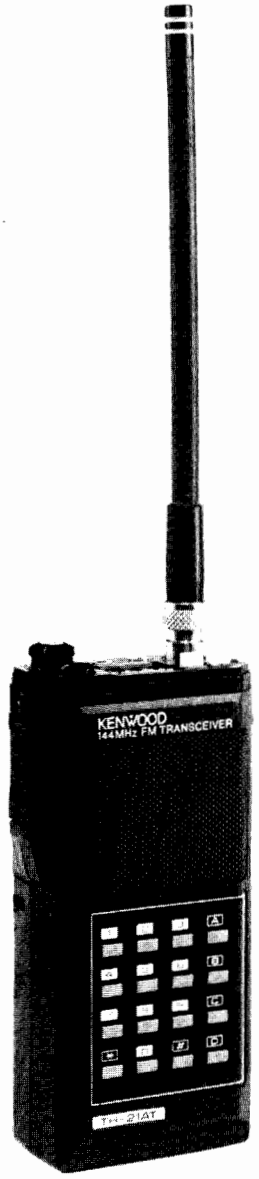
10.00

KENWOOD

SERVICE MANUAL

TH-21A/AT/E BT-2, DC-21, EB-2, PB-21, SC-8/8T, SMC-30, TU-6

2m FM HAND-HELD TRANSCEIVER



Photograph shows TH-21AT type.

CONTENTS

CIRCUIT DESCRIPTION 2
PACKING 7
PARTS LIST 8
PC BOARD VIEWS
- SWITCH UNIT (X41-1590-XX) 18
- TONE UNIT (X52-1270-XX) (TH-21E ONLY) 19
- DTMF UNIT (TH-21AT ONLY) 19
- RF UNIT (X44-1630-XX) 20
- IF UNIT (X48-1410-XX) 22

DISASSEMBLY 23
LEVEL DIAGRAM 25
ADJUSTMENT 26
BT-2 (AAA MANGANESE/ALKALINE BATTERY CASE) 29
EB-2 (EXTERNAL C MANGANESE/ALKALINE BATTERY CASE) 29
PB-21 (Ni-Cd BATTERY) 29
DC-21 (DC-DC CONVERTER) 30
SC-8/8T (SOFT CASE) 30
SMC-30 (SPEAKER MICROPHONE) 31
TU-6 (PROGRAMABLE TONE ENCODER) (TH-21A/AT ONLY) 31
WIRING 32
REFERENCE DATA 32
SCHEMATIC DIAGRAM (TH-21A/AT) 33
SCHEMATIC DIAGRAM (TH-21E) 34
BLOCK DIAGRAM 35
SPECIFICATIONS . . . . . BACK COVER

CIRCUIT DESCRIPTION

Model	Destination	Frequency range (MHz)	RPT·SHIFT Freq' (kHz)	TONE	Ref'
TH-21A	K1,M1,M2	144.00–147.995	±600	Option (TU-6)	
	X	144.00–145.995			
TH-21AT	K2,M3,M4	144.00–147.995			DTMF System used
TH-21E	T	144.00–145.995	–600/REV	1750Hz TONE BURST	TRIO Brand
	W			1750 Hz TONE	

K : U.S.A. M : Gen. T : England W : Europe X : Australia/Newzealand

Table 1 Destination chart

RX Section

The TH-21A/AT/E uses a double super-heterodyne type receiver with a IF frequency of 16.3MHz and a second IF frequency of 455kHz.

The received signal from the antenna is amplified by RF amplifiers Q1 : 2SC2176(H) and Q2 : 2SC2668(Y), which are in connected cascade, and applied to BPF L6–L8. The RF signal is then applied to the first mixer, Q3 : 2SK192A, where it is mixed with the first local oscillator signal from the PLL. The first mixer output passes through a 16.3MHz MCF (F1) and becomes the first IF signal. This signal is amplified by IF amplifier Q4 : 2SC2714(Y) and is applied to IF unit Q1 : MC3359P

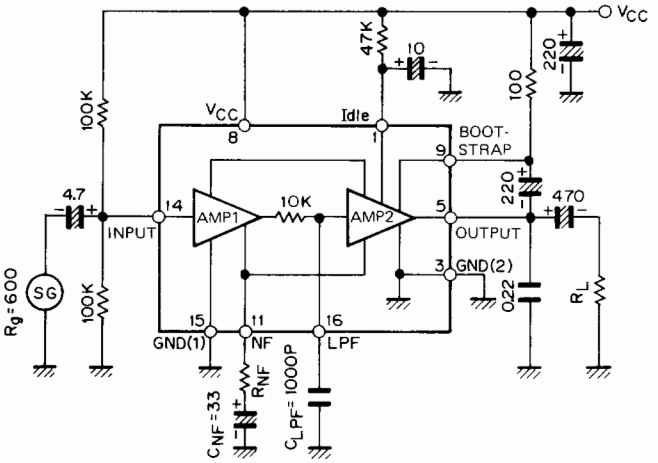


Fig. 1 TA7331F Block diagram (IF unit Q2)

Item	Rating
Noninal center frequency (fo)	16.3MHz
Pass bandwidth	fo ± 7.5kHz or more at 3dB
Attenuation bandwidth	fo ± 25kHz or more at 18dB
Guaranteed attenuation	30dB or more within fo ±1MHz Spurious : 15dB or more at fo ~ fo +500kHz.
Ripple	0.5dB or less
Insertion loss	1.0dB or less
Terminal impedance	1kΩ/1.5pF

Table 2 MCF (L71-0426-05) (RF unit F1)

Item	Rating
Center frequency of 6dB bandwidth (fo)	455kHz ± 1.5kHz
6dB bandwidth	± 7.5kHz or more
40dB bandwidth	± 15kHz or less
Ripple	1.5dB or less (455 ± 5kHz)
Guaranteed attenuation	27dB or more within fo ± 100kHz
Insertion loss	6dB or less at 455kHz
Terminal impedance	1.5kΩ

Table 3 Ceramic filter (L72-0335-05) (IF unit F1)

Q1 consists of the second mixer, second local oscillator, second IF amp, FM demodulator, squelch noise amp and control circuits.

The demodulated audio signal from Q1 is amplified by AF amplifier Q2 : TA7331F, on the IF unit, via the AF volume control (VR1 on the switch unit) to drive the speaker.

The squelch circuit, (an auxiliary circuit of the receiver section) detects the high frequency noise component of the demodulated audio output from Q1.

