverter output 0
INVO1	38	O		Inverter output 1
INVO2	36	O		Inverter output 2
INVO3	19	I/O		Inverter output 3
XRAS	23	I		Not used
XREFSH	6	I		Not used
ADR	33	I		Not used
XRAS0	40	O		Not used
XRAS1	41	O		Not used
MODE3	12	I		Mode setting (Fixed 5V)
XRESET	4	I		Hard reset
RESET	18	I/O		Inverter output of XRESET (Not used)
VDD	39			Power
VSS	17			GND

2-9. RESET CIRCUIT

The output from pin 3 of the Reset IC (IC409) resets the CPU (IC401), the gate array (IC404), the modem (IC405), the gate array on the operating board (IC301), the Port IC (IC1) on the analog board through the IC410.

(1) During to momentary power interruption, 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 power fluctuation.

Timing Chart
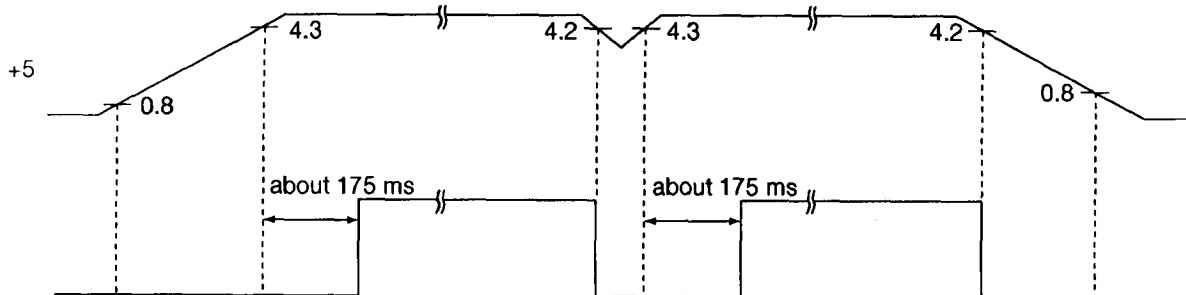
(2) When pin 3 of the IC409 becomes low level, it will prohibit the RAM (IC403) from changing data.
    The RAM (IC403) go into the backup mode, when they are backed up by the lithium battery.

Circuit Diagram
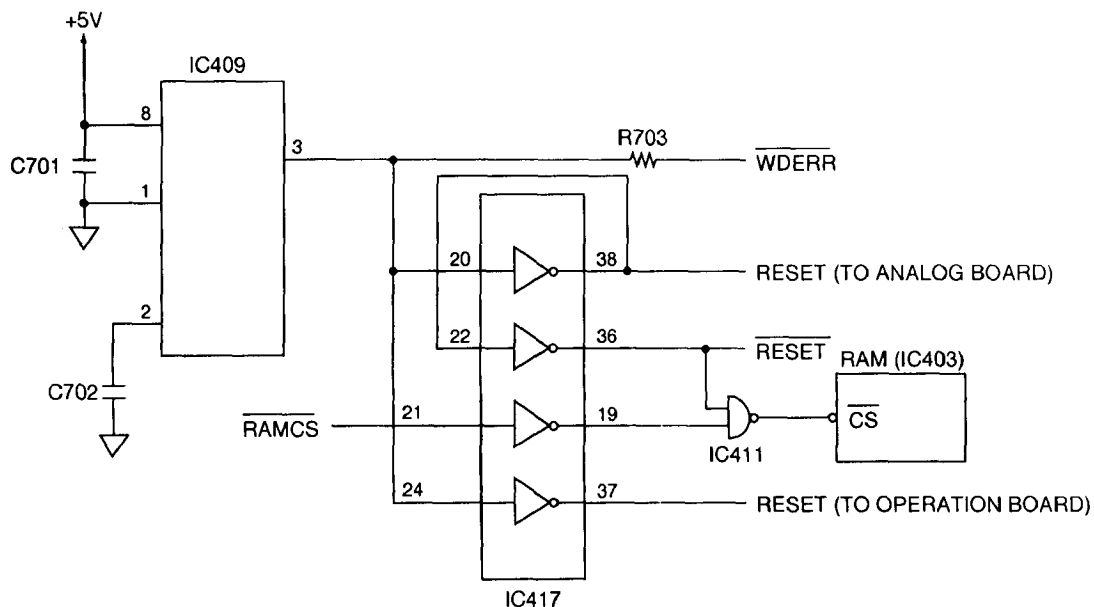
(3) The watch dog timer, built-in the gate array (IC404), is initialized by the CPU (IC401) about every 1.5 ms.
When the watch dog error occurs, pin 114 of the gate array (IC404) becomes low level.
The terminal of $\overline{\text{WDERR}}$ signal is connected to the reset line, so $\overline{\text{WDERR}}$ signal works as the reset signal.

Circuit Diagram
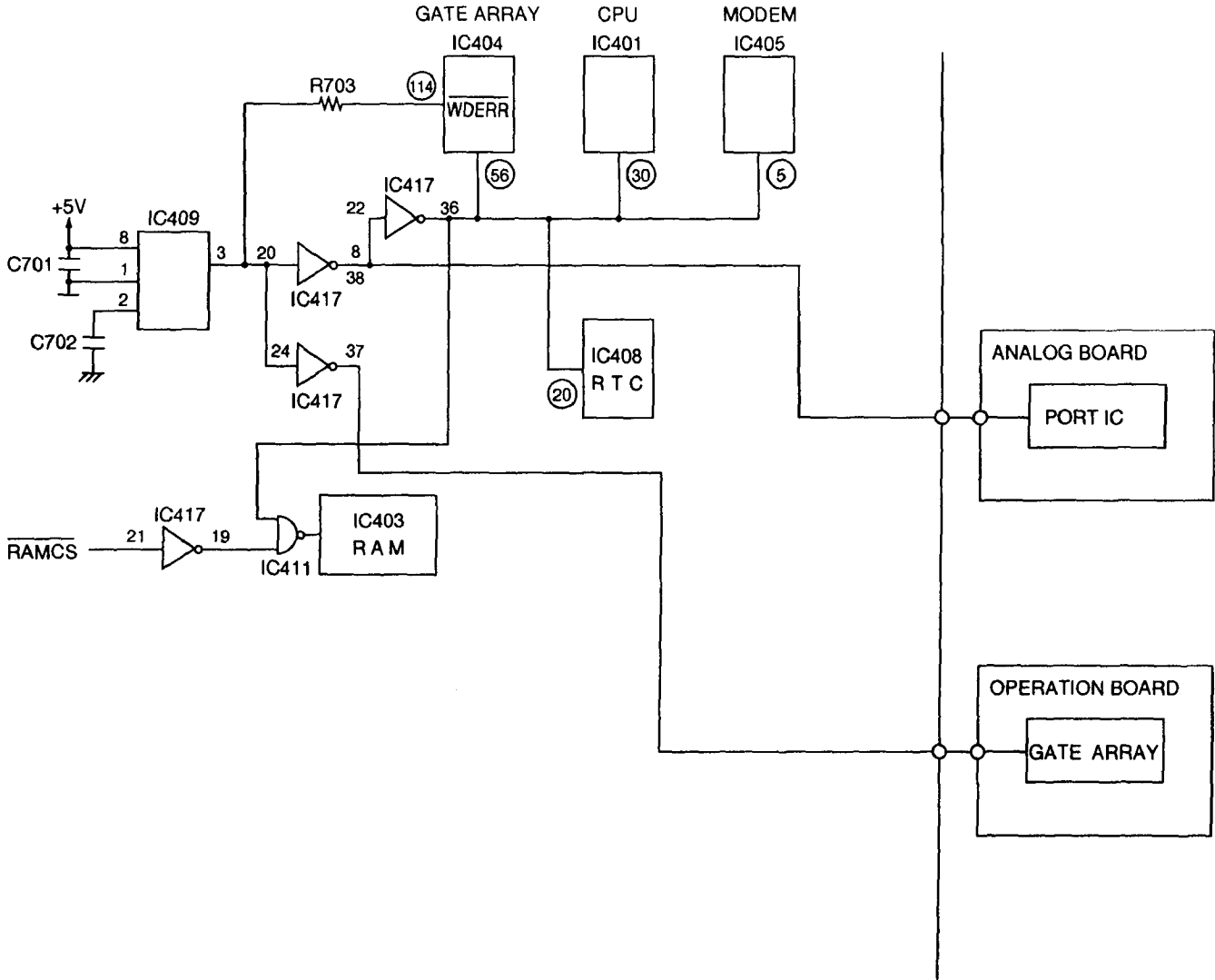
2-10. SRAM BACK UP CIRCUIT

1) Function

This unit has a lithium battery (BATT), which works for the RAM (IC403) and Real Time Clock IC (RTC,IC408).
The user parameter of autodial numbers, the transmission ID, the system setup date and so on are stored in the RAM (IC403).
The RTC (IC408) continues functioning, even when the power switch is OFF, back up by the lithium battery.

2) Circuit Operation

When the power switch is turned ON, thus supplying the power through the IC409 to the RAM (IC403) and RTC (IC408). At this time, the voltage at pin 28 of the RAM and pin 8 of the RTC are +5 V. When the power switch is turned OFF, the BATT supplies the power to the RAM and RTC through the JMP1, R701 and IC409. At the time, the voltage at pin 28 of the RAM and pin 8 of the RTC are about +2.5 V. When the power switch is OFF and the voltage of +15 V goes down, the Reset IC. (IC409) outputs the reset signals. Pin 28 of the RAM (IC403) and pin 8 of the RTC (IC408) become low level, then the RAM and RTC go into the back up mode, when the power consumption is less.

Circuit Diagram
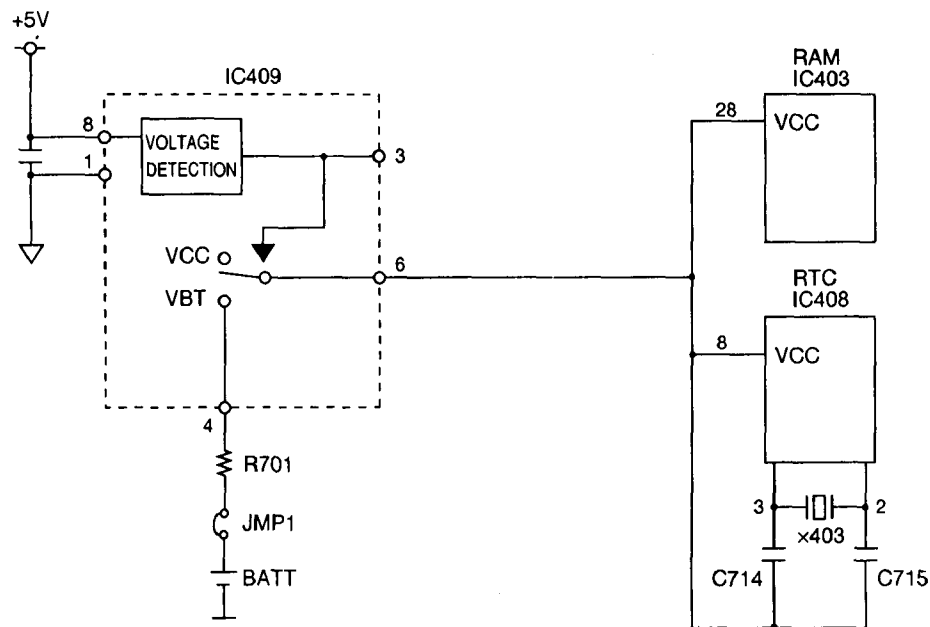
2-11. REAL TIME CLOCK

This is Clock IC. And it is backupped by lithium battery.
This IC reads and writes the data by serial interface.
The serial interface signal is produced in the software, and output from I/O port of CPU (IC 401).
These timings are shown below.

Read Timing

Read command   Clock · Calender data

Write Timing

Write command   Clock · Calender data
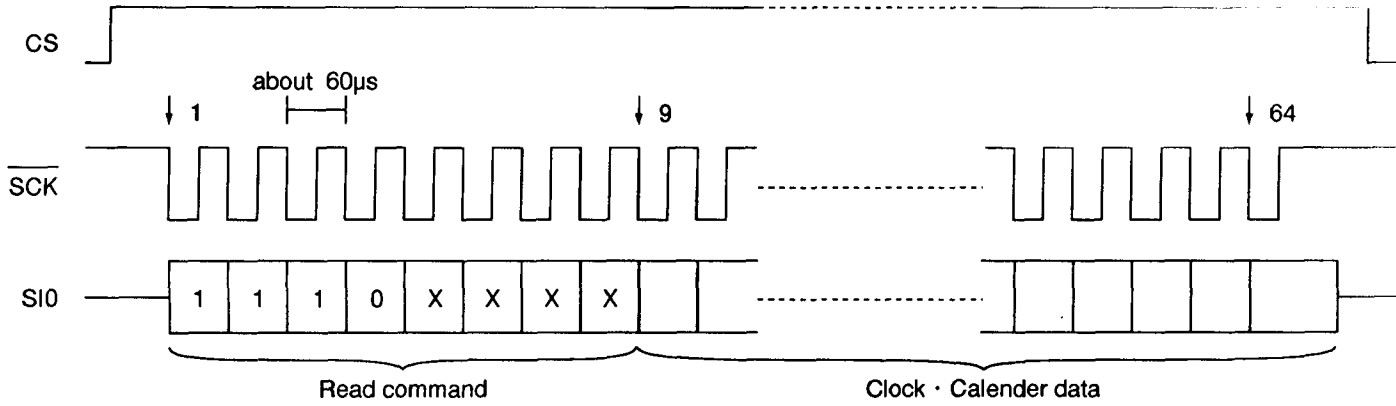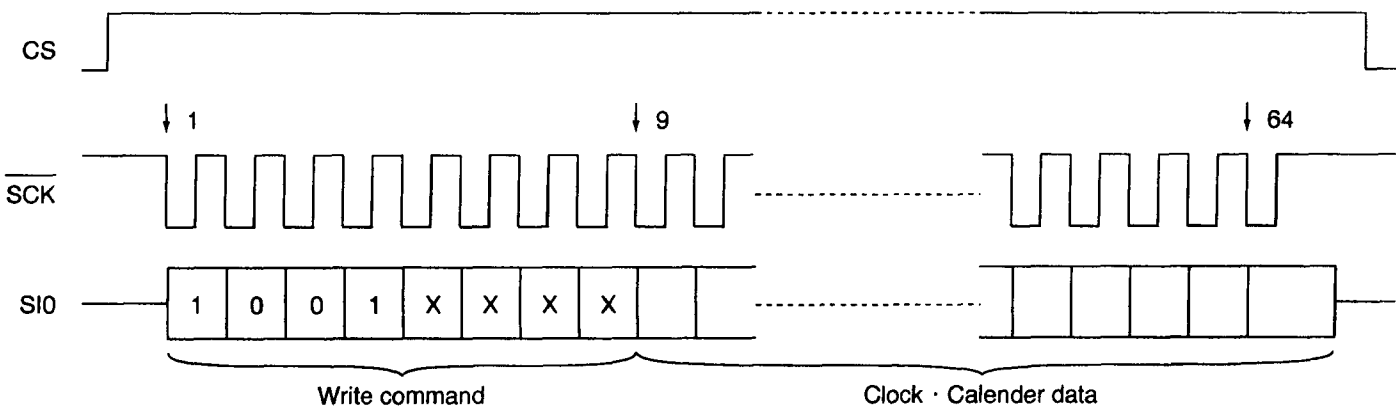
2-12. SUPERVISION CIRCUIT FOR THERMAL HEAD TEMPERATURE

1) Function

Thermal head temperature is disposed to convert voltage to digital data by using A/D converter of IC404. 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
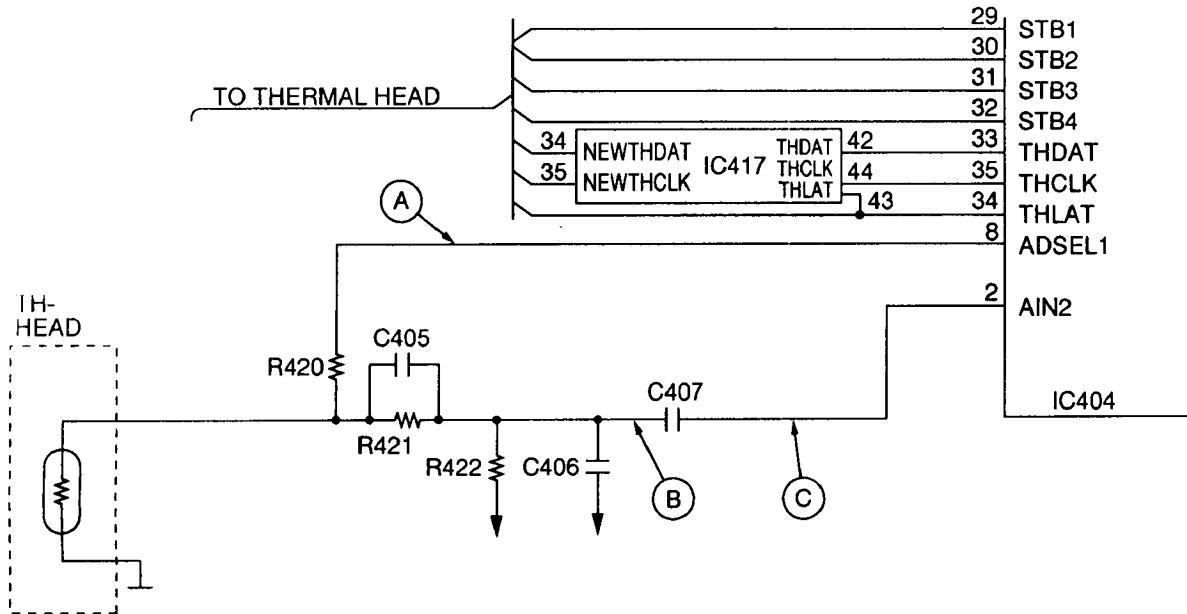
Timing Chart
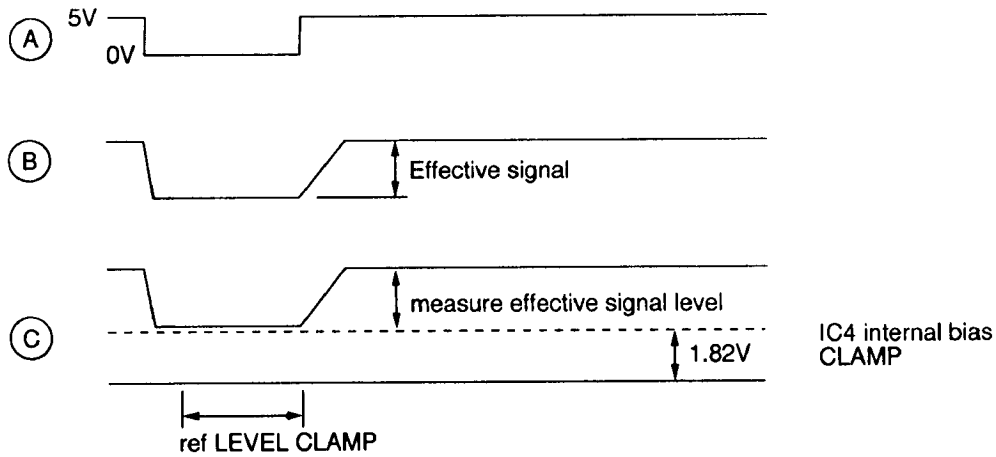
2-13. LED ARRAY

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
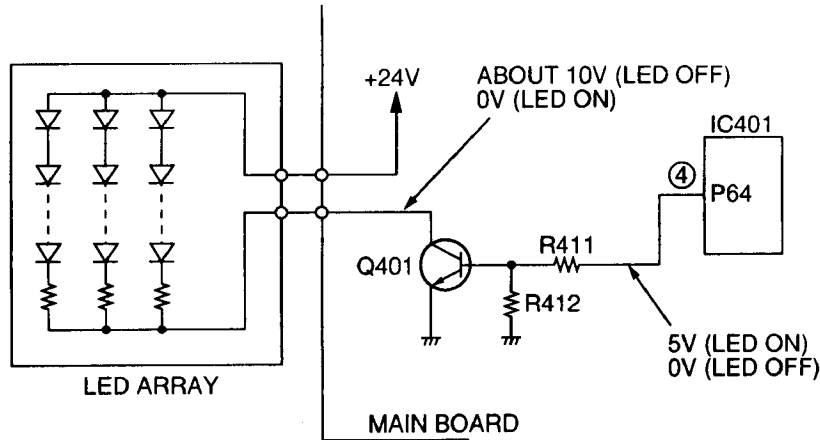
3. FACSIMILE SECTION

3-1. IMAGE DATA FLOW DURING FACSIMILE OPERATION
COPY (Fine, Super-Fine, Half Tone)

1) Line information is read by CCD, by way of route ①, it is inputted to IC404.
2) In IC404, data is adjusted to suitable level for A/D conversion at Analog Signal Processing Section, and by way of route ② it is inputted to A/D conversion (8 bit). After finishing A/D conversion, data is inputted to Image Processing Section by way of route ③, and by way of routes ④ and ⑤, it is stored in RAM as shading data.
3) Draft's information that is read by CCD is inputted to IC404 by way of route ①, and after adjusting to suitable level for A/D conversion by way of route ②, draft's information is converted to A/D (8 bit), and it is inputted to Image Processing Section. The other side, the shading data which flows from RAM by way of routes ⑥ and ⑦, it is inputted to Image Processing Section, and after finishing of draft's information's image processing, white is regarded as "0" and black is regarded as "1", and by way of routes ④ and ⑤, they are stored in RAM.
4) White/Black data stored as above description 3), by way of routes ⑥ and ⑧, it is inputted to P/S converter. White/Black data converted to serial data in P/S converter is inputted to Thermal Head by way of route ⑨ and it is printed out on recording paper.

Note: Standard;   Read 3.58 times/mm
          Fine;   Read 7.7 times/mm
          Super-Fine;   Read 15.4 times/mm

Transmission

1) Same processing of **COPY** items 1) - 3).
2) Data stored in RAM of IC404 is outputted from IC404 by way of routes ⑥ and ⑩, and it is stored in system bus, and by way of route ⑪, it is stored in communication buffer inside DRAM (IC415,IC416).
3) While fetching data stored in communication buffer synchronous with modem, CPU (IC401) inputs data to modem along route ⑫, where it is converted to serial analog data and forwarded over telephone lines via NCU Section.

Reception

1) Serial analog image data is received over telephone lines and input to the modem via NCU section, where it is demodulated to parallel digital data. Then the CPU (IC401) stores the data in the communication buffer DRAM (IC415,IC416) along route ⑪.
2) Data stored in DRAM (IC415,IC416) is decoded by CPU (IC401) by way of route ⑫, and it is stored in DRAM (IC415,IC416) by way of routes ⑬ and ⑤.
3) Same processing of **COPY** item 4).

Block Diagram

IC404

```
                                          ┌──────────┐           ┌──────────┐
                                    ②      │          │     ①     │   CCD    │
                            ┌─────┐◄───────│          │◄──────────│  IMAGE   │
                            │ A/D │        │          │           │  SENSOR  │
                            └──┬──┘        └──────────┘           └──────────┘
                               │③                  ▲
                               ▼                    │              ANALOG
                        ┌────────────┐              │              SIGNAL   PROCESSING
                        │   IMAGE    │                                      SECTION
                        │ PROCESSING │
                        │  SECTION   │
                        └────────────┘
                             ⑦  ④
                                             ┌────────┐
                    ⑬                  ⑤     │        │
                    ⑩                  ⑥     │  RAM   │
                                             └────────┘
                               ⑧
                         ┌──────────┐                   ┌──────────┐
                         │          │         ⑨         │ THERMAL  │
                         │          │──────────────────►│  HEAD    │
                         └──────────┘                   └──────────┘
                            P/S
                            CONVERTER
```

SYSTEM BUS

IC415/416

RAM ⑫ ⑪

IC402

ROM

IC401

CPU

MODEM IC405

NCU

TEL. LINE
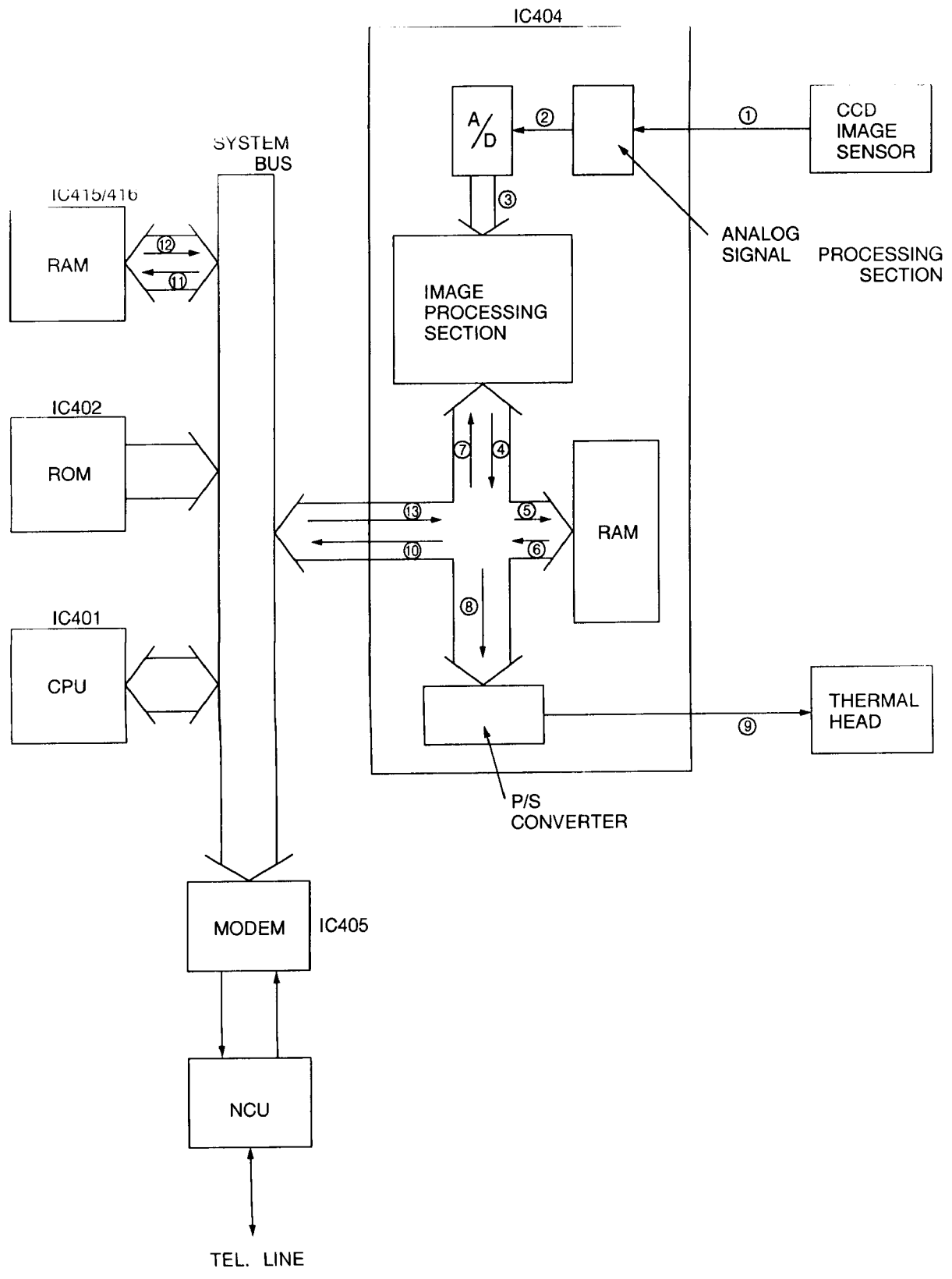
3-2. THERMAL HEAD

1) Function

This unit utilizes state of the art thermal printer technology.

The ink film is chemically processed. When the thermal head contacts this ink film it emits heat momentarily, ink film is melted and transfered to the paper. If this point is continued, litters and/or diagrams appear, and the original document is re-produced.

COMPOSITION OF THE RECEIVE RECORD SECTION (THERMAL RECORDING FORMAT)

Thermal Head

Ink Film

Paper

Platen Roller
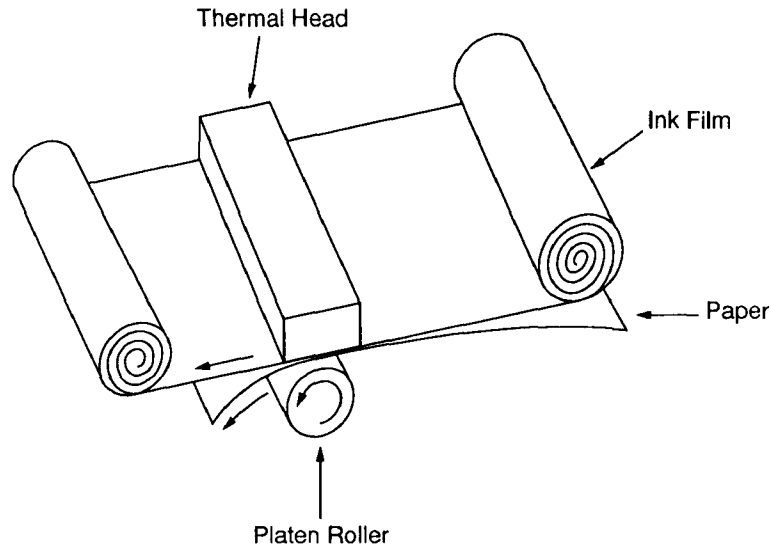
2) Circuit Operation

There are 27 driver ICs aligned horizontally on the thermal head and each one of these ICs can drive 64 heat emitting registers. This means that one line is at a density of 64×27=1728 dots=(8 dots/mm).

White/Black (white=0, black=1) data in one line increments is synchronized at IC417 pin 35 (NEWTHCLK) and sent from IC417 pin 34 (NEWTHDAT) to the shift register of the ICs. The shift registers of the 27 ICs are connected in series, and upon shift of 1728 dot increment, all the shift register become filled with data, and a latch pulse is emitted to each IC from IC404 pin 34 (THLAT).

With this latch pulse, all the contents of shift registers are latched to the latch registers. Thereafter, through the addition of strobe from the IC404 pins (29, 30, 31, 32) only dot of location of black (=1) among latched data activates driver, and current passes to heat emitting body to cause heat emission.

Here the strobe of four lines STB1 to STB4 impresses at intervals of 9.216 msec, as required for one-line printout, for each 1/4th of 27 IC unit (6 unit or 7 unit) upon each time interval divided into four equal increments.

The sequence is as shown below. [Moreover, in the case of strobe width, the resistance value of the thermistor inside the thermal head is constantly detected by IC404 pin 2, and vales from the ROM (IC402) table corresponding to temperatures eliminate temperature changes of density through setting by CPU (IC401).]

When the thermal head is not used, the IC401 (6, TH-POWER) becomes low level, Q407 becomes OFF, RL201 breaks, and the +24 V power supply for the thermal head driver is not impressed to protect the IC.

Circuit Diagram

DIGITAL BOARD

SWITCHING POWER SUPPLY BOARD

THERMAL HEAD

CPU (IC401)

TH-POWER ⑥

Q407

24V RL201 CN301

5V

D202

+5V

CN2

24V

+5V

64DOT   64DOT

NO. 1   NO. 2   NO. 27

ASIC (IC404)

THLAT ㉞   R418   THLAT

THDAT ㉝   R419   THDAT

THCLK ㉟   R417   THCLK

㊸ THLAT
㊷ THDAT ㉞
㊹ THCLK ㉟

GATE ARRAY (IC417)

LATCH REGISTER   LATCH REGISTER

SHIFT REGISTER   SHIFT REGISTER

CN407

STB1 ㉙   R413
STB2 ㉚   R414
STB3 ㉛   R415
STB4 ㉜   R416

ADSEL1 ⑧   R420

C405

AIN2 ②   C407

C406   R422   R421

THERMISTOR

CN407 CN1

Timing Chart

(3.0 μsec×1728)
5.184 msec

CN407

PRINT DATA   NEXT LINE PRINT DATA

① NEWTHDAT

③ NEWTHCLK   3.0 μsec

1728 pcs   320 pcs   1728 pcs

3.0 msec

② THLAT   3.0 μsec

3.0 μsec   about 1.8 msec (at 25°C)

⑦ STB1   TEMPERATURE OF THERMAL HEAD

⑥ STB2

⑤ STB3

④ STB4

9.216msec (Copy)

3-3. READ SECTION

1) Function
- A document is illuminated by the LED array, and the reflections pass through the reduction-projection lens and are imaged on the CCD image sensor.
- The document image is photoelectrically transferred by the CCD image sensor, and an analog image signal corresponding to one line of the document is continuously output.
- The analog image signal enters the image signal processing circuit in ASIC (IC404) and then is coverted into a digital data.

2) Circuit Operation
[Start]
When the START/COPY button is pressed, IC401 pin 4 goes to a high level and Q401 is turned ON, which makes CN406 pin 2 go to a low level and the voltage applied to the LED array to turn on the LED.
F1, F2, FR and FTG signals are output to the CCD board to drive the CCD image sensor. Therefore, when the LED is turned ON, the VIDEO (analog image signal) is output from the CCD board to CN405 pin 7.

CCD Scanner Timing Chart (1 Dot Cycle)
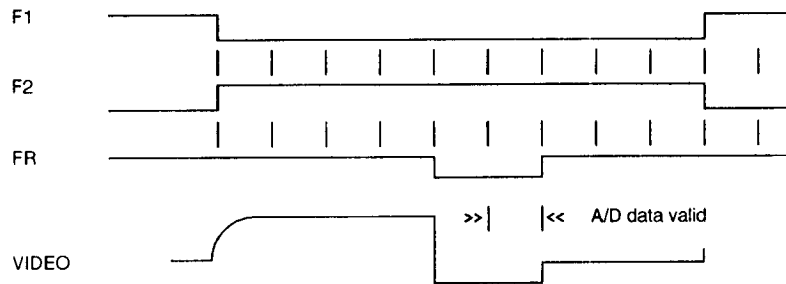
Block Diagram
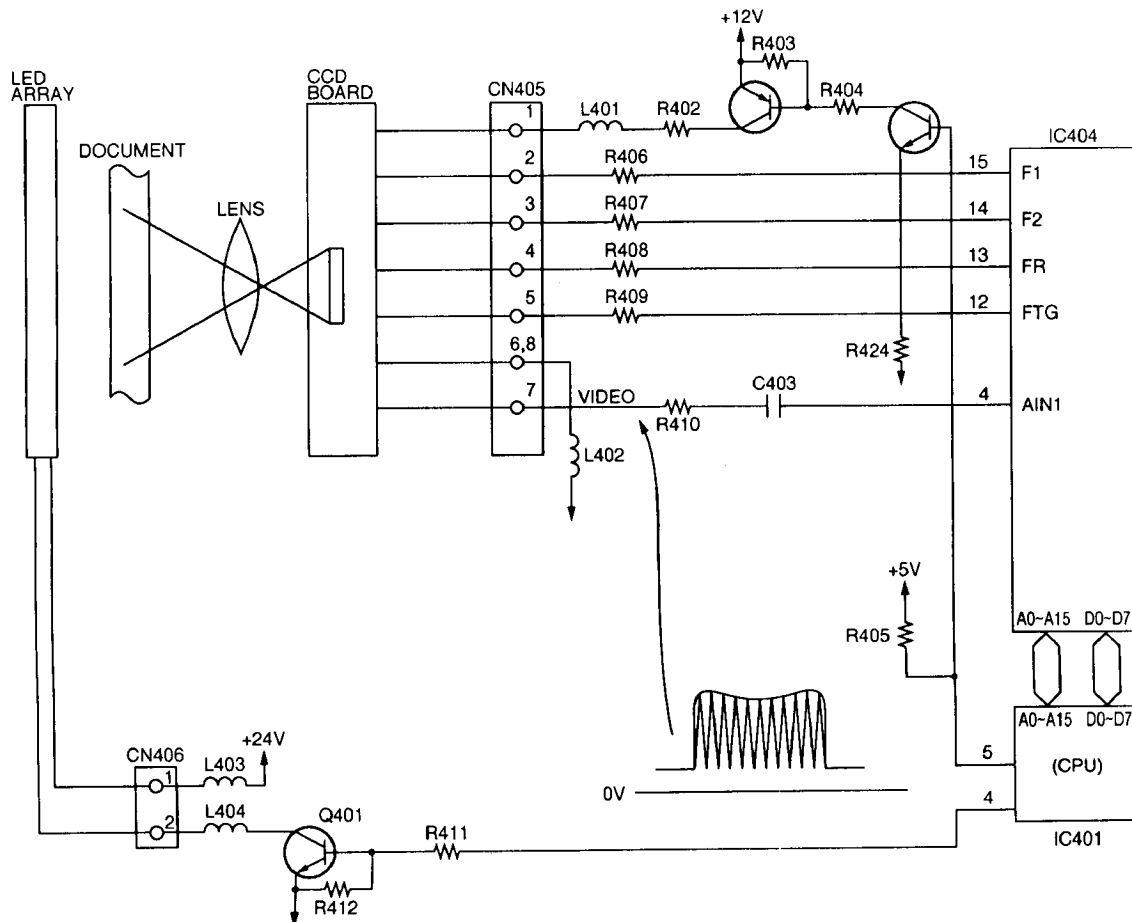
3-4. STEPPING MOTOR DRIVE CIRCUIT

1) Function
Two individual stepping motors are used for transmission and reception. They feed document or recording paper synchronized for reading or printing.

2) TX Motor
During motor drive, gate array IC404 pin 27 becomes high level, driver IC406 pin 14 becomes low level, and Q403 go ON as a result, +24 V is supplied to the motor coil.
Stepping pulses are output form gate array IC404 pins, 23~26, causing driver IC406 pins, 10~13 drives TX Motor Coil. The motor coil is energized sequentially in 2 phase increments, which causes a 1-step rotation. Rotation of 1-step feeds 0.13mm of recording paper or document paper.
Timing chart is below.

