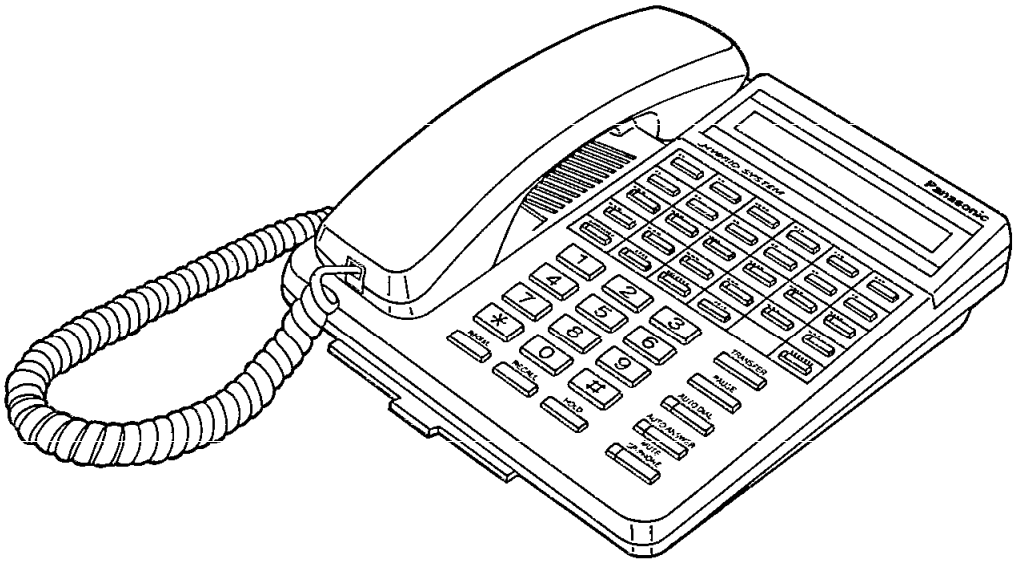
ORDER NO. KM49304512C2

Service Manual

and Technical Guide

PROPRIETARY TELEPHONE FOR ELECTRONIC
MODULAR SWITCHING SYSTEM

KX-T7130E



■ SPECIFICATIONS

Station Loop Limit:	40 ohms
Cabling Method:	2 pair wire
Jacks:	EMSS, Handset/Headset
Display:	16 digits (max.)
Dimensions:	172 (W)×90 (H)×240 (D) mm with handset ($6^{25}/_{32}$"×$3^{17}/_{32}$"×$9^{7}/_{16}$")
Weight:	920 g (2 lb 0.45 oz)

Design and specifications are subject to change without notice.

Panasonic

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.

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LOCATION OF CONTROLS

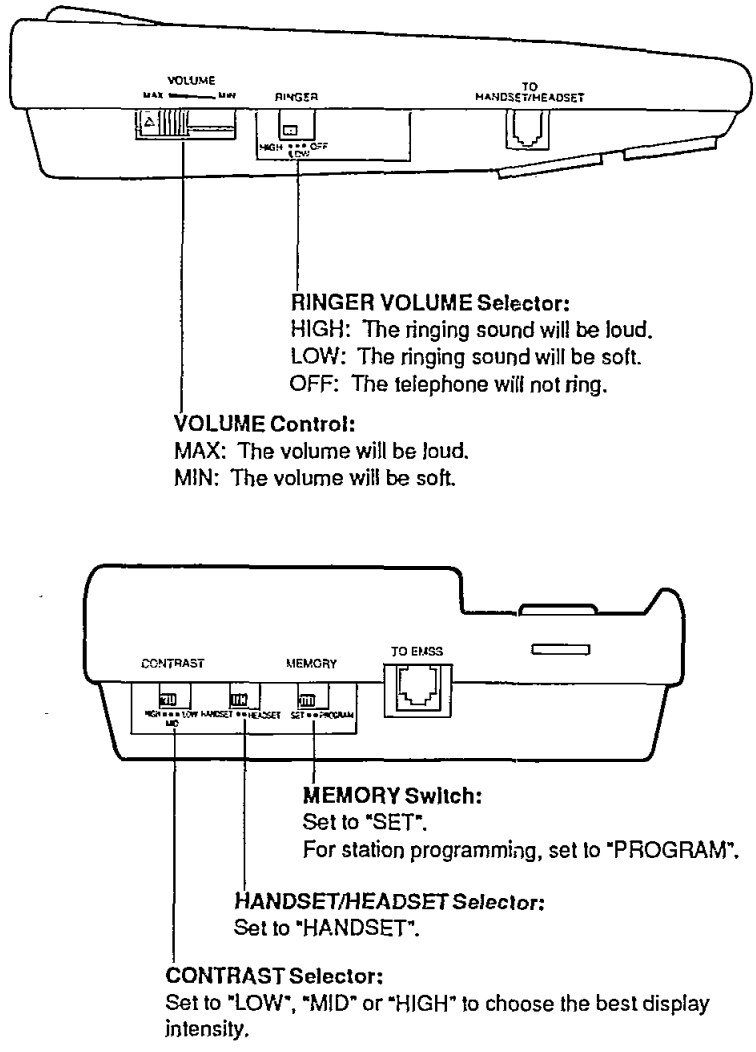
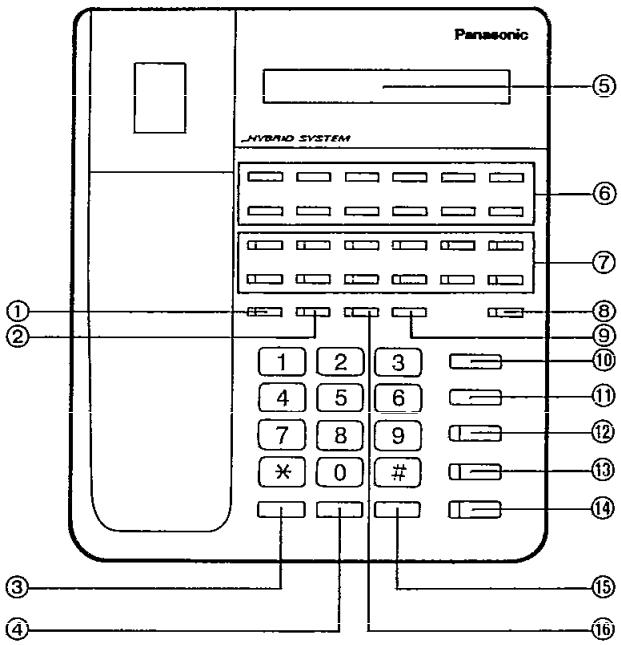


Fig. 1



KX-T7130E is compatible with the Panasonic Electronic Modular Switching Systems and can perform most functions within each systems.

Fig. 2

① INTERCOM Button and Indicator:
Used to make or receive an intercom call.

② CONFERENCE Button and Indicator:
Used to perform a three-party conference.

③ REDIAL Button:
Used to redial the last dialed number.

④ RECALL Button:
Used to send a recall signal to a Central Office.

⑤ LCD (Liquid Crystal Display)

⑥ Programmable Feature Buttons:
Can be used as One-Touch Dialling buttons or system feature buttons.

⑦ Flexible CO Line Buttons and Indicator:
Can be used as CO, Direct Station Selection or One-Touch Dialling buttons.

⑧ Flexible MESSAGE Button and Indicator:
Can be used as Message Waiting, Direct Station Selection, or One-Touch Dialling button.

⑨ SAVE Button:
Used to store a phone number temporarily.

⑩ TRANSFER Button:
Used to transfer an outside or an intercom call to another extension.

⑪ PAUSE Button:
Used to insert a pause in a speed dial number.

⑫ AUTO DIAL/STORE Button and Indicator:
Used before dialling a speed dial number/in "PROGRAM" mode, used to store a station programming procedure in the memory at the end of operation.

⑬ AUTO ANSWER/MUTE Button and Indicator:
Used to answer an intercom call automatically/Used to hear the other party without them hearing you in handsfree mode.

⑭ SP-PHONE Button and indicator:
Used to make or receive a phone call without using the handset.

⑮ HOLD Button:
Used to place a call on hold.

⑯ FWD/DND Button and Indicator:
Used to set or cancel the CALL FORWARDING/DO NOT DISTURB feature.

FOR SERVICE TECHNICIANS

Note the following items when exchanging the LEDs (Ref. No. D617~635) of Dial P.C.Board.

1. Do not use LED again which is removed from P.C.Board.
2. Use soldering iron (less than 15 W) for exchanging LED.
3. Do not heat LED more than 2 seconds.
4. Do not move LED after solder.

CONNECTION

Connect as shown.

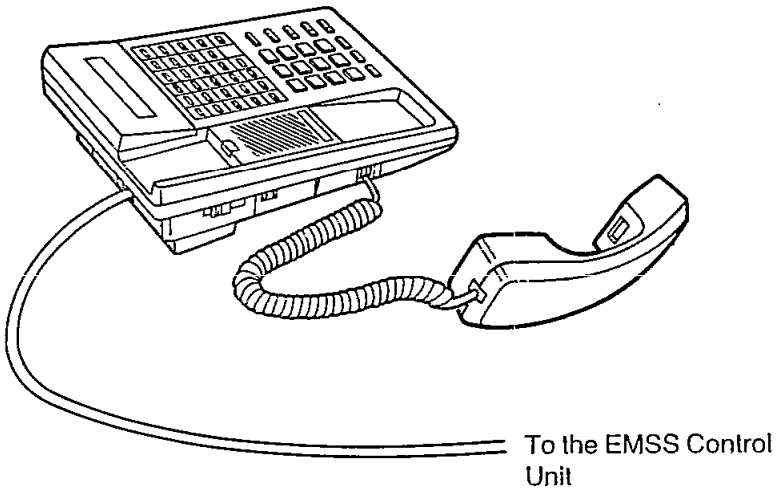


Fig. 3

USING OVERLAY

When the System Program Switch on the EMSS Control Unit is set to the position for programming, the function of the KX-T7130E connected to your EMSS Control Unit will change as follows.

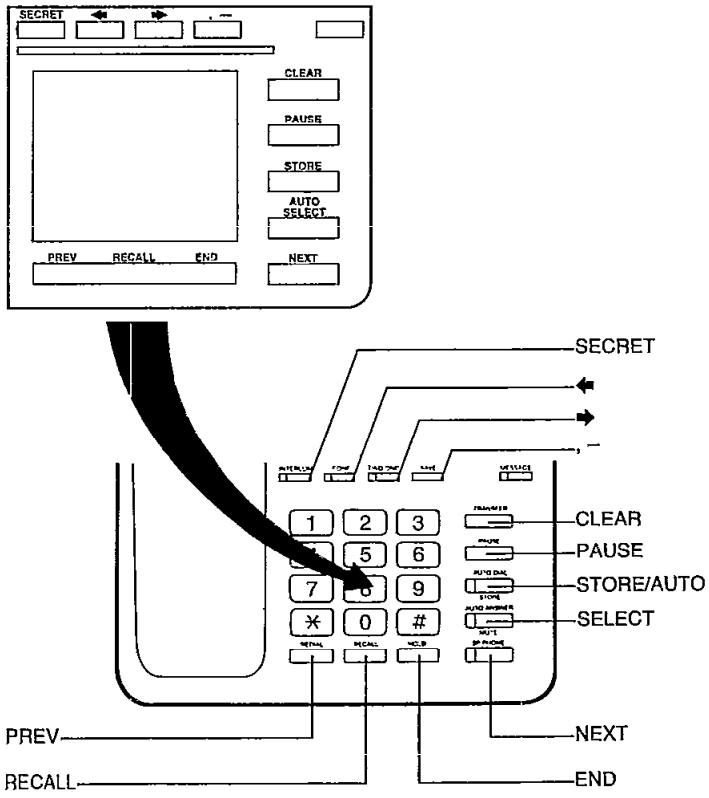


Fig. 4

DISASSEMBLY INSTRUCTIONS

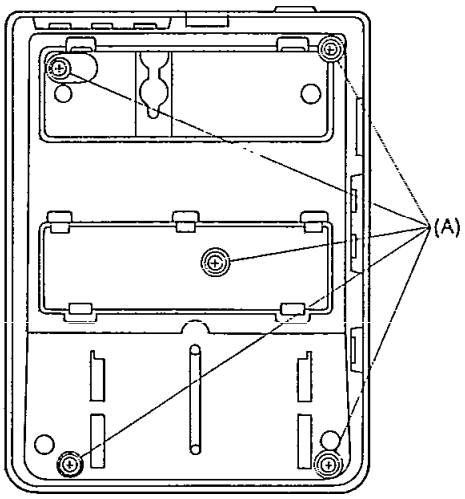


Fig. 5

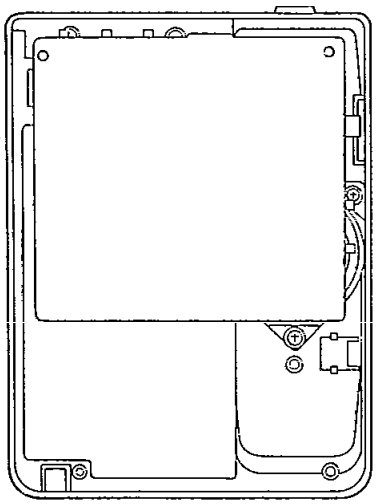


Fig. 6

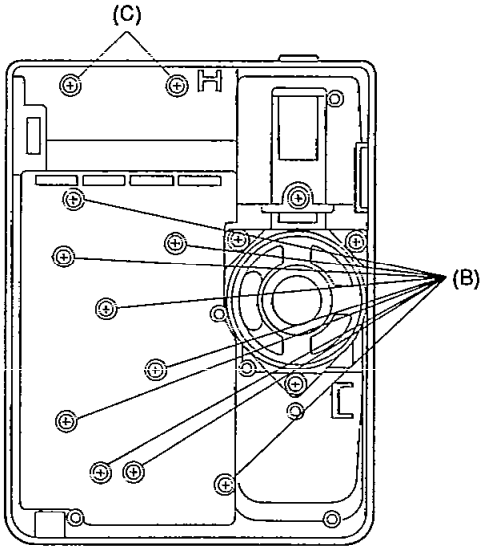


Fig. 7

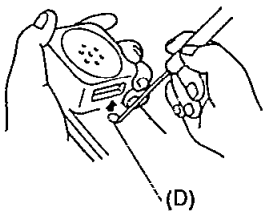


Fig. 8

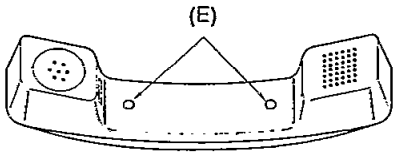


Fig. 9

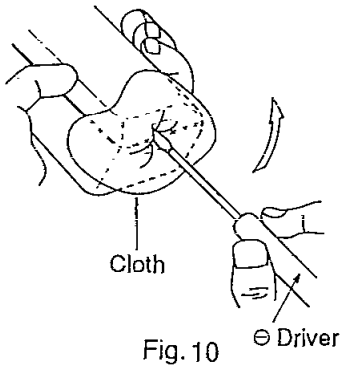
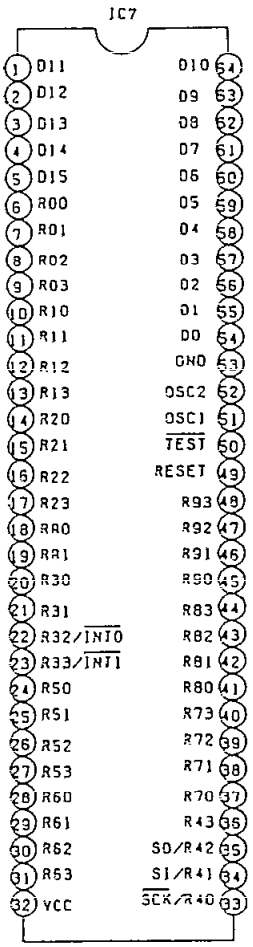


Fig. 10

Ref. No.	Procedure	Shown in Fig. —.	To remove—.	Remove—.
1	1	5	Lower Cabinet	Screw (3×14) ..... (A)×5
2	1, 2	6	Main Board	Remove the Main Board. (Read Note 1)
3	1~4	7	Operation Board	Screw (2.3×8) ..... (B)×9
4				Remove the Operation Board.
5	1, 2, 5	7	LCD Board	Screw (2.3×8) ..... (C)×2
6	6~8	8	Handset Board	Rubbers ..... (D)×2
7		9		Screws (3×10) ..... (E)×2
8		10		Remove the cabinet.