This signal is applied to pin 12 of Q1 via the squelch control, (VR2 on the switch unit). The noise component applied to pin 12, is amplified and then output at pin 13. The output at pin 13 is rectified by D1 and D2 : 1N60As and fed to pin 14. When this rectified voltage is applied to pin 14, the squelch trigger circuit functions, pin 16 is grounded, and Q4 : 2SC2412K and Q3 : 2SB698(E,F) turn OFF. When Q3 turns OFF, AF amp IC Q2 : TA7331F is muted and no audio is output. When a signal is received, the noise level contained in the demodulated output of Q1 reduced, and the squelch trigger circuit does not function. Therefore, Q4 and Q3 turn ON, the AF amp IC is powered, and audio output is obtained.

CIRCUIT DESCRIPTION

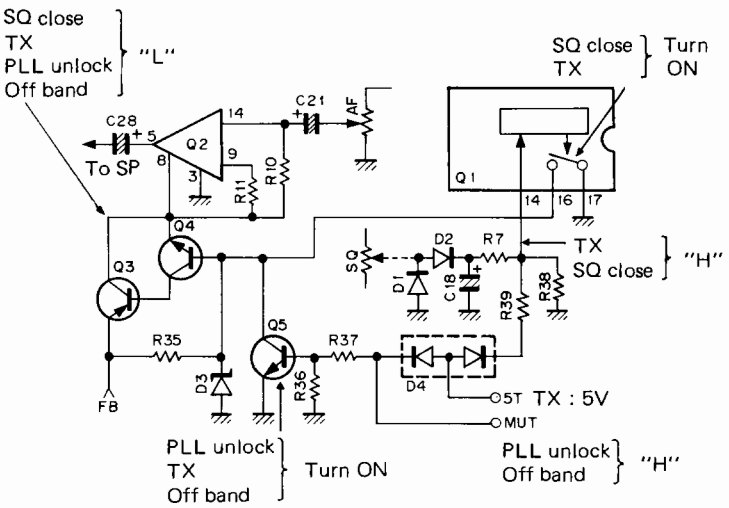


Fig. 2 Squelch-mute circuit

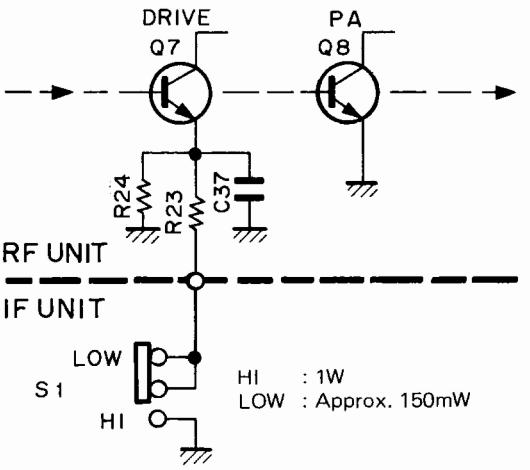


Fig. 3 Power select circuit

TX Section

The VCO local oscillator Q14 : 2SC2714(Y) frequency in transmit is one half the actual TX frequency. The output of VCO buffer amp Q16 : 2SC2671(H) is doubled by Q5 : 2SC2668(Y) and fed through a BPF to obtain the TX frequency. The output of the BPF is fed to pre-driver, Q6 : 2SC2347, driver Q7 : 2SC2053, and is then amplified by the final amplifier Q8 : 2SC1947.

	VCBO	VEBO	VCEO	IC	PC	PC	Tj	Tstg	Ta
Test Conditions			RBE = ∞ Ω		Tc = 25°C	Ta = 25°C			25 ± 3°C
Maximum Rating	35V	4V	17V	1A	10W	1W	+175°C	−65 ~ +175°C	

Table 4 2SC1947 Max. rating (RF unit Q8)

Signals from the microphone and the tone circuits are amplified by mic amp Q6 : NJM4558M. The signal is then applied to voltage variable capacitor diode D16 : 1S2208 of the VCO circuit to modulate the VCO signal. The transmitter section also consists of the power selector circuit and the tone circuit.

To select the power, the emitter resistor R23 (10Ω) of driver Q7 is controlled by the HI/LO switch (S1) on the IF unit. When R23 is grounded, the output power is about 1W. When R23 is opened, the output power becomes about 150mW.

Several different tone circuits are available to provide access to repeaters. Circuits vary depending on country of destination.

1) In E (W) type models (for European countries), when the TONE switch (a non-locking type) is held depressed, the radio enters TX mode and a tone signal of 1750Hz is emitted.
2) In E (T) type models (for the United Kingdom), when the TONE switch is pressed, the radio will enter TX mode and a tone burst of 1750Hz is transmitted.
3) The optional tone encoder (TU-6) may be installed in A/AT versions. With the TU-6, any one of 37 frequencies between 67.0–250.3Hz can be transmitted. When the TONE switch is pressed, the tone signal is continuously transmitted.
4) In AT type models, a DTMF (Dual-Tone Multi Frequency) system is also used. When a key is pressed, the unit enters TX mode and transmits a dual tone signal as long as the key is held depressed.

CIRCUIT DESCRIPTION

PLL Circuit

In RX mode, the VCO oscillates at frequency of 1/2 the first local oscillator [63.85 – 65.8475MHz (T,W,X ; 63.85–64.845MHz)]. In TX mode, the VCO oscillates at a frequency of 1/2 the TX frequency [72–73.9975MHz (T,W,X ; 72 – 72.9975MHz)].
During reception, D15 turns ON to connect C104 into the oscillator circuit which causes the oscillation frequency of the VCO to drop.

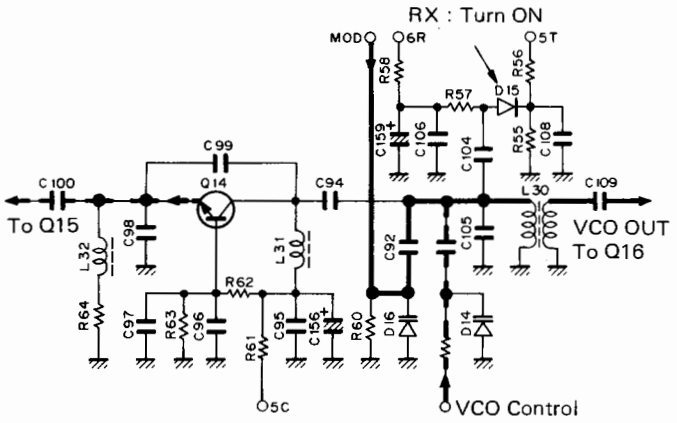


Fig. 4 VCO circuit

The output of the VCO is amplified by Q15 : 2SC2714(Y) and mixed with the HET oscillator Q9 : 2SC2714(Y) signal by PLL mixer Q10 : 2SC2668(Y).
The frequency of the HET oscillator is determined by the crystal selected by the OFFSET switch. Q9 in connection with BPF L25 and L26 acts as a frequency doubler.