Stepping Motor Timing Chart

- 2-2 Phase   - 1-2 Phase

TM0

TM1

TM2

TM3

1/217 (sec)   1/217 (sec)
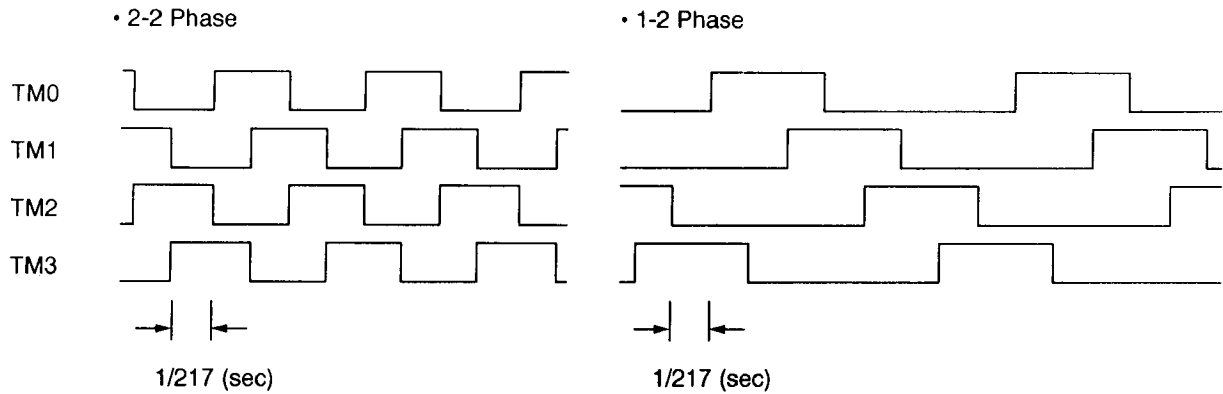
Stepping Motor Drive Mode

Function	Mode	Phase Pattern	Speed
Copy	Fine	1-2	217 pps
FAX	Standard	2-2	217 pps (MAX.)
	Fine or Half tone	1-2	217 pps (MAX.)
Paper Feed	———	2-2	217 pps
Stand-by	———	All phase current off.	Stopped

Circuit Diagram
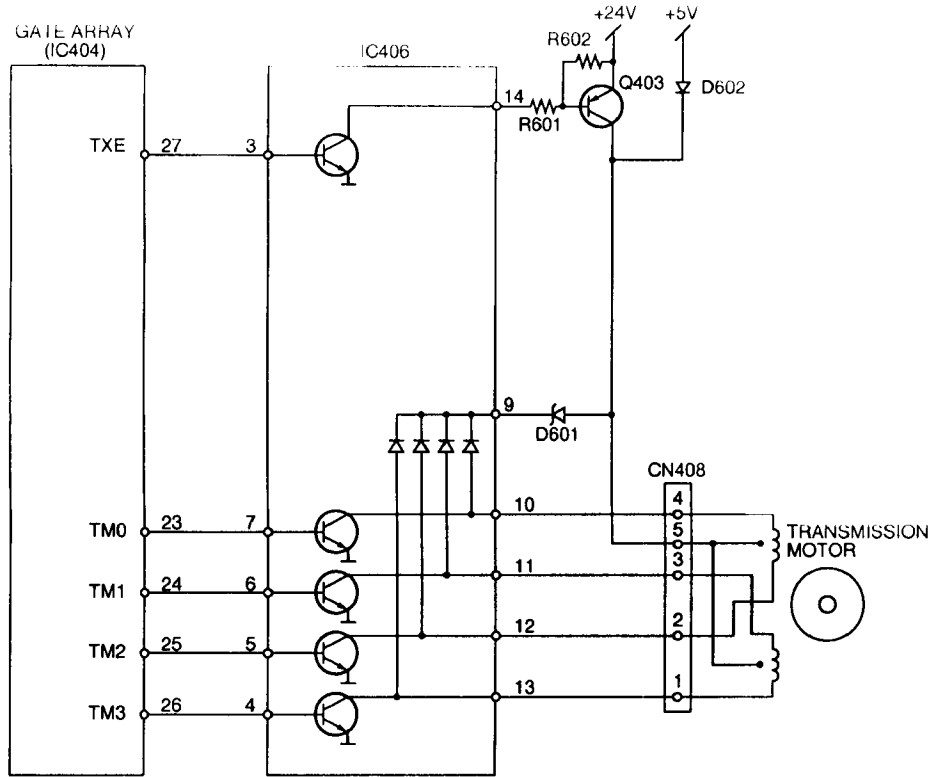
When the motor is stopped long time (about 70~80 msec) at receive mode, gate array IC404 pin 27 becomes low level and driver IC406 pin 14 becomes high level. This causes Q403 to also go OFF, and instead of +24 V, +5 V is supplied through D602 so that the motor is held in place. When the system is in the stand-by mode, all of the motor drive transistor is OFF. Therefore the motor current is OFF.

3) RX Motor

RX motor is used to transfer the recording paper and ink ribbon and its torque is higher than that of TX motor. Therefore, TX motor driver uses the transistor array but RX motor driver uses the chopper IC of current drive type.

The inside of chopper IC and the peripheral circuit diagram are shown below.

Circuit Diagram
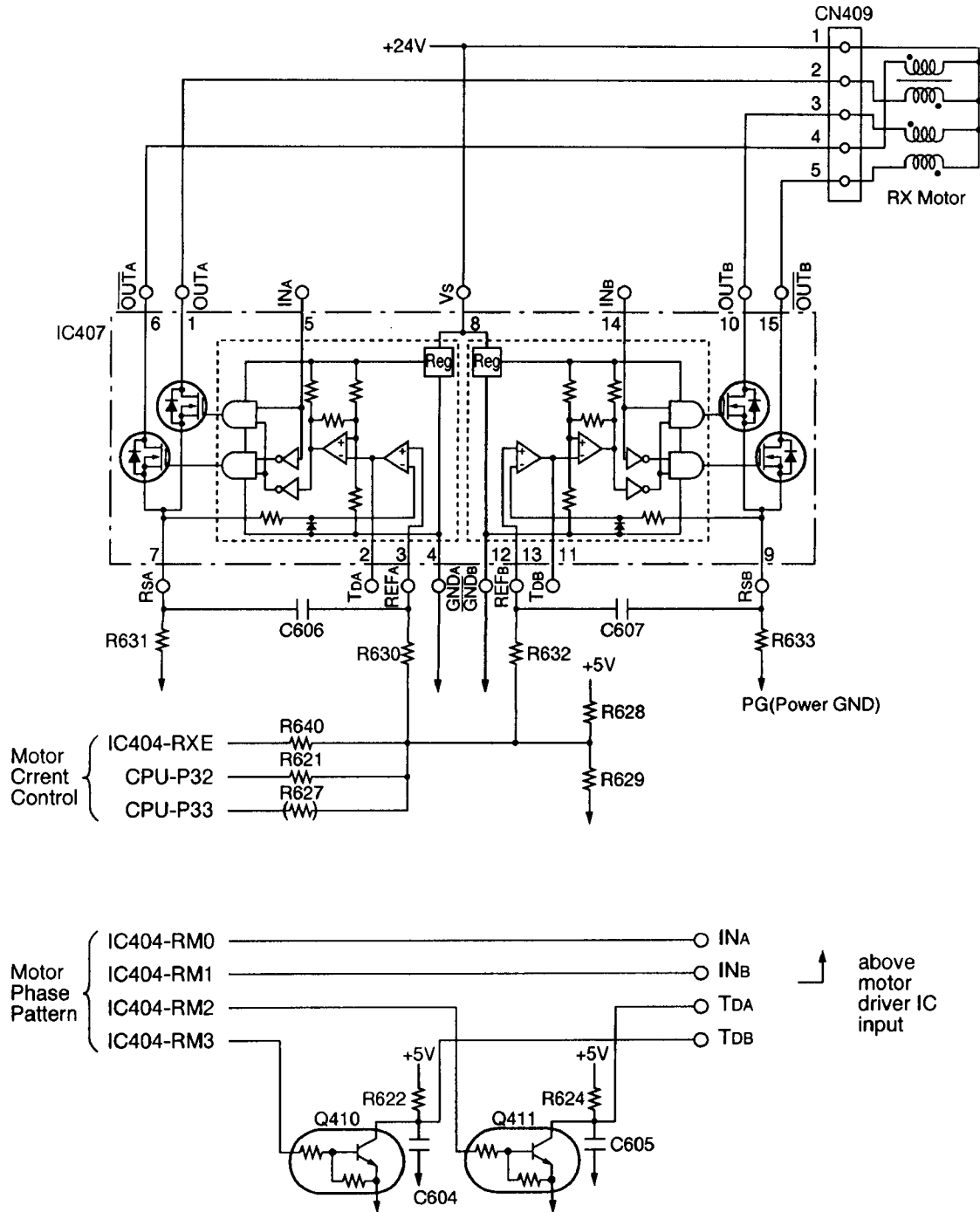
Stepping Motor Timing Chart

• 2-2 Phase   • 1-2 Phase

RM0

RM1

RM2

RM3

1/217 (sec)   1/217 (sec)
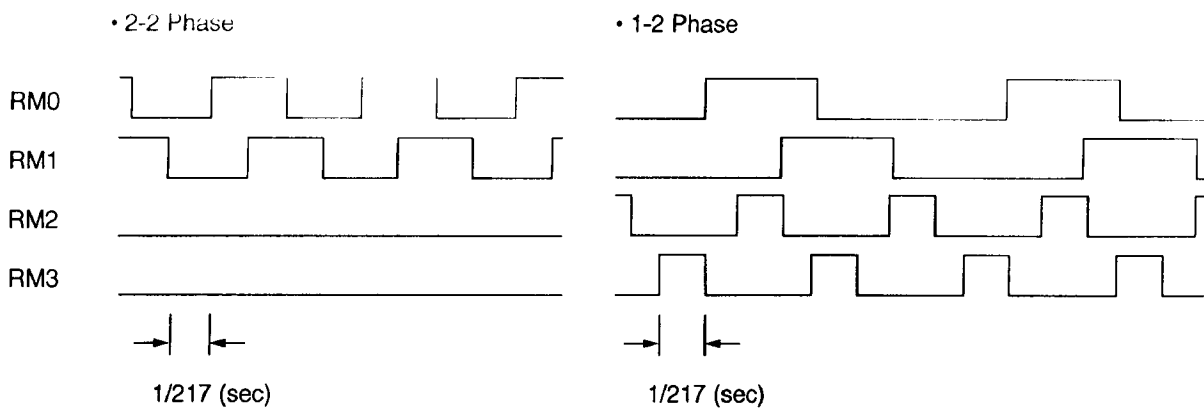
Stepping Motor Drive Mode

Function	Mode	Phase Pattern	Speed
Copy Demonstration Print	Fine	1-2	217 pps
FAX	Standard	2-2	217 pps (MAX.)
	Fine or Half Tone	1-2	217 pps (MAX.)
Paper Feed ※	————	1-2 or 2-2	217 pps or 326 pps
List Print	————	2-2	217 pps
Stand-by	————	All phase current off.	Stopped

※ Paper feed include film feed at cover close, non printing area feed, feed for top of page, error feed....etc.

Motor Current Control

		Motor Drive	Motor Stop
CPU Port	P 32	High level	Low level
	P 33	Unused	Unused
Drive Pattern	RXE	High level	Low level
	RM0	refer to timing chert	Low level
	RM1	refer to timing chert	Low level
	RM2	refer to timing chert	High level
	RM3	refer to timing chert	High level

3-5. SENSORS AND SWITCHES

KX-F1200 has many paper, film handring and check cover sensor. All of sensor shows below.

Sensor Circuit Location	Sensor	Sensor name	Mainly LCD Error Message at sensor fail
Operation Panel	PI302	Document	「CHECK DOCUMENT」
	PI301	Document Read Position	「REMOVE DOCUMENT」
Digital PCB & Sensor PCB	PS904	Paper Set	「OUT OF PAPER」
	PS902	Paper Top	「CHECK CASSETTE」
	PS905	Paper Out	「PAPER JAMMED」
	PS901	Film End	「FILE EMPTY」
	SW1	Cover	「CHECK COVER」

※ See TEST FUNCTION - SENSOR CHECK SECTION for sensor test. (c.f. #815 and #801 of Service Mode test.)

Sensor Location
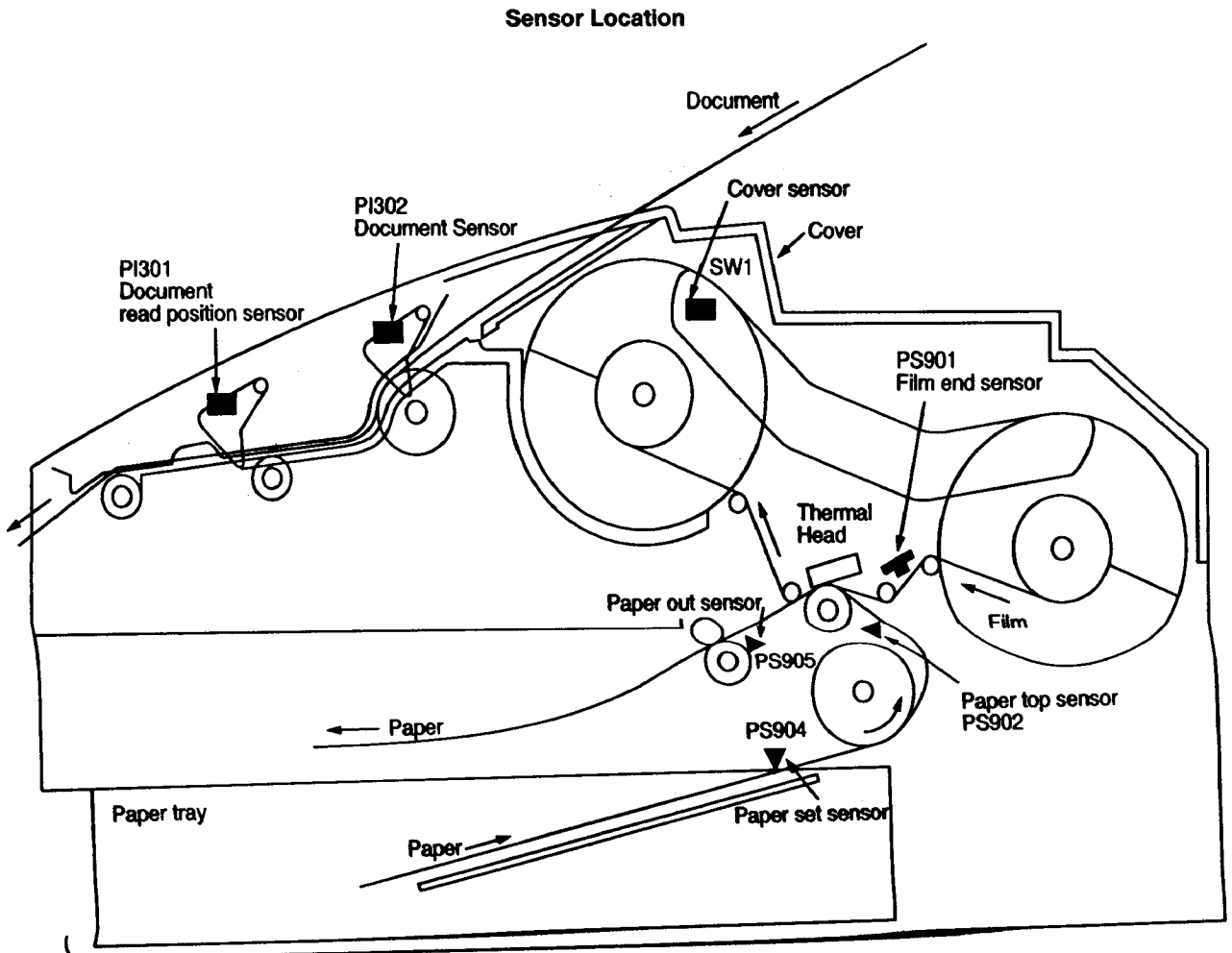
[Paper Set Sensor (PS904)]

When recording paper is present, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of IC401-45 pin (CPU) becomes low level. When the set runs out of recording paper, the shelter plate shuts the sensor light, the phototransistor becomes OFF, and the input signal of IC401-45 pin becomes high level.

Sensor P.C.B.   Digital P.C.B.
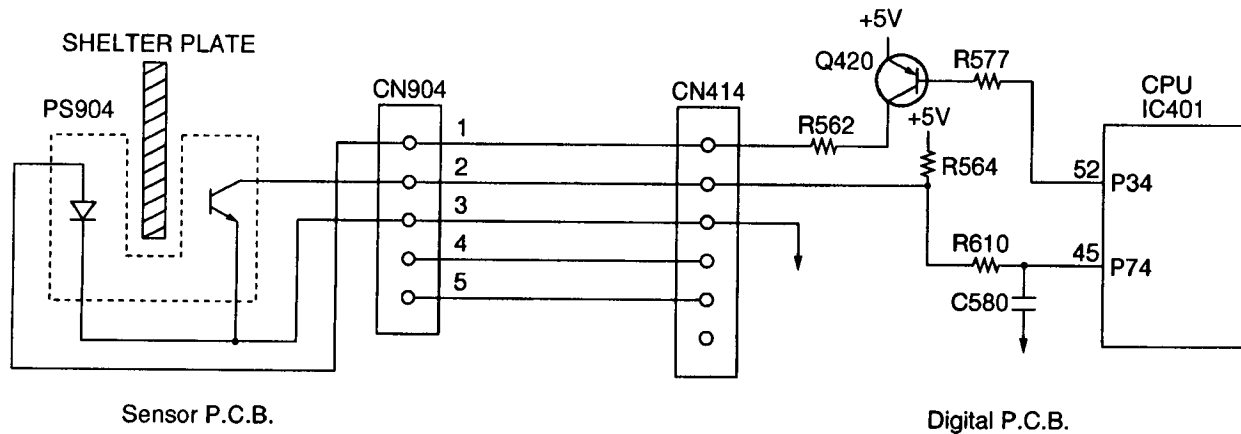
	Phototransistor	Signal (IC401-45 pin)
Set Recording Paper	ON	Low level
No Recording Paper	OFF	High level

[Paper Out Sensor (JAM Sensor) (PS905)]

When the recording paper is jammed, the shelter plate shuts the sensor light, the phototransistor becomes OFF and the input signal of IC401-406 (CPU) becomes high level. Usually, the shelter plate passes the sensor light, the phototransistor, becomes ON, and the input signal of IC401-46 pin becomes low level.
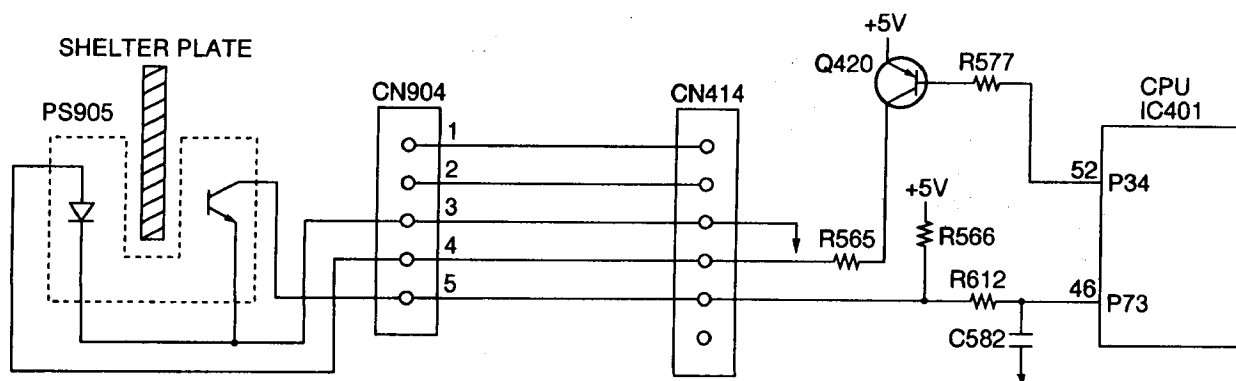
	Phototransistor	Signal (IC401-46 pin)
NO JAM	ON	Low level
JAM	OFF	High level

[Paper top Sensor (PS902)]

When the recording paper is loaded to print head, the shelter plate shuts the sensor light, the phototransistor becomes OFF. And the input signal of IC401-44 (CPU) becomes high level. Usally, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of IC401-44 pin becomes low level.

Sensor P.C.B.   Digital P.C.B.
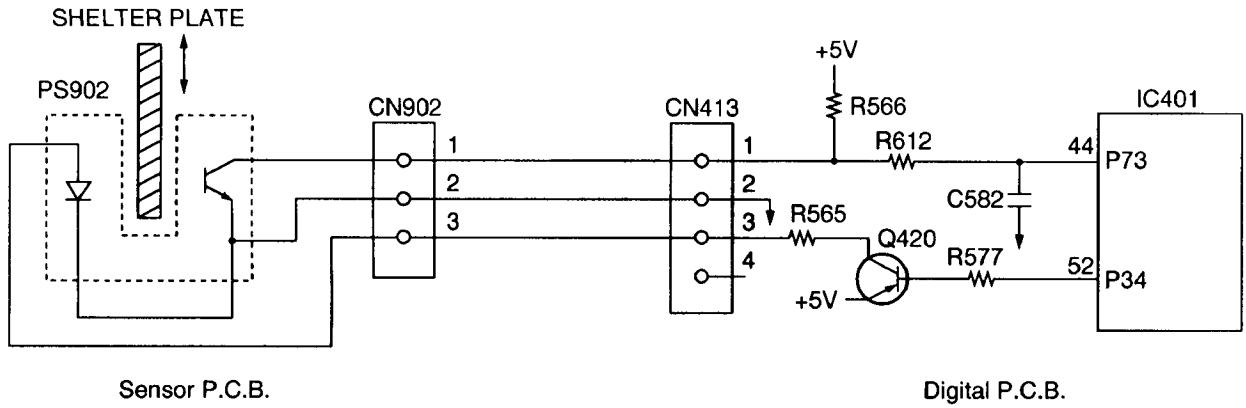
	Phototransistor	Signal (IC401-44 pin)
Paper Pass	OFF	High level
No Paper	ON	Low level

All interrupt Sensor LED current is controlled by IC401-52 pin.
(e.g. PS904, PS902, PS905)

[Cover Sensor (SW1)]

When the upper cabinet is closed, SW1 becomes OFF and IC401-47 pin goes to high level. Vice versa, cabinet is open, SW1 becomes ON and IC401-47 pin goes to Low level.
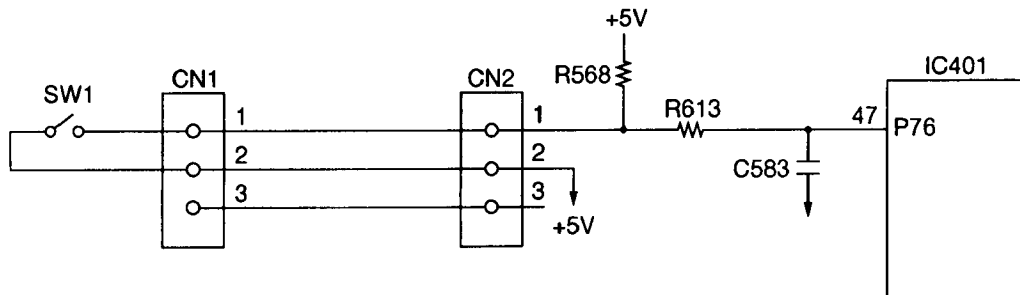
[Read Position Sensor (PI301)]

When an document is brought to read position, the shelter plate shuts the sensor light, the phototransistor becomes OFF, and the input signal of IC301-15 pin (Operation) becomes high level. When there is no document at the read position, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of IC301-15 pin (Operation) becomes low level.
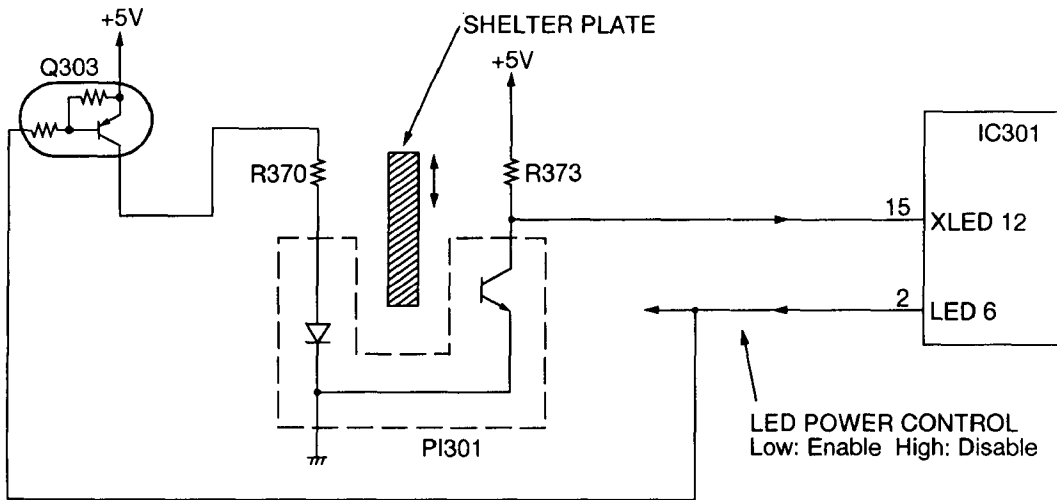
Operation Board

	Phototransistor	Signal (IC301-15 pin)
Out of the Read Position	ON	Low level
At the Read Position	OFF	High level

[Document Sensor (PI302)]

When a document is seen, the shelter plate shuts the sensor light, the phototransistor becomes OFF, and the input signal of IC301-19 pin (Operation) becomes high level. When there is no document, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of IC301-19 pin (Operation) becomes low level.
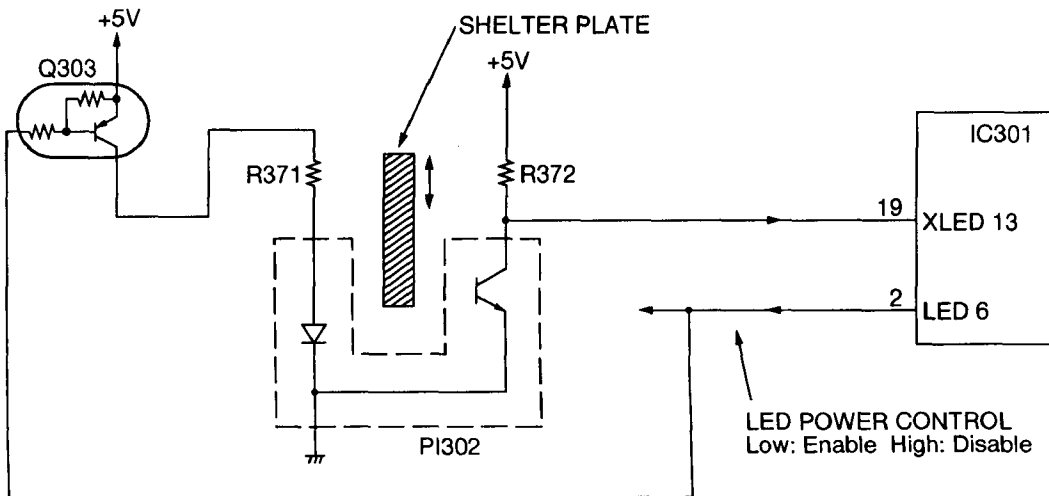
Operation Board

	Phototransistor	Signal (IC301-19 pin)
No Document	ON	Low level
Set Document	OFF	High level

[Film End Sensor (PS901)]

This sensor detects empty ink films by using a reflective type sensor. Normally the ink film coating (color) is black.
When the film is almost empty, a silver colored band will appear on the sensor area.
When film empty is detected, the black and silver level on this sensor is digital data in the A/D converter of the CPU (IC401).
It is necessary to record the black standard level into the memory beforehand. When you're changed the digital board and film end board, it is necessary to perform the resetting.
The reset method is to set the ink film black part. (While feeding the ink film, change the setting. You must have enough space for the black part.) Once in the service mode, press #9000, ✻ ,#802, then START button. The setting is complete.
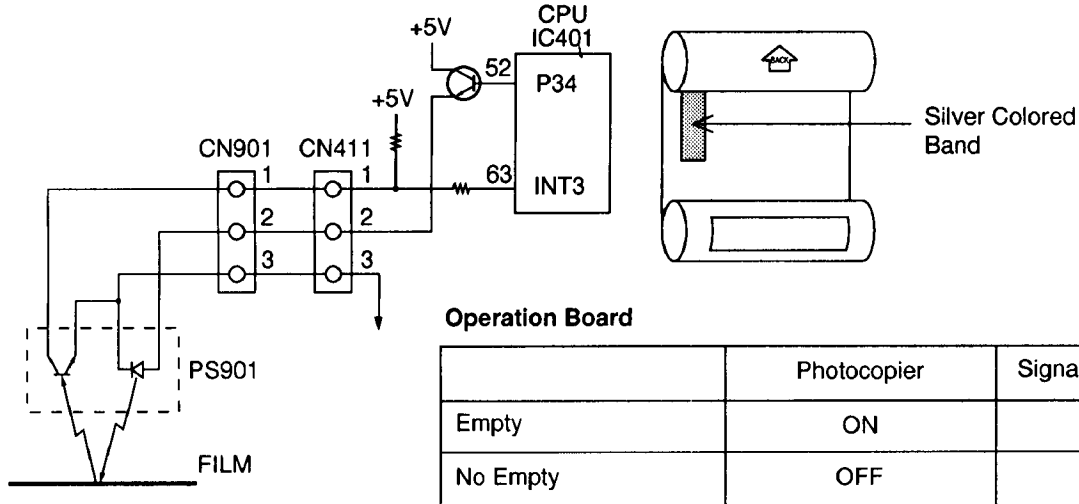
Operation Board

	Photocopier	Signal (IC401-63 pin)
Empty	ON	Low level
No Empty	OFF	High level

4. MODEM SECTION

4-1. FUNCTION

The unit uses a 1 chip modem (IC405), 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, while 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 (CCITT). This 1 chip modem (IC405) has hardware which sends and detects all of the necessary signals for FAX communication.
It can be controlled by writing commands from the CPU (IC401) to the register in the modem (IC405).
This modem (IC405) also sends DTMF signals, generates a call tone (from the speaker), and detects a busy tone and dial tones.

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

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

2) Definition of Each Group
   • Group I (G1)
   A-4 size documents official without using formats which reduce the band width of 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, 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)
   Method of suppressing redundancy in the image signal prior to modulation is used. A-4 size document is sent within about one minute.
   Determined in 1980.
   • Group IV (G4)
   Transmission is via data network. 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 communications 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.

```
                         Message Transmission
                         |←————→|
  | Phase A | Phase B | Phase C | Phase D | Phase E |
  |         |←——————— Facsimile Procedure ———————→|        |
  |←————————————— Facsimile Call —————————————————→|
  |————→
        Progress derection of operation
```
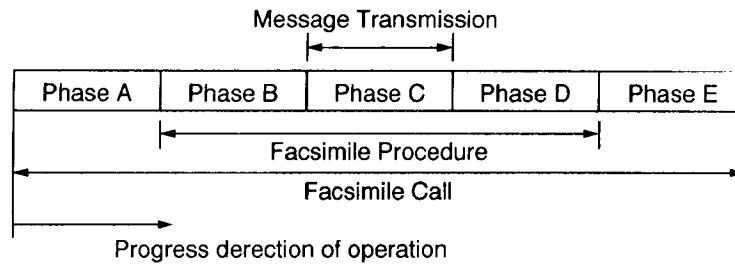
Phase A : Call setting
Call setting can be manual/automatic.
Phase B : Pre-message procedure
Phase B is a pre-processing procedure and a sequence for confirming status of terminal, transmission route, etc. and for terminal control. It implements terminal preparation status, determines and displays terminal constants, confirms synchronization status, etc. and prepares for transmission of facsimile messages.
Phase C : Message transmission
Phase C is the procedure for transmission of facsimile messages.
Phase D : Post message procedure
Phase D is the procedure for confirming that the message is completed and received. In the case of continuous transmission, return is made repeatedly to phase B or phase C for transmission.
Phase E : Call retrieval
Phase E is the procedure for call retrieval, that is, for circuit disconnection.

4) Concerning Transmission of 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 functions at the sending and receiving sides are confirmed, transmission mode is established, and transmission and reception are synchronized.
Image transmission time:
This is the time required for 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 Standard

Item	Telephone Network Facimile
	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 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)

In G3 Facsimile communication, this is the procedure for exchange of control signals between the sending and receiving machines both before and after transception of image signals.

Control signals at 300 bps FSK are: 1850 Hz...0, 1650Hz...1.

An example of binary process in G3 communication is shown below.
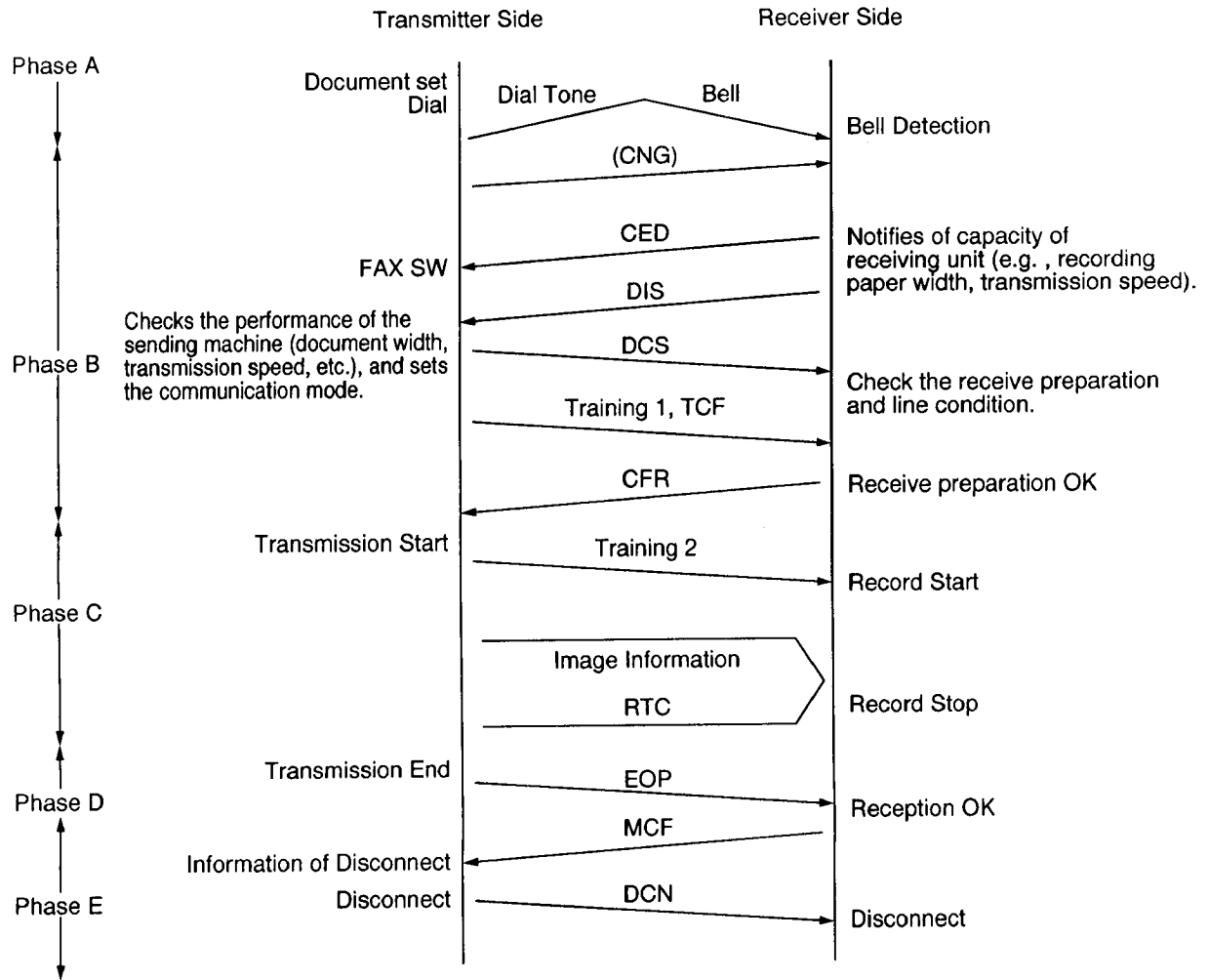
Explanation of Signals

Control signals are comprised mainly of 8-bit identification signals and 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 of capacity of receiving unit

The added data signals are as follows.

(Example)
Signal.....DCS (Digital Command Signal)
Identification Signal Format.....X1000001

(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	

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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 signalling rate	Data signalling 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 new modulation system	
14	Reserved for 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 scan line length of 215 mm ± 1%	1728 picture elements along scan line length of 215 mm ± 1%
(0, 1)	1728 picture elements along scan line length of 215 mm ± 1% and 2048 picture elements along scan line length of 255 mm ± 1% and 2432 picture elements along scan line length of 303 mm ± 1%	2432 picture elements along scan line length of 303 mm ± 1% and
(1, 0)	1728 picture elements along scan line length of 215 mm ± 1% and 2048 picture elements along scan line length of 255 mm ± 1%	2048 picture elements along scan line length of 255 mm ± 1% and
(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

Function:
Notifies of capacity of 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 at 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 1216 picture elements along scan line length of 151 mm ± 1%	0	Middle 1216 elements of 1728 picture elements
35	Recording width capability 864 picture elements along scan line length of 107 mm ± 1%	0	Middle 864 elements of 1728 picture elements
36	Recording width capability 1728 picture elements along scan line length of 151 mm ± 1%	0	Invalid
37	Recording width capability 1728 picture elements along scan line length of 107 mm ± 1%	0	Invalid
38	Reserved for future recording width capability	0	
39	Reserved for future recording width capability	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	————	Fixed pattern is transmitted to receiving side at 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 sending side that TCF has been properly received. If TCF is not properly received, FTT (Failure To Train) X0100010 is relayed to sender. Sender then reduces transmission speed by one stage and initiates training once again.
Training 2	————	Used for reconfirmation of receiving side the same as training 1.

Signal	Identification Signal Format	Function
Image Signal	Refer to next page.	———
RTC (Return to Control)	———	Sends 12 bit (0...01 × 6 times to receiver at same speed as image signal and notifies of completion of transmission of 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, sender transmits image signal of 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	Output in the case of operator call from receiver.

(2) Redundancy Compression Process Coding Mode
This set 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

(a) Document — Basic Technique of Facsimile

(b) Part of document — Facsimile
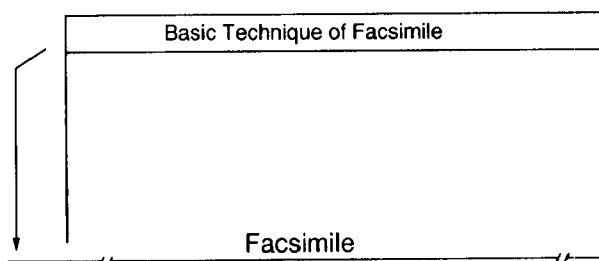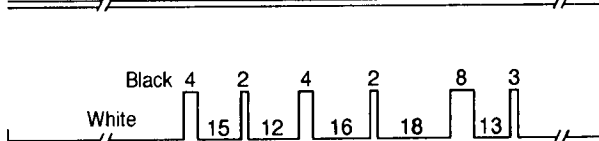
(c) Run length and image signals equivalent to (b)

Black 4 2 4 2 8 3
White 15 12 16 18 13

(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)

4-2. MODEM CIRCUIT OPERATION

The modem (IC405) has all the hardware satisfying the CCITT standards mentioned previously.
When the gate array IC404 (73) is brought to low level, the modem (IC405) is chip-selected and resistors inside IC are selected by select signals from gate array (IC404) LA0-LA4, commands are written through data bus, and all processing is controlled at the CPU (IC401) according to ITU-T procedures. Here the signal $\overline{INT}$ dispatched from $\overline{IRQ}$ (pin 52 of IC405) to the CPU (IC401) and gate array IC404 is output when preparation for acceptance of transmission data is OK and when demodulation of reception data is complete; the CPU (IC401) implements post processing.
This modem (IC405) has an automatic application equalizer. With training signal 1 or 2 at time of G3 reception, it can automatically establish the optimum equalizer. Also, the modem (IC405) generates an internal clock of 24.00014 MHz by means of an external crystal oscillator (X1).

1) Facsimile Transmission
The digital image data on the data bus is modulated in the modem (IC405), and sent from pin 44 via amplifier IC413 (6→7), the NCU section to the telephone line.

