VHF FM TRANCEIVER

TK-240

SERVICE MANUAL

KENWOOD

B51-8055-00 (A) 1452

CONTENTS

GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication data. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts: components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

PERSONNEL SAFETY

The following precautions are recommended for personnel safety:

- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- This equipment should be serviced by a qualified technician only.

SERVICE

This radio is designed for easy servicing. Refer to the schematic diagrams, prited circuit board views, and alignment procedures contained within.

NOTE

WE CANNOT guarantee oscillator stability when using channel elements manufactured by other than KENWOOD or its authorized agents.

TK-240

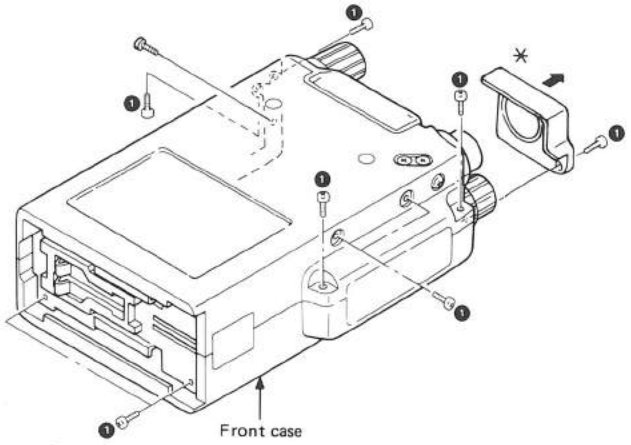
Version	Frequency range	Remark	CTCSS	DTMF	2-TONE	Battery	Charger
K	150 ~ 174MHz	IF1 34.4MHz LOC 34.855MHz	○	OP	OP	OP	OP
K2	136~ 150MHz	IF1 30.825MHz LOC 30.370MHz	↑	↑	↑	↑	↑
P	150~ 174MHz	IF1 34.4MHz LOC 34.855MHz	↑	↑	↑	○	↑
P2	138 ~ 150MHz	IF1 30.825MHz LOC 30.370MHz	↑	↑	↑	↑	↑
M	146 ~ 174MHz	IF1 34.4MHz LOC 34.855MHz	OP	↑	–	↑	↑
M2	136 ~ 150MHz	IF1 30.825MHz LOC 30.370MHz	↑	↑	–	↑	↑
*	136~ 150MHz	IF1 30.825MHz LOC 30.370MHz	↑	↑	–	↑	↑
*	150 ~ 174MHz	IF1 34.4MHz LOC 34.855MHz	↑	↑	–	↑	↑

Asterisk (*) indicates the special version.

DISASSEMBLY FOR REPAIR

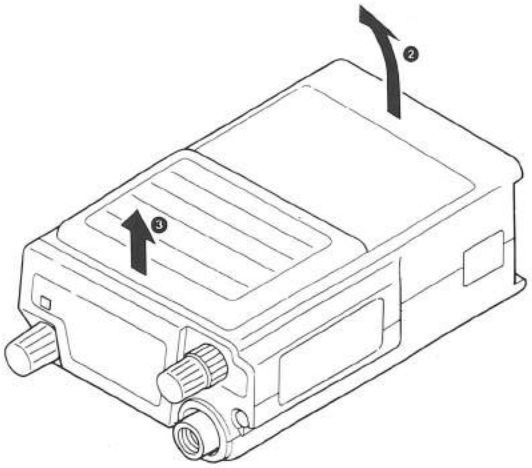
1. Removing the Case

1) Remove the screws from the front-case side of the bottom plate, as well as the screws from both sides of the front and rear cases ①.
Remove the packing of the ANT connector (*)



2) Raise the bottom plate ② and detach the panel side ③ of the front case by pulling it up.

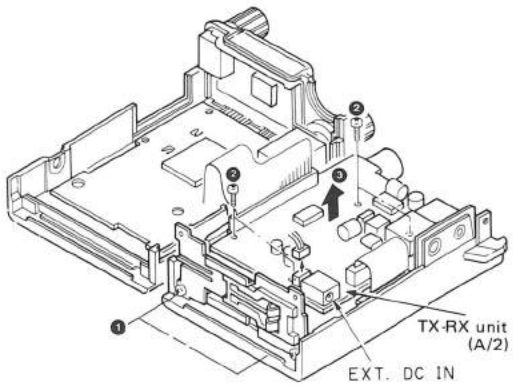
Note: Use care when pulling ③ so the FPC cable in the front case is not cut.



2. Removing the TX/RX Unit (A/2)

1) For the TK-240, remove the two screws clamping the bottom plate ①.
2) Remove the four screws ② clamping the TX/RX unit (A/2).
3) Raise the TX/RX unit (A/2) until it is off the rear case ③.

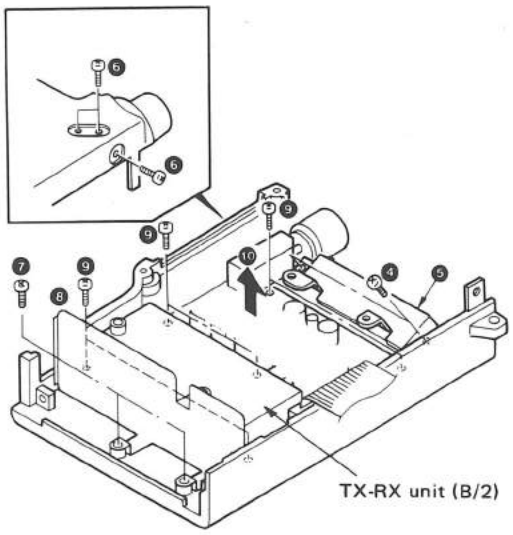
Note: The control unit and TX/RX unit (A/2, B/2) can be checked by connecting an external power supply to EXT DC IN without unplugging the FPC cable.



DISASSEMBLY FOR REPAIR

3. Removing the TX/RX Unit (B/2)

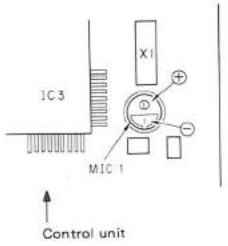
1) Remove the two screws ④ clamping the power module and remove the shield case ⑤. Now the power module can be replaced by unsoldering its lead wire.
2) Locate the three screws ⑥ clamping the ANT connector. Remove them from the rear case.
3) Remove the six screws ⑨ clamping the TX/RX unit (B/2) and pull out B/2.
4) Remove the two screws ⑦ clamping the shield plate and remove the shield plate ⑧.



4. Removing the Control Block

1) Removing the condenser microphone (MIC 1) only
   - The condenser microphone can be changed without removing the control unit.
   - Unsolder the FPC. Raise the FPC and pull out the microphone unit alone in the upward direction.

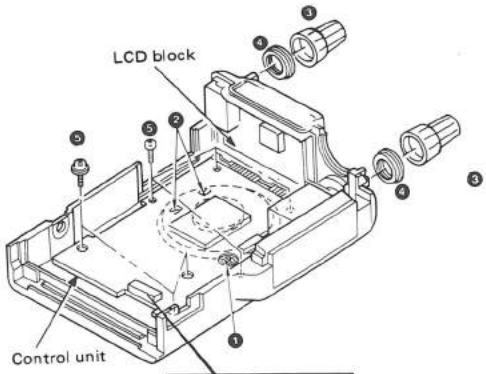
Note: Polarity of condenser microphone
The condenser microphone should be installed to the polarity shown.

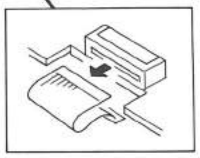


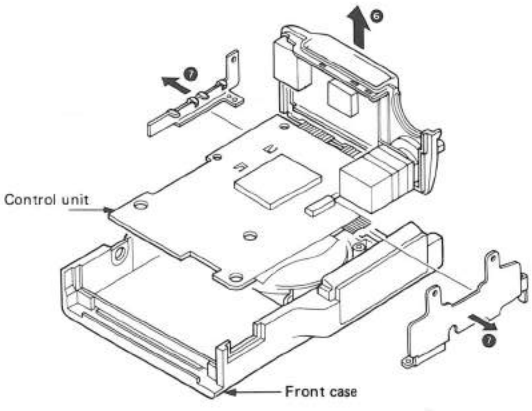
2) Removing the control unit

Note: Before removing the control unit (W02-1628-05), the two FPCs ② must be unsoldered off the speaker (SP1).

- When disassembling the LCD block as well, remove the knobs ③ and nuts ④ of the squelch and encoder.
- Remove the seven screws ⑤ clamping the control unit.
- Hold the front panel and pull up the control unit off the front case ⑥.
- Remove the control unit clamps ⑦.

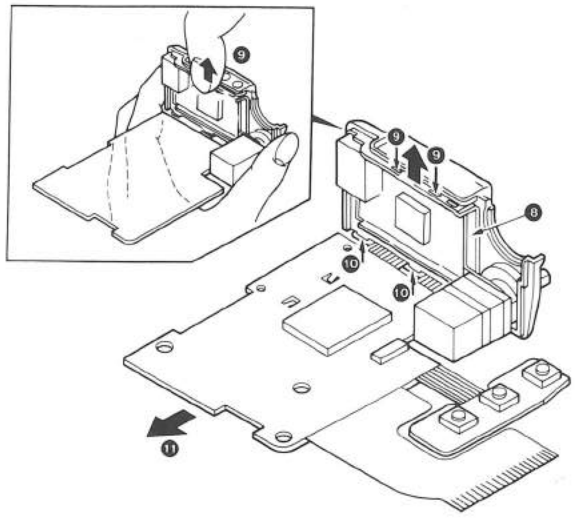




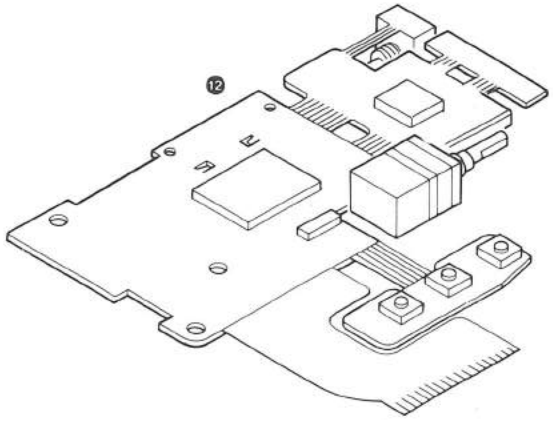


DISASSEMBLY FOR REPAIR

- When detaching the LCD block from the front panel, pull the edge of the front panel in the arrowed direction (➡) until the claw of the clamp ⑧ comes off the groove ⑨.
- Release the claws on the bottom of the front panel from the grooves ⑩.
- Free the clamp ⑧ and slowly slide the control unit ⑪ toward you until it comes off the front panel. (The FPC cable should not be exerted with undue force.)



- The figure below shows how the control unit looks after it is disassembled. ⑫



CIRCUIT DESCRIPTION

1. Frequency Configuration

The frequency configuration is shown in Table 1 and Figure 1.

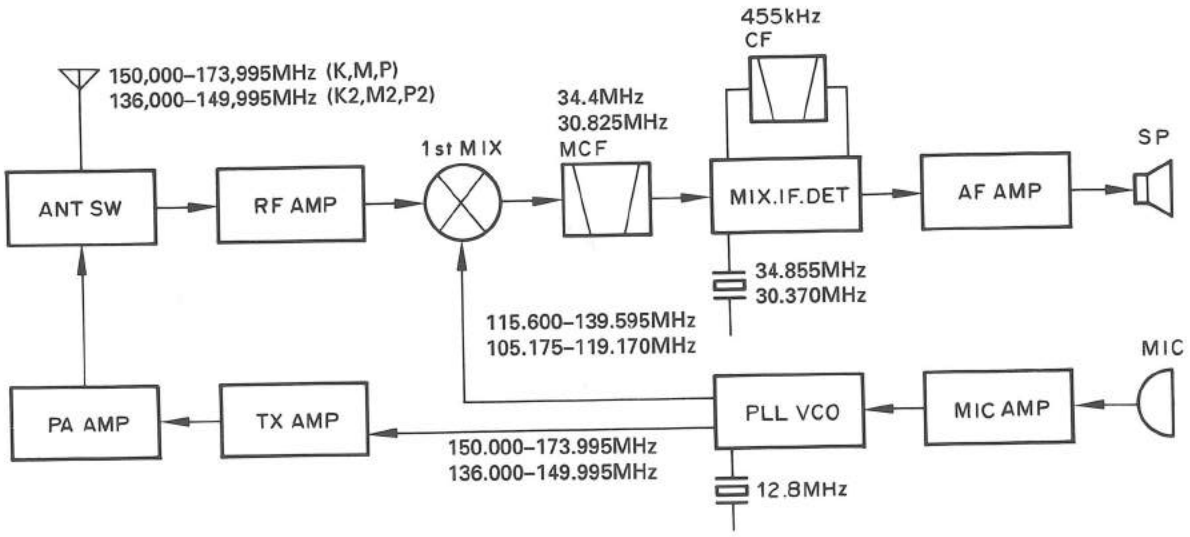


Fig. 1 Frequency configuration

Receiving System	Double conversion techniques	
	1st IF frequency	34.4 MHz (K, M, P) 30.825 MHz (K2, M2, P2)
	2nd frequency	455 kHz
Transmitting System	Direct frequency division	
Modulation	Reactance	

Table 1 Configuration

2. Receiver System

1) RF amplifier

Incoming signals from the antenna pass through a low-pass filter and the transmit/receive switching circuit and enter the RF amplifier section. The signals are amplified by RF amplifier, Q16.

Undesirable signals are removed by a bandpass filter that uses band shift system.

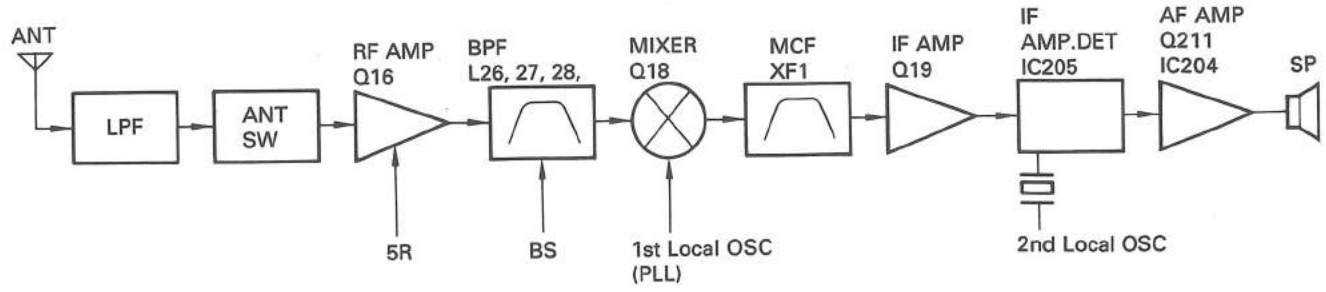


Fig. 2 RX section block diagram

2) First mixer

The signal is then mixed with the first local oscillator signal, from the PLL circuit, by Q18 to produce the first intermediate frequency (IF) signal.

Item	Rating
Nominal center frequency	30.825kHz
Pass band width	±7.5kHz or more at 3dB
Attenuation band width	±32kHz or less at 40dB
Ripple	1.5dB or less
Insertion loss	3dB or less
Guaranteed attenuation	60dB or more within ±1MHz (Spurious: 40dB or more)
Terminal impedance	1.4kΩ/±10%1pF±10%

L71-0263-05 (K2, M2, P2)

The first IF signal passes through a two stage monolithic crystal filter circuit (MCF) to further remove undesired signals.

Item	Rating
Nominal center frequency	34.4MHz
Pass band width	±7.5kHz or more at 3dB
Attenuation band width	±28kHz or less at 40dB
Ripple	1.5dB or less
Insertion loss	3dB or less
Guaranteed attenuation	60dB or more within ±1MHz (Spurious: 40dB or more)
Terminating impedance	800Ω/1.5pF

L71-0298-05 (K,P,M)

Table 2 MCF (TX-RX unit XFI)

3) IF amplifier

The first IF signal is amplified by Q19, and then enters IC205 (FM processing IC). Here the signal is mixed with the second local oscillator signal by IC205 to produce the second IF signal. The second IF signal passes through a ceramic filter to remove undesired signals, and is then reapplied to IC205 for farther amplification and demodulation.

Item	Rating
Nominal center frequency	455kHz
3dB band width	±7.0kHz or more
6dB band width	±10.0kHz or more
70dB bandwidth	±20.0kHz or less
Ripple	3dB or less (455kHz ±7kHz)
Guaranteed attenuation	70dB or more within f_0 ±100kHz
Spurious	40dB or more within 0.1 ~ 1MHz
Insertion loss	4dB or less
Terminal impedance	1.5kΩ

Table 3 Ceramic filter (L72-0373-05) (TX-RX unit CF201)

4) AF amplifier

The frequency characteristics of the detected FM audio signal are corrected by the de-emphasis circuit composed of R252 and C261 and active high-pass filter circuit Q211. The audio signal passes through the AF volume control and is amplified to the desired level by the power amplifier IC204.

5) Squelch and mute circuit

The output from the squelch circuit composed of IC205 and Q212 is applied to pin 12 of the microprocessor via the SC pin. The microprocessor controls the MUTE1 and MUTE2 lines according to the SC input logic and other functional conditions, in order to controls the audio.

The microprocessor also controls MUTE1, MUTE2 and the audio when the CTCSS operates.

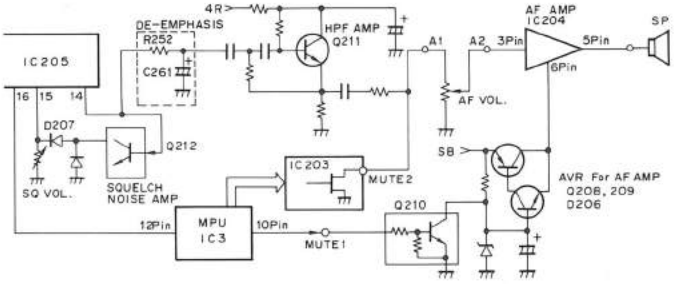


Fig. 3 AMP Squelch and Mute Circuit

Condition			MU1	MU2
TX			H	H
RX	Normal operation	When squelch ON	H	H
		When squelch OFF	L	L

Mute operation when "H"

Table 4 Mute Operating Conditions

3. Transmitter System

1) Microphone amplifier circuit

The signal from the microphone passes through a 6dB/oct pre-emphasis circuit composed of C216 and R209, and is then amplified and limited by IC201 (1/4). Distorted signals components outside the audio band are removed by the splatter filter composed of IC201 (2/4) and (3/4).

2) Modulation circuit

The output from the microphone amplifier passes through the microphone gain control VR201, and is applied to the VCO varactor diodes (D2 and D4).

3) Drive and final circuit

The desired transmit signal is generated directly by the VCO, and is amplified by buffer amplifiers Q3 and Q4 to approximately 0 dBm. The signal is further amplified to approximately 14 dBm by Q14 and Q15. The amplified signal passes through pin diode D13 for transmit output adjustment and enters the power module IC1. The power module is a two stage amplifiers and amplifier the power to about 5 W.

4) Transmit/receive switching circuit

The transmitter output passes through the transmit/receive switching circuit and low-pass filter, and is fed to the antenna. The transmit/receive switching circuit is composed of D14 and D15, which are both on in the transmit mode and off in the receive mode.

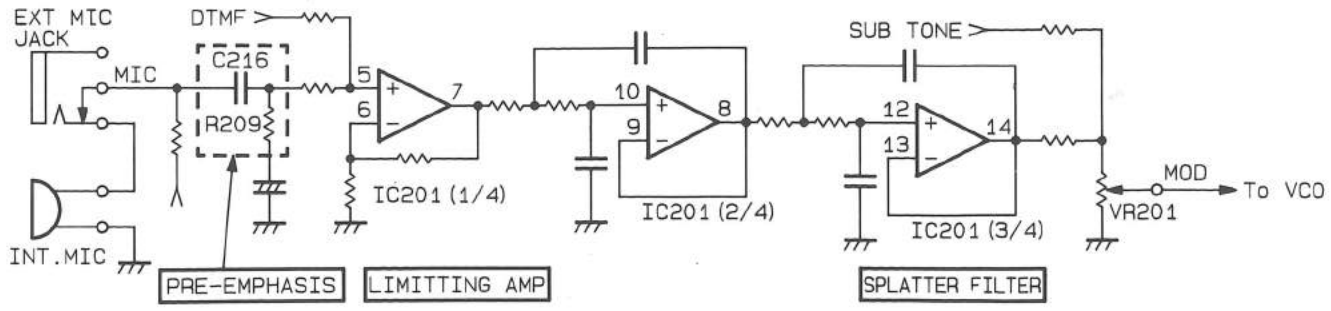


Fig. 4 MIC AMP CIRCUIT

CIRCUIT DESCRIPTION

5) APC circuit

The automatic power control (APC) circuit supplies stable transmission power. It works by detecting the collector current of the final unit of the power module.

The comparator (IC206) compares the transmit output adjustment reference voltage generated by zener diode (D208) and voltage divider VR204 with the detection voltage at R268 and R269 proportional to the collector voltage of the final module.

An APC voltage proportional to the difference between the reference voltage and the detection voltage appears at the output pin (pin 6) of IC206. The APC voltage controls the attenuation of diode D13 on the input side of the power module and keeps the transmitter output stable.

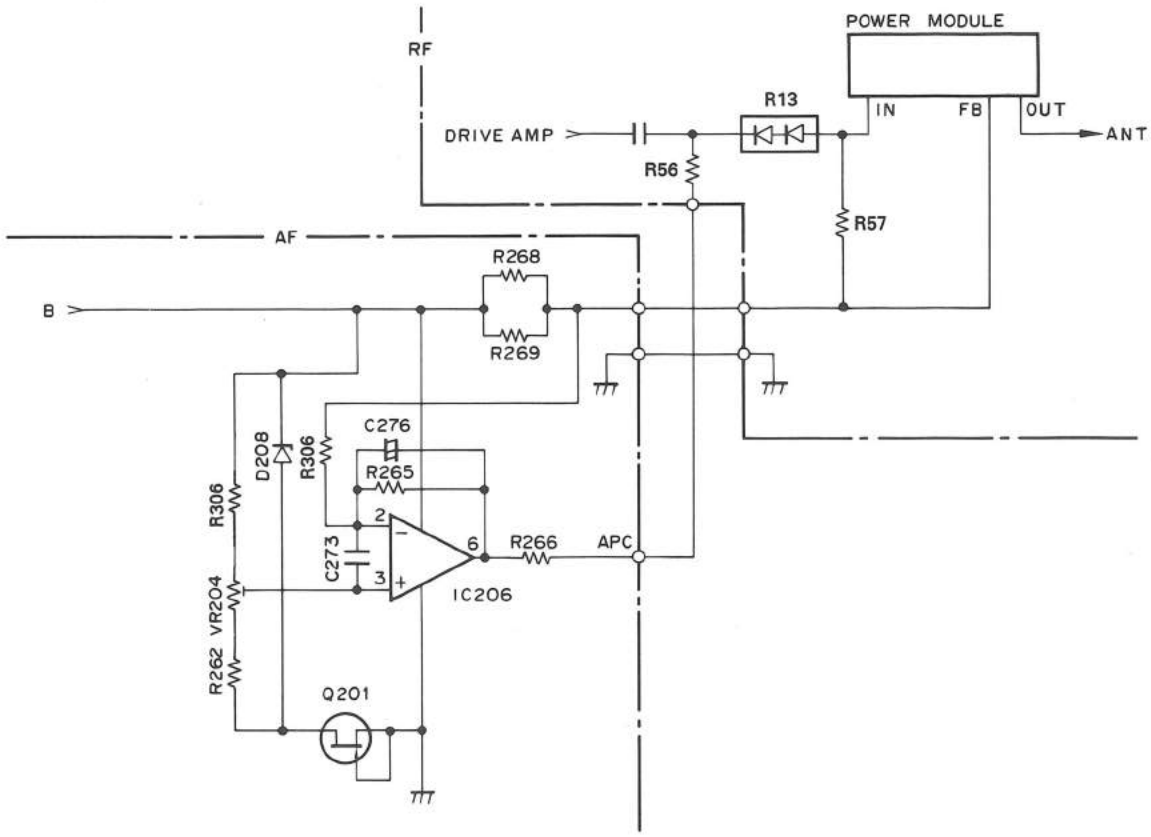


Fig. 5 APC Circuit and Transmitter output Switching Circuit

4. PLL Circuit

1) PLL

The minimum frequency step of the PLL circuit is 5kHz. The reference oscillator frequency of X1 (12.8MHz) is divided by IC1 to produce the 5kHz reference frequency. The comparison frequency is obtained by amplifying the VCO output by Q5 and then dividing it by the pulse-swallow PLL IC IC1.

The 5kHz step PLL is formed by comparing the reference frequency obtained by dividing X1 with the comparison frequency.

2) VCO

The transmit/receive frequency is directly generated by the Colpitts oscillation circuit containg FET, Q1 and Q2. The oscillation frequency is varied by applying the VCO control voltage to variable capacitors D3, D4, D6, and D7. To switch between the transmit and receive frequencies, Q10 turns on, and Q1 (VCO for transmission) oscillates when the T/R pin is low.

CIRCUIT DESCRIPTION

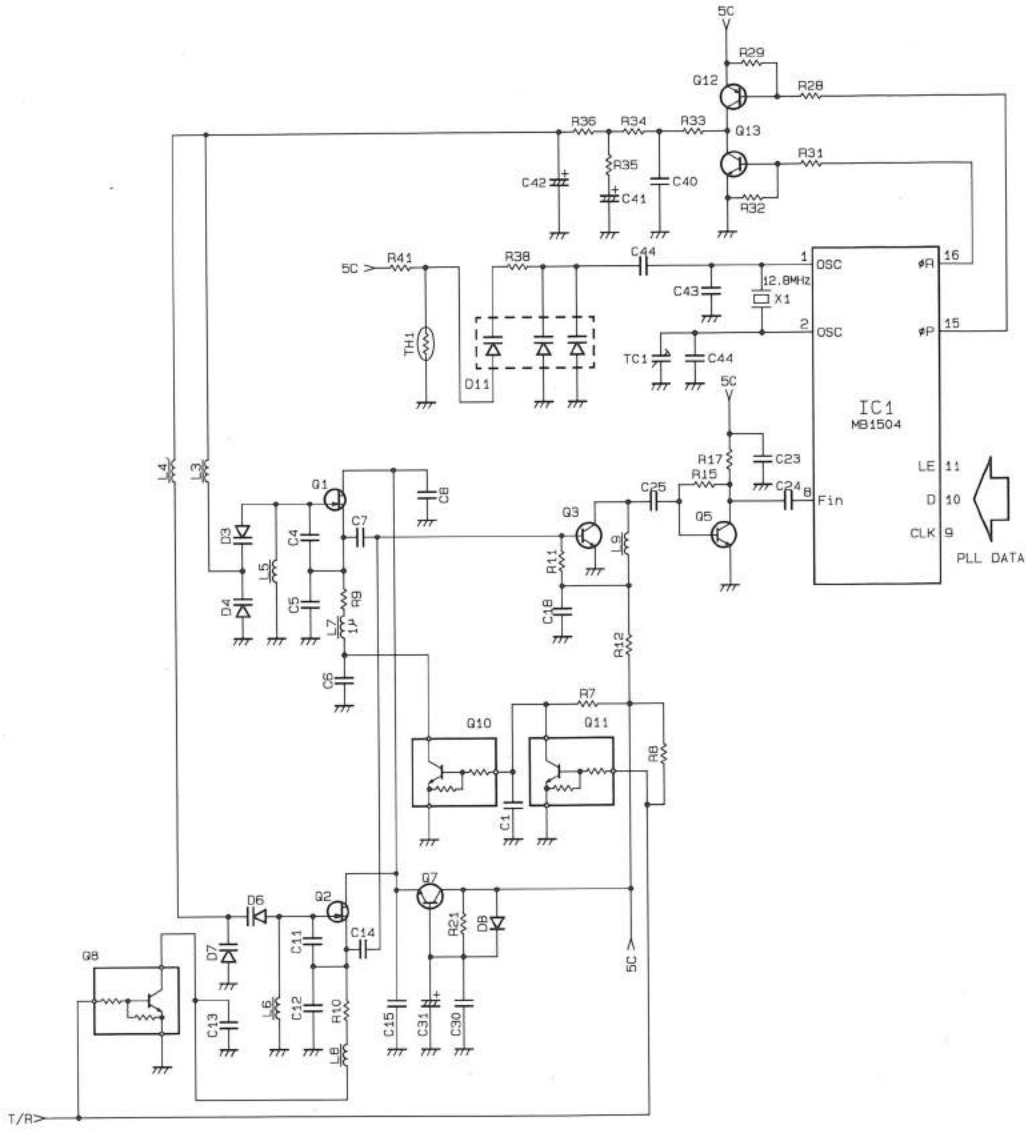


Fig .6 PLL and VCO Circuit

3) Unlock detection circuit

When the PLL is unlocked, the signal applied to the LD pin (pin 7) of IC1 is shaped by D9, R24, C34 and IC2, causing and the UL pin to go " H " the timing of transmit/receive switching is controlled by the microprocessor, which monitors the voltage on the UL pin.

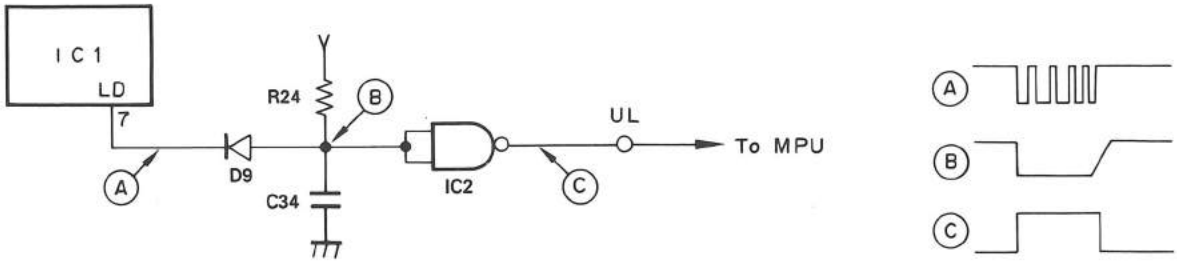


Fig.7 Unlook Detection Circuit

CIRCUIT DESCRIPTION

5. Digital Control Circuits

1) Key, rotary encoder circuit

The signal is applied directly to the microprocessor as shown in Figure 8.

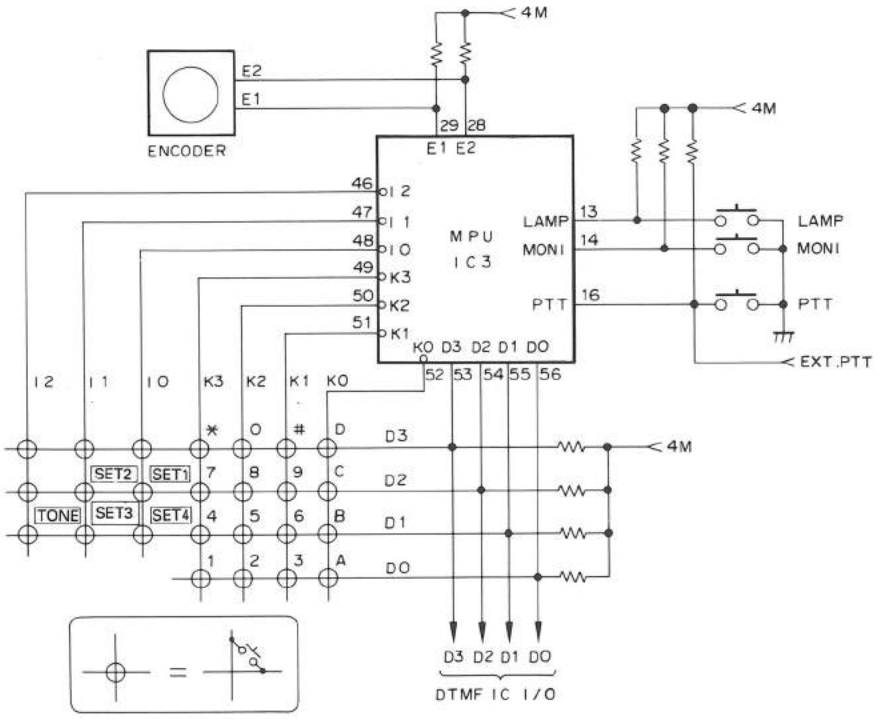


Fig. 8 Key, Encoder Input Circuit

2) Reset

When the power is switched on, reset circuit C23 and Q3 provides a low pulse of about 1 ms duration to reset the microprocessor.

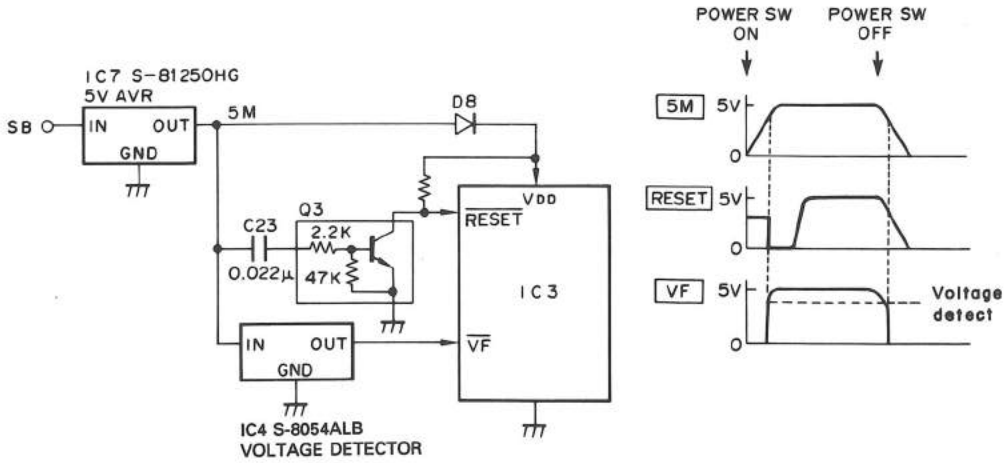


Fig. 9 Reset Circuit

CIRCUIT DESCRIPTION

3) Tone encode circuit

For the subtone, a tone signal of 67.0 to 250.3 Hz is generated by D/A converting the square waves output to B0 to B6 of IC3 by IC5. The signal passes through a low-pass filter R285 and C292 in the TX-RX unit, is mixed with the microphone amplifier output, and modulated by the VCO circuit.

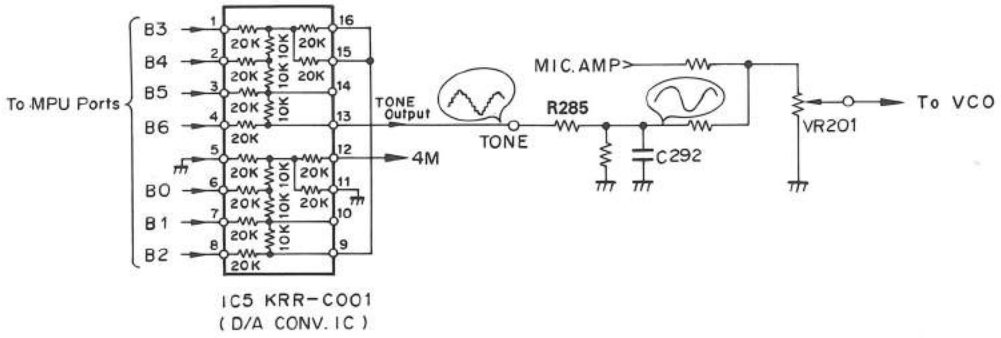


Fig. 10 Tone Encode Circuit

4) Lamp circuit

The LED is turned on and off by switching the 4M voltage with the output from the LAMP pin of the microprocessor.

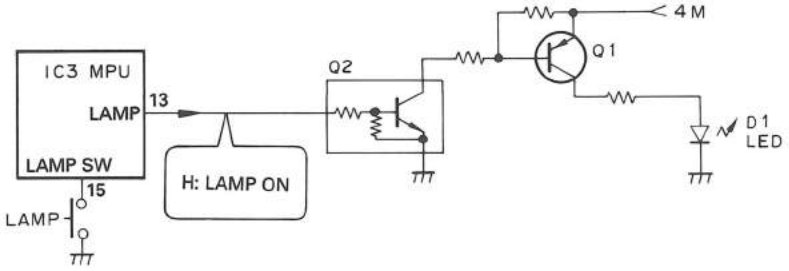


Fig. 11 Lamp Circuit

5) Shift register circuit

Serial data is sent to the shift register IC (TX-RX unit IC203) from the microprocessor. The control output of the shift register is shown in Figure 12.