The output of PLL mixer Q10 passes through a LPF (L28, C79, C80) to obtain a 2–3.995MHz signal (T,W,X ; 2–2.995MHz). This signal is amplified by Q11 : 2SC2668(Y) and is applied to programmable counter Q3 : TC9122P. The signal input to Q11 is divided by 1/400 at 144.00MHz and 1/799 at 147.99MHz (T,W,X ; 1/599 at 145.99MHz). The actual divide ratio is determined by the thumb-wheel switch, (S2) on switch unit, settings.
The output of Q3 is compared with the (5kHz) reference signal by the phase comparator Q13 : TC5081AP. The 10.24MHz reference oscillator signal is divided by 1/2048 in Q12 : TC5082P to obtain the phase comparator reference frequency. The control voltage output of Q13 is fed through a passive type LPF to voltage variable capacitor diode D14 : ITT310TE of VCO circuit to control the VCO frequency.
Peripheral circuits of the PLL are the +5kHz circuit, and PLL unlock circuits. The +5kHz circuit is used to obtain the 5kHz TX and RX frequencies. In RX mode, when the 5k switch, S3 on switch unit, is set to off, D6 of the PLL HET oscillator circuit is forward biased effectively by passing. When the 5k switch is set to ON, the D6 turns off, which connectes TC4 and C61 to crystal (X2) in series.
When a capacitor is connected to the crystal in series, the frequency of oscillation increases. Use TC4 to adjust the +5kHz frequency. The PLL unlock circuit is described in the control circuit section.

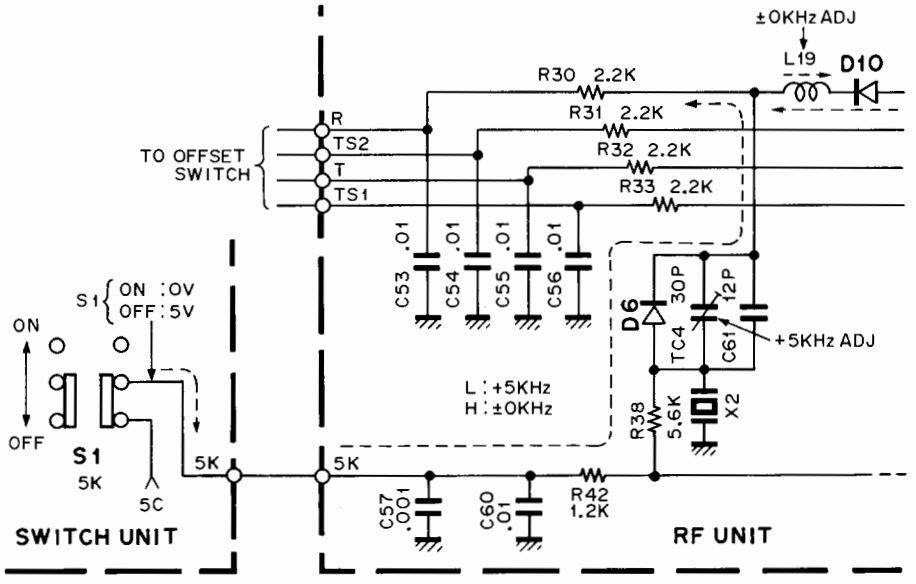
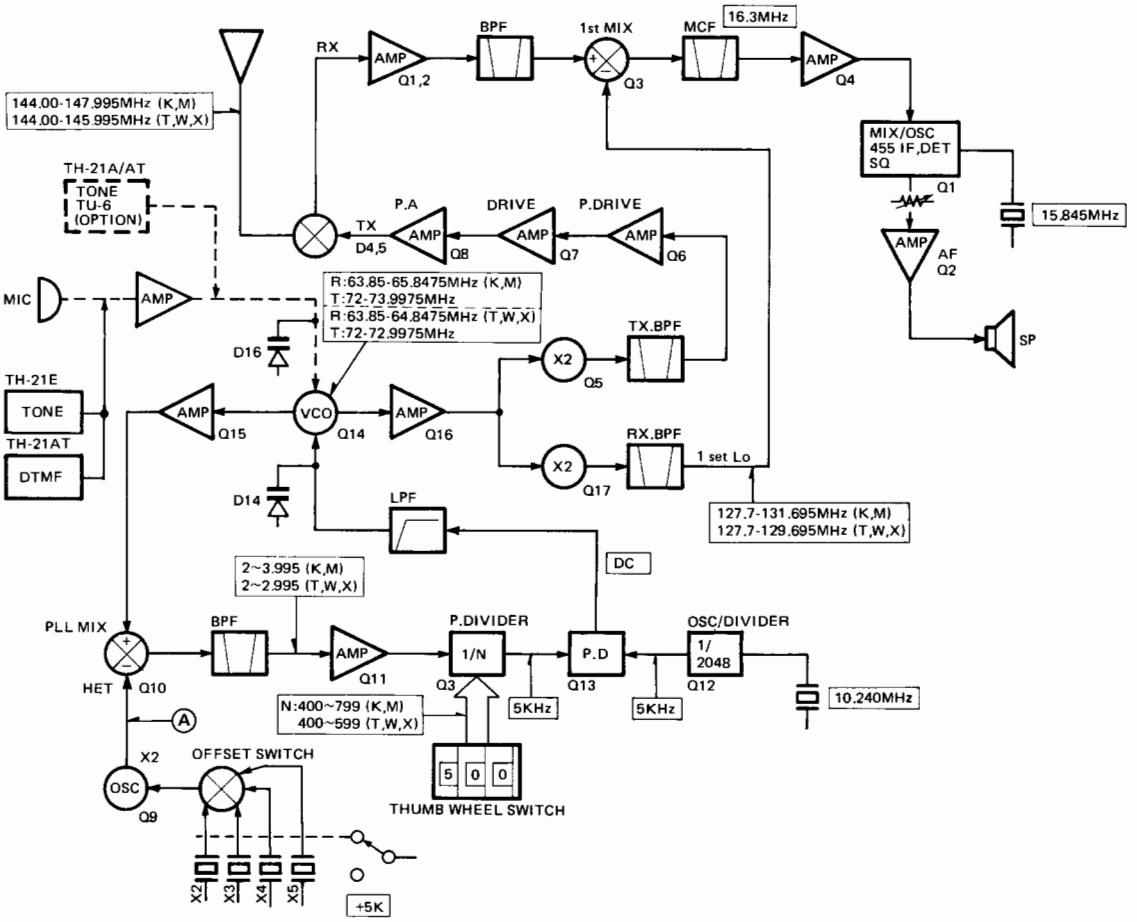