IC405(44) → C508, C509 → R502, R503 → IC413(6 → 7) → CN401(1) → C146 → R192 → IC7(3 → 2) → NCU Section
[R30 → C29 → IC14 (6 → 7) → R20 → T1] → Line1　　　　※Line2 is the same. (IC7 → IC15 → T2 → Line2)

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, internal the equalizer circuit reduces the image signals to the long-distance receiving level.
It 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 → NCU Section → CN401(2) → C521 → R509, R508 → IC413(2 → 1) → C519 → R507 → IC405(45)

3) DTMF Transmission (Line send)
When dialing with handset or speaker-phone, DTMF signal is output from DTMF generator [IC4 (Analog Board)]. When dialing with FAX, DTMF signal is output from Modem [IC405 (Digital Board)].

4) Busy/Dial Tone Detection
The path is the same as for FAX receiving. When it is detected, the carrier detect bit of the resistor in the modem (IC405) becomes 1, and this status is monitored by CPU (IC401). (Auto FAX dialing only)
When dialing with handset or speaker-phone, it is detected by IC13 (Analog Board) and it is output to I/O port [IC1 (Analog Board).

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Circuit Diagram
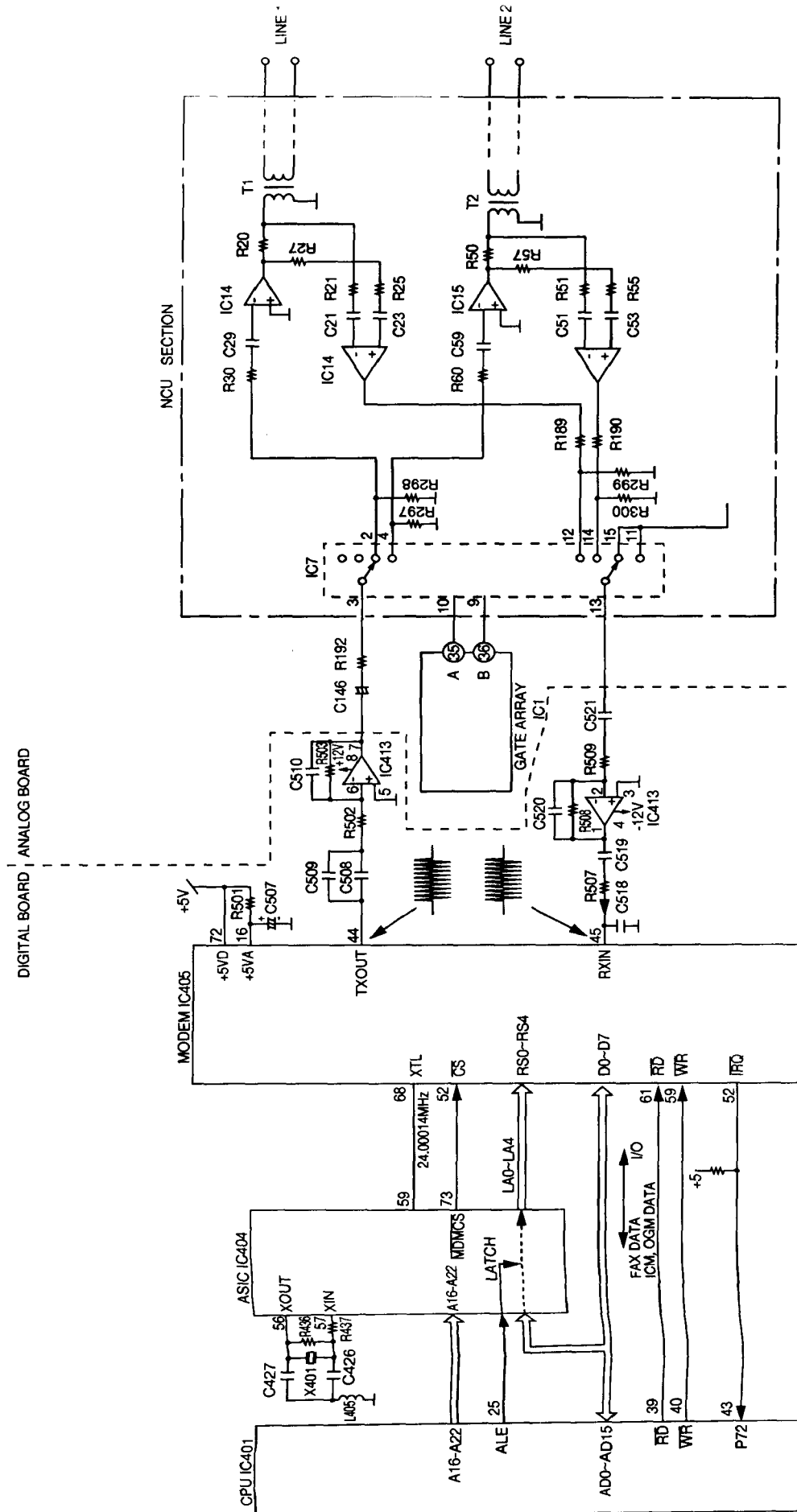
5. EXPLANATION OF ANALOG SECTION BLOCK DIAGRAM

1) Function
The analog section serves as interface with the telephone line. The digital board (IC405) for transmission and reception of FAX signals and reception of DTMF for remote signal detection. Switching between the digital board (IC405) and the other sections is executed by means of a multiplexer in the NCU section. The control signals to the individual analog sections are outputted mainly from the gate array IC1, and the status information for the various sections is also held in the gate array IC1. Simple explanations for the various sections are given below.

2) Circuit Operation

[NCU Section]
Interface with the telephone line. This is composed of bell detection circuit, CPC detection circuit, pulse dial generation circuit, amplifier circuit for line transmission and reception, sidetone circuit multiplexer circuit, etc. See below for details.

[TAM IC (IC10)]
This is a IC for Auto Level Control and VOX detection from the line and Mic signals, voices.
The Digital TAM Unit for OGM and ICM recording and playback, the microphone, are connected this IC.

[Modem (IC405)]
This is used for FAX signal tone modulation, DTMF signal transmission, and reception and line transmission beep generation.

[Speech Network IC (IC2)]
This is special IC combining the hands-free and handset circuits in 1 chip. The handset and microphone are connected to this circuit. At the time of hands-free operation, the SP output is outputted after passage through the power amplifier (IC12) and the key tone and the pulse dial monitor tone output from IC404 (Digital Board) and IC1 (Analog Board) are given as input to this IC and become the monitor tone at the time of hands-free handset dialing.

[Cross Point Mixer IC (IC3)]
This IC combines 6 input analog signals and 6 output analog signals conveniently with using 36 switches.
This connects signals of 2 lines and ITS and TAM signals, and determines signal circuit. Switch control is conducted by serial data from IC1.

[DTMF Generator IC (IC4)]
This generates DTMF signal, and is controlled by IC1.
This is added for the case of using 2 lines at the same time (e.g. Line1:Tel, Line2:FAX).
When dialing with handset or speaker-phone, DTMF is dialed by this IC. In the case of FAX, it is dialed by Modem.

[Voice Synthesizer IC (IC6)]
This IC has a voice message.
Message:
"Hello, no one is available to take your call now, and our machine is busy on another call, please call back in a few minutes. Thank you."

While one line is busy for receiving TAM or FAX, this machine plays this message for TAM or FAX on another line.

[In Use Detect Section]
This section checks line voltage of Line1 and Line2, and detect ON-HOOK or OFF-HOOK of paralleled telephones.
This is constructed by a line voltage detection unit, a detected voltage change unit and a power supply unit (DC-DC converter).

Analog Unit Block Diagram

LINE 1

LINE 2

5VT

LINE 1 NCU SECTION

IN USE DETECT

LINE 2 NCU SECTION

IN USE DETECT

DC-DC CONVERTER

D-TAM BACK UP SECTION

RX
TX
RX (FAX)
TX (FAX)

RX
TX

TX (FAX)
RX (FAX)

MUTI-PLEXER

MODEM IC405

DIGITAL BOARD

6×6 CROSS POINT MIXER IC3

VOICE SYNTHE-SIZER IC6

BEEP ALARM BELL

TX
RX

DTMF GENERA-TOR IC4

TONE DETECT IC13

TAM IC IC5

DIGITAL TAM UNIT

SP AMP IC12

GATE ARRAY IC1

I / O PORT

SPEECH NETWORK IC IC2

HANDSET

MIC

5VT

SPEAKER

5VT

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6. NCU SECTION

6-1. GENERAL

This section is the interface with the telephone line and external telephone. It is composed of remote FAX activation circuit, bell detection circuit, pulse dial circuit, auto disconnect circuit, line amplifier and sidetone circuits and multiplexer.

6-2. REMOTE FAX ACTIVATION CIRCUIT

1) Circuit Operation
After detecting the bell signal, another telephone connected to same line activate the set to FAX mode by using DTMF signal.

Line 1/Line 2 → RLY 1 → T4 → IC8 (15 → 2) → C76 → R92 → IC22 (2 → 1) → R113 → Q22 (C → E) → IC7 (15/11 → 13) → CN1 (2) → Modem

6-3. BELL DETECTION CIRCUIT

1) Circuit Operation (ex. Line1)
Signal waveform of each section are indicated below. Signal (low level section) input to pin 76 of gate array IC1 are read out at CPU and judged as bell.

Between Tip and Ring (Line1)   about 150V   48V

Between PC1(1) and (2)   1.5V   0V   1.5V

PC1(4)/Gate Array IC1 (76)   5V
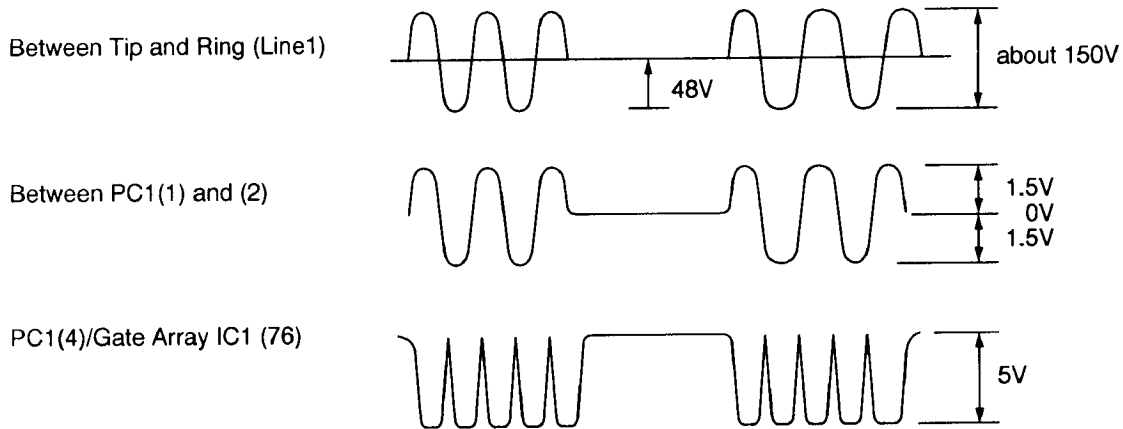
(Line1)
Tip → L1 → C1 → PC1(2 → 1) → R1 → L2 → Ring

※Line2 is the same as above.

6-4. PULSE DIAL CIRCUIT

1) Circuit Operation (ex. Line1)
In OFF-HOOK Condition, the photocoupler PC2 pin (2) is low level by IC1 pin (98) and PC2 pin (4) is low level so Q1 is ON. At the time of pulse dial operation, PC2 pin (2) becomes high level by IC1 pin (98), so that PC2 pin (4) becomes high level, and Q1 becomes OFF line ON/OFF by high/low control for IC1 pin (98) makes pulse dial operation possible.

IC1 (98) High Level → PC2 (2) High level → PC2 (4) High Level → Q1 OFF → Telephone Line (Line1)

※Line2 is the same.

6-5. AUTO DISCONNECT CIRCUIT

1) Function:
This circuit is used to detect the fact that another telephone connected to the same line is OFF-Hook while the unit is in the time of TAM'S answering operation or line hold operation.

2) Circuit Operation: (ex. Line1)
Tip (Ring) → REC1 → Q1 → C8 → D1 → R10 → Q2 → PC3.
During this interval C8 charges and the base of Q2 becomes high, and PC3 pin(2) becomes low, causing PC3 to go ON.
If a parallel-connected telephone or external telephone is put into an OFF-HOOK status,, charge ceases to flow C8 and the base of Q2 becomes low, causing PC3 to go OFF.
When a line is connected, Q2 and PC3 go ON, causing pin 99 of IC1 to go low. When the line is disconnected, Q2 and PC3 go off, causing pin 99 of IC1 to go high.

6-6. LINE AMPLIFIER AND SIDE TONE CIRCUIT

1) Circuit Operation (ex. Line1)
The reception signal received as output from the line transformer T1 is given as input to R21, C21 to IC14 pin (2), and it is inputted to the reception system at an amplifier gain 12.5dB from pin 1 of IC14.
The transmission signal given as input to IC14 pin(6) is amplified to about 20dB, it is outputted form pin 7 of IC14 and it is transmitted to T1 via R20. Without R27, R25, C23, the transmission signal would return completely to the reception amplifier via R21. Here, the signal output from IC14 pin(7) passes through R27, R23, IC23 and enters the amplifier IC14 pin(3), a signal with the reverse phase of the transmission signal is formed at IC14 pin(1), and this is used to cancel the return part of the transmission signal. This is the side tone circuit.

```
Transmission Signal: IC7 (2) → R30 → C29 → IC14 (6)(7) ┬→ R20 ┬→ T1 → Telephone Line
       (FAX)                              ↑             │      │
                                          │            R27     │
Transmission Signal: IC3 (15) → R29 → C28 ┘             │      │
       (Voice)                                          ↓      │
                                                       R25     │
                                                        │   (Side Tone)
                                                        ↓      │
                                                       C23     ↓
                                                        │
                                                        ↓
                                                   IC14 (3)(1)
                                          ┌─────────────┴──────────┐
                                          ↓                        ↓
Reception Signal: Telephone Line → T1 → R21 → C21 → IC14(2)(1) ┬→R189 (FAX Signal)
                                                               └→R173 (Voice Signal)
```
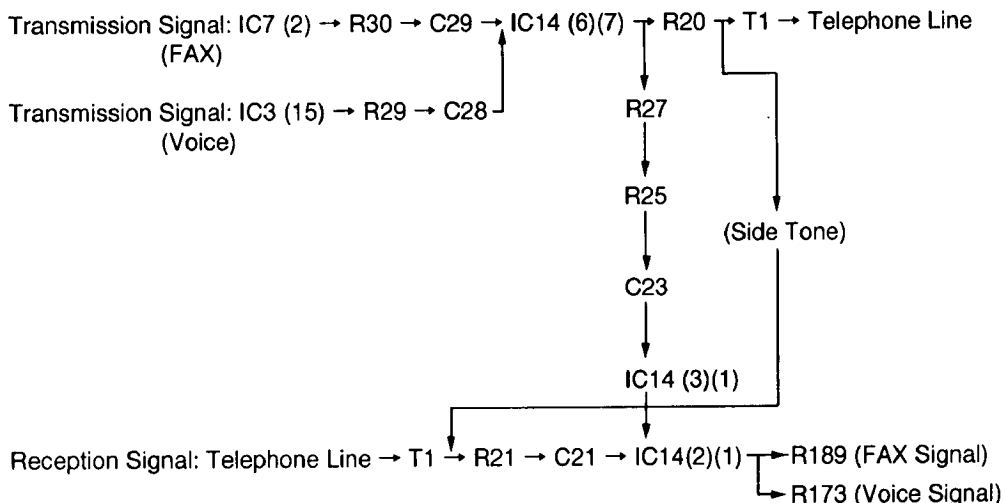
6-7. MULTIPLEXER (IC7)

This multiplexer is used for switching and selecting the transmission and reception system of the FAX circuit (modem).

Multiplexer (IC7)

Control	Switch Mode		Operation
A (Pin 10)=Low B (Pin 9)=Low	Pin 1-3 Pin 12-13	ON	Line1 FAX Reception
A=High B=Low	Pin 5-3 Pin 14-13	ON	Line2 FAX Reception
A=Low B=High	Pin 2-3 Pin 15-13	ON	Line1 FAX Transmission
A=High B=High	Pin 4-3 Pin 11-13	ON	Line2 FAX Transmission

A: IC1 Pin 35

B: IC1 Pin 36

Control Mode for NCU Section Table

Operation	Line	Q1 BREAK L1	Q4 BREAK L2	IC7 A	IC7 B	RLY3 CONF	RLY1	BELL L1	BELL L2	CPC L1	CPC L2	DCN L1	DCN L2
		Control Input to NCU						Control Output from NCU					
Wait Condition		1	1	—	—	0	—	—	—	—	—	—	—
Bell Input	1	1	—	—	—	0	—	1/0	—	—	—	—	—
	2	—	1	—	—			—	1/0	—	—	—	—
FAX Transmit	1	0	—	0	1	0	—	—	—	—	—	—	—
	2	—	0	1	1								
Receive	1	0	—	0	0	0	—	—	—	—	—	—	—
	2	—	0	1	0								
Pulse Dial	1	0/1	—	—	—	0	—	—	—	—	—	—	—
	2	—	0/1										
CPC Input	1	0	—	—	—	0	—	—	—	0→1	—	—	—
	2	—	0								0→1		
Parallel TEL Off-Hook During Line Hold or TAM Answering	1	0	—	—	—	0	—	—	—	—	—	0→1→0	—
	2	—	0									—	0→1→0
Parallel TEL Off-Hook During On-Hook	1	1	—	—	1	0	0	—	—	—	—	—	—
	2	—	1	—	1		1						
Conference		0	0	—	—	1	—	—	—	—	—	—	—

1: High Level(5V)   0: Low Level (0V)

6-8. CONFERENCE

When using handset or speaker-phone, conference (tripartite conference) is possible.
Turning RLY3 ON sets up the signal circuit, and it is valid tripartite conference among KX-F1200, Line1 and Line2.
The larger loss makes the lower sound between Line1 and Line2.
Total Loss=LossA+LossB+LossC (about 5dB)

Block Diagram
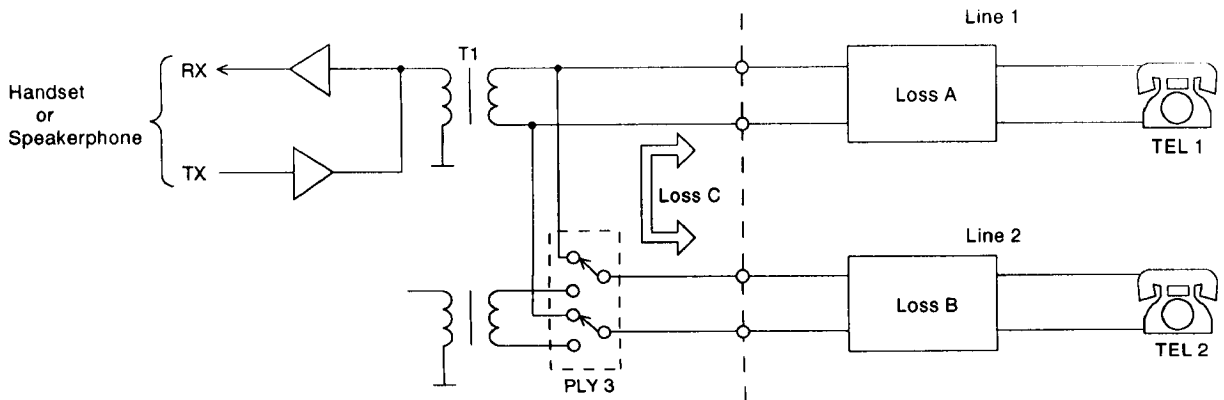
Circuit Diagram
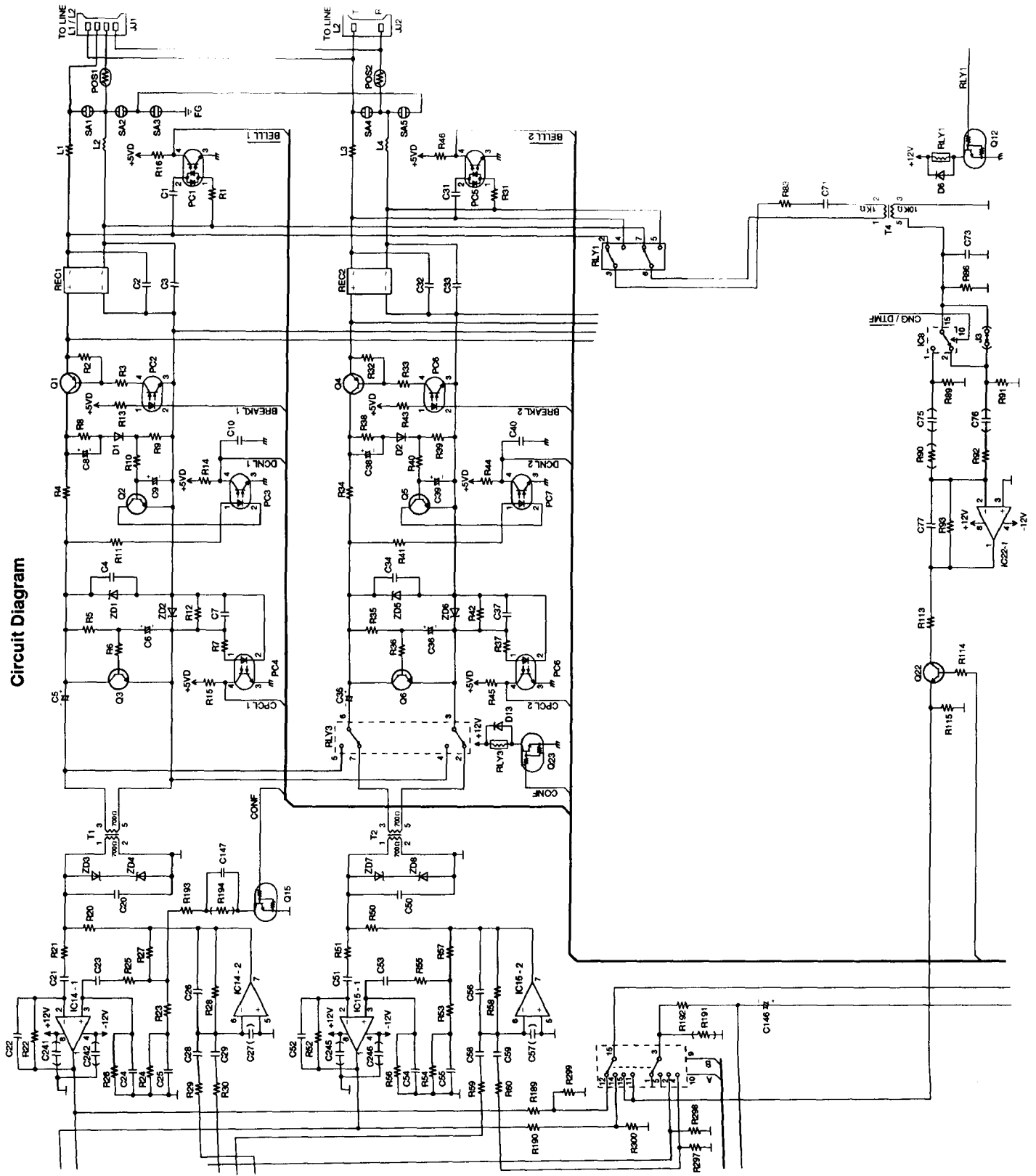
7. CROSS POINT MIXER IC (IC3)

This IC combines 6 input analog signals and 6 output analog signals conveniently with using 36 switches.
This connects signals of 2 lines and ITS and TAM signals, and determines signal circuit.
Switch control is conducted by serial data from IC1.

Block Diagram

```
                            64 bit SHIFT REGISTER          20 ← PS(IC1 58)
                                                           19 ← LATCH(IC1 61)
                            64 bit DATA LATCH              18 ← CLK(IC1 62)
                                                           17 ← DATA(IC1 63)

                    IN1      S57   S49   S41   S33   S9    S1
LINE1  RX →          5
                    IN2      S58   S50   S42   S34   S10   S2
LINE2  RX →          6
                    IN3      S61   S53   S45   S37   S13   S5
TEL    TX →          7
          DTMF      IN4      S62   S54   S46   S38   S14   S6
TAM (OGM) →          8
                    IN5      S63   S55   S47   S39   S15   S7
BUSY OGM →           9
                    IN6      S64   S56   S48   S40   S16   S8
MODEM TX (NC) →     10

                    11     12     13     14     15     16
                    OUT6   OUT5   OUT4   OUT3   OUT2   OUT1

                   DTMF   DTMF   TAM    TEL    LINE2  LINE1
                   SP     H. S   (ICM)  RX     TX     TX
```

Timing Chart

```
            D1  D2  D3  D4  D5        D64
DATA      ─X─X─X─X─X─ • • • • • • ─X─X─

CLOCK     ─┐┌┐┌┐┌┐┌┐┌─ • • • • • • ─┐┌─

LATCH     ──────────────────────────┐┌──

            PULL UP ( PS= "H" → S1, S10=ON )
PS        ─┐
```

Data Dn	Switch Sn
High	On
Low	Off

(n=1~64)

Connection Table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	LINE1 ↓↑ H.S/ SP-Phone	LINE2 ↓↑ H.S/ SP-Phone	L1 L2 H.S/ SP-Phone	LINE1 ↓↑ DTMF (H.S)	LINE1 ↓↑ DTMF (SP-Phone)	LINE2 ↓↑ DTMF (H.S)	LINE2 ↓↑ DTMF (SP-Phone)	LINE1 ↑ OGM	LINE1 ↓ ICM	LINE2 ↑ OGM	LINE2 ↓ ICM	LINE1 ↓↑ TEL TAM	LINE2 ↓↑ TEL TAM	LINE1 ↑ BUSY OGM	LINE2 ↑ BUSY OGM
	CONVER-SATION	CONVER-SATION	CONFER-ENCE	TEL DTMF	TEL DTMF	TEL DTMF	TEL DTMF	TAM	TAM	TAM	TAM	2WAY REC	2WAY REC	BUSY OGM	BUSY OGM
S01															
S02															
S05		●				●	●						●		
S06										●					
S07															●
S08															
S09															
S10															
S13	●		●	●	●							●			
S14								●							
S15														●	
S16															
S33	●		●	●	●							●			
S34		●				●	●						●		
S37															
S38															
S39															
S40															
S41									●			●			
S42											●		●		
S45															
S46															
S47															
S48															
S49															
S50															
S53				●		●									
S54															
S55															
S56															
S57															
S58															
S61					●		●								
S62															
S63															
S64															

8. ITS (Integrated Telephone System) AND MONITOR SECTIONS

8-1. GENERAL

The general ITS operation is executed by the special IC2. This IC has a speakerphone circuit and a handset circuit in 1 chip, and control to each mode is executed from the outside (IC1). At the time of speakerphone operation the speaker output passes through the power amplifier (IC12). The DTMF signal is output from the DTMF generator or modem (IC405: digital board). The alarm tone, the key tone, and the beep are outputted from the gate array IC404 (digital board). At the time of pulse dial operation, the monitor tone is outputted from the gate array IC1.

8-2. SPEAKERPHONE CIRCUIT

1) Function

This circuit controls the automatic switching of the transmitted and received signals, to and from the telephone line, when the unit is used in the hads-free mode.

2) Circuit Operation

The speakerphone can only provide a one-way communication path.

In other words, it can either transmit an outgoing signal or receive an incoming signal at a given time, but cannot do both simultaneously. Therefore, a switching circuit is necessary to control the flow of the outgoing and incoming signals.

This switching circuit is contained in IC2 and consists of voice detector, TX attenuator, RX attenuator, comparator and attenuator control.

The circuit analyzes whether the TX (transmit) or the RX (receiver) signal is louder, and then it processes the signals such that the louder signal is given precedence.

The voice detector provides a DC input to the attenuator control corresponding to the TX signal. The comparator receives a TX and RX signals and supplies a DC input to the attenuator control corresponding to the RX signal.

The attenuator control provides a control signal to the TX and the RX attenuator to switch the appropriate signals ON and OFF. The attenuator control also detects the level of the volume control to automatically adjust for changing ambient conditions.

(Transmission Signal Path)

The input signal from the microphone is sent through the circuit via the following path:

MIC → C110 → IC2[(13) → MIC AMP → SW4 → TX ATT → (27)] → R160 → R161 → C122 → IC18(2)(1) → C125 →
IC3[(7) ⌐→ (15)] → R29 → C28 → IC14(6)(7) → R20 → T1 → Line1
           └→ (16)] → R59 → C58 → IC15(6)(7) → R50 → T2 → Line2

(Reception Signal Path) (ex. Line1)

Signals received from the telephone line are outputted at the speaker via the following path:

Telephone Line → NCU Section[IC14(2)(1)] → R173 → C225 → IC3[(5)(14)] → C117 → R152 → IC2[(22) → SW3 →
RX ATT → (30)] → C98 → IC2[(4) → SW5 → SP AMP → (7)] → R253 → C185 → IC12[(4) → (5)(8) → Speaker

(Control Signal Path)

Control signals for transmission and reception are inputted to IC2 via following path.

(Transmission Control Signal Path)
MIC → C110 → IC2[(13) → MC AMP → SW4 → (31)] → C95 → R130 → IC2[(1) → AMP → Comparator]
(Reception Control Signal Path) (ex. Line1)
Telephone Line → NCU Section [IC14(2)(1)] → R173 → C225 → IC3[(5)(14)] → C117 → R152 → IC2[(22) → SW3 →
RX ATT → (30)] → C98 → IC2[(4) → SW5 → SP AMP → (7)] → C99 → R131 → IC2[(3) → AMP → Comparator]

(Voice Detector)

The transmission signal given as input from the microphone to IC2 pin (1) passes through the built-in amplifier and enters the voice detection circuit for judgment of voice noise. In case of noise, the TX attenuator is made effective via the attenuator control.

(Attenuator Control)

The attenuator control detects the setting of the volume control through pin 11 of IC2 to automatically adjust for changing ambient conditions.

8-3. HANDSET CIRCUIT

1) Transmission Signal

Handset MIC ⌐→ C86 → R124 → IC21 (6) ⌐→ (7) → C93 → R128 → IC2[(26) → Handset MIC AMP → SW1 → (24)] → R162 → C123 → IC18(2)(1)
         │   │ → C125 → IC3[(7) ⌐→ (15)]→ R29 → C28 → IC14(6)(7) → R20 → T1 → Line1
         └→ C87 → R125 → IC21 (5) ┘   └→ (16)]→ R59 → C58 → IC15(6)(7) → R50 → T2 → Line2
                                → NCU Section [IC7(13)(14)] → Telephone Line

2) Reception Signal (ex. Line1)

Telephone Line → NCU Section [IC14(2)(1)] → R173 → C225 → IC3[(5)(14)] → C117 → R152 → IC2[(22) → SW2 →
Handset SP AMP → (19)(20)] → Handset Speaker

8-4. MONITOR CIRCUIT

1) DTMF Monitor
(Speaker Operation)
IC4 (20) → R195 → R158 → C119 → IC18[(2)(1)] → C125 → IC3[(7)(11)] → R181 → C139 → IC2[(4)(7)] → R253 → C185 → IC12[(4) → (5)(8)] → Speaker

(Handset Operation)
IC4 (20) → R195 → R158 → C119 → IC18[(2)(1)] → C125 → IC3[(7)(12)] → R182 → C140 → IC2[(21) → (19)(20)] → Handset Speaker

2) DTMF Signal for Line Transmission
IC4(20) → R195 → R158 → C119 → IC18[(2)(1)] → C125 → IC3[(7) ⌐→ (15)] → R29 → C28 → IC14[(6)(7)] → R20 → T1 → Line1
⌐→ (16)] → R59 → C58 → IC15[(6)(7)] → R50 → T2 → Line2

3) Ring Tone

```
                              Low →
IC405 (44)(Digital Board) → CN2(9) → R211 ─┬──→ R208 ──┬──→ C156 → R206 → IC12 [(4) → (5)(8)] → Speaker
                                           │           │
                                           │           │
                              High →       │           │
                                           └──→ IC11 (9)(8) ──┘
```

4) Alarm/Beep, Keytone

```
                              Beep Keytone →
IC405(43)(Digital Board) → CN2(10) → R209 ─┬──→ R207 ──┬──→ C155 → R205 → IC12[(4) → (5)(8)] → Speaker
                                           │           │
                                           │           │
                              Alarm →      │           │
                                           └──→ IC11 (4)(3) ──┘
```
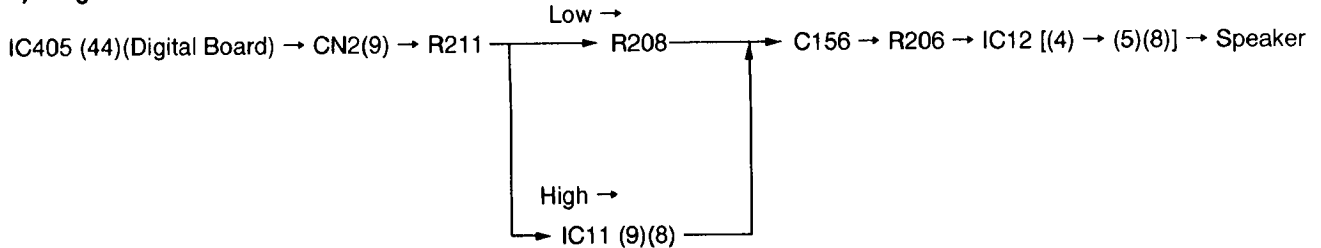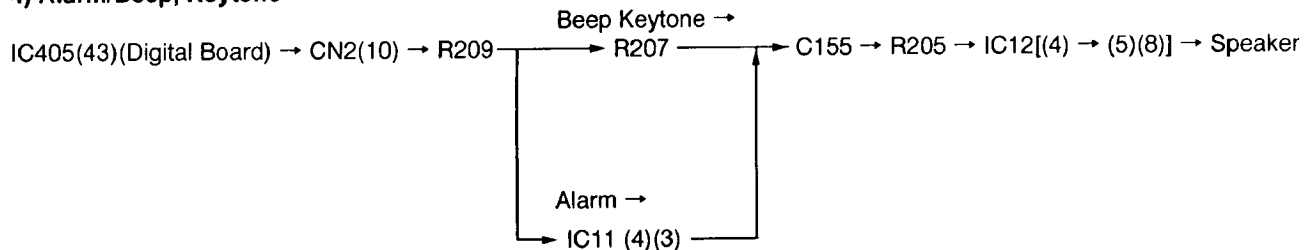
IC2 Control Table

		IC2 Input Logic			IC2 Internal Switch				
		S/H	RMUTE	TMUTE	SW1	SW2	SW3	SW4	SW5
Handset Mode	Communication	0	0	0	O	O	X	X	X
	Transmission Mute	0	0	1	X	O	X	X	X
	Dial	0	1	1	X	X	X	X	X
Speakerphone Mode	Communication	1	0	0	X	X	O	O	O
	Transmission Mute	1	0	1	X	X	O	X	O
	Dial	1	1	1	X	X	X	X	O
Other		0	1	——	X	X	X	X	X

0: Low Level(0V)　　　1: High Level(5V)　　　O: ON　　　X: OFF

Monitor Tone Control Table

		S/H	RMU	TMU	SP MUTE	DP HS	DP SP	ALM/ BEEP	VOL4	BREAK	MODEM TX	TONE 1	TONE 2
Bell Ringing	G/A out H	0	1	1	0	—	—	0	1	0			○
	L	0	1	1	0	—	—	0	0	0			○
Handset Tone Dial		0	1	1	1	—	—	0	—	0	○		
SP-Phone Tone Dial		1	1	1	0	—	—	0	—	0	○		
Handset Pulse Dial		0	1	1	1	1/0	—	0	—	1/0			
SP-Phone Pulse Dial		1	1	1	0	—	1/0	0	—	1/0			
Alarm Ringing		0	1	—	0	—	—	1	—	—		○	
Beep Ringing		0	1	—	0	—	—	0	—	—		○	

8-5. ELECTRONIC VOLUME

Handset volume and speakerphone volume can be switched with the volume key on the Operation Panel.

H/S RX...Normal/Middle/High (3 step)
Switch transistor Q16, Q17 ON/OFF. Concerning control please refer to the table.

SP Phone RX...Low ◄───► High (8 step)
Switch analog SW IC9 ON/OFF. Concerning control please refer to the table.

Electronic Volume Control Table

			VOL1	VOL2	VOL3	VOL4
Handset	High		0	0	—	—
	Middle		0	1	—	—
	Normal		1	0	—	—
SP-Phone	Loud	8	0	0	0	0
	↑	7	1	0	0	0
		6	0	1	0	0
		5	1	1	0	0
		4	0	1	1	0
		3	1	1	1	0
	↓	2	0	1	0	1
	Quiet	1	1	0	1	1

8-6. DTMF GENERATOR

DTMF dial with handset or speaker-phone is controlled by DTMF generator (IC4).
Dial numbers of 0 to 9, ＊ and # are controlled by IC1. For the signal circuit, refer to "8-4, step 1) and 2).

R1	1	2	3
R2	4	5	6
R3	7	8	9
R4	＊	0	#

When dialing "3", they are IC1 ⑦③ (R1:High) and IC1 ⑥⑨ (C3:High).

Circuit Diagram
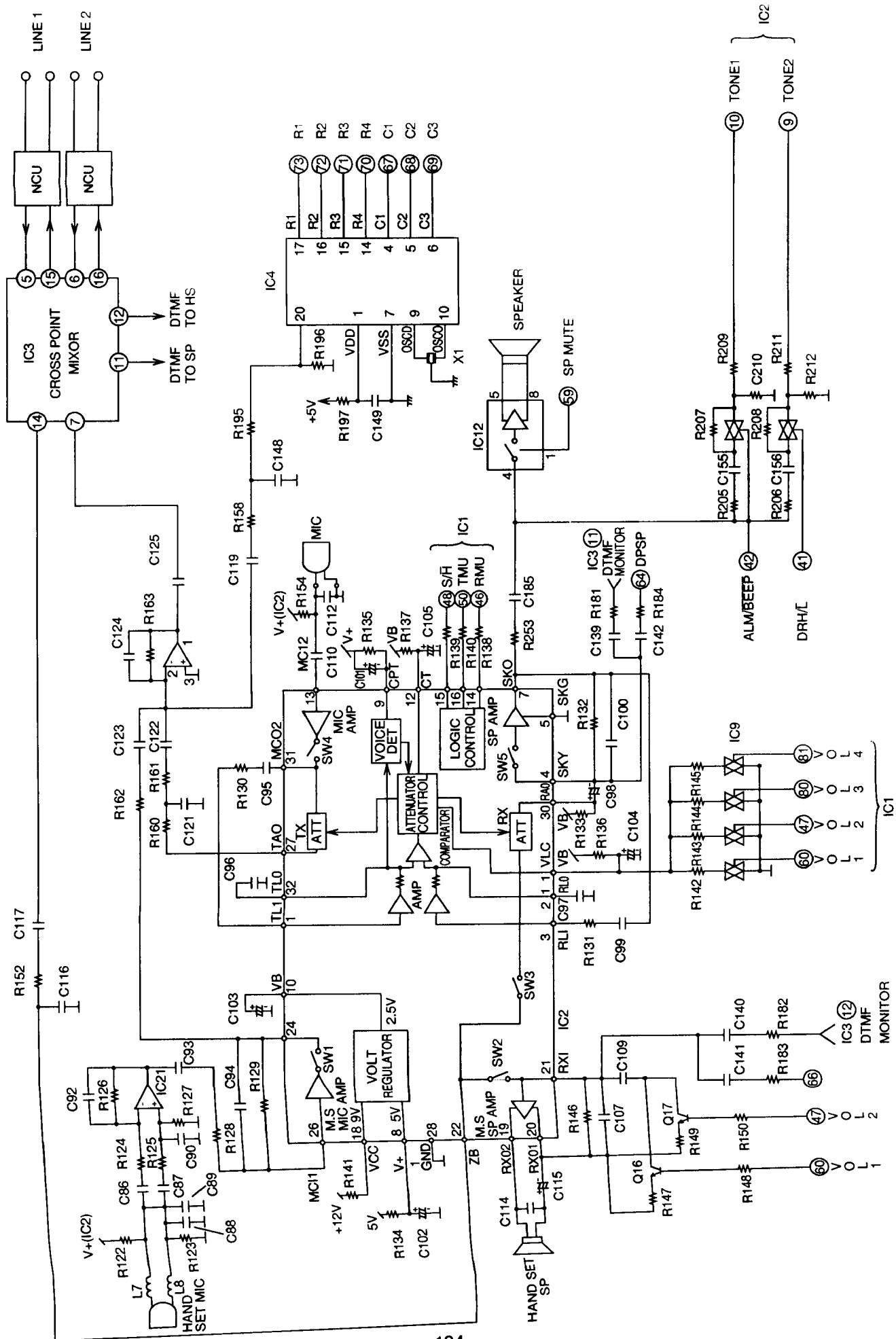
9. IN-USE DETECT CIRCUIT

1) Function

In-use detect circuit detects the lower voltage of telephone line, and recognizes that the paralleled telephone is OFF-HOOK. Then, CPU lights the IN-USE LED on operation panel to red.