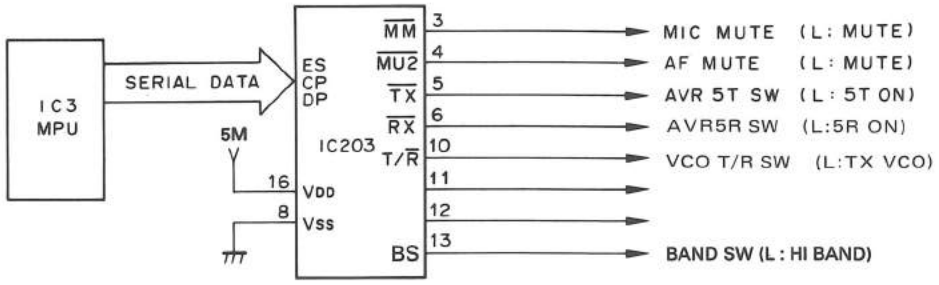


Fig. 12 Shift Resistor : IC203

CIRCUIT DESCRIPTION

6. Power Supply Circuits

1) Power switching circuit (The codes in brackets indicate pin names.)

The power switching circuit generates the 4.8V [5M] reference voltage by stabilizing the voltage at the DC IN pin or BATT pin with IC207 and Q216. The 5V [5T] output in transmit mode, the 4.7V [5R] output in receive mode, and the 4.7V [5C] output in both modes are generated by switching the 4M voltage via the microprocessor. IC7 in the control unit generates 5V [5M] for the control circuit.

2) Battery save

If no key is pressed for 10 seconds with squelch off, the power save circuit activated. Q220 is alternately turned on and off with a ratio of about 1:3 by the signal output from the SAVE pin of the microprocessor. The RX pins of IC203 are also turned on and off alternately.

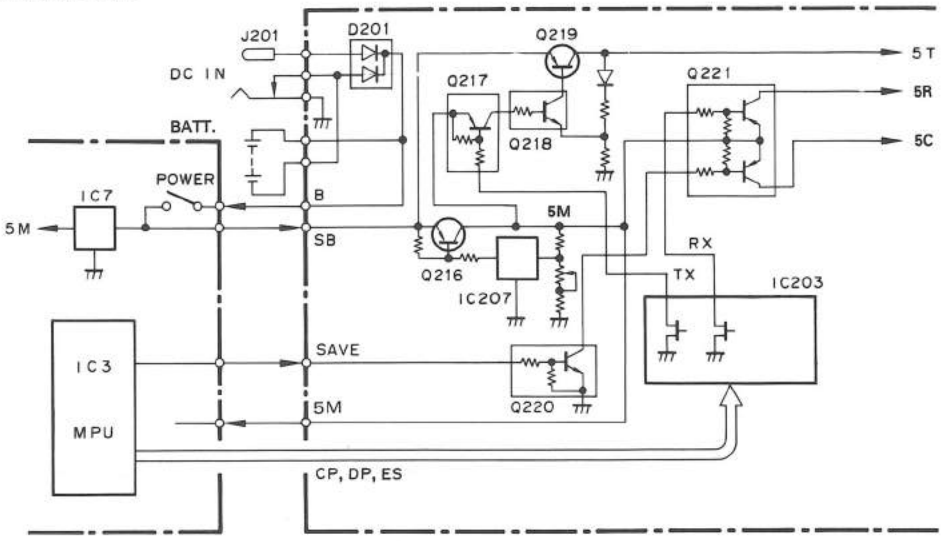


Fig. 13 Power Supply Circuit

7. Additional Circuits

1) CTCSS

The CTCSS circuit sets the tone frequency according to serial data from the microprocessor. The audio signal passes through the de-emphasis circuit and buffer amplifier Q213 and is applied to the RD pin by the detection output. When the tone matches, the SDO pin goes high. The microprocessor checks the SDO pin and controls the MUTE1 pin.

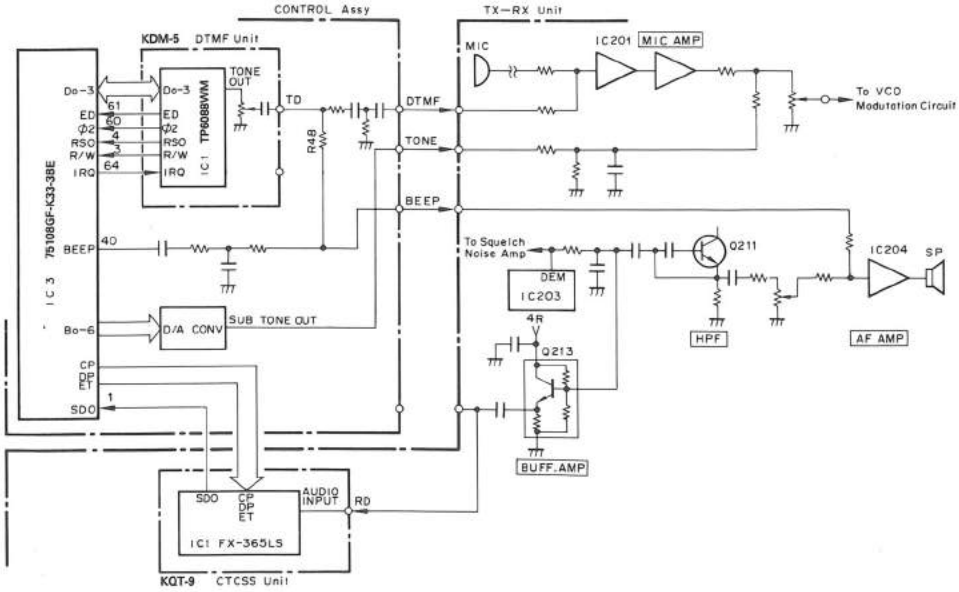


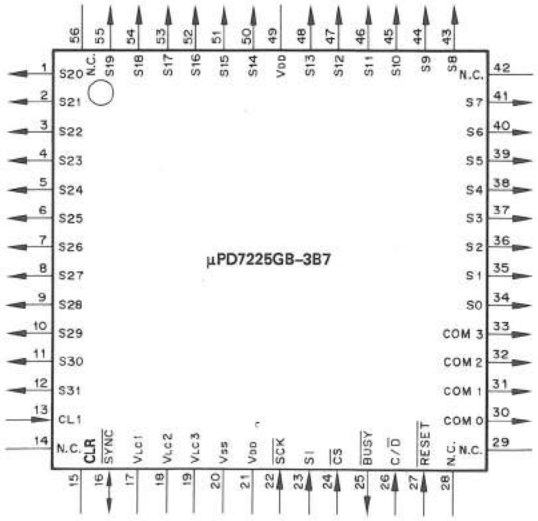
Fig. 14 Additional Circuits (DTMF, CTCSS, BEEP, TONE)

SEMICONDUCTOR DATA

1. LCD driver μPD7225GB-3B7 (Control Unit: IC2)

- Explanation of terminals

Pin No	Port name	I/O	Function
1~ 8	S20~S27	0	Segment drive signal output
9~12	S28∿S31	-	Not used
13	CL1	-	R connection for CLOCK signal generation
14	NC	-	Not used
15	CLR	-	R connection for CLOCK signal generation
16	SYNK	-	Not used
17	VLC1	-	LCD driveing power supply
18	VLC2	-	LCD driveing power supply
19	VLC3	-	GND
20	VSS	-	GND
21	VDD	-	+4V
22	SCK	I	Shift clock input
23	SI	I	Serial data input
24	CS	I	Inable data input
25	BUSY	0	DATA input control
26	C/D	I	Command/data select input
27	RES	I	RESET input
28	NC	-	Not used
29	NC	-	Not used
30~32	COM0~COM2	0	Common signal output
33	COM3	-	Not used
34~41	S0~S7	0	Segment signal output
42	NC	-	Not used
43~48	S8~S13	0	Segment signal output
49	VDD	-	Not used
50~55	S14~S19	0	Segment signal output
56	NC	-	Not used



SEMICONDUCTOR DATA

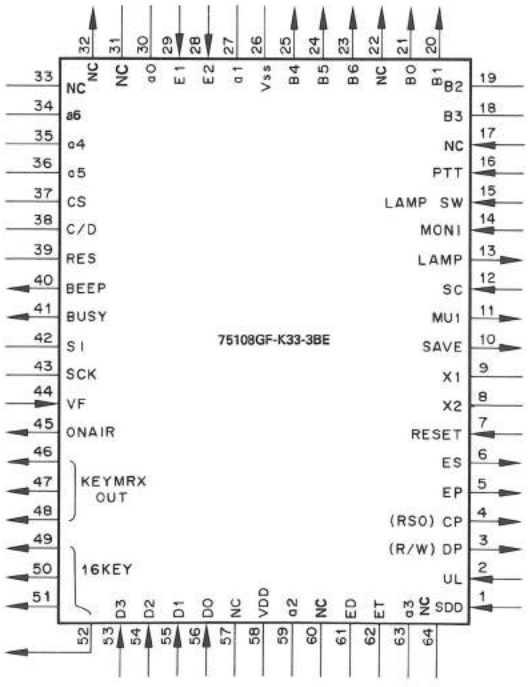
2. MPU 75108GF-K33-3BE (Control Unit: IC3)

- Explanation of terminals

Pin No	Port name	I/O	Function
1	SDO	I	CTCSS tone DET. input: "L": same tone, "H": other
2	UL	I	PLL unlock DATA input: "L": lock, "H": unlock
3	DP	0	PLL, Tone and Shift resistor E^2PROM DATA output
4	CP	0	PLL, Tone and Shift resistor E^2PROM CLOCK output
5	EP	0	ENABLE output (PLL)
6	ES	0	ENABLE output (Shift resistor)
7	RESET	I	Reset voltage input
8	X2	I	CLOCK OSC.
9	X1	I	CLOCK OSC.
10	SAVE	0	Power save control data output
11	MU1	0	AF AMP control data output: "L": OFF, "H": ON
12	SC	I	BUSY data input: "H": BUSY
13	LAMP	0	LAMP control data output
14	MONI	I	MONI SW data input
15	LAMP SW	I	LAMP SW data input : "L" : ON, "H" : OFF
16	PTT	I	PTT SW data input : "H" : PTT SW-ON, "L" : PTT SW-OFF
17	NC	I	Pull up
18	B3	0	Sub tone data output: bit3
19	B2	0	Sub tone data output: bit2
20	B1	0	Sub tone data output: bit1
21	B0	0	Sub tone data output: bit0
22	NC	0	OPEN
23	B6	0	Sub tone data output: bit6
24	B5	0	Sub tone data output: bit5
25	B4	0	Sub tone data output: bit4
26	VSS	-	GND
27	a1	I	Destination
28	E2	I	Encoder data input
29	E1	I	Encoder clock
30	a0	I	Destination
31	NC	I	Pull up
32	NC	I	Pull down
33	NC	I	Pull down
34	a6	I	Destination
35	a4	I	Destination
36	a5	I	Destination
37	CS	0	Chip selecter for LCD driver IC
38	C/D	0	Command/Data switching for LCD driver IC
39	RES	0	Reset of LCD driver IC
40	BEEP	0	BEEP output
41	BUSY	0	BUSY control: "H" BUSY
42	SI	0	DATA for LCD driver IC
43	SCK	0	CLOCK for LCD driver IC

SEMICONDUCTOR DATA

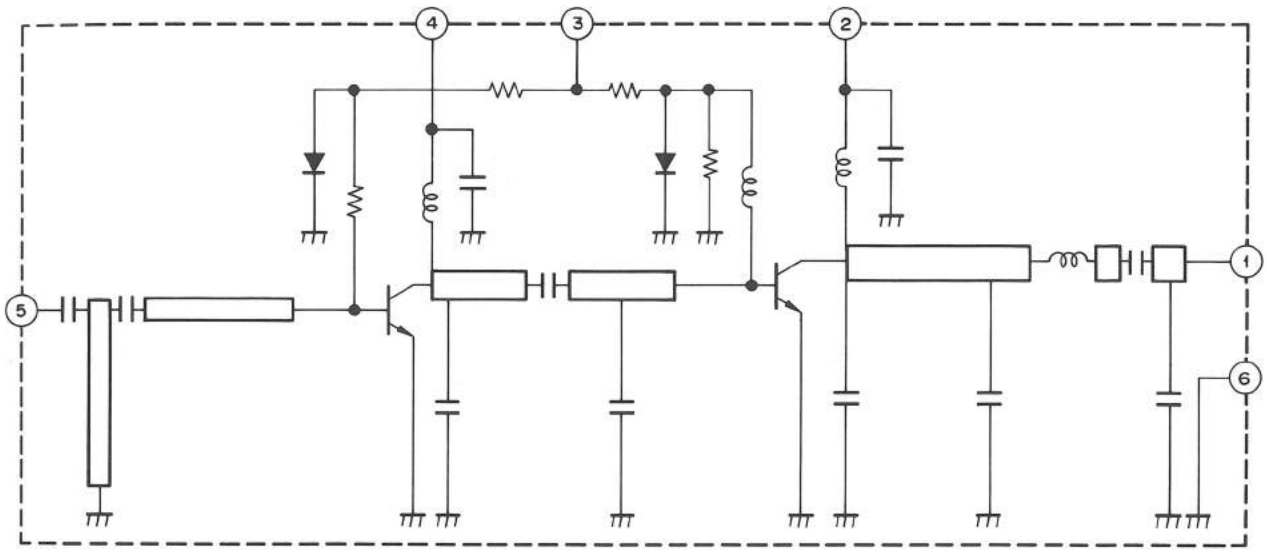
Pin No	Port name	I/O	Function
44	VF	I	BUCK-UP detection
45	ON AIR	0	LED control : "L" TX
46	KEYMRX OUT	0	KEY MATRIX data output
47			
48			
49	16KEY	0	KEY MATRIX data output (DTMF)
50			
51			
52			
53	D3	I	KEY MATRIX data input
54	D2		
55	D1		
56	D0		
57	NC	-	Open
58	VDD	-	+4V
59	a2	I	E^2PROM Enable data output
60	NC	0	Open
61	ED	0	Enable for DTMF
62	ET	0	Enable for CTCSS
63	a3	I	E^2PROM data input
64	NC	I	Pull up



SEMICONDUCTOR DATA

3. Power module M67748LR M67748HR

- Equivalent circuit diagram



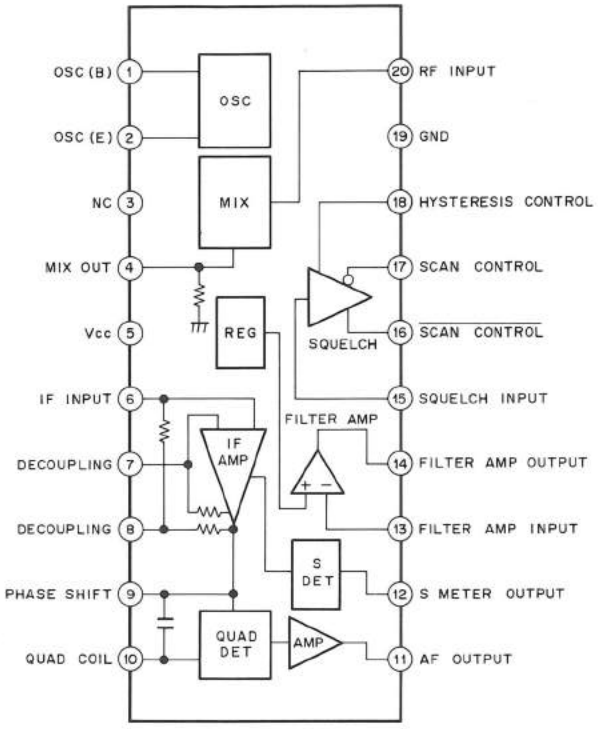
Electrode configuration
1. Output terminal
2. End power supply terminal
3. Base bias power supply terminal
4. First power supply terminal
5. Input terminal
6. Fin (earth)

- Electrical characteristics (Maximum rating)
  M67748LR M67748HR

Item	Symbol	Tc (°C)	Conditions	Rating	Unit
Power supply voltage	V_{CC}	25	Z1 = 50 Ω	16	V
Bias voltage	V_{bb}	25		6	V
Total current	I_{CC}	25		4	A
Input voltage	P_{in}	25	$V_{CC}1 \leqq 12.5V$, Zg = Z1 = 50 Ω	40	mW
Output power	P_{out}	25	$V_{CC}1 \leqq 12.5V$, Zg = Z1 = 50 Ω	10	W
Case temperature during operation	$T_C(_{OP})$			–30 ~ +110	°C
Storage temperature	T_{stg}			–40 ~ +110	°C

SEMICONDUCTOR DATA

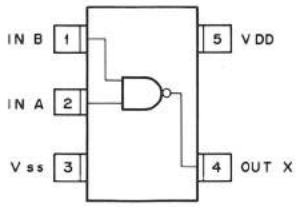
4. FM signal process IC TK10485M (TX-RX unit: IC205)



5. Unlock detection IC TC4S11F (TX-RX unit: IC2)

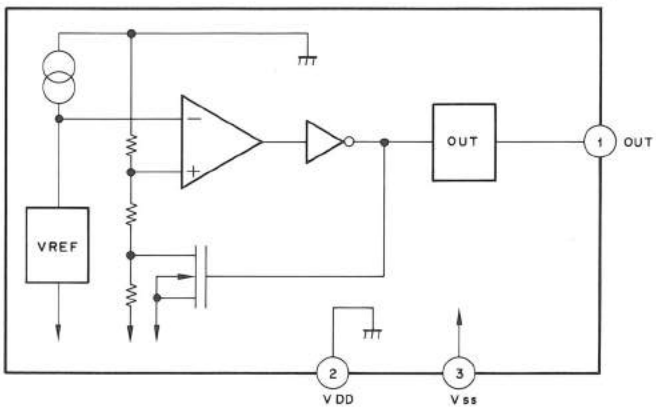
- Logic diagram

- Terminal connection diagram

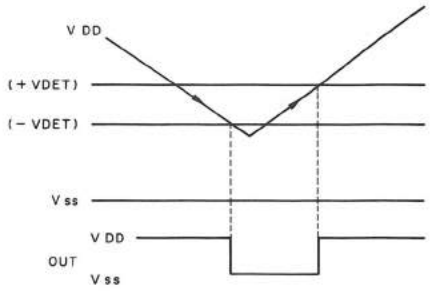


6. Back-up detection IC S-8054ALB-LM-T1 (Control ASSY: IC4)

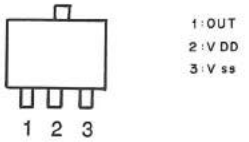
- Block diagram



- Timing chart



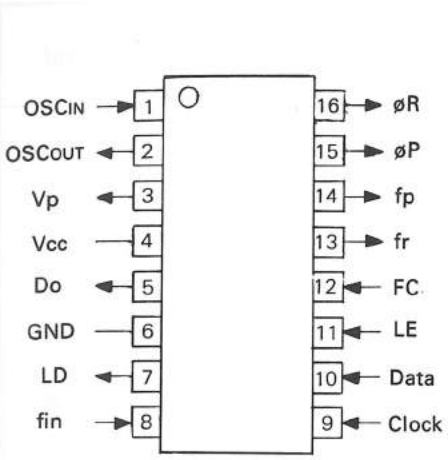
- Pin layout



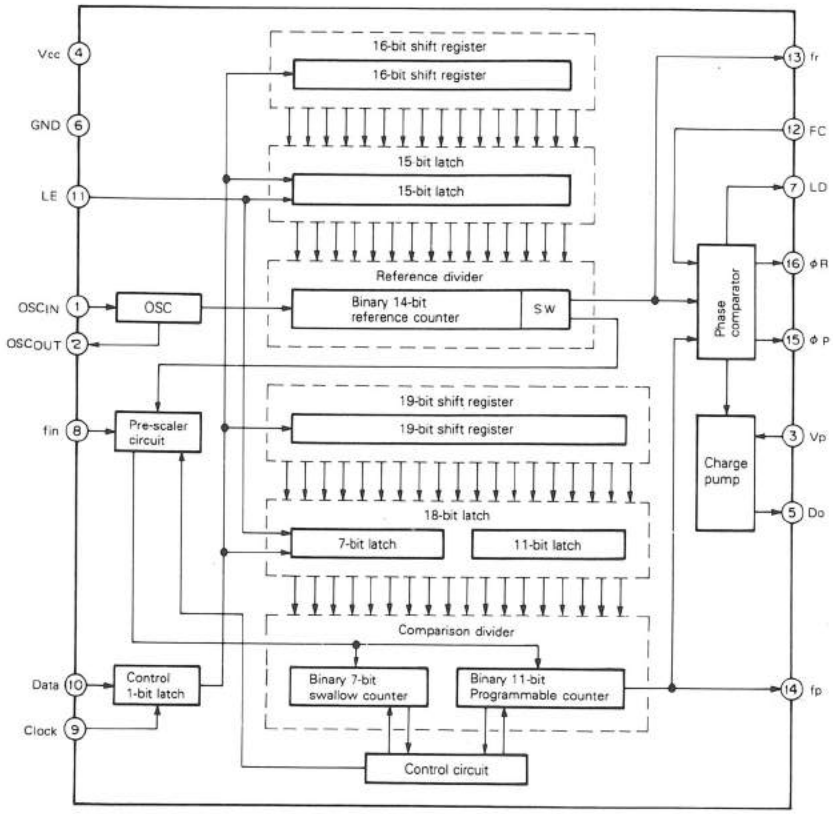
SEMICONDUCTOR DATA

7. PLL IC MB1504 (TX-RX unit: IC1)

- Terminal connection diagram



- Block diagram



- Explanation of terminals

Pin No.	Name	I/O	Function
1	OSCIN	I	Terminal for crystal connection.
2	OSCOUT	O	(OSCIN = Oscillator circuit input terminal, OSCOUT = Oscillator circuit output terminal)
3	VP	O	Power supply terminal for charge pump output.
4	Vcc	–	Power supply terminal.
5	Do	O	Charge pump output terminal. Phase characteristics are inverted according to the setting of the FC terminal.
6	GND	–	Ground terminal.
7	LD	O	Phase detector output terminal. Normally high. Low for the period of about the phase difference between fr and fp.
8	fin	I	Prescaler input terminal. Input with AC coupling.
9	Clock	I	Clock input input terminal for 19-bit and 16-bit shift register. Read data during rise of clock pulse.
10	Data	I	Serial data input terminal in binary code. When high, send data to 15-bit latch. When low, send data to 18-bit latch.
11	LE	I	Load enable signal input terminal. When high, send contents of shift register to latch (includes pull up resistor).
12	FC	I	Phase switch terminal of phase detector. When low, the charge pump and phase detector characteristics invert (includes pull up resistor).
13	fr	O	Monitor terminal of phase detector input. Output equivalent to reference divider.
14	fp	O	Monitor terminal of phase detector input. Output equivalent to programmable divider.
15	øP	O	Phase detector output terminal for external charge pump.
16	øR	O	Phase characteristics are inverted according to the setting of the FC terminal.

8. Shift resister MB88307FP (TX-RX unit: IC203)

- Input timing

Item	Symbol	Terminal	Condition	Rating		Unit
				Main	Max	
Reset signal pulse width	t_{w1}	$\overline{\text{Reset}}$	Fig. 1	100	—	ns
Load signal pulse width	t_{wz}	LOAD	Fig. 1	200	—	ns
Shift clock frequency	f_c	sc	Fig. 2	—	2	MHx
Shift clock sycle time	t_{cyc}	sc	Fig. 2	0.5	—	µs
Shift clock pulse width	P_{WCH} P_{WCL}	sc	Fig. 2	200 10	— 100	ns
Shift clock rise time, fall time	t_{cr} t_{cf}	sc	Fig. 2	100	—	ns
Data input setup time	t_{su}	si	Fig. 2	50	—	ns
Data input hold time	t_H	si	Fig. 2			ns

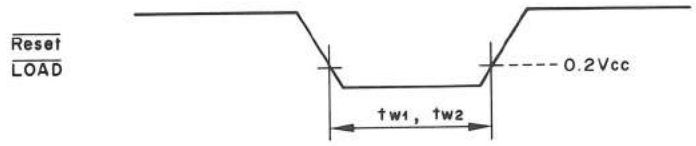


Fig. 1

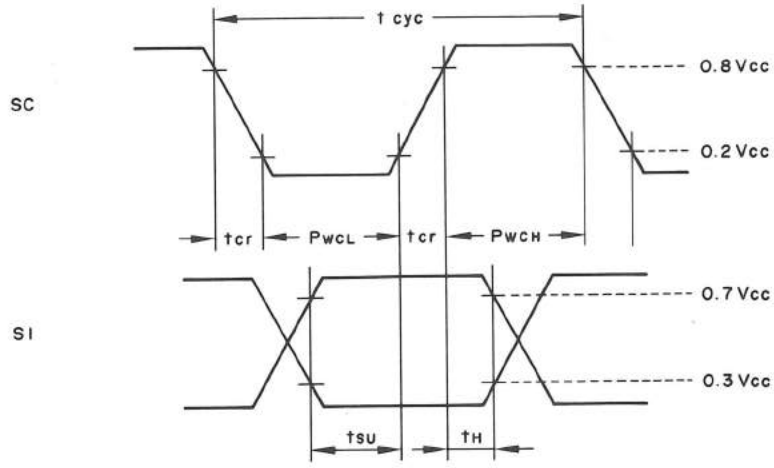


Fig. 2

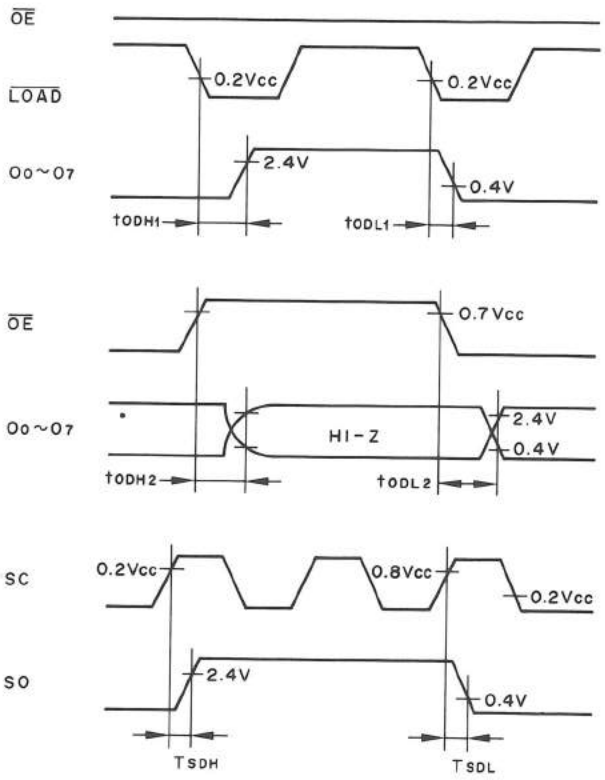
SEMICONDUCTOR DATA

- Output timing

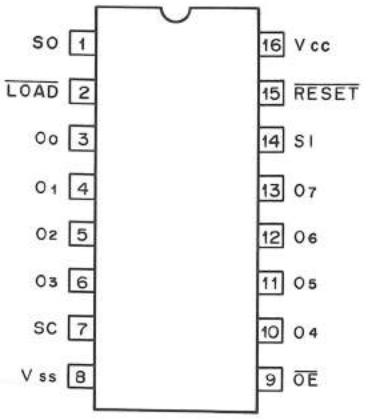
(T_a = –40 ~ +85°C, V_{CC} = 5.0V ±10%, V_{SS} = 0V)

Item	Symbol	Terminal	Rating		Unit
			Min	Max	
0 port delay time	t_{ODH1}	0_0 ~ 0_7	—	500	ns
	t_{ODL1}		—	200	ns
	t_{ODH2}		—	500	ns
	t_{ODL2}		—	500	ns
Serial port dely time	t_{SDH}	SO	—	500	ns
	t_{SDL}		—	200	ns

Load : 50pF + 1.2k Ω



- Terminal layout (Top view)



DESCRIPTION OF COMPONENTS

1. Control Ass'y (W09-1628-05)

Element Number	Aplication/Operation	Operation/Condition/Interchangeability
IC2	LCD Driver	
IC3	MPU	See semiconductor DATA
IC4	Voltage Detecter	MPU Back up : 5M Voltage become 4.0 ~ 4.3 V or less
		Sub tone signal D/A converter
IC5	D/A Converter	5M
IC6	E²PROM	
IC7	AVR	ON when LAMP SW is pressed
Q1	LED Switching	ON when LAMP SW is pressed
Q2	LED Switching	See circuit description Fig. 11
Q3	MPU Reset	ON when LAMP SW is pressed LAMP
D1	LED	ON AIR
D3	LED	
D4-D5	Reverse Power Prevention	
D8	Reverse Power Prevention	

2. TX-RX unit (X57-3620-XX)

Element Number	Application/Operation	Operation/Condition/Intergeability
IC1	PLL	See semiconductor DATA
IC2	UNLOCK detection	"H" when UNLOCK
IC201 (1/4)	Mic AMP	Limiter AMP
IC201 (2/4) (3/4)	Mic AMP	Active LPF
IC203	Shift register	See circuit description
IC204	AF AMP	③ Input ⑤ Output
IC205	FM IC	See semiconductor DATA
IC206	Comparator	APC voltage control
IC207	4.8 [V] AVR	5M
Q1	VCO	TX VCO
Q2	VCO	TX VCO
Q3	VCO Buff. AMP	
Q4	RF AMP	TX AMP
Q5	RF AMP	
Q6	RF AMP	
Q7	Lipple filter	PLL IC ⑧ Fin RX
Q8	Switching	TX: OFF
Q10	Switching	TX: ON
Q11	Switching	TX: OFF
Q12, Q13	Charge pump	
Q14	RF AMP	TX AMP

DESCRIPTION OF COMPONENTS

Element Number	Application/Operation	Operation/Condition/Intergeability
Q15	RF AMP	TX drive AMP
Q16	RF AMP	
Q17	BAND shift switching	
Q18	MIXER	
Q19	IF AMP	
Q201	Constant current	
Q208, Q209	AVR	For IC204 (AFA)
Q210	AF mute	
Q211	HPF	
Q212	Noise AMP	
Q213	AF AMP	
Q215	APC switching	
Q216	AVR	
Q217	AVR switching	
Q218, Q219	AVR	
Q220	5C switching	
Q221	5C, 5R switching	
D1	Voltage shift	
D2	Modulation	
D3, 4, 6, 7	VCO voltage control	
D8	Quick charge	
D9	Waveform shaping	
D10	Quick charge	PLL LPF
D11	Vari-cap. tuning	TCXO
D12	Temperature compensation	Drive AMP
D13	ATT	
D14, 15	TX-RX switching	TX : ON
D16	Surge voltage absorption	
D17, 18	Vari-cap tuning	
D201	Reverse voltage protection	
D202	Voltage shift	
D205	Reverse current prevention	
D206	Reference voltage	
D207	Noise detection	8.2V
D208	Reference voltage	
D209	Voltage shift	3.9V

TERMINAL FUNCITONS

Connector No.	Terminal No.	Terminal name	I/O	Function
CONTROL UNIT (W02-1628-05)				
CN1	CN1=C201 (TX-RX UNIT)			
CN2	1	NC	-	Af output
	2	NC	-	Pull up
	3	TD	0	DTMF tone output
	4	D3	I	Key matrix
	5	5M	-	+ 5V
	6	D2	I	Key matrix
	7	GS	0	Group select
	8	D1	I	Key matrix
	9	ST	I	Single tone
	10	D0	I	Key matrix
	11	NC		
	12	E	-	GND
	13	ED	I	Enable
CN3	1	K3	0	Key matrix
	2	K2		
	3	K1		
	4	K0		
	5	S0	I	
	6	S1		
	7	S2		
	8	S3		
TX-RX UNIT (X57-3620-XX B/2)				
CN1	1	APC	I	APC voltage input
	2	CP	I	Clock (PLL)
	3	DP	I	Serial data (PLL)
	4	UL	I	Unlock signal "H" Unlock
	5	EP	I	Enable (PLL)
	6	MOD	I	MIC AMP output
	7	T/R	I	TX/RX swicthing "H" RX: "L" TX
	8	E	-	GND
	9	5C	I	+5V (Common)
	10	BS	I	Band shift
	11	E	-	GND
	12	5R	I	+5V (RX)
	13	IF	0	RX 1st IF output
	14	5T	I	+5V (TX)
	15	E	-	GND
	16	E	I	GND
CN2	1	FB	-	+B (Final module)
	2	E	-	GND

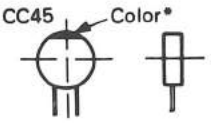
Connector No.	Terminal No.	Terminal name	I/O	Function
TX-RX UNIT (X57-3620-XX A/2)				
CN201	1	E	-	GND
	2	A2	I	AF input
	3	A1	0	AF output
	4	SQ	I	From SQ VR
	5	PTT	I	PTT line "H":RX, "L":TX
	6	SB	-	+B
	7	MIC	I	MIC AMP input
	8	SP	0	Internal SP
	9	NC	I	
	10	DTMF	I	DTMFtone
	11	TONE	I	CTCSS tone input
	12	SC	0	Busy signal "H" Busy
	13	NC	0	S-meter signal
	14	BEEP	I	BEEP signal input
	15	MUTE1	I	MUTE data "H" MUTE
	16	4M	-	+4V (For MPU)
	17	SAVE	I	SAVE data "L":SAVE, "H"normal
	18	B	-	+B
	19	E	-	GND
	20	ES	I	Sift resister inable
	21	UL	0	Unlock data "H" Unlock
	22	EP	I	Inable (PLL)
	23	CP	I	Clock (PLL)
	24	DP	I	Serial data (PLL)
	25	ET	I	Inable (Tone)
	26	SDO	0	CTCSS tone DET. data
	27	RD	0	AF output for DTSS
	28	E	-	GND
	29	E	-	GND
	30	E	-	GND
CN202	CN202=CN1(TX-RX unit X57-3620-XX B/2)			
CN203	1	ET	0	Inable for CTCSS
	2	AO	-	Audio out
	3	DT	0	Serial data
	4	5C	0	+5V
	5	CT	0	Clock for CTCSS
	6	RD	0	AF input for CTCSS
	7	SDO	I	CTCSS DET. input
	8	E	-	GND
	9	TO	I	CTCSS tone input

PARTS LIST

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape .....round, square, etc.
3 = Temp. coefficient
4 = Voltage rating
5 = Value
6 = Tolerance



• Capacitor value

0 1 0 = 1pF
1 0 0 = 10pF
1 0 1 = 100pF
1 0 2 = 1000pF = 0.001μF
1 0 3 = 0.01μF

2 2 0 = 22pF
1st number | Multiplier
2nd number

• Temperature Coefficient

1st Word	C	L	P	R	S	T	U
Color*	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/°C	0	−80	−150	−220	−330	−470	−750

2nd Word	G	H	J	K	L
ppm/°C	± 30	± 60	± 120	± 250	± 500

Example CC45TH = −470±60 ppm/°C

• Tolerance

Code	C	D	G	J	K	M	X	Z	P	No code
(%)	± 0.25	± 0.5	± 2	± 5	± 10	± 20	+ 40 −20	+ 80 −20	+ 100 −0	More than 10μF−10~+50 Less than 4.7μF−10~+75

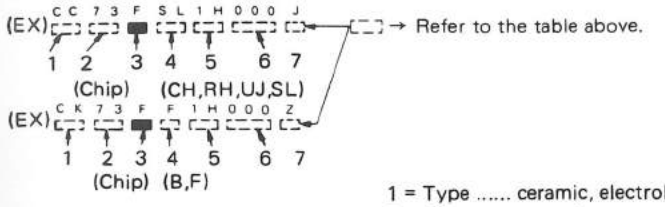
Code	B	C	D	F	G
(pF)	± 0.1	± 0.25	± 0.5	± 1	± 2

Less than 10 pF

• Rating voltage

2nd word / 1st word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	–
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	–
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	–

• Chip capacitors

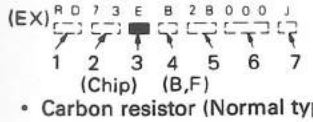


Dimension

Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
E	3.2 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25

RESISTORS

• Chip resistor (Carbon)



1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc.
3 = Dimension
4 = Temp. coefficient
5 = Voltage rating
6 = Value
7 = Tolerance.