Note 1:
When removing the Main P.C. Board, remove from direction of the arrow.

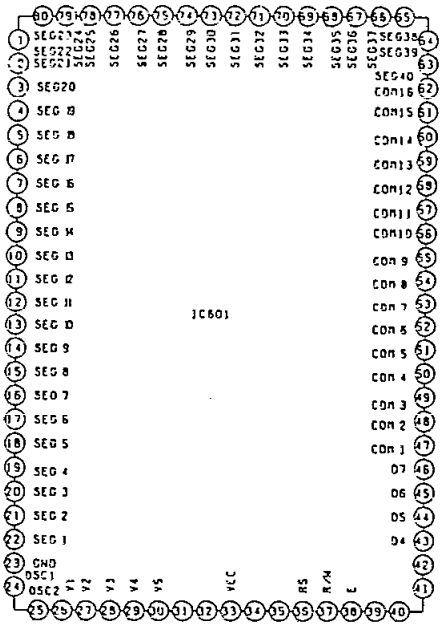
IC DATA



IC7	PQVI4046SA92
Program ROM:	4K Byte (4 bit)
Internal RAM:	1K bit
Clock Frequency:	2.5 MHz
Power Supply Voltage:	2.7–6 V

Pin No.	Mark	Function	High	Low
1	D11	LED Control Output	ON	OFF
2	D12	LED Control Output	ON	OFF
3	D13	LED Control Output	ON	OFF
4	D14	LED Control Output	ON	OFF
5	D15	LED Control Output	ON	OFF
6	R00	LED Control Output	ON	OFF
7	R01	LED Control Output	ON	OFF
8	R02	LED Control Output	ON	OFF
9	R03	LED Control Output	ON	OFF
10	R10	Tone Control Output	ON	OFF
11	R11	Tone Control Output	ON	OFF
12	R12	Tone Control Output	ON	OFF
13	R13	Tone Control Output	ON	OFF
14	R20	Speaker Mute	ON	OFF
15	R21	MIC Mute	ON	OFF
16	R22	Handset / SP-Phone Power Control	ON	OFF
17	R23	Not Used	———	———
18	RA0	Key Input	Disable	Enable
19	RA1	Ground	———	———
20	R30	LCD Data Output	———	———
21	R31	LCD Data Output	———	———
22	R32/ $\overline{INT0}$	Interrupt Input	Standby	Active
23	R33/ $\overline{INT1}$	Interrupt Input	Standby	Active

Pin No.	Mark	Function	High	Low
24	R50	Key Scan Output	Normal	Active
25	R51	Key Scan Output	Normal	Active
26	R52	Key Scan Output	Normal	Active
27	R53	Key Scan Output	Normal	Active
28	R60	DTMF Control	Normal	Active
29	R61	DTMF Control	Normal	Active
30	R62	DTMF Control	Normal	Active
31	R63	Not Used	-------	-------
32	Vcc	(+) Power Source Terminal	-------	-------
33	$\overline{SCK}$/R40	Interrupt Output	Disable	Enable
34	SI/R41	Key Input	Disable	Enable
35	S0/R42	Key Input	Disable	Enable
36	R43	Key Input	Disable	Enable
37	R70	DTMF Control	Normal	Active
38	R71	DTMF Control	Normal	Active
39	R72	DTMF Control	Normal	Active
40	R73	DTMF Control	Normal	Active
41	R80	Not Used	-------	-------
42	R81	SP-Phone Chip Select Control Output	OFF	ON
43	R82	OHCA Test	-------	-------
44	R83	SP-Phone MIC Mute Control Output	ON	OFF
45	R90	Key Input	Disable	Enable
46	R91	Key Input	Disable	Enable
47	R92	Power Fail Detect Input	Power Down	Normal
48	R93	Hook Data Input	Off-Hook	On-Hook
49	RESET	System Reset Input	-------	------
50	$\overline{TEST}$	-------	-------	------
51	OSC1	System Clock	-------	------
52	OSC2	System Clock	-------	------
53	GND	Ground	-------	------
54	D0	LCD Enable Control Output	Active	Normal
55	D1	Key Input	Disable	Enable
56	D2	LED Reset Signal Output	Active	Normal
57	D3	Data Input Control	Normal	Active
58	D4	Data Input	Disable	Enable
59	D5	Data Output	Active	Normal
60	D6	Automatic Redial Signal Input	Disable	Enable
61	D7	SP-Phone Path Control	ON	OFF
62	D8	OHCA Path Control	ON	OFF
63	D9	LED Control Output	ON	OFF
64	D10	LED Control Output	ON	OFF



IC601: PQVIHD44780
Display Data RAM: 80×8 bits
Character Generator ROM: 160 characters

Pin No.	Mark	Function	High	Low
1 / 22	SEG 22 / SEG 1	LCD Segment Signal Output	40 State Output	
63 / 80	SEG 40 / SEG 23			
23	GND	Ground		
24 / 25	OSC 1 / OSC 2	System Clock		
26 / 30	V1 / V5	Power Supply for LCD		
31 / 32		Not used		
33	Vcc	Power Supply		
34 / 35		Not used		
36	RS	Signal to select Resistors	Data Resistor	Instruction Resistor/ Address Resistor
37	R/W	Signal to Select Read and Write	Read	Write
38	E	Operation Start Signal for Data R/W	Active	Normal
39 / 42		Not used		
43 / 46	D4 / D7	Data Bus		
47 / 62	COM 1 / COM 16	LCD Common Signal Output	16 State Output	

BLOCK DIAGRAM

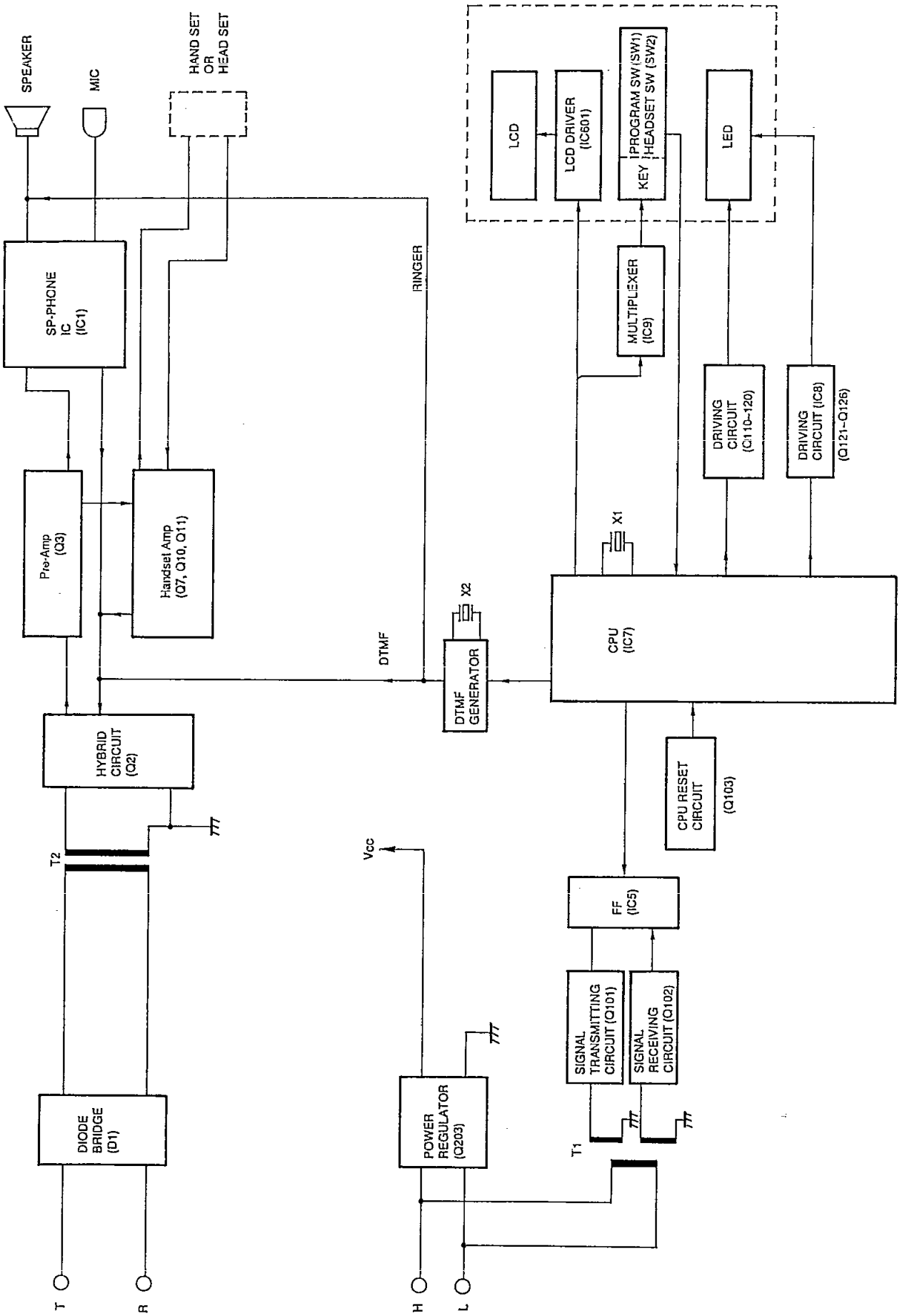


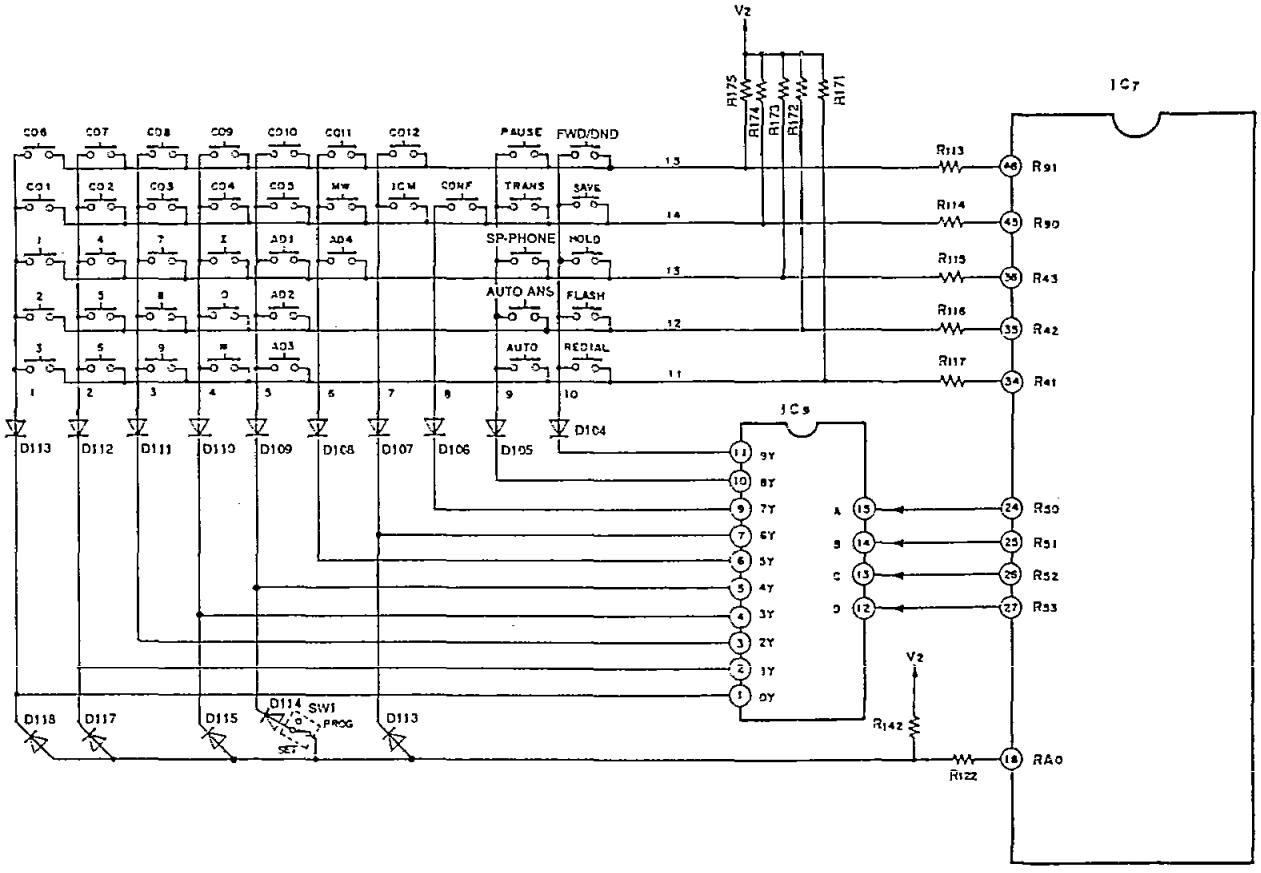
Fig. 11

CIRCUIT OPERATIONS

■ KEY INPUT CONTROL CIRCUIT

Data output from IC7 (R50 to R53) is decoded by IC9 as shown in the table below. This decoded information is used to scan the key matrix. The key matrix is read by IC7 according to the timing shown. If a key is pressed, the input corresponding to the row in which the key is located will be brought low during scanning and will be detected by IC7.

