

Service Manual

and Technical Guide

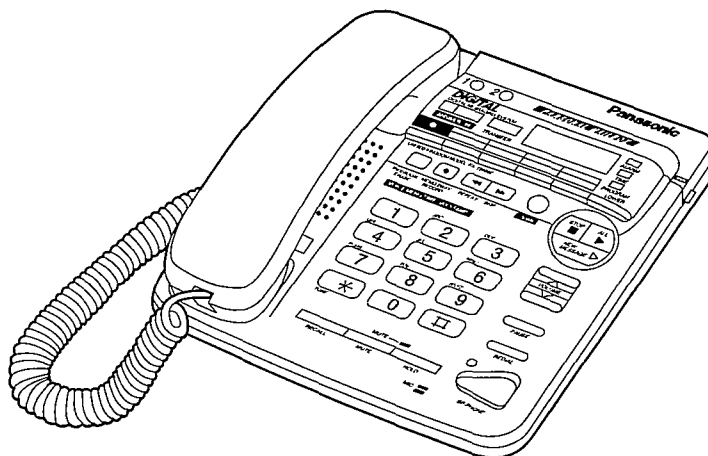
Telephone Equipment

KX-T2886E

(for United Kingdom)

DIGITAL

INTEGRATED TELEPHONE
ANSWERING SYSTEM



■ SPECIFICATIONS

Power Source:	AC; AC Adaptor KX-A11DBEXE or KX-A311E
Pause:	Two automatic dial tone detectors
Dial Speed:	Tone (DTMF)/Pulse (10pps)
Memory Capacity:	8 phone numbers, up to 16 digits
Redial:	-When using the handset, the unit redials the last dialed number once. -When using the SP-Phone button, the unit redials the number up to 3 times if the line is busy (Automatic redial).
Speaker:	Unit; 6.5 cm (2 1/2") PM dynamic Handset; 2.6 cm (1 3/16") PM magnetic type
Microphone:	Condenser microphone
Jacks:	Telephone line, DC IN
Dimensions:	7 13/32" × 8 15/32" × 2 11/32" [188(W) × 215(D) × 60(H)mm]
Weight:	1 lb 13.98 oz (850g) [with handset]

Design and specifications are subject to change without notice.

Panasonic

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⚠ 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.

When you mention the serial number, write down the 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.

When replacing, 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 workable.
- 4) Do not grasp IC or pins with bare fingers.

TABLE OF CONTENTS

	Page		Page
Location of Controls	3	Terminal Guide of IC's, Transistors and Diodes.....	21
Connections	4	Adjustment	22
New Features	4,5	Schematic Diagram (Main)	26~28
Display	5	Printed Circuit Board (Main)	29~32
Operations	6	Schematic Diagram (Digital TAM)	33
Disassembly Instructions	7	Printed Circuit Board (Digital TAM)	34
How to Replace Flat Package IC	8	Block Diagram	35,36
CPU DATA (ITS)	9,10	For schematic Diagram	37
CPU DATA (LCD)	11,12	Circuit Operations	38~57
Speakerphone IC Data	13,14	Troubleshooting Guide	58~67
Record/Play AMP IC Data	15,16	Cabinet and Electrical Parts Location	68
DSP IC Data	17,18	Accessories and Packing Materials	69
Codec IC Data	19	Extension Cable Connecting Method	69
4M Bit RAM IC Data	20	Replacement Parts List	70~76

LOCATION OF CONTROLS

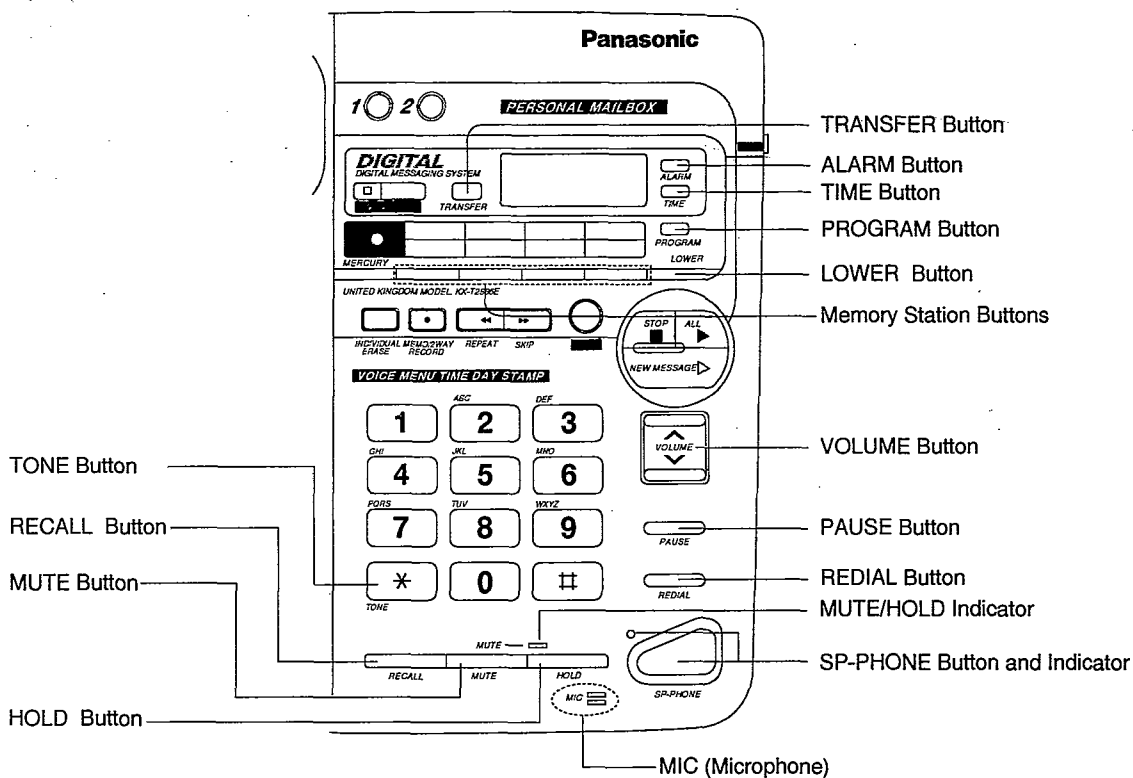


Fig. 1

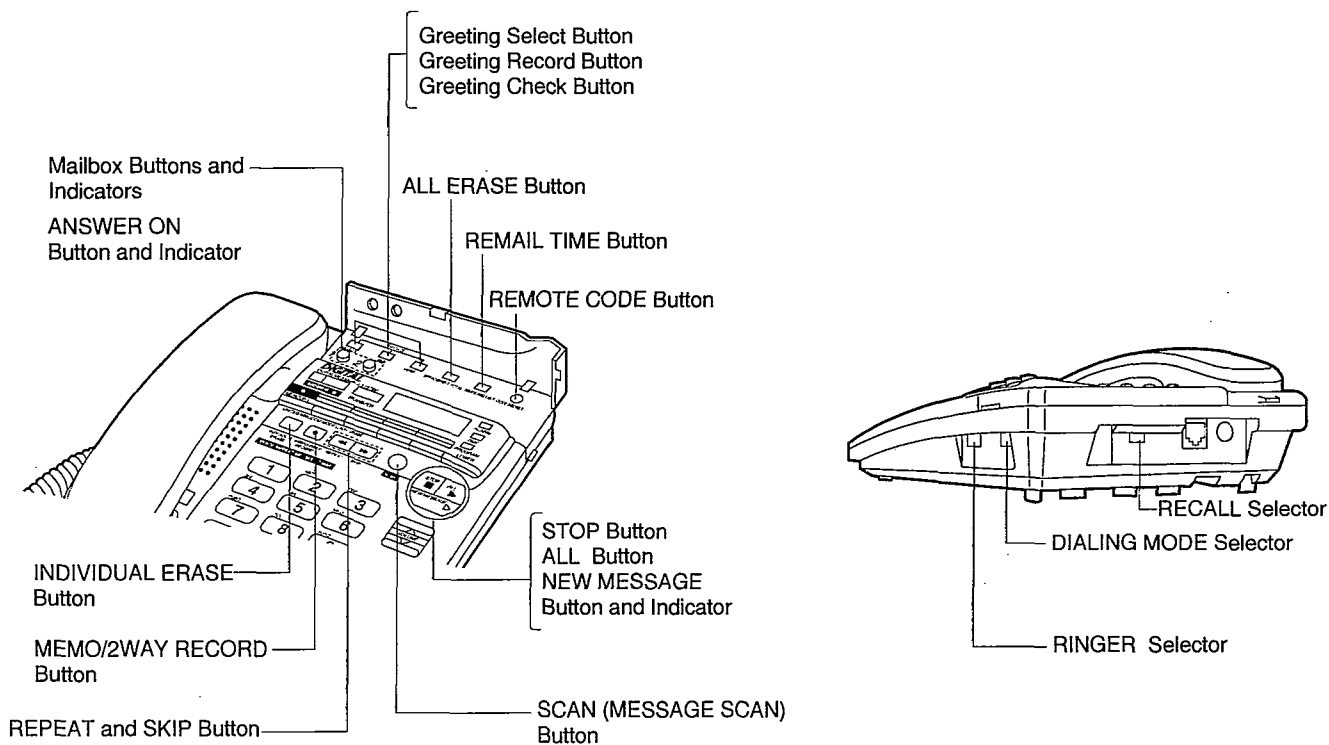
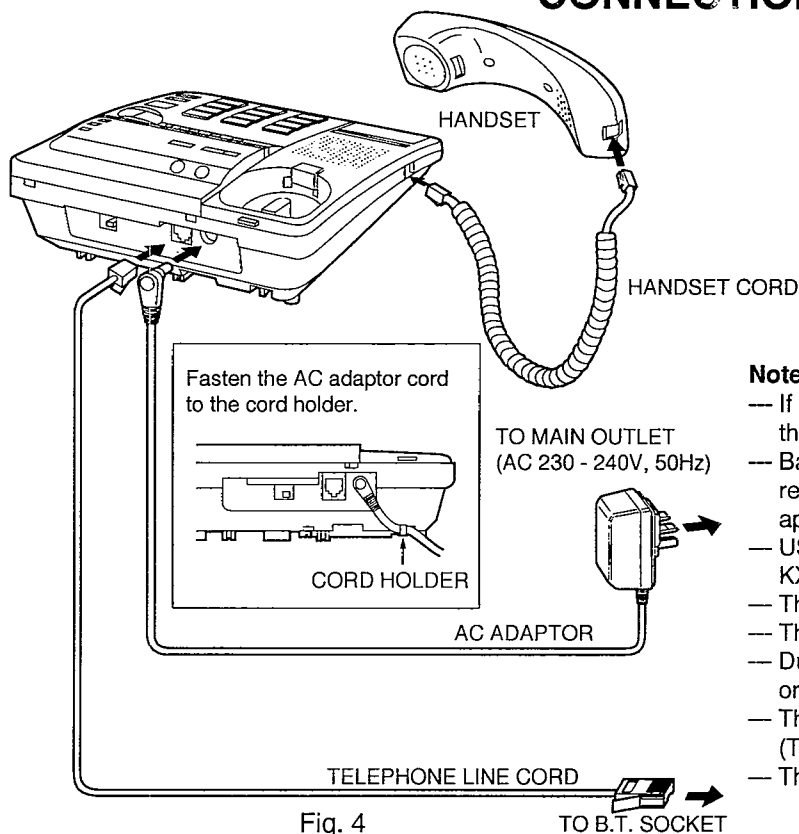


Fig. 2

Fig. 3

CONNECTIONS



Notes:

- If you do not install batteries, or if the battery power is low, the display shows " **LOW** ". Install new batteries.
- Batteries should be installed in order to provide message retention during power failure. Message retention time is approximately 1 day with new batteries.
- USE ONLY Panasonic AC ADAPTOR KX-A11DBEXE or KX-A311E.
- The AC adaptor must remain connected at all times.
- The AC adaptor may feel warm during use. This is normal.
- During a power failure, the unit functions only as an ordinary telephone.
- The Handset Jack and line connections are at TNV (Telecommunication Network Voltage)
- The DC IN Jack is at SELV (Safety Extra Low Voltage).

NEW FEATURES

Mailbox feature

The unit has 3 memory locations — common memory and 2 personal mailboxes. A caller can leave a message in a specified mailbox, and only the person who knows the password can retrieve the message from the mailbox. This is useful when you use the unit jointly with other people.

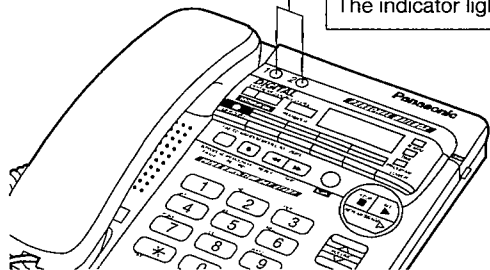
Messages are recorded in common memory unless a specified mailbox is selected.

To use the mailbox

1. Record mailbox greeting message(s) in the mailbox(es).
2. Program each mailbox password.
3. In order to leave a message in a mailbox, each owner of the mailboxes must inform callers, in advance, of their mailbox number.

Mailbox buttons

To select the mailbox, press this button. The indicator lights green.



Recording a mailbox greeting message

This is played back to the caller who selected the specific mailbox.

1. Open the lid, and then press the mailbox button (1 or 2).
—The mailbox indicator light is on.
2. Press the GREETING RECORD.
—"Recording greeting after the beep" is heard, followed by a long beep.
3. Immediately after the long beep, speak into the microphone.
4. To stop recording, press the STOP or GREETING RECORD button.

We recommend you record a brief greeting message leaving more time for incoming messages. If you do not record a mailbox greeting, incoming messages can be left after the long beep.

Sample of personal greeting message

"Hello, this is John. Sorry, I cannot take your call. Please leave your message after the beep. Thank you."

Checking the greeting message for your mailbox

1. Press the mailbox button (1 or 2).
The mailbox indicator light is on.
2. Press the GREETING CHECK button.

Erasing the greeting message for your mailbox

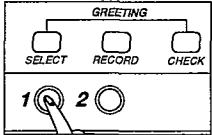
1. Press the mailbox button (1 or 2).
The mailbox indicator light is on.
2. Press the GREETING CHECK.
3. Press the INDIVIDUAL ERASE while the message is being played.

Programming the mailbox password

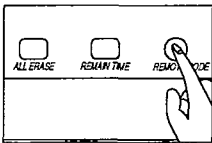
Program your own password (any 3-digit number, 000-999) for your mailbox to prevent other users from retrieving messages.

Note:

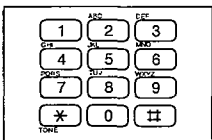
- If you do not program the password, other users can retrieve the messages from the mailbox, even if they do not know the password.
- Once you have programmed the password, you cannot confirm it.
- If you forget your password, consult your service center.
- Use a number that is different from the remote code.



1. Open the lid, and then press the desired mailbox button.
--- The mailbox indicator light is on.



2. Press the REMOTE CODE button.



3. Enter the desired 3-digit number (000-999).
4. To finish programming, press the REMOTE CODE button.
--- A beep is heard.

To re-program your mailbox password

Erase the current password, then enter new one.

To erase the password

1. Open the lid and then press the desired mailbox button.
2. Press the REMOTE CODE and the password, then press MUTE.
3. When the uncorrect password is entered, 6 beeps are heard and you can not erase it. When the password entered is correct, one beep is heard, then press REMOTE CODE to finish.

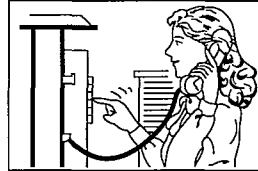
To erase the password

(When you don't know the password and forget the it.)

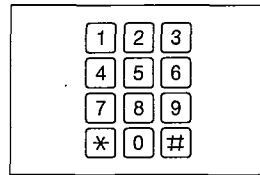
1. Press the desired mailbox button.
2. Press the REMOTE CODE button.
3. Press the "#", "9", "0", "0" and "0" keys.
4. Press the REMOTE CODE button and a beep are heard, the password is erased.

How incoming messages are recorded in each mailbox

In order to leave a message in a mailbox, each owner of the mailboxes must inform callers in advance.



1. A caller calls your unit (from a touch tone telephone only).
--- Common greeting message is heard.
2. A caller presses "#", then enters "1 or 2" (desired mailbox number).
--- Mailbox greeting is heard, followed by a long beep.
3. An incoming message is recorded in a specified mailbox.



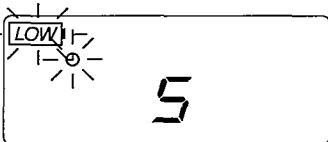
Note:

- If a caller does not specify the mailbox in the step 2, the message will be recorded in the common memory.
- If you have not recorded a mailbox greeting, incoming messages will be left after the long beep.

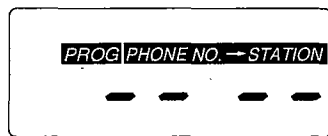
Retrieving messages in your mailbox

When there is an unheard message in the mailbox, the mailbox indicator flashes.

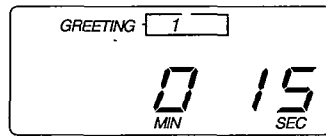
DISPLAY



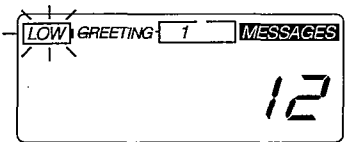
When the unit is initializing.



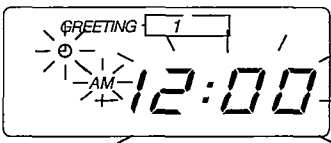
When you press the PROGRAM button to set the unit to the programming mode.



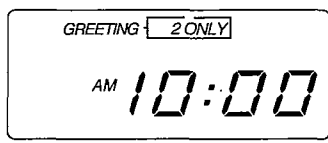
While you are recording or playing the greeting message.



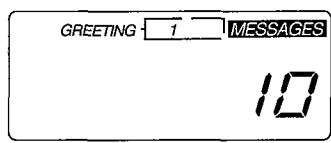
When you do not install batteries, or the battery power is low. Install new ones.



Adjust the time and day.



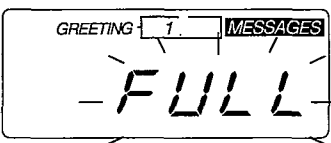
When greeting only function is selected.



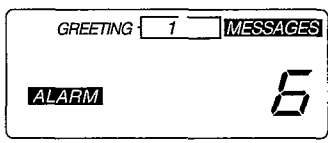
10 messages have been recorded.



When you press the REMAIN TIME button. Remaining recording time is displayed for about 5 seconds.



When the memory is full. Erase some or all messages.



The alarm clock is set to ON.

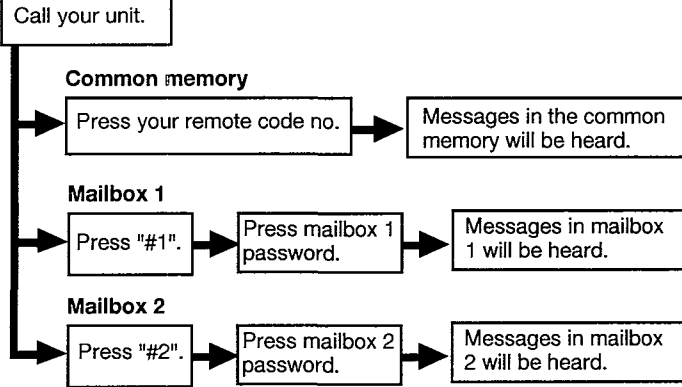
OPERATIONS

Remote operation

You can access your unit and retrieve the recorded messages from a remote location with a touch tone telephone. You can identify a touch tone telephone because it has a * button and a # button, and each button produces a different tone from any other button when pressed.

If you specify the mailbox number, only the memory of the specified mailbox is accessed. If not specified, common memory is accessed.

Summary of remote operation

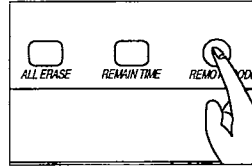


Note:

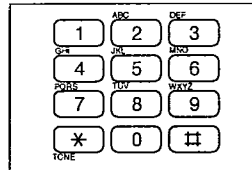
- When you are listening to your messages remotely, the unit will stop playback every 2 minutes 40 seconds and you will hear 2 beeps. To continue playback, press "9" within 10 seconds of hearing the beeps. If you do not press "9" in time, the unit will hand up.
- If two or more people use this unit, we recommend that all messages in the common memory are listened to each time the machine is accessed. If only new messages are played back you can miss messages for you because someone else has already heard them.

Setting the remote code number

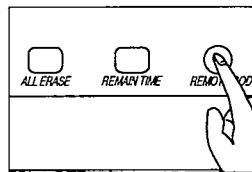
The remote code number prevents unauthorized persons from accessing your unit and listening to your messages. The number preset is "111". Choose any 3-digit number (000-999).



1. Open the lid, and then press REMOTE CODE.
— The current setting is displayed.



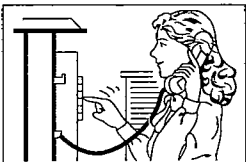
2. Enter the desired 3-digit number (000-999).



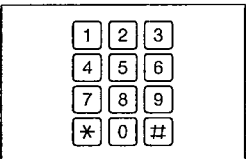
3. To finish programming, press REMOTE CODE.

To check the remote code number;
Press the REMOTE CODE, the current setting is displayed, then press the button again to end.

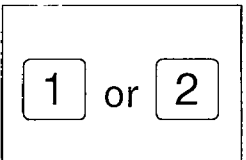
Listening to the recorded messages in the common memory



1. Call your unit, then press your remote code number during common greeting playback.
— The unit tells you the number of recorded messages of the common memory.



2. After 3 seconds, the unit starts the voice menu function.
— "Press 1 to play back all messages, press 2 for other functions." is announced.



Press "1" to use the announced feature.
Press "2" to proceed to other function.

You may hang up at any time to end the remote operation.

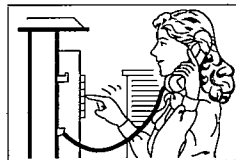
If you want to listen to messages in the mailbox after playing back messages in the common memory.

1. Press "#" and "1 or 2" (desired mailbox number).
2. Enter mailbox password.
3. Wait for the voice menu function or press the direct remote command "4" or "5" to play back messages.

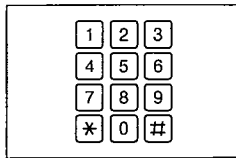
Note:

—If you hear 6 beeps after playing back messages, the memory is full. You must erase some or all messages.

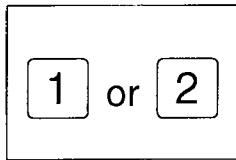
Listening to message in the mailbox 1 or 2



1. Call your unit, and press "#" and "1 or 2" (desired mailbox no.) during common greeting playback.
2. Enter a mailbox password.
— The unit announces the number of messages in the mailbox.
— If you have not set the password use the remote code number.



3. After 3 seconds, the unit starts the voice menu function.
— "Press 1 to play back all messages, press 2 for other functions." is announced.



Press "1" to use the announced feature.
Press "2" to proceed to other function.

You may hang up at any time to end the remote operation.

If you want to listen to messages in the other memory after playing back;

1. Press "#" and "0" (for common memory) or press "#", and the mailbox number.
2. Enter the mailbox password if a mailbox has been selected.
3. Wait for the voice menu function or press the direct remote command "4" or "5" to play back messages.

Note:

—If you hear 6 beeps after playing back messages, the memory is full. You must erase some or all messages.

DISASSEMBLY INSTRUCTIONS

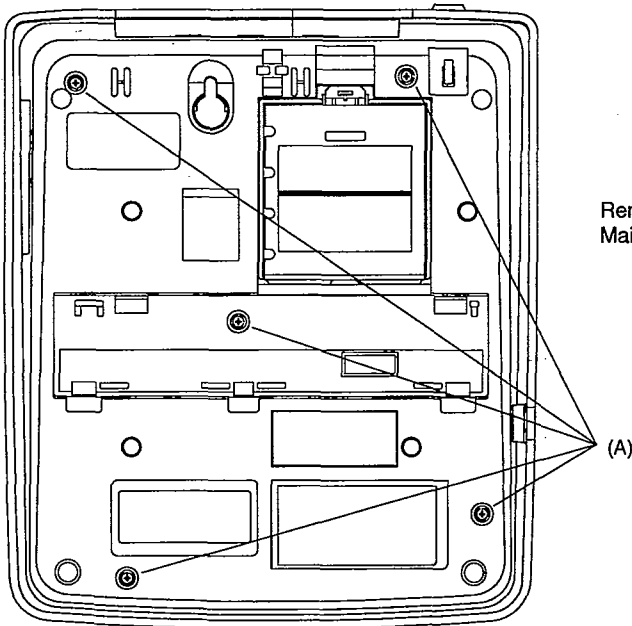


Fig. 5

Remove the
Main P.C. Board

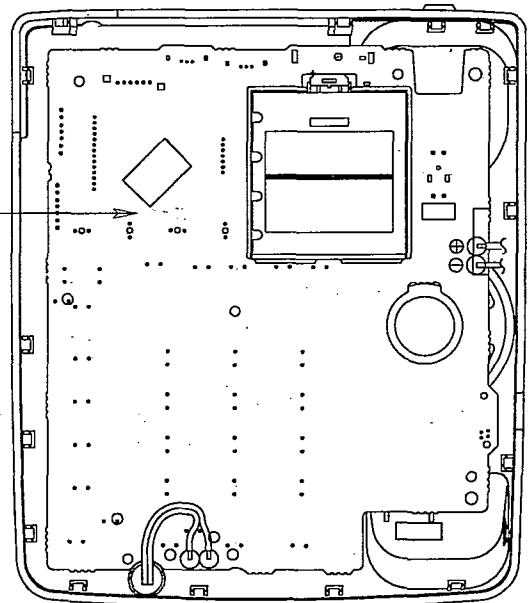


Fig. 6

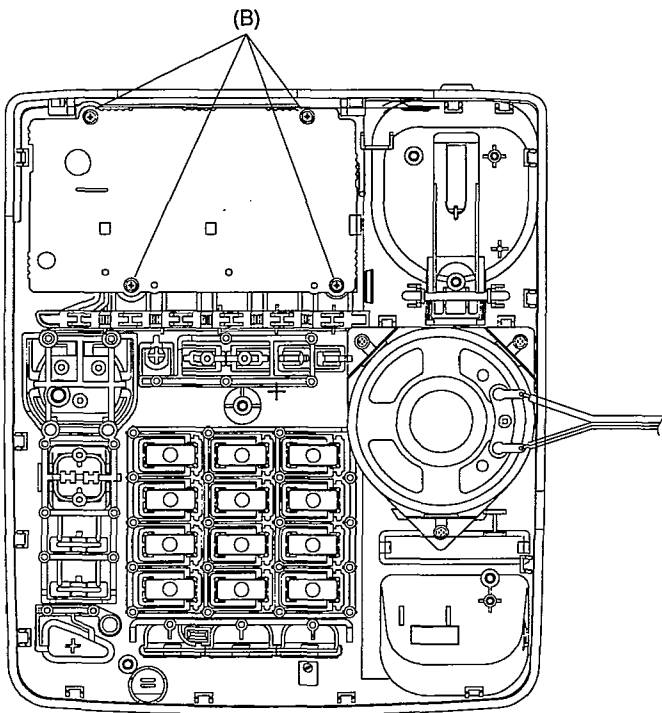


Fig. 7

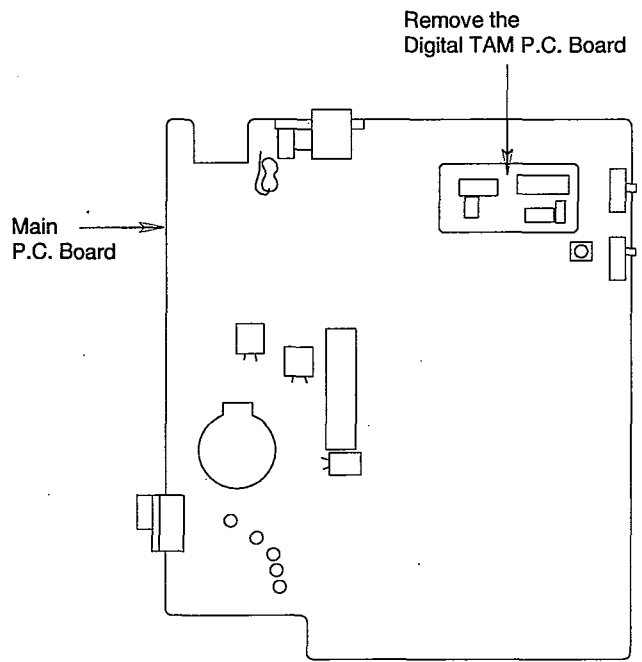


Fig. 8

Ref. No.	Procedure	Shown in Fig. —.	To remove —.	Remove —.
1	1	5	Lower Cabinet	Screws (3×14) (A)×5
2	1, 2	6	Main P.C.Board	Remove the Main P.C.Board
3	1~3	7	Operation P.C.Board	Screws (3×10) (B)×4
4	1, 2, 4	8	Digital TAM P.C.Board	Remove the Digital TAM P.C.Board

HOW TO REPLACE FLAT PACKAGE IC

■ PREPARATION

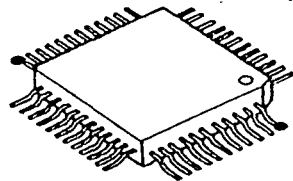
- SOLDER - - - - - Sparkle Solder 115A-1, 115B-1
OR
Almit Solder KR-19, KR-19RMA
- Soldering iron - - - - - Recommended power consumption will be between 30 W to 40 W.
Temperature of Copper Rod 662 ± 50 °F (350 ± 10 °C)

(An expert may handle 60~80 W iron, but beginner might damage foil by overheating.)
- Flux - - - - - HI115 Specific gravity 0.863

(Original flux will be replaced daily.)