Dimension

Dimension code	L	W	T	Wattage
E	3.2 ± 0.2	1.6 ± 0.2	0.57	2B
F	2.0 ± 0.3	1.25 ± 0.2	0.45	2A

Rating wattage

Cord	Wattage	Cord	Wattage	Cord	Wattage
2A	1 /10W	2E	1/ 4W	3A	1W
2B	1/ 8W	2H	1/ 2W	3D	2W
2C	1/ 6W				

Dimension

• Carbon resistor (Normal type)

TK-240

PARTS LIST

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
			TK-240			
1	3B	*	A01-2009-04	METALLIC CABINET		
2	1B	*	A02-0979-04	PLASTIC CABINET		
4	1B	*	A21-1538-04	DRESSING PANEL		
-			A33-0413-08	REFLECTOR		
6	2B	*	A40-0626-24	BOTTOM PLATE		
7	2A	*	A62-0028-04	PANEL ASSY		
8	1A		B09-0319-04	CAP (DC IN)		
-	-	*	B10-1150-04	FRONT GLASS		
D3	-		B30-0842-05	LED (RED)		
12	3B		B42-2437-04	LABEL (MAIN BODY)		
13	3A		B42-3394-04	LABEL (FCC)	KK2	
15	2A, 2C	*	B42-3420-04	LABEL (ACSY)		
16	1A	*	B42-3426-04	LABEL		
-			B44-2163-04	UPC CORD LABEL		
18	1C	*	B62-0012-00	INSTRUCTION MANUAL(ENGLISH)	KK2MM2	
18	1C	*	B62-0012-00	INSTRUCTION MANUAL(ENGLISH)	PP2	
18	1C	*	B62-0014-00	INSTRUCTION MANUAL(CHINESE)	C1	
23	3B	*	B72-0023-04	MODEL NAME PLATE	KMP	
23	3B	*	B72-0024-04	MODEL NAME PLATE	K2M2P2	
23	3B	*	B72-0068-04	MODEL NAME PLATE	*	
23	3B	*	B72-0069-04	MODEL NAME PLATE	*	
29	1C		B46-0409-30	WARRANTY CARD	KK2	
			CC45SL1H470J	CERAMIC 47PF J		
			CC45SL1H101J	CERAMIC 100PF J		
31	3A	*	E04-0182-05	RF COAXIAL CABLE RECEPTACLE		
32	2B		E23-0494-14	TERMINAL (-)		
33	2B		E23-0605-14	TERMINAL (+)		
34	3A	*	E23-0650-14	TERMINAL (RECEPTACLE)		
40	3A		E31-6126-05	FPC		
W206	2B	*	E37-0046-05	CONNECTING WIRE	KK2PP2	
W207	-		E37-0047-05	CONNECTING WIRE	MM2	
W207	-		E37-0047-05	CONNECTING WIRE	*	
-	-		E40-5344-05	FPC CONNECTOR (13P)		
-	-		E40-5361-05	FPC CONNECTOR (8P)		
47	2C	*	F07-1207-03	COVER (SP/MIC)		
48	2A	*	F10-1423-14	SHIELDING CASE (MODULE)		
49	3B	*	F10-1447-04	SHIELDING PLATE		
50	1B		F19-0666-04	BLIND PLATE (MIC)		
51	3A		F29-0435-05	INSULATOR (BELT HOOK)		
52	2A		G02-0505-05	D SPRING		
53	2B		G10-0692-04	NON-WOVEN FABRIC(CTCSS)	KK2PP2	
-		*	G10-0696-04	FELT		
-		*	G11-0645-04	SHEET		
57	2B		G13-0852-04	CUSHION (TERMINAL)		
-			G13-0966-08	CUSHION (DUMMY CONNECTOR LCD)		
-		*	G13-0976-04	CUSHION (FPC)		
60	2A	*	G53-0584-12	PACKING (PANEL)		
61	2B	*	G53-0585-12	PACKING (RELEASE)		
62	2A	*	G53-0586-22	PACKING (SP/MIC)		
63	3A	*	G53-0600-03	PACKING (RECEPTACLE)		
64	1D		H11-0808-14	POLYSTURENE PLATE		

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE : AAFES(Europe) X: Australia

⚠ indicates safety critical components.

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65	3C		H11-0840-04	POLYSTURENE PLATE		
66	2C		H13-0818-04	PROTECTION BOARD	K2P2M2	
66	2C		H13-0818-04	PROTECTION BOARD	*	
67	2D		H13-0841-04	PROTECTION BOARD		
68	3C	*	H52-0017-04	ITEM CARTON BOX		
69	3D		H10-2691-02	POLYSTYRENE FOAMED FIXTURE		
70	2C		H25-0076-03	PROTECTION BAG (COVER,LABEL)		
71	2D		H25-0085-04	PROTECTION BAG (100X200)		
72	2B		J19-1426-03	HOLDER (TERMINAL)		
73	1B		J21-4289-03	MOUNTING HARDWARE(FPC)		
74	1A	*	J21-4291-14	MOUNTING HARDWARE(SP/MIC)		
75	1B		J21-4292-04	MOUNTING HARDWARE(BOTTOM PLATE		
-			J21-4299-08	MOUNTING HARDWARE(LCD)		
77	3B		J21-4307-04	MOUNTING HARDWARE(PTT)		
78	2C		J29-0424-04	BELT HOOK (ACSY)		
79	1B	*	J39-0440-14	MIC SPACER		
80	2A		J69-0321-05	O RING		
81	2A		J99-0313-04	HOLDER	KK2PP2	
82	2B	*	K29-4561-12	KNOB (PTT)		
83	2B		K29-4562-14	KNOB (RELEASE)		
84	2A	*	K29-4579-14	KNOB (VOL)		
85	2A	*	K29-4580-14	KNOB (ENC)		
86	2A	*	K29-4581-04	KEY TOP (TOP)		
L1	-		L39-0489-05	TOROIDAL COIL (POWER SOURCE)		
A	2B		N09-2025-05	SCREW (1.7X3)		
B	3A		N09-2028-05	SCREW (3X4)		
C	1A,2B		N09-2064-05	SCREW (2X3.5)		
D	2A,2B		N09-2086-05	SCREW (2X5)		
E	2B		N09-2087-05	SCREW (2X3.5)		
F	2A,3B		N09-2107-05	SCREW (2X12)		
G	2A	*	N09-2122-05	SCREW (2.6X6)		
H	3A	*	N09-2124-05	SCREW		
88	2A		N14-0545-04	NUT		
J	2A,2B		N30-2003-46	PAN HEAD MACHINE SCREW		
K	3A,3B		N35-2003-45	BINDING HEAD MACHINE SCREW		
L	2A		N35-2005-45	BINDING HEAD MACHINE SCREW		
M	2C	*	N35-2006-45	BINDING HEAD MACHINE SCREW(ACS		
N	2C		N35-2004-45	BINDING HEAD MACHINE SCREW(ACS		
VR1	2A		R23-9403-05	POTENTIO M. 50K/10K		
SP1	1A		T07-0257-05	SPEAKER		
104	3D	*	T90-0381-05	ANTENNA (134-150MHZ)	K2M2P2	
104	3D	*	T90-0381-05	ANTENNA (134-150MHZ)	*	
MIC1	1B	*	T91-0502-05	MICROPHONE		
104	3D		T90-0382-05	ANTENNA (150-162MHZ)	KPM	
D1			LN01301C(Q)	LED (GRN)		
IC1	3A		M67748HR	IC(POWER MODULE)	KMP	
IC1	3A		M67748LR	IC(POWER MODULE)	K2M2P2	
IC1	3A		M67748LR	IC(POWER MODULE)	*	
107	2A		W02-1601-05	ENCODER		
108	2B	*	W02-1628-05	CONTROL UNIT		
109	2D		W09-0508-05	BATTERY ASSY (KNB-5 ACSY)	MM2	
109	2D		W09-0508-05	BATTERY ASSY (KNB-5 ACSY)	*	
110	2B	*	X52-3170-21	CTCSS UNIT	KK2PP2	

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TK-240

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格			Destination 仕向	Remarks 備考
111	2B,3C	*	X57-3620-10	TX-RX UNIT			KMP	
111	2B,3C	*	X57-3620-11	TX-RX UNIT			K2M2P2	
111	2B,3C	*	X57-3620-11	TX-RX UNIT			*	
TX-RX UNIT (X57-3620-XX) -10, -11								
C1 ,2			CK73GB1H102K	CHIP C	1000PF	K		
C3			CK73GB1H103K	CHIP C	0.01UF	K		
C4			CC73GCH1H100D	CHIP C	10PF	D	KMP	
C4 ,5			CC73GCH1H120J	CHIP C	12PF	J	K2M2P2	
C4 ,5			CC73GCH1H120J	CHIP C	12PF	J	*	
C5			CC73GCH1H090D	CHIP C	9PF	D	KMPC2	
C6			CK73GB1H102K	CHIP C	1000PF	K		
C7			CC73GCH1H0R5C	CHIP C	0.5PF	C		
C8			CK73GB1H103K	CHIP C	0.01UF	K		
C9			CC73GCH1H020C	CHIP C	2.0PF	C		
C10			CK73GB1H103K	CHIP C	0.01UF	K		
C11			CC73GCH1H070D	CHIP C	7PF	D	KMP	
C11 ,12			CC73GCH1H100D	CHIP C	10PF	D	K2M2P2	
C11 ,12			CC73GCH1H100D	CHIP C	10PF	D	*	
C12			CC73GCH1H090D	CHIP C	9PF	D	KMP	
C13			CK73GB1H102K	CHIP C	1000PF	K		
C14			CC73GCH1H0R5C	CHIP C	0.5PF	C		
C15			CK73GB1H103K	CHIP C	0.01UF	K		
C16			CC73GCH1H020C	CHIP C	2.0PF	C		
C17			CC73GCH1H101J	CHIP C	100PF	J		
C18			CK73GB1H102K	CHIP C	1000PF	K		
C19			CC73GCH1H100D	CHIP C	10PF	D		
C20			CK73GB1H102K	CHIP C	1000PF	K		
C21			CC73GCH1H080D	CHIP C	8PF	D	KMP	
C21			CC73GCH1H220J	CHIP C	22PF	J	K2M2P2	
C21			CC73GCH1H220J	CHIP C	22PF	J	*	
C22 ,23			CK73GB1H102K	CHIP C	1000PF	K		
C24			CC73GCH1H330J	CHIP C	33PF	J		
C25			CC73GCH1H100D	CHIP C	10PF	D		
C26 ,27			CK73GB1H102K	CHIP C	1000PF	K		
C28			CC73GCH1H100D	CHIP C	10PF	D		
C29 ,30			CK73GB1H102K	CHIP C	1000PF	K		
C31			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C32			CK73GB1H102K	CHIP C	1000PF	K		
C33			CC73GCH1H101J	CHIP C	100PF	J		
C34			CK73FB1E473K	CHIP C	0.047UF	K		
C35			CK73FB1E104K	CHIP C	0.10UF	K		
C36			CK73GB1H102K	CHIP C	1000PF	K		
C37			C92-0010-05	CHIP-TAN	6.8UF	6.3WV		
C38			CK73GB1H102K	CHIP C	1000PF	K		
C39			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C40			CK73FB1E104K	CHIP C	0.10UF	K		
C41			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C42			C92-0002-05	CHIP-TAN	0.22UF	35WV		
C43			CK73GB1H102K	CHIP C	1000PF	K		
C44			CC73GCH1H220J	CHIP C	220PF	J		
C45			CC73GCH1H180J	CHIP C	18PF	J		
C46 ,47			CK73GB1H103K	CHIP C	0.01UF	K		
C48 -50			CK73GB1H102K	CHIP C	1000PF	K		
C51			CC73GCH1H220J	CHIP C	220PF	J		

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格		Destination 仕向	Remarks 備考
C52 -53			CK73GB1H102K	CHIP C	1000PF K		
C54			CK73GB1H102K	CHIP C	1000PF K		
C55			CK73GB1H103K	CHIP C	0.01UF K		
C56			CC73GCH1H180J	CHIP C	18PF J	KMP	
C56			CC73GCH1H220J	CHIP C	22PF J	K2M2P2	
C56			CC73GCH1H220J	CHIP C	22PF J	*	
C57 -59			CK73GB1H102K	CHIP C	1000PF K		
C60			C92-0038-05	ELECTRO	22UF 16WV		
C61			CK73GB1H102K	CHIP C	1000PF K		
C62			C92-0045-05	ELECTRO	22UF 6.3WV		
C63			CK73GB1H102K	CHIP C	1000PF K		
C64			CK73FB1E104K	CHIP C	0.10UF K		
C65			C92-0040-05	ELECTRO	47UF 16WV		
C66			CK73GB1H102K	CHIP C	1000PF K		
C67			CC73GCH1H040C	CHIP C	4PF C	K2M2P2	
C67			CC73GCH1H040C	CHIP C	4PF C	*	
C67			CC73GCH1H060C	CHIP C	6PF C	KMP	
C69			CC73GCH1H560D	CHIP C	56PF J	KPM	
C69			CC73GCH1H820J	CHIP C	82PF J	K2P2M2	
C69			CC73GCH1H820J	CHIP C	82PF J	*	
C70			CC73GCH1H120J	CHIP C	12PF J		
C71			CC73GCH1H030C	CHIP C	3PF C		
C72			CC73GCH1H180J	CHIP C	18PF J	KMP	
C72			CC73GCH1H270J	CHIP C	27PF J	K2M2P2	
C72			CC73GCH1H270J	CHIP C	220PF J	*	
C73			CC73GCH1H030C	CHIP C	3PF C	KPM	
C73			CC73GCH1H040C	CHIP C	4PF C	K2P2M2	
C73			CC73GCH1H040C	CHIP C	4PF C	*	
C74			CC73GCH1H270J	CHIP C	27PF J	KPM	
C74			CC73GCH1H330J	CHIP C	33PF J	K2P2M2	
C74			CC73GCH1H330J	CHIP C	33PF J	*	
C75			CC73GCH1H040C	CHIP C	4PF C	KMP	
C75			CC73GCH1H050C	CHIP C	5PF D	K2M2P2	
C75			CC73GCH1H050C	CHIP C	5PF D	*	
C76			CC73GCH1H100D	CHIP C	10PF J	KMP	
C76			CC73GCH1H120J	CHIP C	12PF J	K2M2P2	
C76			CC73GCH1H120J	CHIP C	12PF J	*	
C77			CC73GCH1H560J	CHIP C	56PF J		
C78			CC73GCH1H040C	CHIP C	4PF C	K2M2P2	
C78			CC73GCH1H040C	CHIP C	4PF C	*	
C79			CC73GCH1H100D	CHIP C	10PF D		
C80			CK73GB1H102K	CHIP C	1000PF K		
C81			CC73GCH1H030C	CHIP C	3PF C		
C82			CK73GB1H102K	CHIP C	1000PF K		
C83			CC73GCH1H070D	CHIP C	7PF D	K2M2P2	
C83			CC73GCH1H070D	CHIP C	7PF D	*	
C83			CC73GCH1H120J	CHIP C	12PF J	KMP	
C84			CC73GCH1HR75C	CHIP C	0.75PF C	KMP	
C84			CC73GCH1H0R5C	CHIP C	0.5PF C	K2M2P2	
C84			CC73GCH1H0R5C	CHIP C	0.5PF C	*	
C85			CC73GCH1H050C	CHIP C	5PF C		

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TK-240

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格			Destination 仕向	Remarks 備考
C86			CC73GCH1H070D	CHIP C	7PF	D	K2M2P2	
C86			CC73GCH1H070D	CHIP C	7PF	D	*	
C86			CC73GCH1H120J	CHIP C	12PF	J	KMP	
C87			CC73GCH1H0R5C	CHIP C	0.5PF	C	K2M2P2	
C87			CC73GCH1H0R5C	CHIP C	0.5PF	C	*	
C87			CC73GCH1H010C	CHIP C	1PF	C	KMP	
C88			CC73GCH1H040C	CHIP C	4PF	C		
C89			CC73GCH1H070D	CHIP C	7PF	D	K2M2P2	
C89			CC73GCH1H070D	CHIP C	7PF	D	*	
C89			CC73GCH1H100D	CHIP C	10PF	D	KMP	
C90			CK73GB1H102K	CHIP C	1000PF	K		
C91			CK73GB1H103K	CHIP C	0.01UF	K		
C92			CK73GB1H102K	CHIP C	1000PF	K		
C93			CC73GCH1H101J	CHIP C	100PF	J		
C94			CC73GCH1H270J	CHIP C	27PF	J	KMP	
C94			CC73GCH1H330J	CHIP C	33PF	J	K2M2P2	
C94			CC73GCH1H330J	CHIP C	33PF	J	*	
C95			CK73FB1H223K	CHIP C	0.022UF	K		
C96			CK73GB1H102K	CHIP C	1000PF	K		
C97			CC73GCH1H060D	CHIP C	6PF	D	K2M2P2	
C97			CC73GCH1H060D	CHIP C	6PF	D	*	
C97			CC73GCH1H090D	CHIP C	9PF	D	KMP	
C98			CK73FB1H223K	CHIP C	0.022UF	K		
C99			CK73GB1H102K	CHIP C	1000PF	K		
C102			CC73GCH1H180J	CHIP C	18PF	J		
C103			CK73GB1H102K	CHIP C	1000PF	K		
C104			CK73GB1H102K	CHIP C	1000PF	K		
C105			CK73GB1H102K	CHIP C	1000PF	K		
C106,107			CC73GCH1H010C	CHIP C	1PF	C	K2M2P2	
C106,107			CC73GCH1H010C	CHIP C	1PF	C	*	
C106,107			CC73GCH1H1R5C	CHIP C	1.5PF	C	KMP	
C108			CC73GCH1H070D	CHIP C	7PF	D	KMP	
C108			CC73GCH1H080D	CHIP C	8PF	D	K2M2P2	
C108			CC73GCH1H080D	CHIP C	8PF	D	*	
C109			CC73GCH1H070D	CHIP C	7PF	D		
C201-205			CK73GB1H102K	CHIP C	1000PF	K		
C206-209			CK73GB1H102K	CHIP C	1000PF	K		
C210			CK73FF1E154Z	CHIP C	0.15UF	Z		
C211			CK73GB1H102K	CHIP C	1000PF	K		
C212			CE04NW1C101M	ELECTR®	100UF	16WV		
C213			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C214			CK73GB1H102K	CHIP C	1000PF	K		
C215			C92-0518-05	CHIP-TAN	0.22UF	8WV		
C216			CK73FB1E103K	CHIP C	0.01UF	K		
C217			CK73GB1H102K	CHIP C	1000PF	K		
C218			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C219			CK73GB1H103K	CHIP C	0.01UF	K		
C220			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C221			CK73GB1H102K	CHIP C	1000PF	K		
C222			CK73GB1H103K	CHIP C	0.01UF	K		
C223			CK73GB1H471K	CHIP C	470PF	K		
C224		*	CK73GB1H122K	CHIP C	1200PF	K		
C225			CC73GCH1H101J	CHIP C	100PF	J		
C226			C92-0507-05	CHIP-TAN	4.7UF	6.3WV		
C227			CK73FB1E473K	CHIP C	0.047UF	K		

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
C228			CK73EF1E334Z	CHIP C 0.33UF Z		
C229			CK73GB1H102K	CHIP C 1000PF K		
C231			C92-0003-05	CHIP-TAN 0.47UF 25WV		
C237			CK73GB1H102K	CHIP C 1000PF K		
C238			C92-0004-05	CHIP-TAN 1.0UF 10WV		
C239			CK73GB1H103K	CHIP C 0.01UF K		
C240			CK73GB1H102K	CHIP C 1000PF K		
C241			C92-0040-05	ELECTRO 47UF 16WV		
C242			C90-2052-05	ELECTRO 68UF 10WV		
C243			C92-0047-05	ELECTRO 47UF 6.3WV		
C244			C92-0513-05	CHIP-TAN 3.3UF 6.3WV		
C245			CK73FB1E473K	CHIP C 0.047UF K		
C248			CK73FB1H273K	CHIP C 0.027UF K		
C249			C92-0045-05	ELECTRO 22UF 6.3WV		
C250,251			CK73FB1H393K	CHIP C 0.039UF K		
C252			C92-0004-05	CHIP-TAN 1.0UF 10WV		
C253			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C254			CK73FB1H223K	CHIP C 0.022UF K		
C255			CK73GB1H102K	CHIP C 1000PF K		
C256			CK73FB1E104K	CHIP C 0.10UF K		
C257-260			CK73GB1H102K	CHIP C 1000PF K		
C261			C92-0001-05	CHIP-TAN 0.1UF 35WV		
C262			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C263			CK73GB1H102K	CHIP C 1000PF K		
C264			CC73GCH1H390J	CHIP C 39PF J		
C265			CC73GCH1H470J	CHIP C 47F J		
C266,267			CK73FB1E104K	CHIP C 0.10UF K		
C268			CC73GCH1H820J	CHIP C 82PF J		
C269			CK73FB1E104K	CHIP C 0.10UF K		
C270			C90-2050-05	ELECTRO 33UF 6.3WV		
C271,272			CK73FB1E104K	CHIP C 0.10UF K		
C273			CK73GB1H102K	CHIP C 1000PF K		
C275			CC73GCH1H151J	CHIP C 150PF J		
C276			C92-0519-05	CHIP-TAN 1UF 25WV		
C279			CK73GB1H102K	CHIP C 1000PF K		
C280			CK73FB1H393K	CHIP C 0.039UF K		
C281			CK73FB1E102K	CHIP C 1000PF K		
C282			CK73GB1H103K	CHIP C 0.01UF K		
C283-286			CK73GB1H102K	CHIP C 1000PF K		
C287			C92-0047-05	ELECTRO 47UF 6.3WV		
C288			CK73GB1H102K	CHIP C 1000PF K		
C289			C92-0045-05	ELECTRO 22UF 6.3WV		
C290,291			CK73GB1H102K	CHIP C 1000PF K		
C292			CK73FB1E183K	CHIP C 0.018UF K		
C295-298			CK73GB1H102K	CHIP C 1000PF K		
C300			CK73FB1E104K	CHIP C 0.10UF K		
C301			CK73GB1H392K	CHIP C 3900PF K		
C302		*	CC73GCH1H820J	CHIP C 82PF J		
TC1			C05-0369-05	TRIMMING CAP 6PF		
TC2			C05-0370-05	TRIMMING CAP 20PF		
CN1			E40-5224-05	FLAT CABLE CONNECTOR(16P)		
CN2			E40-5179-05	PIN ASSY		
CN201			E40-5247-05	FLAT CABLE CONNECTOR(30P)		
CN202			E40-5224-05	FLAT CABLE CONNECTOR(16P)		
CN203			E40-5343-05	CONNECTOR		

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
CN204,205			E40-5179-05	PIN ASSY		
CN206		*	E40-5446-05	PIN ASSY		
J201			E03-0170-05	DC JACK		
J202			E11-0429-05	PHONE JACK (3.5D)		
J203			E11-0439-05	PHONE JACK (2.5D)		
TP4			E23-0342-05	TERMINAL		
TP201			E23-0342-05	TERMINAL		
W201			E31-6119-15	CONNECTING WIRE		
W202-204			E33-1928-05	WIRING KIT		
-			F10-1456-03	SHIELDING CASE (PLL)		
-			J30-0545-05	SPACER		
CD201			L79-0817-05	CRISTAL DISC.		
CF201			L72-0373-05	CERAMIC FILTER		
L1			L92-0130-05	CHIP INDUCTOR		
L2		*	L40-1095-48	SMALL FIXED INDUCTOR(1UH)		
L3 ,4		*	L40-3395-48	SMALL FIXED INDUCTOR(3.3UH)		
L5		*	L34-2363-05	COIL	KMP	
L5			L34-2364-05	COIL	K2M2P2	
L5			L34-2364-05	COIL		
L6		*	L34-2391-05	COIL	KMP	
L6		*	L34-2371-05	COIL	K2M2P2	
L6		*	L34-2371-05	COIL	*	
L7 ,8		*	L40-1095-48	SMALL FIXED INDUCTOR(1UH)		
L9		*	L40-1095-48	SMALL FIXED INDUCTOR(1UH)		
L10			L40-1582-48	SMALL FIXED INDUCTOR(0.15UH)	KPM	
L10			L40-1095-48	SMALL FIXED INDUCTOR(1UH)	K2P2M2	
L10			L40-1095-48	SMALL FIXED INDUCTOR(1UH)	*	
L11			L40-2782-48	SMALL FIXED INDUCTOR(0.27UH)		
L13			L92-0130-05	CHIP INDUCTOR		
L14 ,15			L40-8272-48	SMALL FIXED INDUCTOR(82NH)		
L18		*	L40-2295-48	SMALL FIXED INDUCTOR(2.2UH)		
L19			L92-0130-05	CHIP INDUCTOR		
L20			L34-0893-05	COIL (4T)		
L21			L34-0894-05	COIL (5T)		
L22			L40-2292-19	SMALL FIXED INDUCTOR(2.2UH)		
L23			L34-0894-05	COIL (5T)		
L24			L34-1210-05	COIL (7T)	K2M2P2	
L24			L34-1210-05	COIL (7T)	*	
L24			L34-1258-05	COIL (6T)	KMP	
L25		*	L34-4234-05	COIL (3-1/4T)		
L26 -28		*	L34-4235-05	COIL (3-1/2T)	K2M2P2	
L26 -28		*	L34-4235-05	COIL (3-1/2T)	*	
L26 -28		*	L34-4236-05	COIL (3T)	KMP	
L30			L34-4229-05	COIL		
L31			L40-4782-48	SMALL FIXED INDUCTOR(0.47UH)	KMP	
L31			L40-6882-48	SMALL FIXED INDUCTOR(0.68UH)	K2M2P2	
L31			L40-6882-48	SMALL FIXED INDUCTOR(0.68UH)	*	
L32			L40-1582-48	SMALL FIXED INDUCTOR(0.15UH)		
L201		*	L40-1095-48	SMALL FIXED INDUCTOR(1UH)		
X1			L77-1383-05	CRYSTAL RESONATOR(12.8MHZ)		
X201			L77-1356-05	CRYSTAL RESONATOR(30.37MHZ)	K2M2P2	
X201			L77-1356-05	CRYSTAL RESONATOR(30.37MHZ)	*	
X201			L77-1415-05	CRYSTAL RESONATOR(34.855MHZ)	KMP	

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
XF1			L71-0263-05	MCF(30.825MHZ)	K2M2P2	
XF1			L71-0263-05	MCF(30.825MHZ)	*	
XF1			L71-0298-05	MCF(34.4MHZ)	KMP	
			RK73FB2A473J	CHIP R 47K J 1/10W		
R1			RK73GB1J223J	CHIP R 22K J 1/16W		
R2			RK73GB1J334J	CHIP R 330K J 1/16W		
R3			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R4			RK73GB1J104J	CHIP R 100K J 1/16W		
R5 ,6			RK73GB1J101J	CHIP R 100 J 1/16W		
R7			RK73GB1J103J	CHIP R 10K J 1/16W		
R8			RK73GB1J822J	CHIP R 8.2K J 1/16W		
R9 ,10			RK73GB1J101J	CHIP R 100 J 1/16W		
R11			RK73GB1J104J	CHIP R 100K J 1/16W		
R12			RK73GB1J471J	CHIP R 470 J 1/16W		
R13			RK73GB1J104J	CHIP R 100K J 1/16W		
R14			RK73GB1J101J	CHIP R 100 J 1/16W		
R15			RK73GB1J104J	CHIP R 100K J 1/16W		
R16			RK73GB1J101J	CHIP R 100 J 1/16W		
R17			RK73GB1J681J	CHIP R 681 J 1/16W		
R18			RK73GB1J104J	CHIP R 100K J 1/16W		
R19			RK73GB1J101J	CHIP R 100 J 1/16W		
R21			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R22			RK73FB2A220J	CHIP R 22 J 1/10W		
R23			RK73GB1J101J	CHIP R 100 J 1/16W		
R24			RK73GB1J104J	CHIP R 100K J 1/16W		
R25 -27			RK73GB1J103J	CHIP R 10K J 1/16W		
R28			RK73GB1J223J	CHIP R 22K J 1/16W		
R29			RK73GB1J103J	CHIP R 10K J 1/16W		
R30			RK73GB1J331J	CHIP R 330 J 1/16W		
R31			RK73GB1J223J	CHIP R 22K J 1/16W		
R32			RK73GB1J103J	CHIP R 10K J 1/16W		
R33			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R34			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R35 ,36			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R37			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R38			RK73GB1J104J	CHIP R 100K J 1/16W		
R39			RK73FB2A823F	CHIP R 82K F 1/10W		
R40			RK73FB2A473F	CHIP R 47K F 1/10W		
R41			RK73FB2A153F	CHIP R 15K F 1/10W		
R42			RK73GB1J180J	CHIP R 18 J 1/16W	KPM	
R43 ,44			RK73GB1J271J	CHIP R 270 J 1/16W		
R45			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R46			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R47			RK73GB1J560J	CHIP R 56 J 1/16W		
R48			RK73GB1J220J	CHIP R 22 J 1/16W		
R49			RK73GB1J331J	CHIP R 330 J 1/16W		
R50			RK73GB1J5R6J	CHIP R 5.6 J 1/16W		
R51			RK73GB1J681J	CHIP R 681 J 1/16W		
R52			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R53			RK73GB1J270J	CHIP R 27 J 1/16W		
R54			R92-1252-05	CHIP R 0 OHM		
R55			RK73GB1J561J	CHIP R 560 J 1/16W		
R56 ,57			RK73GB1J271J	CHIP R 270 J 1/16W		
R58			RK73FB2A220J	CHIP R 22 J 1/10W		

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TK-240

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R59 ,60			RK73GB1J271J	CHIP R 270 J 1/16W		
R61			RK73GB1J101J	CHIP R 100 J 1/16W		
R63			RK73GB1J470J	CHIP R 47 J 1/16W		
R64			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R68 ,69			RK73GB1J104J	CHIP R 100K J 1/16W		
R72			RK73GB1J331J	CHIP R 330 J 1/16W		
R73			RK73GB1J822J	CHIP R 8.2K J 1/16W		
R74			RK73GB1J470J	CHIP R 47 J 1/16W		
R75			RK73GB1J102J	CHIP R 1.0K J 1/16W	K2M2P2	
R75			RK73GB1J102J	CHIP R 1.0K J 1/16W	*	
R75			RK73GB1J331J	CHIP R 330 J 1/16W	KMP	
R76			RK73GB1J122J	CHIP R 1.2K J 1/16W	K2M2P2	
R76			RK73GB1J122J	CHIP R 1.2K J 1/16W	*	
R76			RK73GB1J821J	CHIP R 820 J 1/16W	KMP	
R77			RK73GB1J334J	CHIP R 330K J 1/16W		
R78			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R79 ,80			RK73GB1J473J	CHIP R 47K J 1/16W		
R81			RK73GB1J181J	CHIP R 180 J 1/16W		
R82			RK73GB1J103J	CHIP R 10K J 1/16W		
R83			R92-1252-05	CHIP R 0 ΩHM		
R201,202			RK73GB1J101J	CHIP R 100 J 1/16W		
R203			RK73GB1J104J	CHIP R 100K J 1/16W		
R205			RK73GB1J100J	CHIP R 10 J 1/16W		
R206			RK73GB1J471J	CHIP R 470 J 1/16W		
R207			RK73GB1J182J	CHIP R 1.8K J 1/16W		
R208			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R209			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R210			RK73GB1J184J	CHIP R 180K J 1/16W		
R211			RK73GB1J103J	CHIP R 10K J 1/16W		
R212			RK73GB1J823J	CHIP R 82K J 1/16W		
R213			RK73GB1J273J	CHIP R 27K J 1/16W		
R214			RK73GB1J153J	CHIP R 15K J 1/16W		
R215			RK73GB1J391J	CHIP R 390 J 1/16W		
R216			RK73GB1J104J	CHIP R 100K J 1/16W		
R217			RK73GB1J823J	CHIP R 82K J 1/16W		
R218			RK73GB1J104J	CHIP R 100K J 1/16W		
R219			RK73GB1J223J	CHIP R 22K J 1/16W		
R220			RK73GB1J562J	CHIP R 5.6K J 1/16W		
R221			RK73GB1J332J	CHIP R 3.3K J 1/16W		
R222			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R223			RK73GB1J563J	CHIP R 56K J 1/16W		
R224			RK73GB1J153J	CHIP R 15K J 1/16W		
R225			RK73GB1J223J	CHIP R 22K J 1/16W		
R226			R92-1252-05	CHIP R 0 ΩHM		
R227			RK73GB1J224J	CHIP R 220K J 1/16W		
R232			RK73GB1J153J	CHIP R 15K J 1/16W		
R234			RK73GB1J151J	CHIP R 150 J 1/16W		
R235			RK73GB1J103J	CHIP R 10K J 1/16W		
R236			RK73GB1J100J	CHIP R 10 J 1/16W		
R237			RK73GB1J104J	CHIP R 100K J 1/16W		
R238,239			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R240			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R241			RK73GB1J104J	CHIP R 100K J 1/16W		
R242			RK73GB1J272J	CHIP R 2.7K J 1/16W		
R243			RK73GB1J102J	CHIP R 1.0K J 1/16W		

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格			Destination 仕向	Remarks 備考
R244			RK73GB1J152J	CHIP R	1.5K	J 1/16W		
R245			RK73GB1J101J	CHIP R	100	J 1/16W		
R246			RK73GB1J332J	CHIP R	3.3K	J 1/16W		
R247			RK73GB1J102J	CHIP R	1.0K	J 1/16W		
R248			RK73GB1J274J	CHIP R	270K	J 1/16W		
R249			RK73GB1J152J	CHIP R	1.5K	J 1/16W		
R250			RK73GB1J681J	CHIP R	681	J 1/16W		
R251			RK73GB1J332J	CHIP R	3.3K	J 1/16W		
R252			RK73GB1J472J	CHIP R	4.7K	J 1/16W		
R253			RK73GB1J561J	CHIP R	560	J 1/16W		
R254			RK73GB1J473J	CHIP R	47K	J 1/16W		
R255			RK73GB1J103J	CHIP R	10K	J 1/16W		
R256			RK73GB1J271J	CHIP R	270	J 1/16W	KPM	
R256			RK73GB1J391J	CHIP R	390	J 1/16W	K2P2M2	
R256			RK73GB1J391J	CHIP R	390	J 1/16W	*	
R257			RK73GB1J122J	CHIP R	1.2K	J 1/16W		
R258			RK73GB1J222J	CHIP R	2.2K	J 1/16W		
R262			RK73GB1J393J	CHIP R	39K	J 1/16W		
R263			RK73GB1J222J	CHIP R	2.2K	J 1/16W		
R265			RK73GB1J474J	CHIP R	470K	J 1/16W		
R266			RK73GB1J471J	CHIP R	470	J 1/16W		
R268,269			R92-1257-05	RESISTOR	0.47	1/2W		
R273			R92-1252-05	CHIP R	0 OHM			
R274			R92-0679-05	CHIP R	0 OHM			
R276			RK73GB1J222J	CHIP R	2.2K	J 1/16W		
R277			RK73GB1J221J	CHIP R	220	J 1/16W		
R278			RK73GB1J331J	CHIP R	330	J 1/16W		
R279			RK73GB1J562J	CHIP R	5.6K	J 1/16W		
R280			RK73GB1J152J	CHIP R	1.5K	J 1/16W		
R281			RK73GB1J121J	CHIP R	120	J 1/16W		
R282			RK73GB1J222J	CHIP R	2.2K	J 1/16W		
R284			RK73GB1J822J	CHIP R	8.2K	J 1/16W		
R285			RK73GB1J683J	CHIP R	68K	J 1/16W		
R286			R92-0679-05	CHIP R	0 OHM			
R287			R92-1252-05	CHIP R	0 OHM			
R288			R92-0679-05	CHIP R	0 OHM			
R289-293			R92-1252-05	CHIP R	0 OHM			
R295			R92-0679-05	CHIP R	0 OHM			
R299			R92-1252-05	CHIP R	0 OHM			
R301,302			R92-0679-05	CHIP R	0 OHM			
R303			RK73GB1J184J	CHIP R	180K	J 1/16W		
R304			RK73GB1J224J	CHIP R	220K	J 1/16W		
R305			RK73GB1J334J	CHIP R	330K	J 1/16W		
R306			RK73EB2B471J	CHIP R	470	J 1/8W		
R307			RK73GB1J562J	CHIP R	5.6K	J 1/16W		
R308,309			RK73GB1J104J	CHIP R	100K	J 1/16W		
R312			R92-1252-05	CHIP R	0 OHM			
R316			R92-0150-05	CHIP R	0 OHM			
VR201			R12-6532-05	TRIM POT.	470K			
VR204			R12-6495-05	TRIM POT.	4.7K			
VR205			R12-6491-05	TRIM POT.	1K			
D1			DAN202U	DIODE				
D2			MA363	DIODE				
D3 ,4			1T33C	DIODE				