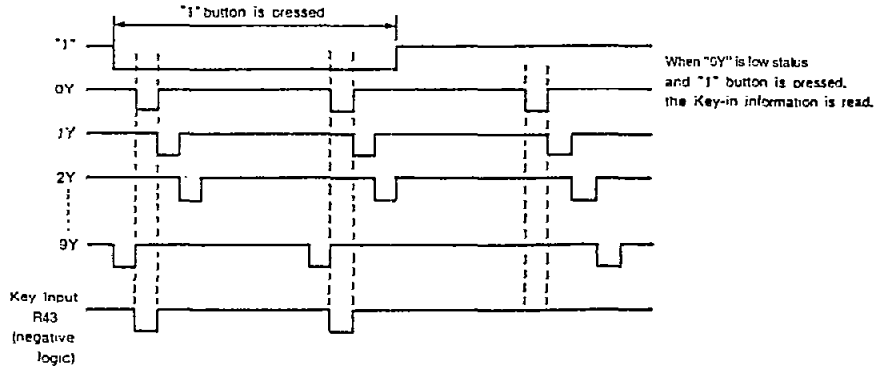
Circuit Diagram



Key Input Control Timing Chart

Logic of IC9

	INPUT				OUTPUT									
No.	A	B	C	D	0Y	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y
0	L	L	L	L	L	H	H	H	H	H	H	H	H	H
1	H	L	L	L	H	L	H	H	H	H	H	H	H	H
2	L	H	L	L	H	H	L	H	H	H	H	H	H	H
3	H	H	L	L	H	H	H	L	H	H	H	H	H	H
4	L	L	H	L	H	H	H	H	L	H	H	H	H	H
5	H	L	H	L	H	H	H	H	H	L	H	H	H	H
6	L	H	H	L	H	H	H	H	H	H	L	H	H	H
7	H	H	H	L	H	H	H	H	H	H	H	L	H	H
8	L	L	L	H	H	H	H	H	H	H	H	H	L	H
9	H	L	L	H	H	H	H	H	H	H	H	H	H	L

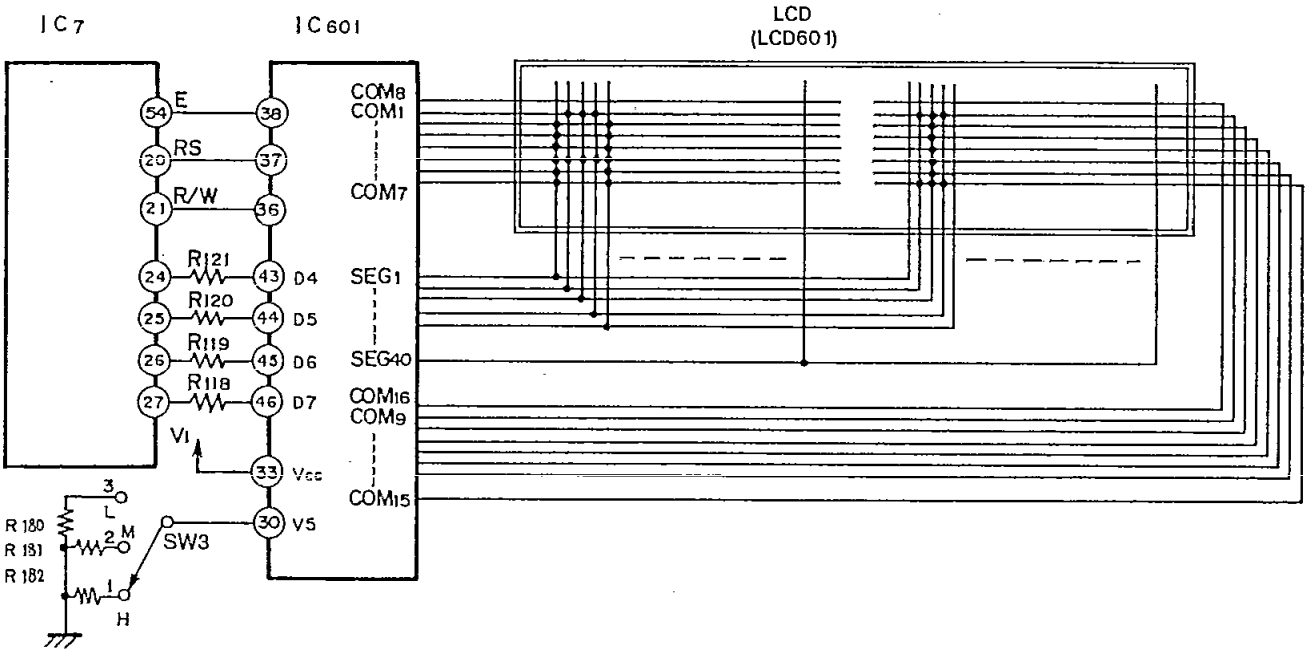


■ LCD CONTROL CIRCUIT

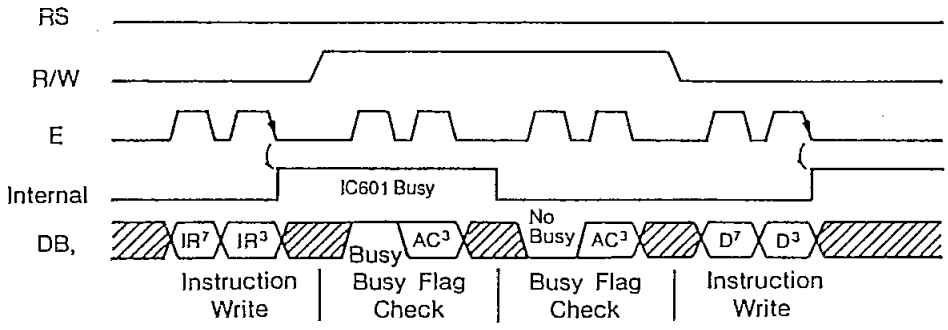
Circuit Operation:

LCD data is output from IC7 (pins 24–27) in two 4 bit words. These are latched onto the LC Display through IC601, according to timing shown below. LCD contrast may be adjusted by varing the voltage level at pin 30, using R160, R181, R182 and SW3.

Circuit Diagram



4-bit Data Transfer Timming Seguene



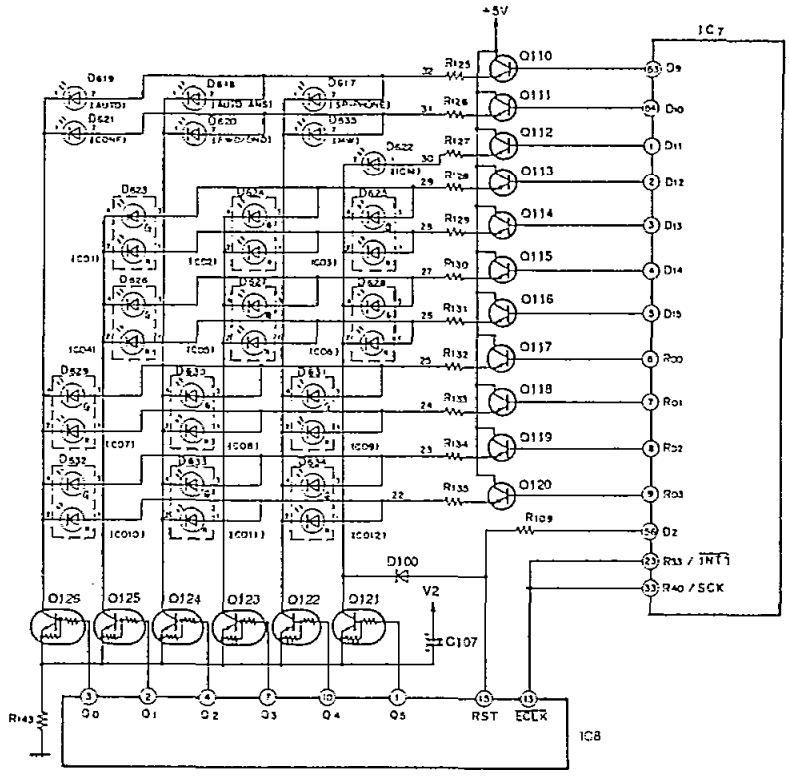
(Note) IR7, IR3 : Instruction 7th bit, 3rd bit
AC3 : Address Counter 3rd bit

■ LED CIRCUIT

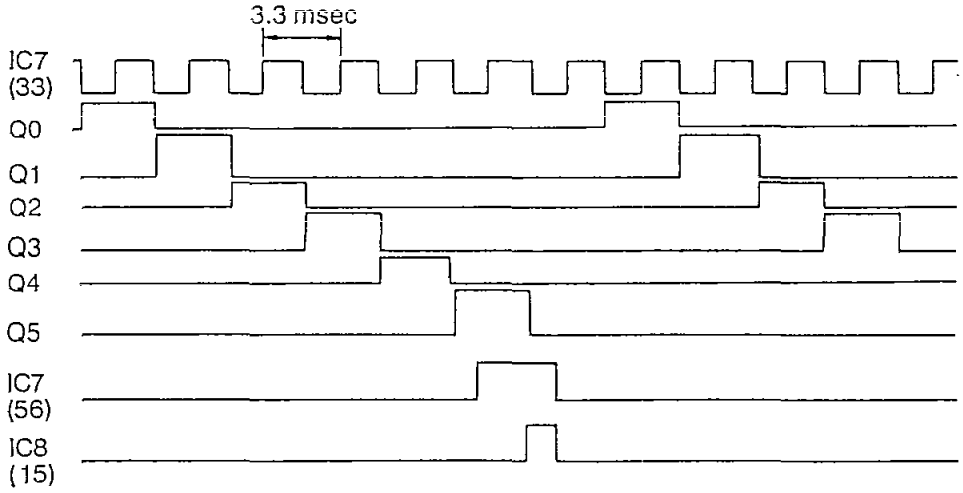
Circuit Operation:

The status of the LED's in the matrix is controlled by the outputs of IC7 and IC8. Transistors Q121 to Q126 are sequentially turned on by IC8 which is reset every 6 cycles by IC7 (pin 56) as shown in the timing chart below. To illuminate an LED a high level is output from the relevant port of IC7 (D9–D15 and R01–R03) at the same time as the corresponding column is taken low by IC8 (Q121–Q126).

Circuit Diagram



Timing Chart



■ DATA COMMUNICATION CIRCUIT

Function:
The data communication circuit provides a path for information exchange between the EMSS and EMSS proprietary telephone, which is used for transmitting such items as key input information and LED/LCD control.

Circuit Operation:
After receiving an IRQ signal from the EMSS, the EMSS proprietary telephone sends key input information (max. 19 pulses). The EMSS proprietary telephone then receives LED control information etc. from the EMSS and returns an acknowledge signal.

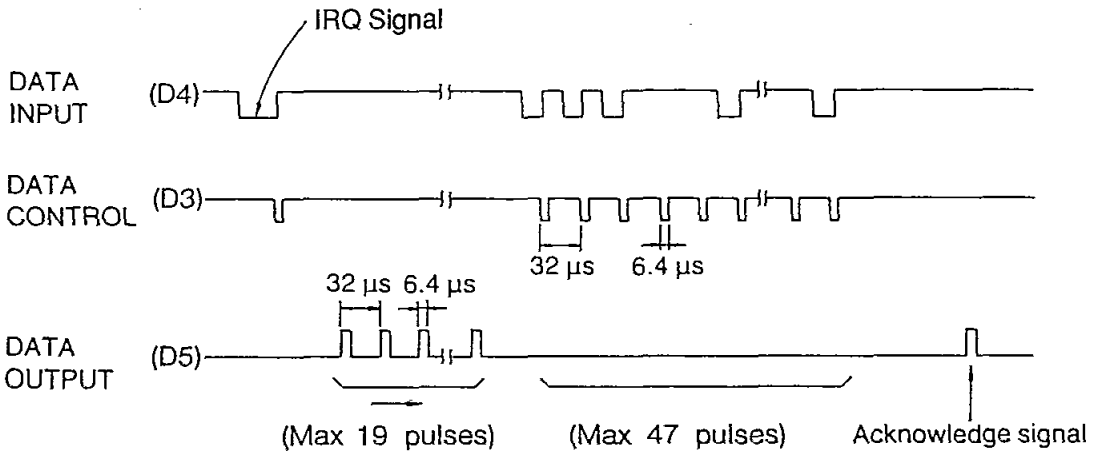
1) Reception
The data from the EMSS is received via the H and L line along the path;

H, L Line → T1 → R166 → Q102 → IC5 → IC7 pin 58

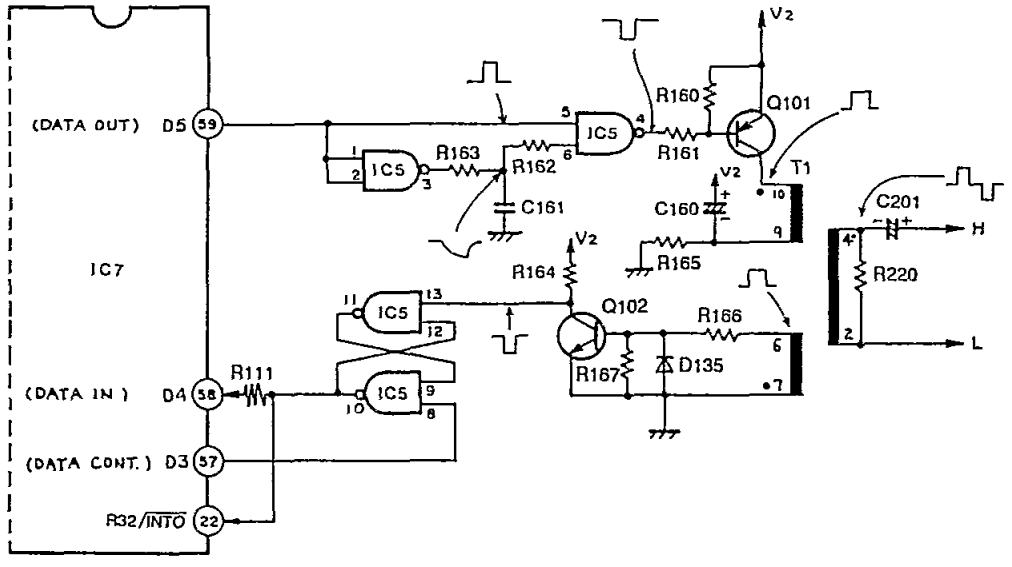
2) Transmission
The data to the EMSS proprietary telephone is transmitted along the following path.