The different voltage is detected at "CO" and "PBX" set in user mode #28.

[
CO mode detects ON-HOOK if the voltage is more than 30V and detects OFF-HOOK if it is less than 24V.
PBX mode detects ON-HOOK if the voltage is more than 21V and detects OFF-HOOK if it is less than 15V.
]

2) Circuit operation

(1) Settings: Line1, CO mode

Line1 T-R (48V) → R63 → ZD9 → Q7 → Q8 → PC11 → $\overline{\text{INUSE L1}}$
             (ON) (ON) (OFF) (OFF)   (High)
                                          ||
                                    | Parallel Tel ON-HOOK |

Line1 T-R (16V) → R63 → ZD9 → Q7 → Q8 → PC11 → $\overline{\text{INUSE L1}}$
             (OFF) (OFF) (ON) (ON)   (Low)
                                          ||
                                    | Parallel Tel OFF-HOOK |

(2) Settings: Line2, PBX mode

Line2 T-R (24V) → R70 → PC10 → ZD12 → Q9 → Q10 → PC12 → $\overline{\text{INUSE L2}}$
             (ON)   (ON) (ON) (OFF) (OFF) (High)
A/B L2=High ─┘ | Parallel Tel ON-HOOK |

Line2 T-R (9V) → R70 → PC10 → ZD12 → Q9 → Q10 → PC12 → $\overline{\text{INUSE L2}}$
             (ON)   (OFF) (OFF) (ON) (ON) (LOW)
A/B L2=High ─┘ | Parallel Tel OFF-HOOK |

Circuit Diagram
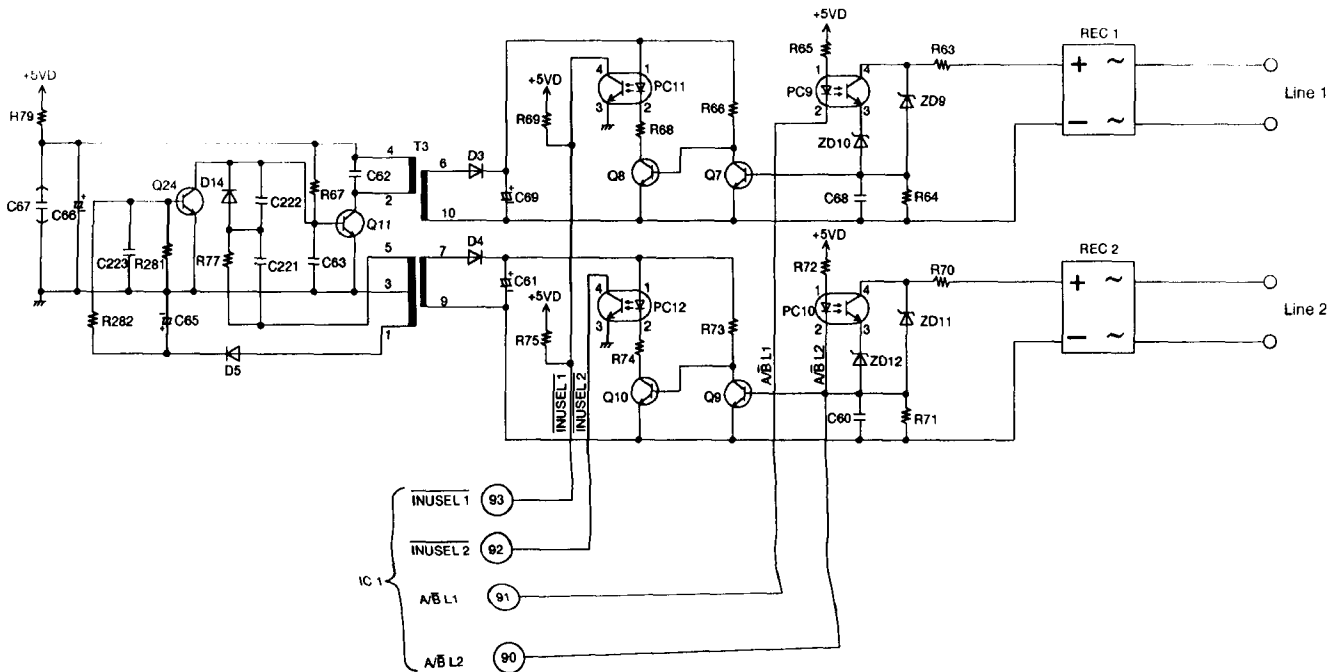
10. DIGITAL TAM BACKUP CIRCUIT

1) Function

This unit has a 6.0 volt battery (1.5 voltx4), which works for the digital TAM unit back up. The battery keeps the digital TAM unit's OGM, ICM and memo recording message in memory if the power is turned off.

2) Circuit Operation

[Power supply]

AC power source turns on, +5 V is supplied to the digital TAM unit as the following path. (Depending on I/O port IC [IC1], the signal of Bout 2 is controlled by H.)

Power Board → Q28 → D·TAM

AC power source turns off, +5 V is supplied to the digital TAM unit as the following path. (Reset signal is inputted by reset circuit, the signal of Bout 2 is controlled by L.)

Battery → CN11 → D20 → R285 → Q27 → R283 → D·TAM

When Back up is necessary, Bout 1 is controlled by H depending on IC1.

Situation		Bout 1	Bout 2
Power source ON	No message in TAM	0	1
Power source ON	Message in TAM	1	1
Power source OFF	————	0	0

1: Hight Level
0: Low Level

[Battery voltage detection]

When detecting battery voltage, to control Bout 3=H depending on IC1. After that to confirm the Batt. Low signal by IC1.

	Bout 3 Output	Batt Low Input	Description
Normal	0	—	—
Battery voltage check	1	0	Full
	1	1	Empty

1: Hight Level
0: Low Level

[Battery check (Bout 3 = 1) executes about 20 second interval.]

Bout 3

20sec
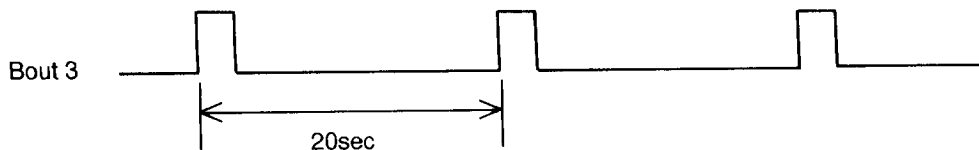
Circuit Diagram
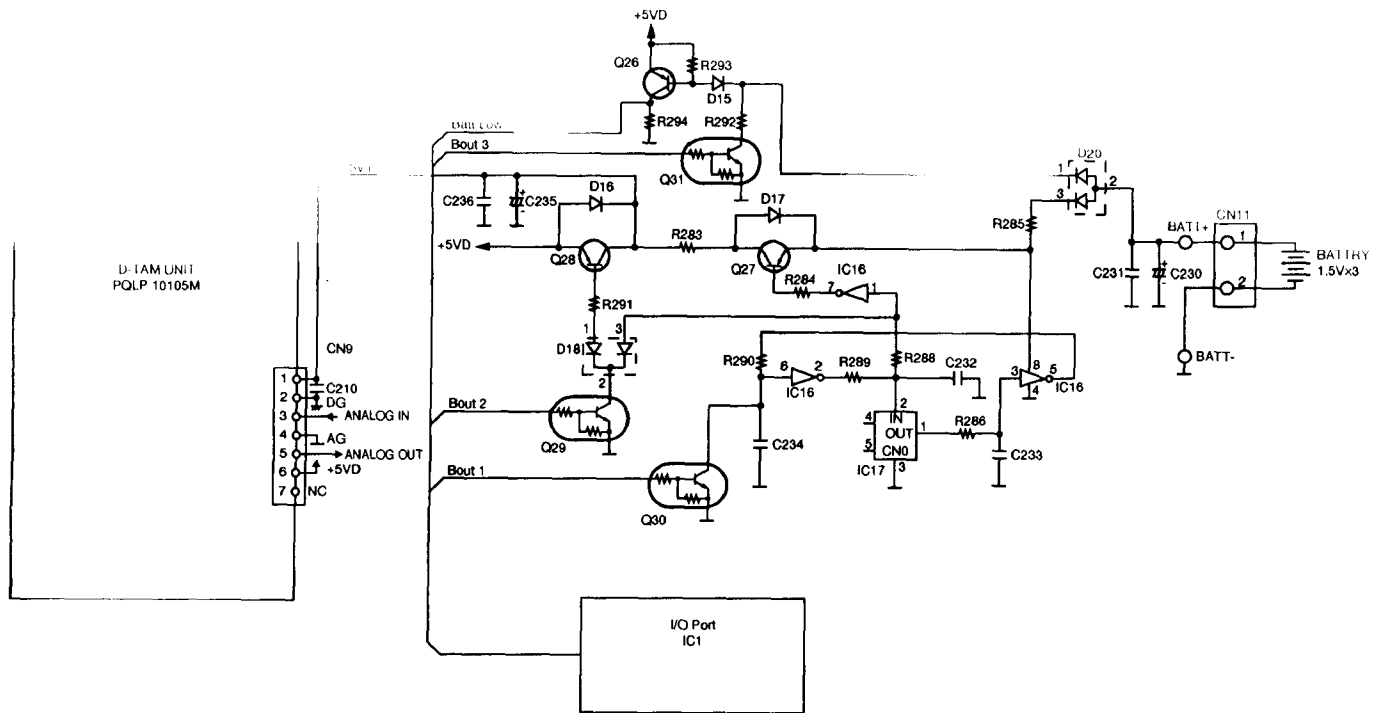
11. ATAS (Automatic Telephone Answering System) SECTION

11-1. MAIN SECTION

1) Function

The ATAS main operation is executed by IC5 and Digital TAM Unit. Control signals are input from gate array IC1.

2) Signal Path and Circuit Operation

(1) OGM/MEMO Record

MIC → C120 → R159 → IC8 (12 → 14) → IC5 (16 → 13) → C174 → R232 → R233 → C176 → CN9 (3) → D-TAM UNIT

(2) ICM Record (ex. Line1)

TEL. Line (Line1) → NCU Section → IC3 [(5)(3)] → C144 → R185 → C132 → IC8 (13 → 14) → IC5 (16 → 13) → C174 → R232 → R233 → C176 → CN9 (3) → D-TAM UNIT

(3) OGM/MEMO/ICM Play to Speaker

D-TAM UNIT → CN9 (5) → C177 → Q18(C → E) → R237 → C178 → IC21 (2 → 1) → R244 → R250 → C182 → IC20 (2 → 1) → C184 → R252 → IC12(4 → 8, 5) → Speaker

(4) OGM/MEMO/ICM to TEL. Line (ex. Line1)

D-TAM UNIT → CN9 (5) → R224 → IC8 (4 → 5) → C164 → R219 → R220 → R217 → R218 → IC19 (3 → 1) → R213 → C131 → R170 → IC18(6 → 7) → C129 → IC3 (8 → 15) → NCU Section (Line1) → TEL. Line (Line1)

(5) VOX

The VOX circuit is the circuit for discrimination of tone or no tone. IC5 pin (2) is Low Level with tone and hight level with no tone. The role of this explanained in the following.

① When no tone is recognized at the time of ICM recording from the line, the recording is ended. (ex. Line1)

TEL. Line (Line1) → NCU Section → IC3 [(5)(3)] → C144 → R185 → C132 → IC8 (13 → 14) → IC5 (16 → VOX detection circuit → 2) → IC1 (89)

② When no tone is recognized at the time of OGM recording from the microphone, the recording is ended.

This is done because suitable OGM sending to line is not possible when recording is not done at or above a certain level.

MIC → R120 → R159 → IC8 (12 → 14) → IC5 (16 → VOX detection circuit → 2) → IC1 (89)

3) Electronic Volume

TAM volume (ICM play) can be switched with the volume key on the operation panel.

OFF ⇔ HIGH (9 steps)

Switch analog SW IC10, IC11 and transistor Q18 ON/OFF. Concerning control please refer to the table.

Electronic Volume Control Table

			VOL5	VOL6	VOL7	VOL8	VOL9	TAMSP
TAM	Loud	8	0	0	0	0	0	1
	↑	7	1	0	0	0	0	1
		6	0	1	0	0	0	1
		5	1	0	1	0	0	1
		4	1	1	1	0	0	1
		3	0	0	0	1	0	1
		2	0	1	1	1	0	1
	↓	1	1	1	1	1	1	1
	Quiet	OFF	1	1	1	1	1	0

4) Voice Synthesizer IC

This IC is a custom IC.

When CPU command is generated, voice synthesizer plays the words from word list.

There is only one pattern of message as follows.

"Hello, no one is available to take your call now, and our machine is busy on another call, please call back in a few minutes. Thank you."

Normally, this message is played when receiving call in TAM or FAX mode during one line is in use.

Also the above message is output to the speaker in service mode 805, and send it to Line (Line1 only) in service mode 806.

(Signal path)

(1) Line out (ex. Line1)

IC6 ⑪ → R254 → R255 → C187 → IC20 (6 → 7) → C192 → IC3 [9 → 15] → NCU Section → Line1

(2) Speaker out (Service mode only)

IC6 ⑪ → C181 → Q19 (C → E) → R240 → C180 → IC21 (2 → 1) → R244 → R250 → C182 → IC20 (2 → 1) → C184 → R252 → IC12 (4 → 5, 8) → Speaker

Circuit Diagram
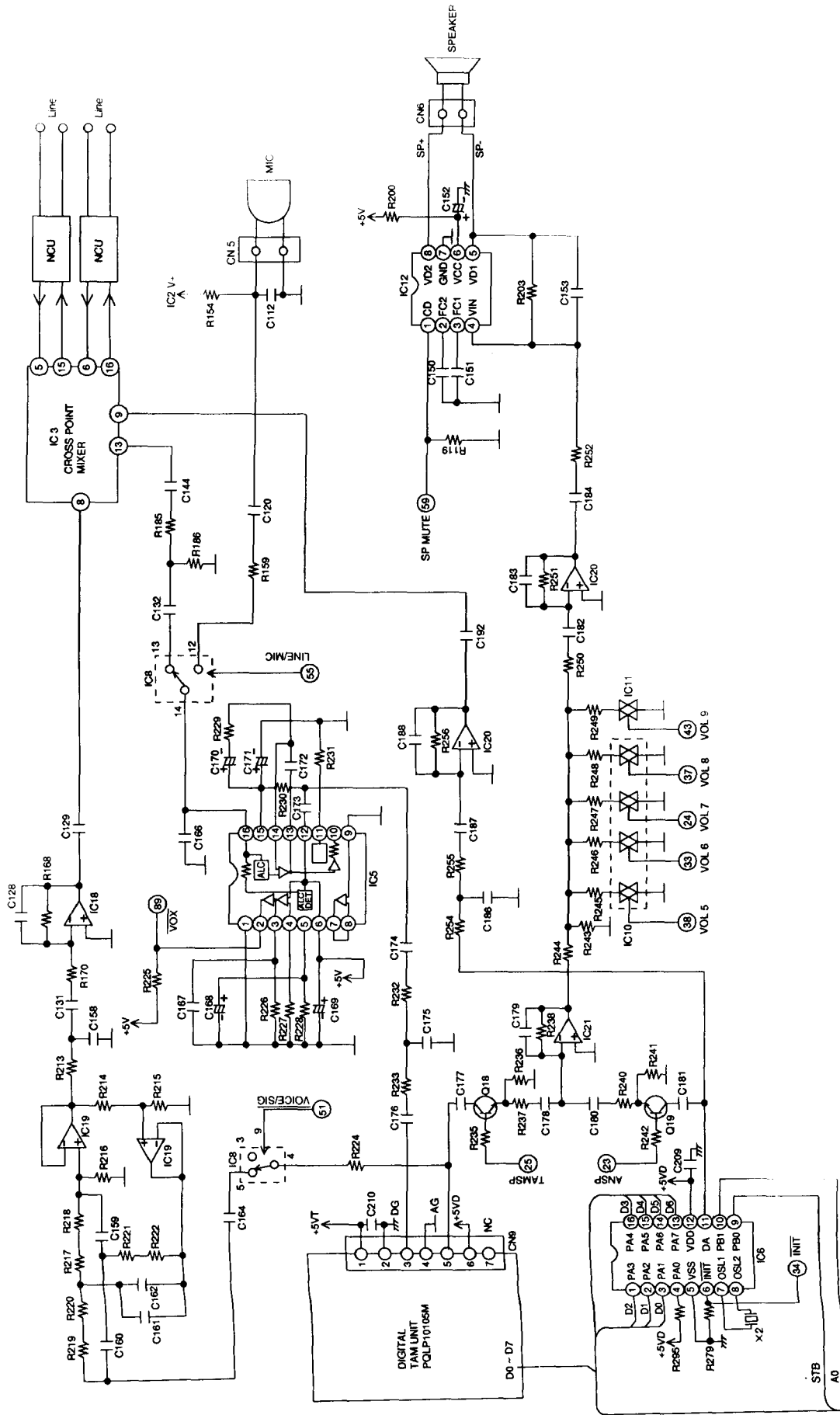
12. DIGITAL TAM SECTION

■ **DSP (Digital Speech/Signal Processing) Circuit**

General Description:
IC701~IC703 is a digital speech/signal processing system that implements all the functions of speech compression, record and playback, and memory management required in a digital telephone answering machine.

The DSP system is fully controlled by a host processor (IC401), via 8 bit interface. The host processor provides activation and control of all that functions, such as speech Recording, Playback, Tone detecting and Line Monitoring.

The DSP system comprises of following:

The Digital Signal Processor which includes the firmware implemented functions.
The Codec (IC702), which is used as the analog I/O interface.
The Audio grade RAM (IC703), which is used for stored voice messages.

Digital TAM Unit
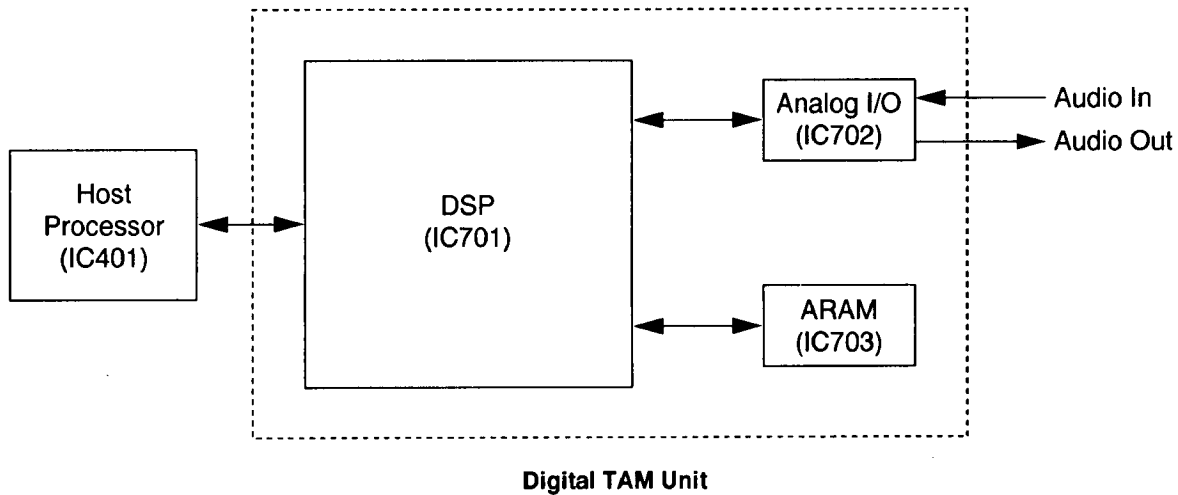
Voice Message Recording:
The DSP system use a proprietary speech compression technique to record and store voice message in audio grade RAMs (IC703, IC704).
An error correction algorithm is used to enable playback of these messages from the ARAM.

13. OPERATION PANEL

The unit consists of LCD (Liquid crystal display), KEYs and LEDs (light-emitting diode). They are controlled by the Gate Array (IC301) and AS IC (IC404: On the DIGITAL BOARD). (Fig.-a)
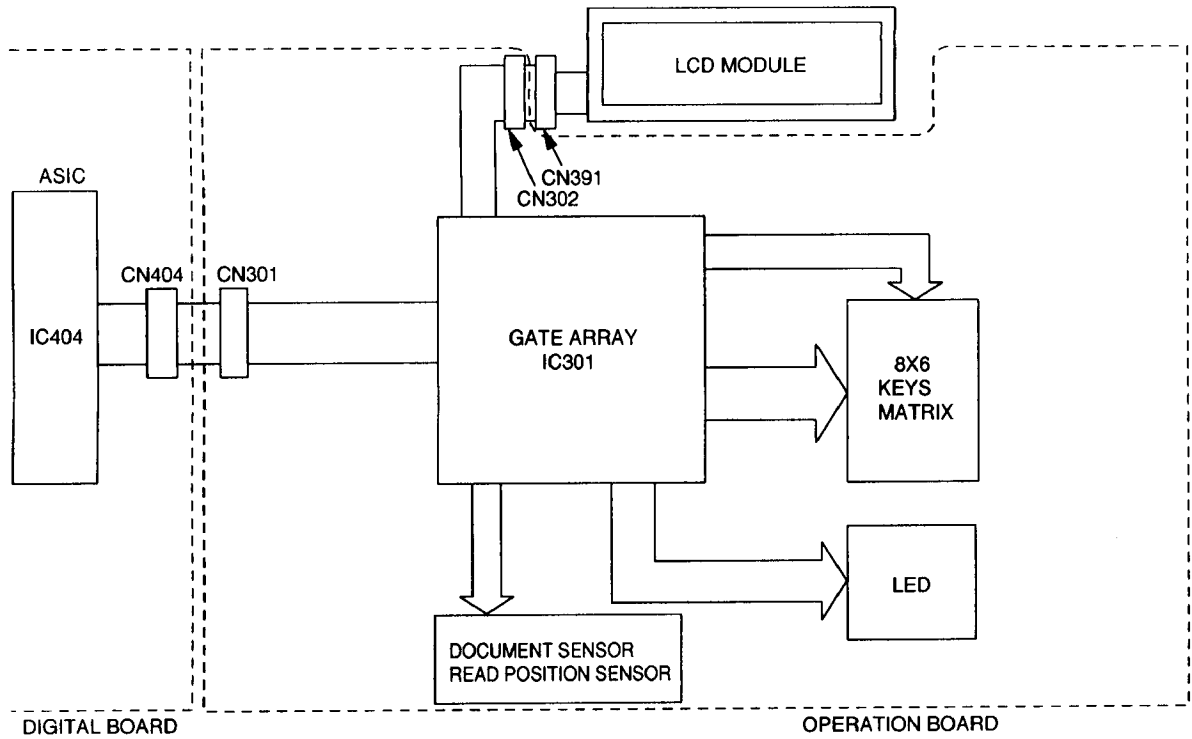
Fig-a DIAGRAM

Key Matrix

	KIN0	KIN1	KIN2	KIN3	KIN4	KIN5	KIN6	KIN7
Y0	S301	S307	S313	S319	S325	S346	S347	S348
	ONE TOUCH 5	ONE TOUCH 6 RINGER 1	ONE TOUCH 7 GREET. REC	ONE TOUCH 8 ALL MESSAG	DIRECTRY	MAIL BOX	MENU	RESOLUTION
Y1	S302	S308	S314	S320	S326	S331	S336	S341
	ONE TOUCH 1	ONE TOUCH 2	ONE TOUCH 3 GRE. SELECT	ONE TOUCH 4 REPEAT	ERASE	RECEIVE MODE LINE 2	RECEIVE MODE LINE 1	NEW MESSAGES
Y2	S303	S309	S315	S321	S327	S332	S337	S342
	FLASH	REDIAL /PAUSE	MUTE	SP-PHONE	LINE 1	LINE 2	HOLD	CONF
Y3	S304	S310	S316	S322	S328	S333	S338	S343
	3	6	9	#	STOP	FILM/PAPER SAVE	ONE TOUCH 12 SKIP	ONE TOUCH 11 GRE. CHECK
Y4	S305	S311	S317	S323	S329	S334	S339	S344
	2	5	8	0	COPY	ONE TOUCH 10 RINGER 2	ONE TOUCH 9	HELP
Y5	S306	S312	S318	S324	S330	S335	S340	S345
	1	4	7	＊	VOL ∧	VOL ∨	START /SET	LOWER

14. LCD CONTROLLER

This IC is a chip with LCD controller and driver built in. The Gate Array (IC301) needs only write ASCII code from the data bus (D4~D7). V1 through V5 are power supplies for crystal drive. R360, R361, R363 are density control resistors. Consequently, in this set the timing (mainly positive clock) is generated by the LCD interface circuitry of the gate array (IC301).

Circuit Diagram
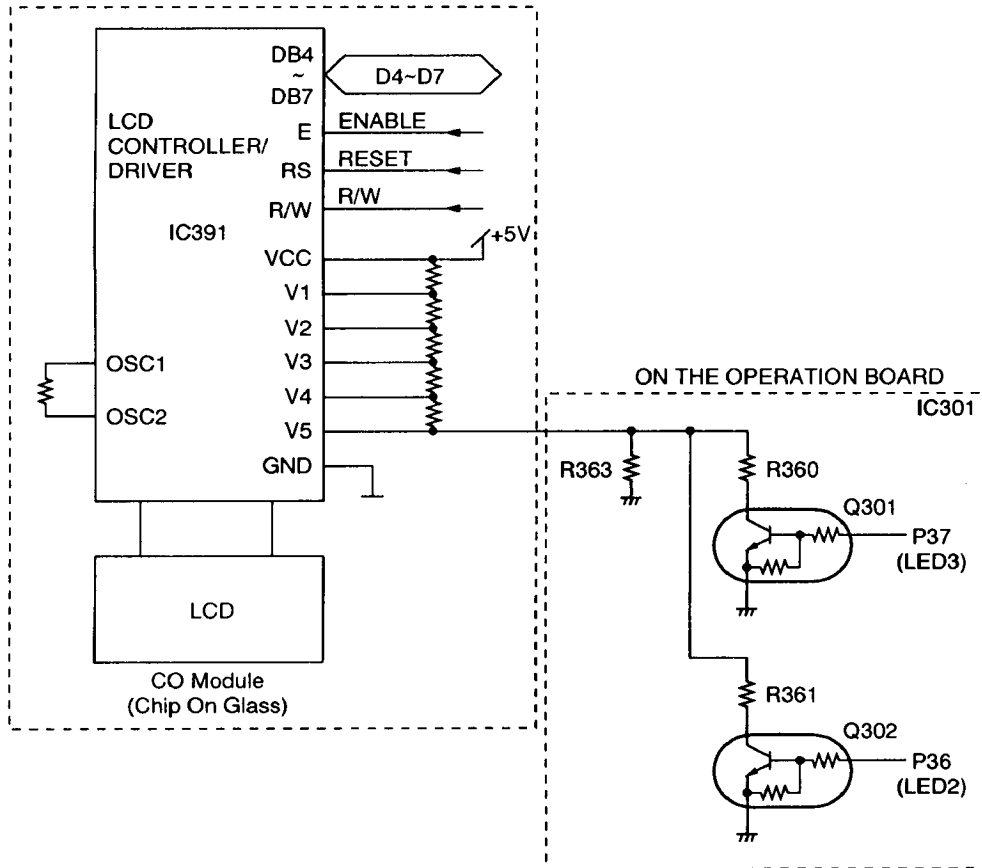
Timing Chart
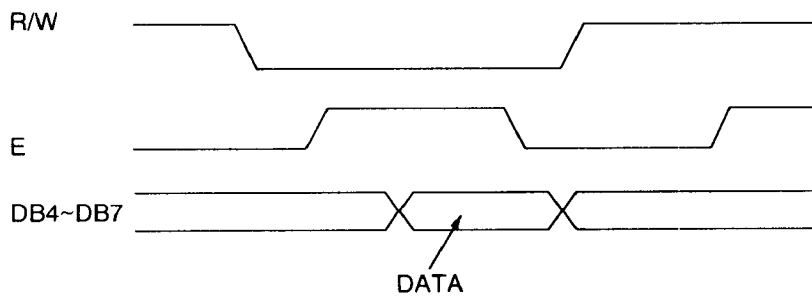
Density	Light(2)	Normal(1)	Dark(3)
P16	L	H	H
P22	L	L	H

Service Mode
565 (1, 2, 3)

15. SWITCHING POWER SUPPLY SECTION

Block Diagram

AC Input

Input Circuit

Rectifier Circuit

A
+
C105
B

Converter Circuit

Q101

C

D

G

24V Output Circuit

H

○ 24V Output

○ GND

Control Circuit (MC101)

SUB Printed Circuit Board IC101

Over Current Circuit

E

F

DC-DC Converter Circuit

○ +12V Output

○ +5V Output

○

○

Error Detecting Circuit

A-B Voltage Wave Form

0

C-D Voltage Wave Form

0

E-F G-H Voltage Wave Form

0
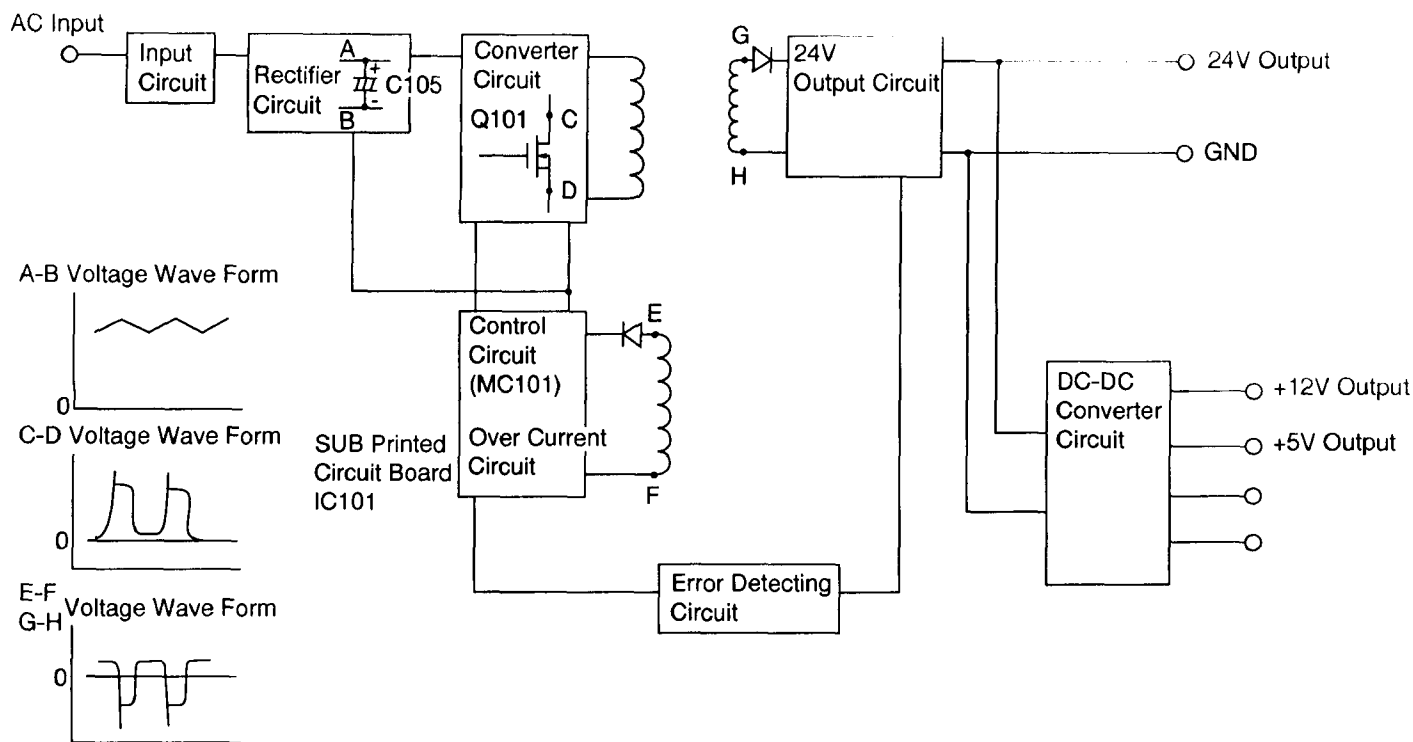
[Input Circuit]
Input current goes into input rectifier circuit through filter circuit. Fitter circuit decreases noise terminal voltage and noise electric field strength.

[Rectifier Circuit]
Input current is rectified by D101 and charge C105 to make DC voltage, then supply power to converter circuit.
Voltage is supplied to control IC's kick-on voltage through R102 and R103. Inrush current is limited by thermistor TH101.

[Converter circuit]
The converter circuit of this power supply circuit is called fly back converter.
We explain the operation of this circuit with the simple circuit.

T101

E i

P

D201

S

+

E o

Q101

B

CONTROL CIRCUIT

P...PRIMARY WINDING

S...SECONDARY WINDING
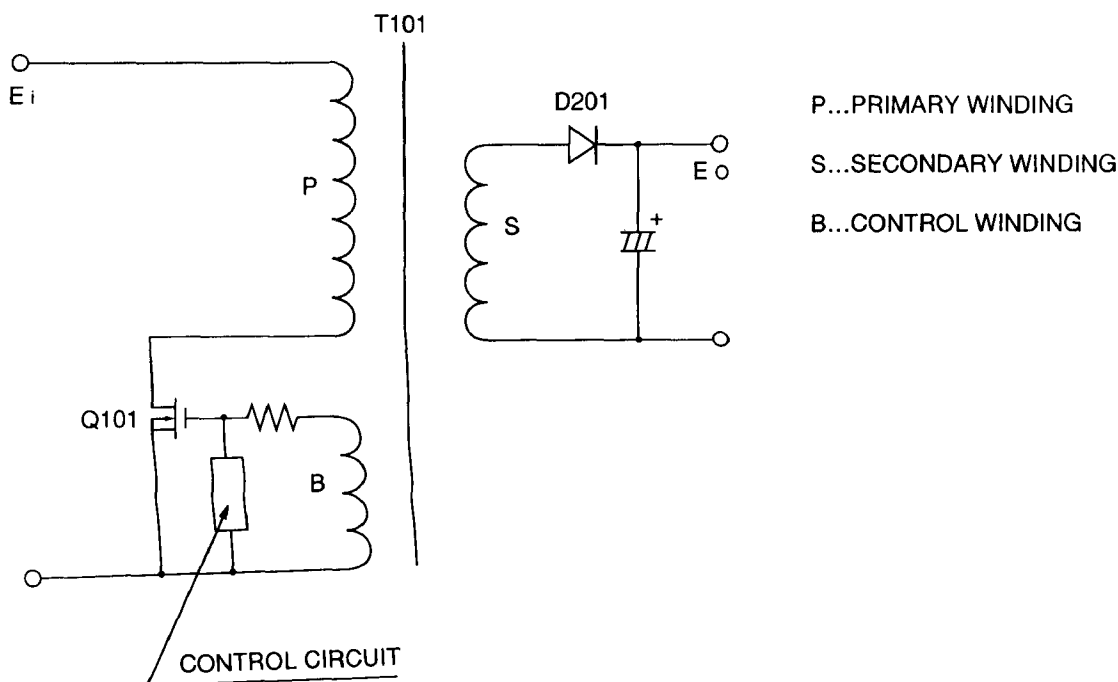
B...CONTROL WINDING

The circuit in the previous page, when the transistor Q101 is ON, secondary rectifier diode D201 is OFF and the energy is charged in the transformer T101. Q101 continues being ON while the voltage is generated by control winding (B). Q101 is tuned OFF by control circuit, then each windings of T101 changes the polarity and rectifier diode D201 truns ON.
The charged energy of T101 supplies power through D201 to output load. And the voltage of control winding is decreased and Q101contines being OFF state. When all energy is discharged through D201, Q101 is turned ON again and it makes the polarity of each windings of T101 in reverse and goes to self oscillation. When input voltage Ei is high, the ON period of Q101 becomes shorter, and when load current is high, the ON period of Q101 becomes longer.
The value of output voltage is

$Eo = d/(1-d)*Ei$

$d = Ton/Ts$

T_{on}: ON TIME OF Q101

T_s : PERIOD OF OSCILLATION
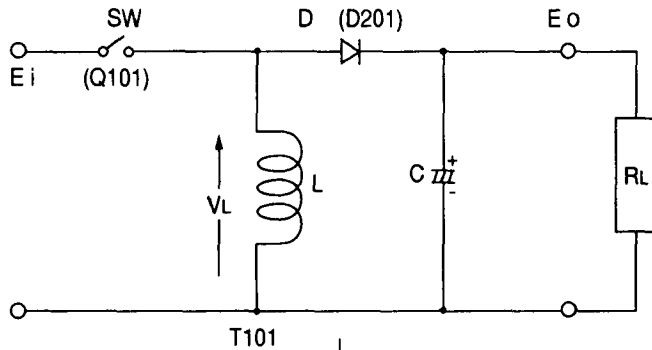
In the equivalent circuit:
When SW is ON, current flows
$SW \rightarrow L$
When SW is OFF, Current flows
$L \rightarrow D \rightarrow R_L$

The value of inductance rectifiers increasing current during ON period.

$IL = Ei / L*d*Ts$ (1)

The value of inductance rectifiers decreasing current during OFF period.

$IL = Eo/L(1-d) * Ts$ (2)

From equations (1) and (2),
$Eo = d/(l-d) * Ei$
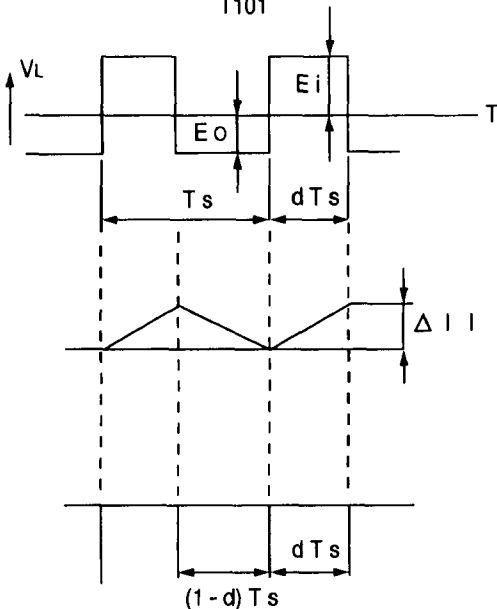
In the actual circuit, the fixed output voltage can be obtained by changing the winding ration of transformer T101. In this converter circuit, the duty ratio of ON period and OFF period of the transistor produces output. In this power supply, the bias winding is also built-in in the transformer and the output value is one. 24V output voltage is stabilized and changes the duty ratio.