Fig. 5 +5kHz shift circuit

CIRCUIT DESCRIPTION



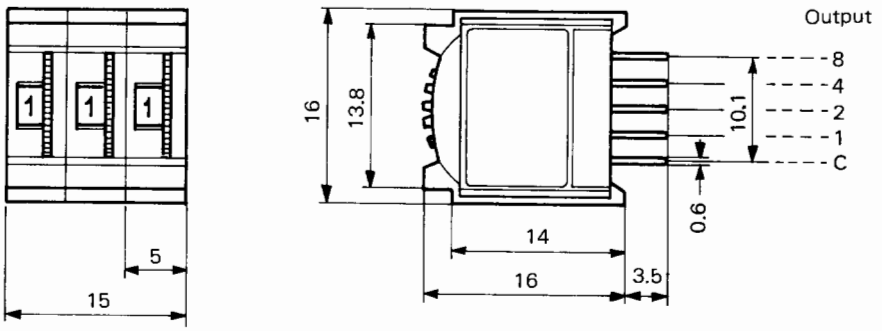
Ⓐ **TH-21A/AT** **K,M,X Type**

	OFF SET Switch			Crystal	
	– (600kHz)	S	+ (600kHz)	X2	61.850MHz
				X3	70.300MHz
RX	X2	X2	X2	X4	70.000MHz
TX	X5	X4	X3	X5	69.700MHz

TH-21E **T,W Type**

	OFF SET Switch			Crystal	
	– (600kHz)	S	REV	X2	61.850MHz
				X3	61.550MHz
RX	X2	X2	X3	X4	70.000MHz
TX	X5	X4	X4	X5	69.700MHz

Fig. 6 Frequency configuration



Dial \ Output	● : Connecto to the common pin			
	8	4	2	1
0				
1				●
2			●	
3			●	●
4		●		
5		●		●
6		●	●	
7		●	●	●
8	●			
9	●			●

Fig. 7 Thumb wheel switch (S59-3401-05) (Switch unit S2)

CIRCUIT DESCRIPTION

Control circuit

A constant regulated 5V is obtained from voltage regulator Q19 : LV517. The 5C signal is available in both TX and RX modes, and is used as a reference voltage on the 6R and 5T AVR's.

The 6R output of Q20 : 2SC1037K is supplied to the RX section and the 5T output is supplied to the TX section. When the PTT switch is pressed, Q7 : 2SA1037K and Q8 : 2SA2412K are forward biased, and the TC line is grounded to place the radio in transmit mode.

The function of the power supply circuit is described in the table below.