IC7 pin 59 → IC5→ R161 → Q101 → T1 → H, L Line

Timing Chart



Circuit Diagram

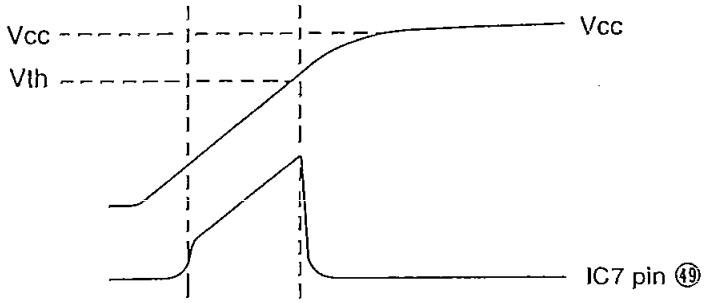


■ RESET CIRCUIT

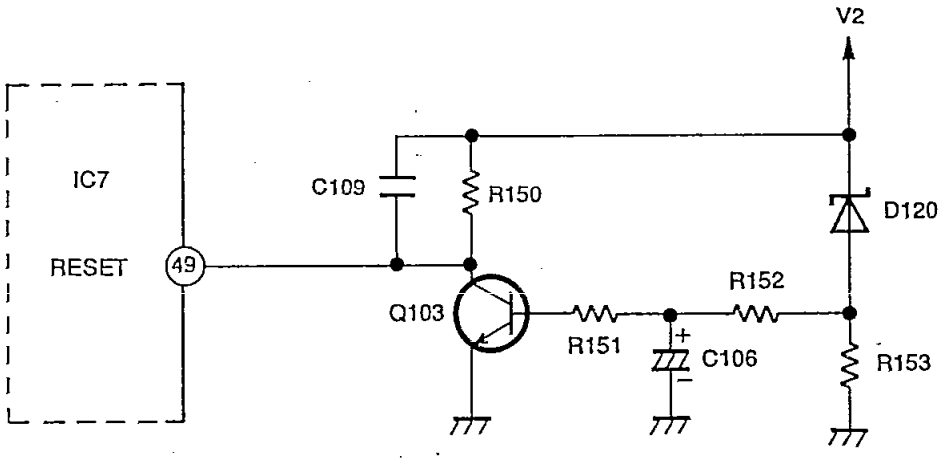
Circuit Operation:
This circuit is used for transmission of a reset pulse to the CPU (IC7) at the following times, connecting the telephone line jack, switch on EMSS. The timing chart is shown below.

Power ON → Q103 OFF → IC7 (Pin 49) high level → Q103 ON → IC7 (Pin 49) low level

Timing Chart



Circuit Diagram

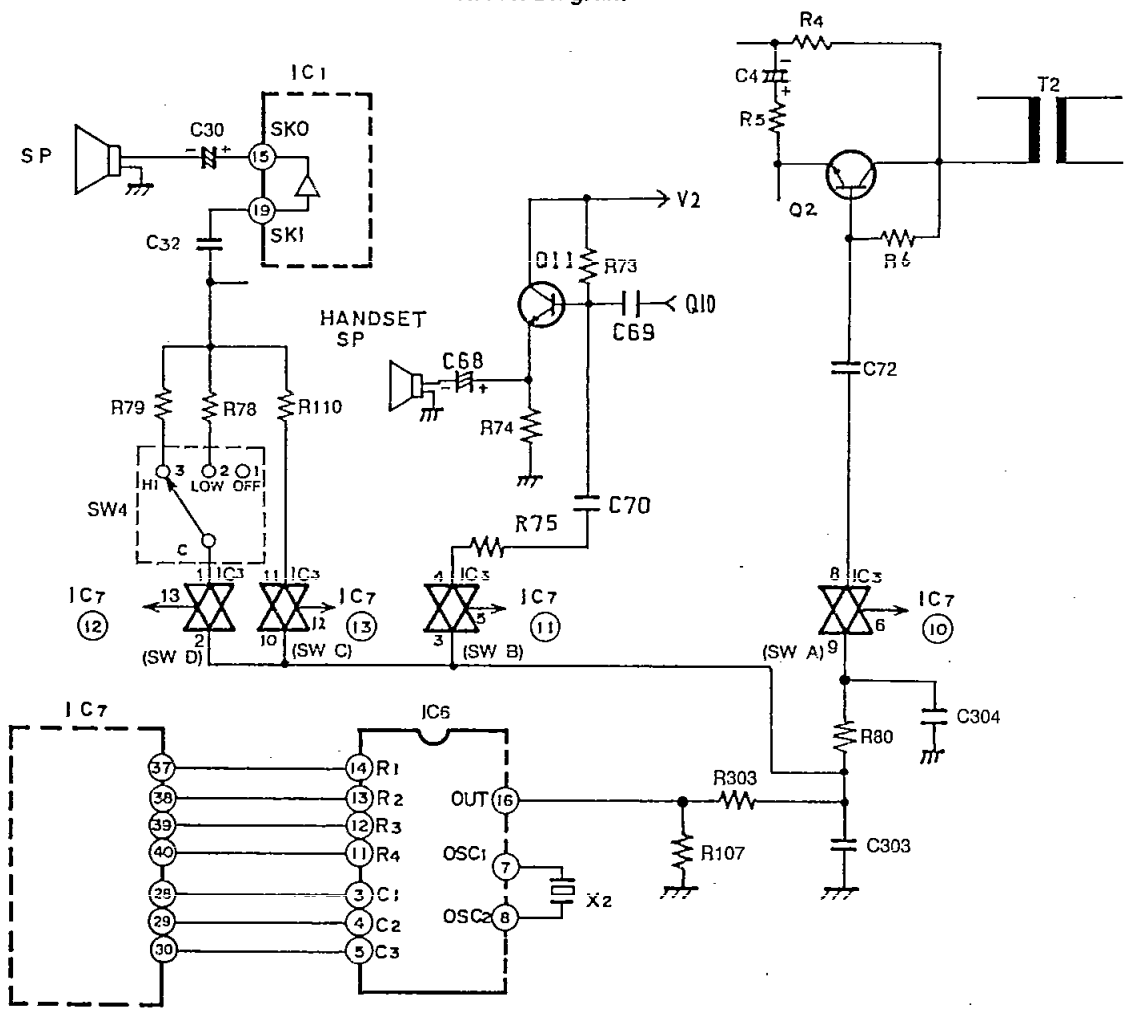


■TONE GENERATION CIRCUIT

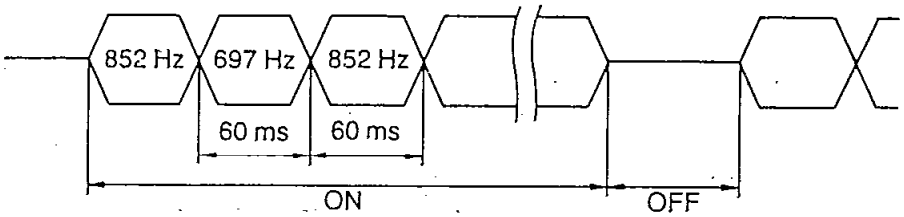
Function:
This circuit generates all system tones including COL, extension, busy and DTMF signals. It is comprised of IC6 (DTMF Generator IC) and IC3 (Analogue Switch).

Circuit Operation:
For the output of a single tone, a row terminal (R1–R4) and the each column (C1–C3) terminal intersecting with it are brought to a low state. For a dual tone, one row terminal and one column terminal are brought to a low state.

Circuit Diagram



1) Calling Tones from COL and EXT.
For a calling tone from a CO line or extension, pin 13 of IC3 (Analogue Switch) is brought to a high state and the single row tone signal shown below is output from IC6. The tone volume is controlled by SW4.



IC6 pin 16 → IC3 pin 2–1 → SW4 → C32 → IC1 pin 19 → IC1 pin 15 → C30 → SP

2) Busy Station Calling Tone

Pin 12 of IC3 (Analogue Switch) is brought to a high state.
852 Hz and 697 Hz signals are output from IC6 alternately at intervals of 60 ms.
The signal flow is;

IC6 pin 16 → IC3 pin 10–11 → R110 → C32 → IC1 pin 19 → IC1 pin 15 → C30 → SP

3) DTMF Signal

Pins 5, 6 and 12 of IC3 are brought to a high state, a DTMF tone is generated as shown below.
The signal flow is;

IC6 pin 16 → IC3 pin 9–8 → C72 → Q2 → T2 → Telephone Line
IC6 pin 16 → IC3 pin 3–4 → R75 → C70 → Q11 → C68 → Handset Speaker
(IC3 pin 10–11 → R110 → C32 → IC1 pin 19 → IC1 pin 15 → C30 → SP)

DTMF Frequency Table

		High Group		
		1209 Hz	1336 Hz	1477 Hz
Low Group	697 Hz	1	2	3
	770 Hz	4	5	6
	852 Hz	7	8	9
	941 Hz	*	0	#

Truth Table

	C1	C2	C3	R1	R2	R3	R4
1	L	H	H	L	H	H	H
2	H	L	H	L	H	H	H
3	H	H	L	L	H	H	H
4	L	H	H	H	L	H	H
5	H	L	H	H	L	H	H
6	H	H	L	H	L	H	H
7	L	H	H	H	H	L	H
8	H	L	H	H	H	L	H
9	H	H	L	H	H	L	H
*	L	H	H	H	H	H	L
0	H	L	H	H	H	H	L
#	H	H	L	H	H	H	L

4) Key-In Tone

An 852 Hz single tone is used as the key-in tone. When pins 5 and 12 of IC3 are brought to a high state, a tone is generated from IC6 and is heard at the speaker.
The signal flow is shown below.

IC6 pin 16 → IC3 pin 3–4 → R75 → C70 → Q11 → C68 → Handset Speaker
IC6 pin 16 → IC3 pin 10–11 → R110 → C32 → IC1 pin 19 → IC1 pin 15 → C30 → SP

CONDITION	IC7 pin 10	IC3 SWA	IC7 pin 11	IC3 SWB	IC7 pin 13	IC3 SWC	IC7 pin 12	IC3 SWD
Ringing	L	OFF	L	OFF	L	OFF	H	ON
Call Waiting	L	OFF	L	OFF	H	ON	L	OFF
Tone Dial (Handset)	H	ON	H	ON	L	OFF	L	OFF
Tone Dial (Speakerphone)	H	ON	L	OFF	H	ON	L	OFF

HANDSET CIRCUIT

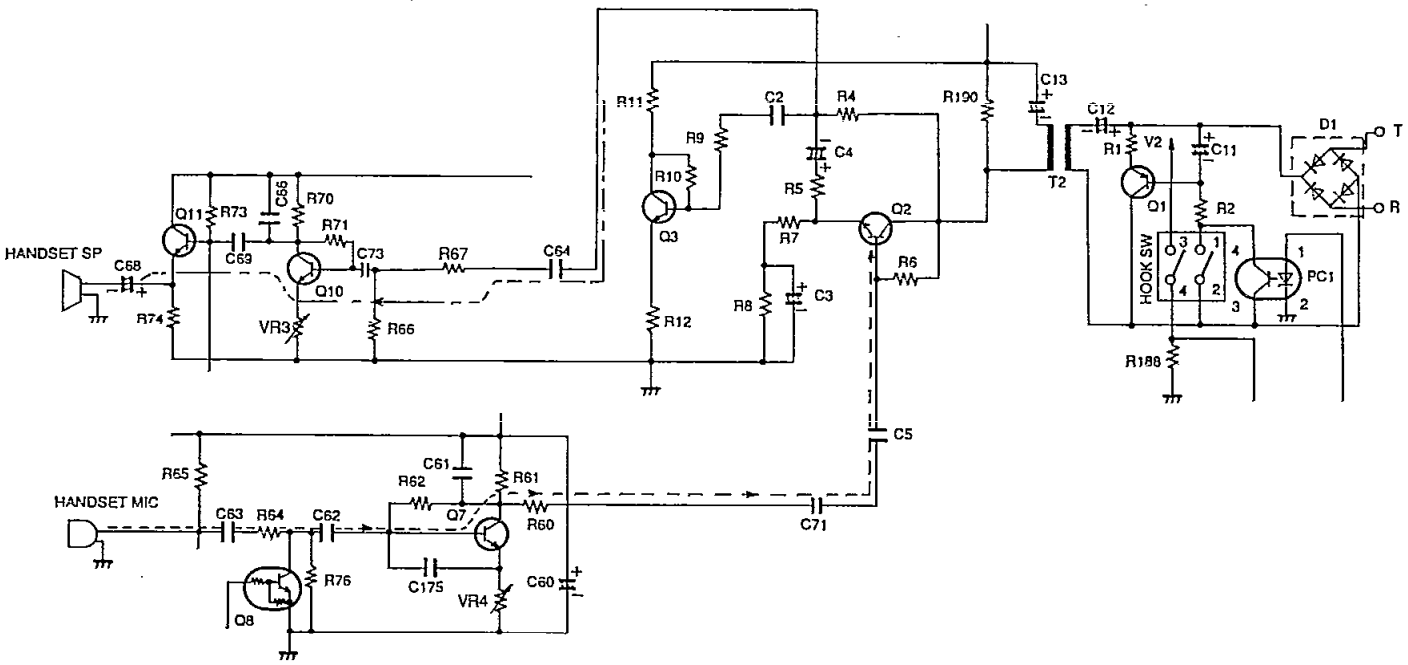
1) Transmission Signal Path

The input signal for the handset microphone is sent to the telephone line via the following path:
Handset MIC → C63 → R64 → C62 → Q7 → R60 → C71 → C5 → Q2 → T2 → D1 → Telephone Line

2) Reception Signal Path

The input signal from the telephone line is sent to the receiver through the following path:
Telephone Line → D1 → T2 → R4 → C64 → R67 → C73 → Q10 → C69 → Q11 → C68 → Handset Speaker

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 IC1 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 Comparator receives a Tx and 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.

1) Control Signal Path

Control signals for transmission and reception are inputted to IC1 via the following path:

(Transmission Control Signal Path)
MIC→IC1 pin 9 →IC1 pin 10→IC1 pin 3 → IC1 pin 4→ IC1 pin 5

(Reception Control Signal Path)
Telephone Line → R4 → Q3 → IC4 pin 1~2 → IC1 pin 7

2) Transmission/Reception Switching

The comparison result between Tx and Rx outputs as a DC level at IC1 pin 23 .
Tx level is high .....pin 23 = pin 20 - 6 mV
Rx level is high.....pin 23 = pin 20 - 150mV
The comparator output is connected to the attenuator control inside IC1.

3) Voice Detector

The output of the mic amp (pin 10 of IC1) is supplied to pin 13 of IC1 as a control signal for the voice detector.