■ PROCEDURE

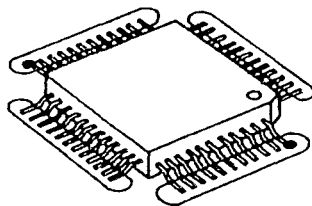
1. Temporarily fix FLAT PACKAGE IC by soldering on two marked 2 pins.



● - - - - - Temporary soldering point.

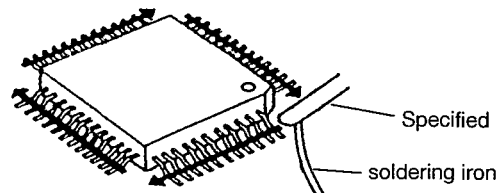
"Most important matter is accurate setting of IC to the corresponding soldering foil.

2. Apply flux for all pins of FLAT PACKAGE IC.



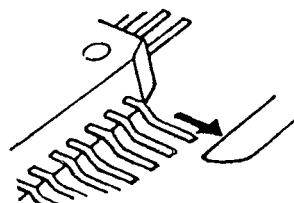
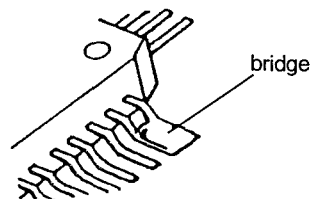
○ - - - - - Flux

3. Solder employing specified solder to direction arrow, as sliding the soldering iron.



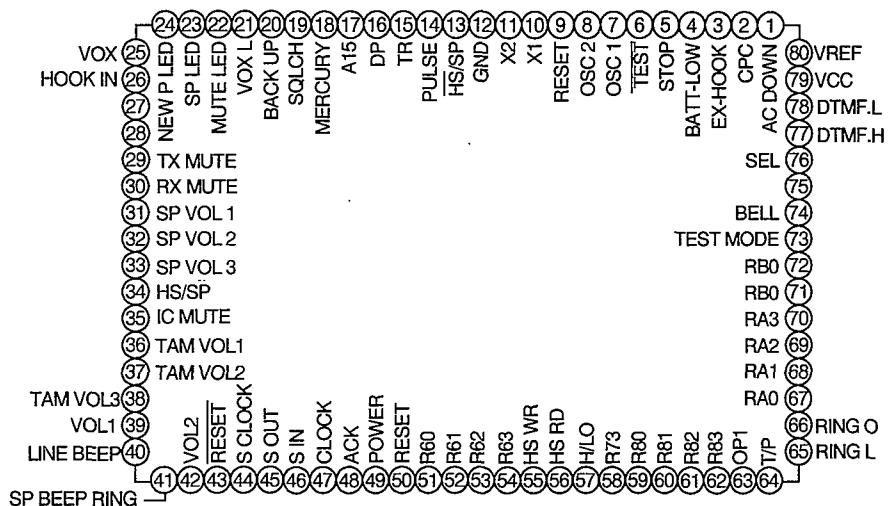
■ MODIFICATION PROCEDURE OF BRIDGE

1. Re-solder slightly on bridged portion.
2. Remove remaining solder along pins employing soldering iron as shown in below Figure.



CPU DATA (ITS)

Part No.: PQVI4639RA20(IC201)
 Power Supply: 5±0.1V
 Program ROM: 16K X 4bit



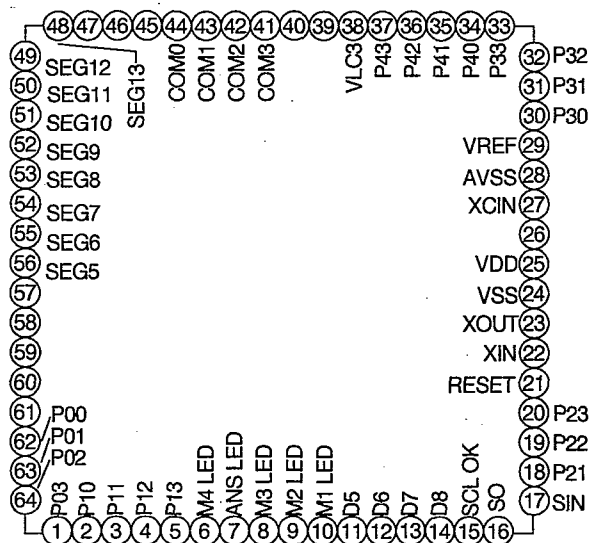
Pin No.	Function	High	Low	Pin No.	Function	High	Low
1	AC Down	Non AC Adaptor	AC Adaptor	36~38	TAM Volume	Open	
2	CPC	CPC In	No CPC	39	Volume 1	Open	
3	EXT HOOK	EXT Hook In	No EXT Hook In	40	Line BEEP	ON	CMOS OPEN
4	Battery Low	Battery Enough	Battery Low			OFF	CMOS OPEN
5	Stop	Stop IN	No Stop	41	SP BEEP	ON	CMOS OPEN
13	Handset/Speaker	Handset Off	Handset On			OFF	CMOS OPEN
14	Pulse	Make	Break	42	Volume 2	Open	
15	TR	Detect Tel Line	Tel Line Off	43	Reset		LCD Reset
16	DP	Make	Break	44	S Clock		
			On-Hook Off Hook	45	S Out		
		AC Adaptor Low	Open	46	S In (Data)		
		No Ac Adaptor	Open	47	Clock		
17	A15			48	ACK	During Communication	Communication end
18	Mercury	Mercury		49	Power		Power Down
19	SQLCH			50	Reset		
20	Back up	Open	DSP Back up	51~54	Transmit/Receive the DSP Data		
21	Vox Level	Sence Low	Sence High	55	HS WR		
22	Mute LED	LED Off	LED On	56	HS RD		
23	SP LED	LED Off	LED On	57	Data H/L		
24	NEW LED	LED Off	LED On	58~62	Key In		Key In
25	VOX	No Sound	Sound	63	Option In		Option In
26	Hook	On-Hook	Off-Hook	64	T/P SW	Pulse	Tone
29	MIC Mute	Mute On	Mute Off	65	Ringer SW (H/L/OFF)	High (65,66) (H,H)	Low (L,H) Off (H,L)
30	SP Mute	Mute On	Mute Off	66			
31~33	SP Volume	Open		67~72	Key Strobe	Normal	Scan
34	Handset/Speaker	SP IC Off	SP IC On	73	Test Mode		
35	IC Mute	Mute On	Mute Off	74	BELL IN		BELL

Pin Description

Function	Signal Name	Pin No.	I/O	Description
Power Supply	Vcc	79	/	Power Source.
	GND	12	/	Ground
System Control	TEST	6	I	Not for User application.
	RESET	9	I	Used to reset CPU.
	OSC1	7	I	I/O terminal for system clock oscillator.
	OSC2	8	O	
	X1	10	I	I/O terminal for sub system clock oscillator.
	X2	11	O	
	STOPC	25	I	I/O terminal for transition from the stop mode to the active mode.
	SEL	76	I	Terminal for selecting the dividing ratio system clock after resetting or the active mode resumes from the stop mode.
Port	D0~D11	13~24	I/O	I/O terminal for every 1-bit access. D0~D3 are high-current source terminals (max. 10 mA) and D4~D11 are high-current sink terminals (max. 15 mA).
	D12, D13	25, 26	I	Input terminal for every 1-bit access.
	R00~RC00	27~75	I/O	I/O terminal for every 4-bit access.
	RD0~RD3, RE0	1~5	I	Input terminal for every 4-bit access.
Interrupt	INT0~INT4	26~30	I	Input terminal for external interrupt.
DTMF Generation Circuit	TONER	78	O	Output for Row's DTMF signal.
	TONEC	77	O	Output for Column's DTMF signal.
	VTref	80	/	Reference level power supply terminal of DTMF signal. Voltage condition: Vcc VTref GND
Timer	EVNB, EVND	42, 43	I	Timer event input terminal.
	TOB, TOC, TOD	39~41	O	Timer output terminal.
Serial Communication Interface	SCK1, SCK2	44, 48	I/O	SCI clock I/O terminal.
	SI1, SI2	45, 49	I	SCI reception data input terminal.
	SO1, SO2	46, 50	O	SCI transmission data output terminal.
Voltage Comparator	COMP0~COMP3	1~4	I	Analog input terminal of voltage comparator.
	VCref	5	/	Input terminal of voltage comparator's reference level voltage.

Note: I=Input O=Output I/O=Input/Output

CPU DATA (LCD)



Part No.: PQVI5204110F(1C601)
 Power Supply: 5±0.1V
 Program ROM: 16K X 10bit

Pin No.	Function	High	Low	Pin No.	Function	High	Low
1	Key Strobe	/		20	—	/	/
2~5	Key Input		Key	21	Reset		
6	Not Used			22	X In		
7	Answer LED		LED ON	23	X Out		
8	Not Used			24	—		
9	M2 LED		LED ON	25	Vdd		
10	M1 LED		LED ON	26	—		
11	—			27	—		
12	—			28	Vss		
13	—			29~40	—		
14	—			41~44	Common		
15	Serial Clock Input			45	Not Used		
16	Serial Out			46	Not Used		
17	Serial In			47	Not Used		
18	—			48~61	Segment		
19	—			62~64	Key Strobe		

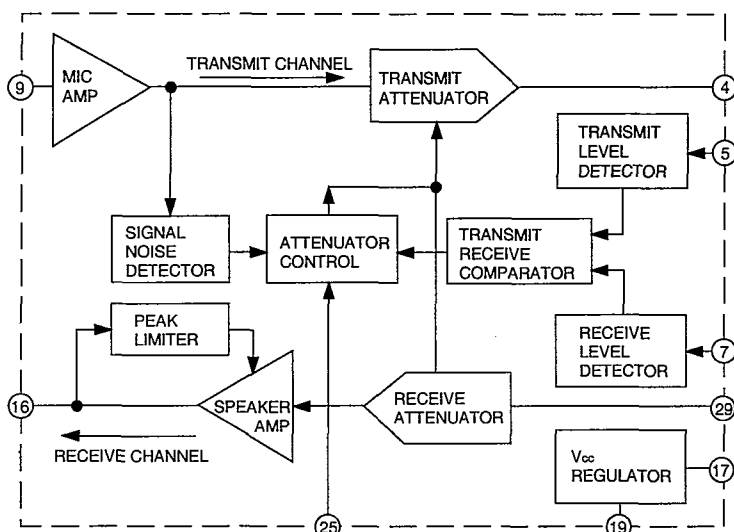
■ Pin Description

Function	Signal Name	Pin No.	I/O	Description
I/O Port	P00~P03	1, 62~64	I/O	For 4-bit signal input and output. Programming the output latch to "1" enables the ports to input signal. The N channel open drain circuit outputs signal.
	P10~P13	2~5	I/O	
	D0~D4	7, 9, 10	I/O	For 4-bit signal input and output. Programming the output latch to "1" enables the ports to input signal. The N channel open drain circuit outputs signal.
Serial I/O Clock I/O	SCK	15	I/O	If the Serial I/O function is selected by software, this is used for the serial I/O terminal of the synchronous clock for the Serial Data transmission.
Serial Data Output	S OUT	16	O	If the Serial I/O function is selected by software, this is used for the output terminal of the Serial Data.
Serial Data Input	S IN	17	I	If the Serial I/O function is selected by software, this is used for the input terminal of the Serial Data.
Input Port	P21~P23	18~20	I	For 4-bit signal input and output.
Reset I/O	RESET	21	I/O	I/O terminal of the reset signal.
Main Clock Input	X IN	22	I	I/O terminal of the main clock generation circuit. This is used by connecting the ceramic oscillator between the X IN and X OUT terminals.
Main Clock Output	X OUT	23	O	
Power Source	Vdd	25	—	Positive power supply voltage terminal.
GND	Vss	28	—	Ground
Input Port	P30~P33	30~33	I	For 4-bit signal input and output.
	P40~P43	34~37	I	
Input power Source for LCD	VLC3	38	I	Power source input terminal for the LCD.
Common Output	COM0~COM3	41~44	O	LCD COMMON output terminal. During 2 time division, COM0 and COM1 are used. During 3 time division, COM0~COM2 are used. During 4 time division, COM0~COM3 are used.
Segment Output	SEG0~SEG13	48~61	O	LCD SEGMENT output terminal.

Note: I=Input O=Output I/O=Input/Output

SPEAKERPHONE IC DATA

Part No.: PQVISC77655V (IC301)



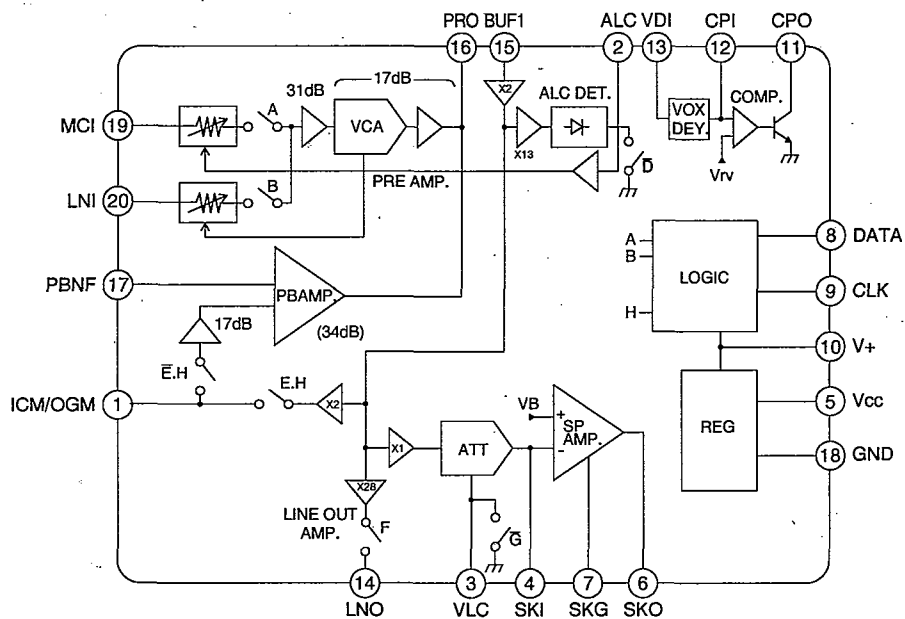
Pin Description

Pin No.	Name	Description
1	RR	A resistor to ground provides a reference current for the transmit and receive attenuators.
2	RTX	A resistor to ground determines the nominal gain of the transmit attenuator. The transmit channel gain is inversely proportional to the RTX resistance.
3	TXI	Input to the transmit attenuator. Input resistance is nominally 5.0 kohms.
4	TXO	Output of the transmit attenuator. The TXO output signal drives the input of the transmit level detector, as well as the external circuit which drives the telephone line.
5	TLI	Input of the transmit level detector. An external resistor ac coupled to the TLI pin sets the detection level. Decreasing this resistor increases the sensitivity to transmit channel signals.
6	TLO	Output of the transmit level detector. The external resistor and capacitor set the time the comparator will hold the system in the transmit mode after speech ceases.
7	RLI	Input of the receive level detector. An external resistor ac coupled to the RLI pin sets the detection level. Decreasing this resistor increases the sensitivity to receive channel signals.
8	RLO	Output of the receive level detector. The external resistor and capacitor set the time the comparator will hold the system in the receive mode after the receive signal ceases.
9	MCI	Microphone amplifier input. Input impedance is nominally 10 kohms and the dc bias voltage is approximately equal to V _B .
10	MCO	Microphone amplifier output. The mic amp gain is internally set at 34 dB (50 V/V).
11	CP1	A parallel resistor and capacitor connected between this pin and V _{cc} holds a voltage corresponding to the background noise level. The transmit detector compares the CP1 voltage with the speech signal from CP2.
13	CP2	A capacitor at this pin peak detects the speech signals for comparison with the background noise level held at CP1.

Pin No.	Name	Description
14	XDI	Input to the transmit detector system. The microphone amplifier output is ac coupled to the XDI pin through an external resistor.
15	SKG	High current ground pin for the speaker amp output stage. The SKG voltage should be within 10 mV of the ground voltage at Pin 22.
16	SKD	Speaker amplifier output. The SKO pin will source and sink up to 100 mA when ac coupled to the speaker. The speaker amp gain is internally set at 34 dB (50 V/V).
17	V+	Input dc supply voltage. V+ can be powered from Tip and Ring if an ac decoupling inductor is used to prevent loading ac line signals. The required V+ voltage is 6.0 to 11V (7.5V nominal) at 7.0 mA.
18	AGC	A capacitor from this pin to VB stabilizes the speaker amp gain control loop, and additionally controls the attack and decay time of this circuit. The gain control loop limits the speaker amp input to prevent clipping at SKO. The internal resistance at the AGC pin is nominally 110 kohms.
19	\overline{CS}	Digital chip select input. When at a Logic "0" (<0.7V) the Vcc regulator is enabled. When at a Logic "1" (>1.6V), the chip is in the standby mode drawing 0.5mA. An open \overline{CS} pin is a Logic "0". Input impedance is nominally 140 kohms. The input voltage should not exceed 11 V.
20	SKI	Input to the speaker amplifier. Input impedance is nominally 20 kohms.
21	Vcc	A 5.4 V regulated output which powers all circuits except the speaker amplifier output stage. Vcc can be used to power external circuitry such as a microprocessor (3.0 mA max). A filter capacitor is required. The MC34018 can be powered by a separate regulated supply by connecting V+ and Vcc to a voltage between 4.5 V and 6.5 V while maintaining \overline{CS} at a Logic "1".
22	VB	An output voltage equal to approximately Vcc/2 which serves as an analog ground for the speakerphone system. Up to 1.5 mA of external load current may be sourced from VB. Output impedance is 250 ohms. A filter capacitor is required.
23	Gnd	Ground pin for the IC (except the speaker amplifier).
24	XDC	Transmit detector output. A resistor and capacitor at this pin hold the system in the transmit mode during pauses between words or phrases. When the XDC pin voltage decays to ground, the attenuators switch from the transmit mode to the idle mode. The internal resistor at XDC is nominally 2.6 kohms.
25	VLC	Volume control input. Connecting this pin to the slider of a variable resistor provides receive mode volume control. The VLC pin voltage should be less than or equal to VB.
26	ACF	Attenuator control filter. A capacitor connected to this pin reduces noise transients as the attenuator control switches levels of attenuation.
28	R XO	Output of the receive attenuator. Normally this pin is ac coupled to the input of the speaker amplifier.
29	R XI	Input of the receive attenuator. Input resistance is nominally 5.0 kohms.
30	R RX	A resistor to ground determines the nominal gain of the receive attenuator. The receive channel gain is directly proportional to the R RX resistance.

RECORD/PLAY AMP IC DATA

Part No.: PQVISC111815 (IC401)



■ Pin Description

Pin No.	Name	Description
1	ICM/OGM	I/O for ICM head. I/O impedance is approximately 20 kohm that keeps high impedance sufficient for head load.
2	ALC	For connection to CR for ALC detection smoothing. The time constant of the CR decides the recovery time. The attack time depends on the values of C and internal resistance (approx. 8.5 kohm).
3	VLC	Volume control input. The speaker output controlled by changing the volume resistance between this pin and GND.
4	SKI	Reverse input of the speaker amplifier. The gain and frequency characteristics are set by external CR. Non-reverse input is biased by internal power source (approx. 1/2 Vcc).
5	Vcc	Power source of IC except LOGIC part.
6	SKO	Output of speaker amplifier. Sets frequency characteristics by connecting to Pin 4 in parallel. Speaker's impedance is normally 30 ohms.
7	SKG	GND speaker amplifier output part.
8	DATA	Input of control data for mute mode. For serial synchronous input with clock signal.
9	CLK	Clock input for data input synchronization. Controls shift register by data bit at fall, and latches by reading data at rise.
10	V+	5.4 V stable output to supply bias with microphone.
11	CPO	output of comparator. Connected to open-collector of NPN transistor.
12	CPI	Input of VOX detector comparator. Compares internal reference voltage with gained voltage, and has a bit hysteresis characteristics.
13	VDI	Input of VOX detector.
14	LNO	Output of buffer amplifier for line output. Current amplifier.

Pin No.	Name	Description
15	BUFI	Inputs of Recording amplifier, line output amplifier, speaker amplifier, and ALC detector. These are input after voltage/radio conversion by CR between this pin and pin 16.
16	PRO	Output of MIC/LINE amplifier and playback amplifier.
17	PBNF	Reverse input of playback amplifier for controlling frequency characteristics. The CR network between this pin and Pins 16 and 18 set frequency and gain.
18	GND	GND for all ICs except speaker amplifier.
19	MCI	Input of microphone amplifier. The input resistance is normally 33 kohms.
20	LNI	Input of line amplifier. The same configuration as MCI.

DSP IC DATA



Part No.: PQVID6305AD (IC701)

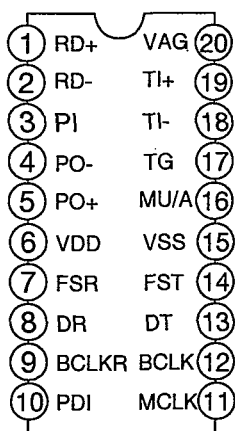
Pin Description

Pin No.	Name	Description
14	HSTDB0 (LSB)	HOST data bus. The HOST writes commands and reads status to/from the D6305A via this bus.
8~13	HSTDB1~6	The HI/LO pin selects between the low byte and the high byte of the command/status.
7	HSTDB7(MSB)	This is used for input when $\overline{\text{HSTWR}}$ is low, and for output when $\overline{\text{HSTRD}}$ is low. It has high impedance when $\overline{\text{HSTWR}}$ and $\overline{\text{HSTRD}}$ are high or $\overline{\text{RESET}}$ is low.
4	HI/LO	High/Low byte select. When this signal is low, the HOST can read/write the low byte of the status/command. When high, the byte is selected.
5	$\overline{\text{HSTRD}}$	HOST read. When low, the HOST reads the low/high byte of the status word.
6	$\overline{\text{HSTWR}}$	HOST write.
3	$\overline{\text{ACK}}$	HOST acknowledge. It goes high when the HOST reads the high byte of the status word.
59	ADDR0(LS8)	External memory address bus
60~72	ADDR1~13	
2	ADDR14	
37	$\overline{\text{EPRRD}}$	Voice prompt ROM/EPROM read (active low).
39	MDB0(LSB)	External memory data bus.
40~45	MDB1~6	
46	MDB7(MSB)	
47~56	MDB8~15	
35	$\overline{\text{DRAMW}}$	ARAM write (active low).
29	$\overline{\text{CAS0}}$	4 Mbit ARAM CAS (ARAM 4)
30	$\overline{\text{CAS1}}$	
33	$\overline{\text{CAS2}}$	
34	$\overline{\text{CAS3}}$	
28	$\overline{\text{RAS}}$	ARAM RAS.

Pin No.	Name	Description
27	DR	Serial input for CODEC PCM data.
25	DX	Serial output for CODEC PCM data.
23	FSYNC	Frame synchronization signal for CODEC.
20	SCLK	Clock output to CODEC.
18	X IN	Crystal input pin for internal oscillator. The frequency is 29.4912 MHz.
17	X OUT	Crystal output pin for internal oscillator.
15	GND	Ground pin.
31	GND	
54	GND	
74	GND	
19	Vcc	+5V battery backed-up power supply input. This power source should be connected to the ARAMs, and voice prompt ROM/EPROM.
32	Vcc	
73	Vcc	
53	Vcc1	
61	PDN	Vcc power fail sensor input, when a low level is detected on this pin, the D6305A enters power-down mode.
21	RESET	Reset input (active high).

CODEC IC DATA

Part No.: PQVIMC5480DW (IC702)

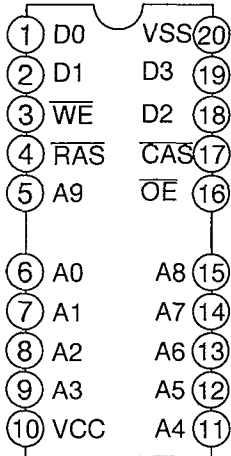


■ Pin Description

Pin No.	Name	Description
1	RO+	Recept the outputted analog.
2	RO-	Recept the outputted analog.
3	PI	Input the power amp.
4	PO-	Output the power amp.
5	PO+	Output the power amp.
6	VDD	Positive power supply pin.
7	FSR	Frame synchronization, reception.
8	DR	Recept the data.
9	BCLKR	Recept the bit clock.
10	PDI	Input the power down.
11	MCLK	Master Clock pin.
12	BCLKT	Transmit the bit clock.
13	DT	Transmit the data.
14	FST	Frame synchronization, transmission.
15	Vss	Negative power supply pin.
16	Mu/A	Select the Mu/A.
17	TG	Transmit gain.
18	TI-	Transmit the inputted analog.
19	TI+	Transmit the inputted analog.
20	VAG	Output the analog ground.

4M ARAM IC DATA

Part No.: PQVID000035 (IC703)



Pin Description

Pin No.	Name	Description
9	A0	Row and column address bits, Row address bits are latched in the chip by the RAS signal. Column address bits are latched in by the CAS signal.
10	A1	
11	A2	
12	A3	
14	A4	
15	A5	
16	A6	
17	A7	
18	A8	
5	A9	
4	RAS	Row address strobe.
23	CAS	Column address strobe.
3	WE	Write enable input which selects read or write mode.
13	VCC	+5V supply.
26	VSS	Ground.
22	OE	Output enable.
1	D1	Data inputs/outputs.
2	D2	
24	D3	
25	D4	

TERMINAL GUIDE OF ICS, TRANSISTORS AND DIODES

<p>PQVI4639RA20 PQVID6305AD</p>	<p>PQVISC77655V</p>	<p>PQVISC111815</p>	<p>PQVITEA1062</p>	<p>PQVITEA1081D PQVIBA8206</p>
<p>PQVI5204110F</p>	<p>PQVIMC5480DW</p>	<p>PQVID000035</p>	<p>MN1280S</p>	<p>2SA1625 PQVT2N6517CA</p>
<p>PQVTFB1J3P PQVTFB1A4M 2SD1819A</p>	<p>2SK1398</p>	<p>2SD2137</p>	<p>MA4056 MA4062 MA4047</p>	<p>MA4360 MA4180</p>
<p>LN268RPXTAB</p>	<p>1SS119 PQVDMTZ6R8 PQVDHZ3BLL PQVDHZS3A1</p>	<p>MA700A</p>	<p>PQVDSSEL4117R</p>	<p>LN265RPH</p>
<p>PQVDSL325MC</p>				

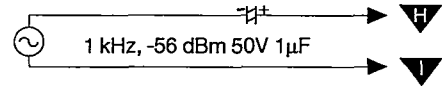
ADJUSTMENT

Perform the following adjustment after replacing IC301 and VR301.

Test Equipment:
Loop Simulator RC Oscillator VTVM
Preparation:
<ol style="list-style-type: none"> Set the unit's controls as follows: <ol style="list-style-type: none"> SP-PHONE SWITCH..."ON" VOLUME CONTROL..."MAX" Set the variable resistor of the loop simulator to maximum resistance (fully counterclockwise). Connect the unit to the Loop Simulator. Make adjustment in a quiet room.

Transmission Level Adjustment (for Speakerphone)

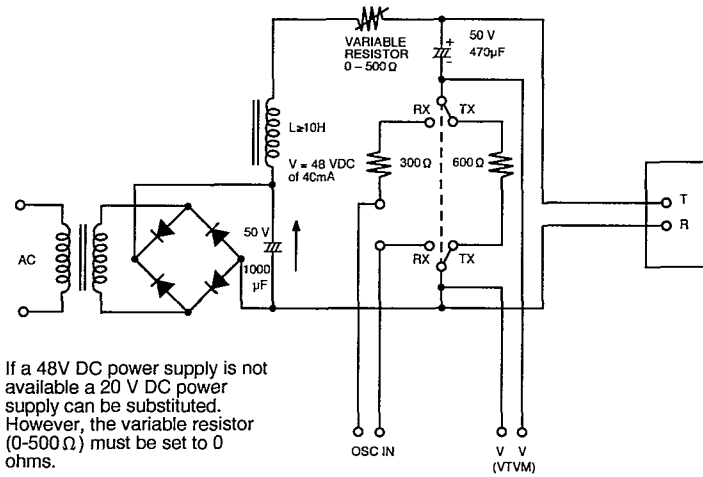
- Connect the Test Point **▼K** - **▼L**.
- Set the Loop Simulator selector switch to "TX".
- Connect the RC Oscillator to Test Point **▼(-)** - **▼(+)**, and connect an electrolytic capacitor (50V, 1 μ F) as show below.
- Set RC Oscillator to 1kHz, 56 dBm.