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X57-3620-10 (K, P, M)
X57-3620-11 (K2, P2, M2)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
D6 ,7			1T33C	DIODE		
D8			DAN202U	DIODE		
D9			MA110	DIODE		
D10			DA204U	DIODE		
D11			MA344B	DIODE		
D12			DA204U	DIODE		
D13			1SV172	DIODE		
D14 ,15			MI808	DIODE		
D16			HSM88AS	DIODE		
D17		*	MA334B	DIODE		
D18			MA344B	DIODE		
D201			EA61FC1F	DIODE		
D202			MA110	DIODE		
D205			DAN202U	DIODE		
D206			02CZ8.2Y	DIODE		
D207			HSM88AS	DIODE		
D208			02CZ3.9Y,Z	DIODE		
D209			DAN202U	DIODE		
D210			MA110	DIODE		
IC1			MB1504	IC(PLL FREQ SYNTHESIZER)		
IC2			TC4S11F	IC(2 INPUT NAND GATE)		
IC201		*	NJM2060M	IC		
IC203			MB88307FP	IC(SHIFT RESISTER)		
IC204			NJM386BD	IC(AF POWER AMP)		
IC205			TK10485M	IC		
IC206			LM301AD	IC(OP AMP)		
IC207			M5236(ML)	IC(AVR)		
Q1 ,2			2SK238(K17)	FET		
Q3			2SC4215(Y)	TRANSISTOR		
Q4 ,5			2SC4083	TRANSISTOR		
Q6			2SC4215(Y)	TRANSISTOR		
Q7			2SC4117(BL)	TRANSISTOR		
Q8			DTC114EU	DIGITAL TRANSISTOR		
Q10 ,11			DTC114EU	DIGITAL TRANSISTOR		
Q12			2SA1312(B)	TRANSISTOR		
Q13			2SC3324(B)	TRANSISTOR		
Q14			2SC4215(Y)	TRANSISTOR		
Q15			2SC4093	TRANSISTOR		
Q16			2SK302(Y)	FET		
Q17			DTC144WU	DIGITAL TRANSISTOR		
Q18			3SK184(S)	FET		
Q19			2SC4215(Y)	TRANSISTOR		
Q201			2SK879(GR,Y)	FET		
Q208			2SB798(DL,DK)	TRANSISTOR		
Q209			2SC4116(GR,BL)	TRANSISTOR		
Q210			DTC144EU	DIGITAL TRANSISTOR		
Q211,212			2SC4116(GR,BL)	TRANSISTOR		
Q213			FMU1	TRANSISTOR		
Q215			DTC114EU	DIGITAL TRANSISTOR		
Q216			2SB798(DL,DK)	TRANSISTOR		
Q217			DTA143ZU	DIGITAL TRANSISTOR		
Q218			DTC114TU	DIGITAL TRANSISTOR		
Q219			2SB798(DL,DK)	TRANSISTOR		
Q220			DTC124TU	DIGITAL TRANSISTOR		
Q221			FMA5	TRANSISTOR		

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CONTROL UNIT (W02-1628-05)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
Q222			DTC144WS	DIGITAL TRANSISTOR		
TH1			157-252-45005	THERMISTOR		
TH201			157-252-43001	THERMISTOR		
CONTROL UNIT (W02-1628-05)						
C1			CK73GB1H103K	CHIP C 0.01UF K		
C2 ,3			CK73GB1H471K	CHIP C 470PF K		
C4 ,5			CK73GB1H103K	CHIP C 0.01UF K		
C6 ,7			CC73GCH1H101J	CHIP C 100PF J		
C8 -10			CK73GB1H471K	CHIP C 470PF K		
C13 -16			CK73GB1H471K	CHIP C 470PF K		
C17 ,18			CK73FB1H473K	CHIP C 0.047UF K		
C19			CC73GCH1H470J	CHIP C 47F J		
C20			CK73GB1H471K	CHIP C 470PF K		
C23			CK73FB1H223K	CHIP C 0.022UF K		
C24			CC73GCH1H101J	CHIP C 100PF J		
C25 -27			CK73GB1H471K	CHIP C 470PF K		
C28			CK73GB1H103K	CHIP C 0.01UF K		
C29			CK73GB1H222K	CHIP C 2200PF K		
C30			C92-0010-05	CHIP TAN 6.8UF 6.3WV		
C31			CK73GB1H122K	CHIP C 1200PF K		
C32			CK73GB1H471K	CHIP C 470PF K		
C33			CK73GB1H103K	CHIP C 0.01UF K		
C34			C92-0010-05	CHIP TAN 6.8UF 6.3WV		
C35			CK73GB1H471K	CHIP C 470PF K		
C36			CC73GCH1H101J	CHIP C 100PF J		
C37			CC73GCH1H470J	CHIP C 47F J		
C38			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		
C39			CC73GCH1H101J	CHIP C 100PF J		
C40 -42			CC73GCH1H470J	CHIP C 47F J		
C43			CC73GCH1H101J	CHIP C 100PF J		
			E29-0484-08	CONNECTOR		
CN2			E40-5344-05	CONNECTOR		
CN3			E40-5361-05	CONNECTOR		
			G13-0966-08	DUMMY CONNECTOR		
			J21-4299-08	MOUNTING HARDWARE		
L1			L33-0737-05	COIL		
X1			L78-0066-05	CRYSTAL		
R1			RK73GB1J184J	CHIP R 180K J 1/16W		
R2			RK73GB1J103J	CHIP R 10K J 1/16W		
R3 -7			RK73GB1J473J	CHIP R 47K J 1/16W		
R8			RK73GB1J471J	CHIP R 470 J 1/16W		
R11			RK73GB1J183J	CHIP R 18K J 1/16W		
R12			RK73GB1J121J	CHIP R 120 J 1/16W		
R13			RK73GB1J103J	CHIP R 10K J 1/16W		
R14			RK73GB1J562J	CHIP R 5.6K J 1/16W		
R15 -19			RK73GB1J473J	CHIP R 47K J 1/16W		
R22 ,23			R92-0670-05	CHIP R 0 OHM		
R24 -26			R92-0670-05	CHIP R 0 OHM		
R27 ,28			RK73GB1J473J	CHIP R 47K J 1/16W		
R31 ,32			RK73GB1J473J	CHIP R 47K J 1/16W		
R33			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R34			RK73FB1J473J	CHIP R 47K J 1/16W		

E: Scandinavia & Europe K: USA P: Canada W: Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

TK-240

PARTS LIST

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

CONTROL UNIT (W02-1628-05)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R37			RK73GB1J473J	CHIP R 47K J 1/16W		
R39			RK73GB1J473J	CHIP R 47K J 1/16W		
R43 ,44			RK73GB1J473J	CHIP R 47K J 1/16W		
R45			RK73GB1J223J	CHIP R 22K J 1/16W		
R46			RK73GB1J564J	CHIP R 560K J 1/16W		
R48			RK73GB1J274J	CHIP R 270K J 1/16W		
R49 -53			RK73GB1J473J	CHIP R 47K J 1/16W		
R59			RK73GB1J224J	CHIP R 220K J 1/16W		
R60			RK73GB1J473J	CHIP R 47K J 1/16W		
R61			RK73GB1J223J	CHIP R 22K J 1/16W		
R62			RK73GB1J224J	CHIP R 220K J 1/16W		
R63			RK73GB1J473J	CHIP R 47K J 1/16W		
R64			RK73GB1J330J	CHIP R 33 J 1/16W		
R65			RK73GB1J224J	CHIP R 220K J 1/16W		
R66 ,67			R92-1252-05	CHIP R 0 ØHM		
R70			RK73GB1J101J	CHIP R 100 J 1/16W		
R71			RK73GB1J102J	CHIP R 1.0K J 1/16W		
R72 -74			R92-1252-05	CHIP R 0 ØHM		
R75 ,76			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R78			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R79			R92-1252-05	CHIP R 0 ØHM		
R80 -81			RK73GB1J472J	CHIP R 4.7K J 1/16W		
VR1			R23-9403-05	TRIM PØT. 50K/10K		
S10 -12			S40-1420-05	SWITCH		
MIC1			T91-0502-05	MICRØPHØNE		
D1			LN01301C(Q)	LED		
D3			B30-0842-05	LED		
D4 -5			1SS272	DIØDE		
D8			DAN202U	DIØDE		
IC1		*	B38-0346-08	LCD		
IC2			UPD7225GB-3B7	IC		
IC3		*	75108GF-K33-3BE	IC		
IC4			S-8054ALB-LM-T1	IC(IC)		
IC5			R90-0711-05	RESISTØR BLØCK		
IC6		*	AK93C47	IC		
IC7			S-81250HG-RD-T1	IC		
Q1			2SA1586(Y)	TRANSISTØR		
Q2			DTC114EU	TRANSISTØR		
Q3			DTC123JU	TRANSISTØR		
EN1			W02-1601-05	ENCØDER		

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE : AAFES(Europe) X: Australia

⚠ indicates safety critical components.

FREQUENCY SETTING

1. Introduction

The frequency for the TK-240 is set by storing the transmit, receive, and CTCSS frequencies in the E²PROM as follows.

1) Modes and their functions
The modes and their functions are summarized below.

Mode name		Function
Setting mode	Dealer setting mode	The dealer determines specifications
	Frequency setting mode	Sets the frequency and tone for each channel
	E²PROM clear mode	After clearing the E²PROM, the frequency setting mode is entered.
	Clone mode	Sets the frequency and tone for each channel with the clone function.
Use mode	User mode	Used by the user for channel display.
	Confirmation mode	The serviceman confirm E²PROM data.

Table 1: Modes and their functions

2) Mode setting
The mode can be changed as follows by remove the two jumpers (TI0 and TI1) and switching the power on without pressing a key.

Jumpers		Mode name
TI0	TI1	
1	0	Dealer specification setting mode
0	1	Setting mode (frequency setting mode)
0	0	Use mode (user mode)

0: No jumper 1: Jumper

Table 2: Mode change with jumpers

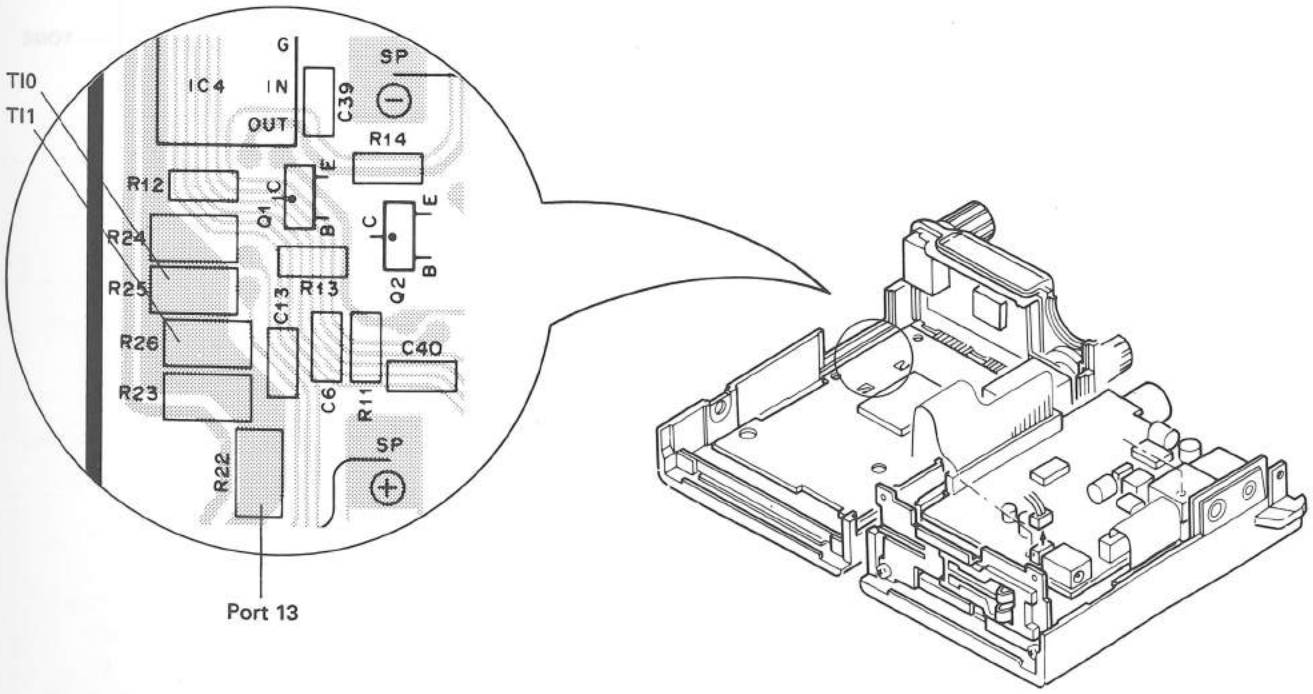


Fig. 1 Jumper locations

FREQUENCY SETTING

The default mode is the frequency setting mode (jumper TI0: 0, TI1: 1)

To enter a mode from the setting mode, perform the following operation and switch the POWER ON. Any of the modes can be set in any order.

Operation	Mode
Turn the POWER ON without pressing a key.	Frequency setting mode
Hold down the [PTT] key and turn the POWER ON.	Dealer setting mode
Hold down the [MONI] key and turn the POWER ON.	E²PROM clear mode
Hold down the [SET1] key and turn the POWER ON.	Clone mode

Table 3 Operations for entering each mode from the setting mode

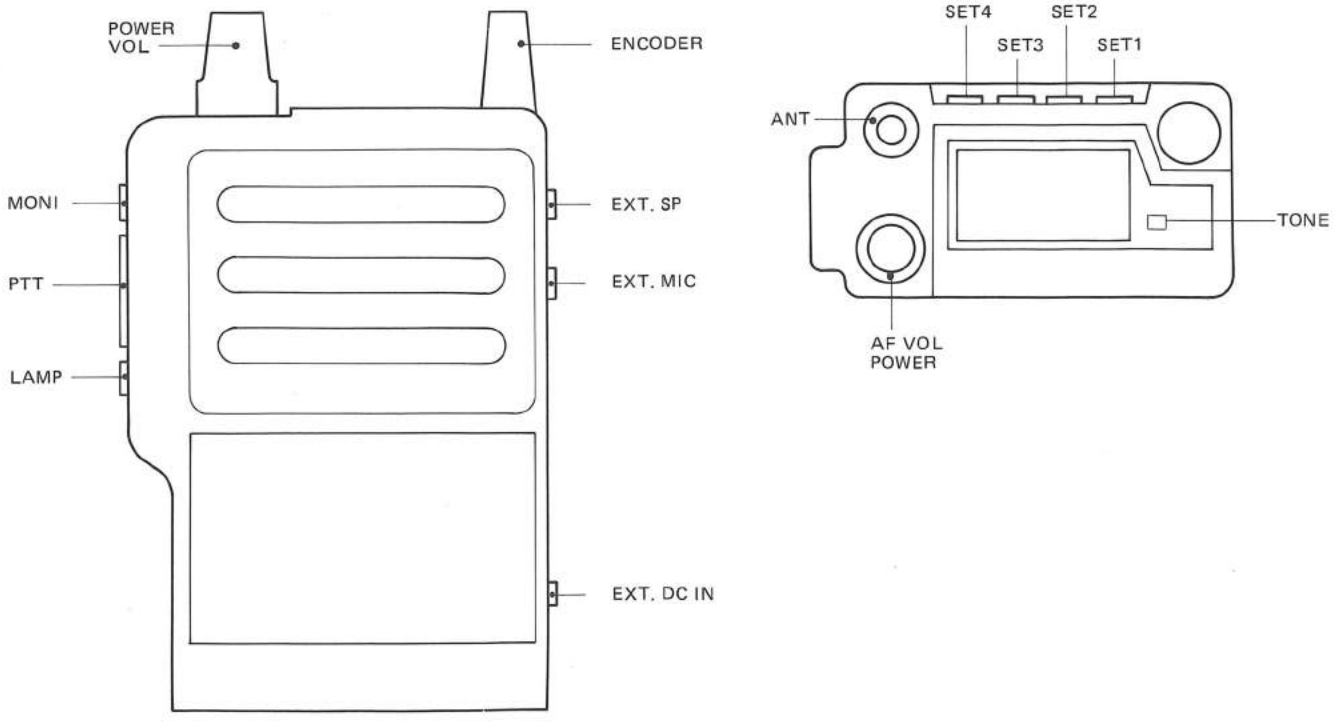


Fig. 2 Operation key locations

FREQUENCY SETTING

When all the work, such as frequency setting and performance checking, is finished, change the mode to the use mode by cutting the jumpers (TI0: 0, TI1: 0) before reassembling the TK-240.

Reference: Even if the use mode has been set by removing jumpers, each of the above modes can be entered by software to improve serviceability.

Operation	Mode
Turn the POWER ON without pressing a key.	User mode
Hold down the [SET3] key and turn the POWER ON.	Confirmation mode
Hold down the [SET3] and [LAMP] keys and turn the POWER ON.	Frequency setting mode
Hold down the [SET3] and [PTT] keys and turn the POWER ON.	Dealer setting mode
Hold down the [SET3] and [MONI] keys and turn the POWER ON.	E2PROM clear mode
Hold down the [SET4] key and turn the POWER ON.	Clone mode

Table 4 Operations for entering each mode from the setting mode

FREQUENCY SETTING

2. Frequency setting mode

① This mode is entered when microprocessor T10 is set to high, T11 to low, and the power is turned on without pressing a key.

② The mode can also be entered from the use mode by holding down the SET3 and LAMP keys and turning the POWER ON. The mode is used by the dealer to write the transmit/receive frequency and CTCSS frequency into the E²PROM.

The mode is entered when the POWER is turned ON in the SETTING MODE without pressing any key. When the POWER is turned ON, the 1-channel receive frequency setting mode (1ch.R-F) is entered. Each time the PTT key is pressed, the mode changes as follows:

1. 1-channel receive frequency setting mode
2. 1-channel receive CTCSS frequency setting mode
3. 1-channel transmit frequency setting mode
4. 1-channel transmit CTCSS frequency setting mode
5. 2-channel receive frequency setting mode

↓ ↓

61. 16-channel receive frequency setting mode
62. 16-channel receive CTCSS frequency setting mode
63. 16-channel transmit frequency setting mode
64. 16-channel transmit CTCSS frequency setting mode
65. END display. (Writing is complete.)

Note: Whether the CTCSS unit is installed or not is determined in step 1. If the CTCSS unit is not installed, the receive CTCSS frequency setting modes are skipped.

- Receive frequency setting mode

  Initial display

  Channel display : Number of channels to be set

  Frequency display: 1) When a frequency has already been written in to the E²PROM, that frequency
  2) When there is no data in the E²PROM, one channel: Initial frequency
  Other channel : Receive frequency of the previous channel

  ① When the encoder is turned, the display frequency changes.
  When the encoder is turned while holding down the LAMP key, the display frequency changes in 1-MHz steps.

  ② When the PTT switch is pressed, the displayed frequency is set as the receive frequency for the channel, and the mode changes to the next receive CTCSS frequency setting mode.

- Receive CTCSS frequency setting mode

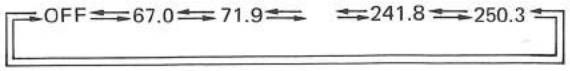
  Initial display

  Channel display : Number of channel to be set

  Frequency display: 1) When a CTCSS frequency has already been written into the E²PROM, that CTCSS frequency
  2) When there is no data in the E²PROM, OFF is displayed.

  ① When the encoder is turned, the CTCSS frequency (38 frequencies + OFF) changes.

  ② When the PTT switch is pressed, the displayed CTCSS frequency is set as the receive CTCSS frequency for the channel, and the mode changes to the next transmit frequency setting mode.



- Transmit frequency setting mode

  Initial display

  Channel display : Number of channel to be set

  Frequency display: 1) When a frequency has already been written in to the E²PROM, that frequency
  2) When there is no data in the E²PROM, the

FREQUENCY SETTING

receive frequency for the channel

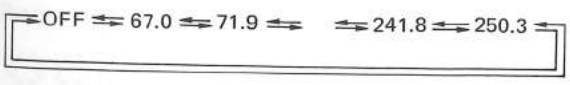
Others : The ON AIR LED lights to distinguish this mode from the receive frequency setting mode.

① When the encoder is turned, the display frequency changes.
When the encoder is turned while holding down the LAMP key, the display frequency changes in 1-MHz steps.

② When the PTT switch is pressed, the displayed frequency is set as the transmit frequency for the channel, and the mode changes to the next transmit CTCSS frequency setting mode.

- Transmit CTCSS frequency setting mode
  Initial display
  Channel display : Number of channel to be set
  Frequency display: 1) When a CTCSS frequency has already been written into the E²PROM, that CTCSS frequency
  2) When there is no data in the E²PROM, OFF is displayed.
  Others : The ON AIR LED lights to distinguish this mode from the receive CTCSS frequency setting mode.

① When the encoder is turned, the CTCSS frequency (38 frequencies + OFF) changes.



② When the PTT switch is pressed, the displayed CTCSS frequency is set as the transmit CTCSS frequency for the channel, and the mode changes to the next receive frequency setting mode.
When the data for all 16 channels has been written, END is displayed, and no further writting is permitted.

Data confirmation with the MONI key

- The written contents can be confirmed by pressing the MONI key in the frequency setting mode. The operation is as follows depending on the condition when the MONI key is pressed.

Condition	Operation
When no write operation is performed using the PTT key after clearing the E²PROM	No operation
When END is displayed	The 1-channel receive frequency setting mode is displayed.
In the receive frequency setting mode	The receive frequency setting mode for the previous channel is displayed.
In a mode other than above	The receive frequency setting mode for that channel is displayed.
When the written contents are being confirmed by pressing the MONI key.	Each time the MONI key is pressed, the modes are displayed in the following order: Receive frequency setting mode → receive CTCSS frequency setting mode → transmit frequency setting mode → transmit CTCSS frequency setting mode → receive frequency setting mode for the next channel. The modes are displayed for the channels in which data has been written. If data is written in channel 1 and channel 6, the channels between them are displayed as blank channels. Note: If the CTCSS unit is not installed, the receive CTCSS frequency setting mode is skipped.

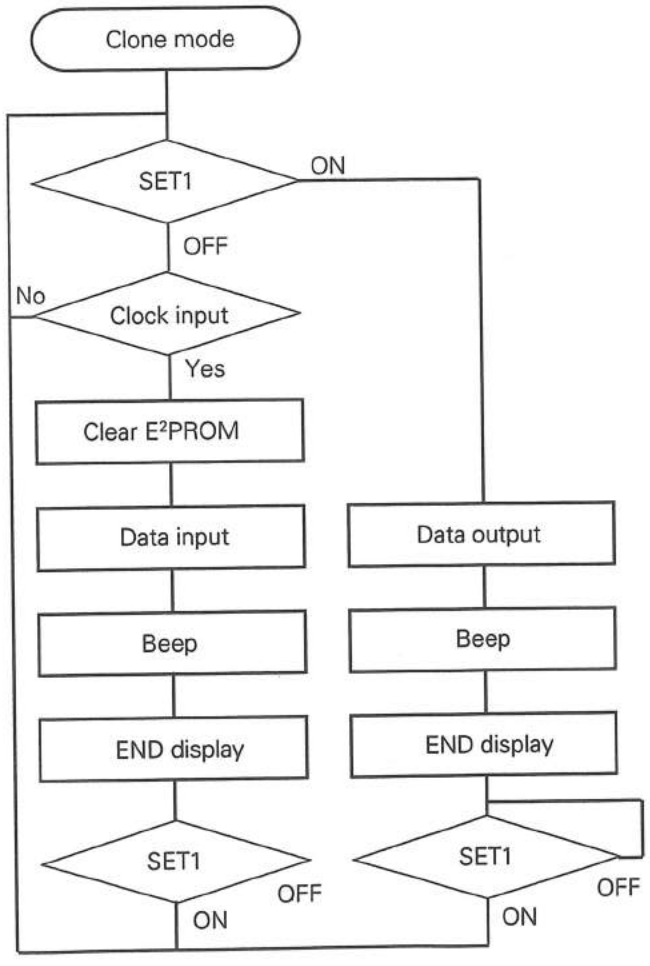
- The encoder, PTT, and LAMP keys are effective and data can be rewritten even when data is being confirmed with the MONI key.

3. Clone mode

In the clone mode, two transceivers are connected together and the contents of the E²PROM of one transceiver are copied to the E²PROM of the other.

FREQUENCY SETTING

- Method of operation
  ① When the SET1 key is held down and the power is turned on in the setting mode, and when the SET4 key is held down and the power is turned on in the use mode, the clone mode is entered and "–C–" is displayed on the LCD.
  ② Connect the clone terminals (PTT line) of the two transceivers in the clone mode.
  ③ When the SET1 key on the transceiver that has the data to be copied from its E²PROM is pressed, the ON AIR LED lights, and the data is copied from that transceiver to the other. (The display on the receiving transceiver remains unchanged.) When data ends (after about 20 seconds), both transceivers beep and show END on their displays.
  ④ When the SET1 key is pressed with END displayed, the mode in ① is entered again. In the clone mode, four types of data can be copied: receive PLL data, transmit PLL data, receive tone, and transmit tone (about 48 bits).



Condition for using the clone mode correctly

The IF and PLL comparison frequency of the transmitter must match those of the receiver.

If they do not, the clone mode can be used, but the data in the receiver is destroyed.

Clone with a land mobile

A handy transceiver and a land mobile can be connected together in the clone mode in the same way and under the same conditions as when connecting two handy transceivers.

Note: If the IF of the TK-240 is 30.825MHz, the IF of the other (TK-705) is 21.4MHz, and the PLL comparison frequencies are the same, the clone mode is effective.

4. User mode

The user mode is for the user. This mode is entered when the power is turned on in the use mode (except when the SET1 key is held down and the power is turned on).

- Initial state
  CH : If the last channel number is maintained, the transceiver enters the receive state with that channel. If not, the transceiver enters the receive state with one channel.
  MONI : OFF
  SQ OFF : OFF
- Functions
  Encoder : Channel UP/DOWN
  MONI : MONI ON/OFF, SQ ON/OFF
  SQ OFF : SQ ON/OFF
  TONE : CTCSS decode ON/OFF
  PTT : Transmit/receive
  LAMP : LAMP ON/OFF

5. Confirmation mode

In this mode, the serviceman can confirms E²PROM data in the use mode.

- Operation

When the SET3 key is held down and the power is turned on in the use mode, the mode changes to the confirmation mode and the receive frequency of 1CH is displayed. Subsequent operations are the same as those for data confirmation with the MONI key in the frequency setting mode. However, the encoder, PTT, SQ OFF, keys are disabled.

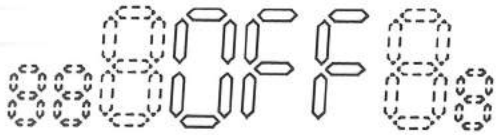
FREQUENCY SETTING

6. Dealer setting mode

This mode is entered when microprocessor **TIO** is set to low, **TI1** to high, and the power is turned on without pressing a key. The mode can be entered from the use mode by holding down the SET3 and PTT keys and turning the power on.

① Signaling setting mode
When the encoder is turned, the display changes. → OFF

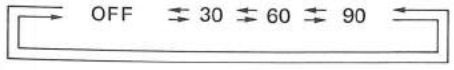
OFF

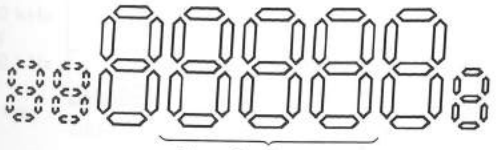


② Busy channel lockout setting mode
When the encoder is turned, the display changes.
ON⇆OFF

③ Battery saving setting mode
When the encoder is turned, the display changes.
ON⇆OFF

④ Time-out timer
When the encoder is turned, the display changes.





Time is displayed

When items ① to ⑤ have all been written, END is displayed, and no further writing is permitted.

The PLL comparison frequency is changed between 5 kHz and 6.25 kHz by the jumper at PORT 13.

Low: 5 kHz High: 6.25 kHz

The step is determined by a combination of the initial frequency and PLL comparison frequency.

Initial frequency	PLL comparison frequency	Step
150MHz	5kHz	5kHz
150MHz	6.25kHz	6.25kHz
450Mhz	5kHz	10kHz
450MHz	6.25kHz	12.5kHz

TK-240

ADJUSTMENT

REQUIRED TEST EQUIPMENT

1. **Stabilized Power Supply**
   1) The supply voltage can be changed between 5V and 18V, and the current is 3A or more.
   2) The standard voltage is 12.0V.
2. **DC Ammeter**
   1) Class 1 ammeter (17 ranges and other features)
   2) The full scale can be set to either 300mA or 3A.
   3) A cable of less internal loss must be used.
3. **Frequency Counter (f. counter)**
   1) Frequencies of up to 1 GHZ or so can be measured.
   2) The sensitivity can be changed to 250MHz or below, and measurements are highly stable and accurate (0.2 ppm or so).
4. **Power Meter**
   1) Measurable frequency: Up to 500MHz
   2) Impedance: 50Ω, unbalanced
   3) Measuring range: Full scal of 10W or so
   4) A standard cable (5D2W 1m) must be used.
5. **RF VTVM (RF V.M)**
   1) Measurable frequency: Up to 500MHz or so
6. **Linear Detector**
   1) Measurable frequency: Up to 500MHz
   2) Characteristics are flat, and CN is 60dB or more.
7. **Digital Voltmeter**
   1) Voltage range: FS = 18V or so
   2) Input resistance: 1MΩ or more
8. **Oscilloscope**
   1) Measuring range: DC to 30MHz
   2) Provides highly accurate measurements for 5 to 25MHz.
9. **AF Voltmeter (AF VTVM)**
   1) Measurable frequency: 50Hz to 1MHz
   2) Maximum sensitivity: 1mV or more
10. **Spectrum Analyzer**
    1) Measuring range: DC to 1GHz or more
11. **Standard Signal Generator (SSG)**
    1) Maximum frequency: 500MHz or more
    2) Output: –20dB/0.1μV to 120dB/1V
    3) Output impedance: 50Ω
12. **Tracking Generator**
    1) Center frequency: 50kHz to 500MHz
    2) Frequency deviation: ±35MHz
    3) Output voltage: 100mV or more
13. **Dummy Load**
    1) 8Ω, 3W or more

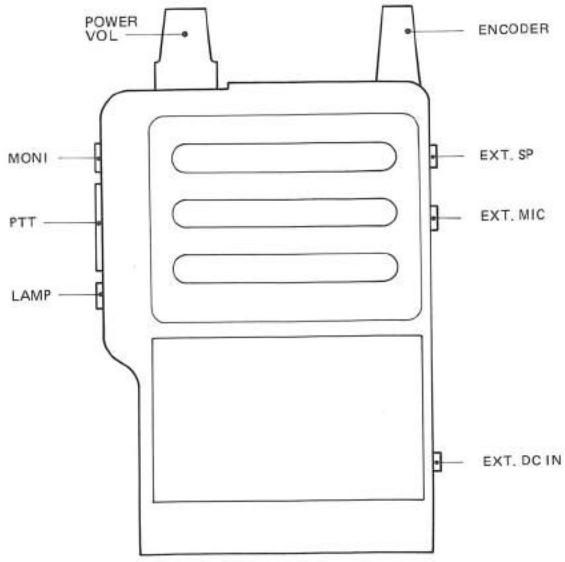
- Use a non-conductive rod such as a Bakelite rod for adjustment (especially of trimmers and coils).
- To protect the SSG, do not send out signals while adjusting the receiving unit.
- The indicated SSG output levels are for maximum output.