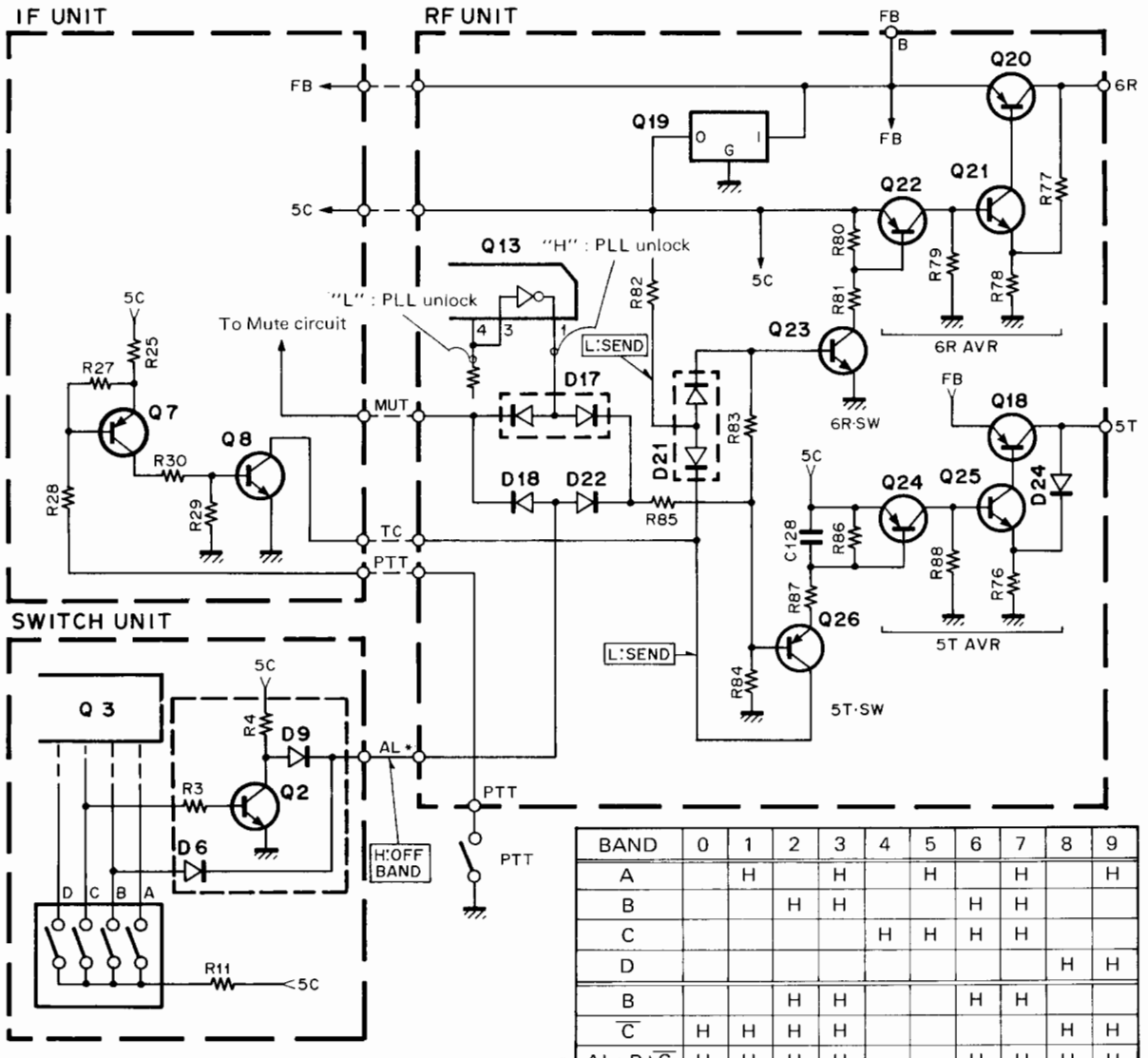
	TC	Q23	Q26	Q22	Q24	6R	5T
RX	H	ON	OFF	ON	OFF	O	X
TX	L	OFF	ON	OFF	ON	X	O

Table 5 Function of power supply circuit

In unlock mode (when PLL is unlocked), the unlock signal "H" is felt at pin 1 of Q13 : TC5081AP. The unlock signal passes through D17 : MA152WA/2, to control Q23 and Q26 and switches the radio to RX. When a frequency is selected out side the normal amateur band, the anti-lock signal (AL) "H" is generated in the switch unit and is applied to D22 : 1SS133 of RF unit, which also places the radio in RX.

When the unlock or anti-lock signal is generated, an logic "H" is fed to the MUT pin (of the IF unit) through D17/2 or D18 : 1SS133 to stop AF amp operation.

During transmitt, the 5T signal is replies to IF unit Q5 : 2SC2412K and Q1 : MC3359P via D4 : MA152WA to stop AF amp operation.



BAND	0	1	2	3	4	5	6	7	8	9
A		H		H		H		H		H
B			H	H			H	H		
C					H	H	H	H		
D									H	H
B			H	H			H	H		
$\overline{C}$	H	H	H	H					H	H
* AL=B+$\overline{C}$	H	H	H	H			H	H	H	H

Fig. 8 Control circuit

CIRCUIT DESCRIPTION/PACKING

Parts No.	W09-0334-05	W09-0335-05	W09-0336-05	W09-0339-05
Input power	AC 120V 60Hz 3W or less	AC 220V 50/60Hz 3W or less	AC 240V 50Hz 3W or less	AC 240V 50/60Hz 3W or less
Output	DC 8.7V 32mA at 0mA/13.5V or less			
Weight	Approx. 120g	Approx. 210g		
Destination	U.S.A	Europe/Gen. M1–4	United Kingdom	Australia/ Newzealand
Ref'			TRIO Brand	

Table 6 Charger specifications

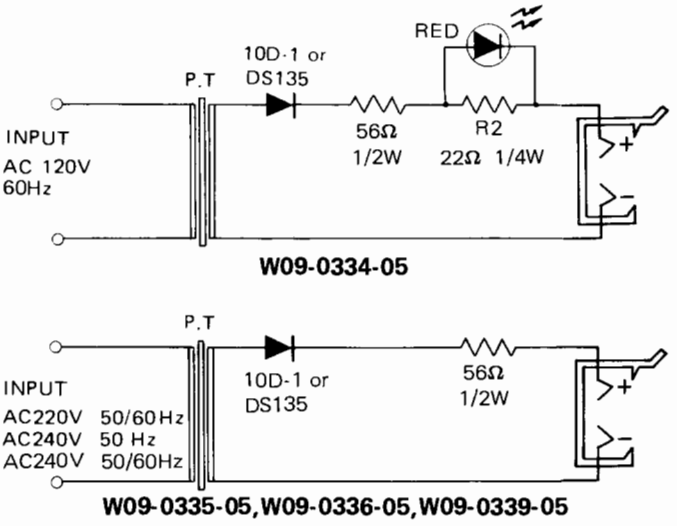
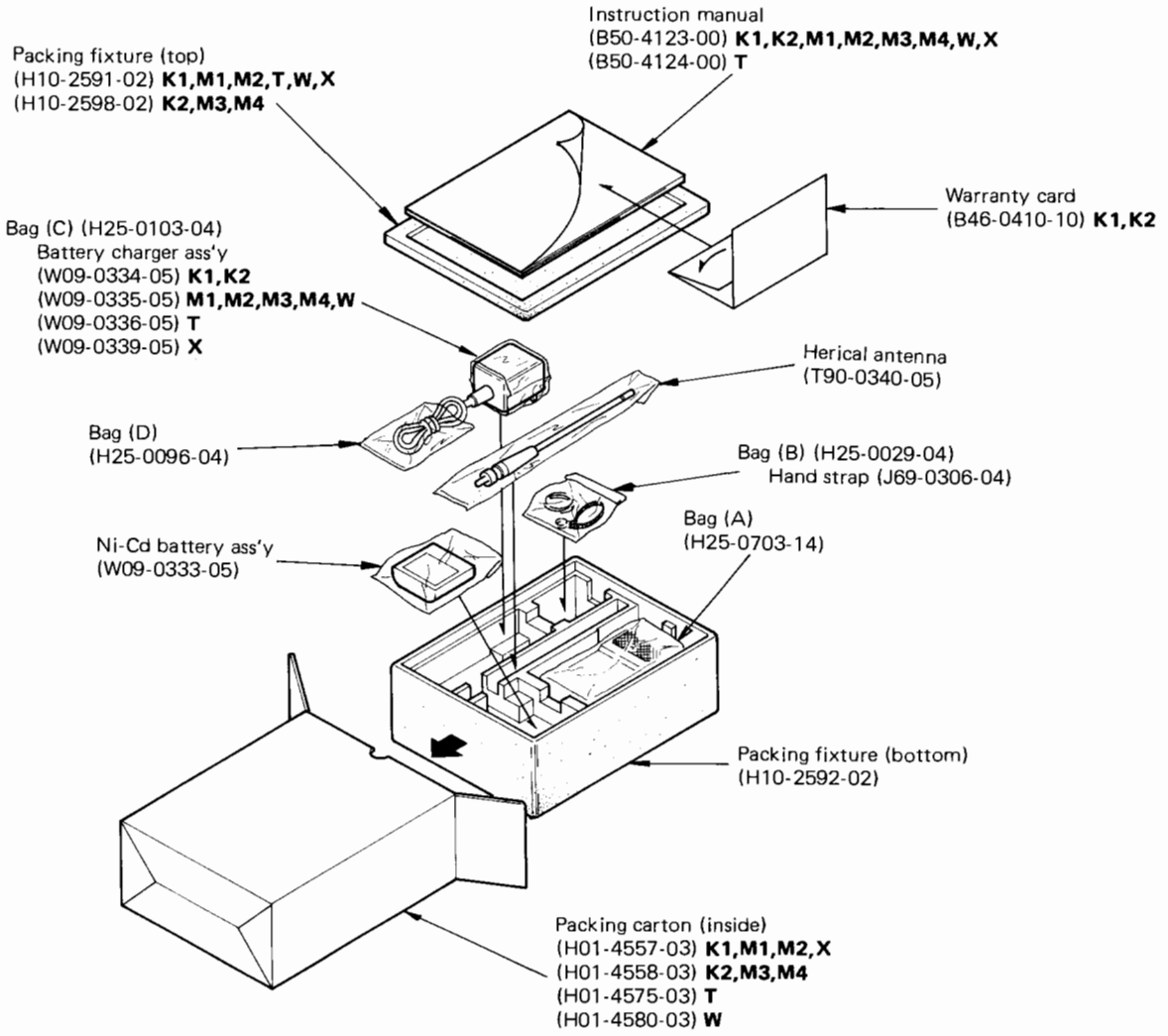