- Connect the VTVM to test point **▼A** - **▼I**.
- Adjust VR301 for a reading of $-26 \text{ dBm} \pm 0.5 \text{ dB}$ on the VTVM.
- Disconnect the test point **▼K** - **▼L**.

Please refer to Circuit Board and wiring Connection Diagram which is located test point (**▼**).

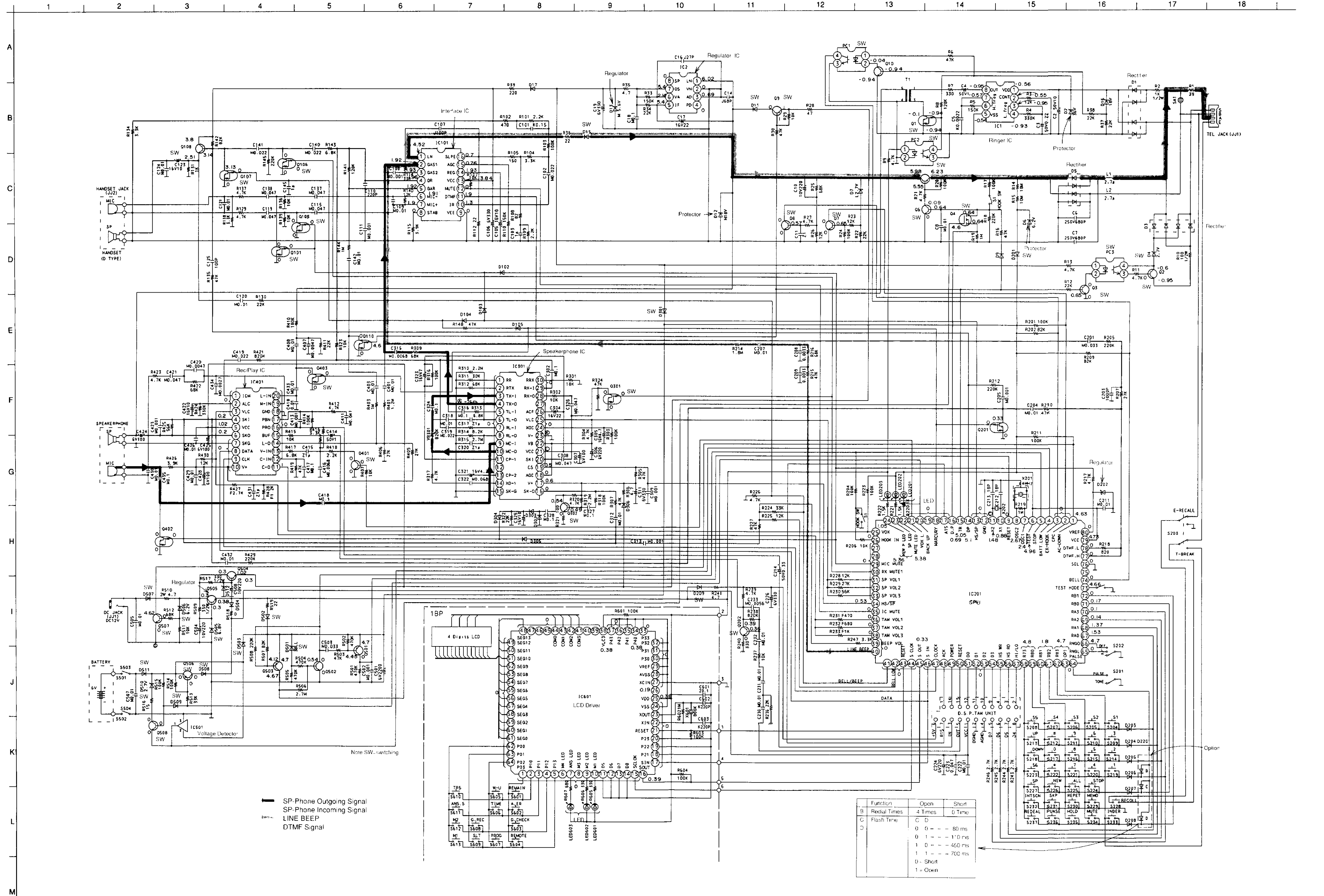
Schematic Diagram of Loop Simulator



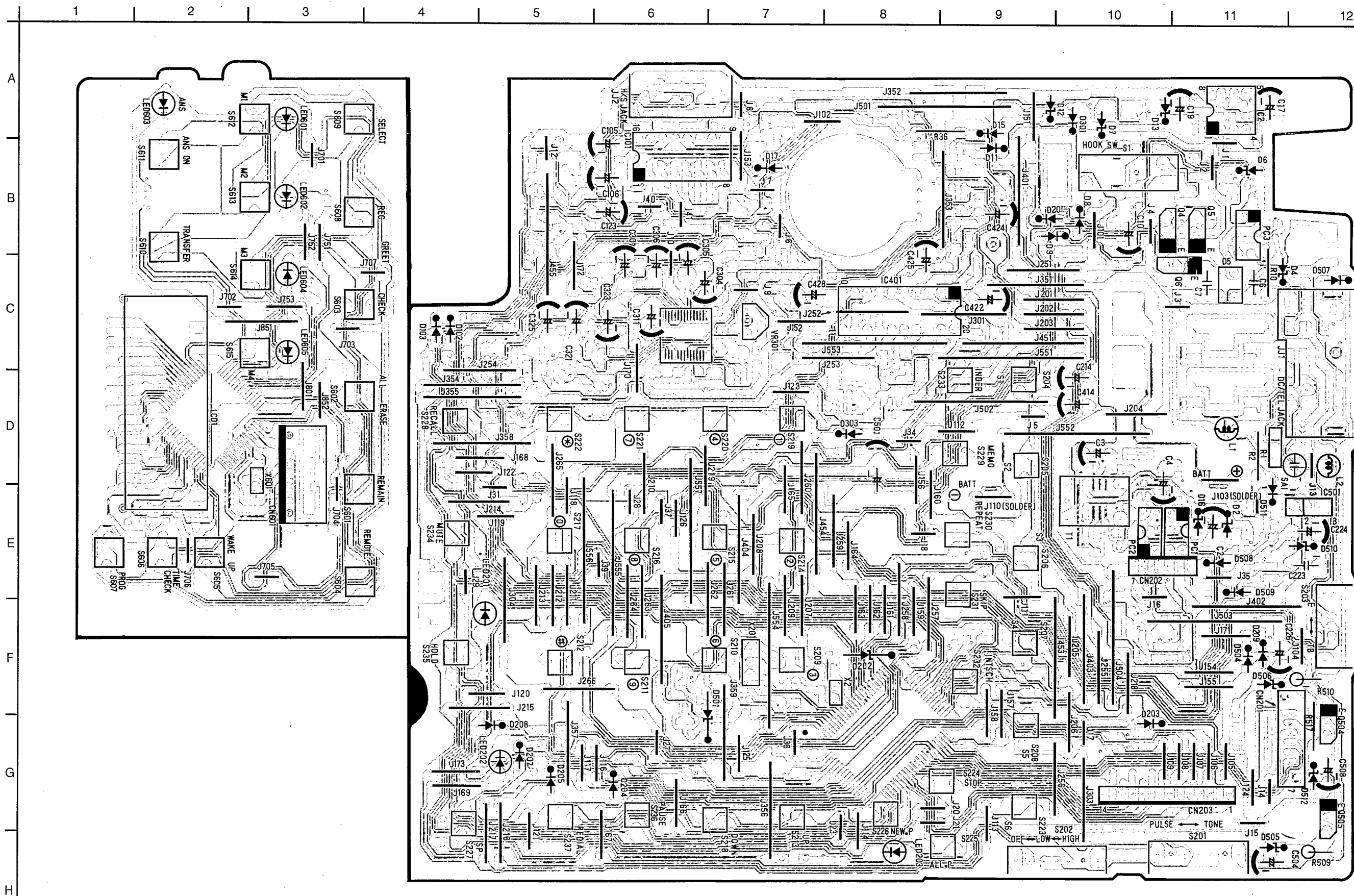
If a 48V DC power supply is not available a 20 V DC power supply can be substituted. However, the variable resistor (0-500 Ω) must be set to 0 ohms.

Fig. 9

SCHEMATIC DIAGRAM

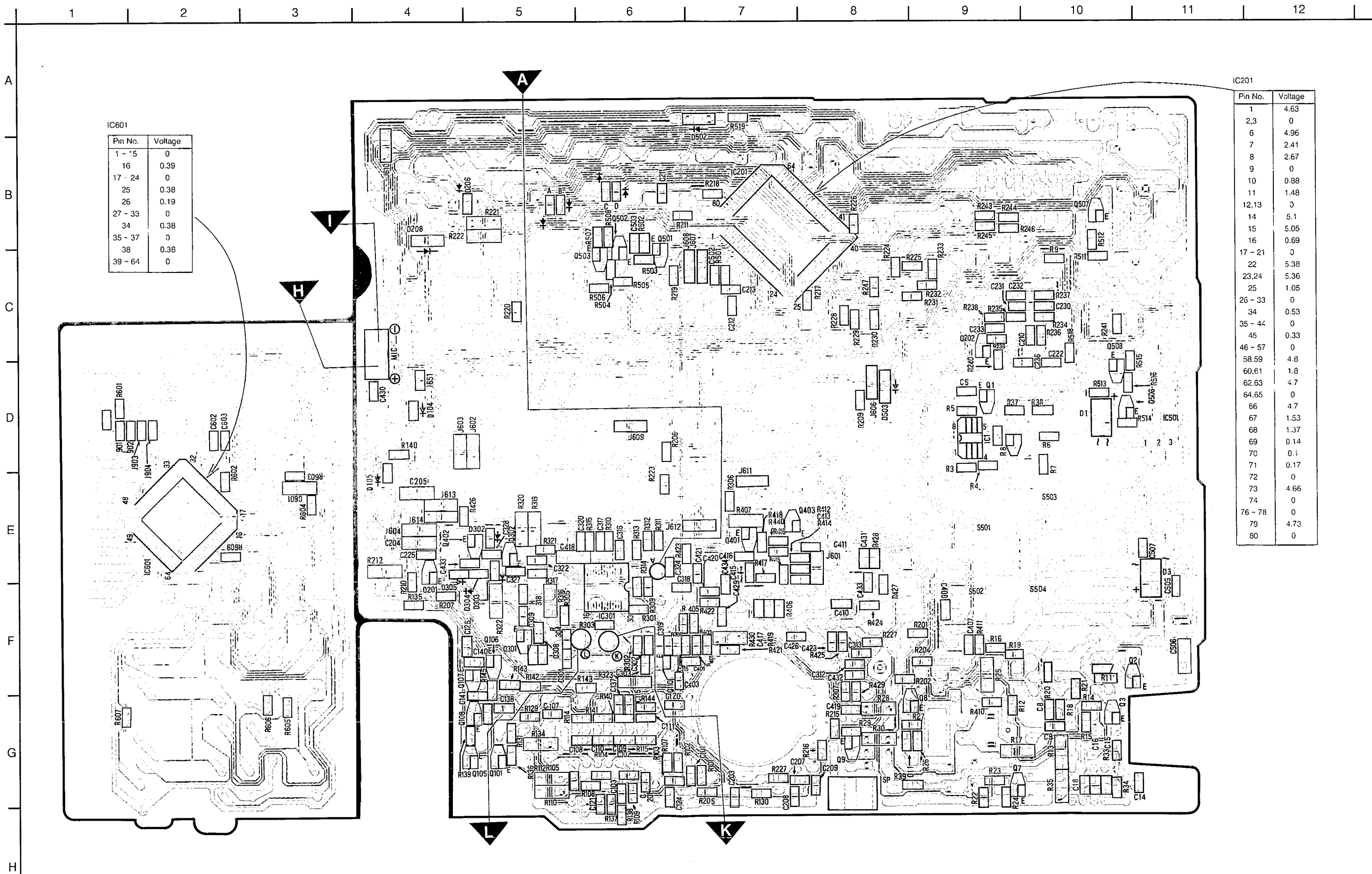


MAIN PRINTED CIRCUIT BOARD (COMPONENT VIEW)



Note : This circuit board may be modified at any time with the development of new technology.

MAIN PRINTED CIRCUIT BOARD (BOTTOM VIEW)



IC601

Pin No.	Voltage
1 - 15	0
16	0.39
17 - 24	0
25	0.38
26	0.19
27 - 33	0
34	0.38
35 - 37	0
38	0.38
39 - 64	0

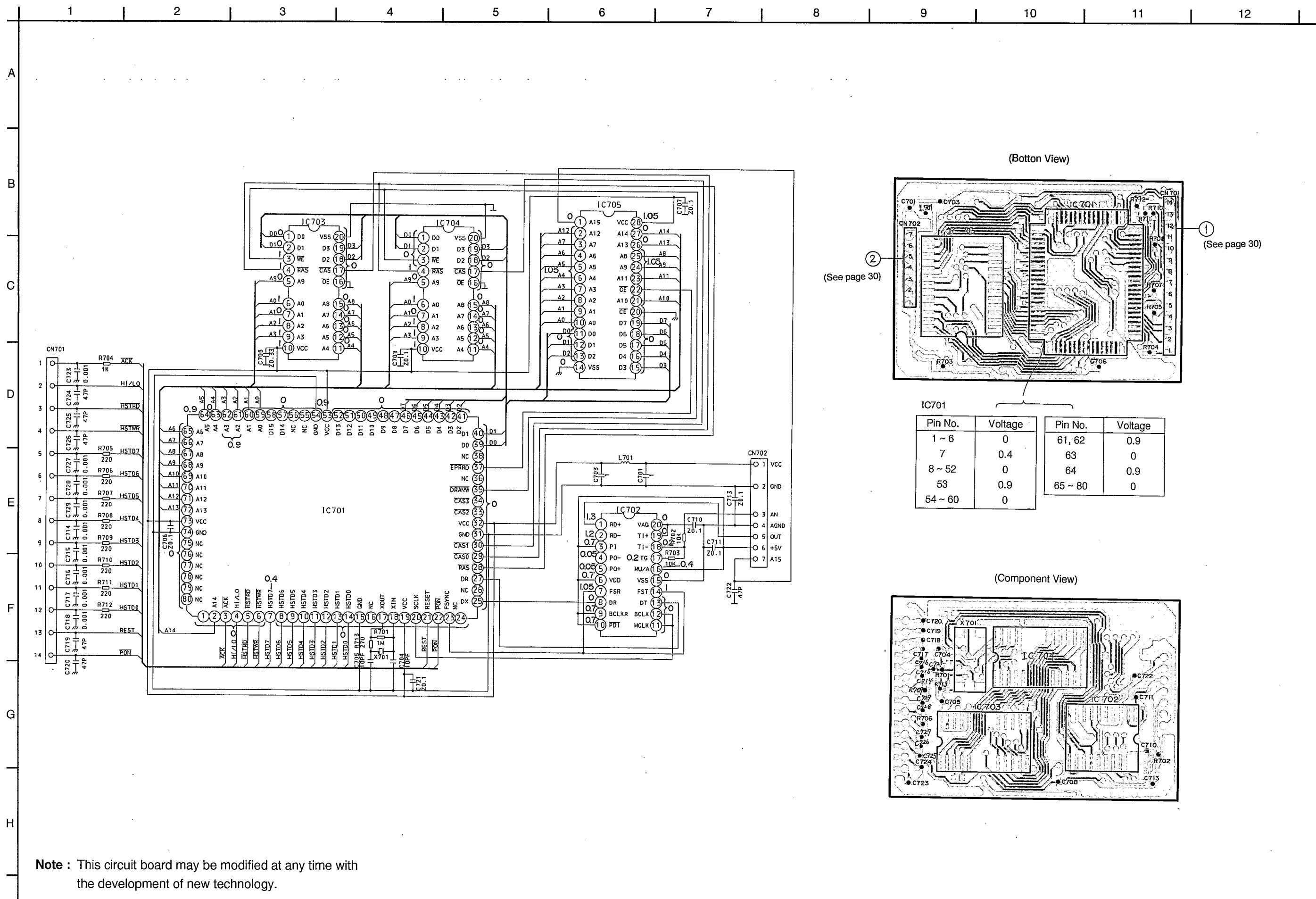
IC201

Pin No.	Voltage
1	4.63
2,3	0
6	4.96
7	2.41
8	2.67
9	0
10	0.88
11	1.48
12,13	0
14	5.1
15	5.05
16	0.69
17 - 21	0
22	5.38
23,24	5.36
25	1.05
26 - 33	0
34	0.53
35 - 44	0
45	0.33
46 - 57	0
58,59	4.8
60,61	1.8
62,63	4.7
64,65	0
66	4.7
67	1.53
68	1.37
69	0.14
70	0.1
71	0.17
72	0
73	4.66
74	0
76 - 78	0
79	4.73
80	0

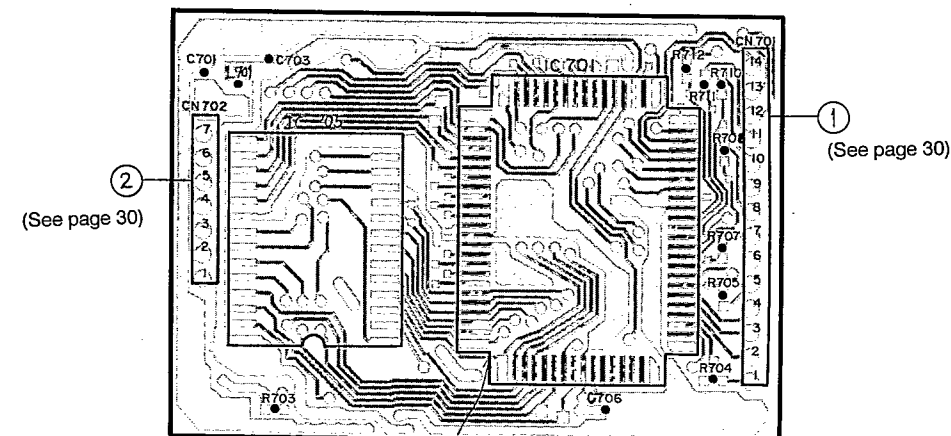
Note : This circuit board may be modified at any time with the development of new technology.

SCHEMATIC DIAGRAM (DIGITAL TAM)

PRINTED CIRCUIT BOARD (DIGITAL TAM)



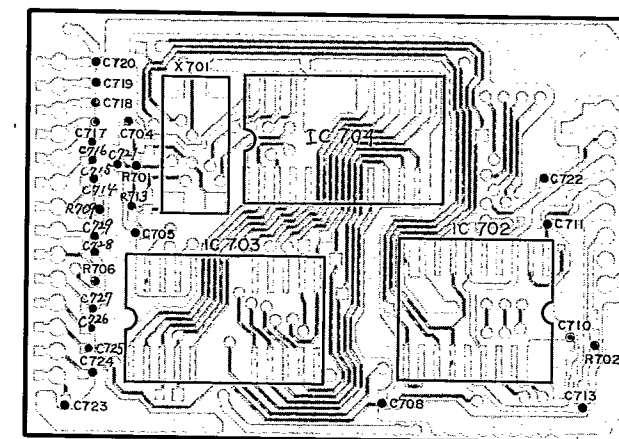
(Bottom View)



IC701

Pin No.	Voltage	Pin No.	Voltage
1 ~ 6	0	61, 62	0.9
7	0.4	63	0
8 ~ 52	0	64	0.9
53	0.9	65 ~ 80	0
54 ~ 60	0		

(Component View)



Note : This circuit board may be modified at any time with the development of new technology.

BLOCK DIAGRAM

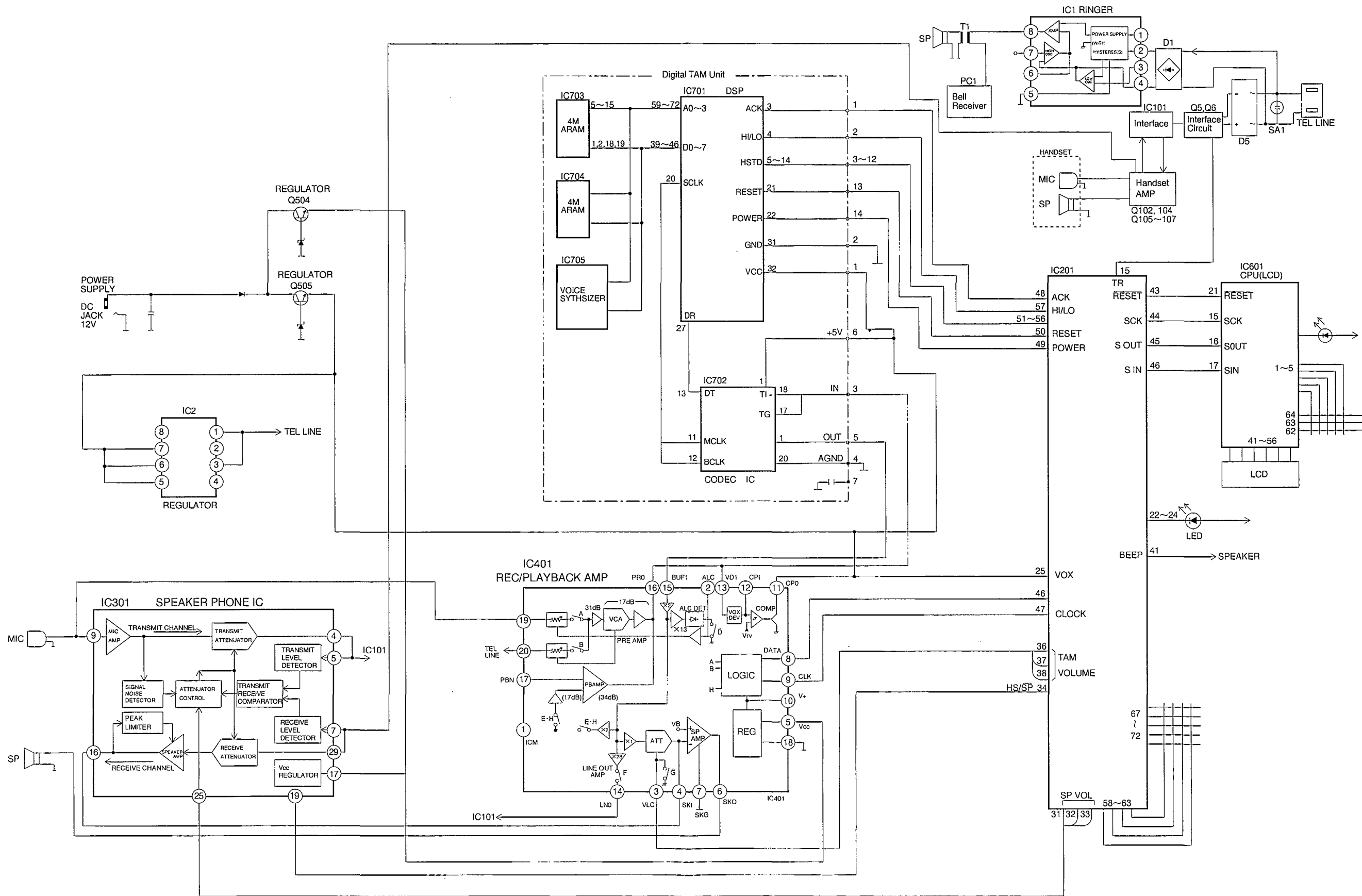


Fig.10

■ FOR SCHEMATIC DIAGRAM

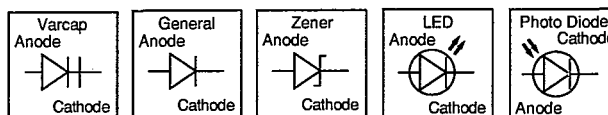
Notes:

1. S1: Hook switch.
2. S202: Ringer Mode Selector switch.
3. S203: Dialing Mode Selector switch.
4. S204: Memory Station switch.
~208
5. S209: Dialing switch.
~212
6. S213: Volume switch.
7. S214: Dialing switch.
~217
8. S218: Volume switch.
9. S219: Dialing switch.
~222
10. S223: Lower switch.
11. S224: Stop switch.
12. S225: All Message switch.
13. S226: New Message switch.
14. S227: SP- Phone switch.
15. S228: Individual Erase switch.
16. S229: MEMO/2WAY Record switch.
17. S230: Repeat switch.
18. S231: Skip switch.
19. S232: Scan switch.
20. S233: Recall switch.
21. S234: Mute switch.
22. S235: Hold switch.
23. S236: Pause switch.
24. S237: Redial switch.
25. DC voltage measurements are taken with electronic voltmeter from negative terminal of battery.
(Add 40 mA to telephone line from the loop simulator.)
26. This schematic diagram may be modified at any time with the development of new technology.

27.

Important safety notice

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



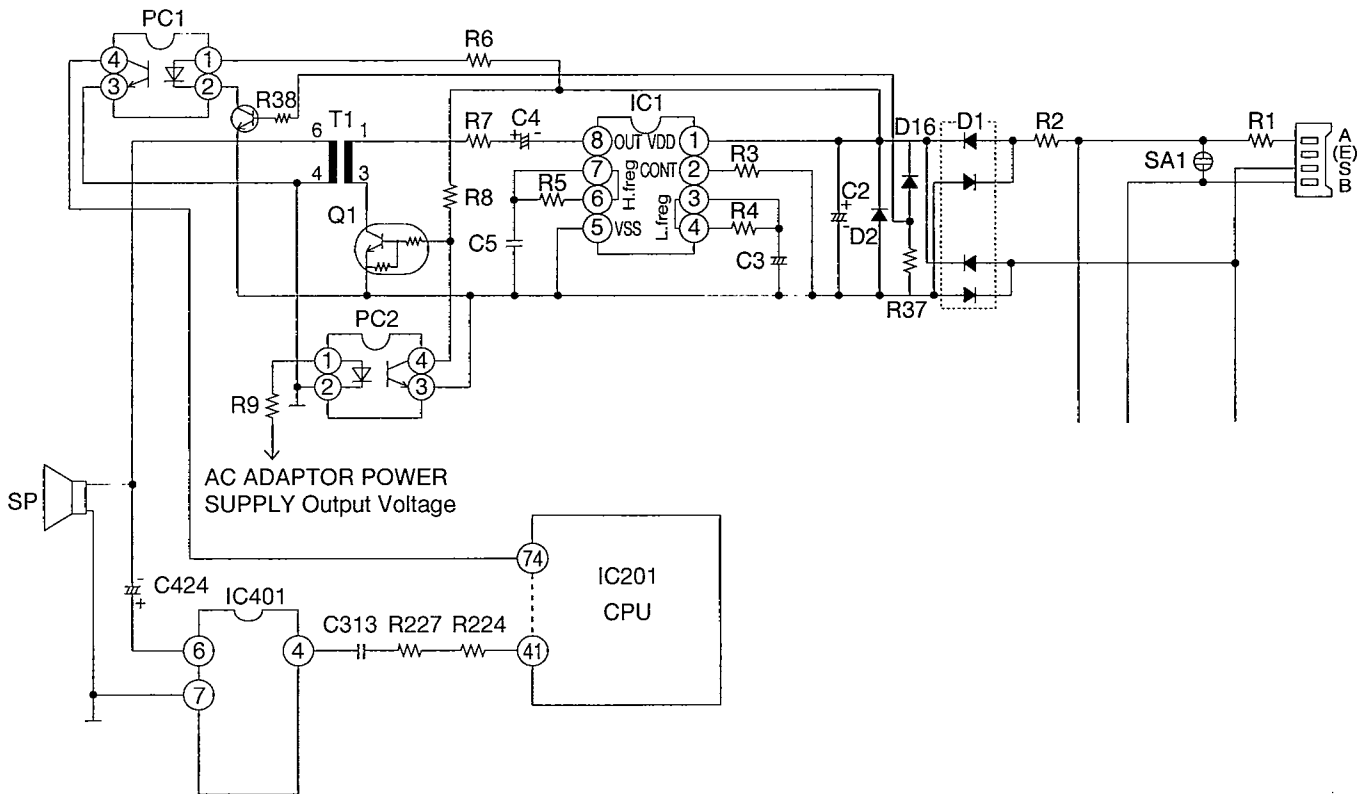
RINGER CIRCUIT

Unit is ON-Hook, so no line current flows. Ring signal is between line A and S. IC1 generates the ringing tone output to the speaker when no AC Adaptor is connected. With AC Adaptor connected, IC201 (CPU) controls the ringing signal to the speaker.

Ring Signal Line A and S → R1 → R2 → D1~D4 →

- AC Adaptor connected (Pin 1 of PC2 is High and Q1 is OFF). Therefore bell input path is → R6 → Pin 1 of PC1 is high level → Pin 4 of PC1 is high level → Pin 74 of IC201 is high level → Pin 41 of IC201 → R224 → R227 → C313 → Pin 4 of IC401 → Pin 6 of IC401 → C424 → Speaker.
- AC Adaptor not connected (Pin 1 of PC2 is Low and Q1 is ON). Therefore bell input path is → Pin 1 of IC1 → Pin 8 of IC1 → C4 → R7 → T1 Primary → T1 Secondary → Speaker.