TK-240

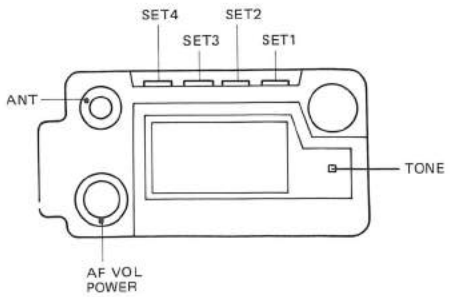
Version	Frequency range	Remark
K	150~174MHz	IF1 34.4MHz LOC 34.855MHz
K2	136~150MHz	IF1 30.825MHz LOC 30.370MHz
P	150~174MHz	IF1 34.4MHz LOC 34.855MHz
P2	138~150MHz	IF1 30.825MHz LOC 30.370MHz
M	146~174MHz	IF1 34.4MHz LOC 34.855MHz
M2	136~150MHz	IF1 30.825MHz LOC 30.370MHz
*	136~150MHz	IF1 30.825MHz LOC 30.370MHz
*	150~174MHz	IF1 34.4MHz LOC 34.855MHz

Type 1	K, P, M
Type 2	K2, P2, M2

Front side view



Panel side view



ADJUSTMENT

Adjustment Points

TX-RX UNIT (X57-3620-XX) (A/2)

Component side view

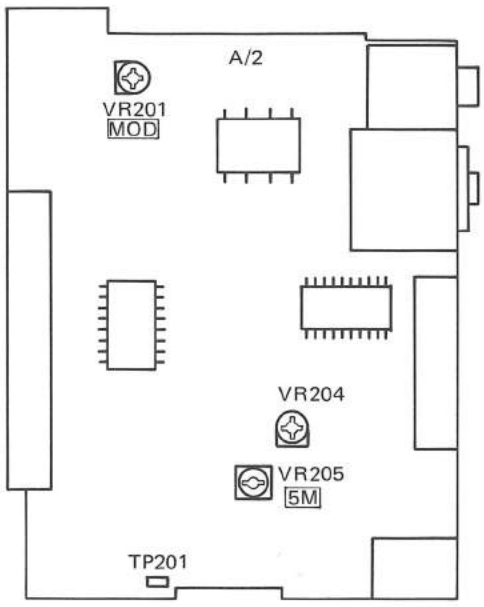


Fig. 1

TX-RX UNIT (X57-3620-XX) (B/2)

Component side view

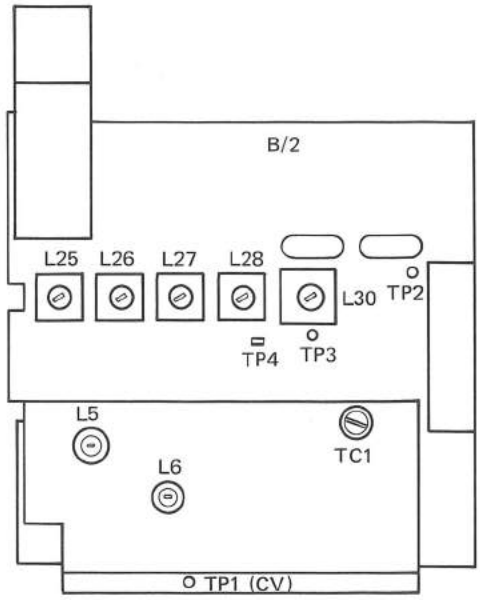


Fig. 2

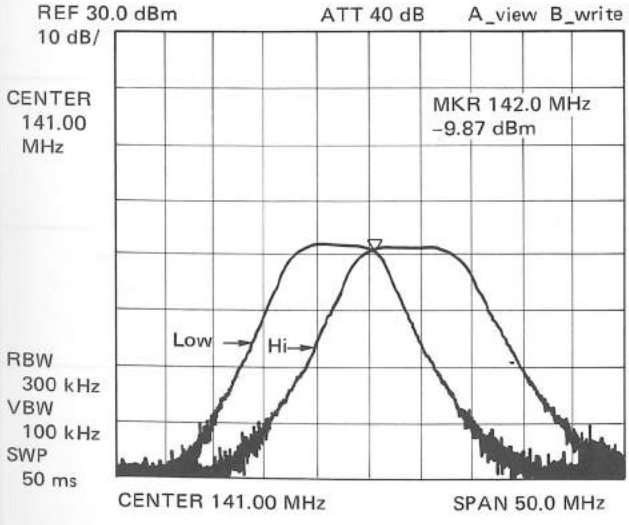


Fig. 3 Version: K2, P2, M2

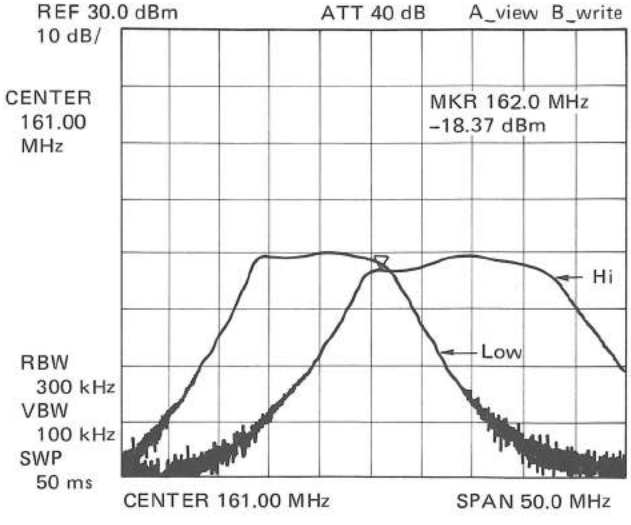


Fig. 4 Version: K, P, M

ADJUSTMENT

Alignment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) POWER SW: OFF							
	2) EXT.DC IN: 13.8V POWER SW: ON * If there is no SSG modulation specification, standard modulation is used (MOD.: 1kHz, DEV.: ±3kHz, AF output: 0.63V/8Ω)							
2. 5M ADJ.		DVM	TX-RX (A/2)	TP-201	TX-RX (A/2)	VR-205	4.8V	4.76~4.84V
3. Write the requested frequencies in the TK-240								
4. PLL lock voltage check	1) CH: Channel with highest TX freq' (fTH). PTT: ON	DVM	TX-RX (B/2)	TP1	TX-RX (B/2)	L5	3.8V (TYPE 1) 3.6V (TYPE 2)	3.79V~3.81V (TYPE 1) 3.59V~3.61V (TYPE 2)
	2) CH: Channel with highest RX freq' (fRH).				TX-RX (B/2)	L6	3.8V (TYPE 1) 3.6V (TYPE 2)	3.79V~3.81V (TYPE 1) 3.59V~3.61V (TYPE 2)
	3) CH: Channel with lowest TX freq' (fTL). PTT: ON						Check	1.2V~1.6V (TYPE 1) 1.6V~2.0V (TYPE 2)
	4) CH: Channel with lowest RX freq' (fRL).							1.1V~1.5V (TYPE 1) 1.5V~1.9V (TYPE 2)
5. Transmit frequency adjustment	1) CH: Channel with center TX freq' (fTM) PTT: ON	F. counter		ANT	TX-RX (B/2)	TC1	Freq' adj. of TX	±500Hz
6. Power (APC) adjustment	1) CH: Channel with center TX freq' (fTM) PTT: ON * Must be performed in a short time	Power meter		ANT	TX-RX	VR204	MAX	6.0W or more ON AIR must light.
	2) CH: Channel with lowest and highest TX freq' (fTL) or (fTH) (Adjust with lower power) PTT: ON	DC ammeter				VR204	5.5W *Turn VR 204 counterclockwise.	1.8A or less
	3) CH: TX freq' (fTM) TX freq' (fTL) and (fTH) (When adjustment is made with fTL, confirm with fTH). PTT: ON							5.0~6.5W 1.8A or less
	4. DC in 8.5V CH: TX freq' (fTM) TX freq' (fTL) TX freq' (fTH) PTT: ON							1.8W or more 1.4A or less
7. Maximun deviation adjustment	1) Connect the AG to the MIC terminal. AG: 1kHz/150mV Deviation meter filter LPF: 20kHz, HPF: OFF De-emphasis: OFF CH: Channel with center TX freq' (fTM). PTT: ON	Power meter AG Deviation meter AF V.M		ANT	TX-RX (A/2)	VR201	±4.2kHz	±100Hz
8. CTCSS	1) CH: set the channel selector to the channel with CTCSS is used. Mutual testing	Monitor Dummy						Squelch open
	2) Monitor PTT: ON							Squelch open
	3) Monitor PTT: OFF							Squelch close

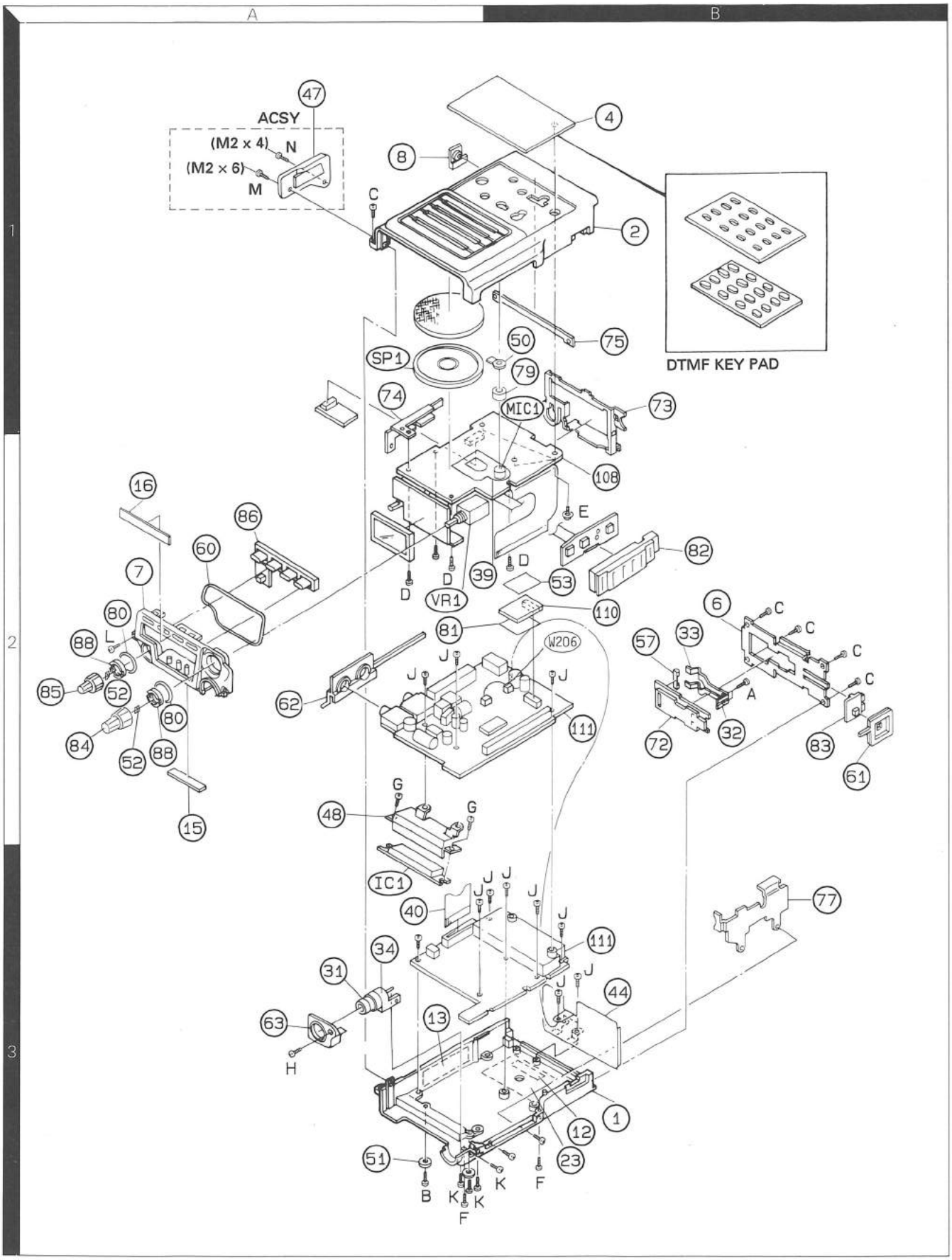
ADJUSTMENT

Alignment

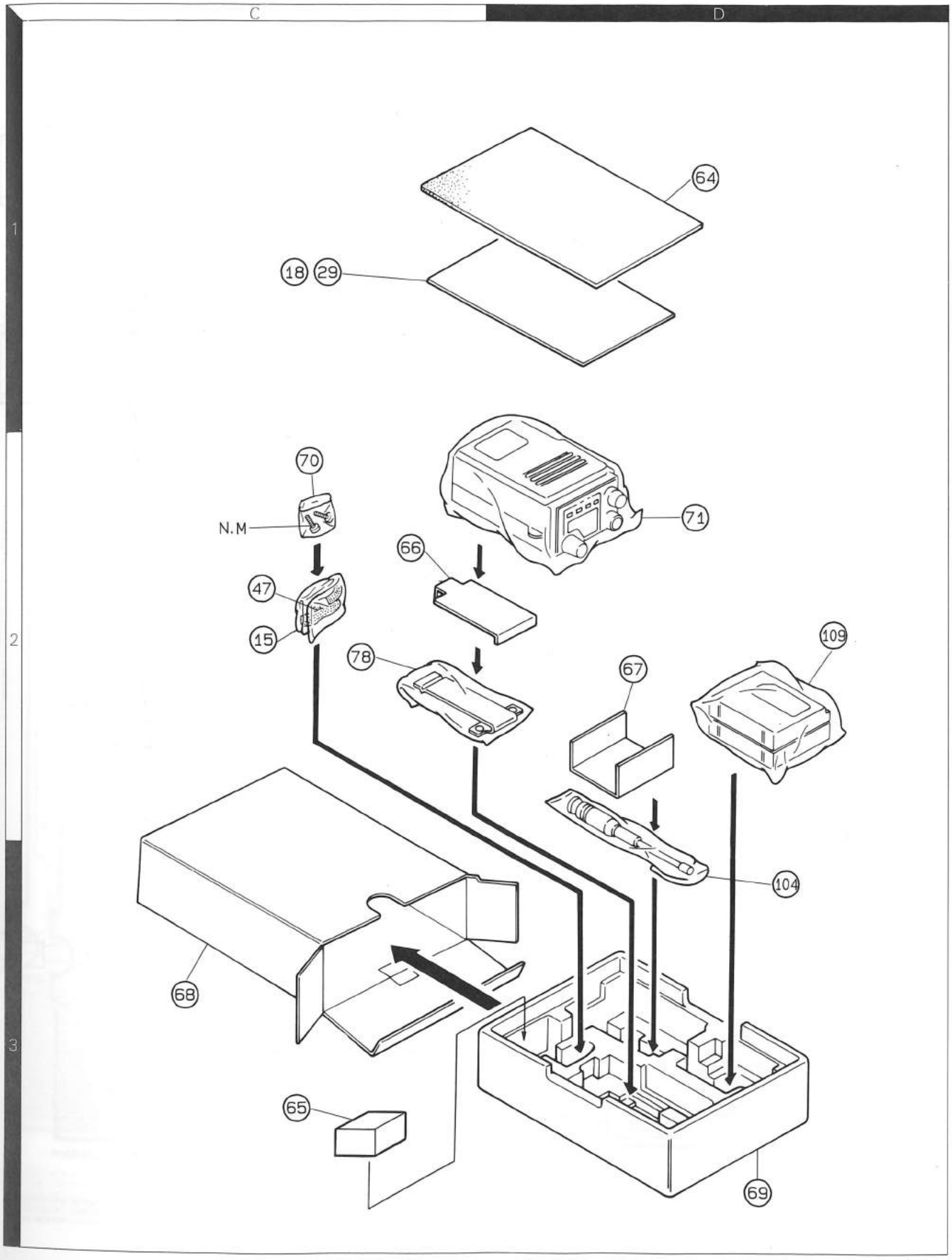
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
9. BPF (Hi)	1) Tracking generator output: −40dBμ Connect the spectrum analyzer to TP4	Tracking generator Spectrum analyzer	TX-RX (B/2)	ANT TP4	TX-RX (B/2)	L25.26 L27.28	Fig. 3 Fig. 4	
10. BPF (Low)	1) Tracking generator output: −40dBμ Connect the spectrum analyzer to TP4						Fig. 3 Fig. 4	
10.Sensitivity	CH: Channel with center RX freq'(fRM) Channel with highest RX freq'(fRH) Channel with lowest RX freq'(fRL) SSG freq': CH(fRH-fRL) SSG output: 0.32μV/−117dBm	Oscilloscope AF. V.M Distortion-meter SSG		EXT.SP			Check	12dB SINAD or more.
11. Major input S/N	CH: Channel with center RX freq'(fRM) SSG output: 60dBμ AF output: 0.63V/8Ω	Oscilloscope AF VTVM SSG		EXT.SP ANT				40dB or more
12. Squelch power consumption	CH: Channel with center RX freq'(fRM) SSG output: OFF	Oscilloscope AF V.M DC Ammeter SSG						Power consumption 65mA or less
	SSG output: 0.2μV/−121dBm							Squelch must be opened
	SSG output: OFF							Squelch must be closed

TK-240

EXPLODED VIEW



PACKING

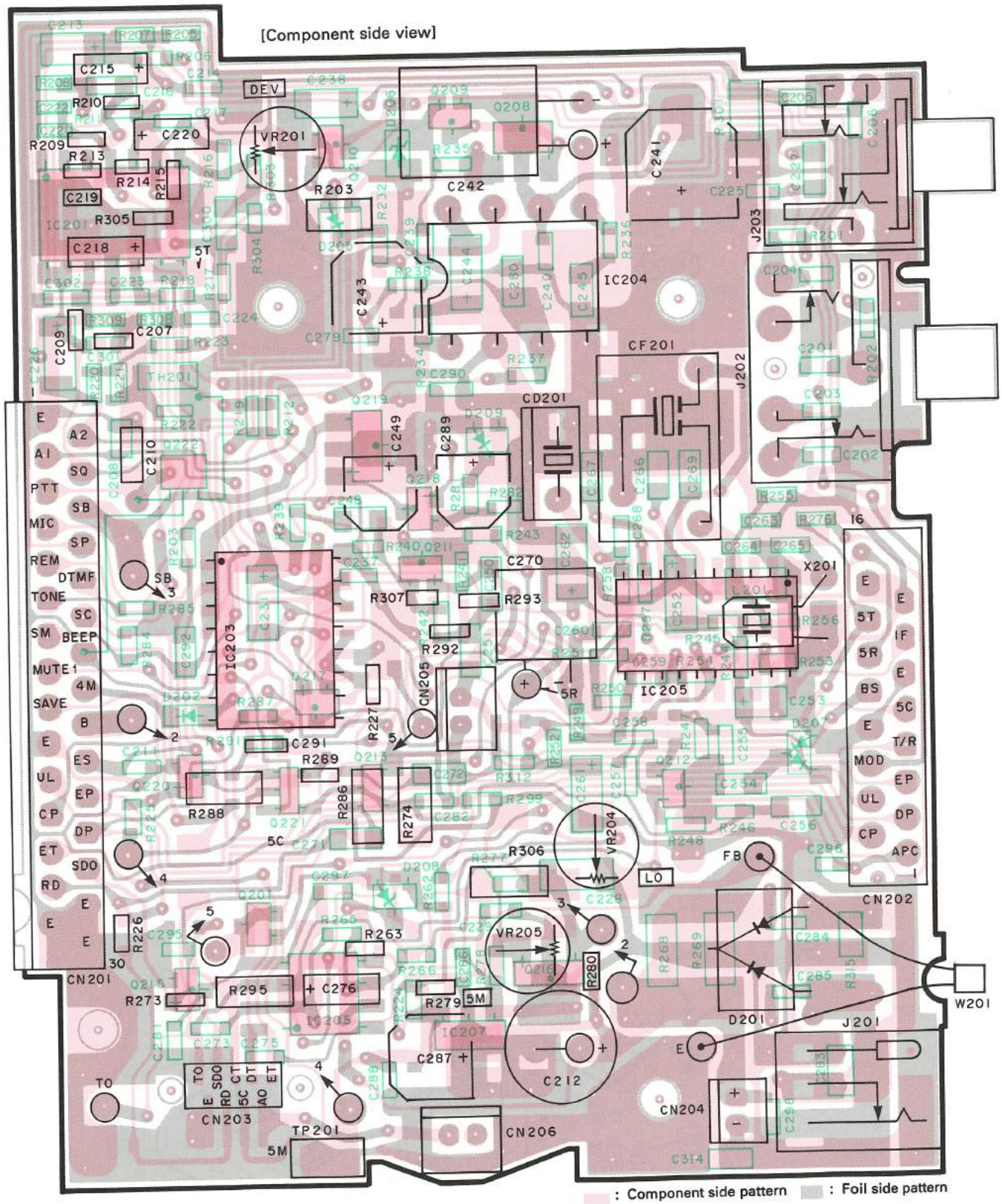


TK-240

PC BOARD VIEW

▼ TX-RX UNIT (X57-3620-XX A/2)

[Component side view]



: Component side pattern : Foil side pattern

Q201: 2SK879 (GR, Y)
Q208, 216, 219: SB798 (DL, DK)
Q209, 211, 212: 2SC4116 (GR, BL)
Q210, 215: DTC114EU

Q213: FMU1
Q222: DTC144WS
Q217: DTA143ZU
Q218: DTC114TU
Q220: DTC124TU
Q221: FMA5

D201: EA61FC1F
D202: MA110
D205, 209: DAN202U
D206: 02CZ8.2Y

D207: HSM88AS
D208: 02CZ3.9Y, Z
D210: MA110

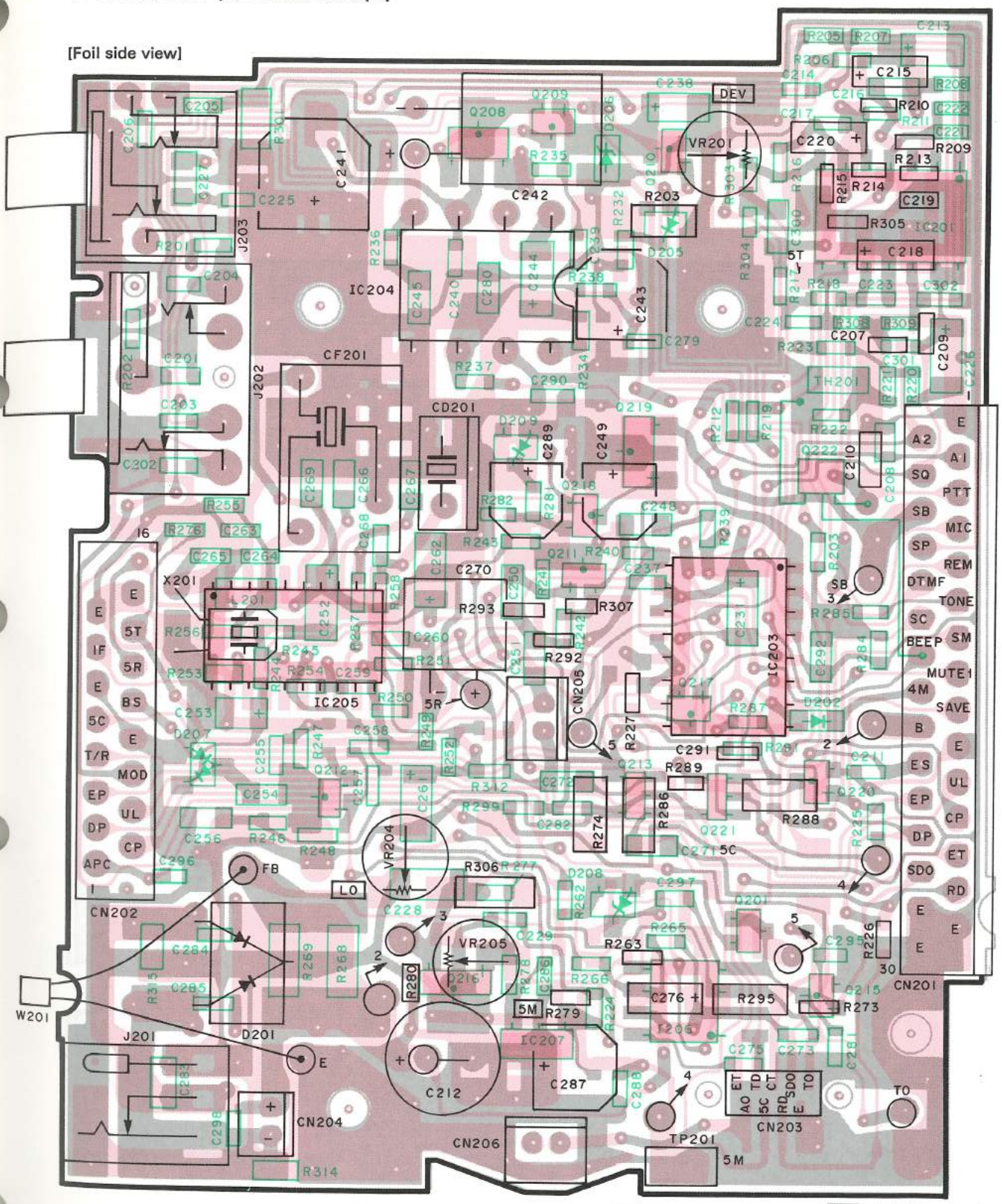
IC201: NJM2060M
IC203: MB88307FP
IC204: NJM3868D

IC205: TK10485M
IC206: LM301AD
IC207: M5236 (ML)

PC BOARD VIEW

▼ TX-RX UNIT (X57-3620-XX A/2)

[Foil side view]



: Component side pattern : Foil side pattern

Q201: 2SK879 (GR, Y)
Q208, 216, 219: 2SB798 (DL, DK)
Q209, 211, 212: 2SC4116 (GR, BL)
Q210, 215: DTC114EU

Q213: FMU1
D202: MA110
Q217: DTA143ZU
Q218: DTC114TU
Q220: DTC124TU
Q221: FMA5
Q222: DTC144WS

D201: EA61FC1F
D202: MA110
D205, 209: DAN202U
D206: 02CZ8.2Y

D207: HSM88AS
D208: 02CZ3.9Y, Z

IC201: NJM2060M
IC203: MB88307FP
IC204: NJM386BD

IC205: TK10485M
IC206: LM301AD
IC207: M5236 (ML)

TK-240

PC BOARD VIEW

▼ TX-RX UNIT (X57-3620-XX B/2)

[Component side view]

: Component side pattern : Foil side pattern

Q1, 2: 2SK238(k17)
Q3, 6, 14, 19: 2SC4215(Y)
Q4, 5: 2SC4083
Q7: 2SC4117(BL)
Q8, 10, 11: DTC114EU
Q12: 2SA1312(B)

Q13: 2SC3324(B)
Q15: 2SC4093
Q16: 2SK302 (Y)
Q17: DTC144VU
Q18: 3SK184(S)

D1, 8: DAN202U
D2: MA363
D3, 4, 6, 7: IT33C
D9: MA110
D10, 12: DA204U
D11, 17, 18: MA 344B

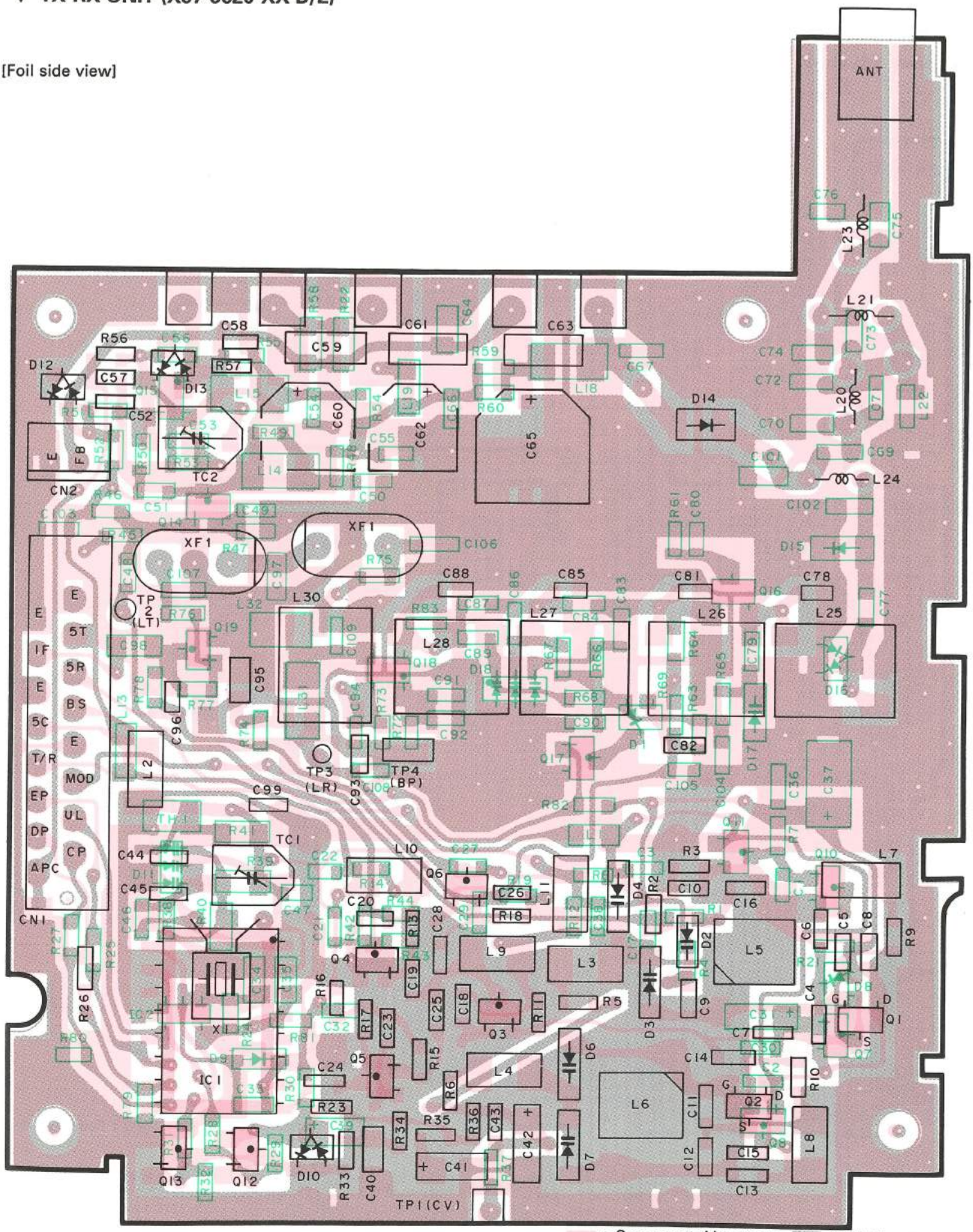
D13: 1SV172
D14, 15: MI808
D16: HSM 88AS

IC1: MB1504
IC2: TC4S11F

PC BOARD VIEW

▼ TX-RX UNIT (X57-3620-XX B/2)

[Foil side view]



: Component side pattern : Foil side pattern

Q1, 2: 2SK238(k17)
Q3, 6, 14, 19: 2SC4215(Y)
Q4, 5: 2SC4083
Q7: 2SC4117(BL)
Q8, 10, 11: DTC114EU
Q12: 2SA1312(B)

Q13: 2SC3324(B)
Q15: 2SC4093
Q16: 2SK302 (Y)
Q17: DTC144WU
Q18: 3SK184(S)

D1, 8: DAN202U
D2: MA363
D3, 4, 6, 7: IT33C
D9: MA110
D10, 12: DA204U
D11, 17, 18: MA 344B

D13: 1SV172
D14, 15: MI808
D16: HSM 88AS

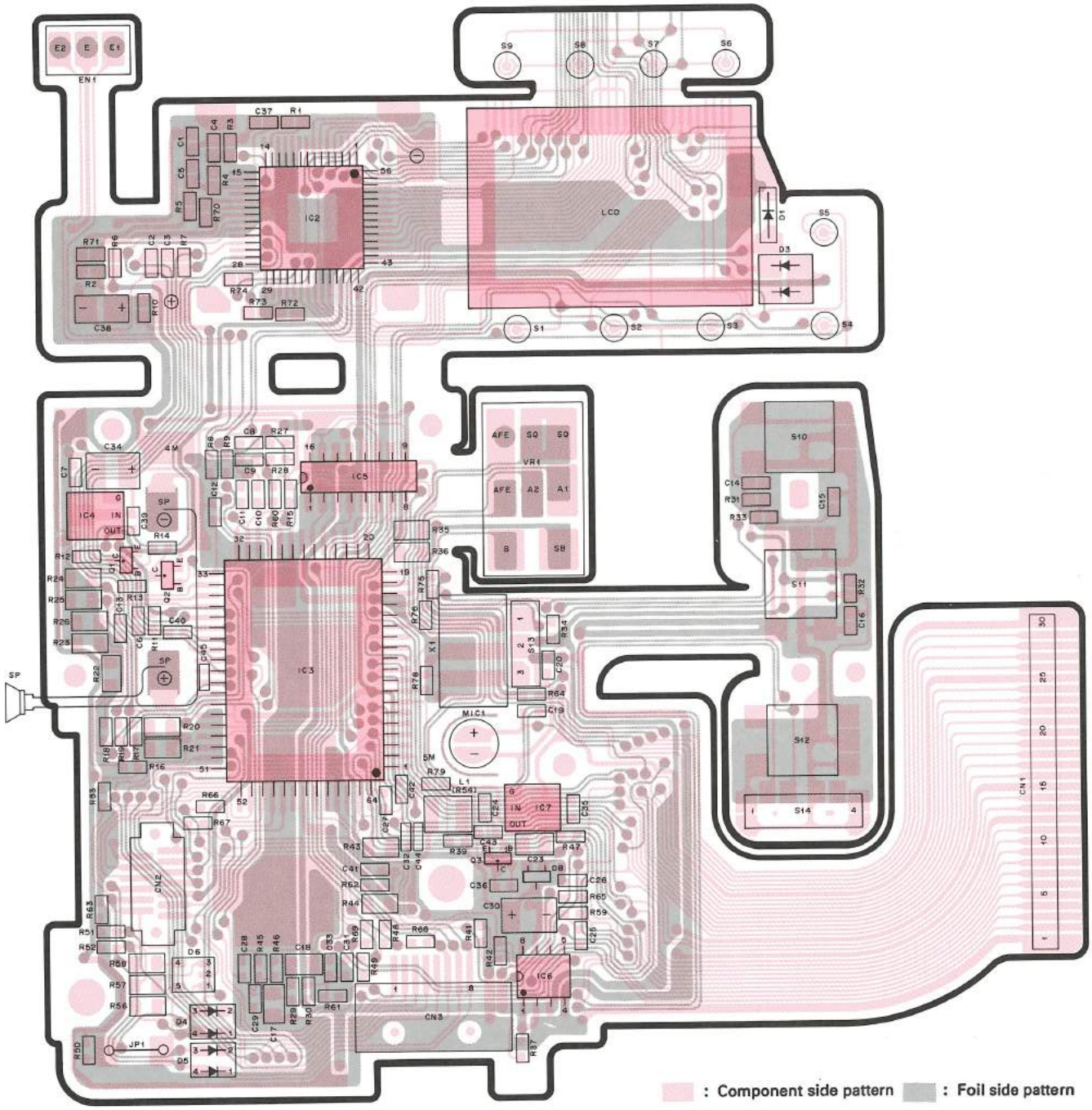
IC1: MB1504
IC2: TC4S11F

TK-240

PC BOARD VIEW

▼ Control ASSY (WO2-1628-05)

[Component side view]



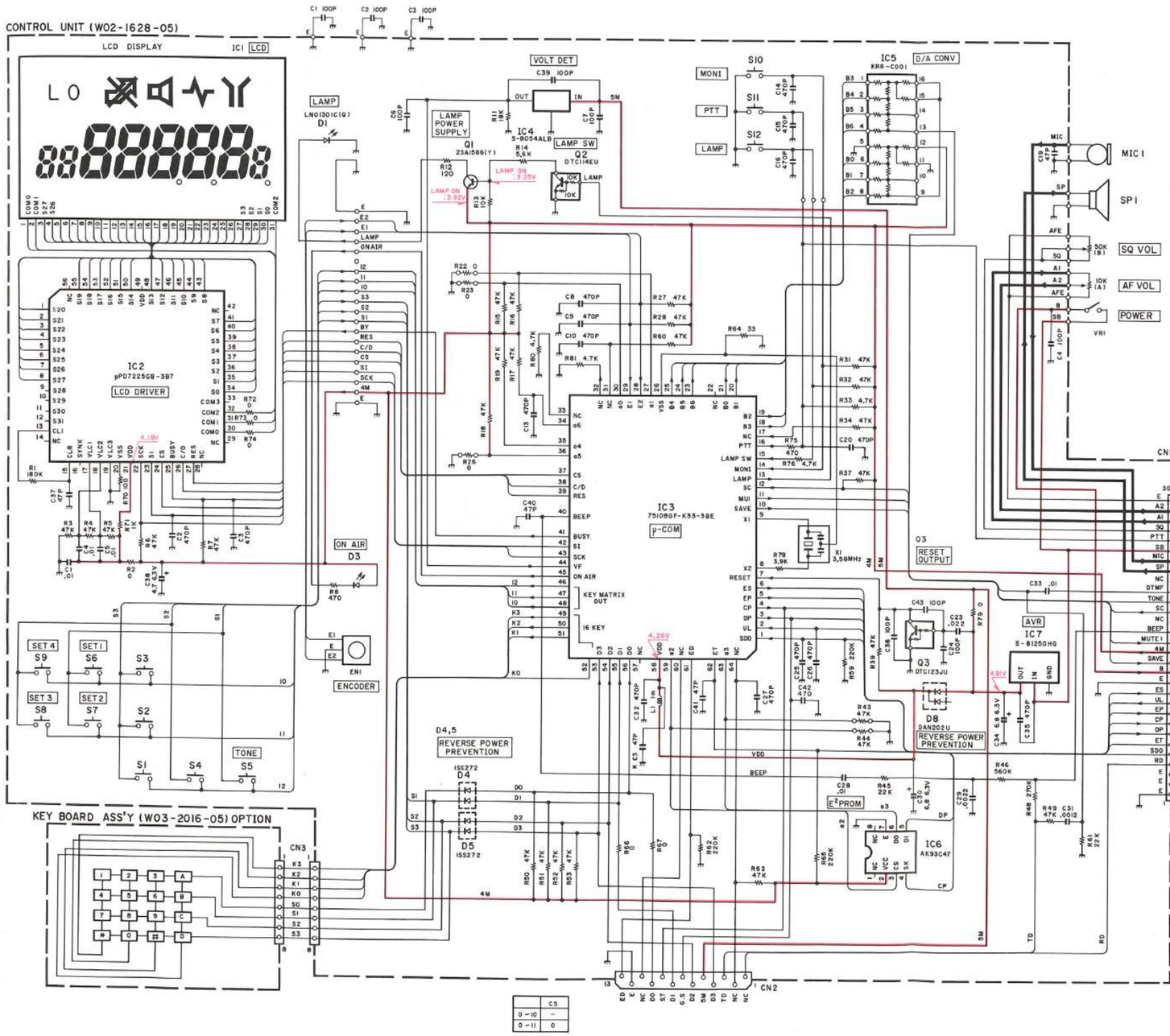
D1: LN01301C (Q)
D3: B30-0842-05
D4-5: 1SS272

D8: DAN202U
IC2: UPD7225GB-3B7
IC3: 75108GF-K33-3BE
IC4: S-8054ALB-LM-T1

IC5: R90-0711-05
IC6: AK93C47
IC7: S-81250HG-RD-T1

Q1: 2SA1586 (Y)
Q2: DTC114EU
Q3: DTC123JU

SCHEMATIC DIAGRAM



	C5
0-10	–
0-11	0

J K L M N O P Q R S T

M) O-11(K2,P2,M2)

TO CN206 *W206 *W207 CN205

(X57-362X-XX)(A/2)

	NO USED UNIT	CTCSS
W206	NO	YES
W207	YES	NO

IC201(2/4) NJM2060M MIC AMP IC201(3/4) NJM2060M MOD ADJ. AF AMP Q213 FMU1 ACTIVE HPF Q211 2SC4116(GR,BL) NOISE DET D207 HSM88AS NOISE AMP Q212 2SC4116(GR,BL) D205 REVERSE POWER PREVENTION IC204 NJM386BD AF AMP IC205 TK10485M FM IC IC206 LM301AD APC Q201 2SK879(GR,Y) CONSTANT CURRENT Q215 DTC114EU APC 4W Q208 2SB798(DL,DK) AVR Q209 2SC4116(GR,BL) AVR D206,208 REFERENCE VOLTAGE Q210 DTC144EU AF MUTE Q220 DTC124TU 5C-SW Q221 FMA5 5C-SW/5R-SW IC203 MB88307FP SHIFT REGISTER

TX-RX UNIT (RF) (X57-362X-XX)(B/2) X-XX:0-10(K,P,M) 0-11(K2,P2,M2)