4) Attenuator Control

The attenuator control detects the setting of the volume control through pin 24 of IC1 and automatically adjusts for changing ambient conditions.

5) Transmission Signal Path

The input signal from the microphone is sent through the circuit via the following path:
Note that, in this case, the logic states of pins 10, 11 and 12 are low, Low and Low respectively.
MIC → C39 → IC1 pin 9 → IC1 pin 10 → IC1 pin 3 → IC1 pin 4 → R14 → IC4 pin 4~3 → C5 → Q2 → T2 → D1 → Telephone Line

6) Reception Signal Path

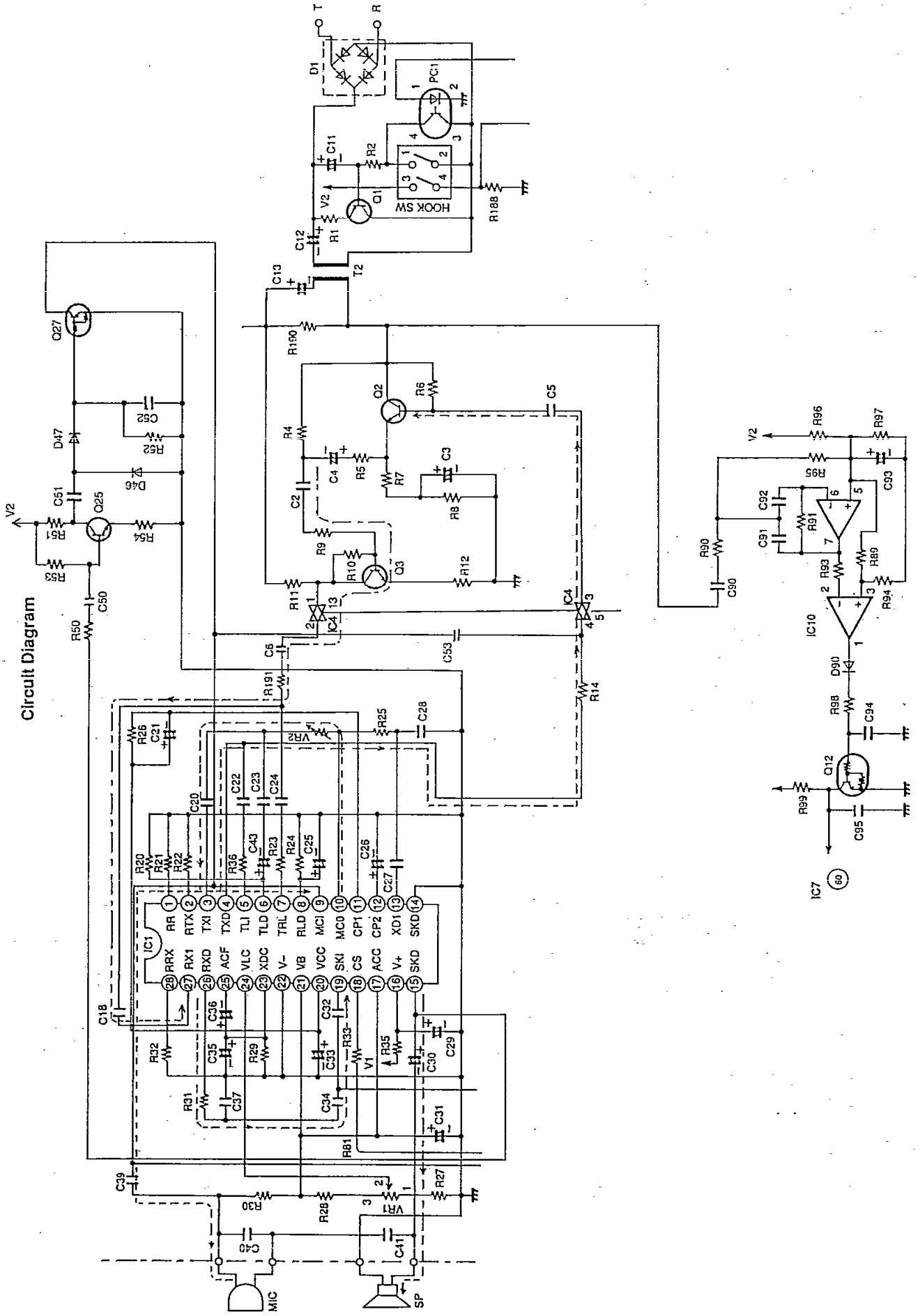
Signals received from the telephone line are outputted at the speaker via the following path:
Note thae, in this case, the logic states of pins 10, 11and 12 are low, low and low.

Telephone Line → D1 → T2 → R4 → Q3 → IC4 pin 1~2 → C6 → R191 → IC1 pin 27 → IC1 pin 26 → IC1 pin 19 → IC1 pin 15 → SP

7) Busy Tone Detector Circuit

Signal for Busy tone detection circuit is;
Telephone Line → D1 → T2 → C90 → IC10 pin 6~7 → IC10 pin 2~1 → D90 → Q12 → IC7 pin 60

Circuit Diagram



■ OHCA (Off Hook Call Announcement) CIRCUIT

Circuit Operation:
The transmission and reception signals on the handset are sent and received, to and from the telephone line (Tip and Ring). But those of OHCA are transmitted, in speakerphone mode, through the OHCA path (OHCA 1 and OHCA 2). Control of the OHCA path and OHCA power is done by pins 17 and 41 of IC7.
During OHCA being active, pins 10, 11 and 12 of IC7 are brought low.

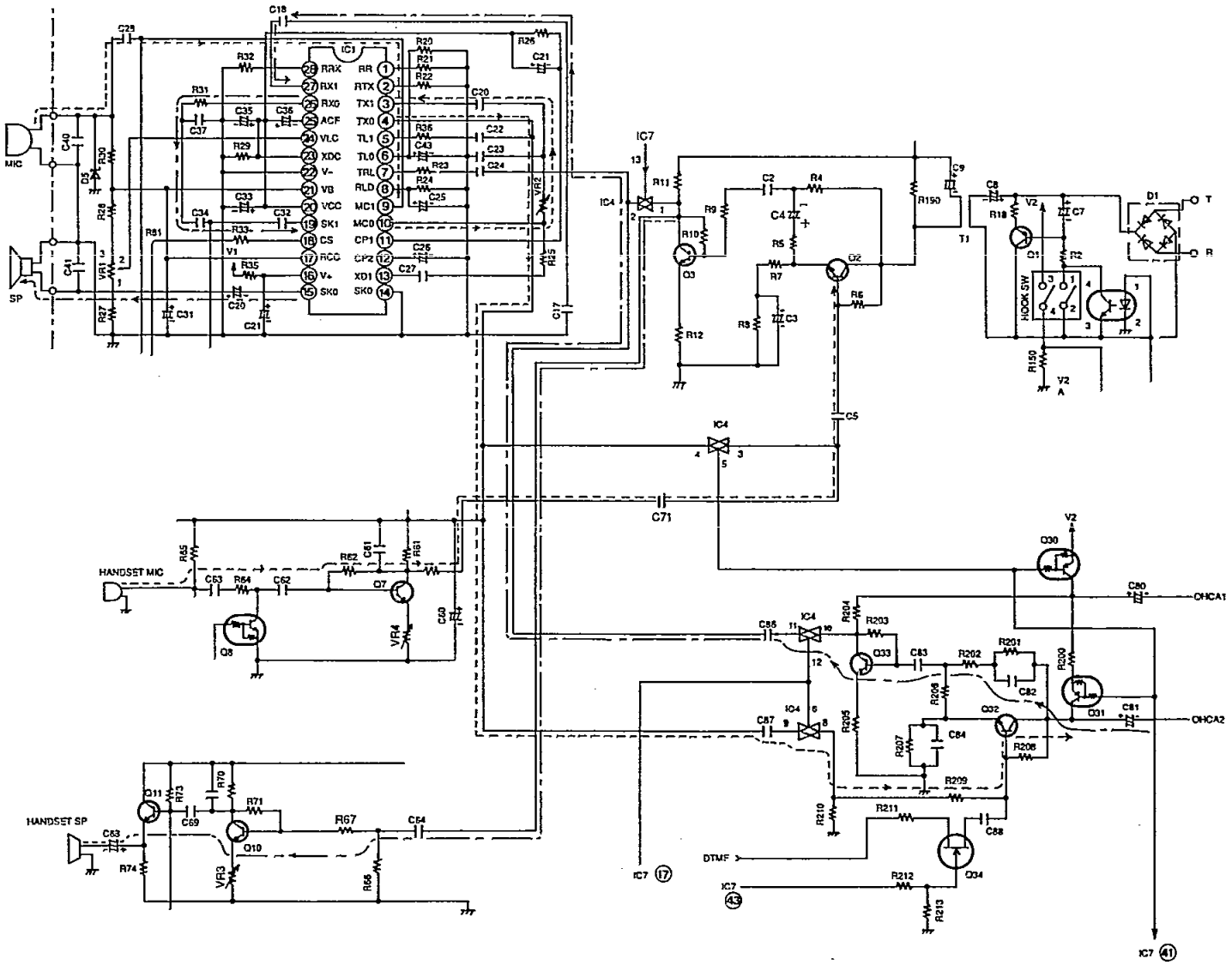
1) Transmisstion Signal path (OHCA mode)
The input signal from the microphone is sent through the OHCA line via the following path:

MIC → C28 → IC1 pin 9 → IC1 pin 10 → IC1 pin 3 → IC1 pin 4 → IC4 pin 9~8 → Q32 → C80, C81 → OHCA Line

2) Reception Signal Path (OHCA mode)
The input signal from the OHCA line is sent to the speaker via the following path:

OHCA LINE → C80, C81 → Q33 → IC4 pin 10~11 → IC1 pin 27 → IC1 pin 26 → IC1 pin 19 → IC1 pin 15 → SP

Circuit Diagram



HOW TO REPLACE FLAT PACKAGE IC

■ PREPARATION

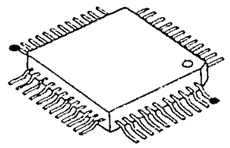
- SOLDER ..... Sparkle Solder 115A-1, 115B-1
  OR
  Almit Solder KR-19, KR-19RMA
- Soldering iron ..... Recomended power consumption will be between 30w to 40w.
  Temperature of Copper Rod 662 ±50° F (350 ±10° C)

  (An expert may use 60–80 W iron, but beginner might damage fbil by overheating)
- Flux ..... HI115 Specific gravity 0.863

  (Original flux will be replaced daily.)

■ PROCEDURE

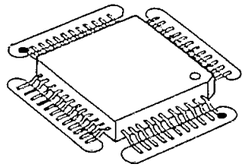
1. Temporary fix FLAT PACKAGE IC by Soldering on marked 2pins.



●.....Temporary soldering point.

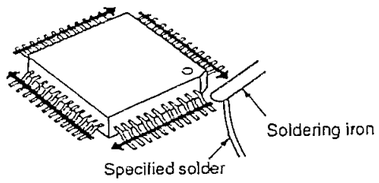
*Most important matter is accurate setting of IC to the corresponding soldering foil.