Circuit Diagram



INTERFACE CIRCUIT

The telephone line is seized by Q5 being switching on via the hook switch S1 being Off-Hook or by the Pin 15 of IC201(CPU) going high. IC101 is the telephone transmission interface IC for line signals and DTMF dialing.

•The DC current flow is thus:

Line A → R1 → L1 → D5 → Emitter of Q5 → Collector of Q5 → D15 → R36 → Pin 1 of IC101 → R112 → D5 → L2 → Line B.

•The AC line signal in is:

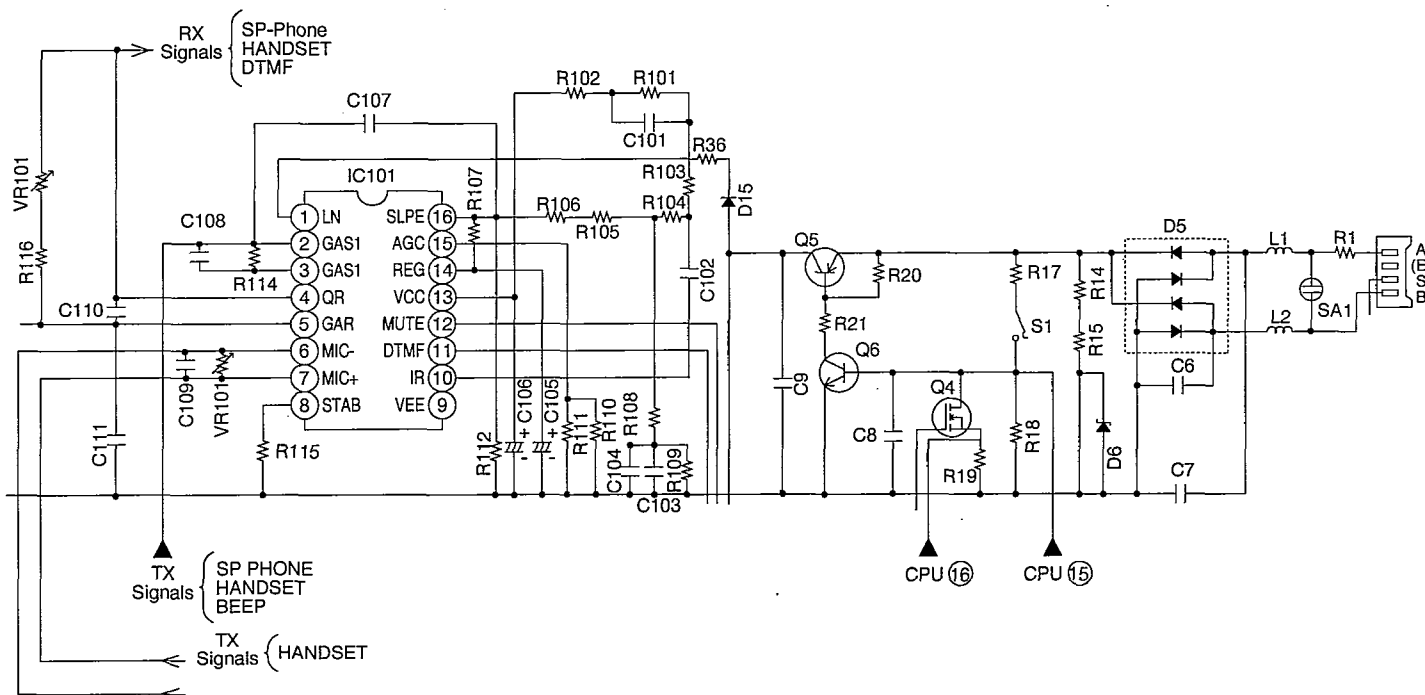
Line A → R1 → L1 → D5 → Emitter of Q5 → Collector of Q5 → D15 → R36 → R103 → C102 → Pin 10 of IC101 → Pin 4 of IC101 → (SP-PHONE, Handset, Detect the DTMF) Circuits.

•Handset signals sent to the line are input to MIC + Pin 7 and MIC-pin 6 of IC101.

SP phone, Beep TAM signals sent to the line are input GAS1 pin 2 of IC101. The AC signal loop out to the line is then as follow :

Pin 1 of IC101 → R36 → D15 → Collector of Q5 → Emitter of Q5 → D5 → L1 → R1 → Telephone Line

Circuit Diagram



■ TONE DIAL CIRCUIT

Function:

The tone dialing circuit consists of a DTMF (Dual Tone Multi Frequency) signals generator (outputted from Pins 77 and 78 of the microprocessor) for tone dialing, and also a circuit for outputting the signal to the line. The DTMF circuit identifies inputs from the 12 keys (1,2,3,4,5,6,7,8,9,0,* and #) by means of a total of seven frequencies, that is four low frequencies (Low group) and three high frequencies (High group).

Circuit Description:

When a dial key is pressed, a DTMF signal is outputted from pins 77 and 78 of IC201 as an analog synthetic wave. The signal flow to the line is as follows:
 IC101 is the line interface IC that provides signal amplification. In tone dialing mode, Pin 12 of IC101 "mute" input is High-Allowing-DTMF-signal to the line as follows: Pins 77 and 78 of IC201 → R218 → R207 → R205 → C201 → Pin 11 of IC101 → Pin 1 of IC101Telephone Line.

The DTMF is also output as a monitor tone to the user when the key is pressed:

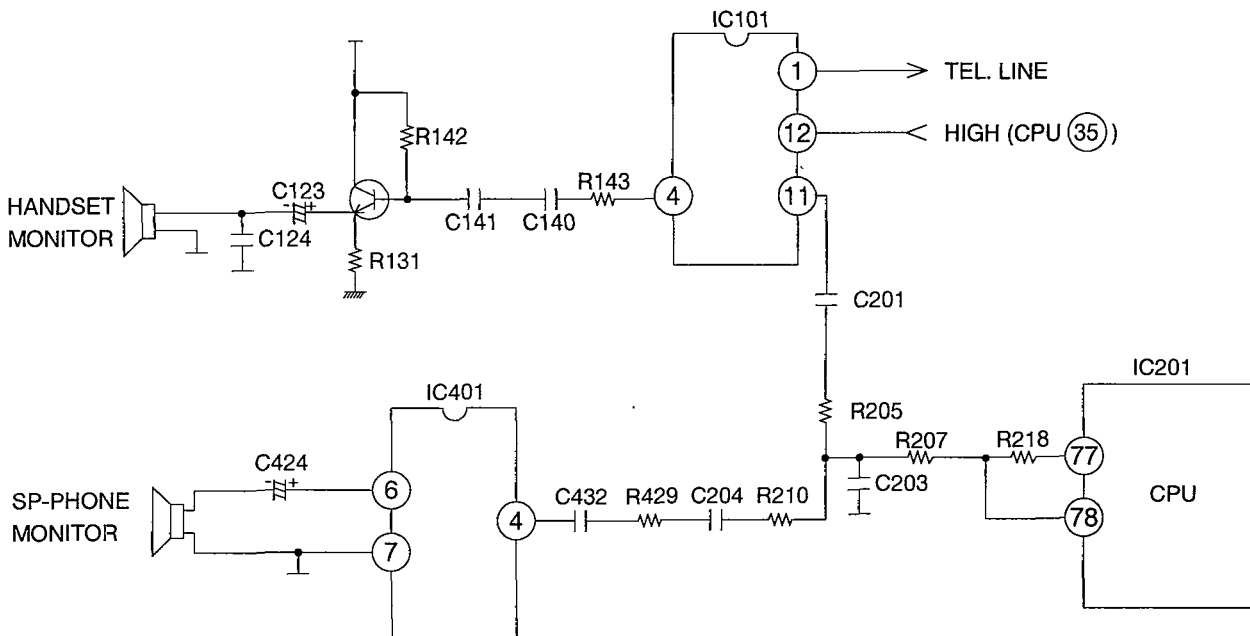
- Handset Monitoring → DTMF input to pin 11 of IC101 → Pin 4 of IC101 → R143 → C140 → C141 → Base of Q108 → Emitter of Q108 → C123.
→ Handset Speaker
- SP-Phone Monitoring → Pins 77 and 78 of IC201 → R218 → R210 → C204 → R429 → C432 → Pin 4 of IC401 → Pin 6 of IC401 → C424 → SP-Phone Speaker.

Tone Frequencies

	High Group	H1	H2	H3
Low Group				
L1		1	2	3
L2		4	5	6
L3		7	8	9
L4		*	0	#

Low Group	Frequencies	High Group	Frequencies
L1	697Hz± 1.5%	H1	1209Hz± 1.5%
L2	770Hz± 1.5%	H2	1336Hz± 1.5%
L3	852Hz± 1.5%	H3	1477Hz± 1.5%
L4	941Hz± 1.5%		

Circuit Diagram



PULSE DIAL CIRCUIT

Circuit Operation:

When Hook-switch S1 is ON (Off-Hook), the circuit is closed and current flows to the base of Q6 via diode bridge D5. Hence Q6 is ON and Q5 is ON. Q4, Q5 and Q6 are the pulse dial generating circuits, driven by the CPU as follows:

Pin 16 of IC201 is High → Q4 is ON → Q6 is OFF → Q5 is OFF → Break period.

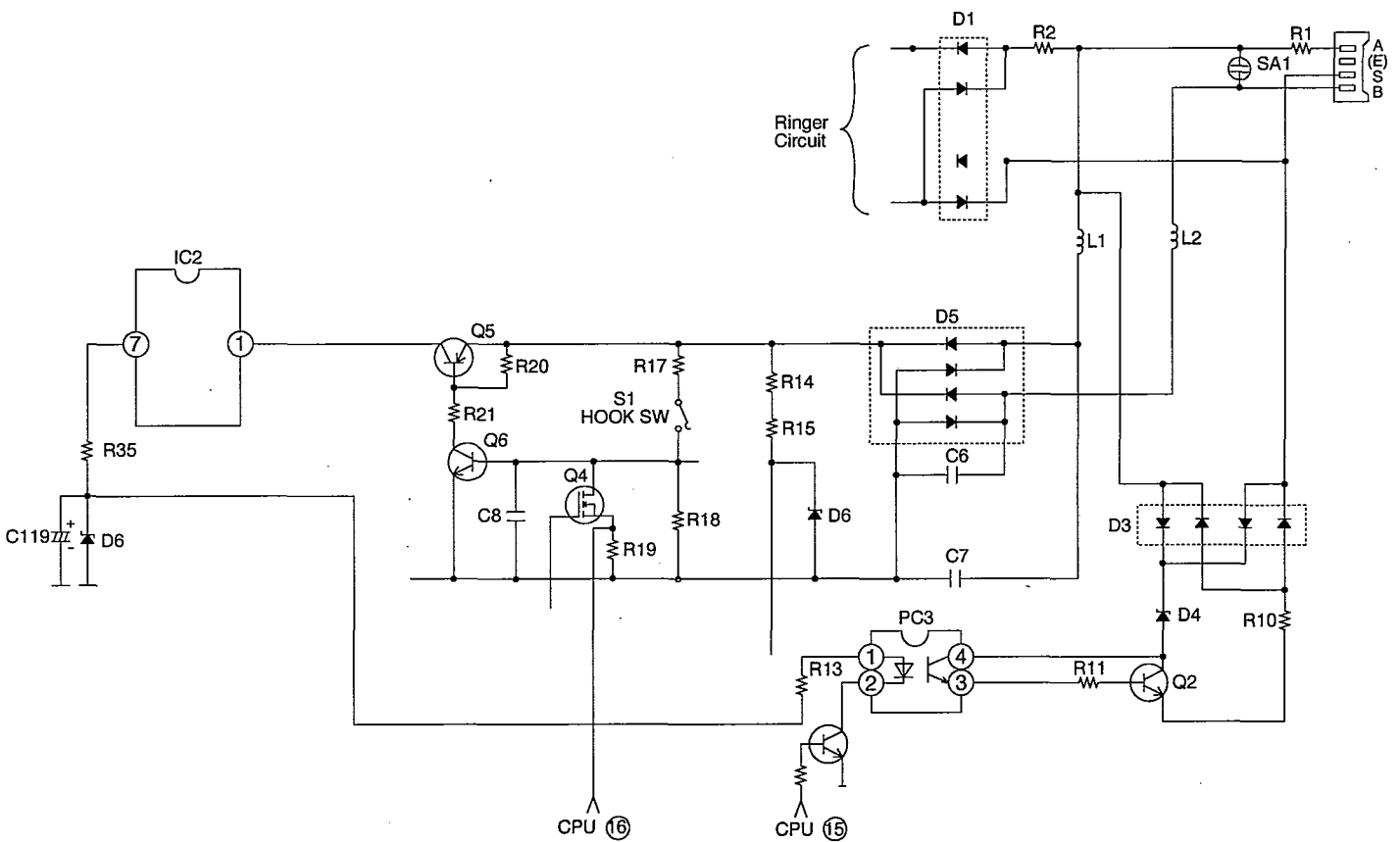
Pin 16 of IC201 is Low → Q4 is OFF → Q6 is ON → Q5 is ON → Make period.

During switching transitions of the line pulses, voltage spikes could activate the ringer detect circuit via diode bridge D1. To prevent this condition a pulse spike limiter circuit is connected between line A and bell line S. Operation is as follows:

• Off-Hook state → Pin 15 of IC2 is High → Q3 is ON → PC3 is ON → Q2 is ON. If voltage spike on LA → D3 → D4 clamps spike to level below ringer detector level.

• On-Hook state → Pin 7 of IC2 is Low → PC3 is OFF → Q3 is OFF → Q2 is OFF. So pulse spike limiter circuit has no affect on incoming ring signal.

Circuit Diagram



■ DC REGULAR CIRCUIT

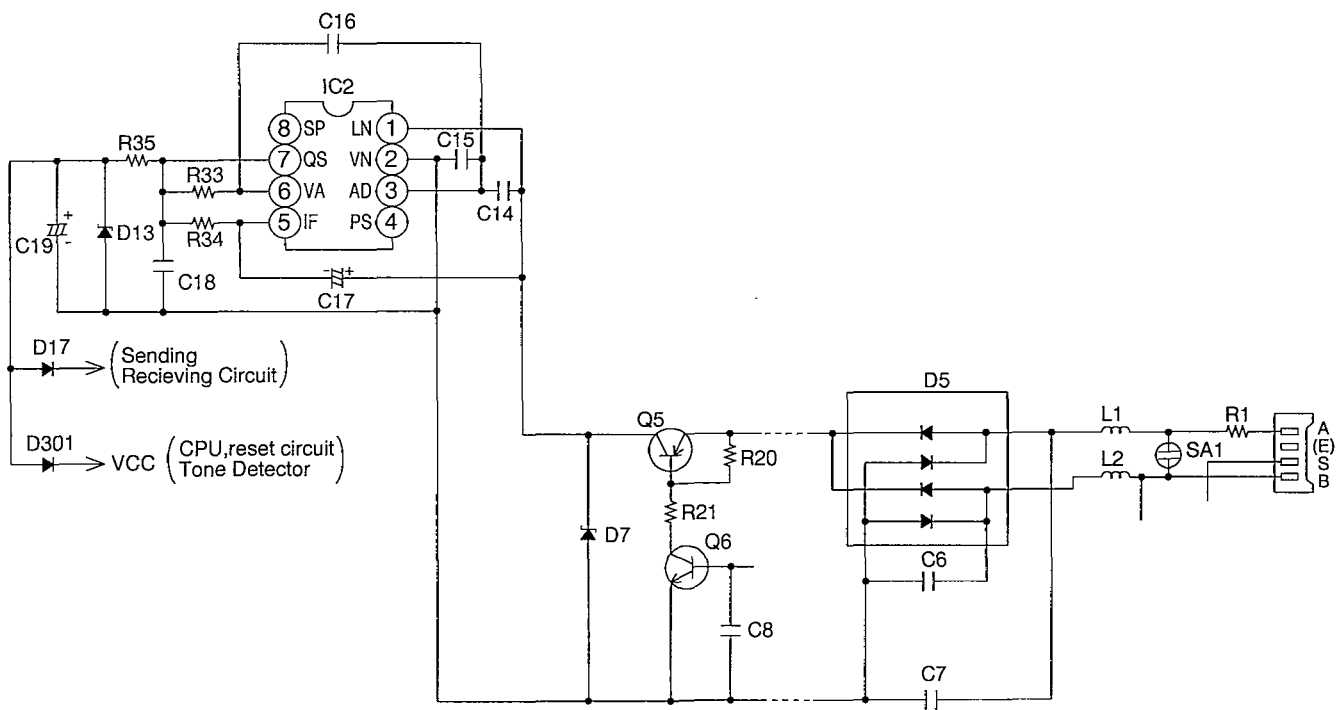
Function:

This circuit provides 4~5V DC power supply to allow the unit to be operated as an ITS in the case of no AC Adaptor being connected. Therefore the use can operate the unit to answer/make telephone calls without any mains power supply.

Circuit Operation:

IC2 is a telephone line powered DC voltage regulator for peripheral circuit supply (Reset circuit, CPU, Sending, Receiving, Dialing circuit). Very high input impedance is provided to AC signals so no distortion of line signals occur. Line A → R1 → L1 → D5 → Emitter of Q5 → Collector of Q5 → Pin 1 of IC2 → Pin 7 of IC1 → R35 → Peripheral Circuits.

Circuit Diagram



■ TONE DETECTOR CIRCUIT AND VOICE DETECTOR CIRCUIT.

Function:

(TONE DETECTOR)

This circuit monitors the line in condition for a busy tone signal. It is used during automatic dialing operations ("1 station dialing" or "Transfer" functions or "Auto Redial"), to check if the dialled number is available.

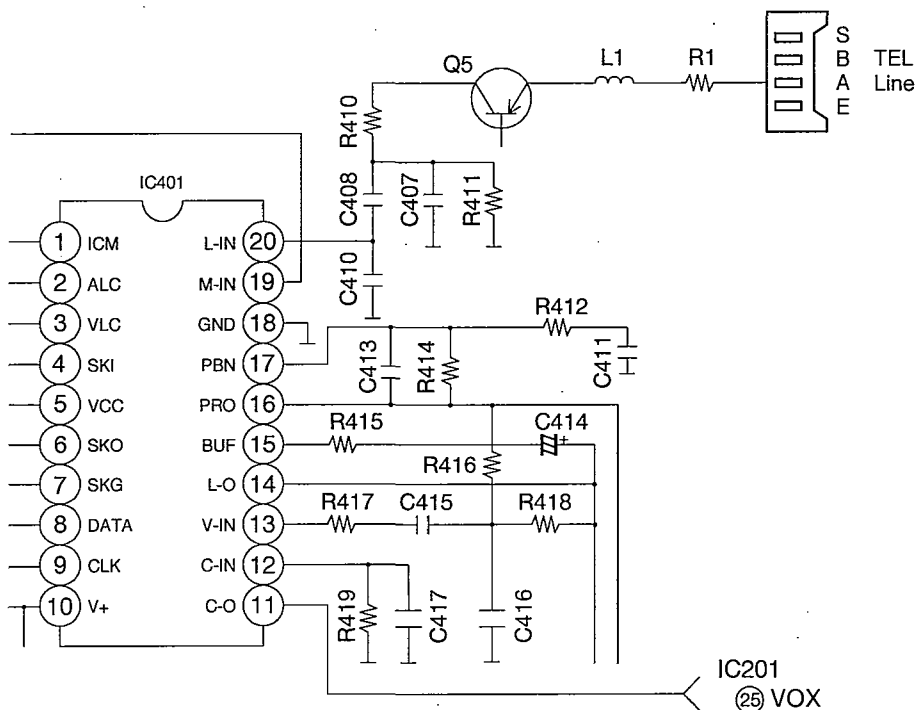
(VOICE DETECTOR)

This circuit detectors the end of Incoming message recording., And the unit releases the line.

Circuit Operation:

Line A → R1 → L1 → Emitter of Q5 → Collector of Q5 → R410 → C410 → Pin 20 of IC401 → Pin 15 of IC401 → R416 → C415 → R417 → IC401 detect the Tone signal → Output the Data from Pin 11 of IC401 (no signal as high.) → Pin 25 of IC201.

Circuit Diagram



■ HANDSET CIRCUIT

Function:

This circuit is the signal interface between the telephone line.

Circuit Operation:

IC101 is the transmission interface IC that forms part of DC loop and AC signal loop. The IC is line powered with intend reference supply. Driven by the the IC201 as follows:

•Pin 35 of IC201 is Low.

•For Handset sending the signal path is:

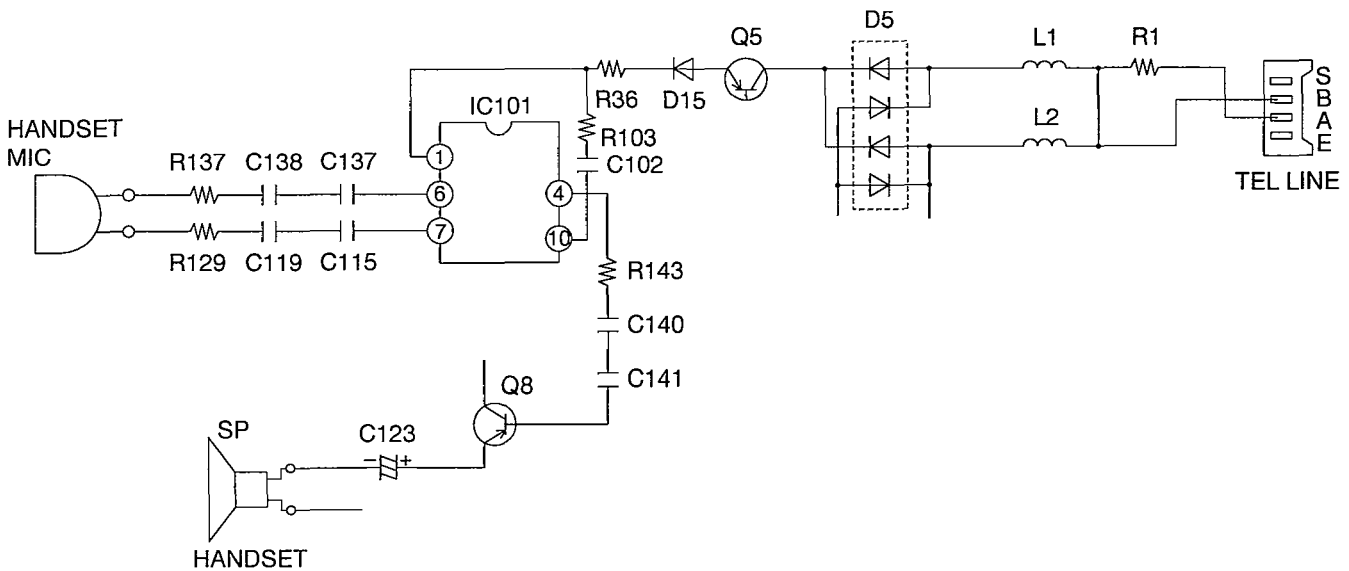
Handset MIC \rightarrow R129, R137 \rightarrow C119, C138 \rightarrow C115, C137 \rightarrow Pin 6 and Pin 7 of IC101 \rightarrow Pin 1 of IC101 \rightarrow R36 \rightarrow D15 \rightarrow Collector of Q5 \rightarrow D5 \rightarrow L1 \rightarrow R1 \rightarrow Tel line.
 \downarrow
 L2 \rightarrow Tel line.

•For Handset receiving the signal path is:

Tel line \rightarrow R1 \rightarrow L1 \rightarrow D5 \rightarrow Emitter of Q5 \rightarrow Collerctor of Q5 \rightarrow D15 \rightarrow R36 \rightarrow R103 \rightarrow C102 \rightarrow
 \uparrow
 L2 \rightarrow

Pin 10 of IC101 \rightarrow Pin 4 of IC101 \rightarrow R143 \rightarrow C140 \rightarrow C141 \rightarrow Base of Q108 \rightarrow Emitter of Q108 \rightarrow C123 \rightarrow Handset SP.

Circuit Diagram



■ SPEAKERPHONE CIRCUIT

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 hands-free mode.

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 IC301 and consists of a Voice Detector, Tx Attenuator, Rx Attenuator, Comparator and Attenuator Control. The circuit analyzes whether the Tx (transmit) or the Rx (receive) 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 TX/RX Comparator receives a Tx and a Rx signal, 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. Speakerphone sending level is adjusted by VR301.

1) Transmission Signal Path

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

• MIC → C435 → C418 → Pin 9 of IC301 → Pin 10 of IC301 → VR301 → C324 → Pin 3 of IC301 → Pin 4 of IC301 → R309 → C315 → Pin 2 of IC101 → Pin 1 of IC101 → Telephone Line.

2) Reception signal Path

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

• Telephone Line → Pin 10 of IC 101 → Pin 4 of IC101 → R323 → C302 → Pin 29 of IC301 → Pin 28 of IC301 → R302 → C326 → C308 → Pin 20 of IC301 → Pin 16 of IC301 → R307 → C312 → Pin 4 of IC401 → Pin 6 of IC251 → C424 → Speaker.

3) Control Signal Path:

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

(Transmission Control Signal Path)

• Mic → Pin 9 of IC301 → Pin 10 of IC301 → Pin 3 of IC301 → Pin 4 of IC301 → C316 → R313 → Pin 5 of IC301.

(Reception Control Signal Path)

• Telephone Line → Pin 4 of IC101 → R323 → C319 → R314 → Pin 7 of IC301.

4) Transmission/reception Switching

The comparison result between Tx and Rx outputs as a DC level of Pin 25 of IC301.

Tx level is high Pin 25 = Pin 20 --- 6mV

Rx level is high Pin 25 = Pin 20 --- 150mV

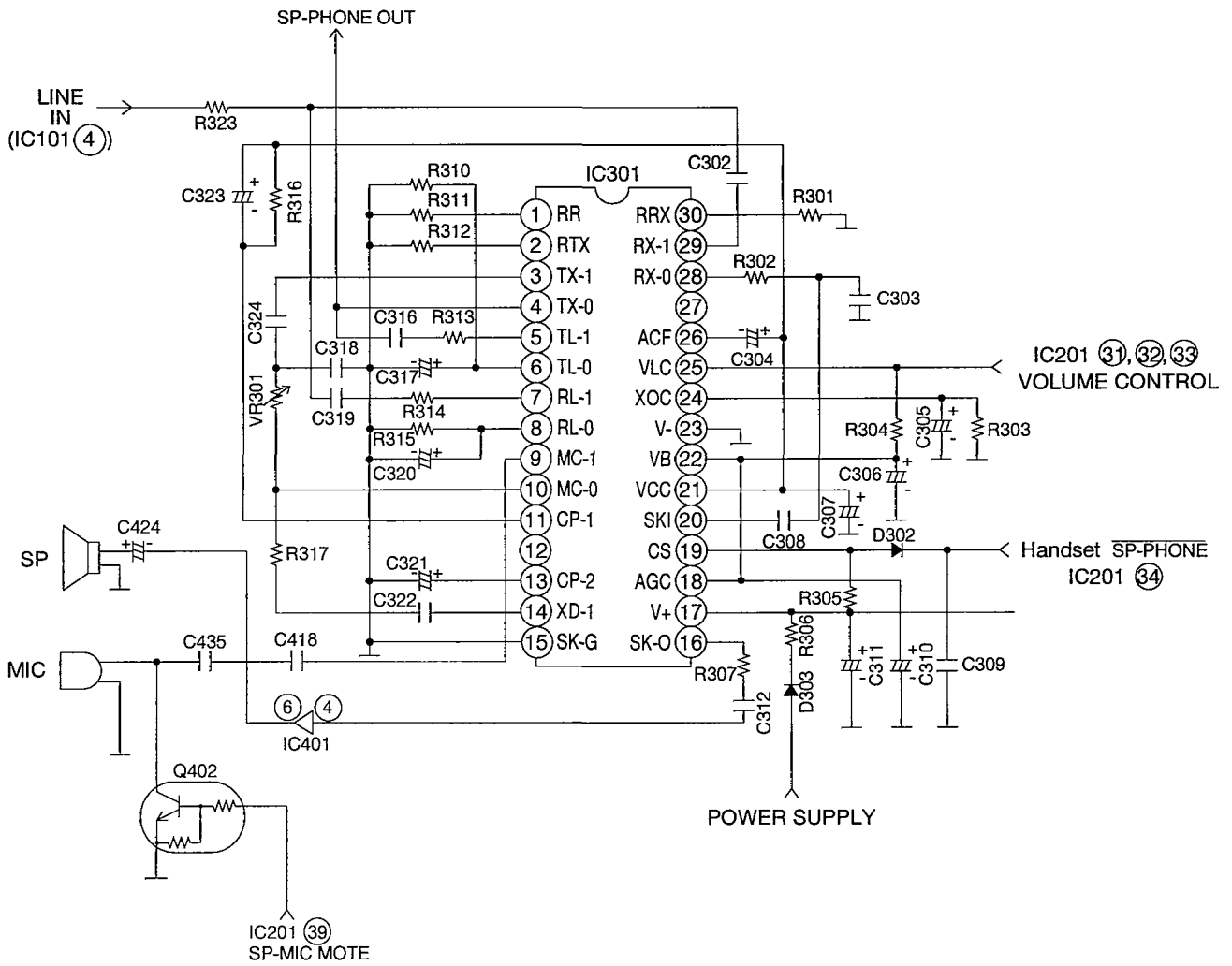
Comparator output is connected to the attenuator control inside of IC301.