D3,4,6,7 VCO VOLT CONTROL VCO Q1 2SK238(K17) VCO BUFFER AMP Q3 2SC4215(Y) MODULATION VCO Q2 2SK238(K17) Q10 DTC114EU Q7 2SC4117(BL) Q11 DTC114EU Q8 DTC114EU Q12,13 CHARGE PUMP Q12 2SA1312(B) Q13 2SC3324(B) D10 DA204U IC1 MB1504 PLL D11 MA344B VARI-CAP TUNING WAVEFORM SHAPING D9 MA110 IC2 TC4511F UNLOCK SIGNAL

RF AMP Q4 2SC4083 Q7 RIPPLE FILTER RF AMP Q14 2SC4215(Y) RF AMP Q15 2SC4093 D12 BIAS TEMPERATURE COMPENSATING D14,15 TX-RX SWITCHING

*IC1 POWER MODULE ATT D13 1SV172 D14 M180B ANT RF AMP Q5 2SC4083 RF AMP Q6 2SC4215(Y) D15 M180B D16 MSM88AS SURGE VOLTAGE ABSORPTION RF AMP Q16 2SK302(Y)

IF AMP Q19 2SC4215(Y) 1st MIXER Q18 3SK184(S) D18 MA344B VOLT SHIFT D1 DAN202U Q17 DTC144WU BAND SHIFT SW D17,18 VARI-CAP TUNING

(X57-362X-XX)

	X201 L77	R256
0-10	1415	270
0-11	1356	390

(X57-362X-XX)

	C4	C5	C11	C12	C21	C56	C67	C72	C75	C76	C78	C83	C84	C86	C87	L10	R42	R43	R44	L14	C69	C73	C74
0-10	10P	9P	7P	9P	8P	18P	6P	18P	4P	10P	NO	12P	.75P	12P	1P	0.15μ	18	270	270	82n	56P	3P	27P
0-11	12P	12P	10P	10P	22P	22P	4P	27P	5P	12P	4P	7P	.5P	7P	.5P	1μ	0	-	-	0.1μ	82P	4P	33P

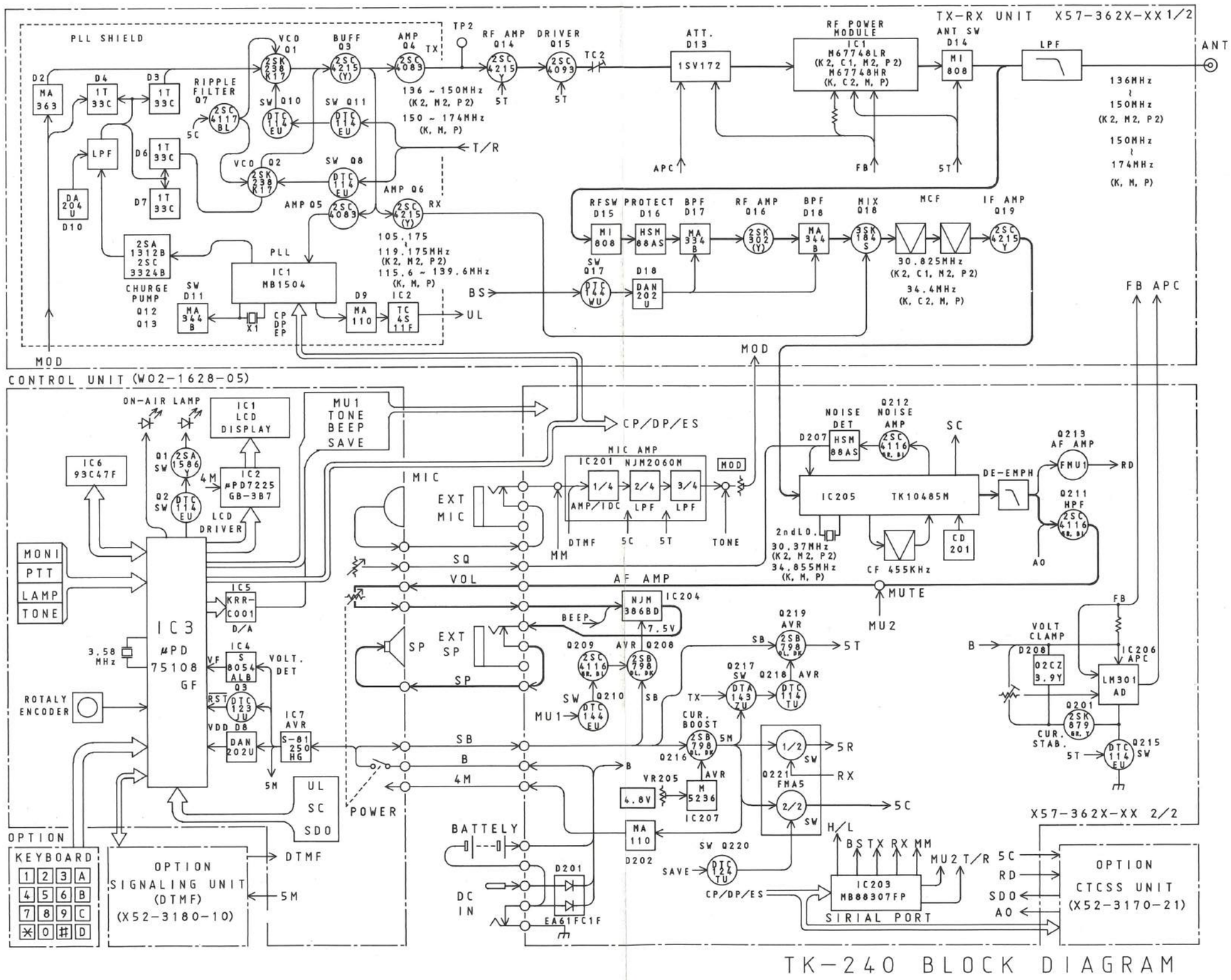
C89	C94	C97	C106	C107	C108	R75	R76	L5	L6	L24	L26, L27, L28	L31	XF1
10P	27P	9P	1.5P	1.5P	7P	330	820	4 1/2T	6 1/2T	Ø2 6T	L34-4236-05	0.47μ	0298
7P	33P	6P	1P	1P	8P	1K	1.2K	5 1/2T	5 1/2T	Ø2 7T	L34-4235-05	0.68μ	0263

POWER MODULE (IC1)
M67748HR
M67748LR

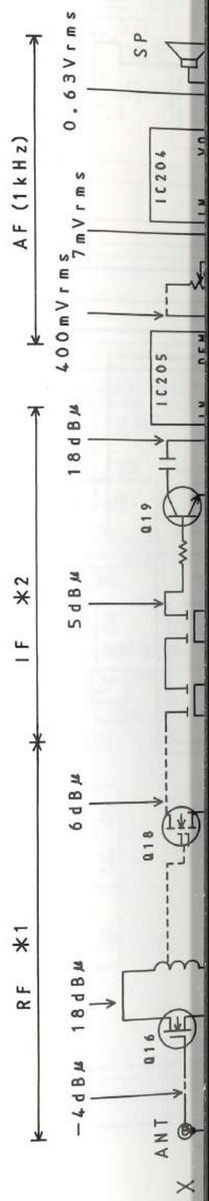
TK-240(K)

TK-240

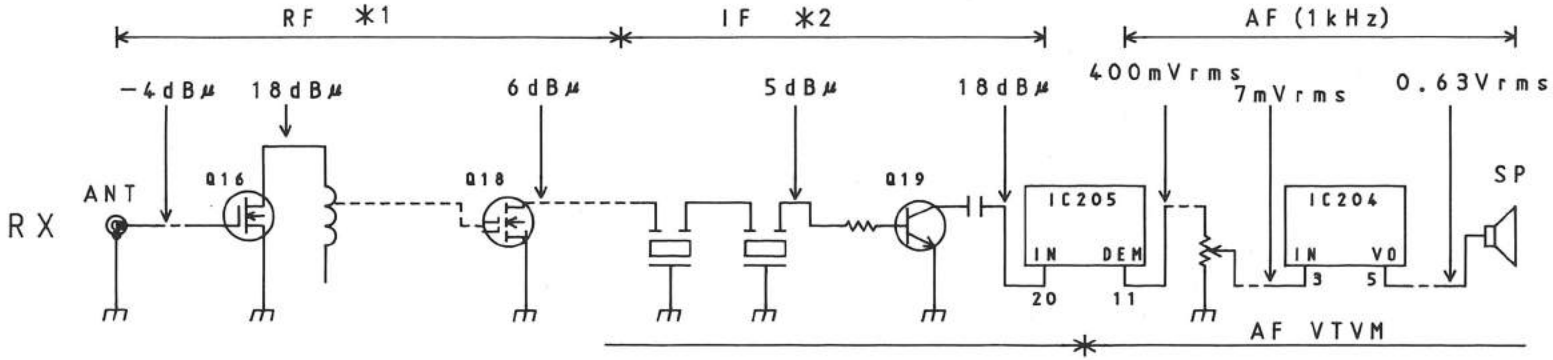
BLOCK DIAGRAM



TK-240 BLOCK DIAGRAM

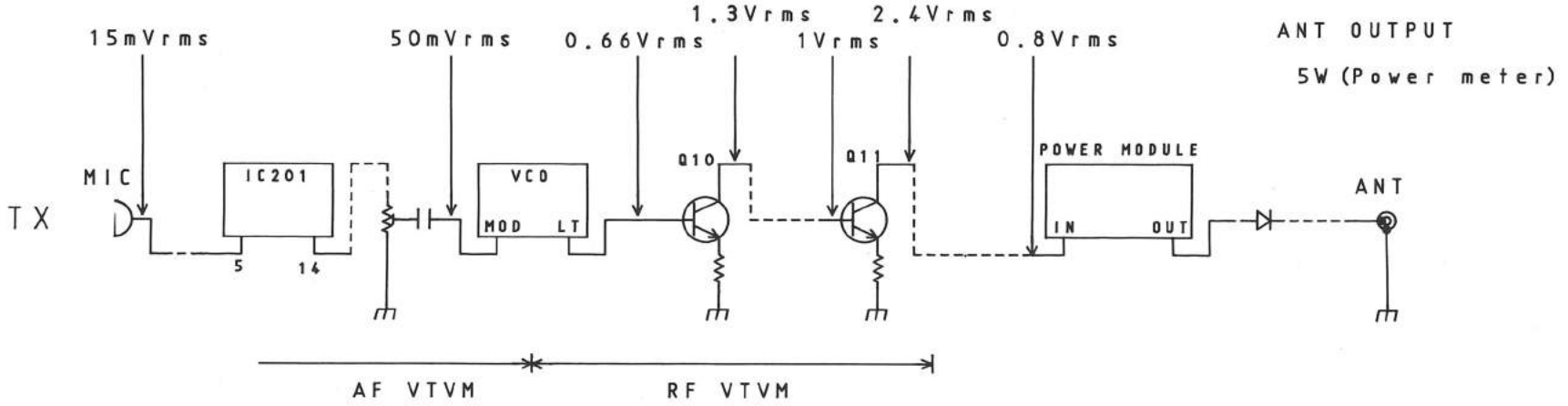


TK-240 LEVEL DIAGRAM



Each of the levels plotted from the RF to 1stIF is the level which can provide 12dB SINAD for an SSG thrugh 0.01μF ceramic capacitor.

The AF level is the value measured by an AF VTVM when an SSG signal of 40dBμ EMF modulated with a 1kHz MOD and a 3kHz DEV is received and the AF output is adjusted to 0.63V/8ohms using AF VOL.

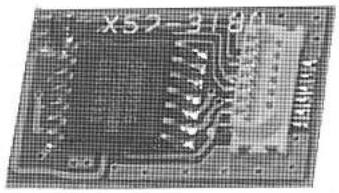


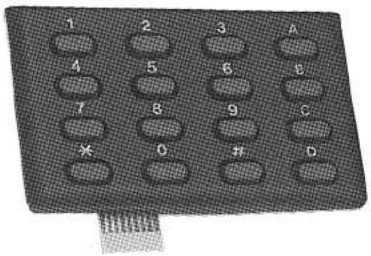
- DC INPUT 13.8V
- Adjust AG so that the MIC jack input has a 3kHz DEV with a 1kHz MOD
- TX frq. *1

	Y50-346*-**	*1	*2
K, P, M	0-10, 1-01 0-21, 3-02	162.100MHz	34.4MHz
K2, P2, M2	0-11, 1-02 0-22, 3-01	143.100MHz	30.825MHz

KDM-5 (DTMF UNIT)

KDM-5 EXTERNAL VIEW





KDM-5 PARTS LIST

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格			Destination 仕向	Remarks 備考
C1,2			CK73FB1E104K	CHIP C	0.10UF	K		
C3			C92-0521-05	CHIP-TAN	0.47UF	20WV		
C4,5			CK73FB1E104K	CHIP C	0.1UF	K		
C6			CK73GB1H471K	CHIP C	470PF	K		
C7			CC73GCH1H270J	CHIP C	27PF	J		
C8			CC73GCH1H330J	CHIP C	33PF	J		
CN1			E40-5342-05	CONNECTOR	13P			
X1			L78-0061-05	XTAL	3.58MHZ			
R1			RK73GB1J271J	CHIP R	270	J 1/16W		
R2			RK73GB1J123J	CHIP R	12K	J 1/16W		
R3			RK73GB1J272J	CHIP R	2.7K	J 1/16W		
R4			RK73GB1J562J	CHIP R	5.6K	J 1/16W		
R5			RK73GB1J122J	CHIP R	1.2K	J 1/16W		
R6			RK73GB1J121J	CHIP R	120	J 1/16W		
R7			R92-1252-05	CHIP R	0 OHM			
VR1			R12-6527-05	TRIM POT.	68K			
IC1		*	TP5088WM	IC				
Q1			2SC4116(GR,BL)	TRANSISTOR				
			W03-2016-05	KEY BOARD ASSY				

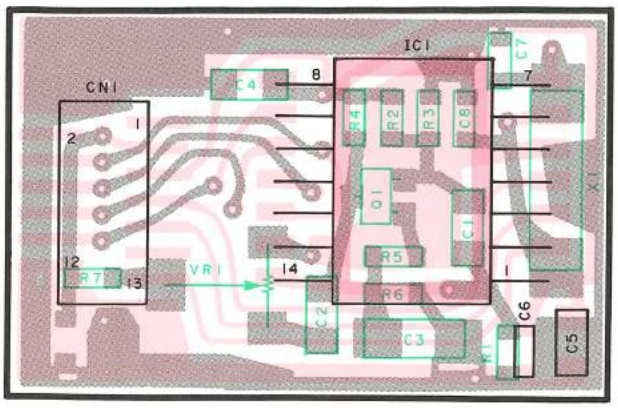
E: Scandinavia & Europe K: USA P: Canada W: Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

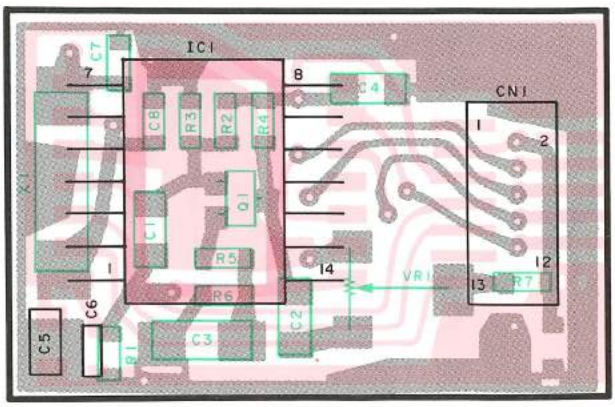
KDM-5 (DTMF UNIT)

KDM-5 PC BOARD VIEWS

[Component side view]



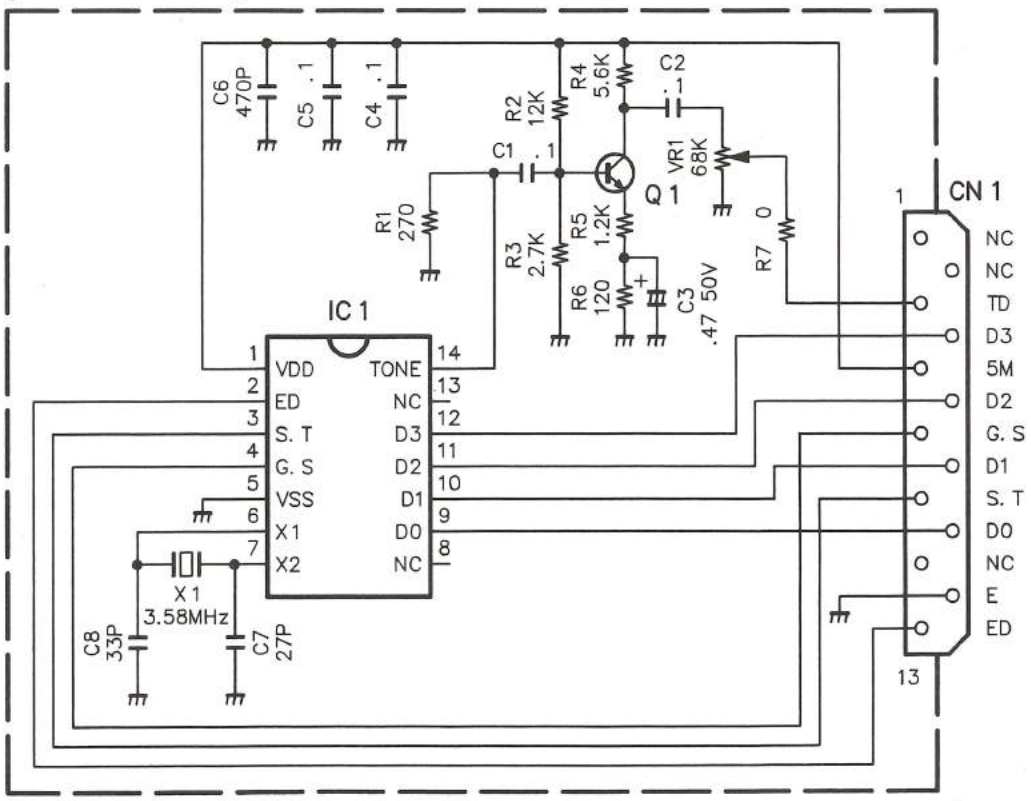
[Foil side view]



: Component side pattern : Foil side pattern

KDM-5 CIRCUIT DIAGRAM

(X52–3180–10)

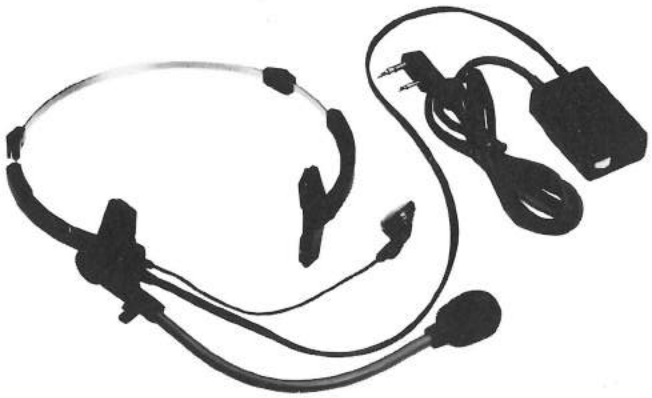


IC 1 : TP5088WM Q1 : 2SC4116 (GR, BL)

TK-240

KHS-1 (HEAD SET WITH VOX & PTT)

KHS-1 EXTERNAL VIEW



KHS-1 PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
		A02-0840-08	Case (Front)
		A02-0841-08	Case (Rear)
		E30-2088-08	Cable with plug
		F09-0418-08	Microphone pad
		F09-0419-08	Ear pad
		J29-0427-08	Clip
VR1		R05-4422-08	Potentiometer 50kΩ
S1		S31-1416-08	Slide switch PTT/VOX
S2		S50-1413-05	Tact switch PTT
		T18-0056-08	Earphone with cable
		T91-0373-18	Microphone Ass'y
		W02-0806-18	VOX/PTT unit
Q1		FMG2	Digital transistor
Q2		FMW2	Digital transistor
Q3		2SC2712(GR)	Chip transistor
IC1		NJM2072M	IC
D1		1SS133	Diode

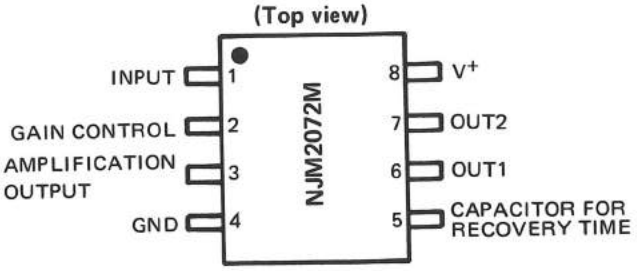
KHS-1 SPECIFICATIONS

Electrical characteristic

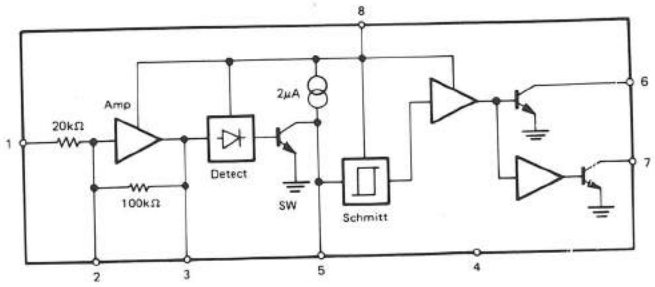
- **Earphone**
  - Diameter φ19
  - Impedance 19Ω (1000Hz)
  - Max. input power 50mW
- **Microphone**
  - Output sensitivity . . . −70dB (0dB = 1V/μbar 1000Hz)
  - Output impedance 1.6kΩ (1000Hz)

KHS-1 SEMICONDUCTOR DATA

- **Terminal connection diagram**



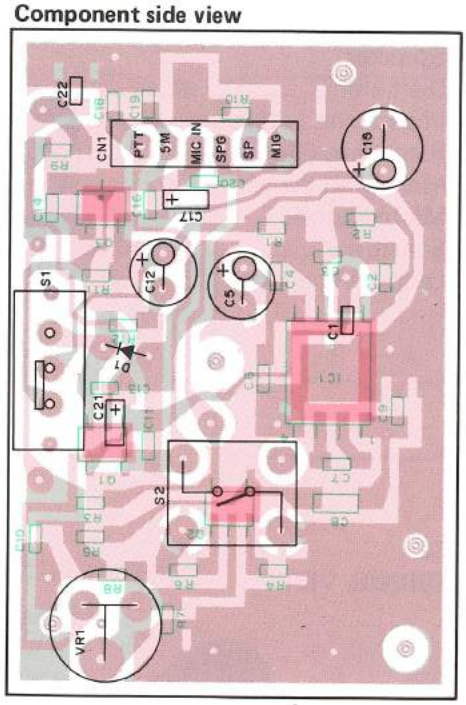
- **Block diagram**



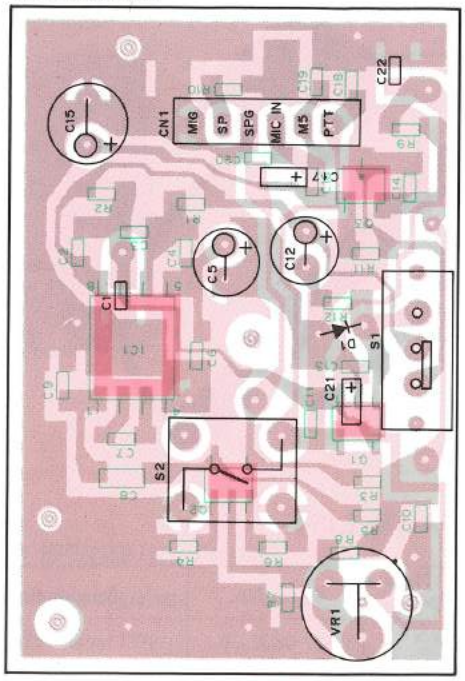
KHS-1 (HEAD SET WITH VOX & PTT)

KHS-1 PC BOARD VIEWS

Component side view

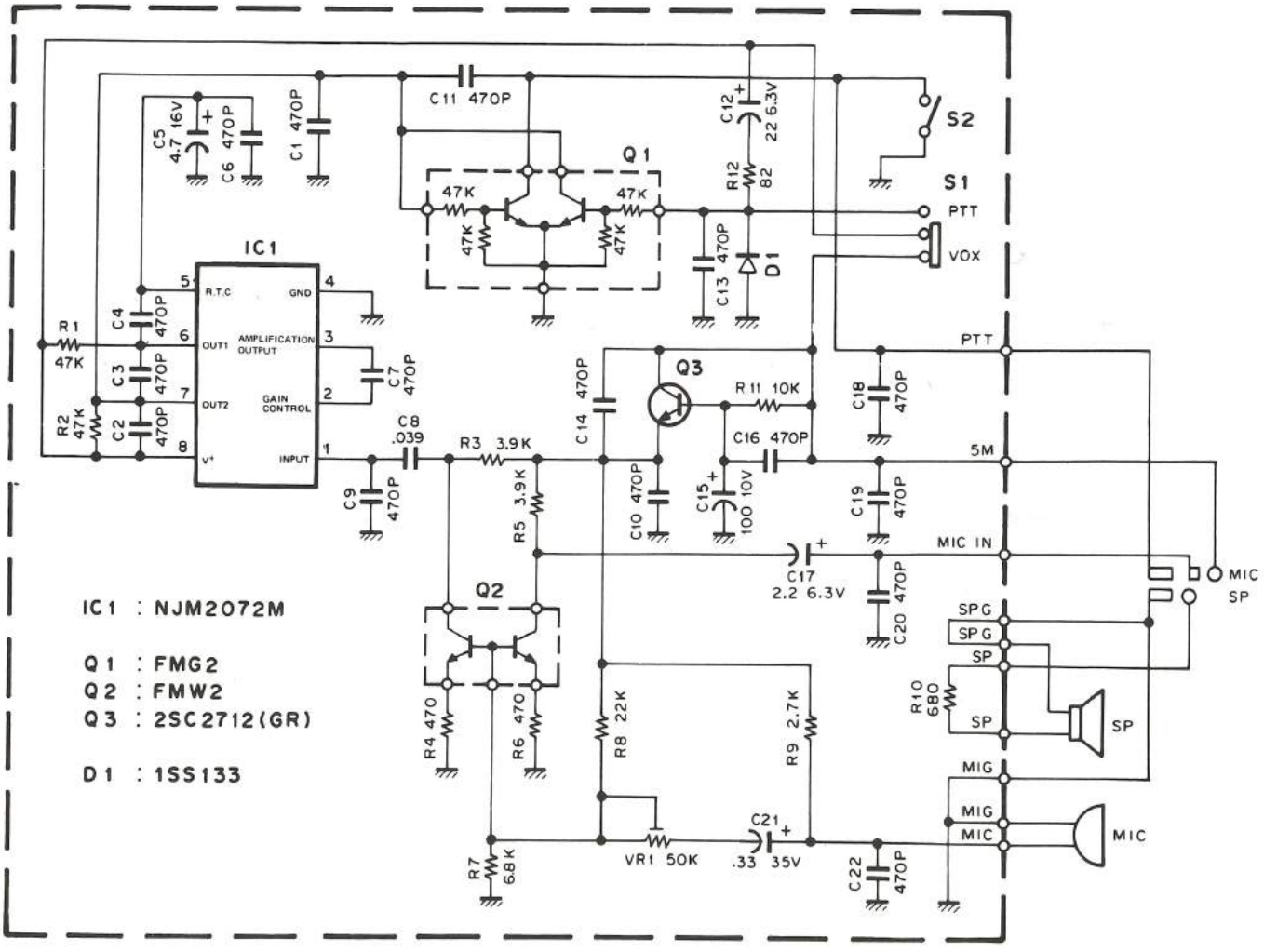


Foil side view



: Component side
: Foil side

KHS-1 CIRCUIT DIAGRAM



TK-240

KMC-8A (SPEAKER MICROPHONE)/KWR-1 (WATERPROOF CASE) KLF-3 (PLUG WITH CORD)

KMC-8A EXTERNAL VIEW

KMC-8A SPECIFICATIONS

Electrical characteristic

- **Speaker**
  - Diameter ..... ϕ50 (mm)
  - Impedance 14Ω
  - Rated input power 0.5W
  - Max. input power 1W
- **Microphone**
  - Sensitivity ..... –62dB ± 4dB at 1000Hz
  - Output impedance ..... 1.6Ω ± 30% at 1000Hz

KMC-8A PARTS LIST

* : New Parts

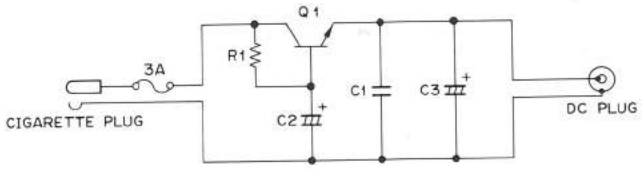
Ref. No.	New Parts	Parts No.	Description
		F07-0892-08	PTT lever
		E30-2102-08	Curl cord ass'y
		S50-1428-08	MICRO SW
		T07-0243-05	Speaker ass'y
		T91-0312-15	Microphone ass'y

KWR-1 EXTERNAL VIEW

KLF-3 EXTERNAL VIEW

CIRCUIT DIAGRAM

KLF-3 CIRCUIT DIAGRAM



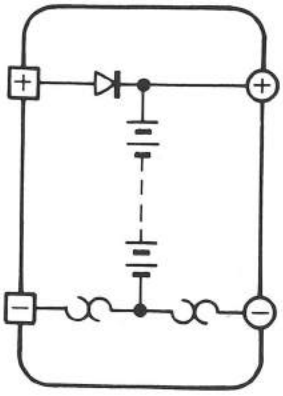
Q1 : 2SD717 (O,Y)
R1 : 22Ω 1/4W

C1 : 0.001μF 50V
C2 : 2.200μF 16V
C3 : 100μF 16V

KNB-5 / 6 / 7 (Ni-Cd BATTERY)

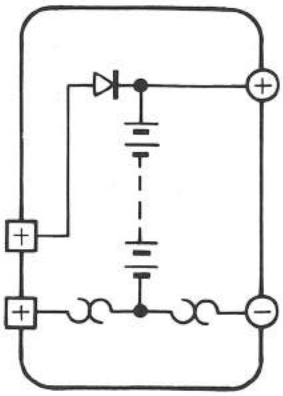
KNB-5 EXTERNAL VIEW

KNB-5 CIRCUIT DIAGRAM



KNB-7 EXTERNAL VIEW

KNB-7 CIRCUIT DIAGRAM



KNB-5 SPECIFICATIONS

Electrical characteristic

Voltage	7.2V (1.2V x 6)
Charging current	600mAh
Dimensions	58 H x 55.5 (58.5) H x 29.5 D (mm)
Weight	180g

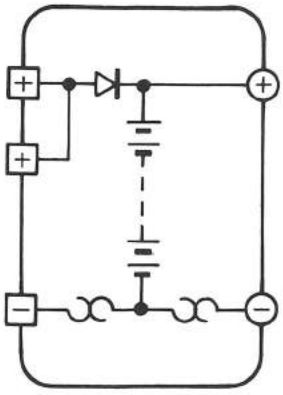
KNB-7 SPECIFICATIONS

Electrical characteristic

Voltage	12V (1.2V x 10)
Charging current	600mAh
Dimensions	58 W x 84 (87) H x 29.5 D (mm)
Weight	270g

KNB-6 EXTERNAL VIEW

KNB-6 CIRCUIT DIAGRAM



KNB-6 SPECIFICATIONS

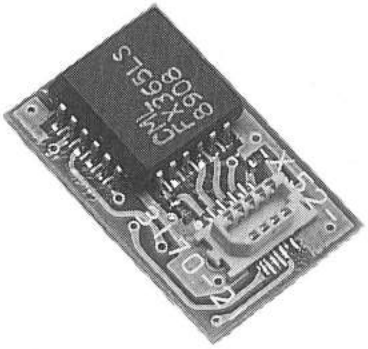
Electrical characteristic

Voltage	7.2V (1.2V x 6)
Charging current	1100mAh
Dimensions	58 W x 98.5 (101.5) H x 29.5 D (mm)
Weight	300g

TK-240

KQT-9 (CTCSS UNIT)

KQT-9 EXTERNAL VIEW



KQT-9 PARTS LIST

⋇ New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
C1			CK73GB1H471K	CHIP C 470PF K		
C2			C92-0521-05	CHIP-TAN 0.47UF 20WV		
C4,5,6			CK73FB1E104K	CHIP C 0.10UF K		
C7			CK73GB1H471K	CHIP C 470PF K		
C8,9			CC73GCH1H221J	CHIP C 220PF J		
C10,11			CK73GB1H103K	CHIP C 0.01UF K		
C12			CK73FB1E104K	CHIP C 0.10UF K		
			E37-0046-05	CONNECTING WIRE		
X1			L78-0062-05	XTAL 1MHZ		
R1			RK73GB1J274J	CHIP R 270K J 1/16W		
R2			RK73GB1J824J	CHIP R 820K J 1/16W		
R4			RK73GB1J103J	CHIP R 10K J 1/16W		
R5			RK73GB1J105J	CHIP R 1.0M J 1/16W		
R6			RK73GB1J473J	CHIP R 47K J 1/16W		
R7			RK73GB1J393J	CHIP R 39K J 1/16W		
R8			RK73GB1J183J	CHIP R 18K J 1/16W		
R9			RK73GB1J564J	CHIP R 560K J 1/16W		
R10			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R11			RK73GB1J561J	CHIP R 560 J 1/16W		
R12			R92-1252-05	CHIP R 0 OHM		
VR1			R12-6526-05	TRIM.POT. 47K		
D1			DAN202U	DIODE		
IC1			FX365LS	IC		
Q1			2SC4116(GR,BL)	TRANSISTOR		

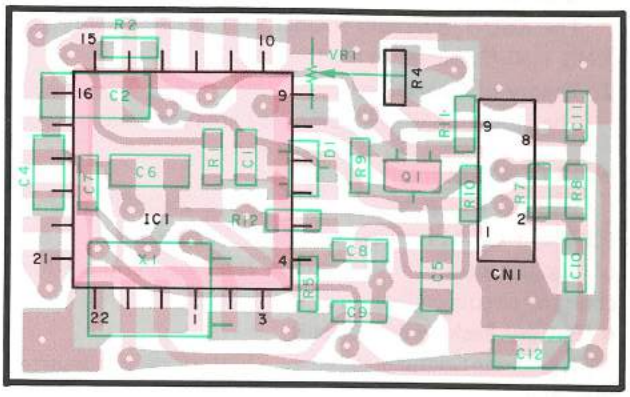
E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

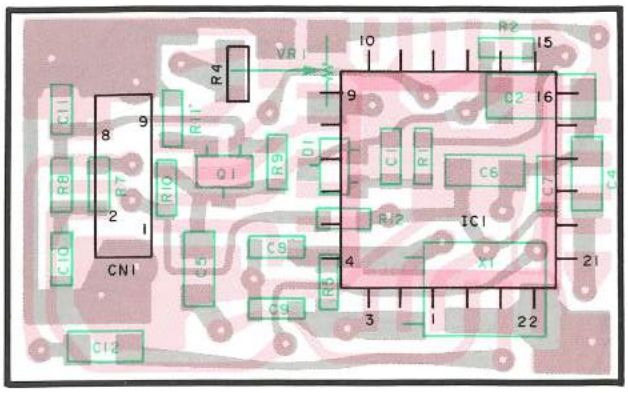
KQT-9 (CTCSS UNIT)

KQT-9 PC BOARD VIEWS

[Component side view]



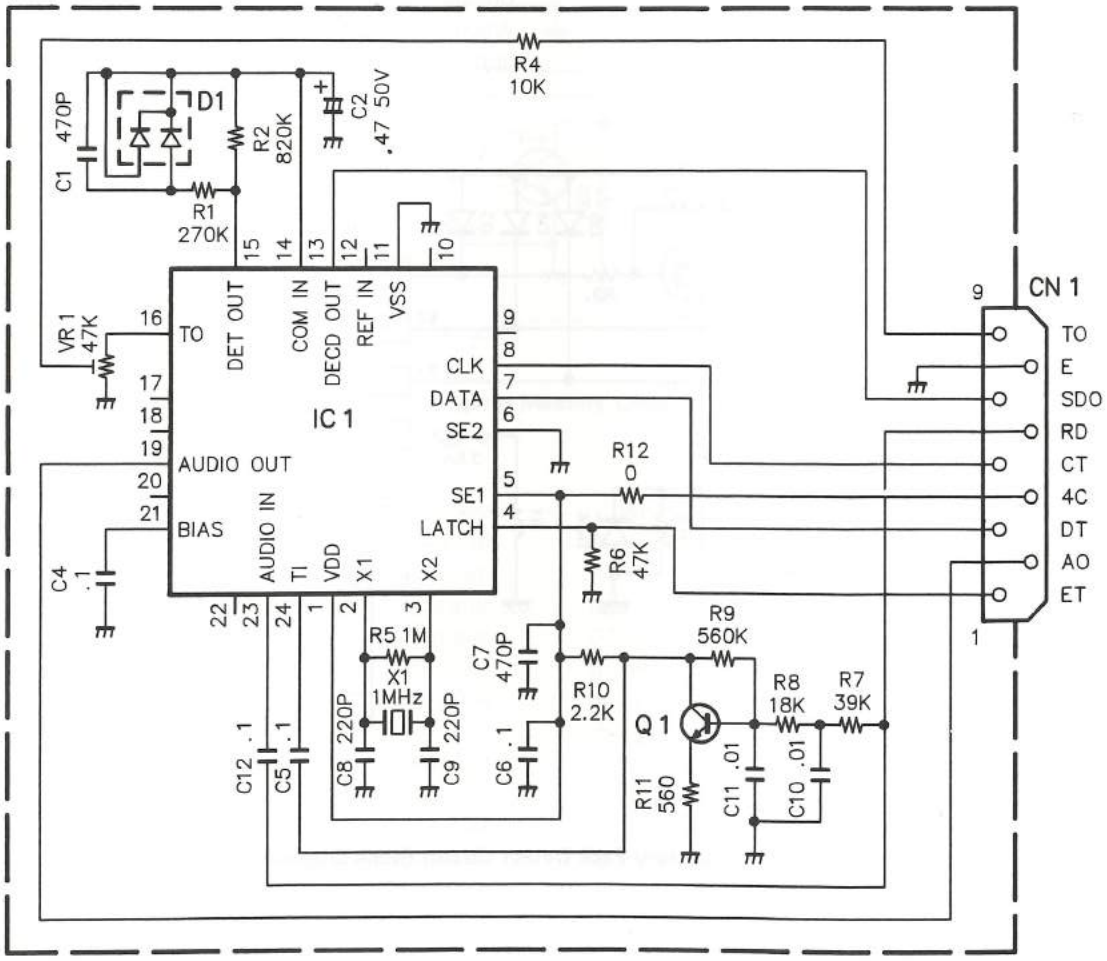
[Foil side view]



: Component side pattern : Foil side pattern

KQT-9 CIRCUIT DIAGRAM

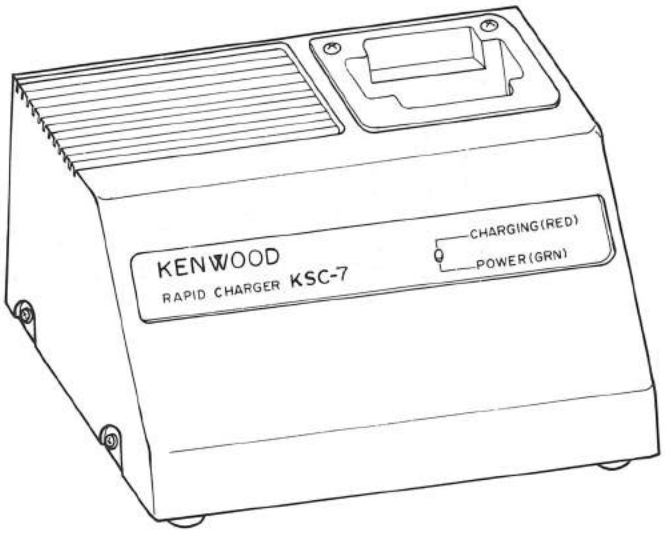
(X52-3170-21)



IC 1 : FX365LS Q1 : 2SC4116 (GR, BL) D1 : DAN202U

KSC-7 (RAPID CHARGER)

KSC-7 EXTERNAL VIEW



KSC-7 CIRCUIT DESCRIPTION

1. General

The KSC-7 is a rapid charger for the KNB-5, KNB-6 and KNB-7 Ni-Cd batteries for the TK-220.