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



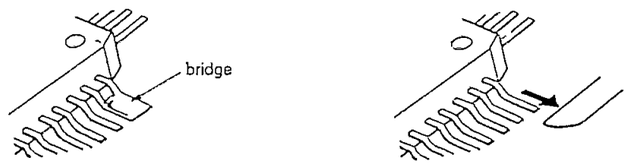
.....Flux

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



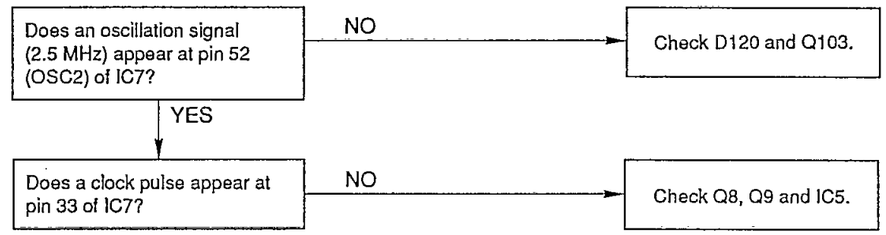
■ MODIFICATION PROCEDURE OF BRIDGE

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

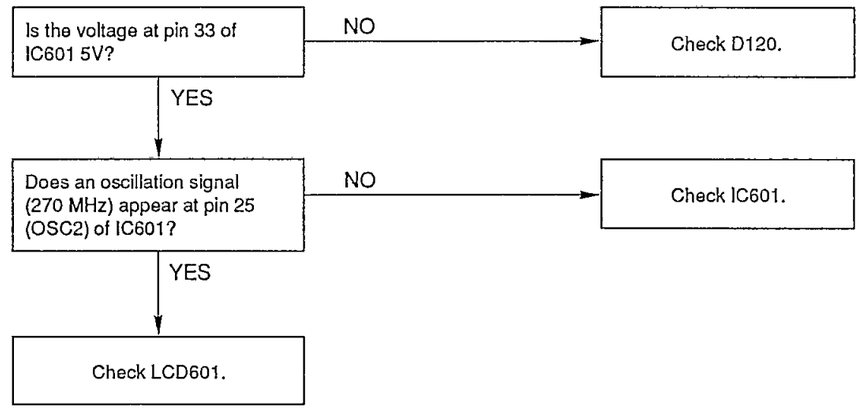


TROUBLESHOOTING GUIDE

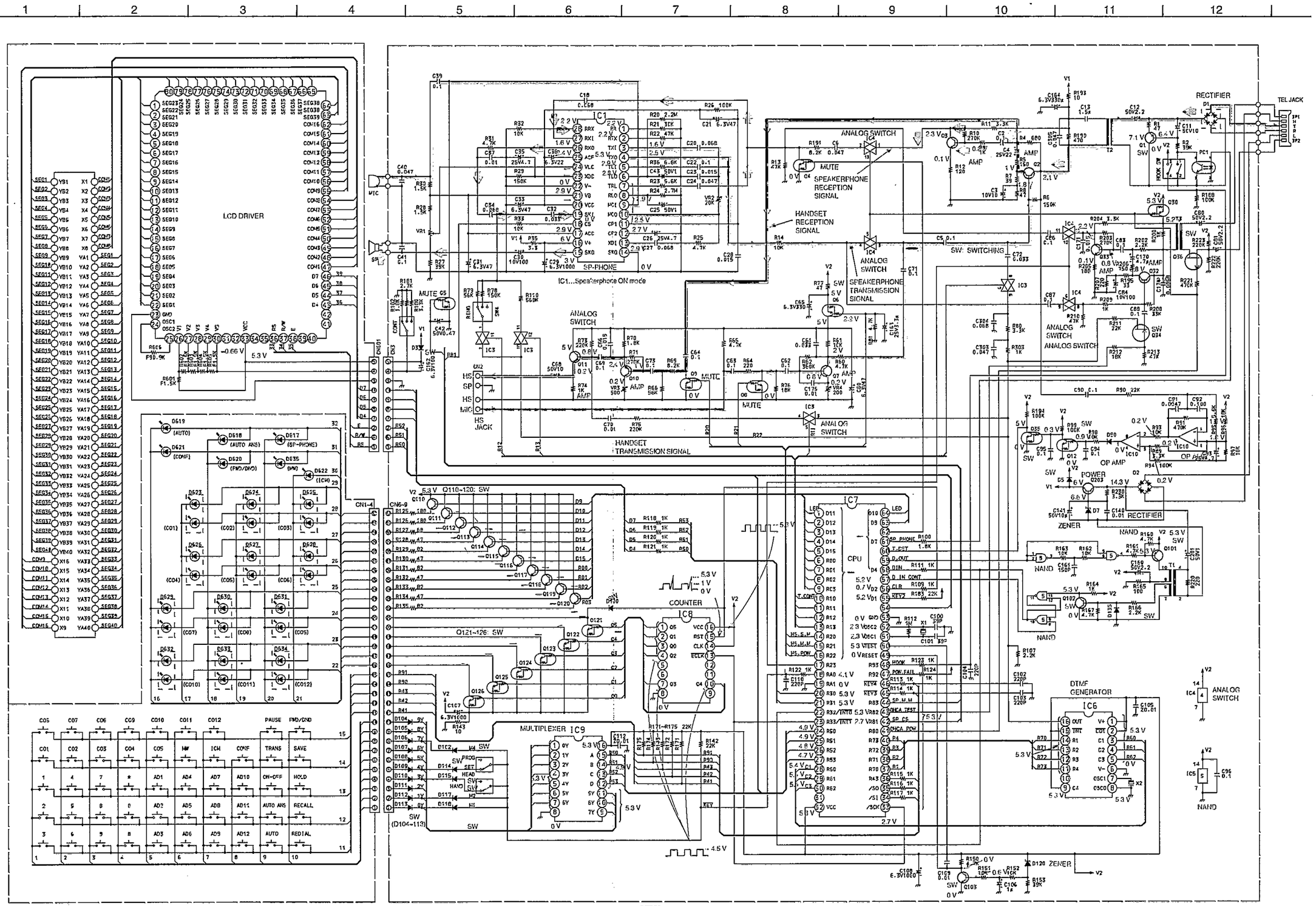
1) NO OPERATION



2) LCD DOES NOT OPERATE

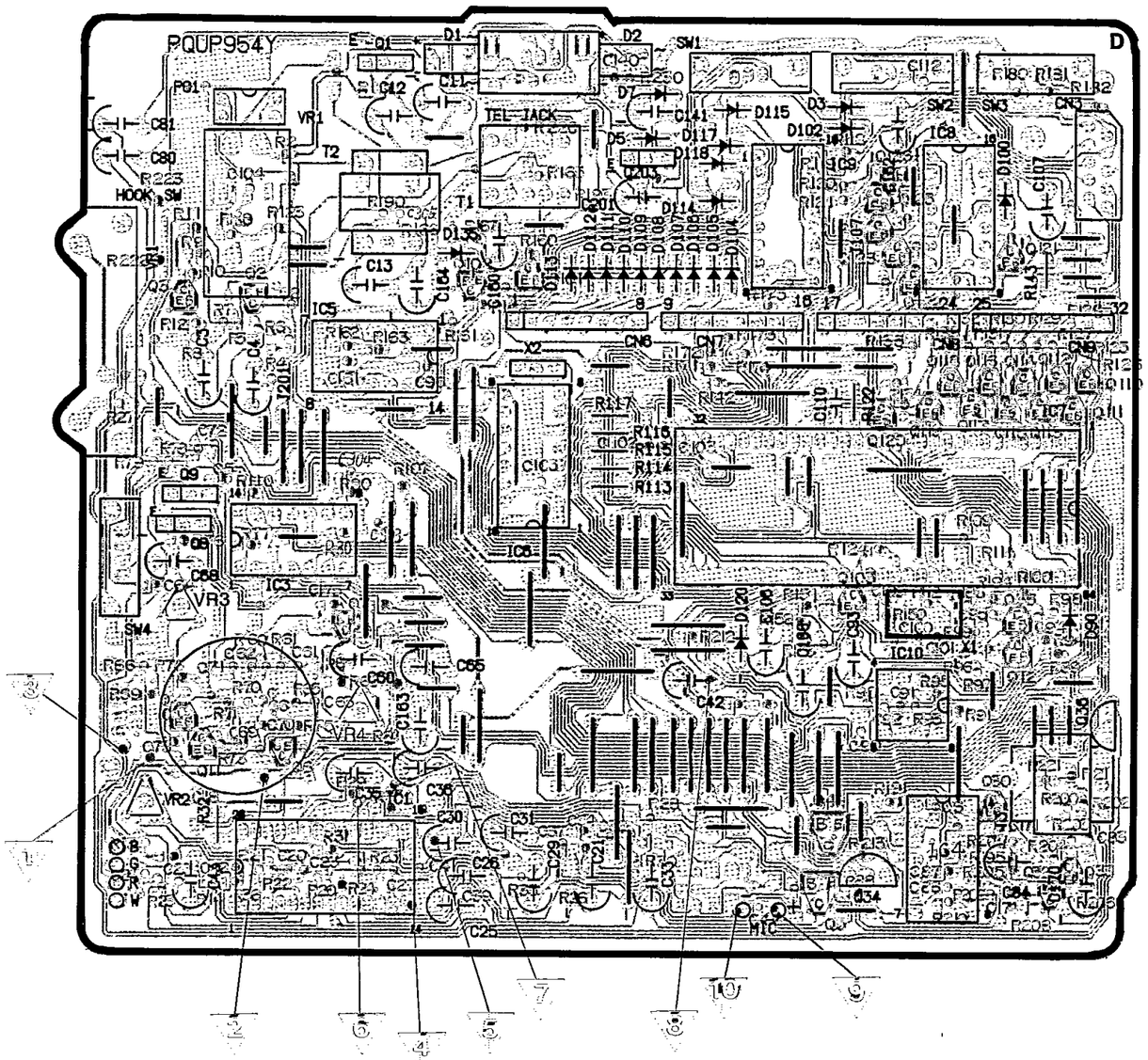


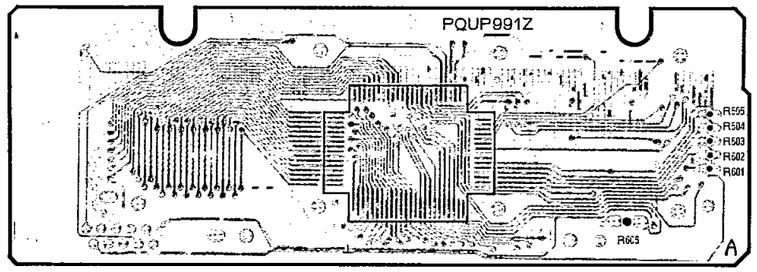
SCHEMATIC DIAGRAM

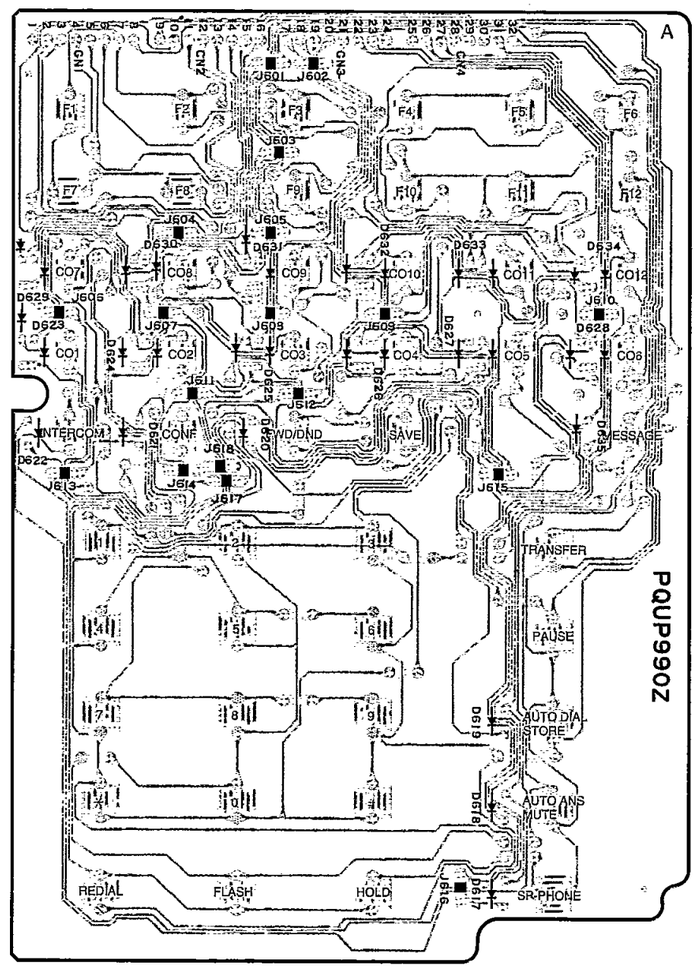


PRINTED CIRCUIT BOARD

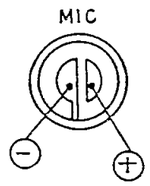
COMPONENT VIEW







MIC



■ FOR SCHEMATIC DIAGRAM

Notes:

1. SW1: Memory switch in "SET" position.
2. SW2: Handset/Headset switch in "HANDSET" position.
3. SW3: Contrast selector switch in "H" position.
4. SW4: Ringer volume selector switch in "HIGH" position.
5. HOOK SW: Hook switch
5. S200: Dail switch. (Rubber switch)
7. DC voltage measurements are taken with electronic voltmeter or oscilloscope from ground.
   (Off-Hook condition
   IC1 ...Speakerphone ON condition)
8. This schematic diagram may be modified at any time with the development of new technology.

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

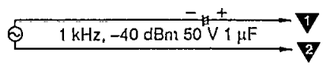
ADJUSTMENT

Perform the following adjustment after replacing IC1 and VR2–VR4.

Teset Equipment:
Loop Simulator
RC Oscillator
VTVM
DC Power Supply

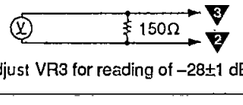
Preparation:
1. Set unit's controls as follows:
   A. SP-PHONE SWITCH..."ON"
   B. VOLUME CONTROL..."MAX"
2. Set the variable resistor of the Loop Simulator to maximum resistance (fully counterclockwise.)
3. Connect the unit to the Loop Simulator.
4. Make adjustment in a quiet room.

Transmission Level Adjustment (for Handset)
1. Set the Loop Simulator selector switch to "TX".
2. Connect the Oscillator to Test Point ▼1(+)–▼2(–), as shown below.
3. Set RC Oscillator to 1 kHz, –40 dBm.



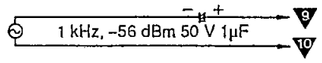
4. Connect the VTVM.
5. Adjust VR4 for a reading of –9±1 dBm, on the VTVM.

Reception Level Adjustment (for Handset)
1. Set the Loop Simulator selector switch to "RX".
2. Apply the 1 kHz, –20 dBm for the Oscillator.
3. Connect the resistor 150Ω to the test point ▼3–▼2, and connect the VTVM to the both ends.



4. Adjust VR3 for reading of –28±1 dBm, on the VTVM.

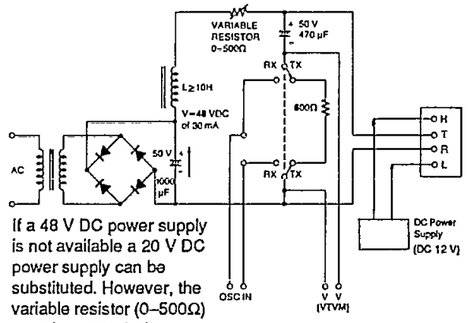
Transmission Level Adjustment (for Speakerphone)
1. Connect the test points ▼4 – ▼5 and ▼6 – ▼7.
2. Set the Loop Simulator selector switch to "TX".
3. Connect the test point ▼4 – ▼8.
4. Connect the RC Oscillator to Test Point ▼9(+)–▼10(–), and connect an electrolytic capacitor (50 V, 1 μF) as shown below.
5. Set RC Oscillator to 1 kHz, 56 dBm.



6. Connect the VTVM to test point ▼10 — ▼9.
7. Adjust VR2 for a reading of –17±0.5 dBm, on the VTVM.
8. Disconnect the test point ▼4 – ▼5, ▼6 – ▼7, and ▼4 – ▼8.

Please refer to Printed Circuit Board which is located test points (▼).