Fig. 9 Charger schematic diagram

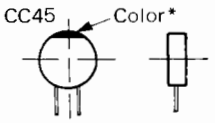
PACKING



PARTS LIST

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

1 = Type ..... ceramic, electrolyic, 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

Less than 10 pF

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

- **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**

(EX) C C 7 3 F S L 1 H 0 0 0 J → Refer to the above table.
1 2 3 4 5 6 7
(Chip) (CH,RH,UJ,SL)

(EX) C K 7 3 F F 1 H 0 0 0 Z
1 2 3 4 5 6 7
(Chip) (B,F)

- **Chip resistor (Carbon)**

(EX) R D 7 3 E B 2 B 0 0 0 J
1 2 3 4 5 6 7
(Chip) (B,F)

- **Carbon resistor (Normal type)**

(EX) R D 1 4 B B 2 C 0 0 0 J
1 2 3 4 5 6 7

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
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

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

Model	Destination	Switch unit	RF unit	IF unit	Tone unit	Touch tone unit
TH-21A	K1 · M1	X41-1590-11	X44-1630-11	X48-1410-11		
	M2 · X	X41-1590-71	X44-1630-71			
TH-21AT	K2 · M3	X41-1590-11	X44-1630-11	X48-1410-11		A09-0402-05
	M4	X41-1590-71	X44-1630-71			
TH-21E	T	X41-1590-51	X44-1630-61	X48-1410-61	X41-1270-51	
	W	X41-1590-61			X41-1270-60	

TH-21A/AT/E GENERAL

N : New parts
* : Please note that parts are sometimes not in stock and it takes much time to deliver.

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY												REFERENCE.NO
			011	012	021	022	023	024	051	061	071				
A02-0670-02	N*	CASE(TOP) 144MHZ.KENWOOD	1		1	1									
A02-0671-02	N*	CASE(TOP) 144MHZ.TRIO							1						
A02-0670-02	N*	CASE(TOP) 144MHZ.KENWOOD								1	1				
A02-0672-01	N*	CASE(TOP) 146MHZ.KENWOOD		1			1	1							
A02-0675-02	N*	CASE(BOTTOM)	1	1	1	1	1	1	1	1	1				
A09-0407-03	N*	CASE(TOP)ASS'Y 144MHZ.KENWOOD	1												
A09-0402-05	N*	CASE(TOP)ASS'Y * WITH DTMF		1											
A09-0407-03	N*	CASE(TOP)ASS'Y 144MHZ.KENWOOD			1	1									
A09-0402-05	N*	CASE(TOP)ASS'Y * WITH DTMF					1	1							
A09-0408-03	N*	CASE(TOP)ASS'Y 144MHZ.TRIO							1						
A09-0407-03	N*	CASE(TOP)ASS'Y 144MHZ.KENWOOD								1	1				
A21-0768-02	N*	ORNAMENTAL PANEL	1	1	1	1	1	1	1	1	1				
B04-0408-04	N*	SP METAL	1												
B04-0409-04	N*	SP METAL		1											
B04-0408-04	N*	SP METAL			1	1									
B04-0409-04	N*	SP METAL					1	1							
B04-0408-04	N*	SP METAL							1	1	1				
B05-0733-04	N*	SP GRILE	1	1	1	1	1	1	1	1	1				
B40-3510-04	N*	MODEL NAME PLATE TH-21A	1												
B40-3534-04	N*	MODEL NAME PLATE TH-21AT		1											
B40-3510-04	N*	MODEL NAME PLATE TH-21A			1	1									
B40-3534-04	N*	MODEL NAME PLATE TH-21AT					1	1							
B40-3535-04	N*	MODEL NAME PLATE TH-21E							1	1					
B40-3510-04	N*	MODEL NAME PLATE TH-21A									1				
B42-2343-04	N*	FCC PLATE	1												
B42-2359-04	N*	FCC PLATE		1											
B42-2343-04	N*	FCC PLATE			1	1									
B42-2359-04	N*	FCC PLATE					1	1							
B42-1745-04	N*	SERIAL NO. LABEL	1	1	1	1	1	1	1	1	1				
B42-2366-04	N*	PLATE HI/LO,- S +	1	1	1	1	1	1	1						
B42-2379-04	N*	PLATE HI/LO,- S REV								1					
B42-2366-04	N*	PLATE HI/LO,- S +									1				
B43-1025-04	N*	BADGE TH-21A	1												
B43-1029-04	N*	BADGE TH-21AT		1											
B43-1025-04	N*	BADGE TH-21A			1	1									
B43-1029-04	N*	BADGE TH-21AT					1	1							
B43-1032-04	N*	BADGE TH-21E							1	1					
B43-1025-04	N*	BADGE TH-21A									1				
B50-4123-00	N	INSTRUCTION MANUAL	1	1	1	1	1	1							
B50-4124-00	N	INSTRUCTION MANUAL							1						
B50-4123-00	N	INSTRUCTION MANUAL								1	1				
CC45SL1H560J		CERAMIC 56P 50V	1	1	1	1	1	1	1	1	1				C ,101
CC73FCH1H300J		CHIP CAP. 30P 50V		2			2	2							C , 6, 7
CE04CW0J100M		ELECTRO 10 6.3V		2			2	2							C , 2, 4
CE04CW1C4R7M		ELECTRO 4.7 16V		1			1	1							C , 5
CK73FB1E103K		CHIP CAP. 0.01 25V		2			2	2							C , 1, 3
E23-0432-04		TERMINAL FOR JUNCTION								2					
E23-0458-04	N	TERMINAL (INSIDE)								2					
E23-0432-04		TERMINAL FOR JUNCTION	2	2	2	2	2	2	2	2	2				
E23-0458-04	N	TERMINAL (INSIDE)	2	2	2	2	2	2	2	2	2				
F10-1314-04	N*	SHIELDING PLATE	1	1	1	1	1	1	1	1	1				
F19-0637-04	N*	SWITCH MASK(A) HI/LO	1	1	1	1	1	1	1	1	1				
F19-0638-04	N*	SWITCH MASK(B) OFFSET	1	1	1	1	1	1	1	1	1				