5) Voice Detector

The output of the mic amp (Pin 10 of IC301) is supplied to Pin 14 of IC301 as a control signal for the voice detector.

6) Attenuator Control

The attenuator control detects the setting of the volume control through Pin 24 of IC301 to automatically adjust for changing ambient conditions.



POWER SUPPLY CIRCUIT

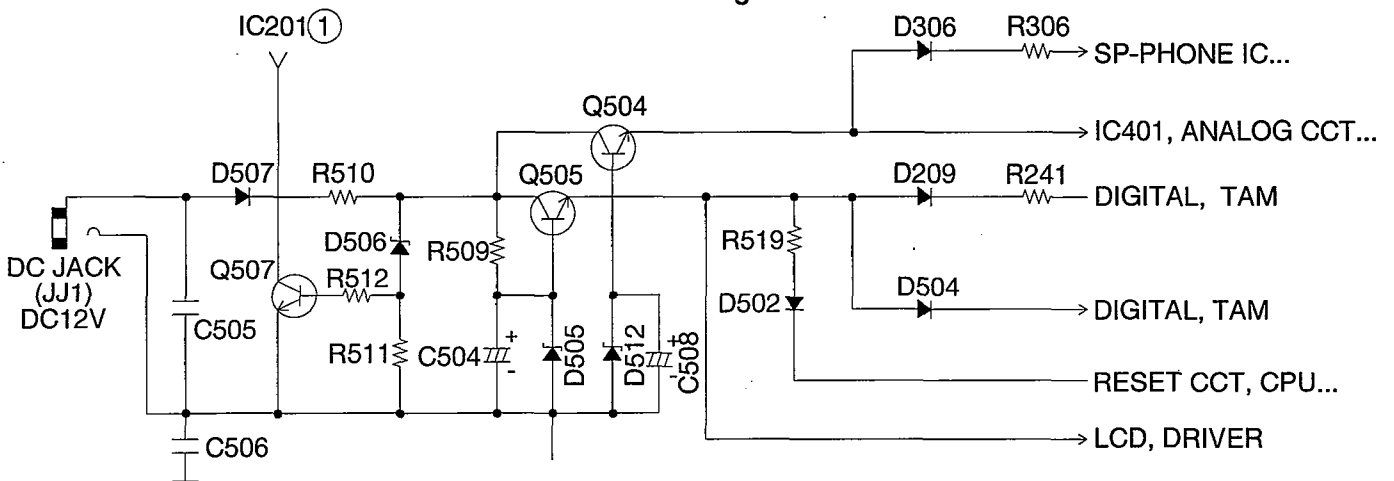
Function:

Power from the DC 12V AC Adaptor is regulated to provide two 6.2V system voltage supplies.

Circuit Operation:

Q504 and Q505 provide 6.2V regulated power supplies derived from D515, D512 6.8V reference diode. These supplies are then shifted to 5.6V by diodes D209, D505, D502 to supply CPU, IC's reset circuit etc. Q507 is turned on via zener diode D506 after connecting the AC Adaptor. Pin 1 of IC201 is then at a Low level indicating AC supply connected. Pin 1 of IC201 is Low when no AC Adaptor is connected.

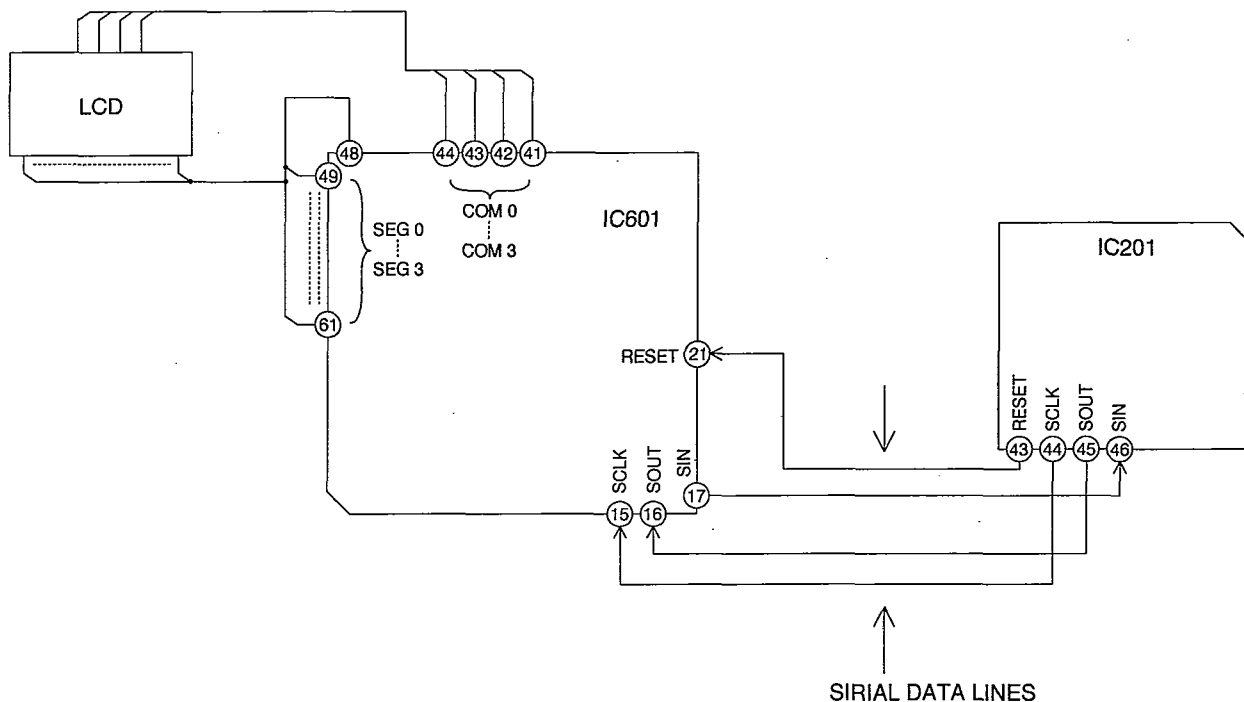
Circuit Diagram



LCD DRIVE CIRCUIT

Function:

In the mutual communication between CPU and LCD Driver, display data is transferred from CPU to LCD Driver IC. LCD Driver displays with outputting 4 common and 14 segment in the disposition of time sharing.



■ AUTO DISCONNECT CIRCUIT

Function:

This circuit detects that another telephone connected to the same telephone line has gone "Off-Hook" when the KX-T2886E unit is in "TAM Record/Play to line mode" or when the "Hold" key on the telephone is active. In both cases the auto-disconnect circuit will release the telephone line.

Circuit Operation:

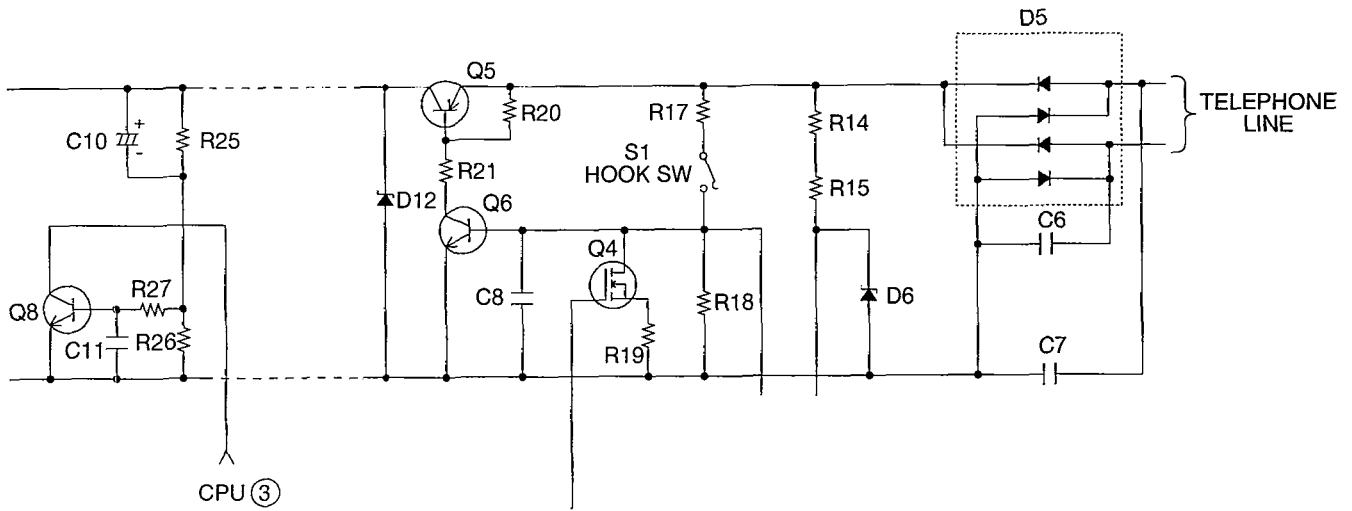
When the unit is on line the circuit causes Pin 3 of IC201 input to be at a Low level by the following condition:

Line A → R1 → L1 → D5 → Q5 → R25 → R27 → Q8 ON → Pin 3 of IC201 Low.

C10 is charged to maintain the base voltage of Q8 high to prevent any small charges in line voltage (not representative of a parallel connected telephone going off hook) affecting the circuit.

When the parallel telephone goes Off-Hook, DC voltage flow is decreased significantly to cause base of Q8 to go Low → Pin 3 of IC201 to go high.

Circuit Diagram



■ CPC (Calling Party Control) CIRCUIT

Function:

This circuit is designed to detect a CPC signal sometimes put into the telephone line by the telephone company when a caller hangs up. The signal is represented by a short break in the telephone line (order of mseconds duration). If a CPC signal is detected the TAM can more quickly release the telephone line.

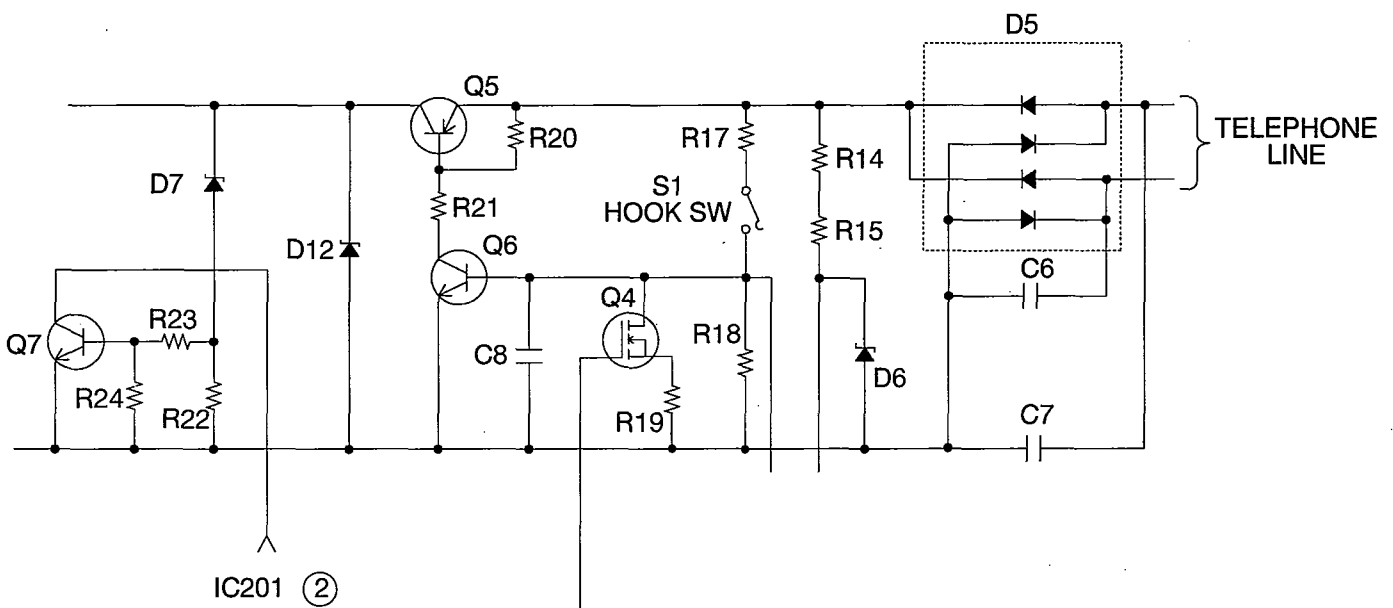
Circuit Operation:

When line current is flowing, the CPC circuit causes Pin 2 of IC201 input to be a Low level.

Line A → R1 → L1 → D5 → Q5 → D7 → R23 → Q7 ON → Pin 2 of IC201 Low.

When a momentary break in line current occurs, Q7 turns Off and Pin 2 of IC201 receives a high level pulse.

Circuit Diagram



■ RING DETECTOR CIRCUIT

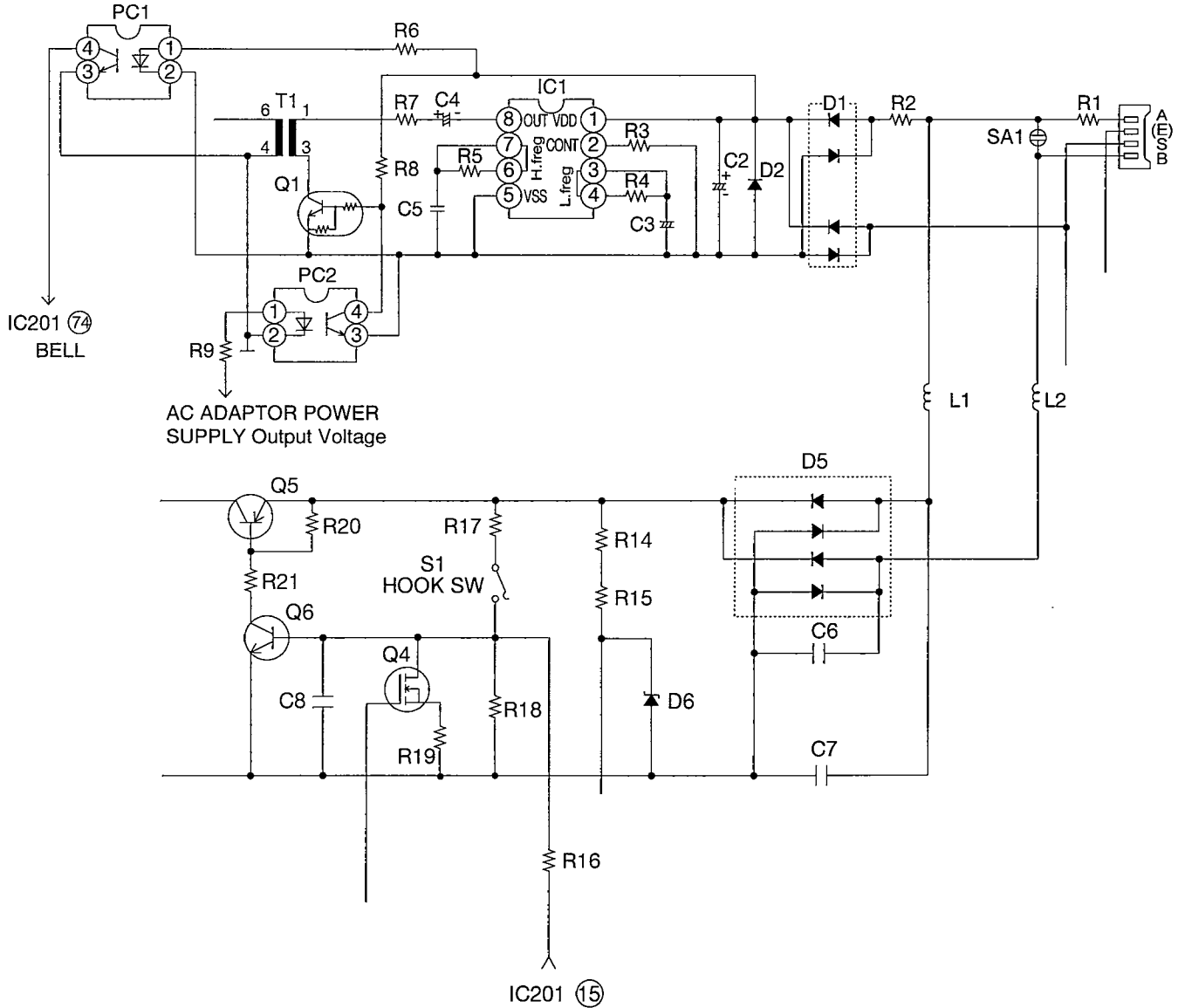
Function:

If the TAM has been set to "ANSWER ON" mode, the unit will automatically seize the line after 2 Rings.

Circuit Operation:

Please refer to "RINGER CIRCUIT" description for the case with AC Adaptor connected. Once Pin 74 of IC201 input has detected the connect number of ring signals, CPU output pin 15 goes high → Q6 ON → Q5 ON → Line seized.

Circuit Diagram



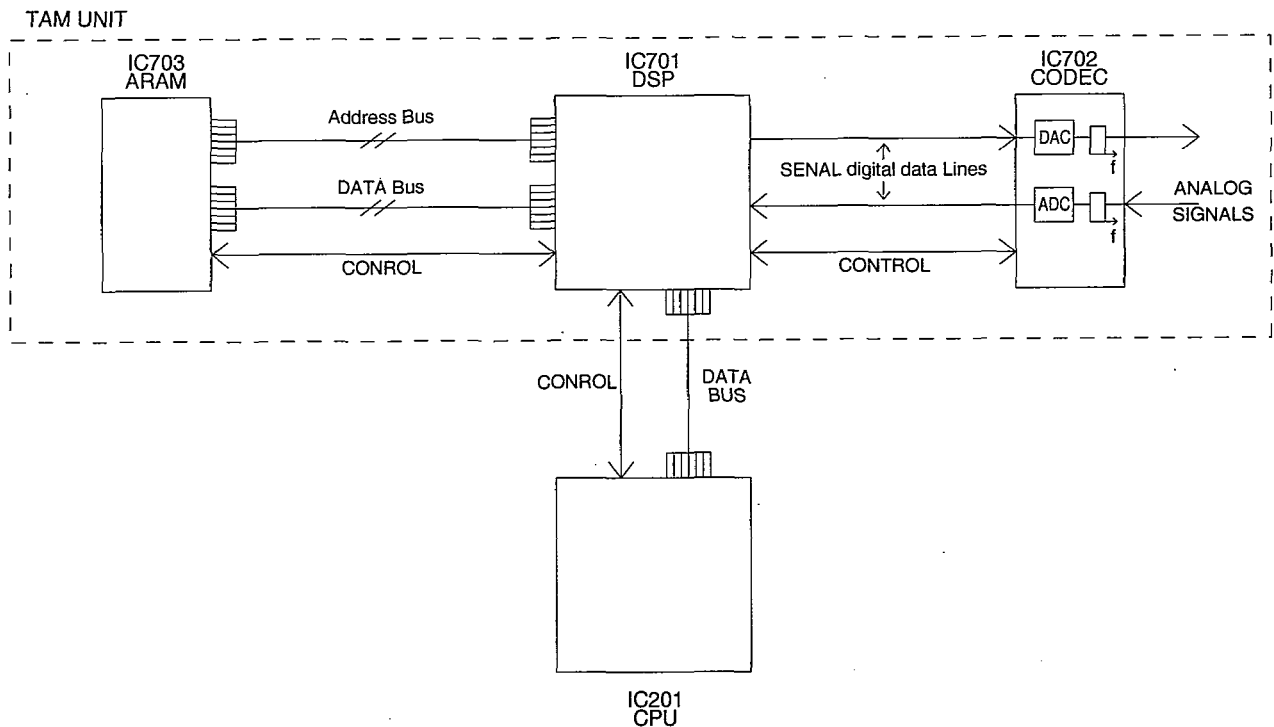
■ ALL DIGITAL TAM SYSTEM, CIRCUIT

The TAM system used in and "All Digital" type. That is all outgoing message (OGM) and incoming messages are stored and processed as digital data, rather than on a conventional cassette tape mechanism. TAM "front end telephone" interface and "Mic 1 speaker" circuits are shared with the ITS. The processing and storing of all TAM messages and signals is carried out by three essential blocks. Firstly a Codec IC is used to convert between analog speech signals (messages) and digital signals via built-in ADC and DAC's, using a PCM format.

Secondly, a "Digital Signal Processing" (DSP) IC is used to provide speech compression, telephone line signal processing, memory management, and all the necessary TAM functions are programmed into the IC. The main CPU IC201 interfaces with the DSP IC to control all functions.

Thirdly a 4M bite ARAM IC (Audio grade DRAM) is used to store all recorded messages. This provides storage for 15~17 minutes of total recording time.

Circuit Diagram

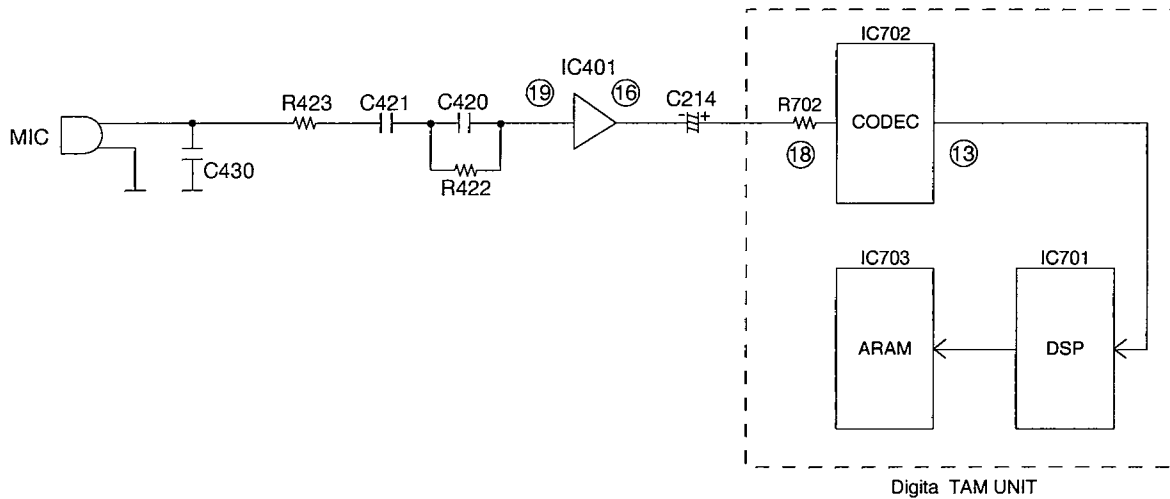


■ MICROPHONE- IN CIRCUIT

Circuit Operation:

MIC → R423 → C421 → R422, C420 → Pin 19 of IC401 → Pin 16 of IC401 → C214 → R702 → Pin 18 of IC702 → Pin 13 of IC702 → IC701 → IC703

Circuit Diagram

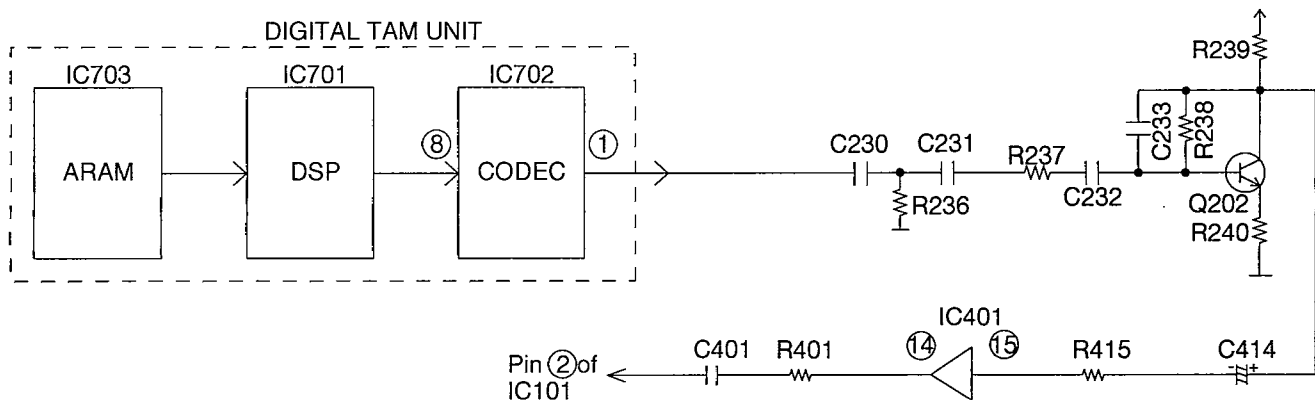


■ LINE OUTPUT (OGM PLAYBACK) CIRCUIT

Circuit Operation:

IC703 → IC701 → Pin 8 of IC702 → Pin 1 of IC702 → C230 → C231 → R237 → C232 → Base of Q202 → Collector of Q202 → C414 → R415 → Pin 15 of IC401 → Pin 14 of IC401 → R401 → C401 → IC101 Line Interface → Telephone Line.

Circuit Diagram

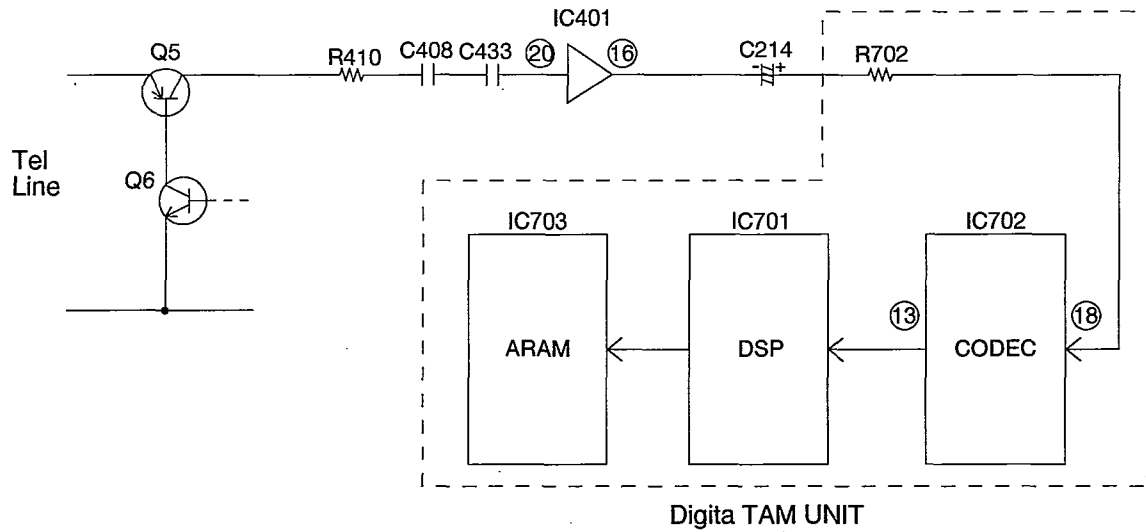


■ LINE IN (ICM RECORDING) CIRCUIT

Circuit Operation:

Telephone Line → R1 → L1 → D5 → Q5 → R410 → C408 → C433 → Pin 20 of IC401 → Pin 16 of IC401 → C214 → R702 → Pin 18 of IC702 → Pin 13 of IC702 → IC701 → IC703.

Circuit Diagram



■ SPEAKER OUT (ICM PLAYBACK) CIRCUIT

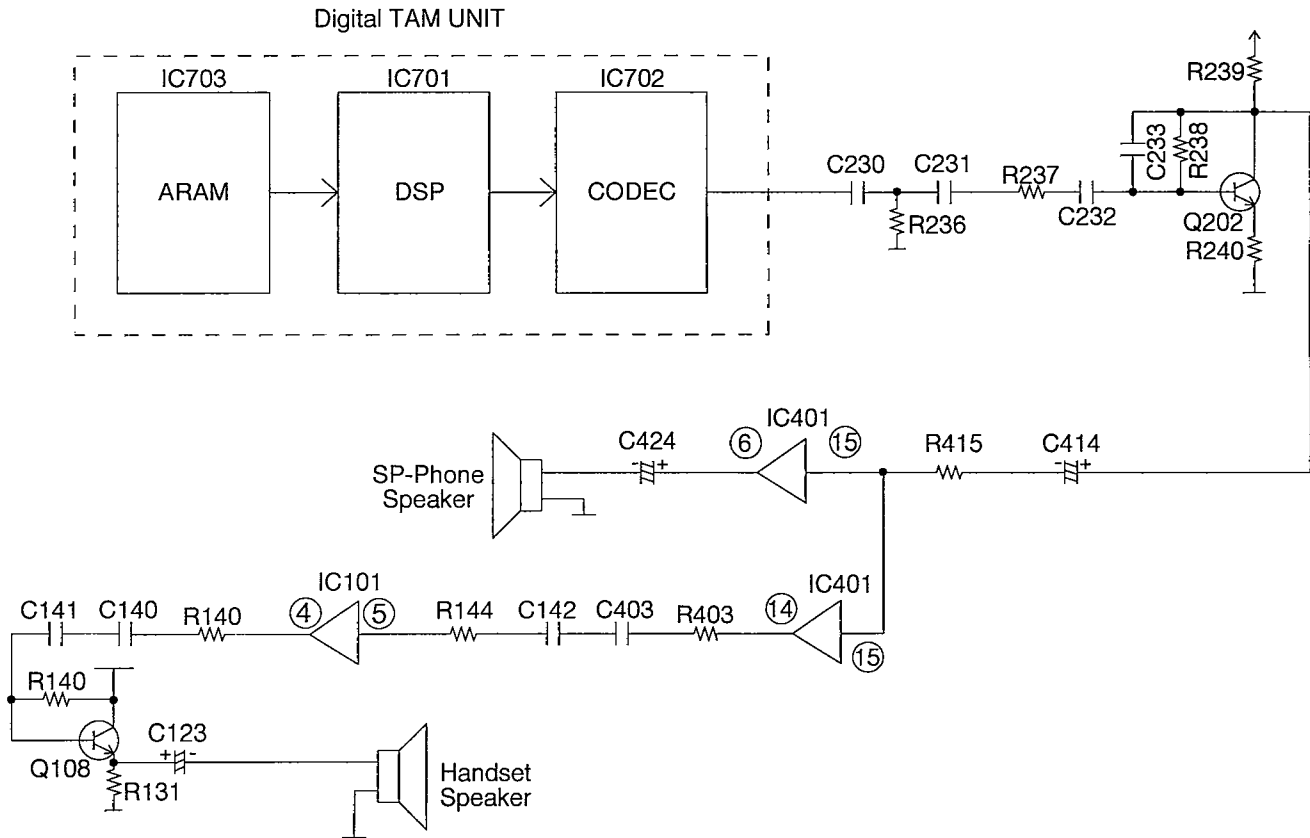
Function:

Recorded messages can be played back through the loud speaker or through the telephone handset.