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

[Over Current Limiter (O.C.L.)]
IC101 rectifiers the highest voltage with resistors R105 and R113 detecting the current in the primary side. When the current is supplied higher than the highest voltage, it switches to ratch mode which stops oscillating.

[DC-DC converter]
Output 5V, +12V, -12V are made by T201,Q202 and DC-DC Converter. 5V output is rectified by D207, Q204, Q205 and Q203. +12V and -12 V define the voltage with the winding ratio of transformer.

Dummy load method (for the quick check of power supply output)

KX-F1200
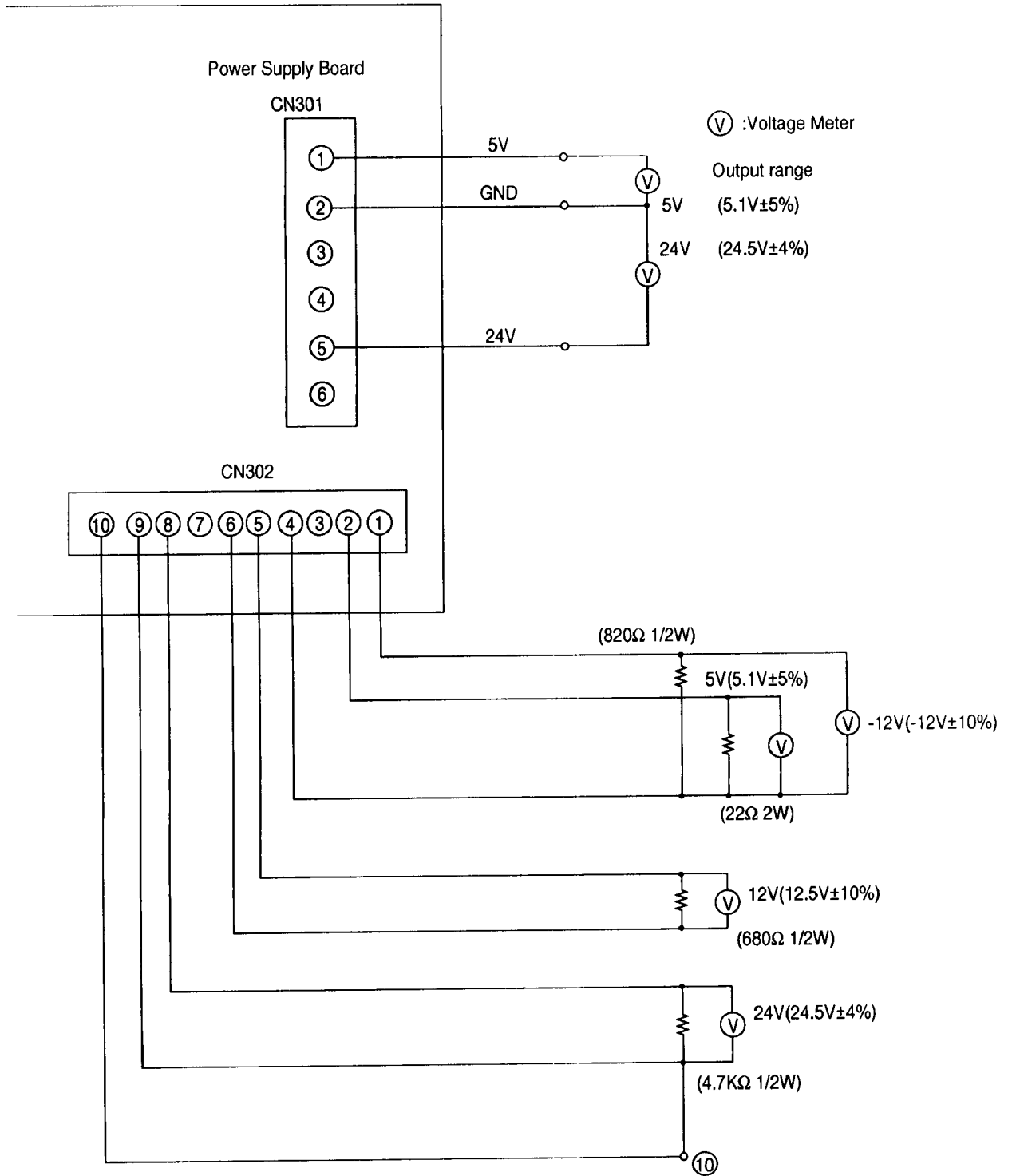
CONNECTION DIAGRAM
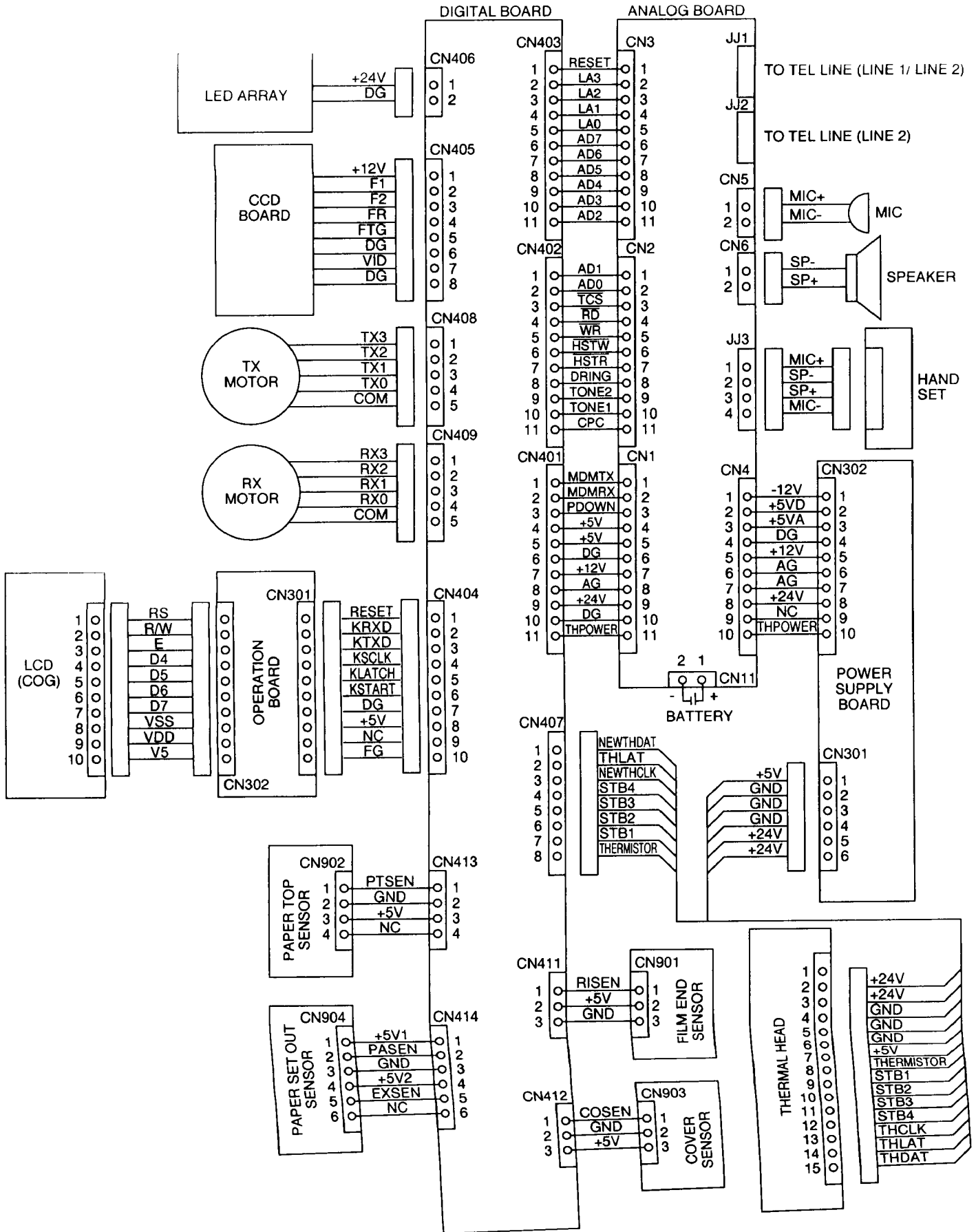
PRINTED CIRCUIT DIAGRAM (DIGITAL BOARD)

(COMPONENT VIEW)

Pin No.	Waveform
8~16, 25~32	5V / 0V

Pin No.	Waveform
56	24MHz 5V / 0V

Pin No.	Waveform
8~15, 56~60	5V / 0V
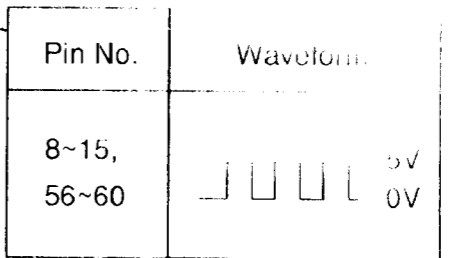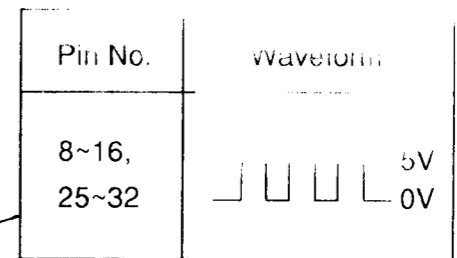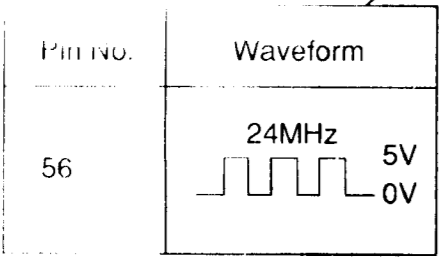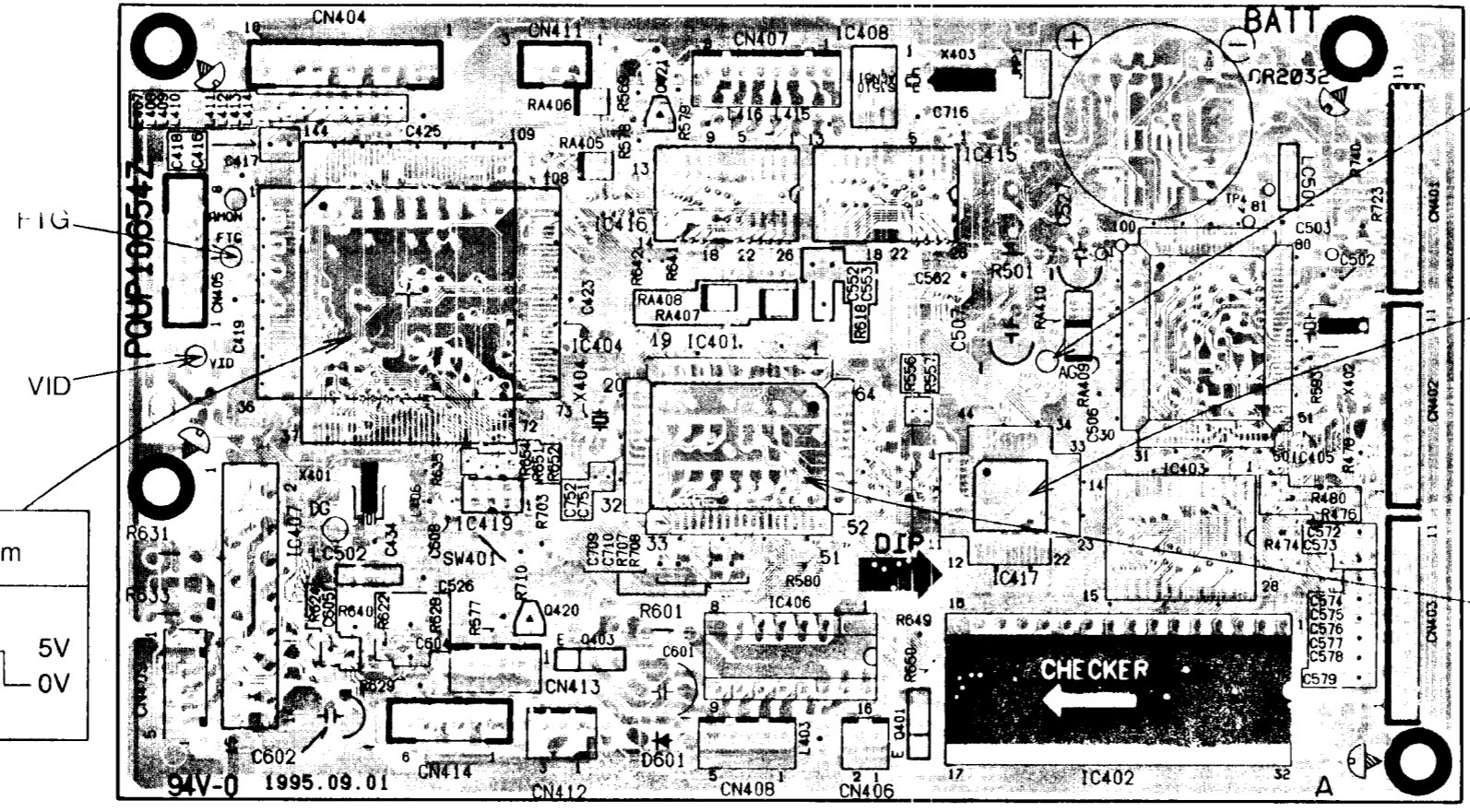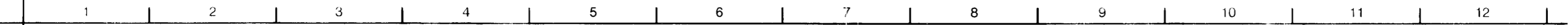
FOR SCHEMATIC DIAGRAM

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

3.

Varcap.	General	Zener	LED	Photo Diode
Anode ... Cathode	Anode ... Cathode	Anode ... Cathode	Anode ... Cathode	Cathode ... Anode
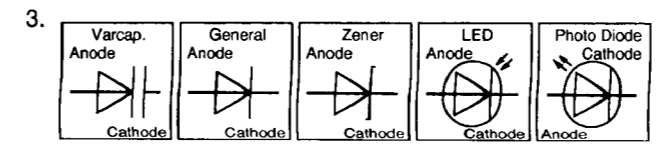
3. ┌─── Important safety notice ───┐

The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards.
When servicing, it is essential that only manufacturer's specified parts can be used for the critical components in the shaded areas of the schematic.

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

(BOTTOM VIEW)

PQUP10654ZA

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

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

PRINTED CIRCUIT BOARD (DIGITAL TAM/ANALOG BOARD)

(COMPONENT VIEW)

Pin No.	Voltage & Waveform
1,2, 5~14, 16~19	5V ⌇⌇⌇ 0V
3,28, 53,78,	5V
4,15,29, 40,54,65, 79,88,90	0V
others	0V or 5V
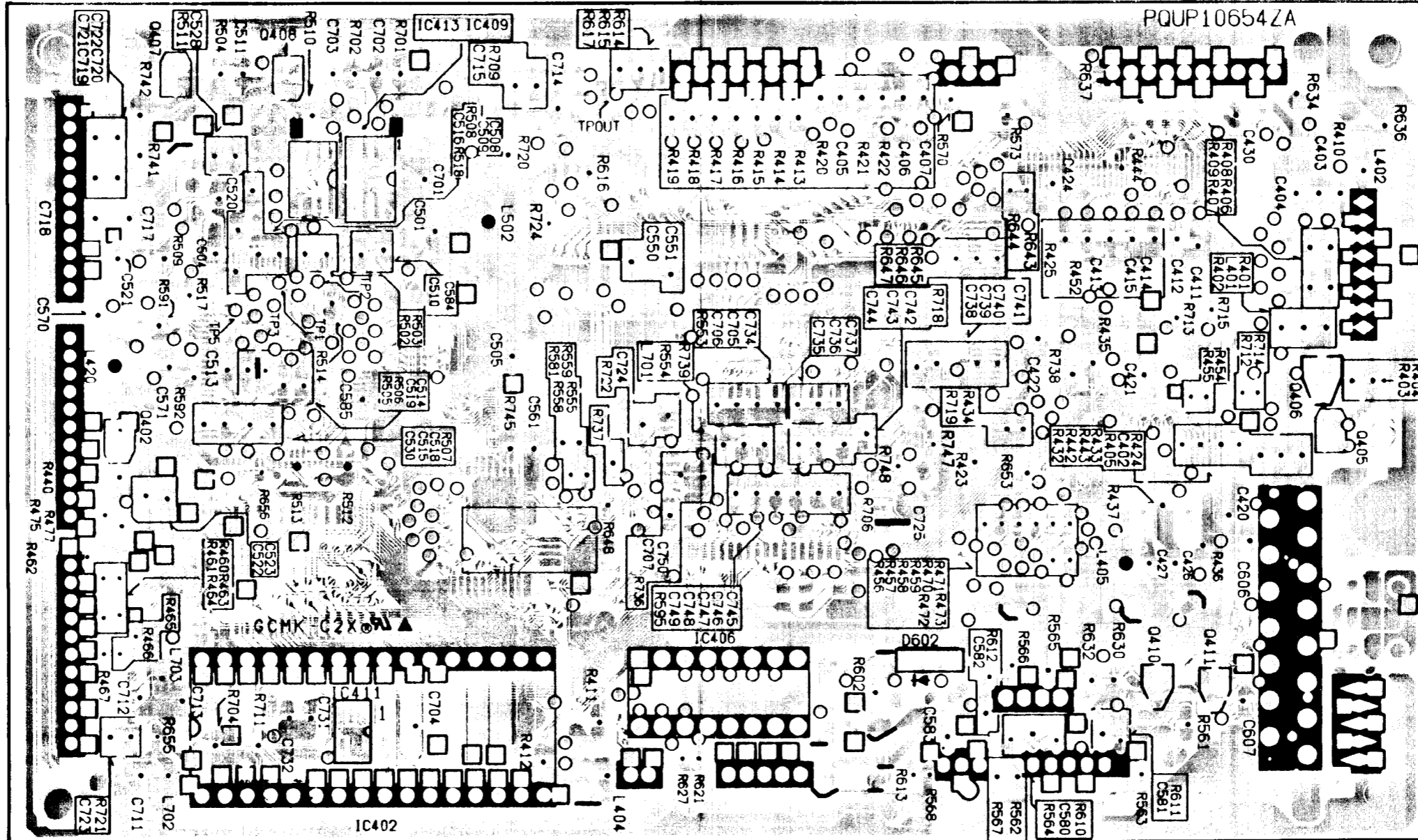
Notes:

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

2. The circuit shown in ▭ on the conductor indicates printed circuit on the front side of the printed circuit board.
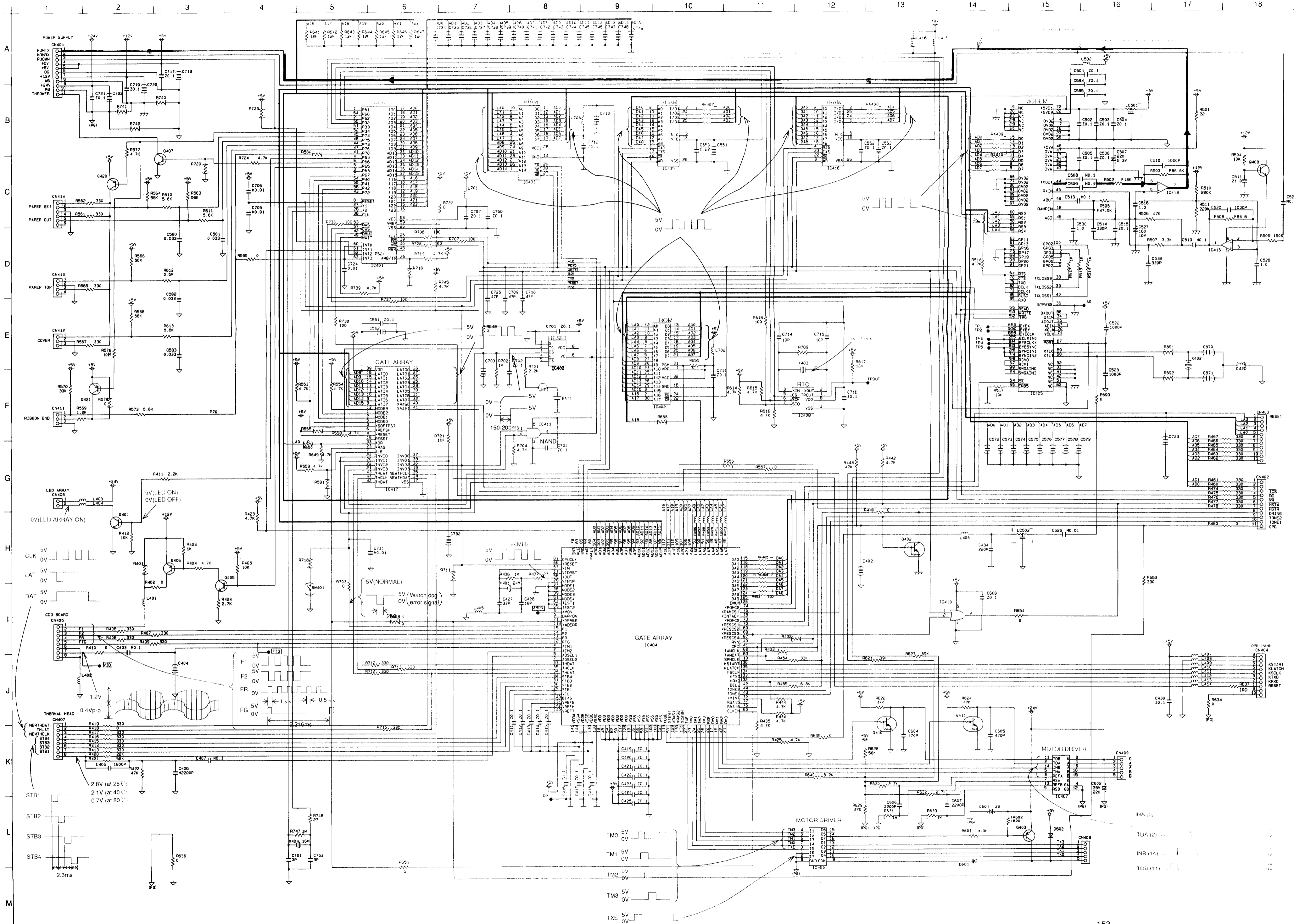
PRINTED CIRCUIT BOARD (DIGITAL TAM/ANALOG BOARD)

(BOTTOM VIEW)
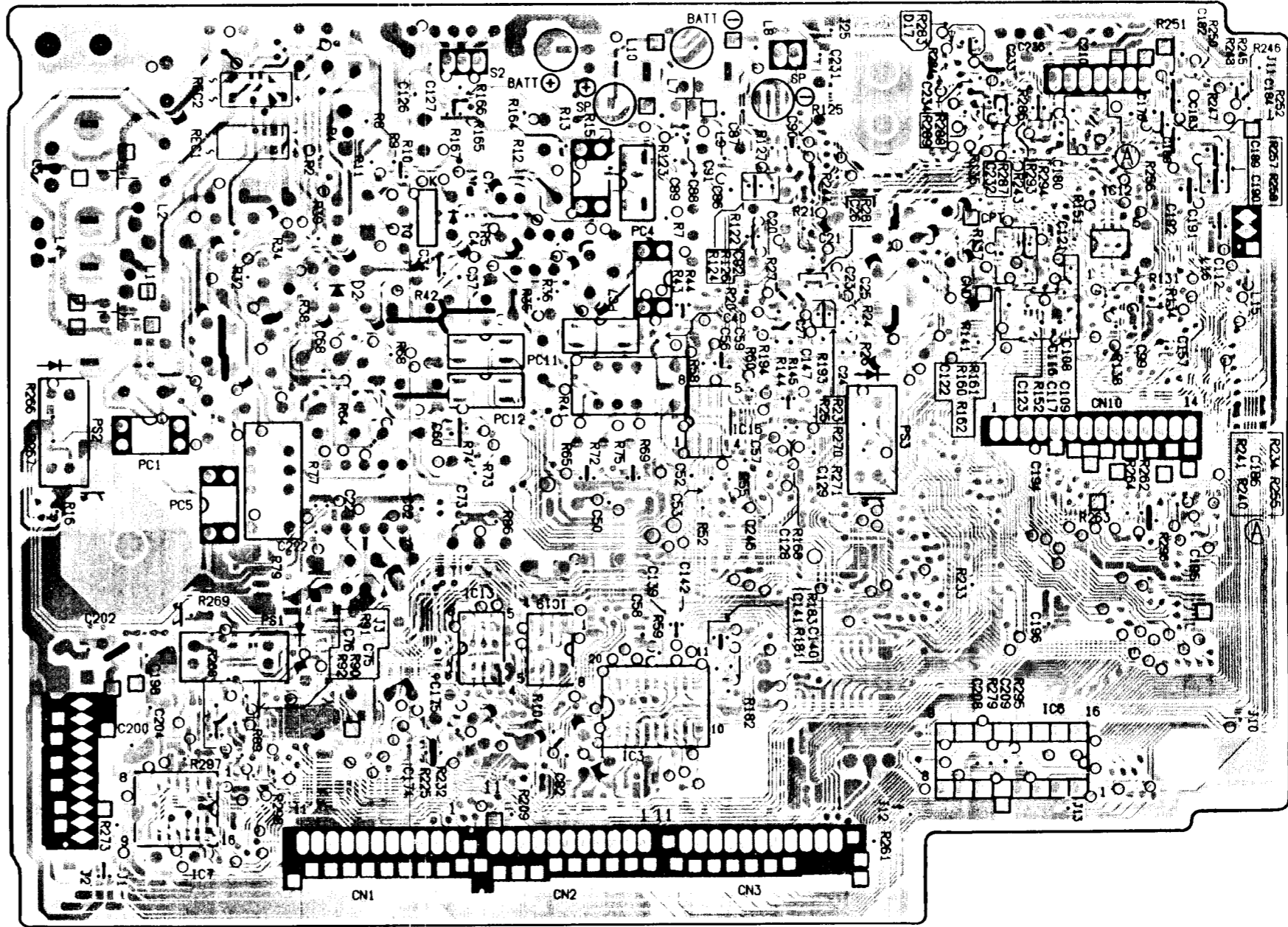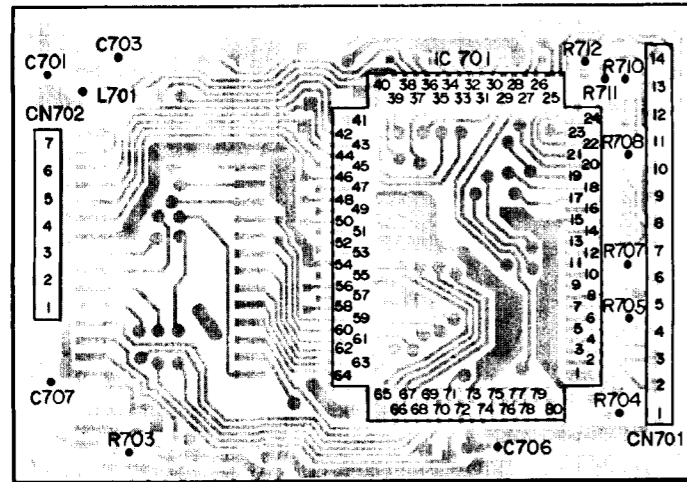
Notes:
1. The circuit shown in ☐ on the conductor indicates printed
   circuit on the back side of the printed circuit board.

2. The circuit shown in ☐ on the conductor indicates printed
   circuit on the front side of the printed circuit board.
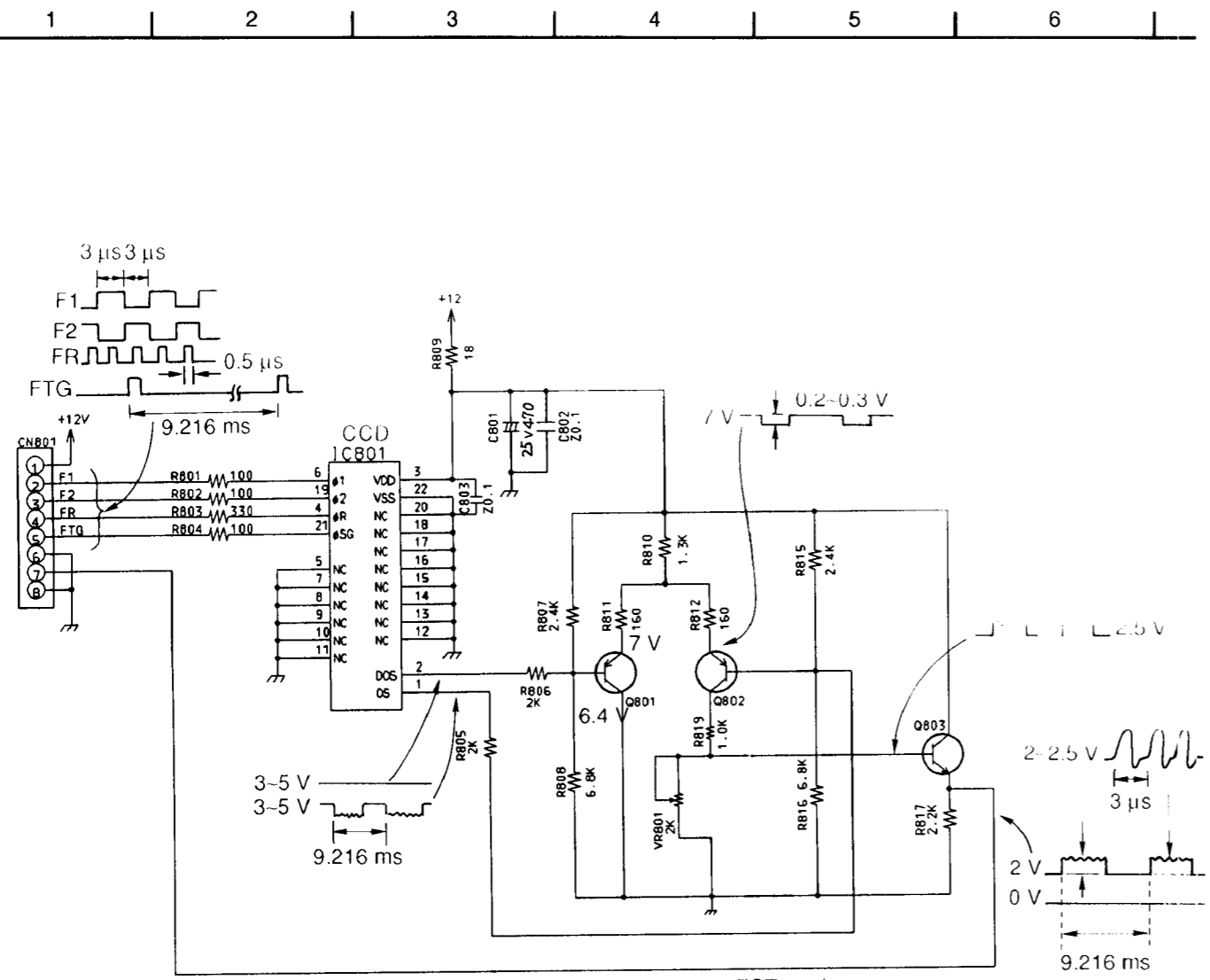
※Waveform, voltage are "COPY", "SEND", CCD/LED TEST mode.
All voltage is 0 V at standby mode.

(COMPONENT VIEW)

PQUP 10494 Z
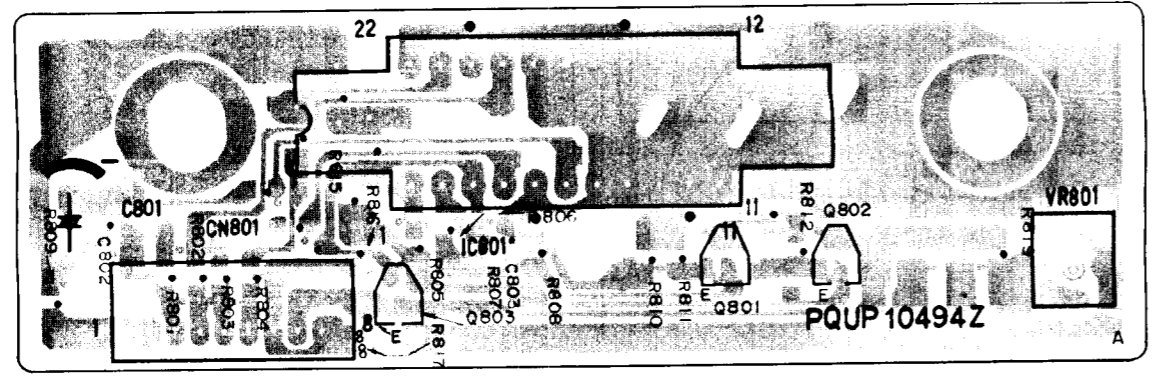
SCHEMATIC DIAGRAM(SWITCHING POWER SUPPLY)
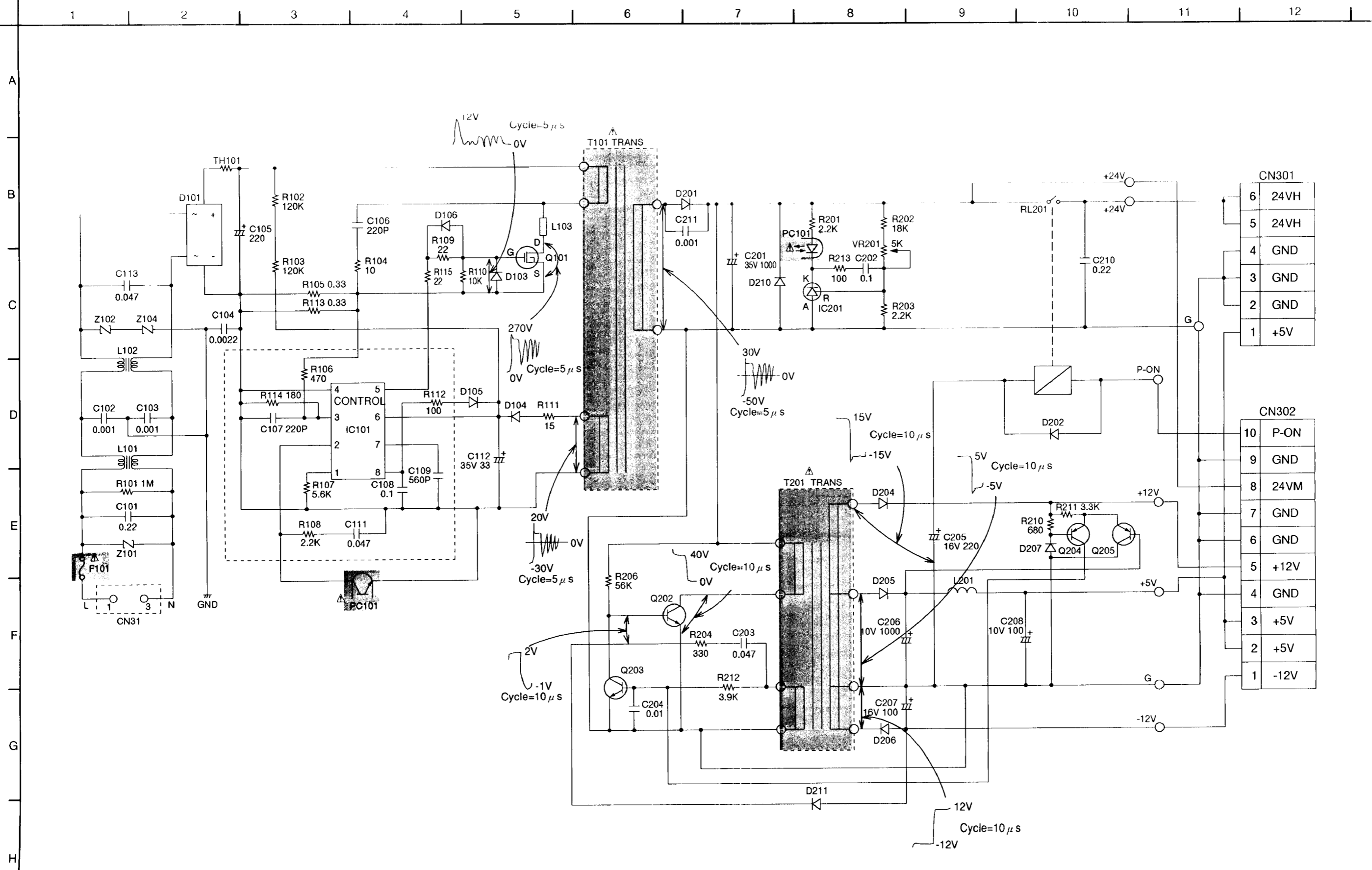
Note:
When measuring the waveform on the primary circuit of the Switch Power Supply Board, be sure
to insulate the ground of the oscilloscope's probe from the ground of its power supply.