DISTINCTION

K1 - 011 K2 - 012

M1 - 021 M2 - 022

M3 - 023 M4 - 024

T - 051 W - 061

X - 071

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY												REFERENCE.NO
			011	012	021	022	023	024	051	061	071				
F20-0520-04	*	CUSHION(B) SP	1	1	1	1	1	1	1	1	1				
F20-0538-04	N*	INSULATING BOARD	1	1	1	1	1	1	1	1	1				
GL9PR24	N	LED RED	1	1	1	1	1	1	1	1	1				D ,101
G10-0633-04	N*	TAPE RF UNIT	2	2	2	2	2	2	2	2	2				
G13-0802-04	N*	CUSHION FOR JUNCTION								2					
G13-0626-04	*	CUSHION MIC	1	1	1	1	1	1	1	1	1				
G13-0802-04	N*	CUSHION FOR JUNCTION	2	2	2	2	2	2	2	2	2				
G13-0803-04	N*	CUSHION(B) FOR PTT	1	1	1	1	1	1	1	1	1				
H01-4557-13	N*	CARTON(INSIDE)	1												
H01-4558-13	N*	CARTON(INSIDE)		1											
H01-4557-13	N*	CARTON(INSIDE)			1	1									
H01-4558-13	N*	CARTON(INSIDE)					1	1							
H01-4575-13	N*	CARTON(INSIDE)							1						
H01-4580-13	N*	CARTON(INSIDE)								1					
H01-4557-13	N*	CARTON(INSIDE)									1				
H10-2591-02	N*	PACKING FIXTURE(TOP)	1		1	1			1	1	1				
H10-2592-02	N*	PACKING FIXTURE(BOTTOM)	1	1	1	1	1	1	1	1	1				
H10-2598-02	N*	PACKING FIXTURE(TOP)		1			1	1							
H25-0703-14	*	BAG(TH-21 BODY)140X190	1	1	1	1	1	1	1	1	1				
H25-0029-04	*	BAG(ACS) 60X110	1	1	1	1	1	1	1	1	1				
H25-0103-04	*	BAG(CHARGER) 125X250	1	1	1	1	1	1	1		1				
H25-0096-04	*	BAG(BATTERY) 100X110	1	1	1	1	1	1	1	1	1				
J25-3251-05	N	FLEXIBLE PC BOARD RF-IF	1	1	1	1	1	1	1	1	1				
J32-0785-04	N	ROUND BOSS M2X6	2	2	2	2	2	2	2	2	2				
J39-0409-14	*	MIC SPACER	1	1	1	1	1	1	1	1	1				
J69-0306-04	N	HAND STRAP (ACS)	1	1	1	1	1	1	1	1	1				
J69-0309-05	N	O RING AF.SQL	2	2	2	2	2	2	2	2	2				
K27-0468-04	N	PUSH KNOB(A) TONE	1	1	1	1	1	1	1	1	1				
K27-0469-04	N	PUSH KNOB(B) +5KHZ	1	1	1	1	1	1	1	1	1				
K29-3012-04	N	KNOB(A) AF	1	1	1	1	1	1	1	1	1				
K29-3013-04	N	KNOB(B) SQL	1	1	1	1	1	1	1	1	1				
K29-3014-04	N	PTT LEVER	1	1	1	1	1	1	1	1	1				
LR40872	N	IC		1			1	1							Q , 3
L78-0010-05	N	CRISTAL 3.58MHZ		1			1	1							X , 1
N09-0683-05	N	SPECIAL SCREW M2 X4	2	2	2	2	2	2	2	2	2				
N30-2004-41		PAN HD SCREW(SWITCH PC BOARD)	1	1	1	1	1	1	1	1	1				
N33-2005-45		ROUND FLAT SCREW(CASE:TOP)	3	3	3	3	3	3	3	3	3				
N33-2008-45		ROUND FLAT SCREW(CASE:TOP)	1	1	1	1	1	1	1	1	1				
N35-2005-45		BIND SCREW(CASE:BOTTOM)	2	2	2	2	2	2	2	2	2				
RD73FB2A473J		CHIP RES. 47K OHM 1/10W		5			5	5							R , 1, 2, 3, 4, 5
RD73FB2A154J		CHIP RES. 150KOHM 1/10W		1			1	1							R , 6
R12-3449-05		TRIM.POT 10K		1			1	1							VR , 1
T07-0235-05	N	SPEAKER	1	1	1	1	1	1	1	1	1				
T18-0054-05		EARPHONE (ACS)	1	1	1	1	1	1			1				
T90-0340-05	N	HERICAL ANTENNA(ACS)	1	1	1	1	1	1	1	1	1				
T91-0312-15		ELECTRIC CONDENSER MIC	1	1	1	1	1	1	1	1	1				
W09-0334-05	N	BATTERY CHARGER ASS'Y 120V	1	1											
W09-0335-05	N	BATTERY CHARGER ASS'Y 220V			1	1	1	1							