Circuit Operation:

IC703 → IC701 → Pin 8 of IC702 → pin 1 of IC702 → C230 → C231 → R237 → C232 → Base of Q202 →
 Collector of Q204 → C414 → R415 → Pin 15 of IC401 → Pin 6 of IC401 → C271 → Speaker
 → Pin 14 of IC401 → R403 → C403 → C142 → R144 →
 Pin 5 of IC101 → Pin 4 of IC101 → R143 → C140 → C141
 → Base of Q108 → Emitter of Q108 → C123 →
 Handset Speaker

Circuit Diagram



MEMORY BACK-UP CIRCUIT

Function:

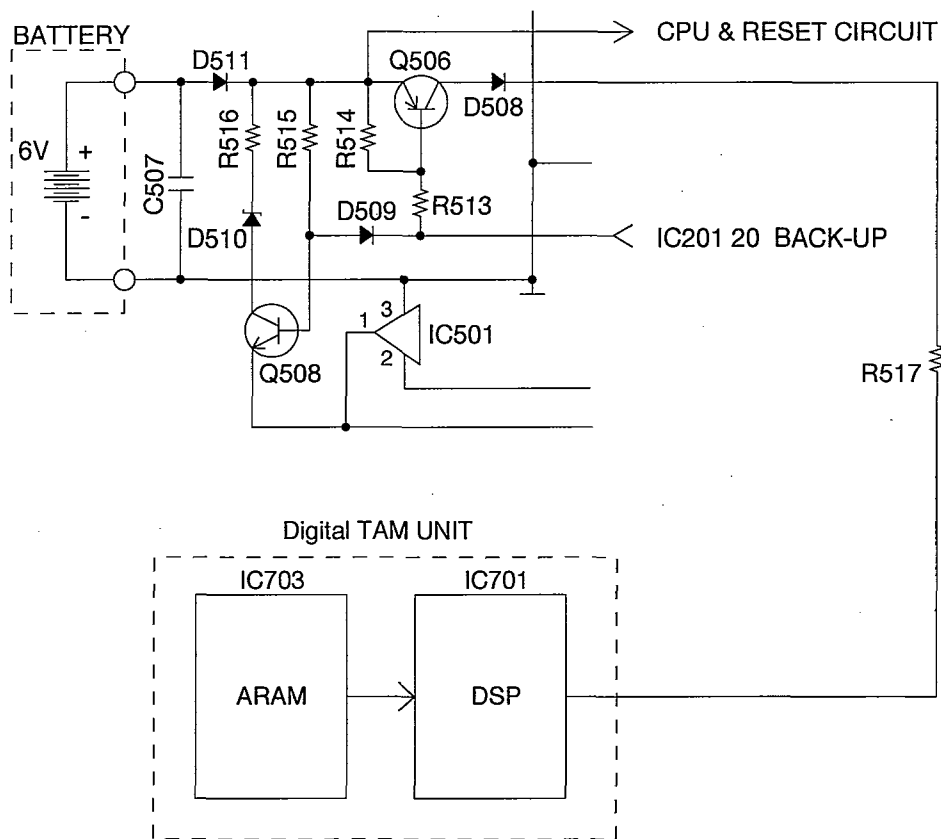
To provide a back-up power source for ARAM/DSP to maintain messages recorded, in the case when no AC Adaptor is connected.

Circuit Operation:

When no AC Adaptor is connected, the CPU is informed of this via Pin 1 of IC201 being High. Therefore Pin 20 of IC201 "Battery Back-up" request, goes Low turning Q506 ON providing Back-up.

Battery → D511 → Emitter of Q506 → Collector of Q506 → D508 → L701 → Pins 19, 32, 53 and 73 of IC701-DSP
 ↳ Pin 10 of IC703-ARAM

Circuit Diagram



■ BATTERY LOW DETECT CIRCUIT

Function:

In the case when AC Adaptor is connected if no batteries installed, or if should the battery terminal voltage fall to a Low level that they must be replaced the user is alerted by the LCD displaying **LOW**.

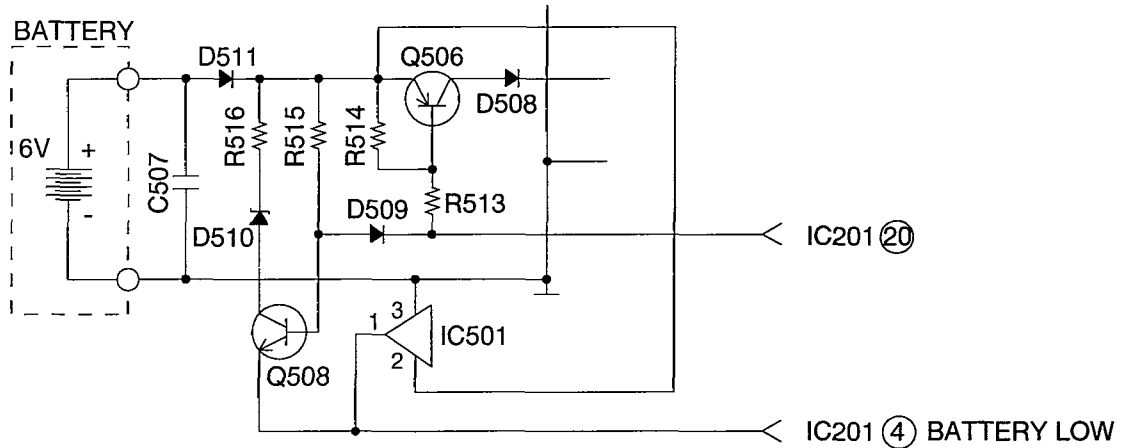
Installing new batteries will ensure the recorded messages are saved in the event of an AC Adaptor power fail.

Circuit Operation:

IC501 is a voltage comparator. It is connected to the battery via D511. When its input Pin 2 of IC501 is $> 4.2V$, its output Pin 1 of IC501 is High when input Pin 2 of IC501 $< 4.2V \rightarrow$ Pin 1 of IC501 is Low, which is input to the CPU "Battery Low" Pin 4 of IC201.

When AC Adaptor power is interrupted and the "Battery Low" is active, Q506 and Q508 is turned on by Pin 20 of IC201 to load the battery with D510/R516. This prevents the battery accidentally resetting the CPU when the battery voltage is falling.

Circuit Diagram



INITIALIZING/RESET CIRCUIT

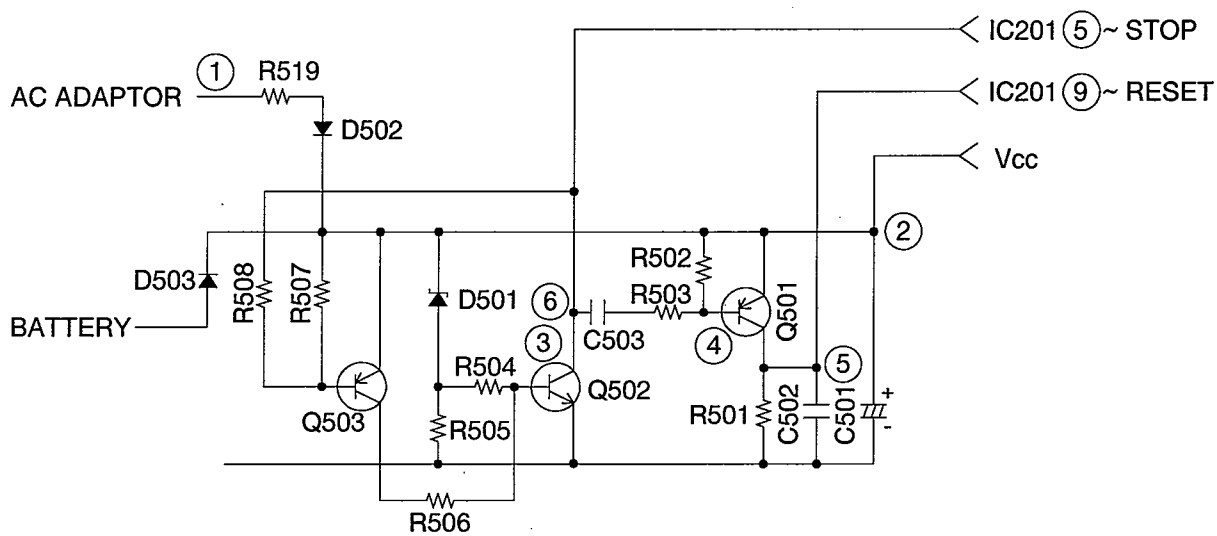
Function:

Used to initialize the CPU when an AC Adaptor is connected or power from telephone line or battery connected.

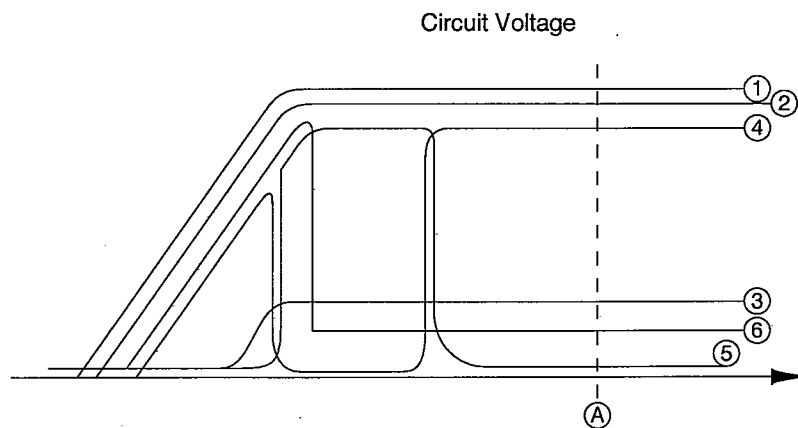
Circuit Operation:

When AC Adaptor is connected the DC voltage is shifted by D502, R519 and power is supplied to the CPU as follows.

Circuit Diagram



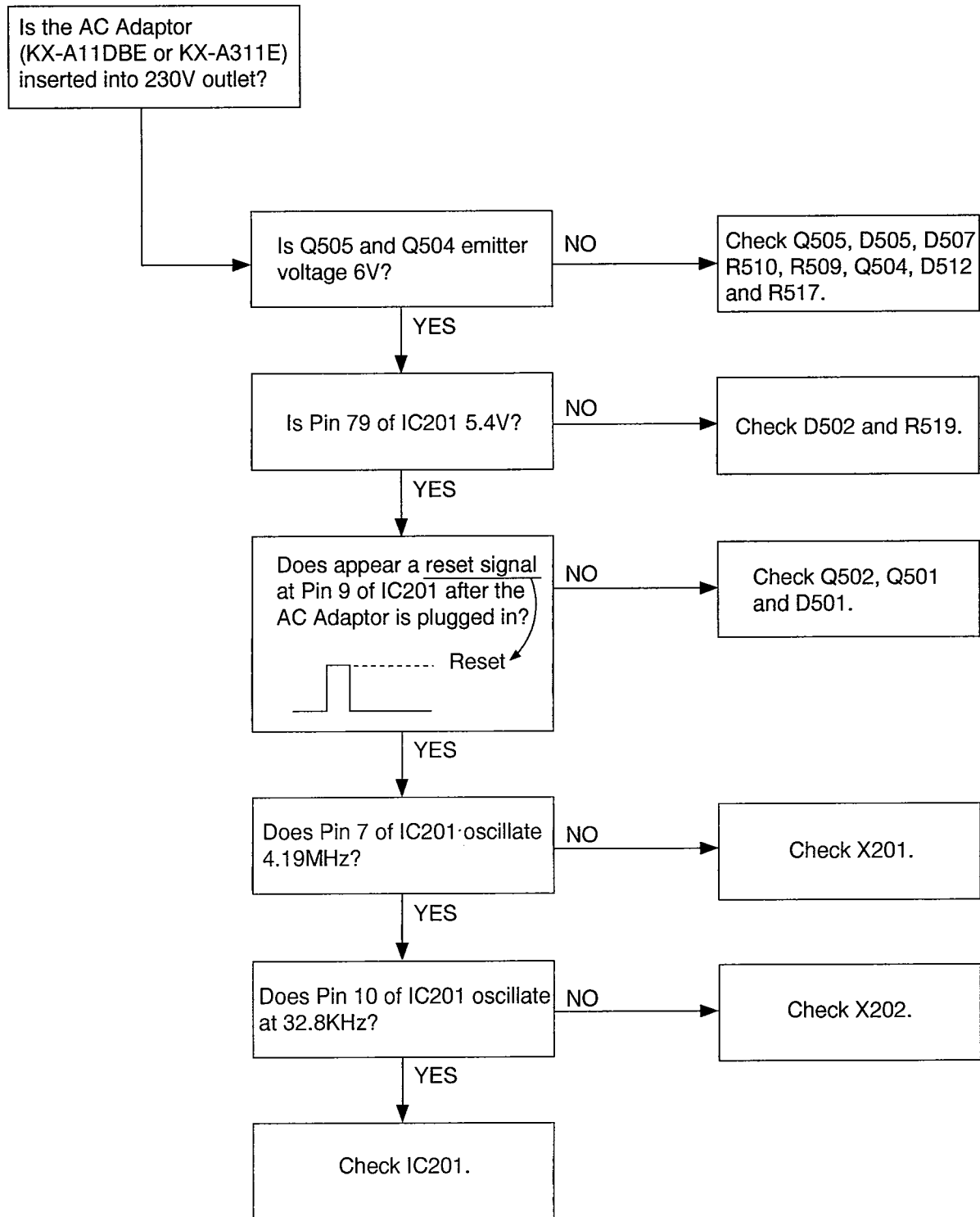
In the case when only battery power is available Q503 ensures that the reset circuit operates correctly when the battery voltage falls below about 2.8V.



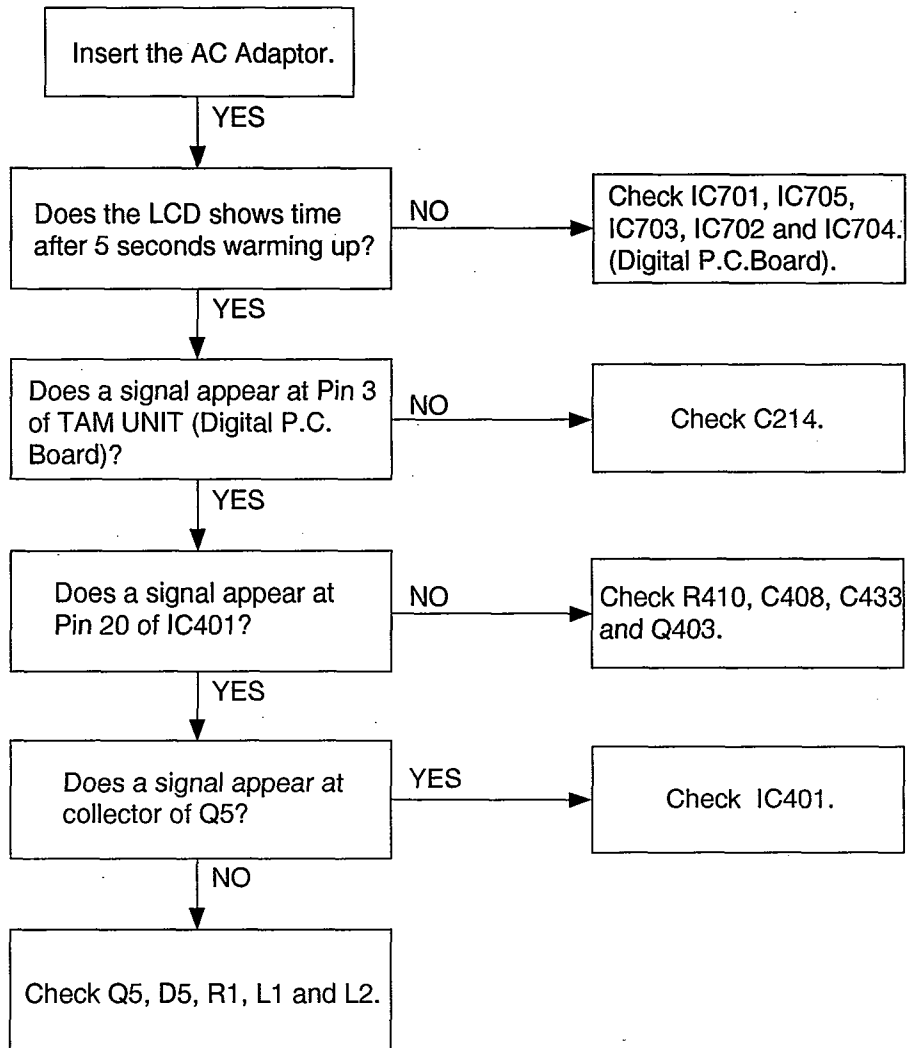
TROUBLESHOOTING GUIDE

(TAM Section)

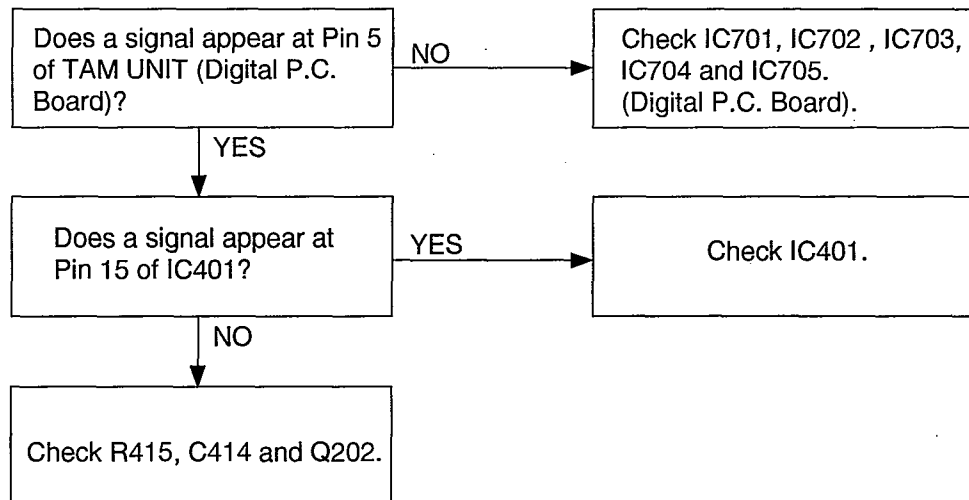
1. FUNCTIONS DO NOT OPERATE.



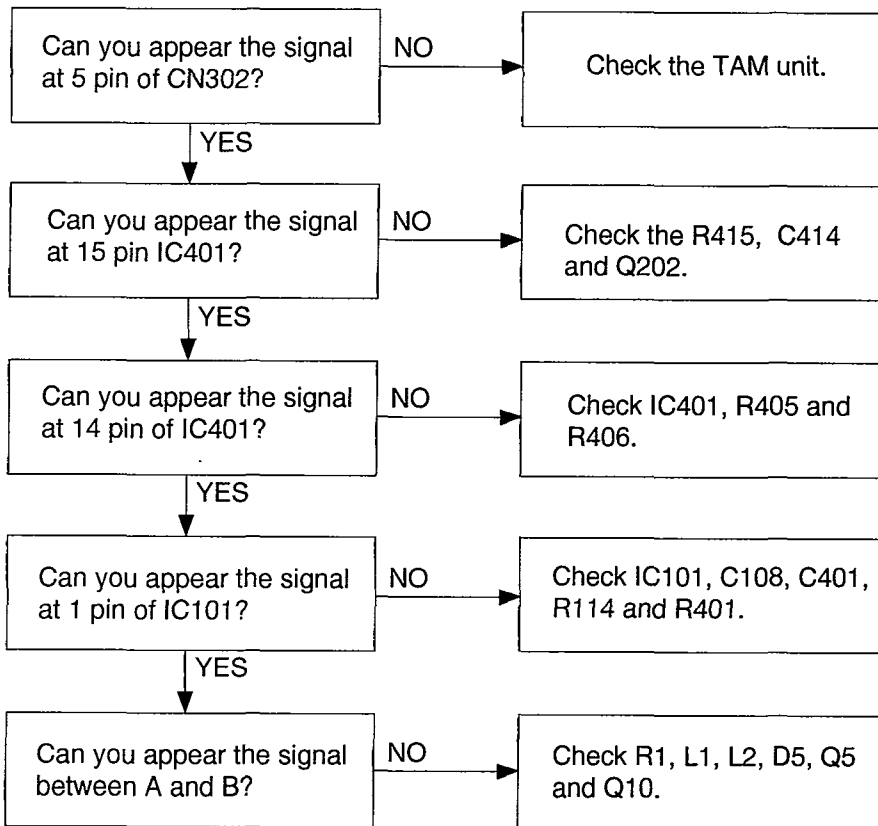
2. DOES NOT RECORD (From Tel Line)



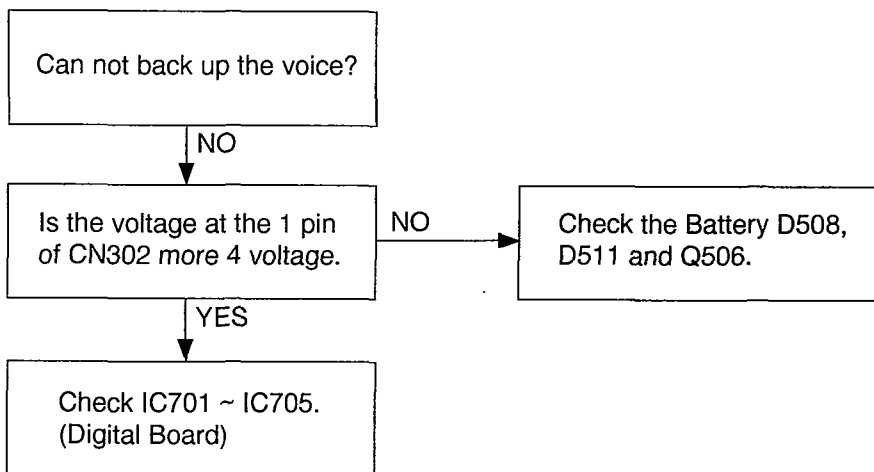
3. DOES NOT PLAYBACK



4. OGM SENDING



5. VOICE BACK UP



6. END OF MESSAGE IS CLIPPED WHEN CALLER HANG UP

When caller hangs up, the KX-T2886E can detect the following 4 signal type.

- A. CPC pulse.
- B. Dial tone or other continuous tones.
- C. Silence
- D. Cycle signals.

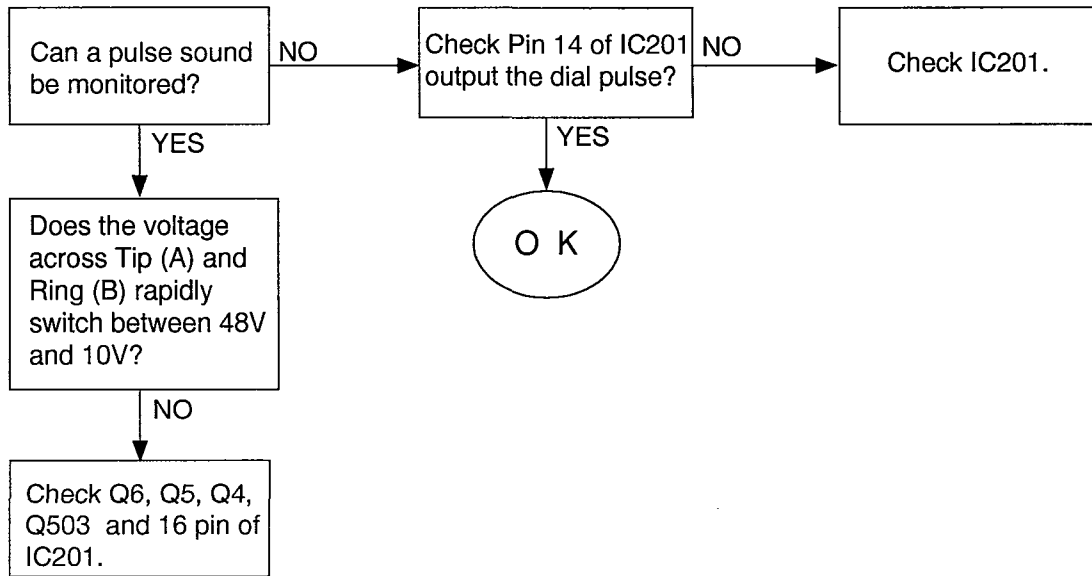
A. Check CPC DETECTOR CIRCUIT (D7, Q7, R22, R23 and R24).

B., C., D.

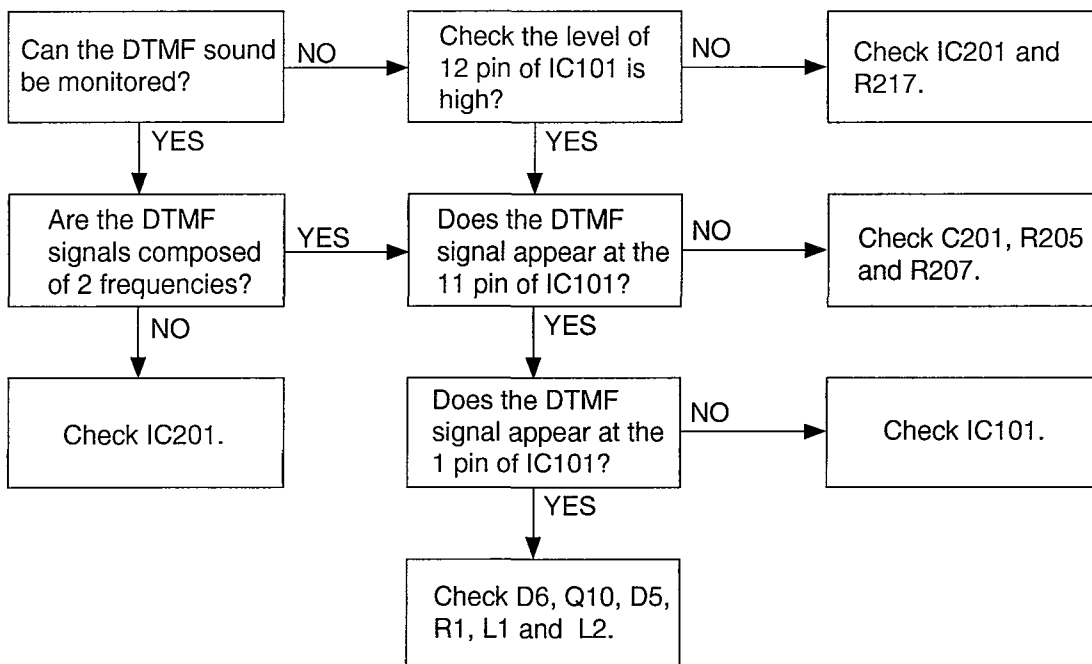
Check Extra Hook DETECTOR CIRCUIT(R25, R26, R27, C10, C11 and Q8).