PRINTED CIRCUIT BOARD (SWITCHING POWER SUPPLY)
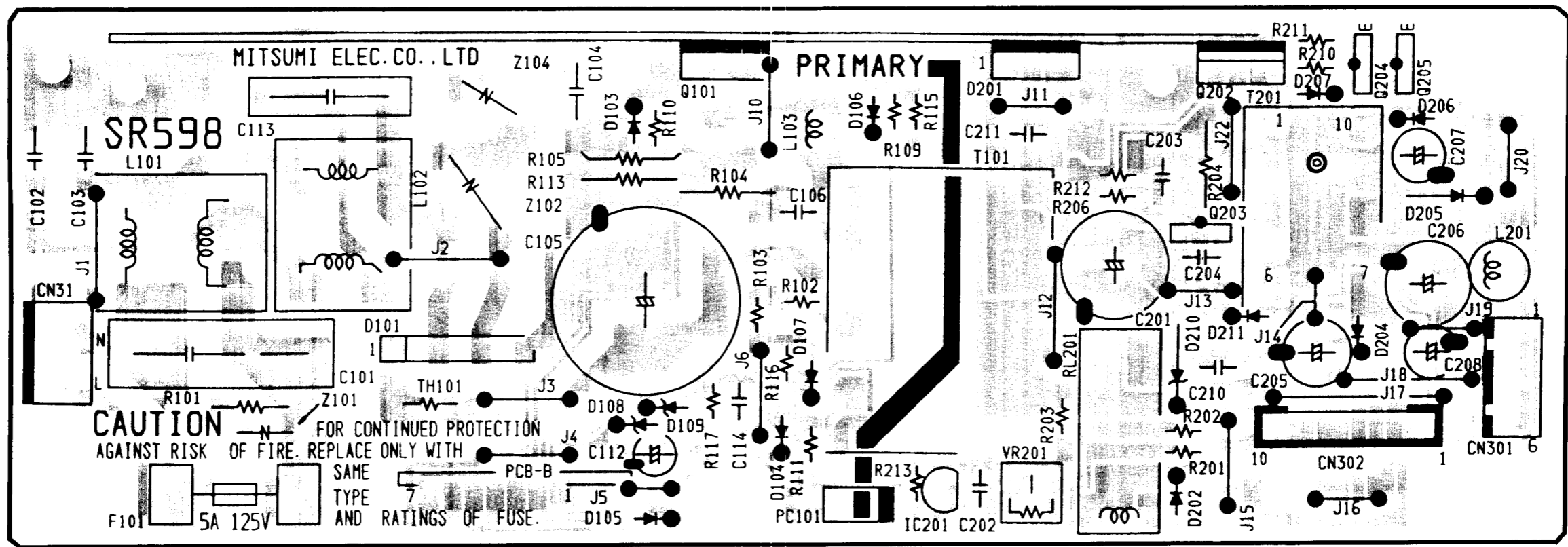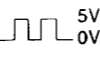
(COMPONENT VIEW)

PRINTED CIRCUIT BOARD (OPERATION BOARD)

(COMPONENT VIEW)
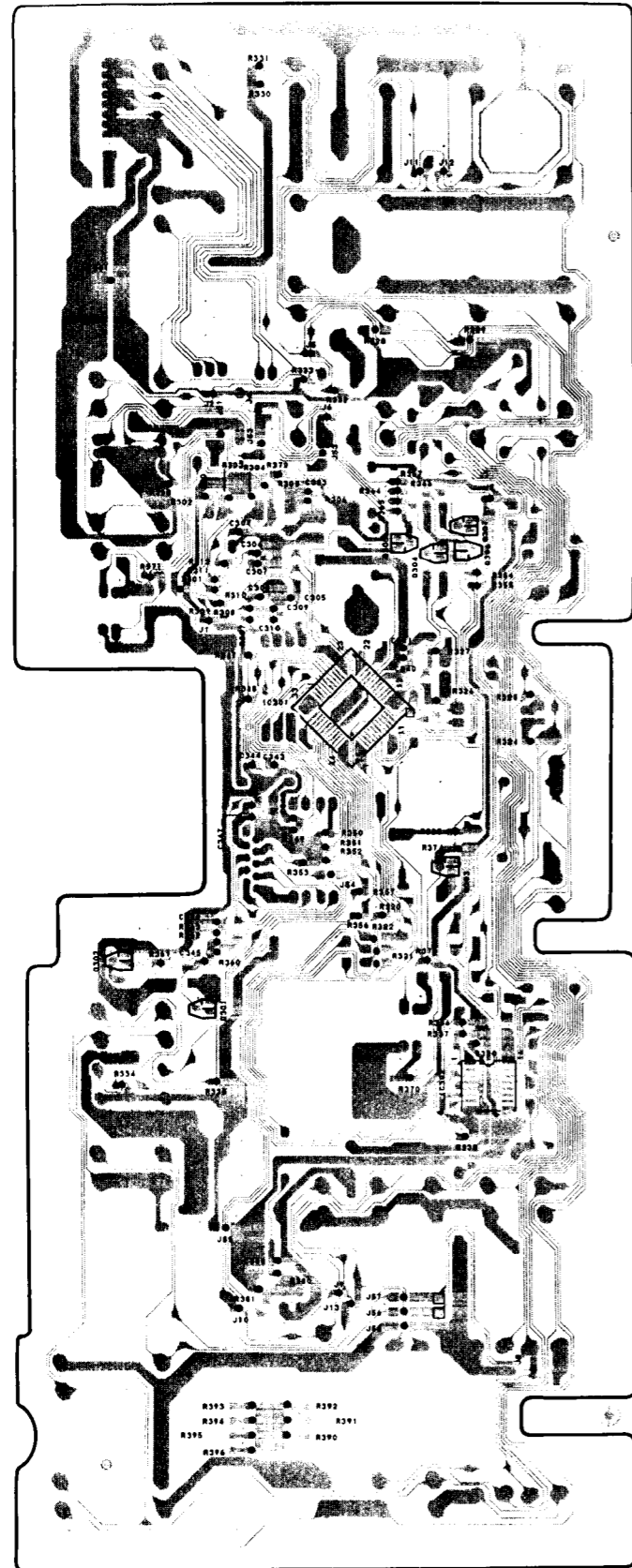
(BOTTOM VIEW)
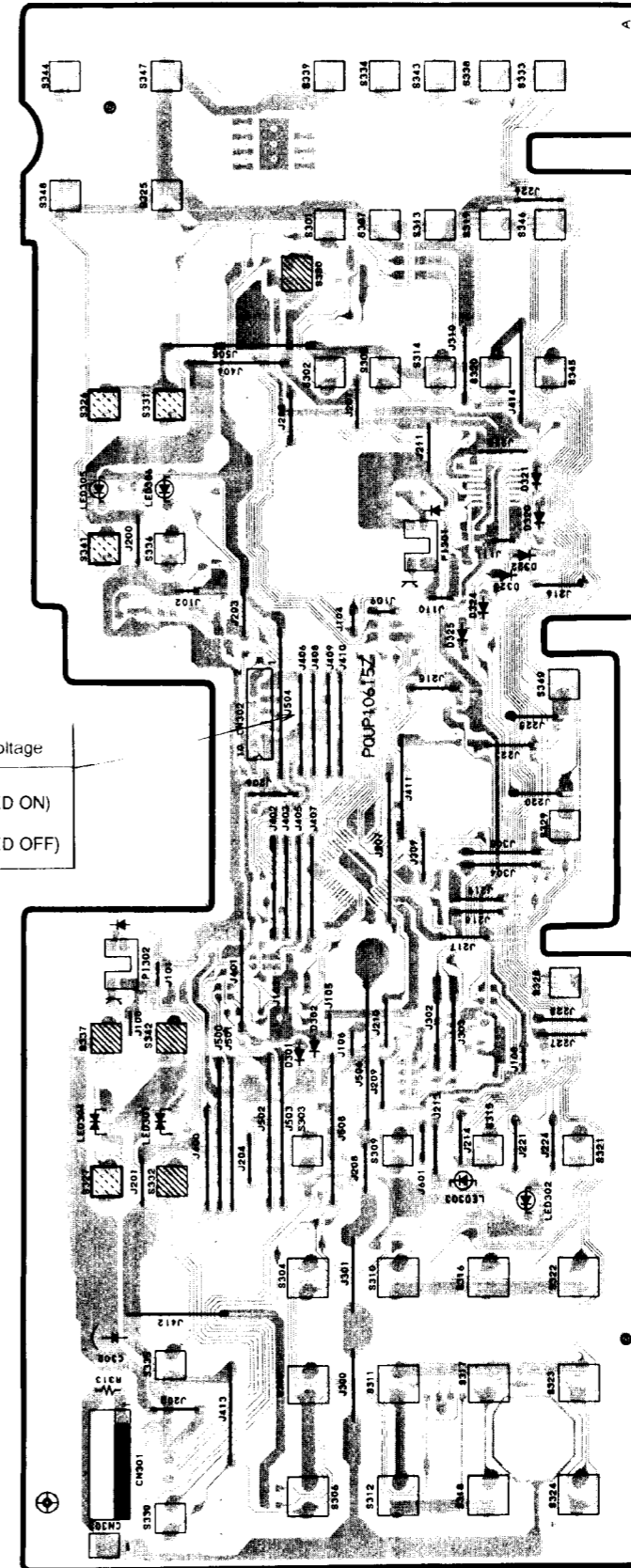
Pin No.	Waveform	Pin No.	Voltage
3,7,8, 11~14, 23~29	5V 0V	4,5	0V (LED ON) 5V (LED OFF)
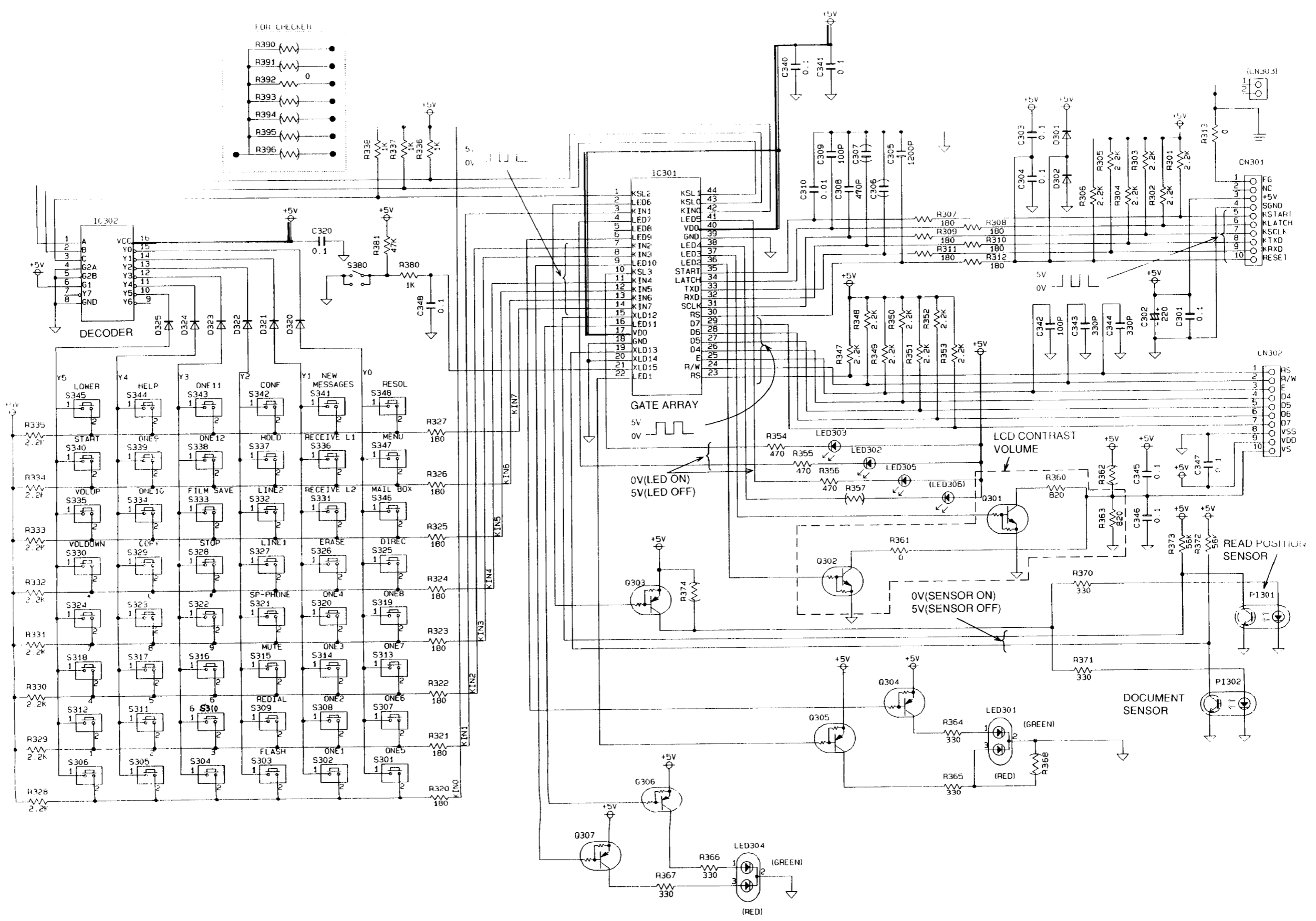
SCHEMATIC DIAGRAM/PRINTED CIRCUIT BOARD(SENSOR)

PQUP10616ZA-A
FILM END SENSOR

PS901

CN901
RISEN 1
+5V 2
GND 3
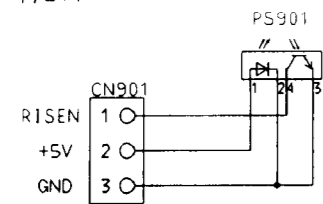
PQUP10616ZA-D
PAPER SET SENSOR (PS904)
PAPER OUT SENSOR (PS905)

PS904   PS905

CN904
+5V1 1
PASEN 2
GND 3
+5V2 4
EXSEN 5
NC 6
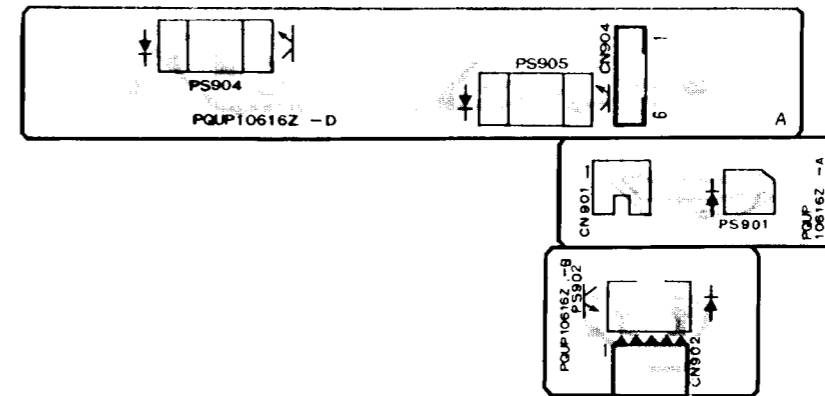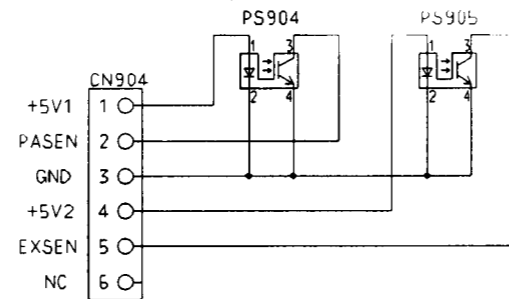
PQUP10616ZA-B
PAPER TOP SENSOR

PS902

CN902
NC 4
+5V 3
GND 2
PTSEN 1
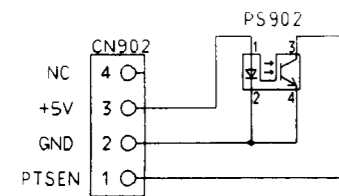
PQUP10659ZA
COVER SENSOR

SW1

CN1   (CN2)
COSEN 1   1 COSEN
GND 2   2 GND
+5V 3   3 +5V
                4 NC

PS904
PQUP10616Z -D

PS905
CN904

CN901   PS901
PQUP 10616Z -A

PQUP10616Z -B
PS902
CN902

CN2
KPC 4594V-0

SW1   CN1
PQUP10659Z   A
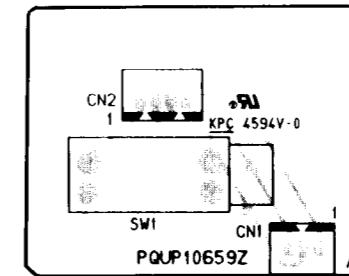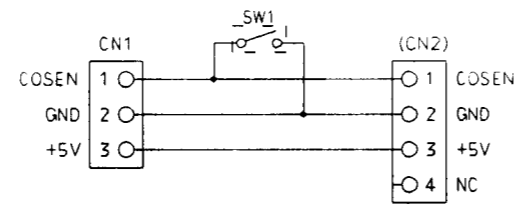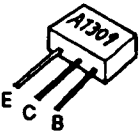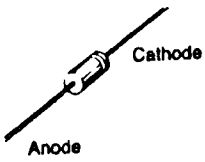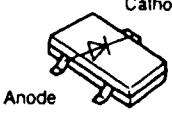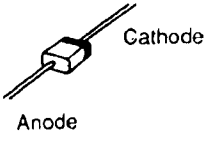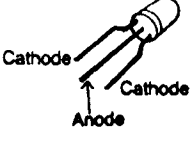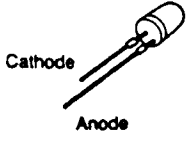
TERMINAL GUIDE OF IC'S TRANSISTORS AND DIODES

PFVI96031FKG	PQVICX58257C	PQVIR96DFXL	PQVICS10256N PQVIBA12003	PQVI63HB110
PQVIHY54256G	PFVITC7S32F PQVIS80732S PQVITC7S00FL	PQVITC7W04FL PQVIS3510ACJ PQVIMC34119M PQVINJM4558M PQVIFA5311S PQVIMM1245BF	PQVIBU121020 MN53007QAF	PFVIBU4066BF
PQVIBU8242F PFVILC7366NM	PQVIBU4053BC PQVISN7H138S	AN1431T	PQVTFS10KM10	2SC1741AS
PQVITC4052BF PQVITA31081F	PQVISMA7029M	PQVIS79164FU	2SA1627	PFWIF1200M
2SB1197K PQVTDTA143EU PQVTDTC114EU, UM5213 2SB1218A, 2SD1819A PQVTDTC143E, 2SB1051K	PQVDS1ZB40F1	RLS71	2SD1921Q 2SB1322	MA2300
PQVDR325CA47	2SD1302	MA6D49	MA143	PQVDD2SBA60
PQVDMZJ24A,PQVDRLZ5R6 MA723, 1SS131	PQVDERA1802 MA165	PQVDHZS2B1 MA4051 MA4056	MA4120M, MA4220 MA4180, MA4150 MA7200	2SC3568

2SA1309	PQVDERA81004	MA141WA	MA728	LN11WP22TDA
LN21RPSLXV				

TOOL

EC10

EC4

EC9

EC12

EC13

EC14

EC1

EC11

EC12

EC7

EC3

EC8

EC5

EC12

EC1

EC7

EC2
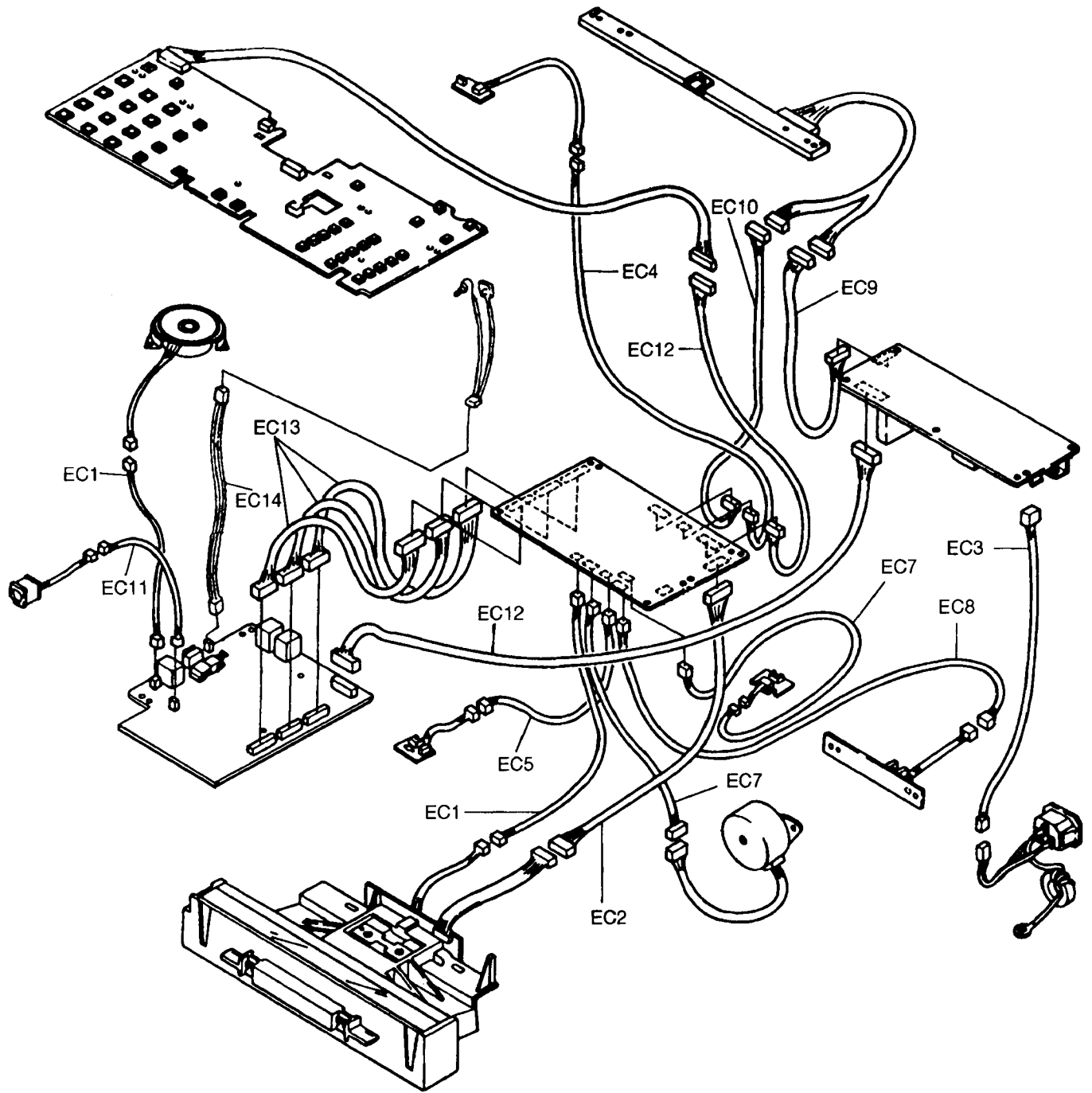
CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION
1. OPERATION PANEL SECTION
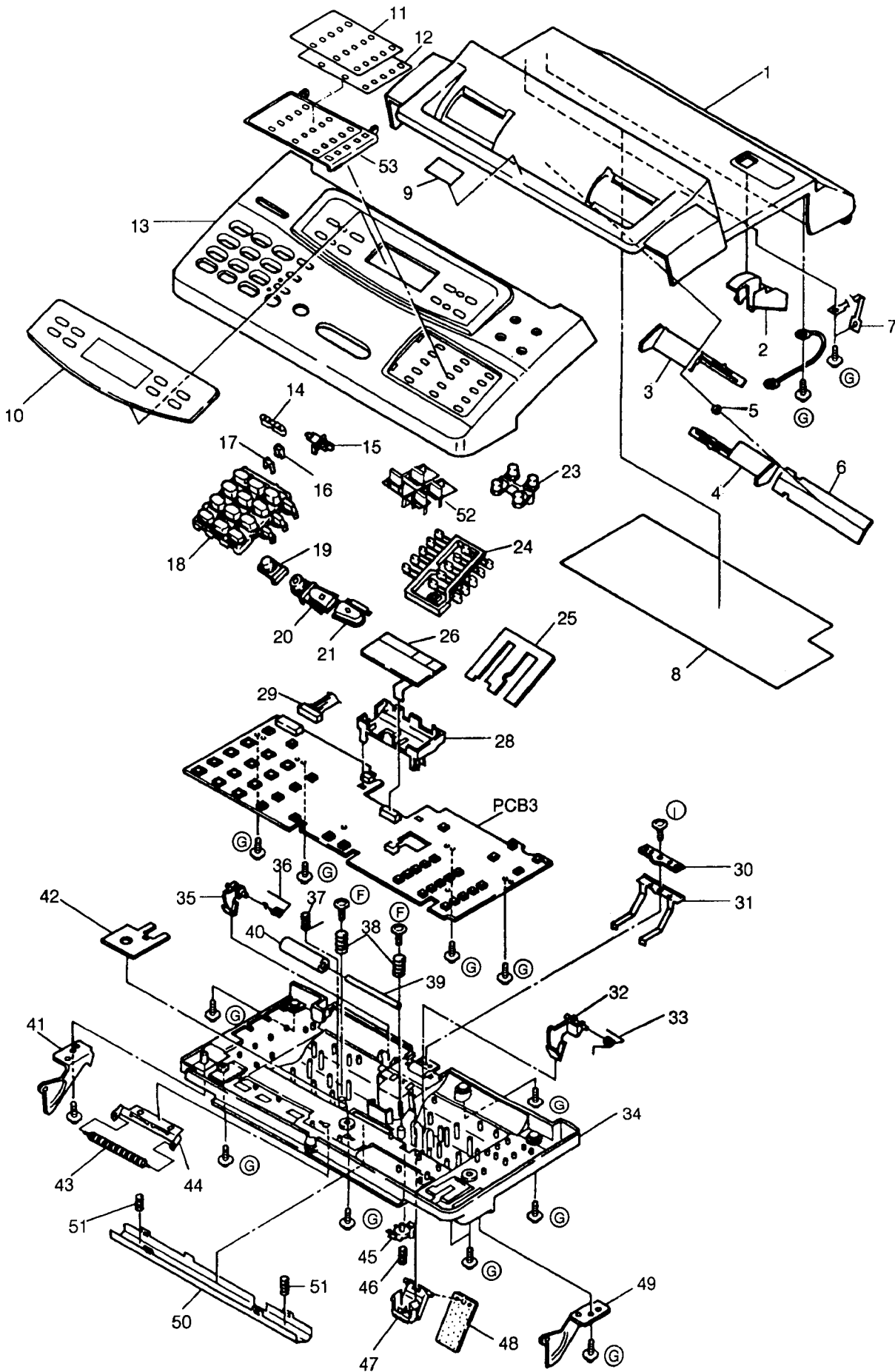
2. UPPER CABINET/P.C.B/THERMAL HEAD SECTION
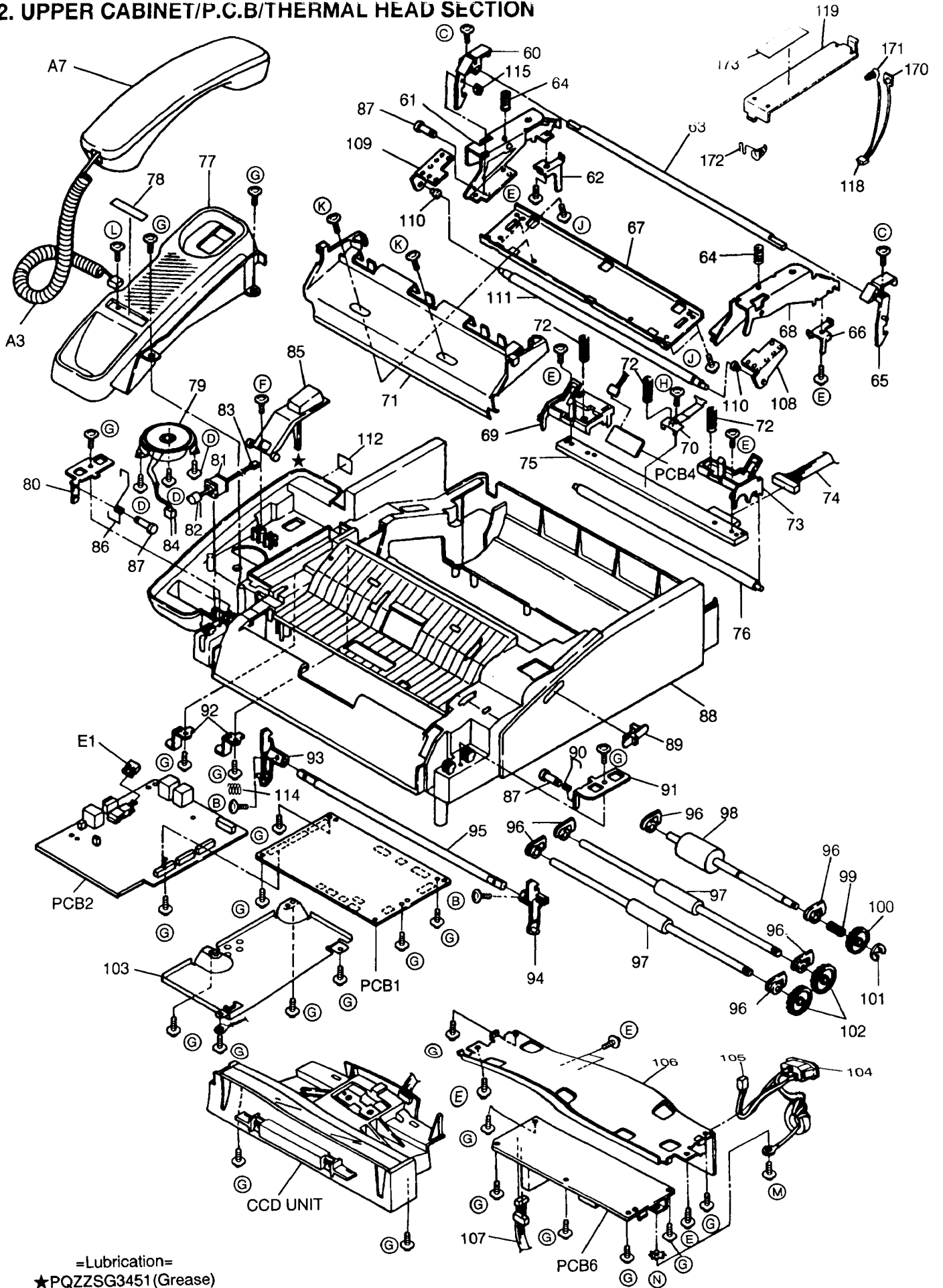
=Lubrication=
★PQZZSG3451(Grease)

3. MECHANICAL SECTION

=Lubrication=
★PQZZSG3451 (Grease)
★★PQZZ0LG425Y (Grease)
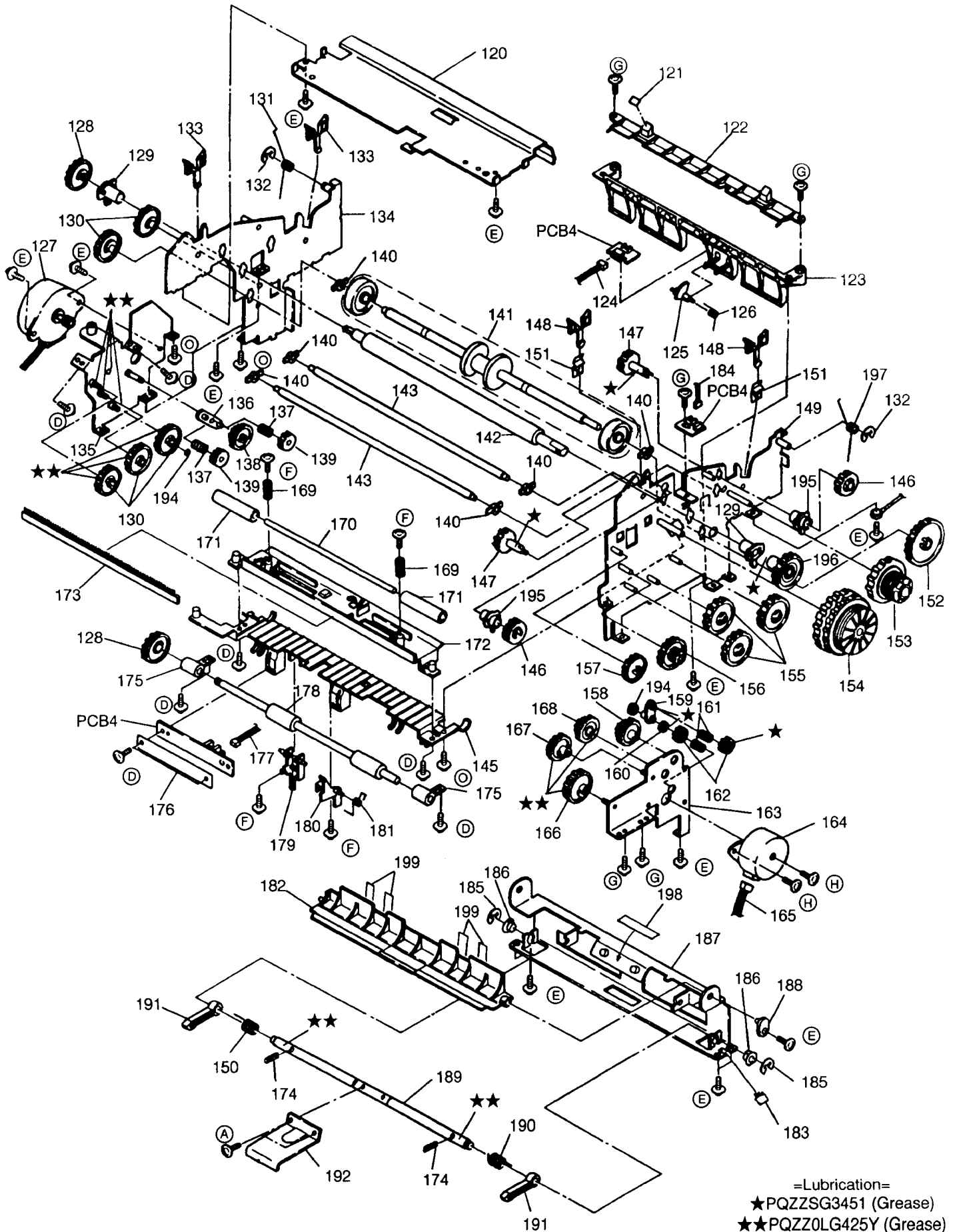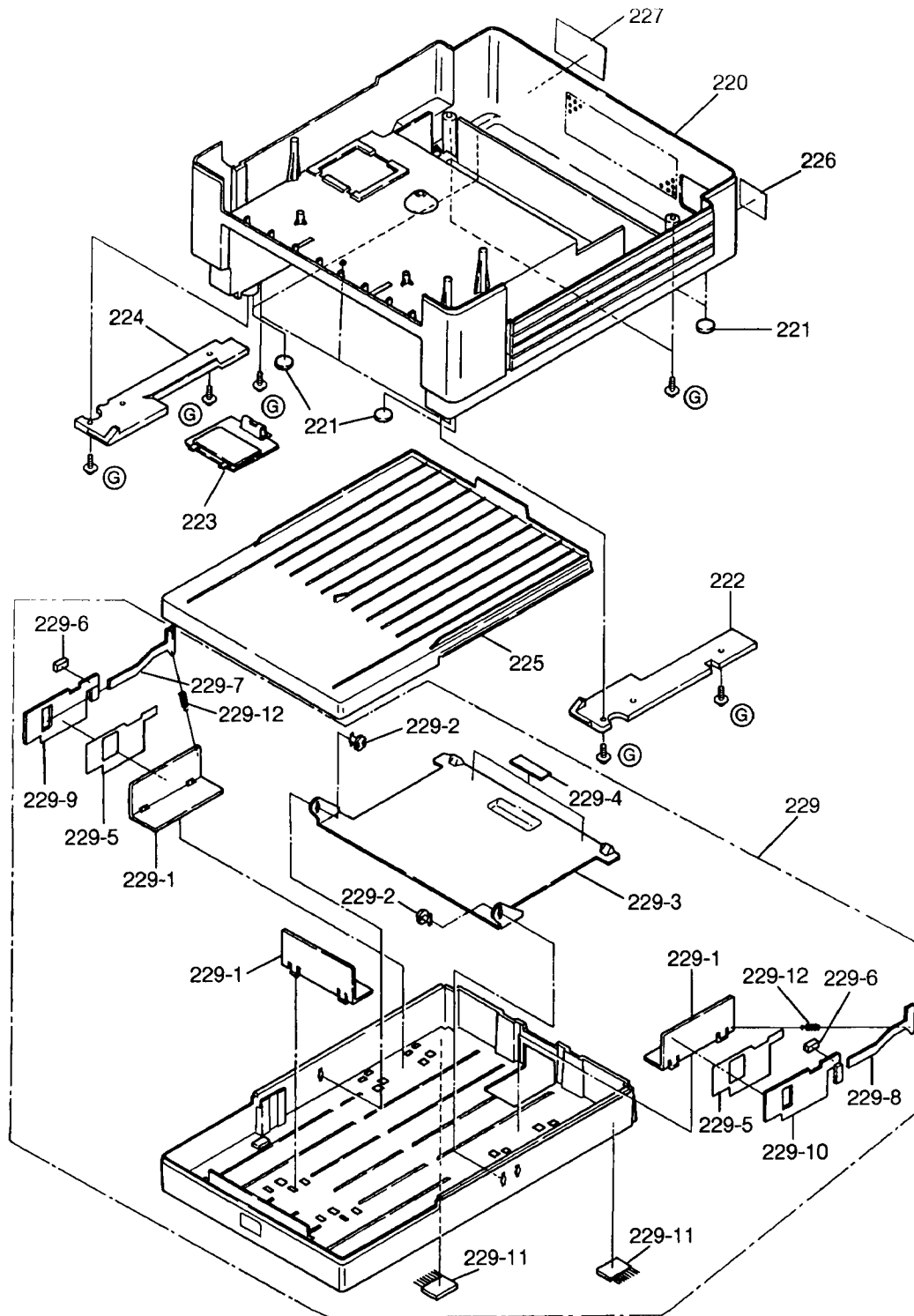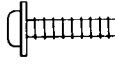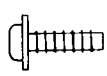
5. CCD UNIT SECTION
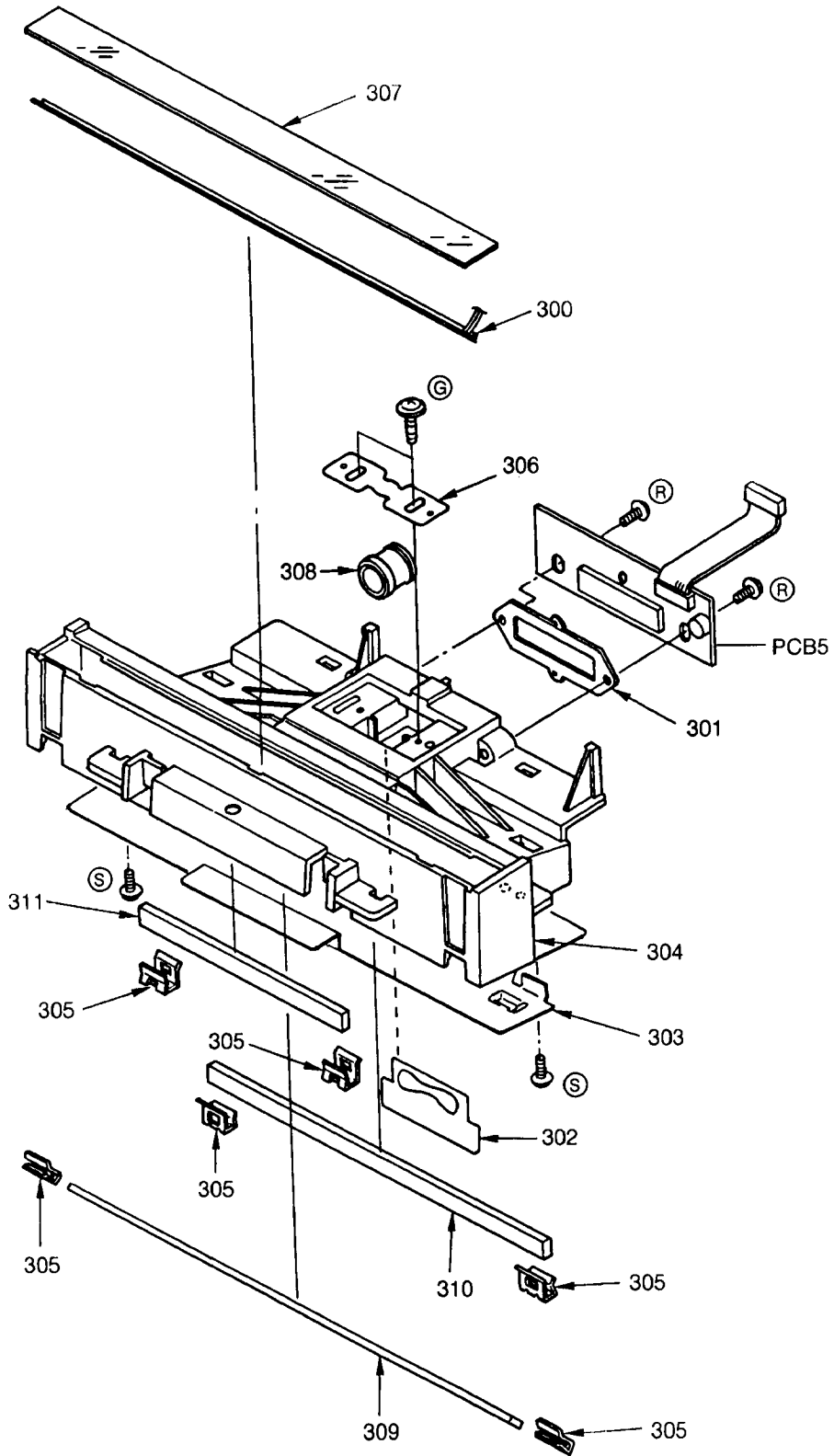
6. ACTUAL SIZE OF SCREWS AND WASHER

Ref. No.	Part No.	Figure	Ref. No.	Part No.	Figure
Ⓐ	XYN3+F8		Ⓚ	XTW3+U8L	
Ⓑ	XYN26+F6		Ⓛ	XTW3+S12P	
Ⓒ	XYC26+CF6		Ⓜ	XSB4+6	
Ⓓ	XTW3+S8M		Ⓝ	XWC4B	
Ⓔ	XTW3+U6L		Ⓞ	XTW3+U6LR	
Ⓕ	XTW3+W8P		Ⓟ	XYC3+CF14	
Ⓖ	XTW3+S10P		Ⓠ	Not Used	
Ⓗ	XTW3+5L		Ⓡ	XYN3+F16	
Ⓘ	XTS26+8G		Ⓢ	XTB3+8G	
Ⓙ	XYN3+C6				

ACCESSORIES AND PACKING MATERIALS

A5
A4
A6, A13
A12
P10
A11
FILM CARTRIDGE
A7
A2
A3
A5
A9
A10
A8 A1
P2
P1
ACCESSORY BOX
P5
P9
P3
P4
P6
P11
P7
P9
P8
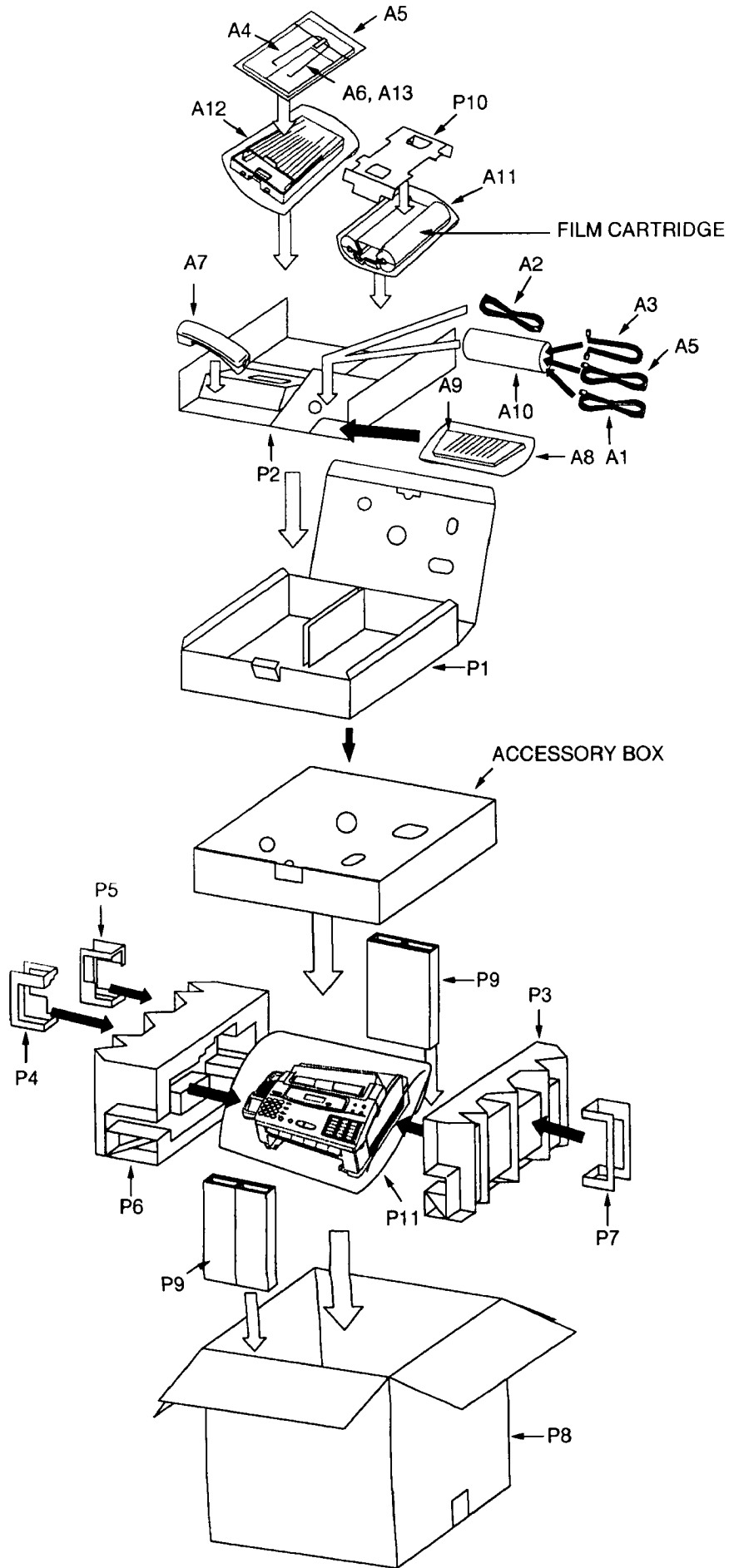
REPLACEMENT PARTS LIST

This replacement parts list is for KX-F1200 only. | Refer to the simplified manual (cover) for other areas.