2. Theory of Operation

The operation of each block is explained below.

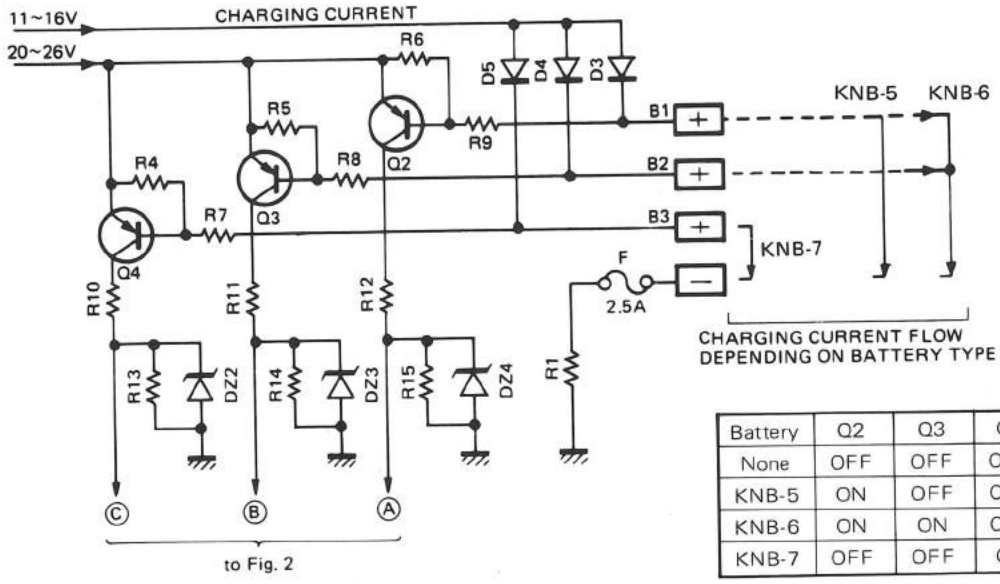
- **+11V AVR Circuit**

This AVR circuit, consisting of a 2SD600F transistor (Q1) and GZA11Y Zener diode (DZ1)provides an output of approximately +11V as the reference voltage for the charging circuit consisting of IC2 to IC5.

- **Battery Pack Detect Circuit**

This circuit detects whether a battery pack is inserted in the charger. Outputs from this circuit are routed to the reset circuit and the battery recognition circuit.

When a KNB-5 is inserted in the charger, a small amount of current flows from Q2 : 2SA608E through R9 to the charging terminal B1 and Q2 turns on. As a result, an output of approximately 11V appears at Ⓐ in **Fig. 1**. Similarly when a KNB-6 is inserted Q3 : 2SA608E turns on and approximately 11V is provided at output Ⓑ . When a KNB-7 is inserted Q4 : 2SA608E turns on and approximately 11V is provided at output Ⓒ



Battery	Q2	Q3	Q4
None	OFF	OFF	OFF
KNB-5	ON	OFF	OFF
KNB-6	ON	ON	OFF
KNB-7	OFF	OFF	ON

Table 1

Fig. 1 Battery Pack Detect Circuit Block Diagram

KSC-7 (RAPID CHARGER)

- **Reset, Charge Status Memory and Display Circuit**

The reset circuit initializes the charging status memory circuit.

	Q8,Q7	Q9	Q10	LED1
PACK OUT	OFF	OFF	ON	–
PACK IN				
• CHARGING	ON	ON	OFF	RED
• COMPLETE	ON	OFF	ON	GRN

Table 2

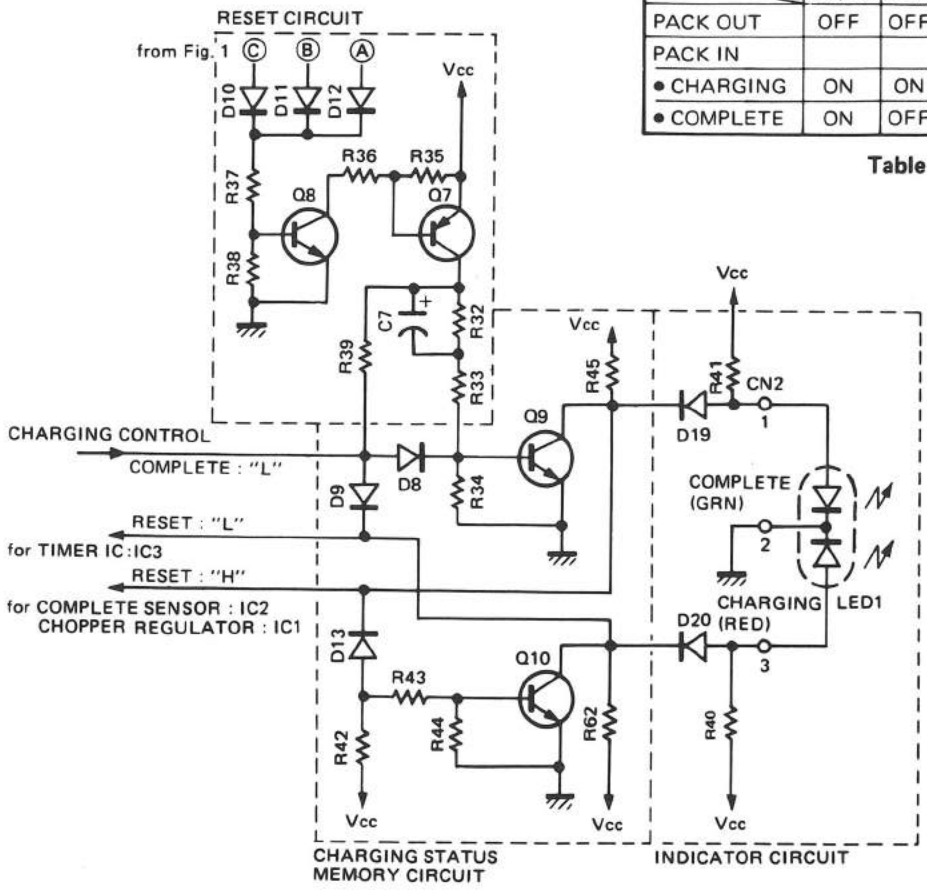


Fig. 2 Reset Circuit/Charge Status Memory Circuit/Display Circuit Block Diagram

The charge status memory circuit is an R-S flip-flop configured from transistors and resistors. The two states of the flip-flop are called COMPLETE and CHARGING. Outputs from the flip-flop drive the LED in the indicator circuit and reset the timer, complete sensor, and chopper regulator. In the COMPLETE state Q9 : 2SC536E is off and Q10 : 2SC536E is on. In the CHARGING state Q9 is on and Q10 is off.

When a battery pack is not inserted, Q8 : 2SC536E and Q7 : 2SC536E turn off. As there is no base voltage to Q9, Q9 also turns off. The base of Q10 receives enough bias from Vcc to turn on, resulting in 0V at the collector. The current flow through R41 to the COMPLETE indicator in LED1 which glows green, because of Q9 if off.

When the battery pack is inserted Q8 and Q7 turn on. As soon as Q7 turns on, charging current flows through R33, R34, and Q9 to C7 and Q9 turns on. The base voltage of Q10, which is connected to Q9 through diode D13, then drops and Q10 turns off. Since Q10 is off, current flows through R40 to the CHARGING indicator in LED1, which glows red to indicate that the battery is charging. When charging of C7 is completed, on-current continues to flow to the base of Q9 through R39 and D8.

When charging is completed the complete sensor (IC2) outputs a Low ("L")signal that ends the flow of current to the base of Q9, turning Q9 off. As a result current flows through R41 to the COMPLETE indicator in LED1, which glows green to indicate that charging is complete.

KSC-7 (RAPID CHARGER)

- **Battery Recognition Circuit**

The battery recognition circuit uses NAND logic to recognize the battery type from the outputs from the battery pack detect circuit. Outputs from this circuit are sent to the charging current limiting circuit and sensor level switching circuit.

	INPUT		OUTPUT		
	A	B	D	F	G
KNB-5	H	L	H	L	H
KNB-6	H	H	L	L	H
KNB-7	L	L	H	L	L

Table 3

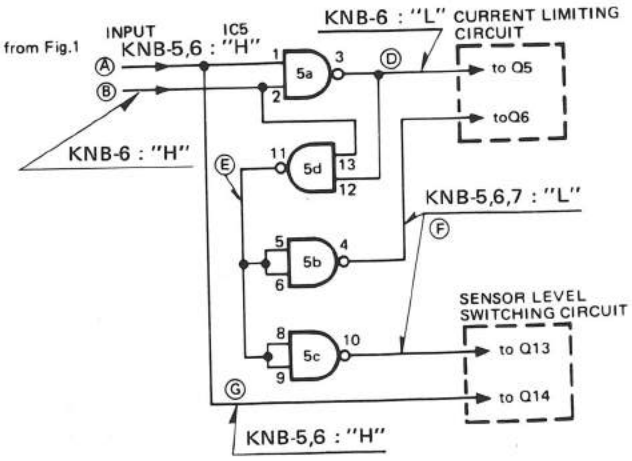


Fig. 3 Battery Recognition Circuit Block Diagram

- **Charging Current Limiting Circuit**

This circuit receives the output of the battery recognition circuit and limits the charging current according to the type (current capacity) of battery. The charging current ICR is detected as a voltage drop across R1 (0.15Ω), which is provided to pin 3 of the operational amplifier IC4(1/2) : LA6393A. Pin 4 receives a reference voltage (V_{REF}) used as a comparison standard for limiting the charging current. The V_{REF} is changed by ON and OFF of Q5 and Q6 (See **Table 4**).

Pin 2 of IC4 : LA6393S provides "L" output when $V_{REF} < V_{CR}$, stopping the operation of the chopper regulator (IC1 : STK772B) and reducing the charging current. The charging current is limited by the formula :

$$I_{CR}\ MAX\ (A) = V_{REF}\ (V)/0.15(\Omega)$$

	Q5	Q6	VREF	ICR MAX
KNB-5	OFF	OFF	0.25V	1.7A
KNB-6	ON	OFF	0.36V	2.4A
KNB-7	OFF	OFF	0.25V	1.7A

Table 4

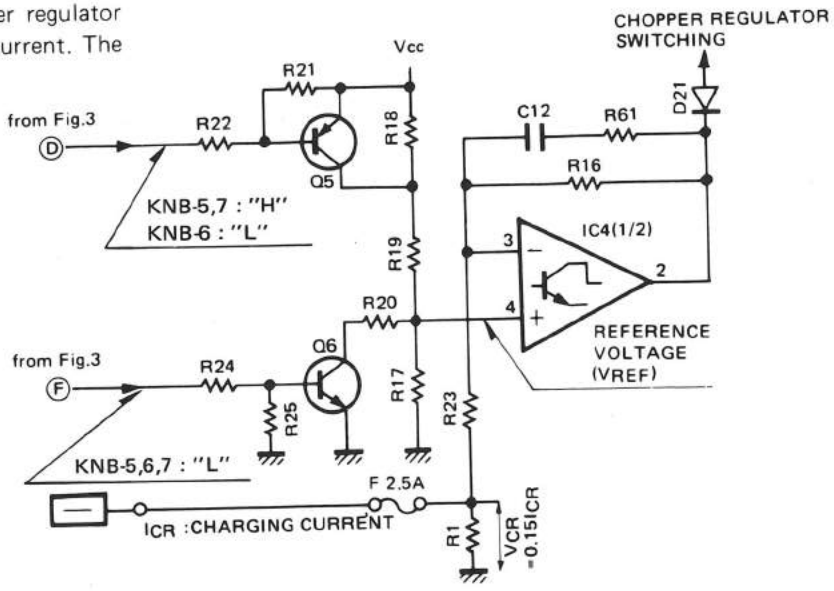


Fig. 4 Charging Current Limiting Circuit Block Diagram

KSC-7 (RAPID CHARGER)

- **Sensor Level Switching Circuit**

This circuit receives the output of the battery recognition circuit and aligns the voltages supplied to the charging status detect circuit according to the battery type (voltage) so that they are nearly equal at completion of charging.

	SHIFT Es (V)	Q11	Q12
KNB-5	2.0	OFF	ON
KNB-6	2.0	OFF	ON
KNB-7	7.6	OFF	OFF

Table 5

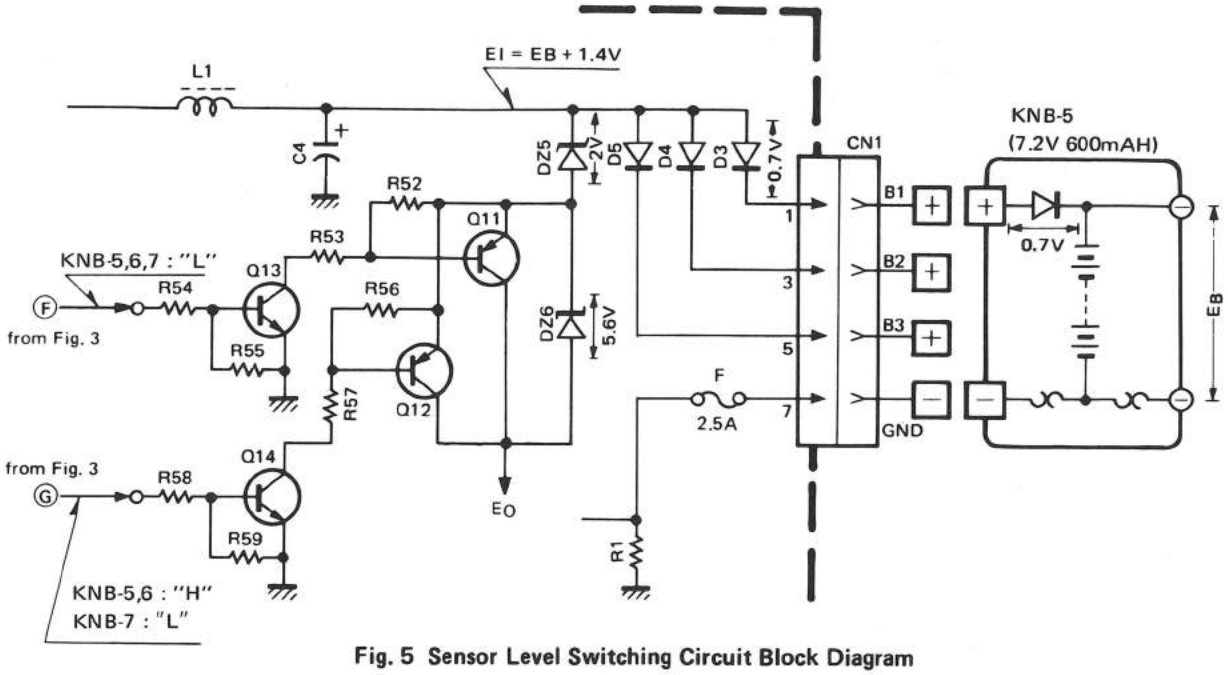


Fig. 5 Sensor Level Switching Circuit Block Diagram

The pin voltages while the Ni-Cd battery is charging are approximately 1.2 times the voltages at the completion of charging. (See **Figure 6**.)

The battery terminal voltage EB is as follows:

Approximately 14.4V for the KNB-7

Approximately 8.6V for the KNB-5, 6

The charging line voltage EI is the EB voltage plus a 1.4V voltage drop added by a diode.

$$EI = EB + 1.4V \quad \ldots\ldots (1)$$

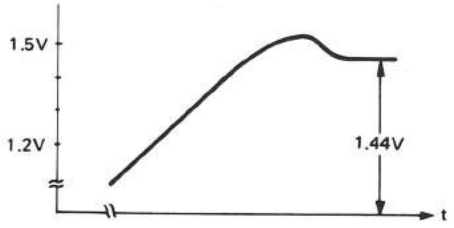


Fig. 6 The pin voltages while the Ni-CD Battery is charging

The EI voltage is output with a level shift as the voltage EO to the charging status detect circuit via Zener diode DZ6 and diodes D17 and D18. The amount of the shift is controlled by switching Q11 : 2SA608E and Q12 : 2SA608E on and off. (See **Table 5**.) If Eq. (1) is substitued into EO in **Table 5**, the results are:

KNB-5,6 : EO = EB – 6.2V

KNB-7 : EO = EB – 0.6V

At the completion of charging the value is approximately 8V.

KSC-7 (RAPID CHARGER)

- **Charging Status Detect Circuit**

This circuit detects the completion of charging and outputs a signal to stop charging. When no battery pack is inserted or charging is completed, a High ("H") Reset signal is applied to D15. When a battery is inserted the Reset signal applied to D15 is cleared. When the Reset signal is cleared, pin 4 of IC2 : KCH-1003 holds the reset state due to the charge in C8 for the duration of the R46-C8 time constant, then goes "L" to clear the reset state. Pins 8 and 9 of IC2 receive divided portions of the battery voltage.
These inputs are tracked as the charging is performed in the long-term memory capacitor "MD". As the Ni-Cd battery charges, the battery voltage reaches a peak, then declines. (See **Fig. 6**.) The MD stores the peak voltage, which is compared with the divided voltages at pins 8 and 9. When the difference ΔV is the same, a "L" signal is output from pin 11 to indicate that charging is complete. The signal indicating completion of charging is applied to the charging status memory circuit.

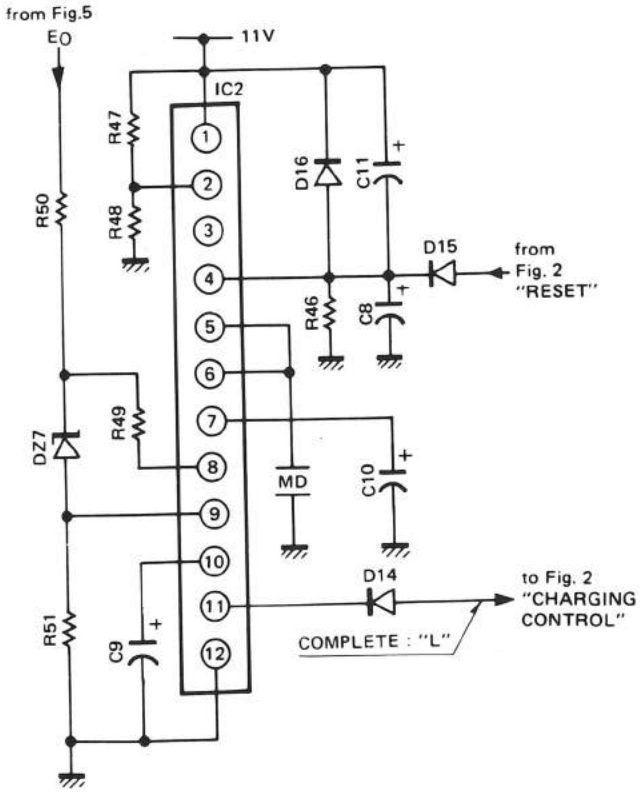


Fig. 7 Charging Status Detect Circuit Block Diagram

- **Timer Circuit**

Battery defects may result in charging continuing indefinitely without completion, so this timer outputs a signal that stops charging approximately 1.7 hours after charging begins. When charging begins and the Reset signal is cleared at pin 3, IC3 : AN6780 begins counting. At the first count of 16384 pin 6 goes from "H" to "L".
The output from pin 6 is connected to the Stop input (pin 2), so the output of IC3 is held in the "L" state until IC3 receives another Reset signal (for example, when the battery is removed).

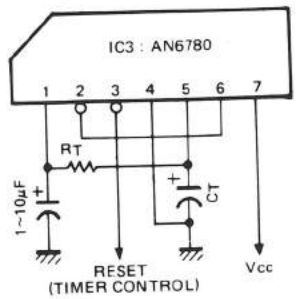


Fig. 8 Timer Circuit Block Diagram

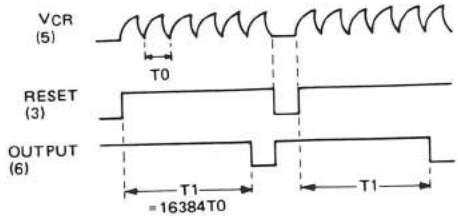


Fig. 9 TIMER TIME T1(s) ≅ 11RT(KΩ)·CT(μF)
TIMER TIME T1(s) ≅ 11×47(KΩ)·10(μF) = 5170 (s)

- **Voltage Comparator Circuit**

This circuit monitors the output (EO) of the sensor level switching circuit and indirectly detects abnormal conditions in the battery pack connected to the charging terminal. When the EO voltage falls to 5.2V or lower, the charging control line goes "L" to halt charging.

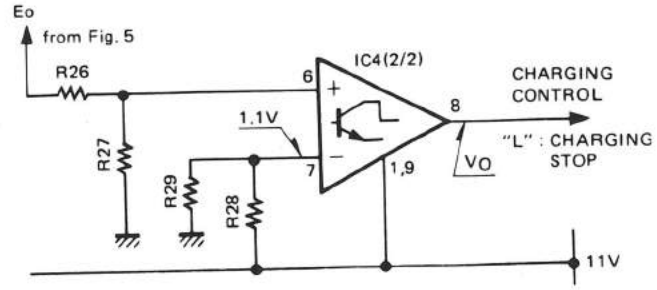


Fig. 10 Voltage Comparator Circuit Block Diagram

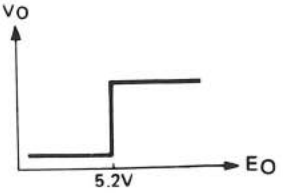


Fig. 11

KSC-7 (RAPID CHARGER)

* New Parts
Parts without **Parts No.** are not supplied.
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KSC-7 PARTS LIST

	Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
				KSC-7			
	1	1A		A02-0816-08	CASE		
	2	1A,1B		A02-0817-05	BATTERY POCKET		
	3	1B		B46-0418-10	WARRANTY CARD		
	4	1B		B50-8186-08	INSTRUCTION MANUAL (KSC-4/5)		
	5	1B		E23-0604-05	TERMINAL		
⚠	6	2A		E30-2038-08	AC CORD		
	8	2B		H01-8129-08	ITEM CARTON CASE		
	9	2B		H10-2584-02	POLYSTYRENE FOAMED FIXTURE (L)		
	10	2B		H10-2585-02	POLYSTYRENE FOAMED FIXTURE (R)		
	11	3A		J02-0439-05	FOOT		
	12	3A		J39-0424-05	SPACER		
⚠	T1	2A		L01-8081-08	POWER TRANSFORMER (AC120V)	K,M2	
⚠	T1	2A		L01-8112-08	POWER TRANSFORMER (AC220V)	M	
	A	3A		N30-3006-41	MACHINE SCREW (M3 X 6)		
	B	2A,1B		N34-4006-46	MACHINE SCREW (M4 X 6 Tr)		
	C	2A,1B		N35-4006-45	MACHINE SCREW (M4 X 6 Bi) BLK		
	D	2A		N87-3008-46	TAPTITE SCREW (φ3 X 8 Br)		
	E	1A		N89-3008-45	TAPTITE SCREW (φ3 X 8 Bi) BLK		
	7	3B		W02-0819-05	CHARGE CONTROL UNIT		
				CHARGE CONTROL UNIT (W02-0819-05)			
	C1			CE04EW1V222M	ELECTRO 2200μF 35WV		
	C2			CE04EW1C470M	ELECTRO 47μF 16WV		
	C3			CE04EW1H010M	ELECTRO 1μF 50WV		
	C4			CE04EW1E471M	ELECTRO 470μF 25WV		
	C5,6			CE04EW1C100M	ELECTRO 10μF 16WV		
	C7			CE04EW1A101M	ELECTRO 100μF 10WV		
	C8			CE04EW1C100M	ELECTRO 10μF 16WV		
	C9,10			CE04EW0J101M	ELECTRO 100μF 6.3WV		
	C11			CE04EW1C330M	ELECTRO 33μF 16WV		
	C12			CK45B1H102K	CERAMIC 0.001μF 50WV		
	C14			CE04EW1H010M	ELECTRO 1μF 50WV		
	C15			C91-0757-05	CERAMIC 0.001μF K		
	C16—18			CK45F1H103Z	CERAMIC 0.01μF Z		
	MD			C91-1038-08	ELECTRO		
⚠	F1			F06-2522-05	FUSE (2.5A)	M,M2	
⚠	F1			F06-2523-05	FUSE (2.5A)	K	

E: Scandinavia & Europe **H**:Audio Club **K**: USA **P**: Canada **W**:Europe
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⚠ indicates safety critical components.

TK-240

KSC-7 (RAPID CHARGER)

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
L1			L33-0694-08	CHOKE COIL (470μH)		
R1			R92-0683-08	FL-PROOF 0.15Ω 4W		
R2			RD14CB2E202J	RD 2K 1/4W		
R3			RD14BB2E302J	RD 3K 1/4W		
R4,5			RD14CB2E103J	RD 10K 1/4W		
R6–9			RD14BB2E103J	RD 10K 1/4W		
R10–12			RD14BB2E202J	RD 2K 1/4W		
R13			RD14BB2E303J	RD 30K 1/4W		
R14,15			RD14CB2E303J	RD 30K 1/4W		
R16			RD14CB2E204J	RD 200K 1/4W		
R17			RD14CB2E391J	RD 390 1/4W		
R18			RD14CB2E362J	RD 3.6K 1/4W		
R19			RD14CB2E113J	RD 11K 1/4W		
R20			RD14BB2E102J	RD 1K 1/4W		
R21			RD14CB2E203J	RD 20K 1/4W		
R22			RD14BB2E203J	RD 20K 1/4W		
R23			RD14BB2E512J	RD 5.1K 1/4W		
R24			RD14BB2E203J	RD 20K 1/4W		
R25			RD14CB2E103J	RD 10K 1/4W		
R26			RD14BB2E103J	RD 10K 1/4W		
R27			RD14CB2E272J	RD 2.7K 1/4W		
R28			RD14CB2E912J	RD 9.1K 1/4W		
R29			RD14CB2E102J	RD 1K 1/4W		
R30			RD14BB2E563J	RD 56K 1/4W		
R31			RD14BB2E202J	RD 2K 1/4W		
R32			RD14CB2E204J	RD 200K 1/4W		
R33			RD14BB2E103J	RD 10K 1/4W		
R34			RD14BB2E682J	RD 6.8K 1/4W		
R35			RD14CB2E203J	RD 20K 1/4W		
R36			RD14BB2E303J	RD 30K 1/4W		
R37			RD14CB2E203J	RD 20K 1/4W		
R38			RD14CB2E103J	RD 10K 1/4W		
R39			RD14BB2E103J	RD 10K 1/4W		
R40			RD14BB2E162J	RD 1.6K 1/4W		
R42			RD14CB2E103J	RD 10K 1/4W		
R43			RD14BB2E203J	RD 20K 1/4W		
R44,45			RD14CB2E103J	RD 10K 1/4W		
R46			RD14CB2E825J	RD 8.2M 1/4W		
R47			RD14CB2E104J	RD 100K 1/4W		
R48			RD14CB2E122J	RD 1.2K 1/4W		
R49			RD14BB2E563J	RD 56K 1/4W		

E: Scandinavia & Europe H:Audio Club K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE : AAFES(Europe) X: Australia

⚠ indicates safety critical components.

KSC-7 (RAPID CHARGER)

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R50			RD14BB2E431J	RD 430 1/4W		
R51			RD14CB2E130J	RD 13 1/4W		
R52			RD14CB2E203J	RD 20K 1/4W		
R53,54			RD14BB2E203J	RD 20K 1/4W		
R55			RD14CB2E103J	RD 10K 1/4W		
R56–58			RD14BB2E203J	RD 20K 1/4W		
R59			RD14CB2E103J	RD 10K 1/4W		
R61			RD14CB2E104J	RD 100K 1/4W		
R62			RD14CB2E103J	RD 10K 1/4W		
R63			RD14BB2E302J	RD 3K 1/4W		
R64			RD14BB2E431J	RD 430 1/4W		
D1–5			DSA26B	DIODE		
D6–16			DS442	DIODE		
D19–21			DS442	DIODE		
DZ1			GZA11Y	ZENER DIODE (11V)		
DZ2–4			GZA10Z	ZENER DIODE (10V)		
DZ5			GZA2.0X	ZENER DIODE (2V)		
DZ6			GZA5.6X	ZENER DIODE (5.6V)		
DZ7			GZA7.5Y	ZENER DIODE (7.5V)		
DZ8			GZA3.0X	ZENER DIODE (3V)		
IC1			STK772B	IC (CHOPPER REGULATOR)		
IC2			KCH-1003	IC (VOLTAGE SENSOR)		
IC3			AN6780	IC (TIMER)		
IC4			LA6393S	IC (DUAL OP IC)		
IC5			LC4011B	IC (QUADRUPLE NAND GATE)		
Q1			2SD600F,KF	TRANSISTOR		
Q2–5			2SA608E,F	TRANSISTOR		
Q6			2SC536E,F	TRANSISTOR		
Q7			2SA608E,F	TRANSISTOR		
Q8–10			2SC536E,F	TRANSISTOR		
Q11,12			2SA608E,F	TRANSISTOR		
Q13,14			2SC536E,F	TRANSISTOR		
LED1	2A		SLP-540D	LED (RED/GRN)		

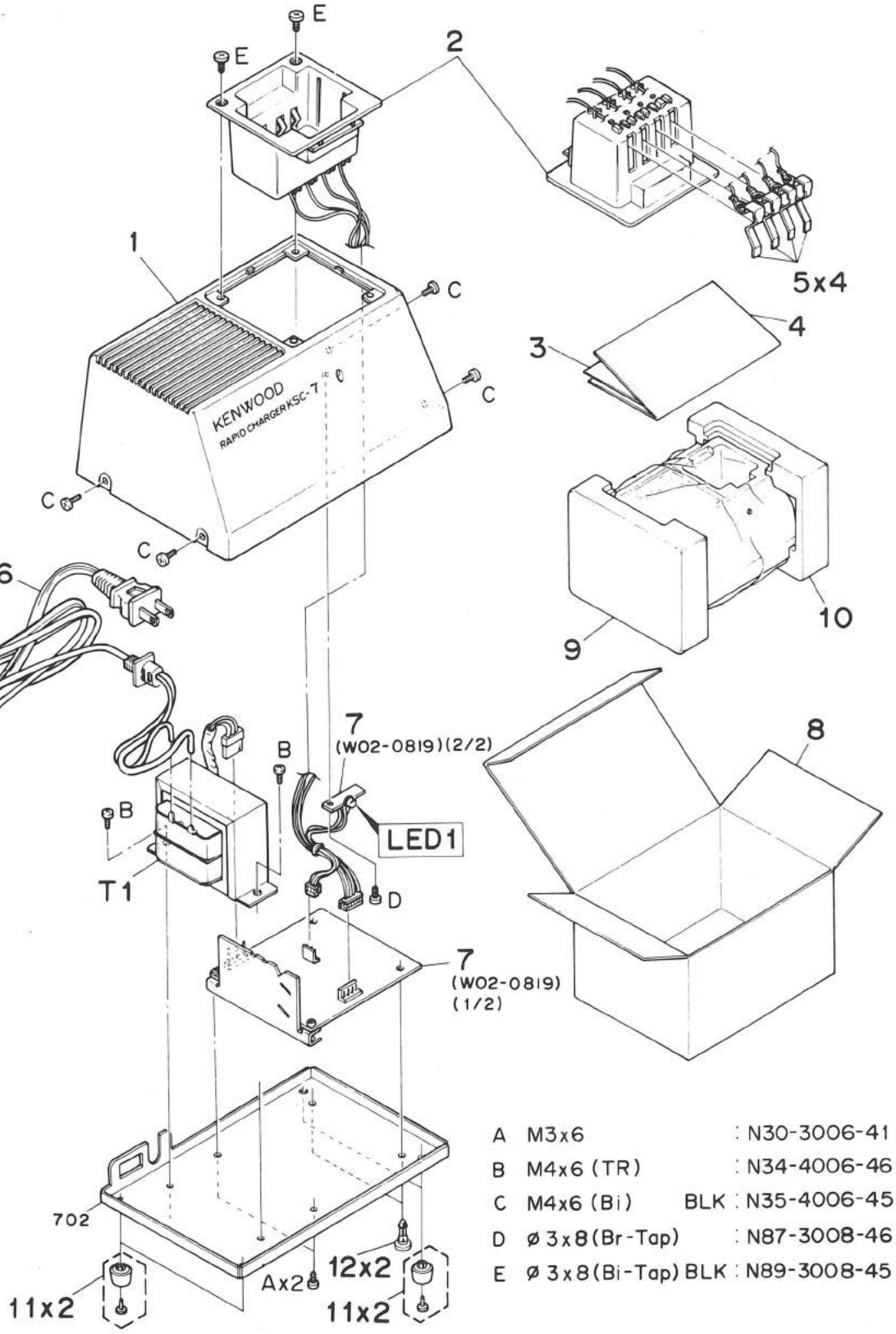
E: Scandinavia & Europe H:Audio Club K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE : AAFES(Europe) X: Australia

⚠ indicates safety critical components.