(ITS Section)

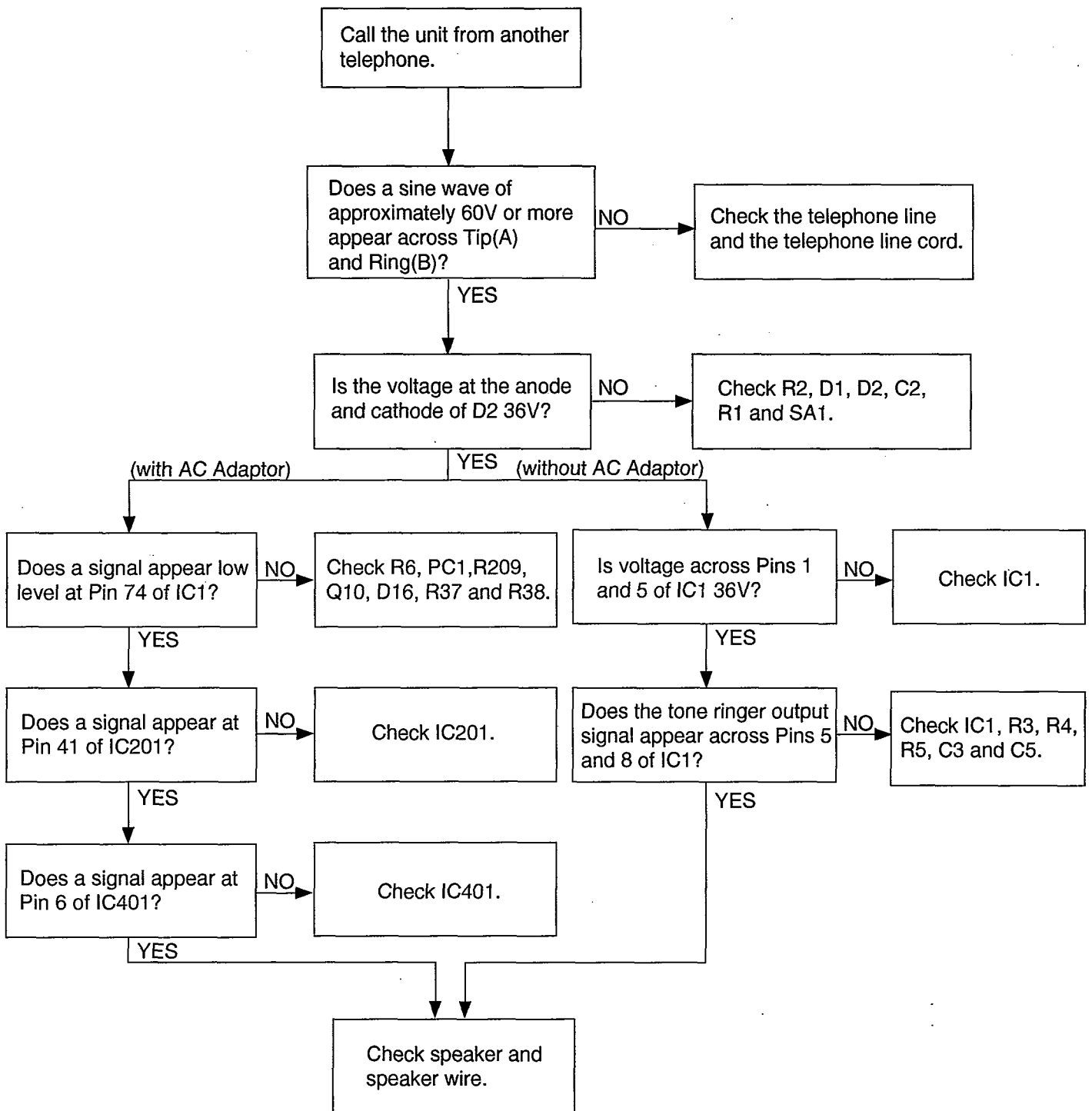
7. PULSE DIALING PROBLEMS



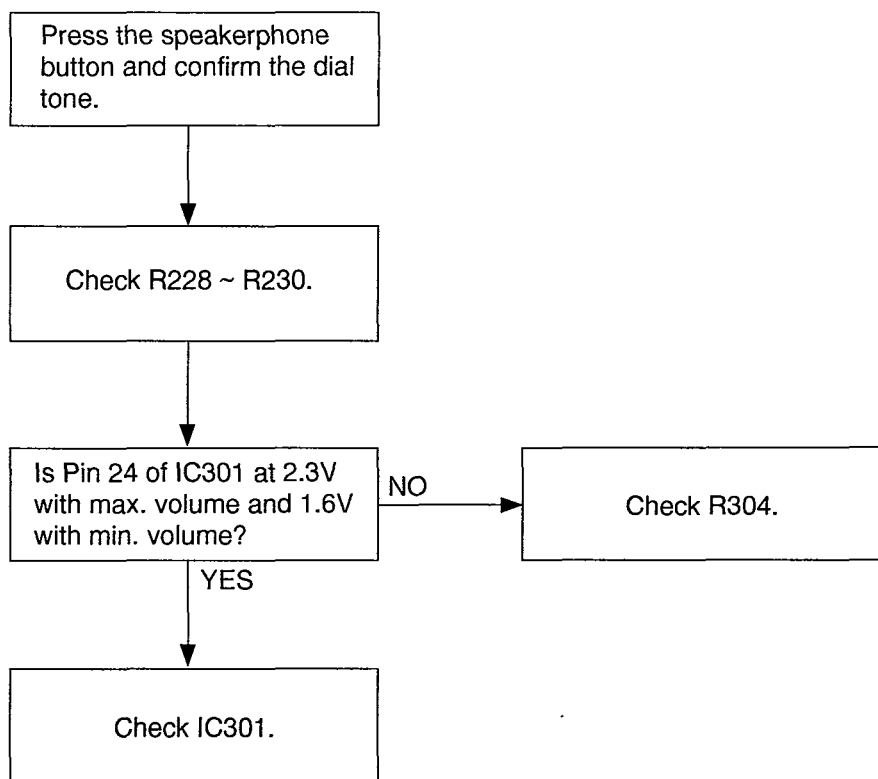
8. TONE DIALING PROBLEMS



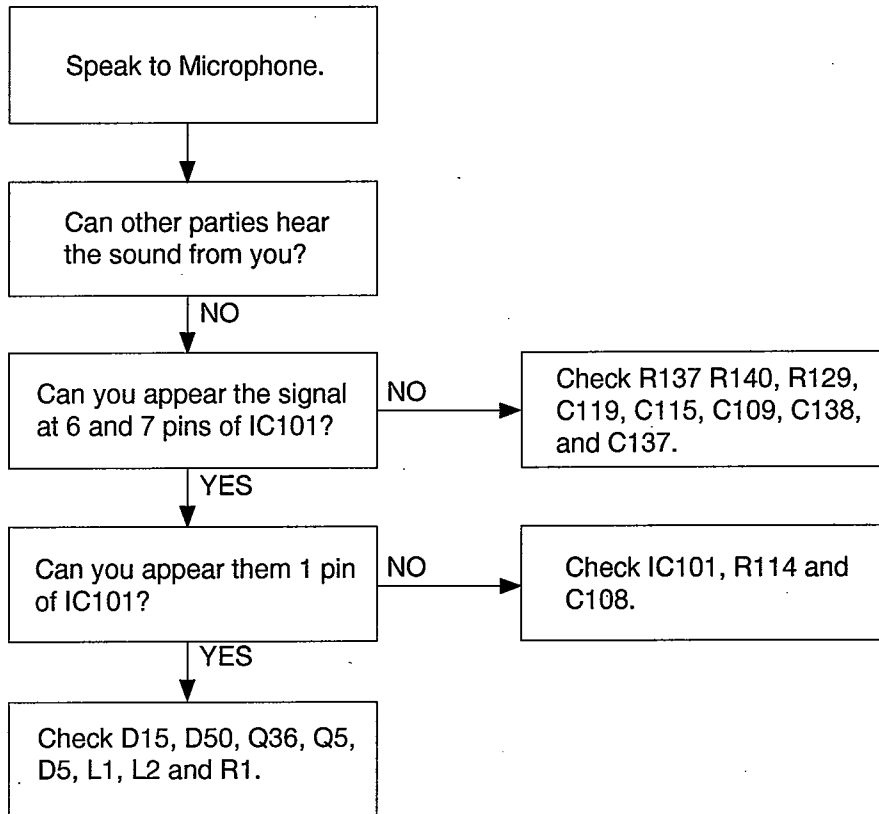
9. NO "RINGING" SOUND WHEN A RING SIGNAL IS INPUT



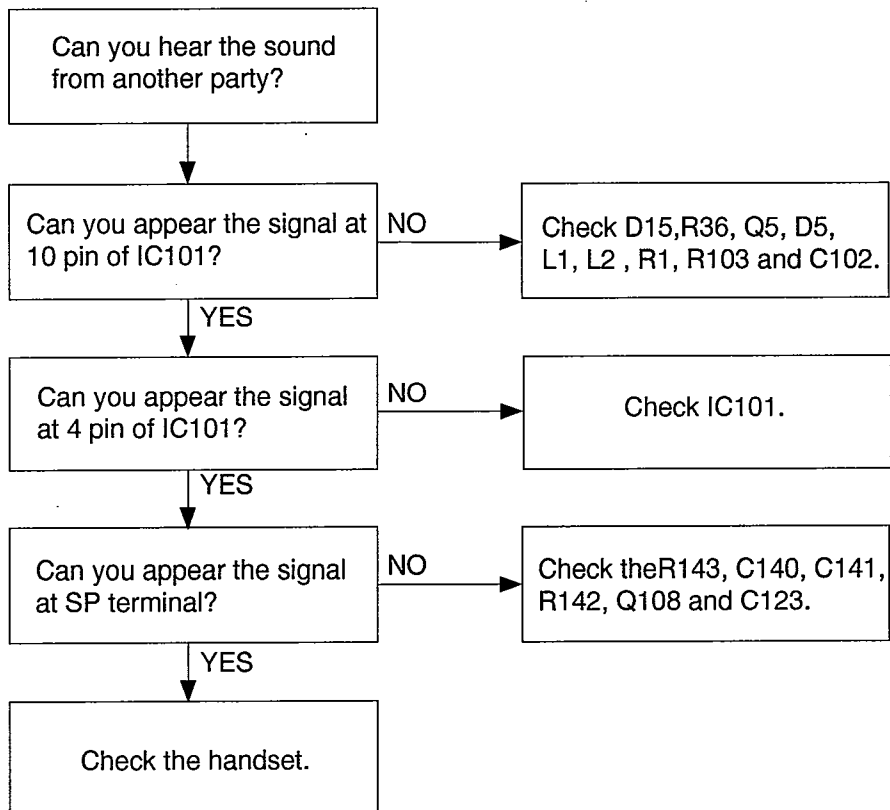
10. IF THE ELECTRONIC VOLUME OF THE SPEAKERPHONE DOES NOT WORK



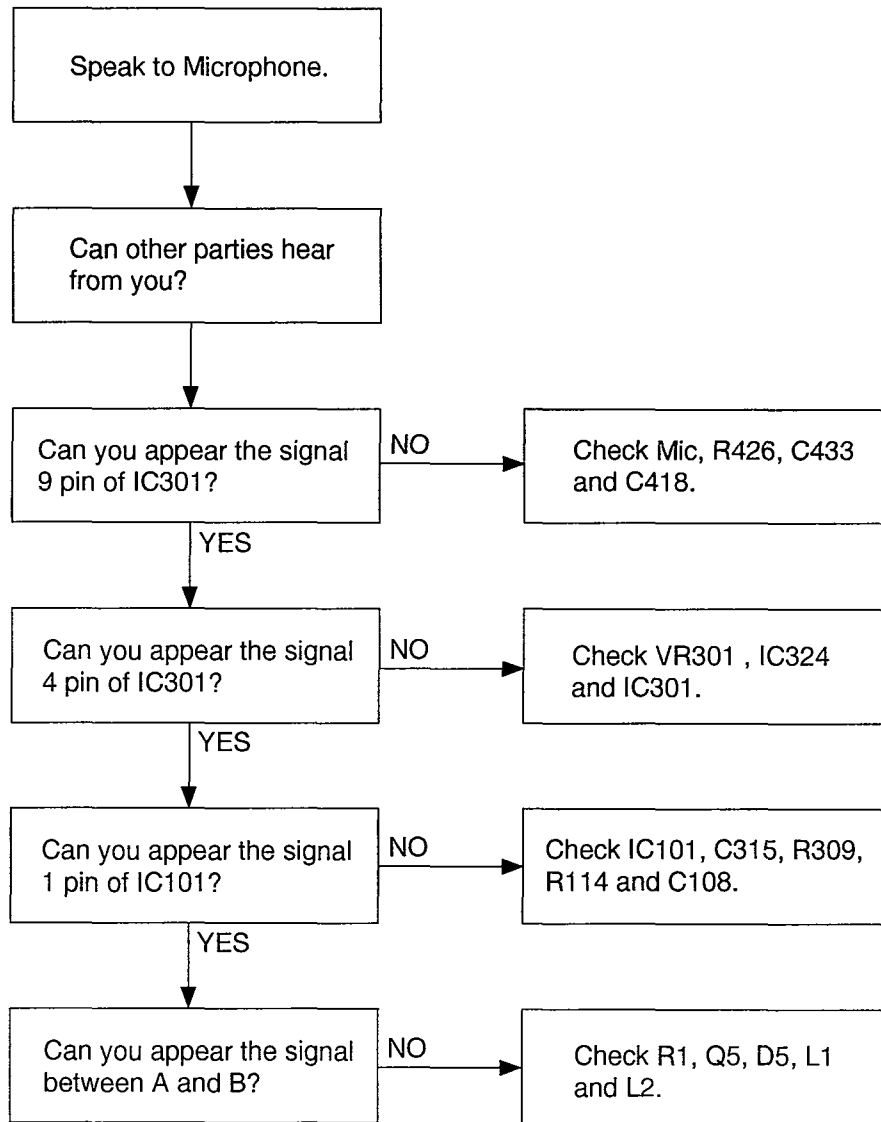
11. HANDSET (SENDING)



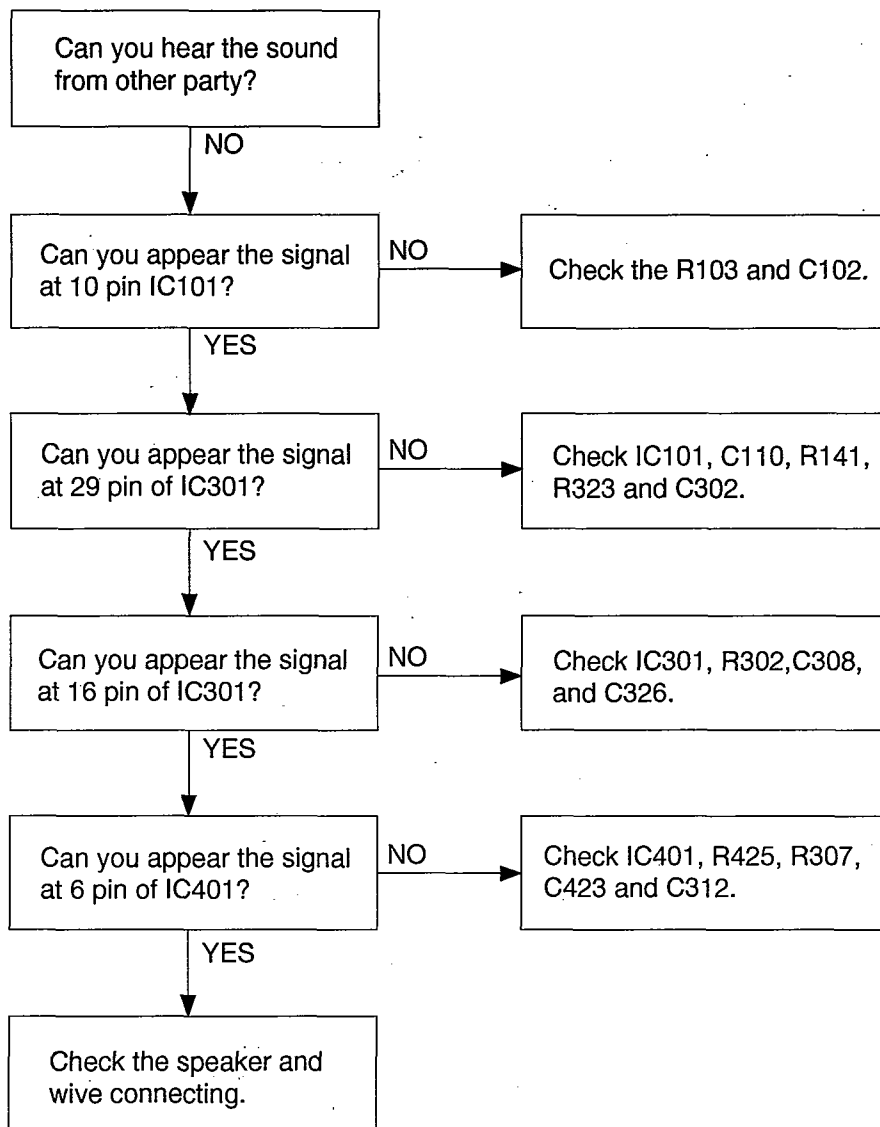
12. HANDSET (RECEIVING)



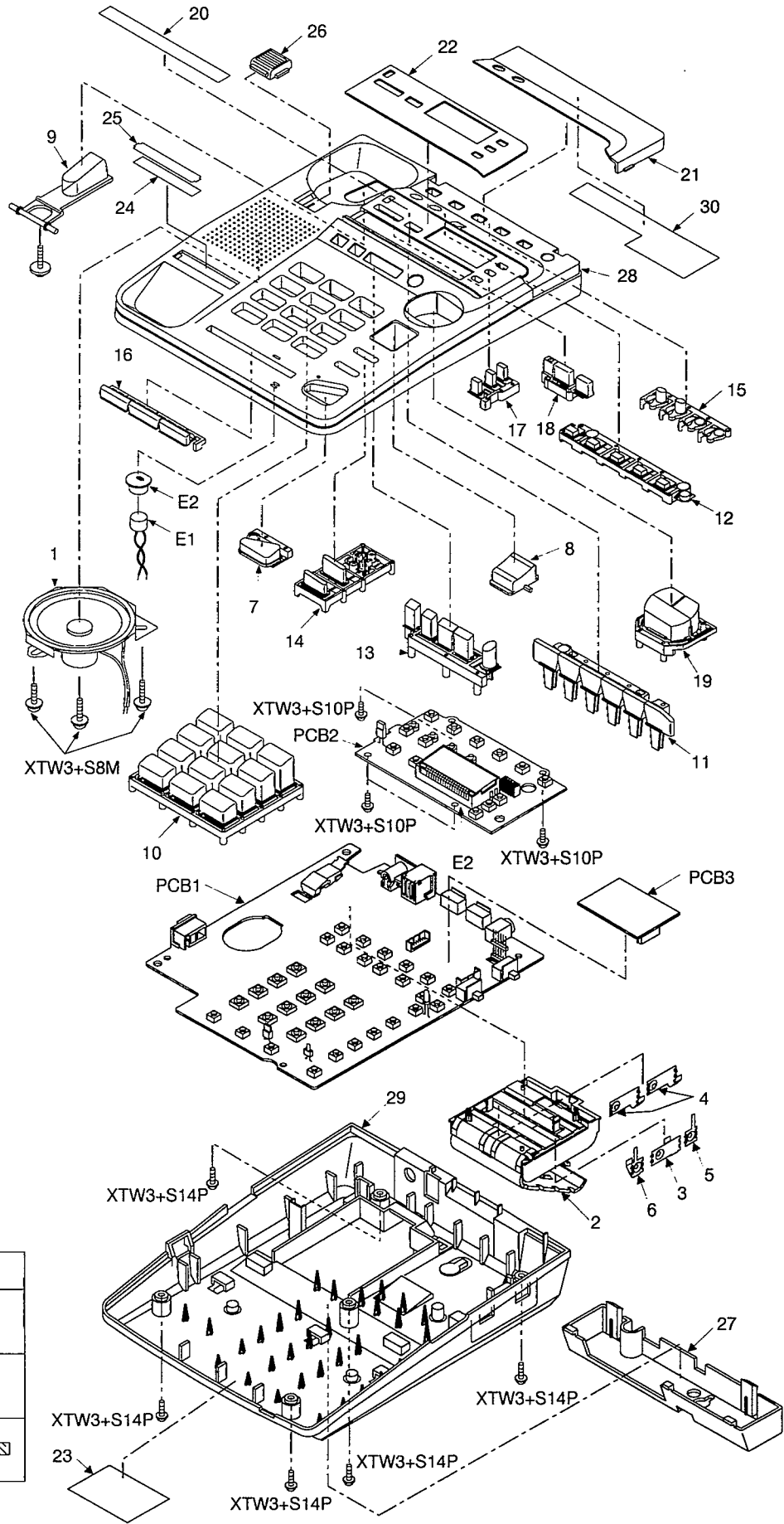
13. SP-PHONE (SENDING)



14. SP-PHONE (RECEIVING)



CABINET AND ELECTRICAL PARTS LOCATION



Actual Size of Screws

Part No.	Actual Size
XTW3+S10P	
XTW3+S8P	
XTW3+S14P	

Fig. 11
- 68 -

ACCESSORIES AND PACKING MATERIALS

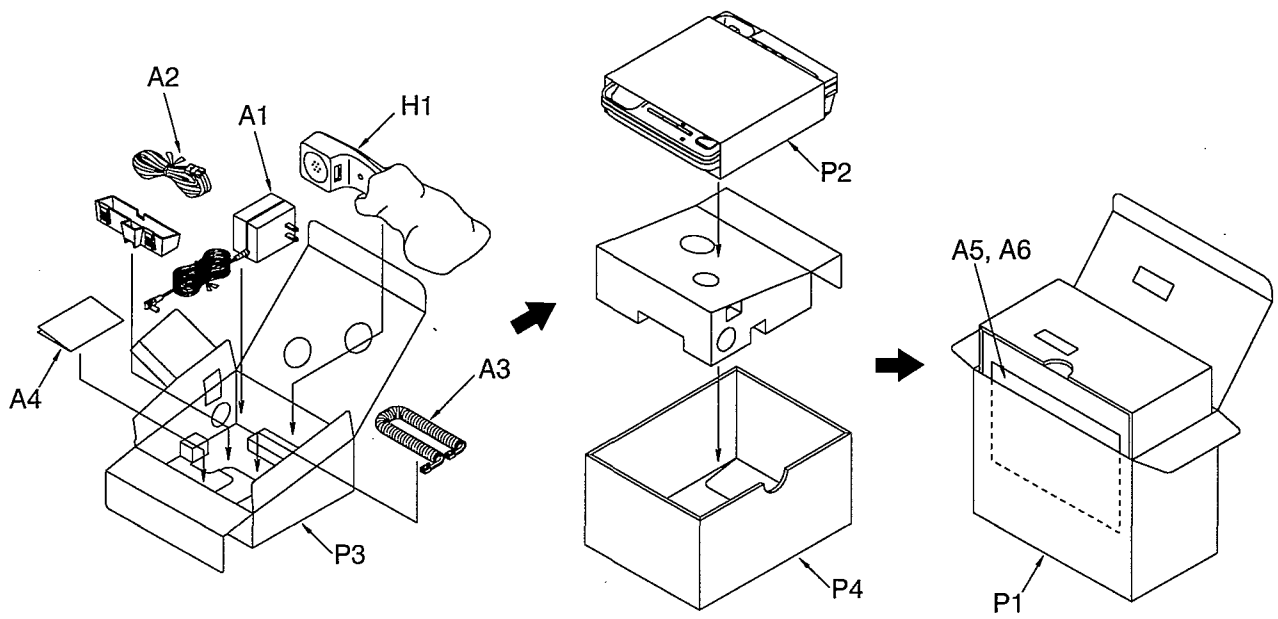


Fig. 12

EXTENSION CABLE CONNECTING METHOD

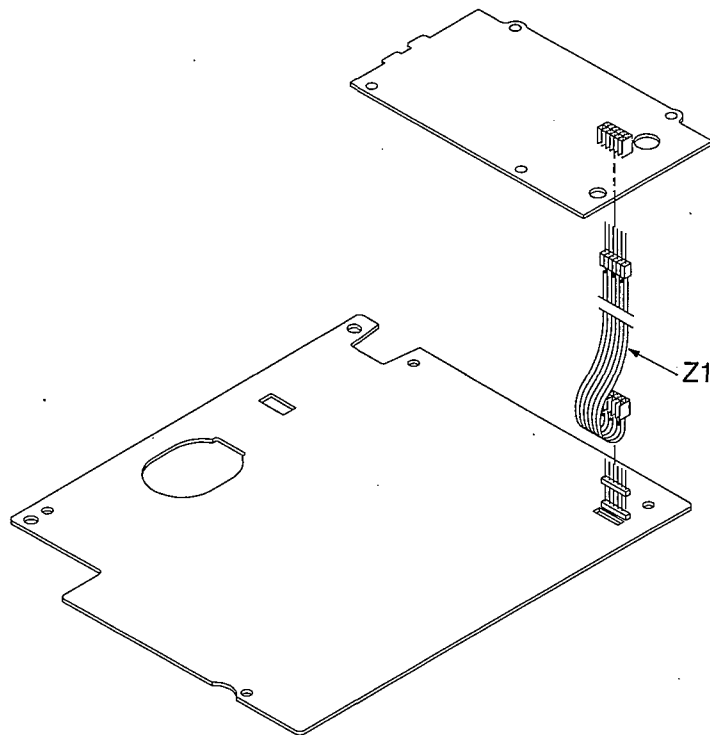


Fig. 13

This replacement parts list is for KX-T2886E only.

REPLACEMENT PARTS LIST

Model KX-T2886E

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 Δ 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=1000 Ω , M=1000K Ω
All capacitors are in MICRO FARADS (μ F) P= μ F
*Type & Wattage of Resistor

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
EQQS:Styrol	ECQE,ECQV,ECQG : Polyester
PQCUV:Chip	ECEA,ECSZ : Electrolytic
EQQMS: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/Set
CABINET & ELECTRICAL PARTS			
1	PQAS65P31Z	SPEAKER	1
2	PQJB3003T	BATTERY CASE	1
3	PQJC313Z	BATTERY TERMINAL, (+) (-)	1
4	PQJC314Z	BATTERY TERMINAL, (+) (-)	2
5	PQJC317Y	BATTERY TERMINAL, (+)	1
6	PQJC318Y	BATTERY TERMINAL, (-)	1
7	PQBC10110Z1	BUTTON, SP-PHONE	1
8	PQBC10111Z1	BUTTON, VOLUME	1
9	PQBH10016Z1	BUTTON, HOOK	1
10	PQBX10163Z1	BUTTON, TONE/DIALING	1
11	PQBX10164Z1	BUTTON, MEMORY STATION	1
12	PQBX10165Z1	BUTTON, REMAIN TIME etc.	1
13	PQBX10166Z1	BUTTON, INDIVIDUAL ERASE etc.	1
14	PQBX10167Z1	BUTTON, PAUSE/REDIAL	1
15	PQBX10168Y1	BUTTON, MAIL BOX	1
16	PQBX10169Z1	BUTTON, HOLD etc.	1
17	PQBX10170Z1	BUTTON, PROGRAM	1
18	PQBX10175Z1	BUTTON, ANSWER ON	1
19	PQBX10176Z1	BUTTON, STOP etc.	1
20	PQGD10136Z	MEMORY CARD	1
21	PQGK10014Y1	DOOR-LID	1
22	PQGP10071X1	PANEL	1
23	PQGT11509Z	NAME PLATE	1
24	PQHP532U	TELEPHONE NUMBER CARD	1

Ref. No.	Part No.	Part Name & Description	Pcs/Set
25	PQHR576Z	TRANSPARENT PLATE	1
26	PQKE10009Z5	HANDSET HANGER	S 1
27	PQKL41Z	STAND	1
28	PQKM10117V1	UPPER CABINET	S 1
29	PQYF10049Q1	LOWER CABINET	S 1
30	PQQT10692Z	INDICATION PLATE-LABEL	1
ACCESSORIES			
A1	KX-A11DBEXE	AC ADAPTOR	1 Δ
A2	PQJA87T	TELEPHONE CORD	1 Δ
A3	PQJA212N	HANDSET CORD	1
A4	PQQW11216Z	DIAL CARD	1
A5	PQQW11225Z	QUICK REFERENCE GUIDE	1
A6	PQQX11277Z	INSTRUCTION BOOK	1
A7	PQZXT2330M	WALL MOUNT KIT	1
H1	PQJXD0204Z	HANDSET ASSEMBLY	1
PACKING MATERIALS			
P1	PQPK11288Z	GIFT BOX	1
P2	PQPH10009Z	PACKING SHEET	1
P3	PQPN10441Y	ACCESSORY BOX	1
P4	PQPN10446Z	CUSHION	1
FIXTURE AND TOOL			
Z1	PQZZ6K16Z	EXTENSION CORD, 6 PIN	1

Note:

1. PQZZ6K16Z is useful for servicing. (They make servicing easy.)

This replacement parts list is for KX-T2886E only.

Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
MAIN PRINTED CIRCUIT BOARD PARTS							
PCB1	PQWP1T2886EU	MAIN, P. C. BOARD ASSEMBLY (RTL)	1				
		(ICS)				(DIODES)	
IC 1	PQVIBA8206F	IC	1	D 1	PQVDS1ZB40F1	DIODE(SI)	1
IC 2	PQVITEA1081D	IC	1	D 2	MA4360	DIODE(SI)	1
IC101	PQVITEA1062	IC	1	D 3	PQVDS1ZB40F1	DIODE(SI)	1
IC201	PQVI4639RA20	IC	1	D 4	PQVDHZS3A1	DIODE(SI)	S 1
IC301	PQVISC77655V	IC	1	D 5	PQVDS1YB40F1	DIODE(SI)	1
IC401	PQVISC111815	IC	1	D 6	MA4062	DIODE(SI)	S 1
IC501	MN1280S	IC	1	D 7	PQVDHZS3A1	DIODE(SI)	S 1
		(TRANSISTORS)		D 9	1SS119	DIODE(SI)	1
Q 1	PQVTFB1J3P	TRANSISTOR(SI)	1	D11	1SS119	DIODE(SI)	1
Q 2	2SD1819A	TRANSISTOR(SI)	1	D12	MA4180	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D13	MA4056	DIODE(SI)	1
Q 3	2SD1819A	TRANSISTOR(SI)	1	D15	1SS119	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D16	MA4180	DIODE(SI)	1
Q 4	2SK1398	TRANSISTOR(SI)	1	D17	1SS119	DIODE(SI)	1
Q 5	2SA1625	TRANSISTOR(SI) [or 2SA1776Q or 2SB1488P or 2SB1488Q]	1	D102	1SS119	DIODE(SI)	1
Q 6	PQVT2N6517CA	TRANSISTOR(SI)	1	D103	1SS119	DIODE(SI)	1
Q 7	2SD1819A	TRANSISTOR(SI)	1	D104	MA110	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D105	MA110	DIODE(SI)	1
Q 8	2SD1819A	TRANSISTOR(SI)	1	D201	1SS119	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D202	PQVDHZ2CLL01	DIODE(SI)	S 1
Q 9	2SB1218A	TRANSISTOR(SI)	1	D203	1SS119	DIODE(SI)	1
		[or 2SA1603S or 2SA1576S]		D204	1SS119	DIODE(SI)	1
Q10	2SD1819A	TRANSISTOR(SI)	1	D205	1SS119	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D206	MA110	DIODE(SI)	1
Q101	PQVTFB1A4M	TRANSISTOR(SI)	1	D207	1SS119	DIODE(SI)	1
Q105	PQVTFB1A4M	TRANSISTOR(SI)	1	D208	RLS71	DIODE(SI)	1
Q106	PQVTFB1J3P	TRANSISTOR(SI)	1	D209	MA723	DIODE(SI)	1
Q107	PQVTFB1J3P	TRANSISTOR(SI)	1	D220	MA110	DIODE(SI)	1
Q108	2SD1819A	TRANSISTOR(SI)	1	D301	1SS119	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D302	MA110	DIODE(SI)	1
Q110	PQVTFB1A4M	TRANSISTOR(SI)	1	D303	MA110	DIODE(SI)	1
Q201	PQVTFB1J3P	TRANSISTOR(SI)	1	D304	MA110	DIODE(SI)	1
Q202	2SD1819A	TRANSISTOR(SI)	1	D305	MA110	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D306	1SS119	DIODE(SI)	1
Q301	PQVTFB1J3P	TRANSISTOR(SI)	1	D501	PQVDHZ3BLL	DIODE(SI)	1
Q302	2SD1819A	TRANSISTOR(SI)	1	D502	RLS71	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D503	RLS71	DIODE(SI)	1
Q401	2SD1819A	TRANSISTOR(SI)	1	D504	1SS119	DIODE(SI)	1
		[or 2SC4155S or 2SC4081S]		D505	PQVDMTZ6R8	DIODE(SI)	1
Q402	PQVTFB1A4M	TRANSISTOR(SI)	1	D506	MA4062	DIODE(SI)	1
Q403	PQVTFB1A4M	TRANSISTOR(SI)	1	D507	PQVDS5688G	DIODE(SI)	1
Q501	2SB1218A	TRANSISTOR(SI)	1	D508	1SS119	DIODE(SI)	1
		[or 2SA1603S or 2SA1576S]		D509	1SS119	DIODE(SI)	1
Q502	2SD1819A	TRANSISTOR(SI)	1	D510	PQVDHZS3A1	DIODE(SI)	S 1
		[or 2SC4155S or 2SC4081S]		D511	1SS119	DIODE(SI)	1
Q503	2SB1218A	TRANSISTOR(SI)	1	D512	PQVDMTZ6R8	DIODE(SI)	1
		[or 2SA1603S or 2SA1576S]				(LEDS)	
Q504	2SD2137	TRANSISTOR(SI)	1	LED201	LN268RPXTAB	DIODE(SI)	1
Q505	2SD2137	TRANSISTOR(SI)	1	LED202	PQVDSSEL4117R	DIODE(SI)	1
Q506	2SB1218A	TRANSISTOR(SI)	1	LED203	LN21RCPHV	DIODE(SI)	1
		[or 2SA1603S or 2SA1576S]				(JACKS)	
Q507	2SD1819A	TRANSISTOR(SI)	1	JJ1	PQJJ2HB1Z	JACK, TELEPHONE LINE, DC IN	1
Q508	2SD1819A	TRANSISTOR(SI)	1	JJ2	PQJJ1TB10Z	JACK, HANDSET	1
		[or 2SC4155S or 2SC4081S]				(CONNECTORS)	
		[or 2SC4155S or 2SC4081S]		CN201	PQJP06A74Z	CONNECTOR, 6PIN	1
		[or 2SC4155S or 2SC4081S]		CN202	PQJP07A92Z	CONNECTOR, 7 PIN	1
		[or 2SC4155S or 2SC4081S]		CN203	PQJP14A92Z	CONNECTOR, 14 PIN	1

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Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
		(SWITCHES)				(OTHERS)	
S 1	ESE14A211	SWITCH, HOOK	1	SA1	PQVDDSS301L	VARISTOR	1
S201	PQSS2A36W	SWITCH, DIALING MODE Selector	1	T1	PQLT2D3A	TRANSFORMER	1
S202	PQSS3A26W	SWITCH, RINGER Selector	1	X201	PQVBT4.0G2	CERAMIC FILTER	1
S203	PQSS2B18W	SWITCH, RECALL Selector	1	X202	PQVCL3276N6Z	CRYSTAL OSCILLATOR	1
S204	EVQ21405R	SWITCH, MEMORY STATION	1	S501	PQJT10094Y	TERMINAL	1
S205	EVQ21405R	SWITCH, MEMORY STATION	1	S502	PQJT10094Y	TERMINAL	1
S206	EVQ21405R	SWITCH, MEMORY STATION	1	S503	PQJT10095Y	TERMINAL	1
S207	EVQ21405R	SWITCH, MEMORY STATION	1	S504	PQJT10095Y	TERMINAL	1
S208	EVQ21405R	SWITCH, MEMORY STATION	1	E1	PQJM122Z	MICROPHONE	1
S209	EVQQJJ05Q	SWITCH, DIALING "3"	1	E2	PQMG10004Z	RUBBER, MICROPHONE COVER	1
S210	EVQQJJ05Q	SWITCH, DIALING "6"	1				
S211	EVQQJJ05Q	SWITCH, DIALING "9"	1				
S212	EVQQJJ05Q	SWITCH, DIALING "#"	1				
S213	EVQ21405R	SWITCH, VOLUME	1				
S214	EVQQJJ05Q	SWITCH, DIALING "2"	1				
S215	EVQQJJ05Q	SWITCH, DIALING "5"	1				
S216	EVQQJJ05Q	SWITCH, DIALING "8"	1				
S217	EVQQJJ05Q	SWITCH, DIALING "0"	1				
S218	EVQ21405R	SWITCH, VOLUME	1				
S219	EVQQJJ05Q	SWITCH, DIALING "1"	1				
S220	EVQQJJ05Q	SWITCH, DIALING "4"	1				
S221	EVQQJJ05Q	SWITCH, DIALING "7"	1	R 1	PQRPAR390N	39	1
S222	EVQQJJ05Q	SWITCH, DIALING ""	1	R 2	ERDS1TJ102	1K	1
S223	EVQ21405R	SWITCH, LOWER	1	R 3	PQ4R10XJ123	12K	1
S224	EVQ21405R	SWITCH, STOP	1	R 4	PQ4R10XJ334	330K	1
S225	EVQ21405R	SWITCH, ALL	1	R 5	PQ4R10XJ154	150K	1
S226	EVQ21405R	SWITCH, NEW MESSAGE	1	R 6	PQ4R10XJ473	47K	1
S227	EVQ21405R	SWITCH, SP-PHONE	1	R 7	PQ4R10XJ331	330	1
S228	EVQ21405R	SWITCH, INDIVIDUAL ERASE	1	R 8	PQ4R10XJ124	120K	1
S229	EVQ21405R	SWITCH, MEMO / 2WAY RECORD	1	R 9	PQ4R10XJ472	4.7K	1
S230	EVQ21405R	SWITCH, REPEAT	1				
S231	EVQ21405R	SWITCH, SKIP	1	R 10	ERDS1TJ101	100	1
S232	EVQ21405R	SWITCH, SCAN	1	R 11	PQ4R10XJ472	4.7K	1
S233	EVQ21405R	SWITCH, RECALL	1	R 12	PQ4R10XJ223	22K	1
S234	EVQ21405R	SWITCH, MUTE	1	R 13	PQ4R18XJ472	4.7K	1
S235	EVQ21405R	SWITCH, HOLD	1	R 14	PQ4R10XJ106	10M	1
S236	EVQ21405R	SWITCH, PAUSE	1	R 15	PQ4R10XJ106	10M	1
S237	EVQ21405R	SWITCH, REDIAL	1	R 16	PQ4R10XJ473	47K	1
				R 17	PQ4R18XJ104	100K	1
				R 18	PQ4R10XJ224	220K	1
				R 19	PQ4R10XJ105	1M	1
				R 20	PQ4R10XJ104	100K	1
				R 21	PQ4R10XJ472	4.7K	1
				R 22	PQ4R10XJ223	22K	1
				R 23	PQ4R10XJ123	12K	1
				R 24	PQ4R10XJ104	100K	1
				R 25	PQ4R18XJ683	68K	1
				R 26	PQ4R10XJ123	12K	1
				R 27	PQ4R10XJ472	4.7K	1
				R 28	PQ4R18XJ470	47	1
				R 29	PQ4R10XJ103	10K	1
				R 30	PQ4R18XJ473	47K	1
				R 31	Not Used		
				R 32	Not Used		
				R 33	PQ4R10XJ154	150K	1
				R 34	PQ4R10XJ223	22K	1
				R 35	PQ4R18XJ473	4.7	1
				R 36	ERD25TJ220	22	1
				R 37	PQ4R10XJ223	22K	1
				R 38	PQ4R10XJ223	22K	1
				R 39	PQ4R10XJ221	220	1
		(VARIABLE RESISTORS)					
VR301	EVNDXAA03B24	VARIABLE RESISTOR, 20kΩ	1				
		(PHOTO COUPLERS)					
PC1	PQVIPC817K	PHOTO ELECTRIC TRANSDUCER	1				
PC2	PQVIPC817K	PHOTO ELECTRIC TRANSDUCER	1				
PC3	PQVIPC817K	PHOTO ELECTRIC TRANSDUCER	1				
		(COILS)					
L1	PQLQXE272J	COIL	1				
L2	PQLQXE272J	COIL	1				

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Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
R101	PQ4R10XJ222	2.2K	1	R228	PQ4R10XJ123	12K	1
R102	PQ4R10XJ471	470	1	R229	PQ4R10XJ273	27K	1
R103	PQ4R10XJ104	100K	1				
R104	PQ4R10XJ332	3.3K	1	R230	PQ4R10XJ563	56K	1
R105	PQ4R10XJ151	150	1	R231	PQ4R10XF4700	470	1
R106	Not Used			R232	PQ4R10XF6800	680	1
R107	PQ4R10XJ103	10K	1	R233	PQ4R10XF1001	100	1
R108	PQ4R10XJ820	82	1	R234	Not Used		
R109	PQ4R10XJ222	2.2K	1	R235	Not Used		
				R236	PQ4R10XJ223	22K	1
R110	PQ4R18XJ154	150K	1	R237	PQ4R10XJ103	10K	1
R111	Not Used			R238	PQ4R10XJ824	820K	1
R112	PQ4R18XJ220	22	1	R239	PQ4R10XJ472	4.7K	1
R113	Not Used						
R114	PQ4R10XJ333	33K	1	R240	PQ4R10XJ331	330	1
R115	PQ4R10XJ392	3.9K	1	R241	PQ4R10XJ4R7	4.7	1
				R242			
R129	PQ4R10XJ472	4.7K	1	R243	PQ4R10XJ272	2.7K	1
				R244	PQ4R10XJ272	2.7K	1
R130	PQ4R10XJ223	22K	1	R245	PQ4R10XJ272	2.7K	1
R131	PQ4R10XJ102	1K	1	R246	PQ4R10XJ272	2.7K	1
R132	Not Used			R247	PQ4R10XJ332	3.3K	1
R133	Not Used						
R134	PQ4R18XJ332	3.3K	1	R301	PQ4R10XJ183	18K	1
R135	PQ4R10XJ473	47K	1	R302	PQ4R10XJ103	10K	1
R136	PQ4R10XJ103	10K	1	R303	PQ4R10XJ104	100K	1
R137	PQ4R10XJ472	4.7K	1	R304	PQ4R10XJ472	4.7K	1
R138	PQ4R10XJ332	3.3K	1	R305	PQ4R10XJ473	47K	1
R139	PQ4R10XJ103	10K	1	R306	PQ4R10XJ4R7	4.7	1
				R307	PQ4R10XJ473	47K	1
R140	PQ4R10XJ123	12K	1	R308	Not Used		
R141	PQ4R10XJ124	120K	1	R309	PQ4R10XJ683	68K	1
R142	PQ4R10XJ823	82K	1				
R143	PQ4R10XJ682	6.8K	1	R310	PQ4R10XJ225	2.2M	1
R144	PQ4R10XJ105	1M	1	R311	PQ4R10XJ303	30K	1
R145	PQ4R10XJ224	220K	1	R312	PQ4R10XJ683	68K	1
R146	Not Used			R313	PQ4R10XJ682	6.8K	1
R147	Not Used			R314	PQ4R10XJ822	8.2K	1
R148	PQ4R10XJ473	47K	1	R315	PQ4R10XJ275	2.7M	1
				R316	PQ4R18XJ104	100K	1
R201	PQ4R10XJ104	100K	1	R317	PQ4R10XJ472	4.7K	1
R202	PQ4R10XJ823	82K	1	R318	PQ4R10XJ104	100K	1
R203	Not Used			R319	PQ4R18XJ225	2.2M	1
R204	PQ4R10XJ104	100K	1				
R205	PQ4R10XJ224	220K	1	R320	PQ4R18XJ472	4.7K	1
R206	PQ4R10XJ103	10K	1	R321	PQ4R10XJ101	100	1
R207	PQ4R10XJ273	27K	1	R322	PQ4R18XJ223	22K	1
R208	Not Used			R323	PQ4R18XJ103	10K	1
R209	PQ4R10XJ823	82K	1	R324	PQ4R10XJ473	47K	1
R210	PQ4R10XJ473	47K	1	R401	PQ4R10XJ125	1.2M	1
R211	PQ4R10XJ104	100K	1	R402	Not Used		
R212	PQ4R18XJ224	220K	1	R403	PQ4R10XJ105	1M	1
R213	Not Used			R404	Not Used		
R214	PQ4R10XJ185	1.8M	1	R405	PQ4R10XJ273	27K	1
R215	PQ4R10XJ473	47K	1	R406	PQ4R10XJ273	27K	1
R216	PQ4R10XJ683	68K	1	R407	PQ4R18XJ103	10K	1
R217	PQ4R10XJ472	4.7K	1				
R218	PQ4R10XJ821	820	1	R410	PQ4R10XJ184	180K	1
R219	PQ4R10XJ105	1M	1	R411	PQ4R10XJ223	22K	1
				R412	PQ4R10XJ472	4.7K	1
R220	PQ4R10XJ102	1K	1	R413	Not Used		
R221	PQ4R18XJ152	1.5K	1	R414	PQ4R10XJ104	100K	1
R222	PQ4R18XJ152	1.5K	1	R415	PQ4R10XJ103	10K	1
R223	PQ4R10XJ104	100K	1	R416	PQ4R10XJ332	3.3K	1
R224	PQ4R10XJ333	33K	1	R417	PQ4R10XJ682	6.8K	1
R225	PQ4R10XJ123	12K	1	R418	PQ4R10XJ222	2.2K	1
R226	PQ4R10XJ472	4.7K	1	R419	PQ4R10XJ473	47K	1
R227	PQ4R10XJ473	47K	1				

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Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
R421	PQ4R10XJ824	820K	1	C105	ECEA1CKS100	10	S 1
R422	PQ4R10XJ683	68K	1	C106	ECEA0JSJ331	330	S 1
R423	PQ4R10XJ472	4.7K	1	C107	ECUV1H101JC	100P	1
R424	PQ4R10XJ334	330K	1	C108	PQCUV1H102J	0.001	S 1
R425	PQ4R10XJ563	56K	1	C109	PQCUV1H103KB	0.01	S 1
R426	PQ4R10XJ392	3.9K	1				
R427	PQ4R10XF2701	270	1	C110	PQCUV1H221JC	220P	1
R428	PQ4R10XF1201	1.2K	1	C111	PQCUV1H102J	0.001	S 1
R429	PQ4R10XJ224	220K	1	C112	Not Used		
				C113	Not Used		
R430	PQ4R18XF1202	12K	1	C114	Not Used		
				C115	PQCUV1E473MD	0.047	1
R501	PQ4R10XJ474	470K	1	C116	Not Used		
R502	PQ4R10XJ474	470K	1	C117	Not Used		
R503	PQ4R10XJ473	47K	1	C118	Not Used		
R504	PQ4R10XJ474	470K	1	C119	PQCUV1E473	0.047	1
R505	PQ4R10XJ474	470K	1				
R506	PQ4R10XJ275	2.7M	1	C120	PQCUV1H103KB	0.01	S 1
R507	PQ4R10XJ823	82K	1	C121	PQCUV1H103KB	0.01	S 1
R508	PQ4R10XJ224	220K	1	C122	Not Used		
R509	ERDS1TJ331	330	S 1	C123	ECEA1HKS100	10	S 1
				C124	PQCUV1H103KB	0.01	S 1
R510	ERDS1VJ4R7	4.7	1	C125	PQCUV1H101JC	100P	1
R511	PQ4R10XJ103	10K	1				
R512	PQ4R10XJ683	68K	1	C137	PQCUV1E473MD	0.047	1
R513	PQ4R10XJ333	33K	1	C138	PQCUV1E473MD	0.047	1
R514	PQ4R10XJ104	100K	1				
R515	PQ4R10XJ104	100K	1	C140	PQCUV1H223MD	0.022	1
R516	PQ4R10XJ150	15	1	C141	PQCUV1H223MD	0.022	1
R517	ERDS1TJ331	330	1	C142	ECUV1H103KB	0.01	S 1
R518	Not Used			C143	Not Used		
R519	PQ4R10XJ220	22	1	C144	Not Used		
				C145	PQCUV1H105JC	1	S 1
J601~604 J606~614	PQ4R10XJ000	0	13	C201	PQCUV1H333JC	0.033	S 1
				C202	Not Used		
J651	PQ4R10XJ000	0	1	C203	PQCUV1H102J	0.001	S 1
J652	PQ4R10XJ000	0	1	C204	ECUV1H103KB	0.01	S 1
				C205	ECUV1H102KB	0.001	S 1
				C206	Not Used		
				C207	PQCUV1H103KB	0.01	S 1
				C208	PQCUV1H332KB	0.0033	S 1
				C209	PQCUV1H332KB	0.0033	S 1
				C211	PQCUV1H103KB	0.01	S 1
				C212	PQCUV1H180JC	18P	1
				C213	PQCUV1H180JC	18P	1
				C214	ECEA1HKSR33	0.33	1
		(CAPACITORS)					
C2	ECEA1HKS100	10	S 1	C222	PQCUV1H103KB	0.01	S 1
C3	ECEA1HKSR22	0.22	1	C223	EECW5R5D473	0.047	S 1
C4	ECEA1HKS010	1	1	C224	ECEA1AU221	220	S 1
C5	PQCUV1H222KB	0.0022	1	C225	Not Used		
C6	ECKD2H681KB	680P	S 1	C226	ECEA0JU331	330	1
C7	ECKD2H681KB	680P	S 1				
C8	PQCUV1H103KB	0.001	S 1	C230	PQCUV1H103KB	0.01	S 1
				C231	PQCUV1H103KB	0.01	S 1
C10	ECEA1AKS221	220	S 1	C232	PQCUV1H103KB	0.01	S 1
C11	PQCUV1H105JC	1	1	C233	PQCUV1H562KB	0.0056	S 1
C12	Not Used						
C13	Not Used			C302	PQCUV1E104MD	0.1	S 1
C14	PQCUV1H680JC	68P	1	C303	Not Used		
C15	Not Used			C304	ECEA1CKS220	22	S 1
C16	PQCUV1H270JC	27P	1	C305	ECEA1CKS4R7	4.7	1
C17	ECEA1CKS220	22	S 1	C306	ECEA0JK221	220	S 1
C18	PQCUV1E104MD	0.1	S 1	C307	ECEA0JKS101	100	1
C19	ECEA0JSJ331	330	S 1	C308	PQCUV1E473MD	0.047	1
				C309	PQCUV1H102J	0.001	S 1
C101	PQCUV1C154KB	0.15	1				
C102	PQCUV1H223MD	0.022	1				
C103	PQCUV1H105JC	1	S 1				
C104	Not Used						

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Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
C311	ECEA0JSJ331	330	S 1	OPERATION PRINTED CIRCUIT BOARD PARTS			
C312	PQCUV1H103KB	0.01	S 1	PCB2	PQWP2T2886EU	OPERATION, P.C.BOARD ASS'Y (RTL)	1
C313	PQCUV1H103KB	0.01	S 1	IC601	PQVI5204110F	(IC) IC	1
C314	Not Used			LED601	PQVDSL325MC	(LEDS) LED	1
C315	PQCUV1H682KB	0.0068	S 1	LED602	PQVDSL325MC	LED	1
C316	PQCUV1E104MD	0.1	S 1	LED605	LN265RPH	LED	1
C317	PQCUV1H105JC	1	S 1	CN601	PQJS06A36Z	(CONNECTOR) CONNECTOR, 6 PIN	1
C318	PQCUV1H103KB	0.01	S 1	S601	EVQ21405R	(SWITCHES) SWITCH, REMAIN TIME	1
C319	PQCUV1H223MD	0.022	1	S602	EVQ21405R	SWITCH, ALL ERASE	1
C320	PQCUV1H105JC	1	S 1	S603	EVQ21405R	SWITCH, GREETING CHECK	1
C321	ECEA1CKS4R7	4.7	1	S604	EVQ21405R	SWITCH, REMOTE CODE	1
C322	PQCUV1C683MD	0.068	1	S605	EVQ21405R	SWITCH, ALARM	1
C323	ECEA1CKS470	47	1	S606	EVQ21405R	SWITCH, TIME	1
C324	PQCUV1E104MD	0.1	S 1	S607	EVQ21405R	SWITCH, PROGRAM	1
C325	ECEA1CKS100	10	S 1	S608	EVQ21405R	SWITCH, GREETING RECORD	1
C326	PQCUV1E473MD	0.047	1	S609	EVQ21405R	SWITCH, GREETING SELECT	1
C327	PQCUV1E104MD	0.1	S 1	S610	EVQ21405R	SWITCH, TRANSFER	1
C328	PQCUV1E104MD	0.1	S 1	S611	EVQ21405R	SWITCH, ANSWER ON	1
C401	PQCUV1H103KB	0.01	S 1	S612	EVQ21405R	SWITCH, MAILBOX	1
C402	Not Used			S613	EVQ21405R	SWITCH, MAILBOX	1
C403	PQCUV1H103KB	0.01	S 1	E101	PQHR10214Z	(OTHERS) LCD HOLDER	1
C404	Not Used			LCD1	PQADB5702AZ	LIQUID CRYSTAL DISPLAY	1
C405	Not Used			X601	PQVBB800J1	CERAMIC FILTER	1
C406	Not Used			R601	PQ4R10XJ104	(RESISTORS) 100K	1
C407	PQCUV1H472KB	0.0047	S 1	R602	PQ4R10XJ105	1M	1
C408	PQCUV1H103KB	0.01	S 1	R603	PQ4R10XJ104	100K	1
C410	PQCUV1H103KB	0.01	S 1	R604	PQ4R10XJ104	100K	1
C411	PQCUV1E473MD	0.047	1	R605	PQ4R10XJ331	330	1
C412	Not Used			R606	PQ4R10XJ331	330	1
C413	PQCUV1H102J	0.001	S 1	R607	PQ4R10XJ681	680	1
C414	ECEA1HKS010	1	S 1	C601	ECUV1H104MD	(CAPACITORS) 0.1	S 1
C415	PQCUV1H105JC	1	S 1	C602	PQCUV1H221JC	220P	S 1
C416	PQCUV1H682KB	0.0068	S 1	C603	PQCUV1H221JC	220P	S 1
C417	PQCUV1E104MD	0.1	S 1	J901	PQ4R10XJ000	0	1
C418	ECUV1H104MD	0.1	1	J904	PQ4R10XJ000	0	1
C419	PQCUV1H223MD	0.022	1				
C420	PQCUV1H472KB	0.0047	1				
C421	PQCUV1E473MD	0.047	1				
C422	ECEA1CKS100	10	S 1				
C423	PQCUV1H102J	0.001	S 1				
C424	ECEA0JKS101	100	1				
C425	ECEA0JKS101	100	1				
C426	PQCUV1H103KB	0.01	S 1				
C427	Not Used						
C428	ECEA0JKS101	100	1				
C429	PQCUV1H103KB	0.01	S 1				
C430	PQCUV1H103KB	0.01	S 1				
C431	PQCUV1H105JC	1	S 1				
C432	PQCUV1H103KB	0.01	S 1				
C433	PQCUV1H103KB	0.01	S 1				
C434	PQCUV1H272KB	0.0027	S 1				
C435	PQCUV1E104MD	0.1	S 1				
C501	ECEA1AU222	2200	S 1				
C502	PQCUV1H102J	0.001	S 1				
C503	PQCUV1H333JC	0.033	S 1				
C504	ECEA1AU221	220	1				
C505	PQCUV1H103KB	0.01	S 1				
C506	Not Used						
C507	PQCUV1H103KB	0.01	S 1				
C508	ECEA1AU221	220	1				

428

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Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
DIGITAL TAM PRINTED CIRCUIT BOARD PARTS							
PCB3	PQLP10061E	DIGITAL TAM P.C.BOARD ASSY (RTL)	1	C723	ECUV1H102KBV	0.001	1
		(ICS)		C724	ECUV1H470JCV	47P	1
IC701	PQVID6305AD	IC	1	C725	ECUV1H470JCV	47P	1
IC702	PQVIMC5480DW	IC	1	C726	ECUV1H470JCV	47P	1
IC703	PQVID000035	IC	1	C727	ECUV1H102KBV	0.001	1
IC704	PQVID000035	IC	1	C728	ECUV1H102KBV	0.001	1
IC705	PQVILH53170M	IC	1	C729	ECUV1H102KBV	0.001	1
		(CONNECTORS)					
CN701	PQJS14A56Z	CONNECTOR, 14PIN	1				
CN702	PQJS07A56Z	CONNECTOR, 7PIN	1				
		(OTHERS)					
L701	PQLQR1ET	COIL	1				
		(RESISTORS)					
R701	ERJ3GEYJ105	1M	1				
R702	ERJ3GEYJ103	10K	1				
R703	ERJ3GEYJ103	10K	1				
R704	ERJ3GEYJ102	1K	1				
R705	ERJ3GEYJ221	220	1				
R706	ERJ3GEYJ221	220	1				
R707	ERJ3GEYJ221	220	1				
R708	ERJ3GEYJ221	220	1				
R709	ERJ3GEYJ221	220	1				
R710	ERJ3GEYJ221	220	1				
R711	ERJ3GEYJ221	220	1				
R712	ERJ3GEYJ221	220	1				
R713	ERJ3GEYJ271	270	1				
		(CAPACITORS)					
C701	PQCUV1H105JC	1	S 1				
C703	PQCUV1H105JC	1	S 1				
C704	ECUV1H100DCV	10P	S 1				
C705	ECUV1H100DCV	10P	S 1				
C706	ECUV1H104ZV	0.1	S 1				
C707	ECUV1H104ZV	0.1	S 1				
C708	ECUV1C334ZV	0.33	1				
C709	ECUV1H104ZV	0.1	S 1				
C710	ECUV1H104ZV	0.1	S 1				
C711	ECUV1H104ZV	0.1	S 1				
C713	ECUV1H104ZV	0.1	S 1				
C714	ECUV1H102KBV	0.001	1				
C715	ECUV1H102KBV	0.001	1				
C716	ECUV1H102KBV	0.001	1				
C717	ECUV1H102KBV	0.001	1				
C718	ECUV1H102KBV	0.001	1				
C719	ECUV1H470JCV	47P	1				
C720	ECUV1H470JCV	47P	1				
C721	ECUV1H104ZV	0.1	S 1				
C722	ECUV1H470JCV	47P	1				