REPLACEMENT PARTS LIST

Model KX-F1200

Notes:
1. RTL (Retention Time Limited)
   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 (Ω) K=1000Ω, M=1000KΩ
   All capacitors are in MICRO FARADS (μF) P= μμF
   *Type &Wattage of Resistor

Type

ERC: Solid	ERX: Metal Film	PQ4R: Carbon
ERD: Carbon	ERG: Metal Oxide	ERS: Fusible Resistor
PQRD: Carbon	ER0: Metal Film	ERF: Cement Resistor

Wattage

10, 16: 1/8W	14, 25: 1/4W	12: 1/2W	1: 1W	2: 2W	3: 3W

*Type &Voltage of Capacitor

Type

ECFD: Semi-Conductor	ECCD, ECKD, ECBT, PQCBC: Ceramic
ECQS: Styrol	ECQE, ECQV, ECQG: Polyester
PQCUV: Chip	ECEA, ECSZ: Electrolytic
ECQMS: Mica	ECQP: Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others		
1H: 50V	05: 50V	0F: 3.15V	0J: 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		0J: 6.3V	1E, 25: 25V	2A: 100V	

Ref. No.	Part No.	Part Name & Description		Pcs

CABINET, MECHANICAL AND ELECTRICAL PARTS

(1. OPERATION PANEL SECTION)

Ref. No.	Part No.	Part Name & Description		Pcs
1	PQKM10209Z1	CABINET BODY (TOP COVER)		1
2	PQDE10057Z1	LEVER, FILM DETECTION		1
3	PQKR10014Y2	GUIDE-L, DOCUMENT		1
4	PQKR10015Y2	GUIDE-R, DOCUMENT		1
5	PQDG10033Z	GEAR, DOCUMENT GUIDE		1
6	PQMH10182Z	ANGLE, DOCUMENT GUIDE		1
7	PQHX10583Z	PLASTIC PARTS, STOPPER BELT		2
8	PQQT11147Z	LABEL, HEAD CAUTION	S	1
9	Not Used			
10	PQGP10120Z	PANEL, LCD		1
11	PQGV10032Z	TRANSPARENT PLATE, MEMORY CARD		1
12	PQGD10145Z	MEMORY CARD		1
13	PQGG10061X1	PANEL (GRILLE), OPERATION		1
14	PQBC10170Z2	BUTTON, VOLUME		1
15	PQHR10445Z	SPACER, VOLUME BUTTON		1
16	PQGP10091Z	COVER-A, LED		1
17	PQGP10092Z	COVER-B, LED		1
18	PQBX10217Y2	BUTTON, DIAL		1
19	PQBC10167Z1	BUTTON, SP-PHONE		1
20	PQBX10216Z2	BUTTON, STOP/COPY		1
21	PQBC10166Z1	BUTTON, START		1
22	Not Used			
23	PQBX10253Z1	BUTTON, HELP		1
24	PQBX10255Z1	BUTTON, ONE TOUCH		1
25	PQHX10585Z	PLASTIC PARTS, ONE TOUCH BUTTON SHEET		1
26	PQAVLNY151G	LCD UNIT		1
27	Not Used			
28	PQHR10310Z	GUIDE, LCD UNIT		1
29	PQJS10P07Z	CONNECTOR LEAD, 10P		1

Ref. No.	Part No.	Part Name & Description	Pcs
30	PQMH10125Y	ANGLE, ADF SPRING	1
31	PQUS10123X	SPRING, DOCUMENT FEED	1
32	PQDE10034Y	LEVER, DOCUMENT DETECT	1
33	PQUS10135Y	SPRING, DOCUMENT DETECT LEVE	1
34	PQUV10022Y	COVER, OPERATION PANEL	1
35	PQDE10033Z	LEVER, READ DETECTION	1
36	PQUS10134Z	SPRING, DOCUMENT DETECT LEVE	1
37	PQUS10148Z	SPRING, OPERATION EARTH	1
38	PQUS10125Y	SPRING, ROLLER	2
39	PQDF10036Z	SHAFT, SUPPORT ROLLER	1
40	PQDR9685Z	ROLLER, SUPPORT	1
41	PQMH10250Z	ANGLE, OPERATION SUPPORT	1
42	PQHX10570Z	COVER, STATIC ELECTRIC	1
43	PQDR10005Z	ROLLER, EXIT	1
44	PQUS10181Z	SPRING, EXIT	1
45	PQHR10312Z	LEVER, SEPARATION SPRING AJT	1
46	PQUS10124Z	SPRING, SEPARATION	1
47	PQHR10311Z	GUIDE, SEPARATION RUBBER	1
48	PQHG10357Z	SEPARATION RUBBER	1
49	PQMH10251Z	ANGLE, OPERATION SUPPORT	1
50	PQZE3F1000M	READING PLATE ASS'Y	1
51	PQUS10177Z	SPRING, READING PLATE	2
52	PQBX10252Z3	BUTTON, TAM/2-LINE SYSEM etc.	2
53	PQKK10060Z1	COVER, DIALER	1
		(2. UPPER CABINET/ PCB/ THERMAL HEAD SECTION)	
60	PQDE10060Z	LEVER, HEAD ARM LOCK	1
61	PQMH10245Z	ARM-L, TERMAL HEAD	1
62	PQMH10253Z	ANGLE, HEAD ARM	1
63	PQDF10046Z	SHAFT, HEAD ARM LOCK	1
64	PQUS10168Z	SPRING	2
65	PQDE10052Z	LEVER, HEAD ARM LOCK	1
66	PQMH10243Z	ANGLE, HEAD ARM	1
67	PQMD10085Z	FRAME, TERMAL HEAD	1
68	PQMH10246Z	ARM-R, TERMAL HEAD	1
69	PQDE10053Z	GUIDE-L, TERMAL HEAD	1
70	PQMH10255Z	ANGLE, TERMAL HEAD FULCRUM	1
71	PQHR10450Z	COVER	1
72	PQUS10167Z	SPRING, TERMAL HEAD	3
73	PQDE10054Z	GUIDE-R, TERMAL HEAD	1
74	PQJS15P01Z	CONNECTOR LEAD, 15P	1
75	PQJHS0016Z	TERMAL HEAD	1
76	PQDF10047Z	SHAFT, FILM GUIDE ROLLER	1
77	PQKM10211Z1	HANDSET CRADLE	1
78	PQHX10241Z	CARD, TEL. NO.	1
79	PQAS5P13Z	SPEAKER	1
80	PQMH10248Z	ANGLE, SCANNER	1
81	PQHG556Z	RUBBER PARTS, MIC COVER	1
82	PQJM128Z	MICROPHONE	1
83	PQJS02Q62Z	CONNECTOR LEAD, 2P	1
84	PQJS02Q68Z	CONNECTOR LEAD, 2P	1
85	PQBH10019Z2	BUTTON, HOOK	1
86	PQUS10174Z	SPRING, OPERATION PANEL	1
87	PQHD10010Y	SCREW	3
88	PQKM10210X1	CABINET BODY	1
89	PQBD10033W2	KNOB, OPEN	1
90	PQUS10184Z	SPRING, OPERATION PANEL	1
91	PQMH10249Z	ANGLE, SCANNER	1
92	PQMH10247Z	ANGLE, P. C. B.	2
93	PQDE10063Z	LEVER-L, LOCK	1
94	PQDE10062Y	LEVER-R, LOCK	1
95	PQDF10051Z	SHAFT, LOCK LEVER	1
96	PQDJ10002Z	SPACER, ROLLER	6
97	PQDN10022Z	ROLLER, DOCUMENT FEED	2
98	PQDN10021Z	ROLLER, SEPARATION	1
99	PQUS10014Z	SPRING, ONE WAY	1

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Ref. No.	Part No.	Part Name & Description	Pcs	Ref. No.	Part No.	Part Name & Description	Pcs
100	PQDG10006Z	GEAR, SEPARATION ROLLER	1	168	PQDG10025Z	GEAR, IDLE	1
101	XUC2FY	RETAINING RING	1	169	PQUS10125Y	SPRING, ROLLER	2
102	PQDG10034Z	GEAR, DOCUMENT FEED ROLLER	2	170	PQDF10045Z	SHAFT, P. EXIT ROLLER	1
103	PQMD10087Z	FRAME, BOTTOM	1	171	PQDR9685Z	ROLLER, SUB	2
104	PQJP3A3Z	AC INLET ⚠	1	172	PQUG10010Z	GUIDE, P. EXIT	1
105	PQJS02Q59Y	CONNECTOR LEAD, 2P	1	173	PQJE113Z	UNITISTATIC BRUSH	1
106	PQMD10088Z	FRAME	1	174	XPL2A12WVW	PIN	2
107	PQJS10P06Z	CONNECTOR LEAD, 10P	1	175	PQDJ10016Z	SPACER, EXIT ROLLER	2
108	PQMH10257Z	ANGLE, SEPARATION ROLLER	1	176	PQHX10582Z	COVER, SENSOR BOARD	1
109	PQMH10256Z	ANGLE, SEPARATION ROLLER	1	177	PQJS6P03Z	CONNECTOR LEAD, 6P	1
110	PQDJ10021Y	SPACER, SEPARATION ROLLER	2	178	PQDN10029Z	ROLLER, PAPER EXIT	1
111	PQDF10057Z	SHAFT, SEPARATION ROLLER	1	179	PQDE10056Z	LEVER, PAPER SENSOR	1
112	Not Used						
113	Not Used			180	PQDE10051Z	LEVER, P. EXIT SENSOR	1
114	PQUS10018Z	SPRING, LOCK LEVER SHAFT	1	181	PQUS10165Z	SPRING, P. EXIT SENSOR	1
115	XNG26F	NUT	1	182	PQUG10006Y	GUIDE, SEPARATION	1
116	PQJS02Q89Z	CONNECTOR LEAD, 2P	1	183	PQJV10008Z	UNITISTATIC BRUSH	1
117	PQKK10048Z2	COVER, BATTERY	1	184	PQJS3P05Z	CONNECTOR, 3P	1
118	PQJC915Z	BATTERY TERMINAL, + SIDE	1	185	XUC5FY	RETAINING RING	2
119	RJC314Z	BATTERY TERMINAL, - SIDE	1	186	PQDJ10020Z	SPACER, LIFT UP	2
400	RJC746Z	BATTERY TERMINAL, + - SIDE	1	187	PQMD10083Z	CHASSIS, PICK UP	1
401	PQQT11089Z	LABEL, BATTERY COVER	1	188	PQHR10444Z	SPACER, SEPARATION	1
				189	PQDF10043Z	SHAFT, LEFT PLATE	1
		(3. MECHANICAL SECTION)					
120	PQMD10086Z	CHASSIS, MEMBER-A	1	190	PQUS10162Z	SPRING, LIFT	1
121	PQQT11153Z	INDICATION LABEL	1	191	PQDE10050Z	ARM, LIFT UP	2
122	PQUG10009Z	GUIDE, P. PAPER	1	192	PQMH10244Z	ANGLE, LIFT	1
123	PFUG1001Z	GUIDE, P. PAPER	1	193	Not Used		
124	PQJS4P02Z	CONNECTOR LEAD, 4P	1	194	PQFN51Z	WASHER	2
125	PQDE10055Z	LEVER, P. TOP SENSOR	1	195	PQDJ10019Z	SPACER, FILM GEAR	2
126	PQUS10171Z	SPRING, P. TOP SENSOR	1	196	PQDG10048Z	GEAR, FILM DRIVE	1
127	PQJQ10015Z	RX MOTOR	1	197	PQUS10178Z	SPRING, HEAD ARM	1
128	PQDG10053Z	GEAR, ROLLER DRIVE	2	198	PFHX1004Z	SPACER	1
129	PQDJ10018Y	SPACER, PLATEN	2	199	PQHX10606Z	SPACER SHEET	4
130	PQDG10054Z	GEAR, IDLE	5				
131	PQUS10170Z	SPRING, HEAD ARM	1			**(4. LOWER CABINET/PAPER**	
132	XUC4FY	RETAINING RING	2			**CASSETTE SECTION)**	
133	PQDJ10017Y	SPACER (LEAD CLAMPER)	2	220	PQKF10149Z1	CABINET PLATE	1
134	PQUA10012Z	CHASSIS	1	221	PQHG10065Z	RUBBER PARTS, LEG	4
135	PQUA10014Z	SUB CHASSIS	1	222	PQKR10017Z	GUIDE-R, PAPER CASSETTE	1
136	PQDE10061Y	ARM, RX RENDULUM	1	223	PQKE55Z4	ROM LID	1
137	PQUS10179Z	SPRING, RX RENDULUM	2	224	PQKR10018Z	GUIDE-L, PAPER CASSETTE	1
138	PQDG10051Z	GEAR, RX SUN	1	225	PQZE2F1000M	COVER, PAPER CASSETTE	1
139	PQDG10052Z	GEAR, RX PLANETARY	2	226	PFQT1001Z	LABEL, AC IN	1
140	PQDJ10008Y	SPACER, ROLLER	6	227	PQGT12276Z	NAME PLATE	1
141	PFDX1001Z	ROLLER, PICK UP	1	229	PQZE1F1000M	PAPER CASSETTE ASS'Y	1
142	PQDN10028Z	ROLLER, PLATEN	1	229-1	PQKR10016Y1	GUIDE, LEAGL CHANGE	3
143	PQDF10044Z	SHAFT, FILM GUIDE ROLLER	2	229-2	PQHR10443Z	SPACER, PAPER CASSETTE	2
144	Not Used			229-3	PQMD10082Y	ANGLE, PAPER CASSETTE	1
145	PQUG10007Z	GUIDE, P. EXIT	1	229-4	PQHG10355Y	RUBBER, CASSETTE SEPARATION	2
146	PQDG10050Z	GEAR, RIBBON	2	229-5	PFHS1001Z	SHEET	2
147	PQDG10049Z	GEAR, RIBBON	2	229-6	PQHG431Z	CORNER RUBBER	2
148	PQDJ10017Z	SPACER, RIBBON	2	229-7	PFMH1001Z	CORNER THERMINAL-L	1
149	PQUA10013Z	CHASSIS	1	229-8	PFMH1002Z	CORNER THERMINAL-R	1
150	PQUS10161Z	SPRING, LIFT	1	229-9	PFMH1003Z	CORNER ANGLE-L	1
151	PQUS10188Z	SPRING	2	229-10	PFMH1004Z	CORNER ANGLE-R	1
152	PQDG10047Z	GEAR, PICK UP	1	229-11	PQJV10008Z	UNITISTATIC BRUSH	2
153	PQDX10017Z	GEAR, SUPPLY TORQUE LIMITOR	1	229-12	PFUS1001Y	SPRING	2
154	PQDX10016Z	GEAR, WIND TORQUE LIMITER	1				
155	PQDG10058Z	GEAR, IDLE	3			**(5. CCD SECTION)**	
156	PQDG10057Z	GEAR, IDLE	1	300	LNR304501	LED ARRAY	1
157	PQDG10056Z	GEAR, IDLE	1	301	PQHR9725Z	SPACER	1
158	PQDG10059Z	GEAR, IDLE	1	302	PQHX10457Z	COVER	1
159	PQDE10059Y	ARM, RX PENDULUM	1	303	PQMD10073Z	COVER	1
160	XWE3	WASHER	1	304	PQUA10008Z	CHASSIS	1
161	PQUS10191Z	SPRING, RX PENDULUM	2	305	PQUS216Z	SPRING, MIRROR	6
162	PQDG10055Z	GEAR, PLANETARY	2	306	PQUS217Z	SPRING, LENS	1
163	PQUA10015Z	CHASSIS, TX GEAR	1	307	PQ0G10003Z	GLASS	1
164	PQJQ10010Z	TX MOTOR	1	308	PQ0L6Y	LENS S	1
165	PQJS5P04Z	CONNECTOR LEAD, 5P	1	309	PQ0M10010Z	MIRROR, LONG	1
166	PQDG10029Z	GEAR, IDLE	1	310	PQ0M10011Z	MIRROR, MIDDLE	1
167	PQDG10026Z	GEAR, IDLE	1	311	PQ0M10012Z	MIRROR, SHORT	1

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Ref. No.	Part No.	Part Name & Description		Pcs
		ACCESSORIES AND PACKING MATERIALS		
A1	PQJA59V	CORD, TEL.	⚠ S	1
A2	PQJA200Z	CORD, AC	⚠	1
A3	PQJA212M	CORD, HANDSET		1
A4	PQZSF1000M	SPRING (STACKER)		1
A5	XZB30X45A03	PROTECTION COVER (DOCUMENTS)		1
A6	PQQX11546Z	INSTRUCTION BOOK		1
A7	PQJXD0105Z	HANDSET ASS'Y	S	1
A8	XZB15X40A04	PROTECTION COVER (D. TRAY)		1
A9	PQKS10011Z	DOCUMENT TRAY		1
A10	XZB20X20A04	PROTECTION COVER (CORDS)		1
A11	XZB36X40A04	PROTECTION COVER (INK FILM)		1
A12	XZB36X50A04	PROTECTION COVER (P. CASSETTE)		1
A13	PQQW11520Z	QUICK REFERENCE GUIDE		1
A14	PQQW11521Z	CARD, REMOTE CONTROL		1
A15	PQJA48W	CORD, TEL. (4P)	⚠	1
P1	PQPN10499Z	ACCESSORY BOX		1
P2	PQPE10027Z	CUSHION FOR ACCESSORY BOX		1
P3	PQPN10501Z	CUSHION-R		1
P4	PQPE10029Z	CUSHION-L1		1
P5	PQPE10030Z	CUSHION-L2		1
P6	PQPN10502Z	CUSHION-L		1
P7	PQPE10028Z	CUSHION-R1		1
P8	PQPK11988Z	PACKING CASE		1
P9	PQPE10038Y	CUSHION		2
P10	PQPE10037Z	CUSHION, INK FILM		1
P11	PQPH10051Z	PROTECTION COVER (SET)		1
		DIGITAL BOARD PARTS		
PCB1	PFWP1F1200M	DIGITAL BOARD ASS'Y(RTL)		1
		(ICs)		
IC401	PFVI96031FKG	IC		1
IC402	PFWIF1200M	IC		1
IC403	PQVICX58257C	IC	S	1
IC404	PQVIM66358FP	IC		1
IC405	PQVIR96DFXL	IC		1
IC406	PQVIBA12003	IC	S	1
IC407	PQVISMA7029M	IC		1
IC408	PQVIS3510ACJ	IC		1
IC409	PQVIMM1245BF	IC		1
IC411	PQVITC7S00FL	IC		1
IC413	PQVINJM4558M	IC	S	1
IC415	PQVIHY54256G	IC		1
IC416	PQVIHY54256G	IC		1
IC417	PQVIBU121020	IC		1
IC419	PFVITC7S32F	IC		1
		(TRANSISTORS)		
Q401	2SD1921Q	TRANSISTOR(SI) (or 2SD1994A)	S	1
Q402	PQVTDTC114EU	TRANSISTOR(SI) (or UN5211)	S	1
Q403	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q405	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q406	2SB1051K	TRANSISTOR(SI) (or 2SB1197K)	S	1
Q407	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q408	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q410,411	PQVTDTC114EU	TRANSISTOR(SI) (or UN5211)	S	2
Q420,421	2SB1197K	TRANSISTOR(SI)		2
		(DIODES)		
D601	MA7200	DIODE(SI)		1
D602	RLS71	DIODE(SI)		1
		(BATTERY)		
BATT	PQPCR2032H09	LITHIUM BATTERY	S	1

Ref. No.	Part No.	Part Name & Description		Pcs
		(CONNECTORS)		
CN401	PQJP11A19Z	CONNECTOR, 11P		1
CN402	PQJP11A19Z	CONNECTOR, 11P		1
CN403	PQJP11A19Z	CONNECTOR, 11P		1
CN404	PQJP10G30Y	CONNECTOR, 10P		1
CN405	PQJP8G30Y	CONNECTOR, 8P		1
CN406	PQJP02G100Z	CONNECTOR, 2P		1
CN407	PQJP08G100Z	CONNECTOR, 8P		1
CN408	PQJP05G100Z	CONNECTOR, 5P		1
CN409	PQJP05A22Z	CONNECTOR, 5P		1
CN411	PQJP3G30Y	CONNECTOR, 3P		1
CN412	PQJP03G100Z	CONNECTOR, 3P		1
CN413	PQJP04G100Z	CONNECTOR, 4P		1
CN414	PQJP6G30Y	CONNECTOR, 6P		1
		(CAPACITORS)		
C403	PQCUV1E104MD	0.1	S	1
C405	PQCUV1H182KB	0.0018	S	1
C406	PQCUV1H222KB	0.0022	S	1
C407	PQCUV1E104MD	0.1	S	1
C411-425	PQCUV1E104MD	0.1		14
C426	PQCUV1H180JC	18P		1
C427	PQCUV1H330JC	33P		1
C430	PQCUV1E104MD	0.1	S	1
C434	PQCUV1H221JC	220P		1
C501	PQCUV1E104MD	0.1	S	1
C502	PQCUV1E104MD	0.1	S	1
C503	PQCUV1E104MD	0.1	S	1
C504	PQCUV1E104MD	0.1	S	1
C505	PQCUV1E104MD	0.1	S	1
C506	PQCUV1E104MD	0.1	S	1
C507	ECEA0JK221	220		1
C508	PQCUV1E104MD	0.1	S	1
C509	PQCUV1E104MD	0.1	S	1
C510	PQCUV1H102J	0.001		1
C511	PQCUV1H105JC	1	S	1
C513	PQCUV1E104MD	0.1	S	1
C514	PQCUV1H331JC	330P	S	1
C515	PQCUV1E104MD	0.1	S	1
C516	PQCUV1H105JC	1	S	1
C518	PQCUV1H331JC	330P	S	1
C519	PQCUV1E104MD	0.1	S	1
C520	PQCUV1H102J	0.001		1
C521	PQCUV1E104MD	0.1	S	1
C522	PQCUV1H102J	0.001		1
C523	PQCUV1H102J	0.001		1
C526	PQCUV1H103KB	0.01	S	1
C527	ECEA1CK101	100		1
C528	PQCUV1H105JC	1	S	1
C530	PQCUV1H105JC	1	S	1
C550	PQCUV1C224ZF	0.22		1
C552,553	PQCUV1E104MD	0.1	S	2
C561	PQCUV1E104MD	0.1	S	1
C580-583	PQCUV1E333MD	0.033	S	4
C584	PQCUV1E104MD	0.1	S	1
C585	PQCUV1E104MD	0.1	S	1
C601	ECEA1VKA220	22		1
C602	ECEA1VU221	220		1
C604,605	PQCUV1H471JC	470P		2
C606,607	PQCUV1H222KB	0.0022	S	2
C608	PQCUV1E104MD	0.1	S	1
C701	PQCUV1E104MD	0.1	S	1
C702	PQCUV1E104MD	0.1	S	1

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Ref. No.	Part No.	Part Name & Description		Pcs
C704	PQCUV1E104MD	0.1	S	1
C705	PQCUV1H103KB	0.01	S	1
C706	PQCUV1H103KB	0.01	S	1
C707	PQCUV1E104MD	0.1	S	1
C709	PQCUV1H470JC	47P		1
C710	PQCUV1H470JC	47P		1
C711	PQCUV1E104MD	0.1	S	1
C712	PQCUV1E104MD	0.1	S	1
C714	PQCUV1H100DC	10P	S	1
C715	PQCUV1H100DC	10P	S	1
C716	PQCUV1E104MD	0.1	S	1
C717	PQCUV1E104MD	0.1	S	1
C719	PQCUV1E104MD	0.1	S	1
C721	PQCUV1E104MD	0.1	S	1
C724	PQCUV1H103KB	0.01	S	1
C725	PQCUV1H470JC	47P		1
C731	PQCUV1H103KB	0.01	S	1
C750	PQCUV1E104MD	0.1	S	1
C751,752	ECUV1H030CCV	3P		2
		(CERAMIC FILTERS)		
LC501	EXCEMT222D	CERAMIC FILTER		1
LC502	EXCEMT220B	CERAMIC FILTER		1
		(COILS)		
L403	PQLQR2BT	COIL	S	1
L404, 415	PQLQR2BT	COIL	S	2
L405	PQLQR1ET	COIL		1
L406	PQLQR1E21A05	COIL		1
L407-414	PQLQR1RM601	COIL		8
		(COMPONENT COMBINATIONS)		
RA405,406	EXRV8V331JV	RASISTOR ARRAY		2
RA407-RA410	EXRV8V101JV	RASISTOR ARRAY		4
		(RESISTORS)		
L401	PQ4R10XJ000	0		1
L402	PQ4R10XJ000	0		1
L502	PQ4R18XJ000	0		1
L701	PQ4R10XJ000	0		1
L702	PQ4R10XJ000	0		1
L703	PQ4R10XJ000	0		1
R402	PQ4R10XJ000	0		1
R403	PQ4R10XJ102	1K		1
R404	PQ4R10XJ472	4.7K		1
R405	PQ4R10XJ103	10K		1
R406-409	PQ4R10XJ331	330		4
R410	PQ4R10XJ000	0		1
R411	PQ4R10XJ222	2.2K		1
R412	PQ4R10XJ103	10K		1
R413-417	PQ4R10XJ331	330		5
R418	PQ4R10XJ000	0		1
R419	PQ4R10XJ331	330		1
R420	PQ4R10XJ223	22K		1
R421	PQ4R10XJ563	56K		1
R422	PQ4R10XJ473	47K		1
R423	PQ4R10XJ472	4.7K		1
R424	PQ4R10XJ272	2.7K		1
R425	PQ4R10XJ472	4.7K		1
R434	ERJ3GEYJ472	4.7K		1
R435	PQ4R10XJ472	4.7K		1

Ref. No.	Part No.	Part Name & Description		Pcs
R436	PQ4R10XJ105	1M		1
R437	PQ4R10XJ270	27		1
R440	ERJ3GEYJ000	0		1
R442	PQ4R10XJ472	4.7K		1
R443	PQ4R10XJ473	47K		1
R444	PQ4R10XJ472	4.7K		1
R452	PQ4R10XJ331	330		1
R454	ERJ3GEYJ333	33K		1
R455	ERJ3GEYJ682	6.8K		1
R456-459	PQLQR1RM601	COIL		4
R460-467	ERJ3GEYJ331	330		8
R470-473	PQLQR1RM601	COIL		4
R474,475	ERJ3GEYJ331	330		2
R476	PQ4R10XJ331	330		1
R477,478	ERJ3GEYJ331	330		2
R480	ERJ3GEYJ000	0		1
R501	ERD25TJ220	22	S	1
R502	PQ4R10XF1802	18K		1
R503	PQ4R10XF8662	86.6K		1
R504	PQ4R10XJ103	10K		1
R505	ERJ6ENF4752	47.5K		1
R506	ERJ3GEYJ473	47K		1
R507	PQ4R10XJ332	3.3K		1
R508	PQ4R10XF8662	86.6K		1
R509	PQ4R10XJ154	150K		1
R510	PQ4R10XJ224	220K		1
R511	PQ4R10XJ224	220K		1
R512	PQ4R18XJ102	1K		1
R513	PQ4R18XJ102	1K		1
R514	PQ4R10XJ102	1K		1
R517	ERJ3GEYJ103	10K		1
R518	PQ4R10XJ472	4.7K		1
R553,554	PQ4R10XJ472	4.7K		2
R557	ERJ3GEYJ000	0		1
R558,559	ERJ3GEYJ472	4.7K		2
R561,562	PQ4R10XJ331	330		2
R563,564	ERJ3GEYJ563	56K		2
R565	PQ4R10XJ331	330		1
R566	ERJ3GEYJ563	56K		1
R567	PQ4R10XJ331	330		1
R568	ERJ3GEYJ563	56K		1
R569	PQ4R10XJ122	1.2K		1
R570	ERJ3GEYJ333	33K		1
R573	ERJ3GEYJ562	5.6K		1
R577	PQ4R10XJ472	4.7K		1
R578	PQ4R10XJ103	10K		1
R593	PQ4R10XJ000	0		1
R595	PQ4R10XJ000	0		1
R601	ERD25TJ332	3.3K	S	1
R602	PQ4R10XJ821	820		1
R610-613	ERJ3GEYJ562	5.6K		4
R614-616	PQ4R10XJ472	4.7K		3
R617	PQ4R10XJ103	10K		1
R618	PQ4R10XJ101	100		1
R621	ERJ3GEYJ393	39K		1
R622	PQ4R10XJ473	47K		1
R624	PQ4R10XJ473	47K		1

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Ref. No.	Part No.	Part Name & Description		Pcs
R627	ERJ3GEYJ393	39K		1
R628	PQ4R10XJ563	56K		1
R629	PQ4R10XJ471	470		1
R630	PQ4R10XJ272	2.7K		1
R631	ERDS1VJ1R0	1		1
R632	PQ4R10XJ272	2.7K		1
R633	ERDS1VJ1R0	1		1
R634	PQ4R10XJ000	0		1
R635	ERJ3GEYJ000	0		1
R636	PQ4R10XJ000	0		1
R637	ERJ3GEYJ101	100		1
R640	PQ4R10XJ822	8.2K		1
R641,642	ERJ3GEYJ123	12K		2
R643,644	ERJ3GEYJ123	12K		2
R645,646	PQ4R10XJ123	12K		2
R647	PQ4R10XJ123	12K		1
R648	ERJ3GEYJ000	0		1
R649	PQ4R10XJ472	4.7K		1
R651	ERJ3GEYJ000	0		1
R653	ERJ3GEYJ331	330		1
R654,655	ERJ3GEYJ000	0		2
R701	PQ4R10XJ222	2.2K		1
R702	PQ4R10XJ105	1M		1
R703	PQ4R10XJ000	0		1
R704	PQ4R10XJ472	4.7K		1
R706-708	PQ4R10XJ101	100		3
R712-715	ERJ3GEYJ331	330		4
R719	ERJ3GEYJ472	4.7K		1
R721	PQ4R10XJ103	10K		1
R722	PQ4R10XJ000	0		1
R724	ERJ3GEYJ472	4.7K		1
R736	PQ4R10XJ101	100		1
R737	PQ4R10XJ101	100		1
R738	PQ4R10XJ101	100		1
R739	PQ4R10XJ472	4.7K		1
R745	PQ4R10XJ472	4.7K		1
R747	ERJ3GEYJ105	1M		1
R748	ERJ3GEYJ270	27		1
		(CRYSTAL OSCILLATORS & CERAMIC FILTER)		
X401	PQVCJ2400N5Z	CRYSTAL OSCILLATOR		1
X403	PQVCL3276N6Z	CRYSTAL OSCILLATOR		1
X404	PFVBKBR16.0M	CERAMIC FILTER		1
		ANALOG BOARD PARTS		
PCB2	PQLP10158M	ANALOG BOARD ASSY (RTL)		1
		(ICs)		
IC1	PQVI63HB110	IC	S	1
IC2	PQVIS79164FU	IC		1
IC3	PQVIBU8242F	IC		1
IC4	PFVILC7366NM	IC		1
IC5	PQVITA31081F	IC		1
IC6	PQVICS10256N	IC		1
IC7	PQVITC4052BF	IC	S	1
IC8	PQVIBU4053BC	IC	S	1
IC9	PFVIBU4066BF	IC	S	1
IC10,11	PFVIBU4066BF	IC	S	2
IC12	PQVIMC34119M	IC	S	1
IC14,15	PQVINJM4558M	IC		2
IC16	PQVITC7W04FL	IC		1

Ref. No.	Part No.	Part Name & Description		Pcs
IC17	PQVIS80732S	IC		1
IC18,19	PQVINJM4558M	IC	S	2
IC20	PQVINJM4558M	IC	S	1
IC21	PQVINJM4558M	IC	S	1
IC22	PQVINJM4558M	IC	S	1
		(TRANSISTORS)		
Q1	2SA1627	TRANSISTOR(SI)		1
Q2	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	1
Q3	2SC2235	TRANSISTOR(SI)		1
Q4	2SA1627	TRANSISTOR(SI)		1
Q5	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	1
Q6	2SC2235	TRANSISTOR(SI)		1
Q7,8,9	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	1
Q10	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	1
Q11	2SD1302	TRANSISTOR(SI)		1
Q12	PQVTDTC143E	TRANSISTOR(SI)		1
Q14	UN5213	TRANSISTOR(SI)	S	1
Q15	PQVTDTC143E	TRANSISTOR(SI)		1
Q16-19	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	4
Q22	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	1
Q23	PQVTDTC143E	TRANSISTOR(SI)		1
Q24,25	2SD1819A	TRANSISTOR(SI) (or 2SC4155S)	S	2
Q26,27	2SB1218A	TRANSISTOR(SI) (or 2SA1576R)	S	2
Q28	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q29	PQVTDTC143E	TRANSISTOR(SI)		1
Q30	PQVTDTC143E	TRANSISTOR(SI)		1
Q31	PQVTDTC143E	TRANSISTOR(SI)		1
		(DIODES)		
D1,2	RLS71	DIODE(SI)		2
D3,4,5	1SS131	DIODE(SI) (or 1SS120)	S	3
D6	RLS71	DIODE(SI)		1
D11	1SS131	DIODE(SI)		1
D12	MA143	DIODE(SI)		1
D13	RLS71	DIODE(SI)		1
D14	1SS131	DIODE(SI)		1
D15	MA728	DIODE(SI)		1
D16	MA723	DIODE(SI)		1
D17	MA728	DIODE(SI)		1
D18	MA141WA	DIODE(SI)		1
D20	MA141WA	DIODE(SI)		1
REC1,2	PQVDS1ZB40F1	DIODE(SI)		2
ZD1	MA4180	DIODE(SI)	S	1
ZD2	PQVDHZS2B1	DIODE(SI)	S	1
ZD3	MA4056	DIODE(SI)	S	1
ZD4	PQVDRLZ5R6	DIODE(SI)	S	1
ZD5	MA4180	DIODE(SI)	S	1
ZD6	PQVDHZS2B1	DIODE(SI)	S	1
ZD7	MA4056	DIODE(SI)	S	1
ZD8	PQVDRLZ5R6	DIODE(SI)	S	1
ZD9	PQVDMZJ24A	DIODE(SI)	S	1
ZD10	MA4120M	DIODE(SI)	S	1
ZD11	PQVDMZJ24A	DIODE(SI)	S	1
ZD12	MA4120M	DIODE(SI)	S	1
		(CONNECTORS & JACKS)		
CN1,2,3	PQJS11A10Z	CONNECTOR, 11P		3
CN4	PQJP10G30Y	CONNECTOR, 10P		1
CN5	PQJP2G30Z	CONNECTOR, 2P		1
CN6	PQJP02G100Z	CONNECTOR, 2P		1