Schematic Diagram of Loop Simulator



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

Fig. 12

EXTENSION CORD CONNECTING METHOD

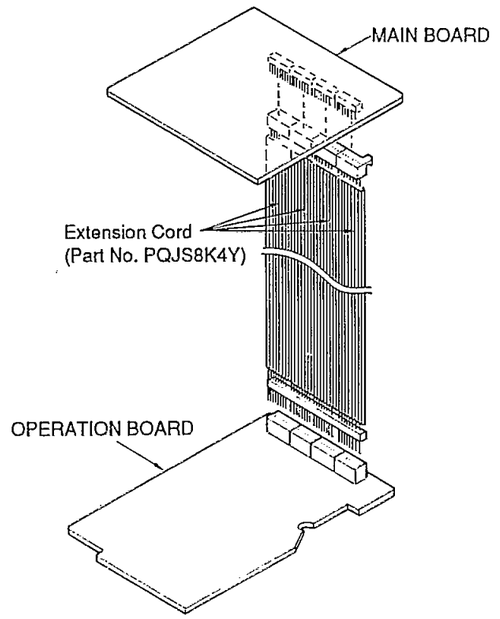
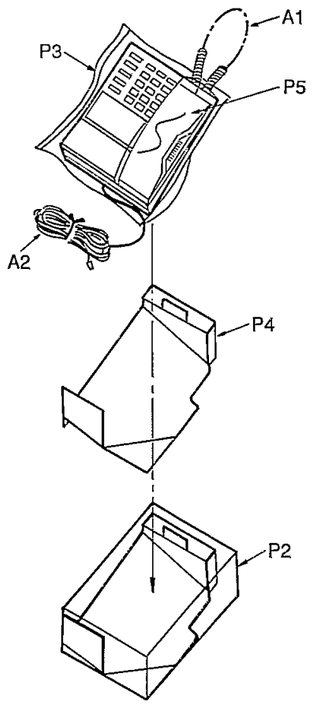


Fig. 13

ACCESSORIES AND PACKING MATERIALS



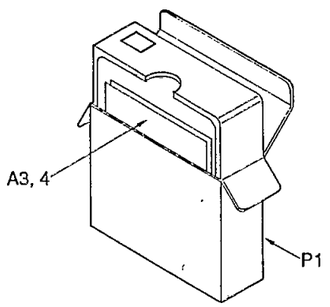
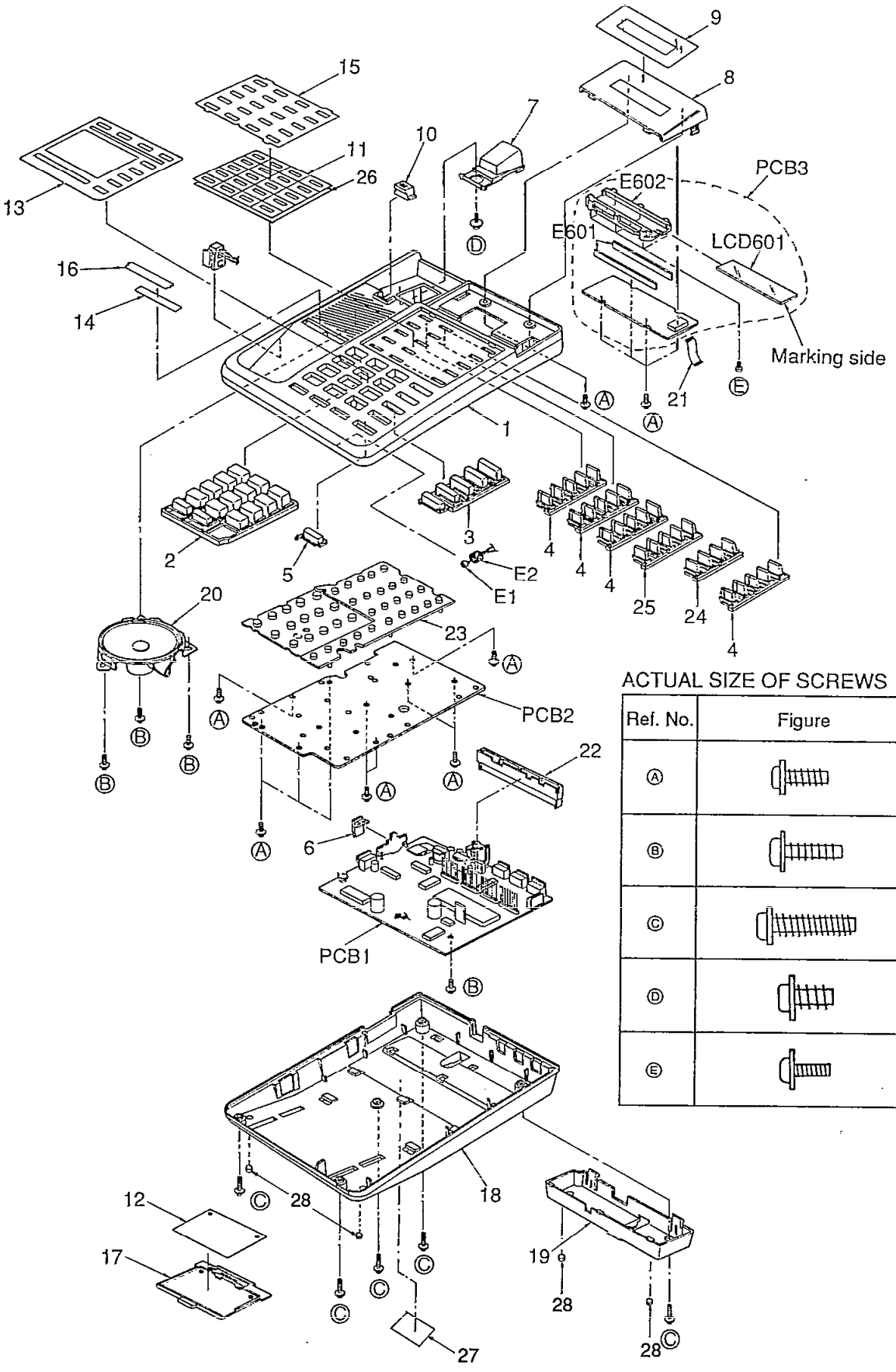


Fig. 14

CABINET AND ELECTRICAL PARTS LOCATION



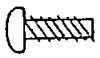
ACTUAL SIZE OF SCREWS

Ref. No.	Figure	Part No.
Ⓐ		XTW26+S8F
Ⓑ		XTW3+S10P
Ⓒ		XTW3+S14P
Ⓓ		XTW3+W6F
Ⓔ		XTW23+8F

Fig. 15

HANDSET PARTS LOCATION

ACTUAL SIZE OF SCREWS

Ref. No.	Figure	Part No.
Ⓐ		XTN3+10G
Ⓑ		XTW3+W8P

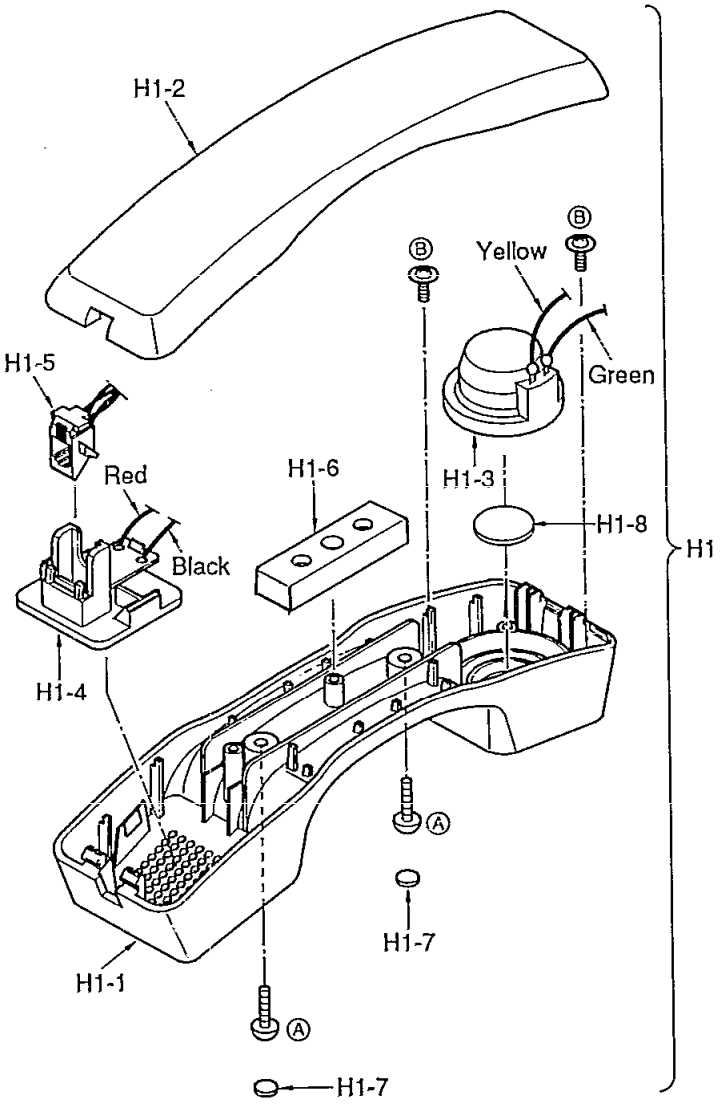


Fig. 16

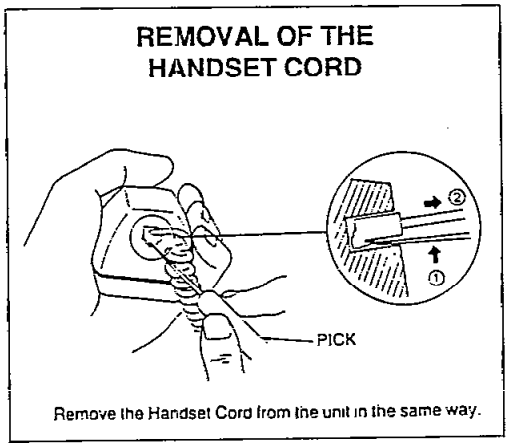


Fig. 17

REPLACEMENT PARTS LIST

Model KX-T7130E

Notes:
1. The marking (RTL) indicates that the Retention Time is limited for this item. After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependant 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. The S mark indicates service standard parts and may differ from production parts.
3. 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.
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 : Polyster
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 AND ELECTRICAL PARTS		
1	PQKM209W81	UPPER CABINET		1
2	PQBCX198Z1	BUTTON, DIAL/REDIAL/FLASH		1
3	PQBCX199Z1	BUTTON, TRANS/PAUSE/AUTO etc.		1
4	PQBCX215Z1	BUTTON, MEMORY-A		4
5	PQBC282Z	BUTTON, HOLD		1
6	PQBD166X1	KNOB, VOLUME		1
7	PQBE37Z1	BUTTON, HOOK		1
8	PQGG91Y	GRILLE		1
9	PQGP130W	LCD PANEL		1
10	PQKE82Z1	HANGER		1
11	PQGD10019Y1	TEL. NO. CARD (LARGE)		1
12	PQHP5107Z	MEMORY CARD		1
13	PQGD10006W	OVERLAY		1
14	PQHP532X	TEL. NO. CARD (SMALL)		1
15	PQHR5393Y	TRANSPARENT PLATE [TEL. NO. CARD (LARGE)]		1
16	PQHR576Z	TRANSPARENT PLATE [TEL. NO. CARD (SMALL)]		1
17	PQHR9565Y1	COVER, MEMORY CARD		1
18	PQKF189Y81	LOWER CABINET ASS'Y		1
19	PQKL37Z81	STAND ASS'Y		1
20	PQAS65P06V	SPEAKER		1
21	PQJE115Z	FLAT CABLE		1
22	PQHR9597Z	SPACER		1
23	PQSE119Z	KEY SWITCH		1
24	PQBCX216Y1	BUTTON, MEMORY-B		1
25	PQBCX216Z1	BUTTON, MEMORY-C		1
26	PQGD10019Z1	TEL. NO. CARD (LARGE)(WITH CO)		1
27	PQGT10296Z	NAME PLATE	⚠	1
28	PQHG316Z	FOOT RUBBER		4
		HANDSET PARTS		
H1	PQJX2PSL05Z	HANDSET ASSEMBLY	⚠	1
H1-1	PQKM211P81	LOWER CABINET		1
H1-2	PQKF192Y81	UPPER CABINET		1
H1-3	PQAX4P03Y	SPEAKER		1
H1-4	PQWMJ2PYL02Y	MICROPHONE ASS'Y		1
H1-5	PQJJ1TB17X	JACK	S	1
H1-6	PQHM67Z	WEIGHT		1
H1-7	PQHG695W	RUBBER PARTS, CAP		2
H1-8	PQHS277Z	FELT PART		1

Ref. No.	Part No.	Part Name & Description		Pcs
		ACCESSORIES AND PACKING MATERIALS		
A1	PQWAT7020EUK	HANDSET CORD		1
A2	PQJA87T	TELEPHONE CORD	⚠	1
A3	PQQX10149Y	INSTRUCTION BOOK	⚠	1
A4	PQQW10534Z	LEAFLET		1
P1	PQPK10235Z	GIFT BOX		1
P2	PQPN10124Z	CUSHION		1
P3	XZB30X25A01	PROTECTION COVER (FOR UNIT)		1
P4	PQPN10125Z	ACCESSORY BOX		1
P5	PQPH75Z	PROTECTION COVER (FOR HANDSET)		1
		MAIN BOARD PARTS		
PCB1	PQWP1T7130EU	MAIN BOARD ASS'Y (RTL)		1
		(ICs)		
IC1	PQVISC77655S	IC		1
IC2	Not Used			
IC3,4	PQVITC4066BP	IC	S	2
IC5	PQVITC4011BP	IC	S	1
IC6	PQVITP5089N	IC		1
IC7	PQVI4046SA92	IC		1
IC8	PQVITC4017BP	IC	S	1
IC9	PQVITC7H42P	IC	S	1
IC10	PQVIUPC358C	IC	S	1
		(TRANSISTORS)		
Q1	2SA1626	TRANSISTOR(SI)	S	1
Q2,3	2SD1819A	TRANSISTOR(SI)	S	2
Q4,5	PQVTFB1J3P	TRANSISTOR(SI)		2
Q6	PQVTDTA143XU	TRANSISTOR(SI)		1
Q7	2SD1819A	TRANSISTOR(SI)	S	1
Q8,9	PQVTBB1J3P	TRANSISTOR(SI)		2
Q10,11	2SD1819A	TRANSISTOR(SI)	S	2
Q12	PQVTDTC143E	TRANSISTOR(SI)		1
Q30	PQVTDTA143XU	TRANSISTOR(SI)		1
Q32,33	2SD1819A	TRANSISTOR(SI)	S	2
Q34	2SK117	TRANSISTOR(SI)		1
Q35	UN5213	TRANSISTOR(SI)	S	1
Q36	2SJ103	TRANSISTOR(SI)		1
Q101	2SB1216A	TRANSISTOR(SI)	S	1
Q102,103	2SD1819A	TRANSISTOR(SI)	S	2
Q110-120	2SD1819A	TRANSISTOR(SI)	S	11
Q121	PQVTDTC123E	TRANSISTOR(SI)		1
Q122-126	PQVTDTC143E	TRANSISTOR(SI)		5
Q203	2SD2136	TRANSISTOR(SI)		1
		(DIODES)		
D1,2	PQVDS1YB40F1	DIODE(SI)		2
D3	1SS131	DIODE(SI)		1
D4	Not Used			
D5	1SS131	DIODE(SI)		1
D6	Not Used			
D7	MA4068	DIODE(SI)		1
D90	1SS131	DIODE(SI)		1
D100	1SS131	DIODE(SI)		1
D101	Not Used			
D102,104-115 ,	1SS131	DIODE(SI)		13
D117,118	1SS131	DIODE(SI)		2
D120	MA4039	DIODE(SI)		1
D135	1SS131	DIODE(SI)		1
		(PHOTO ELECTRIC TRANSDUCER)		
PC1	PQVITLP627	PHOTO COUPLER	S	1
		(SWITCHES)		
SW1	PQSS2A27Y	SWITCH, MEMORY		1
SW2	PQSS2A27Y	SWITCH, HANDSET/HEADSET		1
SW3	PQSS3A17Y	SWITCH, CONTRAST		1
SW4	PQSS3A17Y	SWITCH, RINGER		1
HOOK SW	ESE14A211	SWITCH, HOOK		1