TK-240

KSC-7
DISASSEMBLY/PACKING

KSC-7 (RAPID CHARGER)

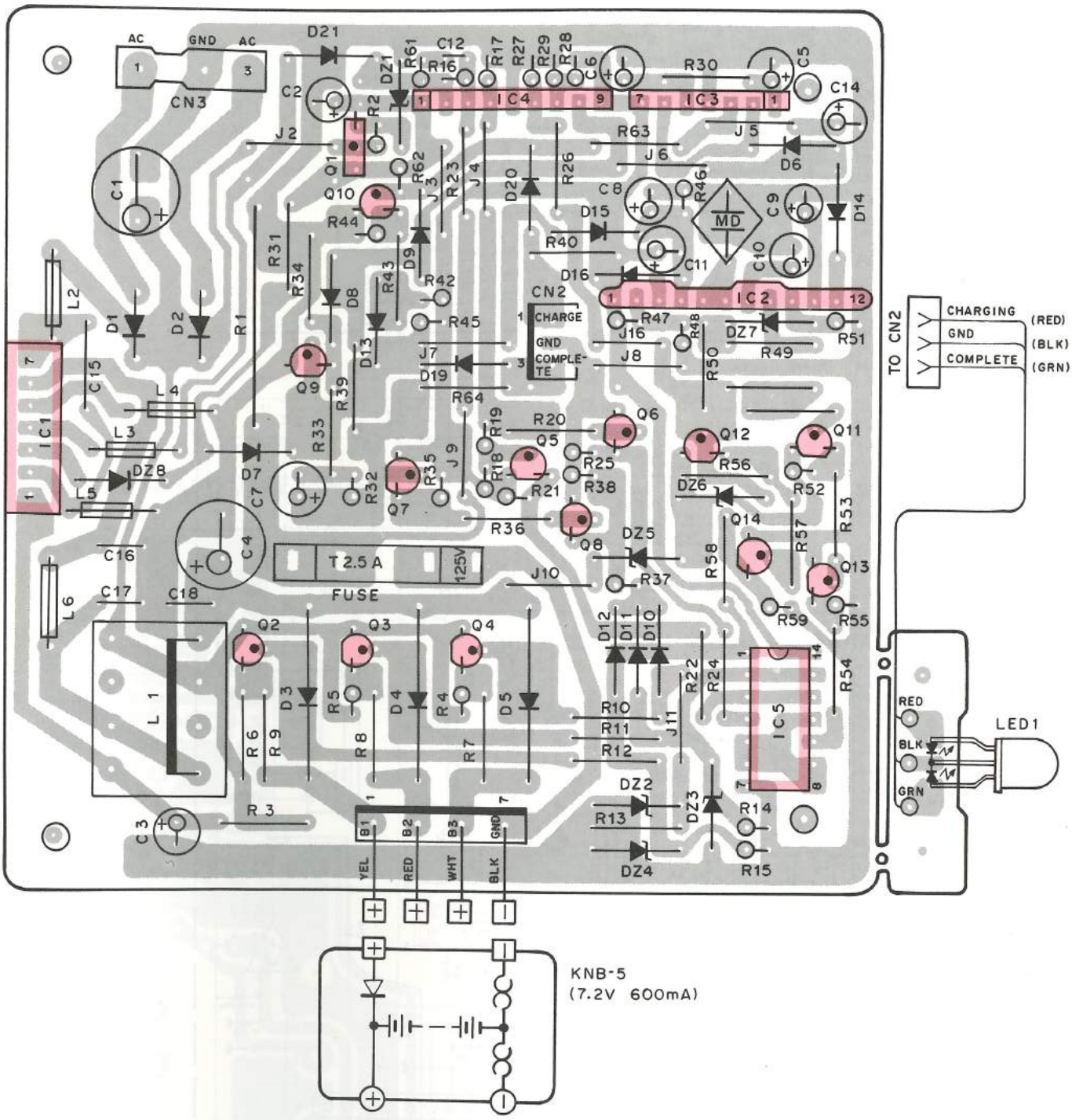


A	M3x6		: N30-3006-41
B	M4x6 (TR)		: N34-4006-46
C	M4x6 (Bi)	BLK	: N35-4006-45
D	ø 3x8 (Br-Tap)		: N87-3008-46
E	ø 3x8 (Bi-Tap)	BLK	: N89-3008-45

Parts with the exploded numbers larger than 700 are not supplied.

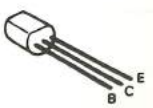
KSC-7 (RAPID CHARGER)

KSC-7 PC BOARD VIEW

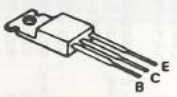


Q1 : 2SD600F,KF Q2–5,7,11,12 : 2SA608E,F Q6,8–10,13,14 : 2SC536E,F
IC1 : STK772B IC2 : KCH-1003 IC3 : AN6780 IC4 : LA6393S IC5 : LC4011B
D1–5 : DSA26B D6–16,19–21 : DS442
DZ1 : GZA11Y DZ2–4 : GZA10Z DZ5 : GZA2.0X DZ6 : GZA5.6X DZ7 : GZA7.5Y DZ8 : GZA3.0X

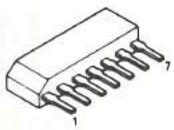
2SA608E
2SA608F



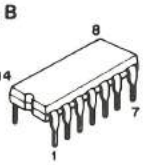
2SC536E 2SD600F
2SC536F 2SD600KF



AN6780



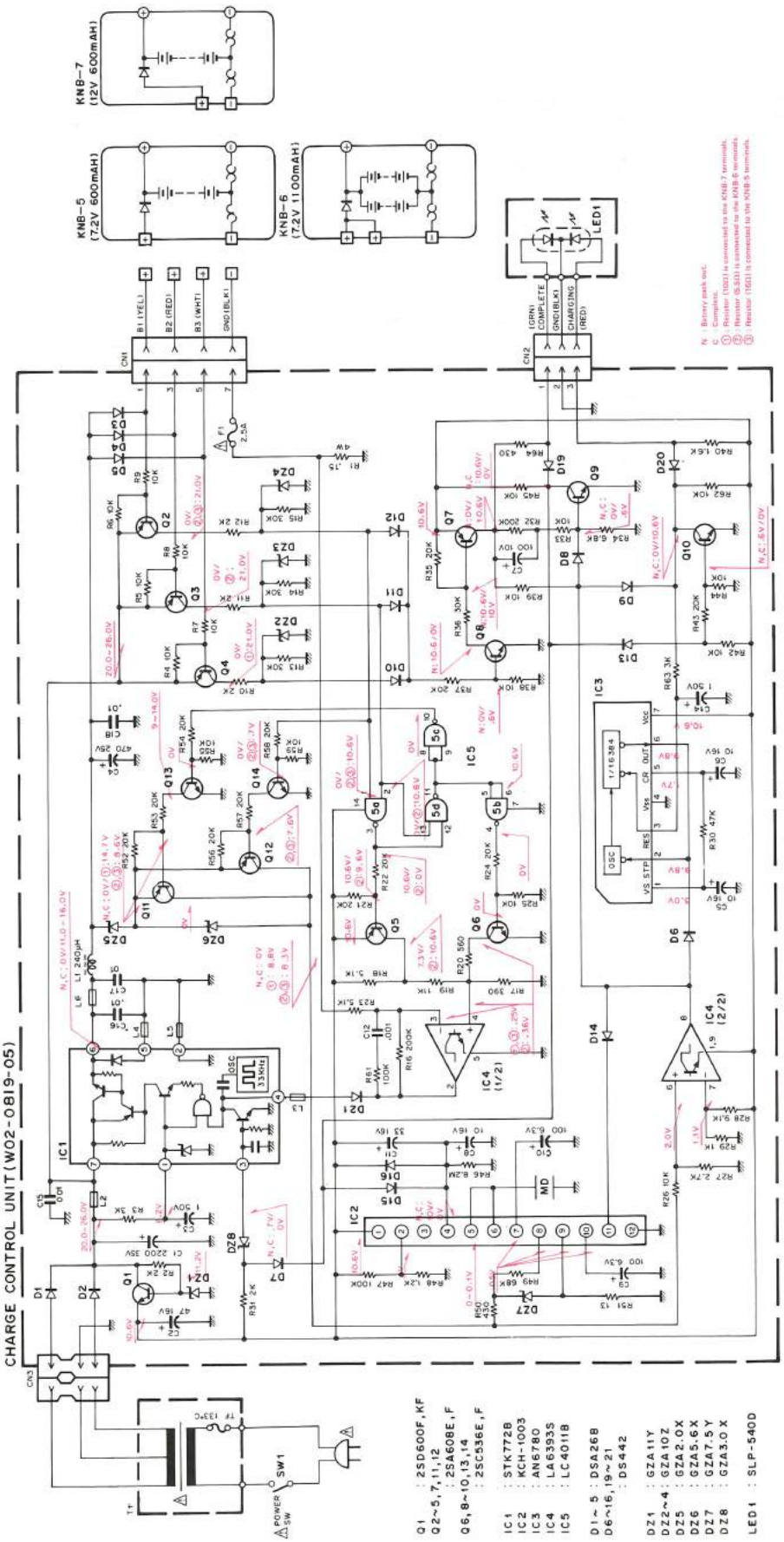
LC4011B



LA6393S

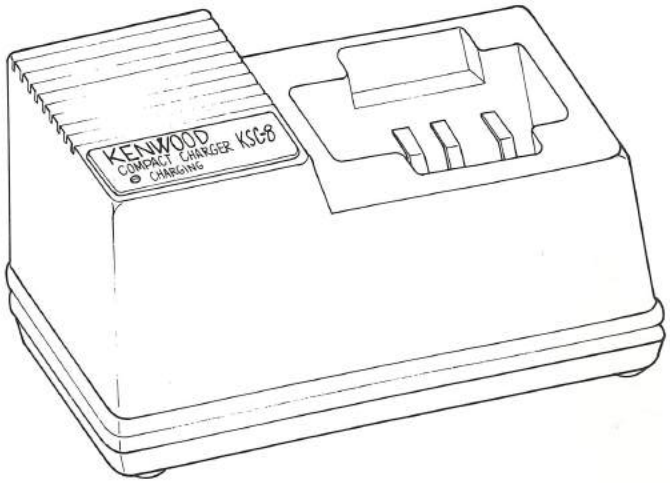
KSC-7 (RAPID CHARGER)

KSC-7 CIRCUIT DIAGRAM



KSC-8 (COMPACT CHARGER)

KSC-8 EXTERNAL VIEW

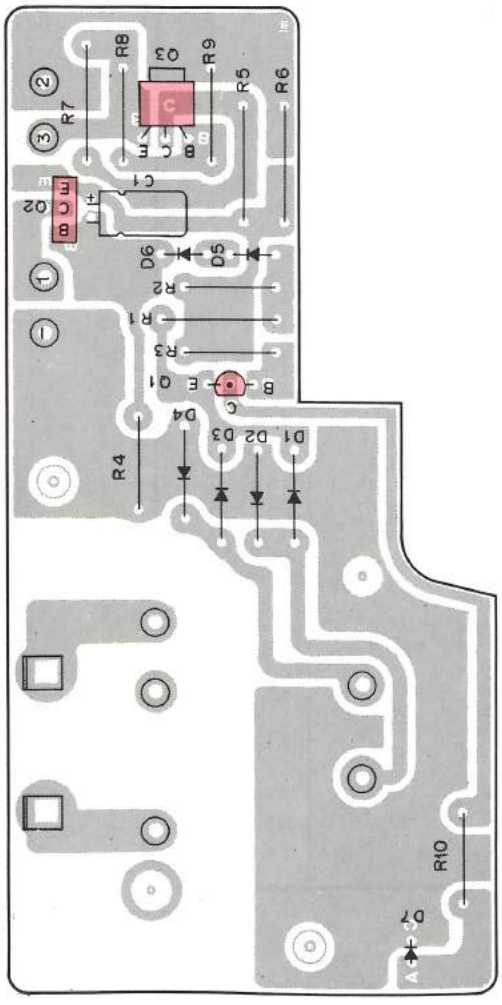


KSC-8 PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
		A02-0830-08	Case (Upper)
		A02-0832-08	Case (Lower)
D7		B30-0858-08	LED SR615D
		B50-8205-08	Instruction manual
		B40-3791-08	Model name plate **K,M2**
		B40-3792-08	Model name palte **M**
		B41-0667-08	Caution label
		E30-2097-08	AC power cord
		L01-8027-08	Power transformer 220V **M**
		L01-8111-08	Power transformer 120V **K,M2**
		W02-0805-05	Module
Q1		2SA1115(E)	Transistor
Q2		2SA1241(Y)	Transistor
Q3		2SC3076	Transistor
D1–4		DSF-10TB	Diode
D5,6		1SS133	Diode

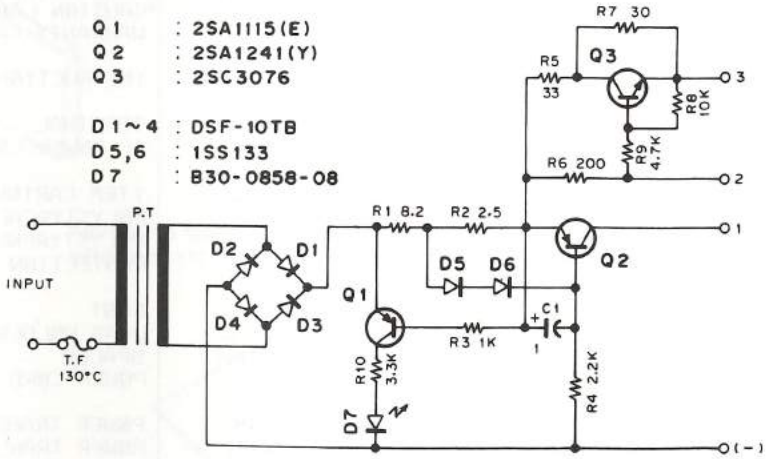
KSC-8 PC BOARD VIEW



KSC-8 CIRCUIT DIAGRAM

Q1 : 2SA1115(E)
Q2 : 2SA1241(Y)
Q3 : 2SC3076

D1~4 : DSF-10TB
D5,6 : 1SS133
D7 : B30-0858-08



TK-240

KSC-76 (MULTIPLE RAPID CHARGER)

KSC-76 EXTERNAL VIEW

KSC-76 PARTS LIST

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
1	1A		A02-0817-05	BATTERY POCKET		
2	3A		A10-1283-01	CHASSIS		
3	2A		A20-2661-01	PANEL		
4	2A		A23-1496-03	REAR PANEL		
8	1A		B30-0853-05	LED		
9	2A		B40-3819-04	MODEL NAME PLATE	KM2	
9	2A		B40-3820-04	MODEL NAME PLATE	M	
11	2A		B41-0658-14	CAUTION LABEL		
-			B46-0418-10	WARRANTY CARD	K	
-			B50-8233-00	INSTRUCTION MANUAL		
15	1A		E23-0604-05	TERMINAL		
16	2B		E30-0780-05	AC POWER CORD		
-			H01-8187-04	ITEM CARTON BOX		
-			H10-2623-11	POLYSTYRENE FOAMED FIXTURE(L)		
-			H10-2629-11	POLYSTYRENE FOAMED FIXTURE(R)		
-			H20-1403-03	PROTECTION COVER (KSC-76)		
30	3A		J02-0323-05	FOOT		
32	1A		J19-1423-05	LEAD HOLDER		
33	3A		J39-0424-05	SPACER		
34	2B		J42-0083-05	POWER CORD BUSHING		
38	2A		L01-8015-05	POWER TRANSFORMER (220V)	MM2	
38	2A		L01-8061-05	POWER TRANSFORMER (120V)	K	
A	3A		N35-3006-41	BINDING HEAD MACHINE SCREW		
B	3A		N89-3008-45	BINDING HEAD TAPTITE SCREW		
C	2A		N09-0631-05	SCREW		
42	3A		W02-0819-05	PCB UNIT		

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE : AAFES(Europe) X: Australia

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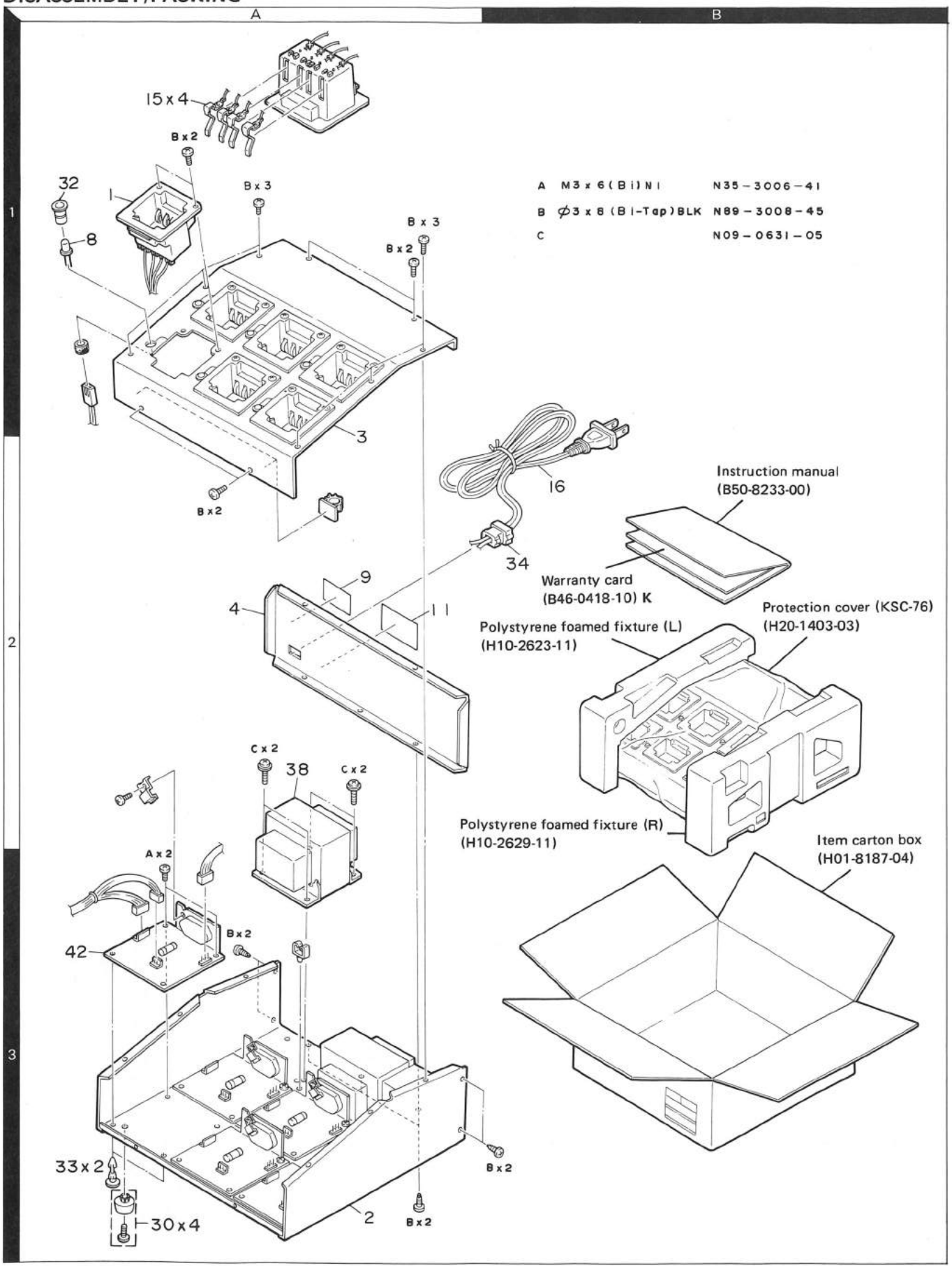
KSC-76 (MULTIPLE RAPID CHARGER)

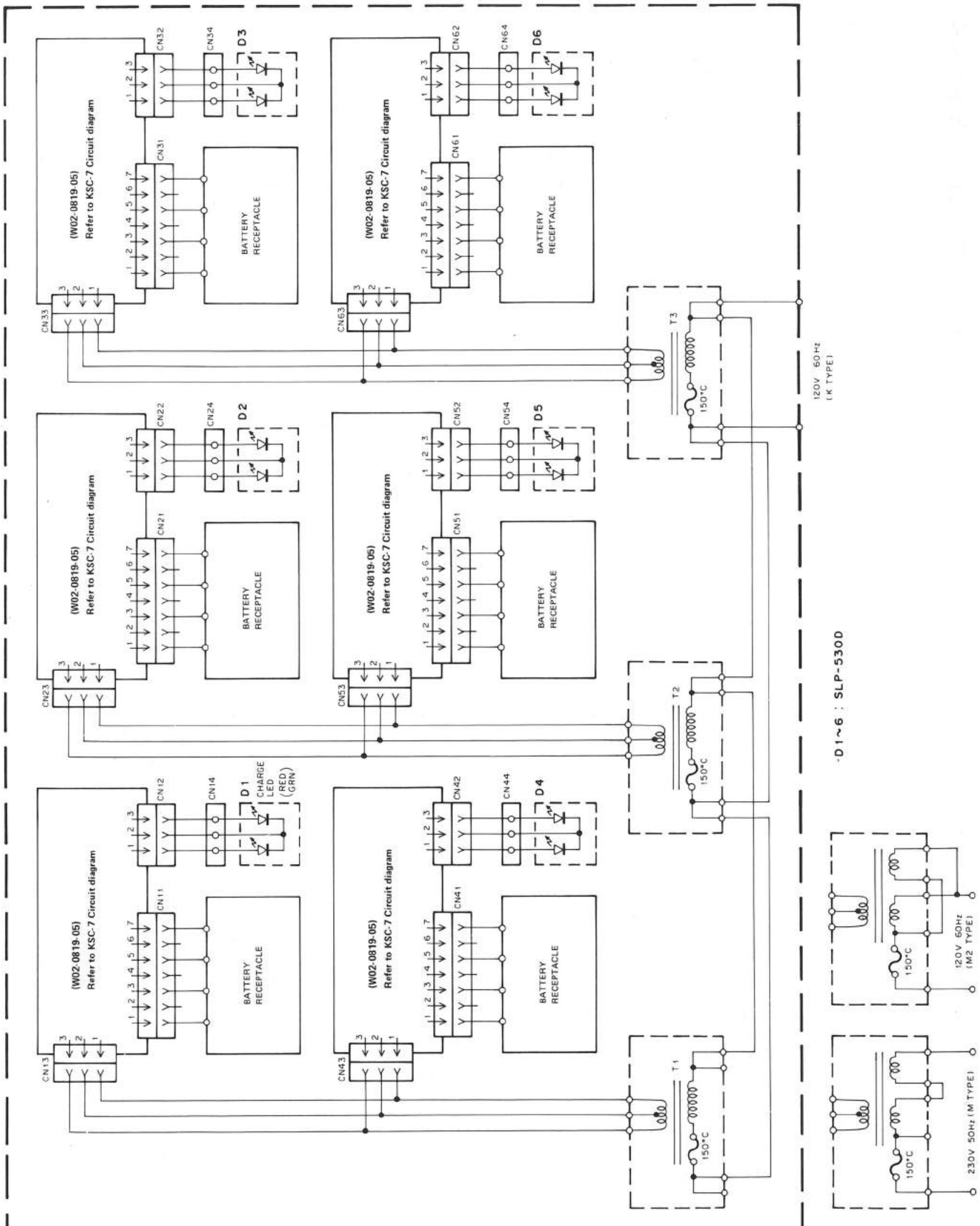
KSC-76 DISASSEMBLY/PACKING



TK-240

KSC-76 (MULTIPLE RAPID CHARGER)

KSC-76 CIRCUIT DIAGRAM



KSC-86 (MULTIPLE CHARGER)

KSC-86 EXTERNAL VIEW

KSC-86 PARTS LIST

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
1	1A		A02-0817-05	BATTERY POCKET		
2	3A		A10-1290-01	CHASSIS		
3	2A		A20-2662-01	PANEL		
4	2A		A23-1497-03	REAR PANEL		
8	1A		B30-0854-05	LED		
9	2A		B40-3821-04	MODEL NAME PLATE	KM2	
9	2A		B40-3822-04	MODEL NAME PLATE	M	
11	2A		B41-0658-14	CAUTION LABEL		
-			B46-0418-10	WARRANTY CARD	K	
			B42-3301-04	LA LICENCE LABEL	K	
-			B50-8233-00	INSTRUCTION MANUAL		
14	3A		E22-0271-05	TERMINAL BOARD		
15	1A		E23-0604-05	TERMINAL		
16	2B		E30-0780-05	AC POWER CORD		
20	2A		F20-1007-04	INSULATING BOARD		
25	3A		G13-0897-04	FORMED PLATE		
-			G13-0811-04	FORMED PLATE (ACCESSARY)		
-			H01-8188-04	ITEM CARTON BOX		
-			H10-2605-11	POLYSTYRENE FOAMED FIXTURE(L)		
-			H10-2606-11	POLYSTYRENE FOAMED FIXTURE(R)		
-			H20-1414-03	PROTECTION COVER (KSC-86)		
-			H25-0077-03	PROTECTION BAG (ACCESSARY)		
30	3A		J02-0439-05	FOOT		
32	1A		J19-1423-05	LED HOLDER		
33	2A		J21-4238-04	MOUNTING HARDWARE		
34	2B		J42-0083-05	POWER CORD BUSHING		
-			J02-0437-04	FOOT (ACCESSARY)		
-			J19-1417-04	HOLDER (ACCESSARY)		
38	2A		L01-8027-05	POWER TRANSFORMER (220V)	M	
38	2A		L01-8111-05	POWER TRANSFORMER (120V)	KM2	
-			N09-0694-05	SCREW (ACCESSARY)		
-			N35-3008-41	BINDING HEAD MACHINE SCREW		
A	2A,3A		N89-3008-41	BINDING HEAD TAPTITE SCREW		
B	3A		N89-3008-45	BINDING HEAD TAPTITE SCREW(PCB		
C	2A		N89-2612-46	BINDING HEAD TAPTITE SCREW		
42	2A		W02-0805-05	PCB UNIT		

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
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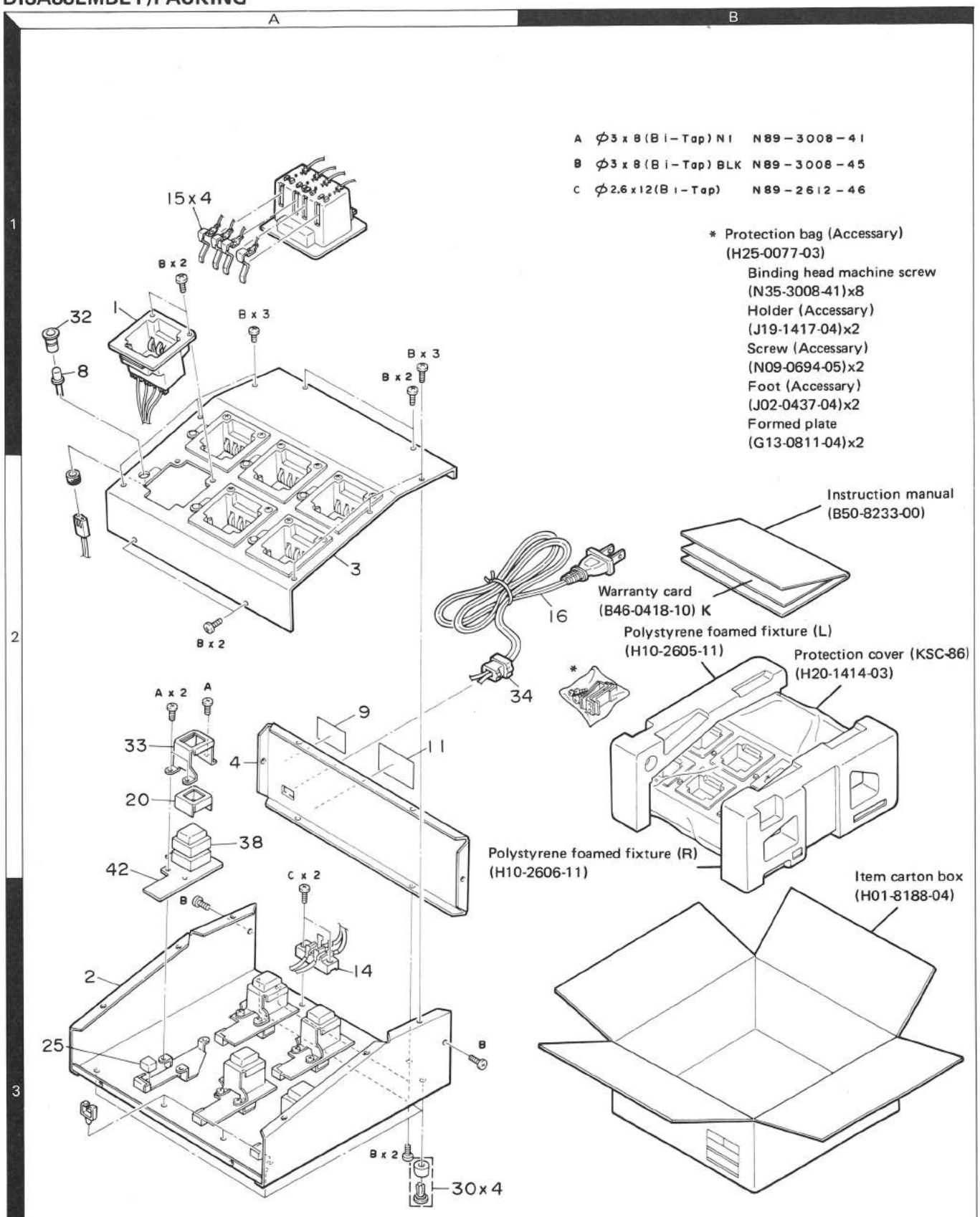
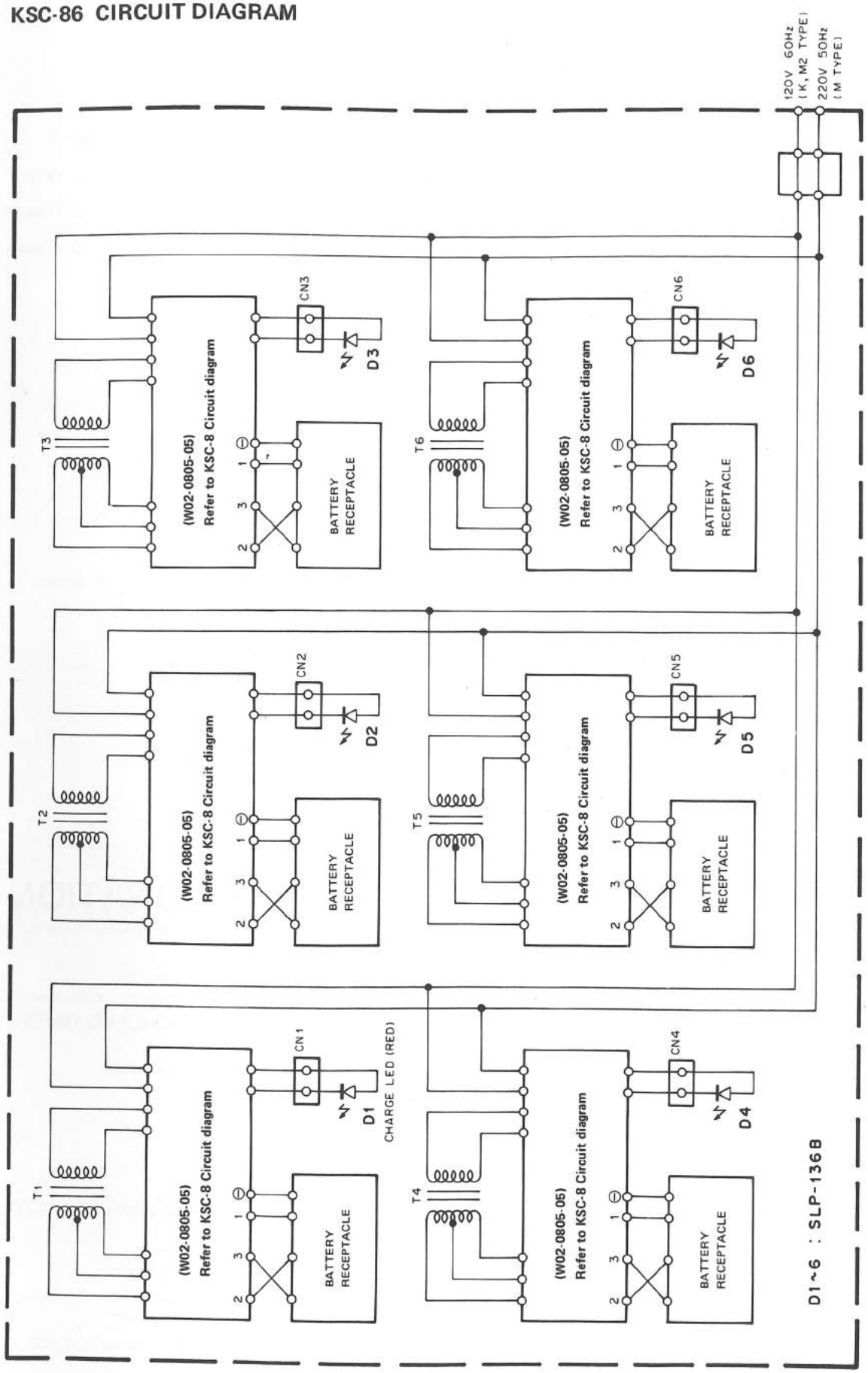
KSC-86
DISASSEMBLY/PACKING

KSC-86 (MULTIPLE CHARGER)



KSC-86 (MULTIPLE CHARGER)

KSC-86 CIRCUIT DIAGRAM



SPECIFICATIONS

GENERAL

Frequency Range	150 to 174MHz
Number of Channels	16 semi-duplex channels
Channel Spacing	30kHz (PLL channel step 5kHz)
Battery Voltage	7.5V (with KNB-5 or KNB-6) 12.5V (with KNB-7)
Temperature Range	–30°C to +60°C (–22°F to +140°F)
Battery Life	More than 8 hours with KNB-6 battery (5-5-90 Duty Cycle)
Dimensions and Weight	
With KNB-5 (7.5V 600mA battery)	5.69" (144.5mm) H × 2.28" (58mm) W × 1.16" (29.5mm) D 14.1ozs. (400g)
With KNB-6 (7.5V 1100mA battery)	7.38" (187.5mm) H × 2.2[illegible] (58mm) W × 1.16" (29.5mm) D 17.64ozs. (500g)
With KNB-7 (12.5V 600mA battery)	7.38" (187.5mm) H × 2.28" [illegible]3mm) W × 1.16" (29.5mm) D 17.64ozs. (500g)
Compliance	FCC parts 22, 74 and 90
FCC ID	ALH TK-240-1 (150~174MHz)
Applicable MIL-STD	MIL 810D Rain Method 506.2 Procedure 2

RECEIVER

(Measurements made per EIA standard EIA-316-B)

Sensitivity	
EIA 12dB SINAD	0.25μV
20dB Quieting	0.35μV
Squelch Sensitivity	0.16μV threshold
Modulation Acceptance	±7kHz
Selectivity	–70dB
Intermodulation	–65dB
Spurious Rejection	–70dB
Image Rejection	–70dB
Audio Power Output	250mW at less than 5% distortion (300mW with KNB-7 battery)
Frequency Stability	±0.0005% from –30°C to +60°C
Channel Frequency Spread	24MHz

TRANSMITTER

(Measurements made per EIA standard EIA-316-B)

RF Power Output	5 watts with KNB-7 battery 2 watts with KNB-5 or KNB-6 battery
Spurious and Harmonics	–70dB
Modulation	F3E, ±5kHz for 100% at 1000Hz
FM Noise	–45dB
Microphone Impedance	High impedance
Audio Distortion	1.0% at 1000Hz
Frequency Stability	±0.0005% from –30°C to +60°C
Channel Frequency Spread	24MHz

Note:

Frequency Range		
M Type	Type 1	150~174MHz
	Type 2	136~150MHz

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