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Ref. No.	Part No.	Part Name & Description		Pcs
CN9	PQJP07A92Z	CONNECTOR, 7P		1
CN10	PQJP14A92Z	CONNECTOR, 14P		1
CN11	PQJP2D68Z	CONNECTOR, 2P		1
JJ1	PQJJ1TB26Z	JACK	S	1
JJ2	PQJJ1T004Z	JACK		1
JJ4	PQJJ1TB18Z	JACK		1
		(CAPACITORS)		
C1	ECQE2224KF	0.22		1
C2	ECKD2H681KB	680P	S	1
C3	ECKD2H681KB	680P	S	1
C4	ECUV1H103KBV	0.01		1
C5	ECEA1HKS4R7	4.7	S	1
C6	ECEA1CKS100	10	S	1
C7	PQCUV1E333MD	0.033		1
C8	ECEA1CU221	220		1
C9	ECEA1CKS100	10	S	1
C10	PQCUV1C334ZF	0.33		1
C20	ECUV1H102KBV	0.001		1
C21	PQCUV1E104MD	0.1	S	1
C22	ECUV1H680JCV	68P		1
C23	PQCUV1E104MD	0.1	S	1
C24	ECUV1H680JCV	68P		1
C25	PQCUV1C683MD	0.068		1
C26	ECUV1H680JCV	68P		1
C28,29	PQCUV1E104MD	0.1	S	2
C31	ECQE2224KF	0.22		1
C32,33	ECKD2H681KB	680P	S	2
C34	ECUV1H103KBV	0.01		1
C35	ECEA1HKS4R7	4.7	S	1
C36	ECEA1CKS100	10	S	1
C37	PQCUV1E333MD	0.033		1
C38	ECEA1CU221	220		1
C39	ECEA1CKS100	10	S	1
C40	PQCUV1C334ZF	0.33		1
C50	ECUV1H102KBV	0.001		1
C51	PQCUV1E104MD	0.1	S	1
C52	ECUV1H680JCV	68P		1
C53	PQCUV1E104MD	0.1	S	1
C54	ECUV1H680JCV	68P		1
C55	PQCUV1C683MD	0.068		1
C56	ECUV1H680JCV	68P		1
C58,59	PQCUV1E104MD	0.1	S	2
C60	PQCUV1C334ZF	0.33		1
C61	ECEA1CKS100	10	S	1
C62	PQCUV1H223KB	0.022	S	1
C63	PQCUV1H471JC	470P	S	1
C65	ECEA1HKS010	1	S	1
C66	ECEA1HU220	22	S	1
C68	PQCUV1C334ZF	0.33		1
C69	ECEA1CKS100	10	S	1
C71	ECQE2104KF	0.1		1
C73	ECUV1H223KBV	0.022	S	1
C76	PQCUV1H223KB	0.022	S	1
C77	ECUV1H331JCV	330P	S	1
C82	PQCUV1E473MD	0.047		1
C83	ECUV1H222KBV	0.0022		1
C84	PQCUV1E473MD	0.047	S	1
C85	PQCUV1C224ZF	0.22	S	1
C86,87	PQCUV1C683MD	0.068		2
C88,89	ECUV1H103KBV	0.01		2
C90	ECUV1H392KBV	0.0039		1

Ref. No.	Part No.	Part Name & Description		Pcs
C92	ECUV1H392KBV	0.0039		1
C93	PQCUV1E333MD	0.033		1
C94	ECUV1H221JC	220P	S	1
C95	PQCUV1H333MD	0.033		1
C96,97	PQCUV1H105JC	1	S	2
C98	ECEA1HKS2R2	2.2	S	1
C99	PQCUV1C224ZF	0.22	S	1
C100	ECUV1H561JCV	560P	S	1
C101	ECEA1CKS470	47	S	1
C102	ECEA0JU471	470		1
C103	ECEA1AU221	220	S	1
C104	ECEA1HKS4R7	4.7	S	1
C105	ECEA1CKS100	10		1
C107	ECUV1H822KBV	0.0082		1
C109	PQCUV1H105JC	1	S	1
C110	PQCUV1E473MD	0.047		1
C112	ECUV1H103KBV	0.01		1
C114	ECUV1H103KBV	0.01		1
C115	ECEA1HKS4R7	4.7	S	1
C116	ECUV1H223KBV	0.022	S	1
C117	PQCUV1C224ZF	0.22	S	1
C119	ECUV1H223KBV	0.022	S	1
C120	PQCUV1E333MD	0.033		1
C121	ECUV1H222KBV	0.0022		1
C122	PQCUV1H472KB	0.0047		1
C123	PQCUV1H103KB	0.01	S	1
C124	ECUV1H331JCV	330P	S	1
C125	PQCUV1H223KB	0.022	S	1
C126	ECUV1H103KBV	0.01		1
C127	ECUV1H103KBV	0.01		1
C128	ECUV1H681KB	680P		1
C129	PQCUV1H223KB	0.022	S	1
C131	PQCUV1H103KB	0.01	S	1
C132	PQCUV1E333MD	0.033		1
C133	ECEA1CKS470	47	S	1
C134	ECEA1CKS470	47	S	1
C135	ECUV1H103KBV	0.01		1
C136	ECUV1H101JCV	100P		1
C137	ECUV1H101JCV	100P		1
C138	ECUV1H101JCV	100P		1
C139	ECUV1H103KBV	0.01		1
C140	ECUV1H472KBV	0.0047		1
C141	ECUV1H472KBV	0.0047		1
C142	ECUV1H472KBV	0.0047		1
C143	ECUV1H223KBV	0.022	S	1
C144	PQ4R10XJ000	0 (RESISTOR)	S	1
C146	ECEA1HKSR47	0.47	S	1
C147	PQCUV1H105JC	1	S	1
C148	ECUV1H222KBV	0.0022		1
C149	PQCUV1E104MD	0.1	S	1
C150,151	PQCUV1H105JC	1	S	2
C152	ECEA0JU331	330		1
C153	ECUV1H102KBV	0.001		1
C155	PQCUV1H223KB	0.022	S	1
C156	PQCUV1E104MD	0.1	S	1
C158	ECUV1H682KBV	0.0068		1
C159	ECHU1C682GA	0.0068		1
C160	ECHU1C682GA	0.0068		1
C161	ECHU1C682GA	0.0068		1
C162	ECHU1C682GA	0.0068		1
C164	PQCUV1C683MD	0.068		1
C166	ECUV1H223KBV	0.022	S	1
C167	PQCUV1E104MD	0.1	S	1
C168	ECEA0JKS220	22	S	1
C169	ECEA1AU221	220	S	1

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Ref. No.	Part No.	Part Name & Description		Pcs
C170	ECEA1CKS100	10	S	1
C171	ECEA1AU101	100	S	1
C172	ECUV1H102KBV	0.001		1
C173	PQCUV1E473MD	0.047		1
C174	PQCUV1E104MD	0.1	S	1
C175	PQCUV1E473MD	0.047		1
C176	PQ4R10XJ000	0 (RESISTOR)		1
C177	PQCUV1C683MD	0.068		1
C178	PQCUV1H223KB	0.022	S	1
C179	ECUV1H152KBV	0.0015		1
C180	PQCUV1H223KB	0.022	S	1
C181	PQCUV1C683MD	0.068		1
C182	PQCUV1H103KB	0.01		1
C183	ECUV1H221JCV	220P		1
C184	PQCUV1E104MD	0.1	S	1
C185	PQCUV1E333MD	0.033		1
C186	ECUV1H681KBV	680P		1
C187	PQCUV1H103KB	0.01	S	1
C188	ECUV1H152KBV	0.0015	S	1
C192	PQCUV1H223KB	0.022	S	1
C193,194	ECUV1H103KBV	0.01		2
C195,196	ECUV1H104ZFV	0.1	S	2
C197	ECEA1CK101	100		1
C198	ECUV1H104ZFV	0.1	S	1
C199	ECEA1EU101	100	S	1
C200	ECUV1H104ZFV	0.1	S	1
C201	ECEA1CK101	100	S	1
C202	ECUV1H104ZFV	0.1	S	1
C203	ECEA1CK101	100	S	1
C204-207	ECUV1H104ZFV	0.1	S	4
C208	ECUV1H102KBV	0.001		1
C209	PQCUV1E104MD	0.1	S	1
C210	PQCUV1E104MD	0.1	S	1
C221	ECUV1H102KBV	0.001		1
C222	ECUV1H222KBV	0.0022		1
C223	PQCUV1H103KB	0.01	S	1
C224,225	PQCUV1C683MD	0.068		2
C230	ECEA1AU101	100		1
C231	ECUV1H104ZFV	0.1	S	1
C232	ECUV1H102KBV	0.001		1
C233	ECUV1H102KBV	0.001		1
C234	ECUV1H102KBV	0.001		1
C235	ECEA1AU101	100	S	1
C236	ECUV1H104ZFV	0.1	S	1
C237	ECUV1H104ZFV	0.1	S	1
C238	ECUV1H104ZFV	0.1	S	1
		(COILS)		
L2,3,4	PQLQR1ET	COIL		3
L7-10	PQLQR2BT	COIL	S	3
		(THERMISTORS)		
POS1	PQRPBC120N	THERMISTOR (POSISTOR)		1
POS2	PQRPBC120N	THERMISTOR (POSISTOR)		1
		(PHOTO ELECTRIC TRANSDUCERS)		
PC1	PQVIPC814K	PHOTO COUPLER	⚠ S	1
PC2	PQVITLP627	PHOTO COUPLER	⚠ S	1
PC3,4	PQVIP27011M3	PHOTO COUPLER	⚠ S	2
PC5	PQVIPC814K	PHOTO COUPLER	⚠ S	1
PC6	PQVITLP627	PHOTO COUPLER	⚠ S	1
PC7,8,9	PQVIP27011M3	PHOTO COUPLER	⚠ S	3
PC10	PQVIP27011M3	PHOTO COUPLER	⚠ S	1
PC11	PQVIP27011M3	PHOTO COUPLER	⚠ S	1
PC12	PQVIP27011M3	PHOTO COUPLER	⚠ S	1

Ref. No.	Part No.	Part Name & Description		Pcs
		(RESISTORS)		
J1,8,9,10	ERJ3GEYJ0R00	0		4
J25	ERJ3GEYJ0R00	0		1
L1,3	PQ4R10XJ5R6	5.6		2
L11-14	PQ4R10XJ000	0		4
L15,16	ERJ3GEYJ0R00	0		2
R1	ERDS1TJ473	47K	S	1
R2	ERJ3GEYJ104	100K		1
R3	ERDS2TJ472	4.7K		1
R4	PQ4R18XJ5R6	5.6		1
R5	ERJ3GEYJ103	10K		1
R6	ERJ3GEYJ472	4.7K		1
R7	ERJ3GEYJ330	33		1
R8	ERJ3GEYJ393	39K		1
R9	ERJ3GEYJ103	10K		1
R10	ERJ3GEYJ682	6.8K		1
R11	ERJ3GEYJ822	8.2K		1
R12	ERJ3GEYJ391	390		1
R13	ERJ3GEYJ182	1.8K		1
R14	ERJ3GEYJ473	47K		1
R15	ERJ3GEYJ472	4.7K		1
R16	ERJ3GEYJ333	33K		1
R20	PQ4R10XF1001	1K		1
R21	ERJ3GEYJ563	56K		1
R22	ERJ3GEYJ244	240K		1
R23	ERJ3GEYJ681	680		1
R24	ERJ3GEYJ621	620		1
R25	ERJ3GEYJ563	56K		1
R26	ERJ3GEYJ244	240K		1
R27	PQ4R10XJ202	2K	S	1
R28	ERJ3GEYJ224	220K		1
R29	ERJ3GEYJ223	22K		1
R30	ERJ3GEYJ223	22K		1
R31	ERDS1TJ473	47K	S	1
R32	ERJ3GEYJ104	100K		1
R33	ERDS2TJ472	4.7K		1
R34	PQ4R18XJ5R6	5.6		1
R35	ERJ3GEYJ103	10K		1
R36	ERJ3GEYJ472	4.7K		1
R37	ERJ3GEYJ330	33		1
R38	ERJ3GEYJ393	39K		1
R39	ERJ3GEYJ103	10K		1
R40	ERJ3GEYJ682	6.8K		1
R41	ERJ3GEYJ822	8.2K		1
R42	ERJ3GEYJ391	390		1
R43	ERJ3GEYJ182	1.8K		1
R44	ERJ3GEYJ473	47K		1
R45	ERJ3GEYJ472	4.7K		1
R46	ERJ3GEYJ333	33K		1
R50	PQ4R10XF1001	1K		1
R51	ERJ3GEYJ563	56K		1
R52	ERJ3GEYJ244	240K		1
R53	ERJ3GEYJ681	680		1
R54	ERJ3GEYJ621	620		1
R55	ERJ3GEYJ563	56K		1
R56	ERJ3GEYJ244	240K		1
R57	PQ4R10XJ202	2K	S	1
R58	ERJ3GEYJ224	220K		1
R59	ERJ3GEYJ223	22K		1
R60	ERJ3GEYJ223	22K		1
R63	ERC14GK226	22M		1
R64	ERJ3GEYJ335	3.3M		1
R65	ERJ3GEYJ222	2.2K		1
R66	ERJ3GEYJ224	220K		1

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Ref. No.	Part No.	Part Name & Description	Pcs
R68	ERJ3GEYJ102	1K	1
R69	ERJ3GEYJ473	47K	1
R70	ERC14GK226	22M	1
R71	ERJ3GEYJ335	3.3M	1
R72	ERJ3GEYJ222	2.2K	1
R73	ERJ3GEYJ224	220K	1
R74	ERJ3GEYJ102	1K	1
R75	ERJ3GEYJ473	47K	1
R76	ERJ3GEYJ224	220K	1
R77	ERJ3GEYJ472	4.7K	1
R79	ERJ3GEYJ330	33	1
R83	ERDS1TJ473	47K S	1
R86	ERJ3GEYJ681	680	1
R89	ERJ3GEYJ224	220K	1
R91	ERJ3GEYJ473	47K	1
R92	ERJ3GEYJ563	56K	1
R93	ERJ3GEYJ684	680K	1
R104	ERJ3GEYJ103	10K	1
R105	ERJ3GEYJ394	390K	1
R106	ERJ3GEYJ562	5.6K	1
R107	ERJ3GEYJ183	18K	1
R108,109	ERJ3GEYJ103	10K	2
R110	ERJ3GEYJ114	110K	1
R111	ERJ3GEYJ472	4.7K	1
R112	ERJ3GEYJ473	47K	1
R113	ERJ3GEYJ222	2.2K	1
R114	ERJ3GEYJ473	47K	1
R115	ERJ3GEYJ223	22K	1
R122,123	ERJ3GEYJ152	1.5K	2
R124-127	ERJ3GEYJ153	15K	4
R128	ERJ3GEYJ223	22K	1
R129	ERJ3GEYJ224	220K	1
R130	ERJ3GEYJ682	6.8K	1
R131	ERJ3GEYJ102	1K	1
R132	ERJ3GEYJ223	22K	1
R133	ERJ3GEYJ102	1K	1
R134	ERJ3GEYJ560	56	1
R135	ERJ3GEYJ104	100K	1
R136	ERJ3GEYJ512	5.1K	1
R137	ERJ3GEYJ563	56K	1
R138,139	ERJ3GEYJ333	33K	2
R140	ERJ3GEYJ333	33K	1
R141	ERJ3GEYJ681	680	1
R142	ERJ3GEYJ224	220K	1
R143	ERJ3GEYJ114	110K	1
R144	ERJ3GEYJ104	100K	1
R145	ERJ3GEYJ513	51K	1
R146	ERJ3GEYJ472	4.7K	1
R147	ERJ3GEYJ392	3.9K	1
R148	ERJ3GEYJ104	100K	1
R149	ERJ3GEYJ103	10K	1
R150	ERJ3GEYJ154	150K	1
R151	ERJ3GEYJ275	2.7M	1
R152	ERJ3GEYJ123	12K	1
R154	ERJ3GEYJ682	6.8K	1
R158	ERJ3GEYJ823	82K	1
R159	ERJ3GEYJ0R00	0	1
R160	ERJ3GEYJ473	47K	1
R161	ERJ3GEYJ154	150K	1
R162	ERJ3GEYJ823	82K	1
R163	ERJ3GEYJ683	68K	1
R164	ERJ3GEYJ101	100	1

Ref. No.	Part No.	Part Name & Description	Pcs
R165	ERJ3GEYJ473	47K	1
R166	ERJ3GEYJ101	100	1
R167,168	ERJ3GEYJ473	47K	2
R170	ERJ3GEYJ104	100K	1
R171,174	ERJ3GEYJ222	2.2K	2
R172,173	ERJ3GEYJ562	5.6K	2
R174	ERJ3GEYJ222	2.2K	1
R175	ERJ3GEYJ470	47	1
R176	ERJ3GEYJ472	4.7K	1
R177	ERJ3GEYJ331	330	1
R178,179	ERJ3GEYJ102	1K	2
R180	ERJ3GEYJ102	1K	1
R181	ERJ3GEYJ563	56K	1
R182	ERJ3GEYJ224	220K	1
R183	ERJ3GEYJ335	3.3M	1
R184	ERJ3GEYJ474	470K	1
R185	ERJ3GEYJ103	10K	1
R186	ERJ3GEYJ272	2.7K	1
R187,188	ERJ3GEYJ222	2.2K	2
R189	ERJ3GEYJ472	4.7K	1
R190	ERJ3GEYJ472	4.7K	1
R192	ERJ3GEYJ202	2K	1
R193	ERJ3GEYJ152	1.5K	1
R195	ERJ3GEYJ123	12K	1
R196	ERJ3GEYJ473	47K	1
R197	ERJ3GEYJ470	47	1
R198	ERJ3GEYJ332	3.3K	1
R199	ERJ3GEYJ103	10K	1
R200	ERDS2TJ4R7	4.7	1
R201	ERJ3GEYJ155	1.5M	1
R202	ERJ3GEYJ105	1M	1
R203	ERJ3GEYJ103	10K	1
R205	ERJ3GEYJ473	47K	1
R206	ERJ3GEYJ103	10K	1
R207	ERJ3GEYJ563	56K	1
R208	ERJ3GEYJ473	47K	1
R209	ERJ3GEYJ333	33K	1
R210,211	ERJ3GEYJ153	15K	2
R212	ERJ3GEYJ223	22K	1
R213	ERJ3GEYJ103	10K	1
R214	ERJ3GEYJ271	270	1
R215	ERJ3GEYJ182	1.8K	1
R216	ERJ3GEYJ474	470K	1
R217	ERJ3EKF2800	280	1
R218	ERJ3EKF2102	21k	1
R219	ERJ3EKF2800	280	1
R220	ERJ3EKF2102	21k	1
R221	ERJ3EKF4420	442	1
R222	ERJ3EKF1022	10.2K	1
R224,225	ERJ3GEYJ472	4.7K	2
R226	ERJ3GEYJ105	1M	1
R227	ERJ3GEYJ822	8.2K	1
R228	ERJ3GEYJ124	120K	1
R229	ERJ3GEYJ561	560	1
R230	ERJ3GEYJ563	56K	1
R231	ERJ3GEYJ472	4.7K	1
R232	ERJ3GEYJ222	2.2K	1
R233	ERJ3GEYJ0R00	0	1
R235	ERJ3GEYJ104	100K	1
R236	ERJ3GEYJ473	47K	1
R237	ERJ3GEYJ473	47K	1
R238	ERJ3GEYJ153	15K	1
R240	ERJ3GEYJ333	33K	1
R241	ERJ3GEYJ473	47K	1

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Ref. No.	Part No.	Part Name & Description	Pcs
R242	ERJ3GEYJ104	100K	1
R243	ERJ3GEYJ103	10K	1
R244	ERJ3GEYJ392	3.9K	1
R245	ERJ3GEYJ103	10K	1
R246	ERJ3GEYJ302	3K	1
R247	ERJ3GEYJ162	1.6K	1
R248	ERJ3GEYJ511	510	1
R249	ERJ3GEYJ121	120	1
R250	ERJ3GEYJ473	47K	1
R251	ERJ3GEYJ334	330K	1
R252	ERJ3GEYJ103	10K	1
R253	ERJ3GEYJ183	18K	1
R254	ERJ3GEYJ473	47K	1
R255	ERJ3GEYJ104	100K	1
R256	ERJ3GEYJ683	68K	1
R261	ERJ3GEYJ101	100	1
R262-265	ERJ3GEYJ103	10K	4
R267	ERJ3GEYJ563	56K	1
R269	ERJ3GEYJ563	56K	1
R271	ERJ3GEYJ563	56K	1
R272	ERJ3GEYJ123	12K	1
R273	ERJ3GEYJ563	56K	1
R274	ERJ3GEYJ222	2.2K	1
R279	ERJ3GEYJ103	10K	1
R281	ERJ3GEYJ224	220K	1
R282	ERJ3GEYJ471	470	1
R283	ERJ3GEYJ0R00	0	1
R284	ERJ3GEYJ223	22K	1
R285	ERJ3GEYJ0R00	0	1
R286	ERJ3GEYJ103	10K	1
R288	ERJ3GEYJ824	820K	1
R289	ERJ3GEYJ103	10K	1
R290	ERJ3GEYJ153	15K	1
R291	ERJ3GEYJ222	2.2K	1
R292,293	ERJ3GEYJ104	100K	2
R294	ERJ3GEYJ223	22K	1
R295	ERJ3GEYJ103	10K	1
R297,298	ERJ3GEYJ222	2.2K	2
R299	ERJ3GEYJ332	3.3K	1
R300	ERJ3GEYJ332	3.3K	1
		(RELAYS)	
RLY1	AHX203	RELAY ⚠	1
RLY3	AHX203	RELAY ⚠	1
		(VARISTORS)	
SA1	PQVDRA311PT3	VARISTOR (SURGE ABSORBER) S	1
SA2	PQVDDSA102MS	VARISTOR (SURGE ABSORBER)	1
SA3,4	PQVDRA311PT3	VARISTOR (SURGE ABSORBER) S	2
SA5	PQVDDSA102MS	VARISTOR (SURGE ABSORBER)	1
		(SWITCHES)	
S1	ESE14A211	PUSH SWITCH	1
S2	PQSS2A27Z	SLIDE SWITCH	1
		(TRANSFORMERS)	
T1,2	PQLT8E7A	TRANSFORMER ⚠	2
T3	PQLT9D1A	TRANSFORMER ⚠	1
T4	PQLT8D2A	TRANSFORMER ⚠	1
		(OTHER)	
E1	PQHR9451Y	HOOK SW SPACER	1
X1	PQVBT3.58G2	CERAMIC FILTER S	1
X2	PQVBT7.68T1	CERAMIC FILTER S	1

Ref. No.	Part No.	Part Name & Description	Pcs
		OPERATION BOARDS PARTS	
PCB3	PQLP10159M	OPERATION BOARD ASS'Y (RTL)	1
		(ICs)	
IC301	MN53007QAF	IC	1
IC302	PQVISN7H138S	IC	1
		(TRANSISTORS)	
Q301	PQVTDTC114EU	TRANSISTOR(SI)	1
Q302	PQVTDTC114EU	TRANSISTOR(SI)	1
Q303-307	PQVTDTA143EU	TRANSISTOR(SI)	5
		(DIODES)	
D301	1SS131	DIODE(SI)	1
D302	1SS131	DIODE(SI)	1
D320-325	1SS131	DIODE(SI)	6
LED301	LN11WP22TDA	LED	1
LED302	PQVDR325CA47	LED S	1
LED303	PQVDR325CA47	LED S	1
LED304	LN11WP22TDA	LED	1
LED305	LN21RPSLXV	LED	1
		(CONNECTORS)	
CN301	PQJP10G43Y	CONNECTOR, 10P	1
CN302	PQJS10X59Z	CONNECTOR, 10P	1
		(CAPACITORS)	
C301	PQCUV1E104MD	0.1 S	1
C302	ECEA1AKS221	220	1
C303	PQCUV1E104MD	0.1 S	1
C304	PQCUV1E104MD	0.1 S	1
C305	PQCUV1H122KB	0.0012 S	1
C308	PQCUV1H471JC	470P	1
C309	PQCUV1H101JC	100P	1
C310	PQCUV1H103KB	0.01 S	1
C320	PQCUV1E104MD	0.1 S	1
C340	PQCUV1E104MD	0.1 S	1
C341	PQCUV1E104MD	0.1 S	1
C342	PQCUV1H101JC	100P	1
C343	PQCUV1H331JC	330P	1
C344	PQCUV1H331JC	330P	1
C345-348	PQCUV1E104MD	0.1 S	4
		(PHOTO ELECTRIC TRANSDUCERS)	
PI301	PQVISGKP01	SENSOR	1
PI302	PQVISGKP01	SENSOR	1
		(RESISTORS)	
J1-9	PQ4R10XJ000	0	9
J10-13	PQ4R10XJ000	0	4
J50-58	PQ4R18XJ000	0	9
R301	PQ4R10XJ222	2.2K S	1
R302	PQ4R10XJ222	2.2K	1
R303	PQ4R10XJ222	2.2K	1
R304	PQ4R10XJ222	2.2K S	1
R305	PQ4R10XJ222	2.2K S	1
R306	PQ4R10XJ222	2.2K S	1
R307-312	PQ4R10XJ181	180 S	6
R320	PQ4R10XJ181	180	1
R321, 322	PQ4R18XJ181	180 S	2
R323-327	PQ4R10XJ181	180 S	5
R328, 329	PQ4R18XJ222	2.2K S	2
R330-335	PQ4R10XJ222	2.2K S	6
R336	PQ4R10XJ102	1K S	1
R337	PQ4R10XJ102	1K S	1
R338	PQ4R10XJ102	1K S	1

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Ref. No.	Part No.	Part Name & Description		Pcs
R347	PQ4R10XJ222	2.2K	S	1
R348	PQ4R10XJ222	2.2K	S	1
R349	PQ4R10XJ222	2.2K		1
R350	PQ4R10XJ222	2.2K		1
R351	PQ4R10XJ222	2.2K	S	1
R352	PQ4R10XJ222	2.2K	S	1
R353	PQ4R10XJ222	2.2K	S	1
R354	PQ4R10XJ471	470	S	1
R355	PQ4R10XJ471	470	S	1
R356	PQ4R10XJ471	470	S	1
R360	PQ4R10XJ821	820	S	1
R361	PQ4R10XJ000	0	S	1
R363	PQ4R10XJ821	820	S	1
R364	PQ4R10XJ331	330	S	1
R365, 366 ,367	PQ4R10XJ331	330	S	3
R370	PQ4R10XJ331	330		1
R371	PQ4R10XJ331	330	S	1
R372, 373	PQ4R10XJ563	56K		2
R380	PQ4R10XJ102	1K	S	1
R381	PQ4R10XJ473	47K	S	1
R392	PQ4R10XJ000	0	S	1
		(SWITCHES)		
S301,302 ,303,307 ,308,309 ,313,314 ,315	EVQ21405R	SWITCH		9
S304,305 ,306,310 ,311,312 ,316,317	PQSH1A43Z	SWITCH		8
S318	PQSH1A43Z	SWITCH	S	1
S319	EVQ21405R	SWITCH		1
S320,321	EVQ21405R	SWITCH		2
S322,323 ,324	PQSH1A43Z	SWITCH	S	3
S325	EVQ21405R	SWITCH		4
S326-329	EVQ21405R	SWITCH		6
S330,331	EVQ21405R	SWITCH		2
S332-341	EVQ21405R	SWITCH		10
S342-348	EVQ21405R	SWITCH		7
S380	PQSH1A101Z	SWITCH		1
		SENSOR BOARD PARTS		
PCB4	PQLP10141M	SENSOR BOARD ASS'Y (RTL)		1
		(CONNECTOR)		
CN1	PQJP03G100Z	CONNECTOR, 3P		1
CN901	PQJP3G43Y	CONNECTOR, 3P		1
CN902	PQJP4G90Z	CONNECTOR, 4P		1
CN904	PQJP6G30Y	CONNECTOR, 6P		1
		(PHOTO ELECTRIC TRANSDUCER)		
PS901	PQVIPS6002A	SENSOR		1
PS902	PQVISGKP01	SENSOR		1
PS904	PQVIPS4506	SENSOR	S	1
PS905	PQVIPS4506	SENSOR	S	1
		(SWITCH)		
SW1	ESE14A211	SWITCH		1

Ref. No.	Part No.	Part Name & Description		Pcs
		CCD BOARD PARTS		
PCB5	PQWP2F500M	CCD BOARD ASS'Y (RTL)		1
		(IC)		
IC801	PQWP2F500M	CCD BOARD ASS'Y (RTL)		1
		(TRANSISTORS)		
Q801,802	2SB1218A	TRANSISTOR(SI)	S	2
		(or 2SA1576R, 2SA1602F 2SA1603F)		
Q803	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
		(CONNECTOR)		
CN801	PQJS08Q63Z	CONNECTOR, 8P		1
		(CAPACITORS)		
C801	ECEA1EU471	470		1
C802,803	PQCUV1E104MD	0.1		2
		(RESISTORS)		
J801-803	PQ4R10XJ000	0	S	3
J804-806	PQ4R18XJ000	0	S	3
R801,802	PQ4R10XJ101	100	S	2
R803	PQ4R10XJ331	330	S	1
R804	PQ4R10XJ101	100	S	1
R805,806	PQ4R10XJ202	2K	S	2
R807	PQ4R10XJ242	2.4K	S	1
R808	PQ4R10XJ682	6.8K	S	1
R809	PQ4R10XJ180	18	S	1
R810	PQ4R10XJ132	1.3K	S	1
R811,812	PQ4R10XJ161	160	S	2
R815	PQ4R10XJ242	2.4K	S	1
R816	PQ4R10XJ682	6.8K	S	1
R817	PQ4R10XJ222	2.2K	S	1
R819	PQ4R10XJ102	1K	S	1
		(VARIABLE RESISTOR)		
VR801	EVNDXAA03B23	SEMI-FIXED RESISTOR, 2K (B)		1
		SWITCHING POWER SUPPLY BOARD PARTS		
PCB6	PQLP10133M-M	POWER SUPPLY BOARD ASS'Y (RTL) ⚠		1
		(ICs)		
IC101	PQVIFA5311S	IC		1
IC201	AN1431T	IC	S	1
		(TRANSISTORS)		
Q101	PQVTFS10KM10	TRANSISTOR(SI)		1
Q202	2SC3568	TRANSISTOR(SI)		1
Q203	2SC1741AS	TRANSISTOR(SI)		1
Q204,205	2SA1309	TRANSISTOR(SI)	S	2
		(DIODES)		
D101	PQVDD2SBA60	DIODE(SI)	S	1
D103,105	MA4220	DIODE(SI)	S	2
D104,204 ,206	PQVDERA1802	DIODE(SI)	S	3
D106,202	MA165	DIODE(SI)		2
D201	MA6D49	DIODE(SI)	S	1
D205	PQVDERA81004	DIODE(SI)		1
D207	MA4051	DIODE(SI)		1
D210	MA2300	DIODE(SI)	S	1
D211	MA4150	DIODE(SI)	S	1
		(CONNECTORS)		
CN31	PQJP2D98Z	CONNECTOR, 2P		1
CN301	PQJP6G100Z	CONNECTOR, 6P		1
CN302	PQJP10G30Y	CONNECTOR, 10P		1

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Ref. No.	Part No.	Part Name & Description		Pcs
		(CAPACITORS)		
C101	ECQU2A224MV	0.22	S	1
C102,103	ECKDRS102MB	0.001	S	2
C104	ECKDRS222ME	0.0022	S	1
C105	EETLD2D221C	220	S	1
C106	ECKD3A221KBN	220P	S	1
C107	ECUV1H221KBM	220P (for PCB-SUB 68-4391A)		1
C107	ECUV1H221KBN	220P (for PCB-SUB 68-4391B)		1
C108	ECUV1H104KBW	0.1		1
C109	ECUV1H561KBM	560P (for PCB-SUB 68-4391A)		1
C109	ECUV1H561KBN	560P (for PCB-SUB 68-4391B)		1
C111	ECUV1H473KBW	0.047 (for PCB-SUB 68-4391A)		1
C111	ECUV1H473KBX	0.047 (for PCB-SUB 68-4391B)		1
C112	ECA1VHG330	33	S	1
C113	ECQU2A473MV	0.047	S	1
C201	EEUFA1V103	10000	S	1
C202	ECQB1H104KF	0.1	S	1
C203	ECQB1H473JF	0.047	S	1
C204	ECQB1H103JF	0.01	S	1
C205	PQCEA16B220	22P	S	1
C206	PQCEA10B1000	1000	S	1
C207	PQCEA16A100	10P	S	1
C208	ECA1AHG101	100P	S	1
C210	ECQV1H224JZ	0.22	S	1
C211	ECKD3A102KBN	0.001	S	1
		(FUSE)		
F101	PQBA1C50NBKL	FUSE	⚠	1
		(COILS)		
L101,102	ELF18D290R	COIL (LINE FILTER)	S	2
L103	EXCELDR35	BEAD CORE		1
L201	PQLQ681388A	COIL		1
		(PHOTO ELECTRIC TRANSDUCER)		
PC101	PQVIPC817CD	PHOTO COUPLER	S	1
		(RELAY)		
RL201	PQSLG5P1DC12	RELAY	S	1
		(RESISTORS)		
R101	ERDS1FJ105	1M	S	1
R102,103	ERDS2TJ124	120K	S	2
R104	ERG1SJU100	10	S	1
R105,113	ERX1SJR33P	0.33	S	2
R106	PQ4R18XJ471	470 (for PCB-SUB 68-4391A)	S	1
R106	PQ4R10XJ471	470 (for PCB-SUB 68-4391B)	S	1
R107	PQ4R18XJ562	5.6K (for PCB-SUB 68-4391A)	S	1
R107	PQ4R10XJ562	5.6K (for PCB-SUB 68-4391B)	S	1
R108	PQ4R18XJ222	2.2K (for PCB-SUB 68-4391A)	S	1
R108	PQ4R10XJ222	2.2K (for PCB-SUB 68-4391B)	S	1
R109,115	ERDS2TJ220	22	S	2
R110	ERDS2TJ103	10K	S	1
R111	ERDS2TJ150	15	S	1
R112	PQ4R18XJ101	100 (for PCB-SUB 68-4391A)	S	1
R112	PQ4R10XJ101	100 (for PCB-SUB 68-4391B)	S	1
R114	PQ4R18XJ181	180 (for PCB-SUB 68-4391A)	S	1
R114	PQ4R10XJ181	180 (for PCB-SUB 68-4391B)	S	1
R201,203	ERDS2TJ222	2.2K	S	2
R202	ERDS2TJ183	18K	S	1
R204	ERDS1TJ331	330	S	1
R206	ERDS2TJ563	56K	S	1
R210	ERDS2TJ681	680	S	1
R211	ERDS2TJ332	3.3K	S	1
R212	ERDS2TJ392	3.9K	S	1
R213	ERDS2TJ101	100	S	1
		(THERMISTOR)		
T101	ETS29AE125A	TRANSFORMER	⚠	1
T201	ETS22AE159A	TRANSFORMER	⚠	1

Ref. No.	Part No.	Part Name & Description		Pcs
		(THERMISTOR)		
TH101	PQRRT8D11F2	THERMISTOR	S	1
		(VARIABLE RESISTOR)		
VR201	EVNDJAA03B53	SEMI-FIXED RESISTOR, 5K (B)		1
		(VARISTORS)		
Z101	ERZC10DK471	VARISTOR	S	1
Z102	ERZV10DK182U	VARISTOR	S	1
Z104	ERZC10DK751U	VARISTOR	S	1
		DIGITAL TAM BOARD PARTS		
PCB7	PQLP10105M	DIGITAL TAM BOARD ASS'Y (RTL)		1
		(ICs)		
IC701	PQVID6305ADW	IC		1
IC702	PQVIMC5480DW	IC		1
IC703	PQVIKM5040AC	IC		1
		(CONNECTORS)		
CN701	PQJS14A56Y	CONNECTOR, 14 PIN		1
CN702	PQJS07A56Y	CONNECTOR, 7 PIN		1
		(COIL)		
L701	PQLQR1ET	COIL		1
		(CRYSTAL OSCILLATOR)		
X701	PQVCG2949N5Z	CRYSTAL OSCILLATOR		1
		(CAPACITORS)		
C701	PQCUV1H105JC	1	S	1
C703	PQCUV1H105JC	1	S	1
C704,705	ECUV1H100DCV	10P		2
C706,707	ECUV1H104ZFV	0.1	S	2
C708-711	ECUV1H104ZFV	0.1	S	4
C713	ECUV1H104ZFV	0.1	S	1
C714-720	ECUV1H150JCV	15P		7
C721	ECUV1H104ZFV	0.1	S	1
C723-729	ECUV1H150JCV	15P		7
		(RESISTORS)		
R701	ERJ3GEYJ105	1M		1
R702	ERJ3GEYJ103	10K		1
R703	ERJ3GEYJ103	10K		1
R704	ERJ3GEYJ102	1K		1
R705	ERJ3GEYJ221	220		1
R706-712	ERJ3GEYJ221	220		7
R713	ERJ3GEYJ271	270		1

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Ref. No.	Part No.	Part Name & Description	Pcs
		FIXTURES AND TOOL	
EC1	PQZZ2K12Z	EXTENSION CORD, 2P	2
EC2	PQZZ8K18Z	EXTENSION CORD, 8P	1
EC3	PQZZ2K13Z	EXTENSION CORD, 2P	1
EC4	PQZZ3K8Z	EXTENSION CORD, 3P	1
EC5	PQZZ3K12Z	EXTENSION CORD, 3P	1
EC6	PQZZ4K7Z	EXTENSION CORD, 4P	1
EC7	PQZZ5K6Z	EXTENSION CORD, 5P	1
EC8	PQZZ6K7Z	EXTENSION CORD, 6P	1
EC9	PQZZ6K14Z	EXTENSION CORD, 6P	1
EC10	PQZZ8K15Z	EXTENSION CORD, 8P	1
EC11	PQZZ2K6Z	EXTENSION CORD, 2P	1
EC12	PQZZ10K4Z	EXTENSION CORD, 10P	2
EC13	PQZZ11K8Z	EXTENSION CORD, 11P	4
EC14	PQZZ2K7Z	EXTENSION CORD, 2P	1
	PQZZ2F500M	SEPARATION SPRING HEINGHT TOOL	1
	PQZZF500M	CCD TOOL	1
		Notes:	
		1. Tools and Extension	
		Cords (Ref. No. EC1, EC2)	
		are necessities for servicing.	
		2. Extension Cords (Ref. No. EC3-EC13)	
		are useful for servicing.	
		(They make servicing easy.)	