Ref. No.	Part No.	Part Name & Description		Pcs
		(TRANSFORMERS)		
T1	ETE13K24AY	PULSE TRANSFORMER		1
T2,3	PQLT8D2A	COMMUNICATION TRANSFORMER	S	2
		(VARIABLE RESISTORS)		
VR1	PQVAL204B24A	VOLUME CONTROL, 20kΩ (B)	S	1
VR2	PQNB3A00B24M	SEMI-FIXED, 20kΩ (B)	S	1
VR3	PQNB3A00B52M	SEMI-FIXED, 500Ω (B)	S	1
VR4	PQNB3A00B22M	SEMI-FIXED, 200Ω (B)	S	1
		(CRYSTAL OSCILLATOR & CERAMIC FILTER)		
X1	PQVCX2500N9	CRYSTAL OSCILLATOR		1
X2	PQVBT3.58G7	CERAMIC FILTER		1
		(CAPACITORS)		
C1	Not Used			
C2	PQCUV1E104MD	0.1		1
C3	ECEA1HKS100	10	S	1
C4	ECEA0JKS220	22		1
C5	PQCUV1E104MD	0.1		1
C6	PQCUV1E473MD	0.047		1
C7	Not Used			
C8	Not Used			
C9	Not Used			
C10	Not Used			
C11	ECEA1HKS100	10		1
C12	ECEA2CU2R2	2.2		1
C13	ECQV1H155JL3	1.5		1
C14	Not Used			
C15	Not Used			
C16	Not Used			
C17	Not Used			
C18	ECUV1H683MD	0.068	S	1
C19	Not Used			
C20	PQCUV1C683MD	0.068		1
C21	ECEA1CKS470	47	S	1
C22	PQCUV1E104MD	0.1		1
C23	PQCUV1H153KB	0.015		1
C24	PQCUV1E473MD	0.047		1
C25	ECEA1HKS010	1		1
C26	ECEA1HKS4R7	4.7	S	1
C27	PQCUV1C683MD	0.068		1
C28	PQCUV1H153KB	0.015		1
C29	ECEA0JU102	1000		1
C30	ECEA1CK101	100	S	1
C31	ECEA1CKS470	47	S	1
C32	PQCUV1H333JC	0.033		1
C33	ECEA1CKS470	47	S	1
C34	PQCUV1C683MD	0.068		1
C35	ECEA1HKS4R7	4.7	S	1
C36	ECEA0JKS220	22		1
C37	PQCUV1H103KB	0.01		1
C39	PQCUV1E104MD	0.1		1
C40	PQCUV1E473MD	0.047		1
C41	ECUV1H104MD	0.1	S	1
C42	ECEA1HKSR47	0.47		1
C43	ECEA1HKS010	1		1
C60	ECEA1CKS470	47	S	1
C61	PQCUV1H333JC	0.033		1
C62	PQCUV1E104MD	0.1		1
C63	PQCUV1E104MD	0.1		1
C64	PQCUV1E104MD	0.1		1
C65	ECEA0JU331	330		1
C66	PQCUV1H153KB	0.015		1
C67	Not Used			
C68	ECEA1HKS100	10		1
C69	PQCUV1E104MD	0.1		1
C70	PQCUV1H103KB	0.01		1
C71	PQCUV1E104MD	0.1		1
C72	PQCUV1E333MD	0.033		1
C73	PQCUV1E104MD	0.1		1
C80	ECEA1HKS2R2	2.2		1
C81	ECEA1HKS2R2	2.2		1
C82	Not Used			
C83	PQCUV1E104MD	0.1		1
C84	ECEA1CK101	100	S	1
C85	Not Used			

Ref. No.	Part No.	Part Name & Description (Value)		Pcs
C86	PQCUV1E104MD	0.1		1
C87	PQCUV1E104MD	0.1		1
C88	PQCUV1E104MD	0.1		1
C90	PQCUV1E104MD	0.1		1
C91	PQCUV1H472KB	0.0047		1
C92	PQCUV1E104MD	0.1		1
C93	ECEA1HKS4R7	4.7	S	1
C94	PQCUV1E104MD	0.1		1
C95	PQCUV1E104MD	0.1		1
C96	PQCUV1E104MD	0.1		1
C97	Not Used			
C98	Not Used			
C99	Not Used			
C100	PQCUV1H390JC	39P		1
C101	PQCUV1H390JC	39P		1
C102	PQCUV1H221JC	220P		1
C103	PQCUV1H221JC	220P		1
C104	PQCUV1H221JC	220P		1
C105	PQCUV1H103KB	0.01		1
C106	ECEA1HKS010	1		1
C107	ECEA0JU102	1000		1
C108	ECEA0JU102	1000		1
C109	PQCUV1H103KB	0.01		1
C110	PQCBC1H221KB	220P		1
C111	Not Used			
C112	PQCUV1H103KB	0.01		1
C140	PQCUV1H103KB	0.01		1
C141	ECEA1HKS100	10		1
C160	ECEA1HKS2R2	2.2		1
C161	PQCUV1H151JC	150P		1
C162	ECEA1CK101	100	S	1
C163	ECEA1HKS3R3	3.3	S	1
C164	ECEA0JU331	330		1
C170	ECEA1HKS4R7	4.7		1
C171	PQCUV1H153KB	0.015		1
C172	Not Used			
C173	Not Used			
C174	PQCUV1H682KB	0.0068		1
C175	PQCUV1H103KB	0.01		1
C201	ECEA1HKS010	1		1
C303	PQCUV1E473MD	0.047		1
C304	PQCUV1C683MD	0.068		1
C305	PQCUV1E473MD	0.047		1
		(RESISTORS)		
R1	PQ4R10XJ470	47		1
R2	PQ4R10XJ393	39K		1
R3	Not Used			
R4	PQ4R10XJ681	680		1
R5	PQ4R10XJ151	150		1
R6	PQ4R10XJ154	150K		1
R7	PQ4R10XJ390	39		1
R8	PQ4R10XJ470	47		1
R9	PQ4R10XJ102	1K		1
R10	PQ4R10XJ274	270K		1
R11	PQ4R10XJ332	3.3K		1
R12	PQ4R10XJ121	120		1
R13	PQ4R10XJ473	47K		1
R14	PQ4R10XJ103	10K		1
R15	Not Used			
R16	Not Used			
R17	Not Used			
R18	Not Used			
R19	Not Used			
R20	PQ4R10XJ225	2.2M		1
R21	PQ4R10XJ303	30K		1
R22	PQ4R10XJ473	47K		1
R23	PQ4R10XJ562	5.6K		1
R24	PQ4R10XJ275	2.7M		1
R25	PQ4R10XJ472	4.7K		1
R26	PQ4R18XJ104	100K		1
R27	PQ4R18XJ393	39K		1
R28	PQ4R10XJ152	1.5K		1
R29	PQ4R10XJ154	150K		1
R30	PQ4R10XJ152	1.5K		1
R31	PQ4R10XJ472	4.7K		1

Ref. No.	Part No.	Part Name & Description (Value)	Pcs
R32	ERDS2TJ103	10K	1
R33	PQ4R10XJ103	10K	1
R34	Not Used		
R35	PQ4R18XJ3R3	3.3	1
R36	PQ4R10XJ682	6.8K	1
R60	PQ4R10XJ472	4.7K	1
R61	PQ4R10XJ103	10K	1
R62	PQ4R10XJ364	360K	1
R63	Not Used		
R64	PQ4R10XJ221	220	1
R65	PQ4R10XJ472	4.7K	1
R66	PQ4R10XJ563	56K	1
R67	Not Used		
R68	Not Used		
R69	PQ4R10XJ822	8.2K	1
R70	PQ4R10XJ182	1.8K	1
R71	PQ4R10XJ274	270K	1
R72	Not Used		
R73	PQ4R10XJ224	220K	1
R74	PQ4R10XJ102	1K	1
R75	PQ4R10XJ224	220K	1
R76	PQ4R10XJ183	18K	1
R77	PQ4R10XJ470	47	1
R78	PQ4R10XJ154	150K	1
R79	PQ4R10XJ563	56K	1
R80	PQ4R10XJ332	3.3K	1
R81	PQ4R10XJ472	4.7K	1
R89	PQ4R10XJ332	3.3K	1
R90	PQ4R10XJ223	22K	1
R91	PQ4R10XJ474	470K	1
R92	Not Used		
R93	PQ4R10XJ103	10K	1
R94	PQ4R10XJ104	100K	1
R95	PQ4R10XJ562	5.6K	1
R96	PQ4R10XJ183	18K	1
R97	PQ4R10XJ103	10K	1
R98	PQ4R10XJ103	10K	1
R99	PQ4R10XJ104	100K	1
R100	PQ4R10XJ182	1.8K	1
R101	Not Used		
R102	Not Used		
R103	Not Used		
R104	Not Used		
R105	Not Used		
R106	Not Used		
R107	PQ4R10XJ222	2.2K	1
R108	Not Used		
R109	PQ4R18XJ102	1K	1
R110	PQ4R10XJ564	560K	1
R111	PQ4R18XJ102	1K	1
R112	PQ4R10XJ105	1M	1
R113	ERDS2TJ102	1K	1
R114	ERDS2TJ102	1K	1
R115	ERDS2TJ102	1K	1
R116	ERDS2TJ102	1K	1
R117	ERDS2TJ102	1K	1
R118	PQ4R10XJ102	1K	1
R119	PQ4R10XJ102	1K	1
R120	PQ4R10XJ102	1K	1
R121	PQ4R10XJ102	1K	1
R122	ERDS2TJ102	1K	1
R123	PQ4R10XJ102	1K	1
R124	PQ4R10XJ102	1K	1
R125	PQ4R10XJ181	180	1
R126	PQ4R10XJ181	180	1
R127	PQ4R10XJ680	68	1
R128	PQ4R10XJ330	33	1
R129	PQ4R10XJ820	82	1
R130	PQ4R10XJ330	33	1
R131	PQ4R10XJ820	82	1
R132	PQ4R10XJ330	33	1
R133	PQ4R10XJ820	82	1
R134	PQ4R10XJ330	33	1
R135	PQ4R10XJ820	82	1
R136	Not Used		
R137	Not Used		
R138	Not Used		
R139	Not Used		
R140	Not Used		
R141	Not Used		
R142	PQ4R10XJ223	22K	1

Ref. No.	Part No.	Part Name & Description	Pcs
R143	ERDS2TJ100	10	1
R144	Not Used		
R145	Not Used		
R146	Not Used		
R147	Not Used		
R148	Not Used		
R149	Not Used		
R150	PQ4R10XJ472	4.7K	1
R151	PQ4R10XJ103	10K	1
R152	PQ4R10XJ103	10K	1
R153	PQ4R10XJ392	3.9K	1
R154	Not Used		
R155	Not Used		
R156	Not Used		
R157	Not Used		
R158	Not Used		
R159	Not Used		
R160	PQ4R10XJ472	4.7K	1
R161	PQ4R10XJ472	4.7K	1
R162	PQ4R10XJ103	10K	1
R163	PQ4R10XJ103	10K	1
R164	PQ4R10XJ102	1K	1
R165	PQ4R10XJ101	100	1
R166	PQ4R10XJ222	2.2K	1
R167	PQ4R10XJ472	4.7K	1
R168	Not Used		
R169	Not Used		
R170	Not Used		
R171	PQ4R10XJ223	22k	1
R172	PQ4R10XJ223	22k	1
R173	PQ4R10XJ223	22k	1
R174	PQ4R10XJ223	22k	1
R175	PQ4R10XJ223	22k	1
R176	Not Used		
R177	Not Used		
R178	Not Used		
R179	Not Used		
R180	PQ4R10XJ332	3.3K	1
R181	PQ4R10XJ272	2.7K	1
R182	PQ4R10XJ182	1.8K	1
R183	PQ4R10XJ223	22K	1
R184	Not Used		
R185	Not Used		
R186	Not Used		
R187	Not Used		
R188	PQ4R10XJ104	100K	1
R189	Not Used		
R190	PQ4R10XJ471	470	1
R191	PQ4R10XJ822	8.2K	1
R192	Not Used		
R193	PQ4R10XJ100	10	1
R194	PQ4R10XJ104	100K	1
R195	PQ4R10XJ330	33	1
R200	PQ4R10XJ102	1K	1
R201	Not Used		
R202	PQ4R10XJ222	2.2K	1
R203	PQ4R10XJ274	270K	1
R204	PQ4R10XJ332	3.3K	1
R205	PQ4R10XJ181	180	1
R206	PQ4R10XJ151	150	1
R207	PQ4R10XJ221	220	1
R208	PQ4R10XJ333	33K	1
R209	PQ4R10XJ102	1K	1
R210	PQ4R10XJ473	47K	1
R211	PQ4R10XJ223	22K	1
R212	PQ4R10XJ183	18K	1
R213	PQ4R10XJ473	47K	1
R220	PQ4R10XJ221	220	1
R221	PQ4R10XJ474	470K	1
R222	PQ4R10XJ224	220K	1
R223	PQ4R10XJ224	220K	1
R230	PQ4R10XJ332	3.3K	1
R303	PQ4R10XJ102	1K	1

Ref. No.	Part No.	Part Name & Description		Pcs
		(CONNECTORS & JACKS)		
CN3	PQJS10X54Z	CONNECTOR, 10P		1
CN6-9	PQJP8D113Z	CONNECTOR, 8P		4
HS	PQJJ1TB2T	JACK, HANDSET	S	1
JACK				
TEL	PQJJ1TC5Z	JACK, EMSS		1
JACK				
		(OTHERS)		
E1	RJM142Z	MICROPHONE	S	1
E2	PQHG503Z	RUBBER PARTS, MIC COVER		1
		OPERATION BOARD PARTS		
PCB2	PQWP2T7130EU	OPERATION BOARD ASS'Y (RTL)		1
		(DIODES)		
D617-621	LN1261C	LED		5
D622	LN1361C	LED		1
D623-634	LN2162C13TR	LED		12
D635	LN1261C	LED		1
		(CONNECTOR)		
CN1-4	PQJS8B30Z	CONNECTOR, 8P		4
		LCD BOARD PARTS		
PCB3	PQWP3T7130EU	LCD BOARD ASS'Y (RTL)		1
		(IC)		
IC601	PQVIHD44780	IC		1
		(RESISTORS)		
R601	PQ4R10XJ152	1.5K		1
R602	PQ4R10XJ152	1.5K		1
R603	PQ4R10XJ152	1.5K		1
R604	PQ4R10XJ152	1.5K		1
R605	PQ4R10XJ152	1.5K		1
R606	PQ4R18XF9092	90.9K		1
		(OTHERS)		
LCD601	PQADLF7192G6	LIQUID CRYSTAL DISPLAY	S	1
CN601	PQJS10X53Z	CONNECTOR,10P		1
E601	PQSE121Z	CONNECTOR, LCD		2
E602	PQHR9567Z	GUIDE, LCD		1

MEMO

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