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY											REFERENCE.NO
			011	012	021	022	023	024	051	061	071			
W09-0336-05	N	BATTERY CHARGER ASS'Y 240V							1					
W09-0335-05	N	BATTERY CHARGER ASS'Y 220V								1				
W09-0339-05	N	BATTERY CHARGER ASS'Y 240V									1			
W09-0333-05	N	NI-CD BATTERY ASS'Y	1	1	1	1	1	1	1	1	1			
X41-1590-11	N*	SWITCH UNIT	1	1	1									
X41-1590-71	N*	SWITCH UNIT				1								
X41-1590-11	N*	SWITCH UNIT					1							
X41-1590-71	N*	SWITCH UNIT						1						
X41-1590-51	N*	SWITCH UNIT							1					
X41-1590-61	N*	SWITCH UNIT								1				
X41-1590-71	N*	SWITCH UNIT									1			
X44-1630-11	N*	RF UNIT	1	1	1									
X44-1630-71	N*	RF UNIT				1								
X44-1630-11	N*	RF UNIT					1							
X44-1630-71	N*	RF UNIT						1						
X44-1630-61	N*	RF UNIT							1	1				
X44-1630-71	N*	RF UNIT									1			
X48-1410-11	N*	IF UNIT	1	1	1	1	1	1						
X48-1410-61	N*	IF UNIT							1	1				
X48-1410-11	N*	IF UNIT									1			
X52-1270-51	N*	TONE UNIT							1					
X52-1270-60	N*	TONE UNIT								1				
2SA1037K(Q)		CHIP TR.		1			1	1						Q , 2
2SA1162(Y)		CHIP TR.												Q , 2
2SC2412K(Q)		CHIP TR.		1			1	1						Q , 1
2SC2712(Y)		CHIP TR.												Q , 1

SEMICONDUCTOR

Item	Re-marks	Part No.
Diode		1S1555
		1S2588
		1SS133
		BA282
		MA856
		MI301
Vari-cap		1S2208
		ITT310TE
Zener Diode		MTZ6.8JB
LED		GL9PR24
Chip Diode		MA152WA
		MA152WK

Item	Re-marks	Part No.
TR		2SB698(E,F)
		2SC1947
		2SC2053
		2SC2347
		2SC2668(Y)
		2SC2671(H)
Chip TR		2SA1037K(Q)
		2SA1037K(R)
		2SA1162(G)
		2SA1162(Y)
		2SC2412K(Q)
		2SC2712(Y)
		2SC2714(Y)
FET		2SK192A(Y)

Item	Re-marks	Part No.
IC		LR40872
		LVC517
		MC3359P
		NJM555M
		NJM4558M
		TA7331F
		TC5081AP
		TC5081P
		TC5082P
		TC9122P

SWITCH UNIT (X41-1590-XX) (-11 : K1,K2,M1,M3 -51 : T -61 : W -71 : M2,M4,X)

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY 011	051	061	071	REFERENCE.NO
CK73FB1H102K		CHIP CAP. 1000P 50V	14	14	14	14	R , 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
L33-0682-05	N	CHOKE COIL	1	1	1	1	L , 1
L92-0110-05		FERRITE CORE	1	1	1	1	L , 2
MA152WK		CHIP DIODE	2	2	2	2	D , 4, 5
RD14CB2C101J		RES. CARBON 100 OHM 1/6W	1	1		1	R , 11
RD14CB2C101J		RES. CARBON 100 OHM 1/6W			1		R , 5
RD14CB2C103J		RES. CARBON 10K OHM 1/6W	1				R , 2
RD14CB2C103J		RES. CARBON 10K OHM 1/6W		2	2	2	R , 2, 4
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	1				R , 1
RD73FB2A473J		CHIP RES. 47K OHM 1/10W		2	2	2	R , 1, 3
RD73FB2A102J		CHIP RES. 1K OHM 1/10W	1	1	1	1	R , 6
RO5-3427-15	N	POTENTIOMETER 10K (B) WITH SW	1	1	1	1	VR , 1
RO5-3428-05	N	POTENTIOMETER 10K (B)	1	1	1	1	VR , 2
R92-0670-05		CHIP RES. 0 OHM	3				R , 7, 8, 9
R92-0670-05		CHIP RES. 0 OHM		4	4	4	R , 7, 8, 9, 10
S40-2445-05		PUSH SWITCH(SELF LOCK)	2	2		2	S , 3, 4
S40-2445-05		PUSH SWITCH(SELF LOCK)			1		S , 3
S40-2446-05		PUSH SWITCH(NON LOCK)			1		S , 4
S59-3401-05	N	THUMB WHEEL SWITCH	1	1	1	1	S , 2
TC9122P		IC	1	1	1	1	Q , 3
1SS133		DIODE		2			D , 6, 9
1SS133		DIODE			2		D , 6, 7
2SC2412K(Q)		CHIP TR.	1				Q , 1
2SC2412K(Q)		CHIP TR.		2	2	2	Q , 1, 2
2SC2712(Y)		CHIP TR.					Q , 1
2SC2712(Y)		CHIP TR.					Q , 1, 2

RF UNIT (X44-1630-XX) (-11 : K1,K2,M1,M3 -61 : T,W -71 : M2,M4,X)

PART.NO	NOTE	NAME & DESCRIPTION			DISTINCTION & QUANTITY 011	061	071	REFERENCE.NO
BA282		DIODE			4		4	L , 10, 11, 12, 13
BA282		DIODE				4		L , 10, 12, 13, 23
CC45CH1H090D		CERAMIC	9P	50V	1	1	1	C , 51
CC45CH1H150J		CERAMIC	15P	50V	1	1	1	C , 52
CC73FCH1H330J		CHIP CAP.	33P	50V	2	2	2	C , 28, 48
CC73FCH1H100D		CHIP CAP.	10P	50V	12		12	C , 8, 12, 22, 25, 27, 32, 62 , 63, 64,109,113,118
CC73FCH1H100D		CHIP CAP.	10P	50V		11		C , 8, 12, 22, 25, 27, 32, 63 , 64,109,113,118
CC73FCH1H390J		CHIP CAP.	39P	50V	3	3	3	C , 42, 79, 80
CC73FCH1H010C		CHIP CAP.	1P	50V	4	4	4	C , 26, 33, 92,117
CC73FCH1H1R5C		CHIP CAP.	1.5P	50V	2	2	2	C , 11, 13
CC73FCH1H470J		CHIP CAP.	47P	50V	2	2	2	C , 35, 74
CC73FCH1H120J		CHIP CAP.	12P	50V	2	2	2	C , 99,116
CC73FCH1H560J		CHIP CAP.	56P	50V	3	3	3	C , 70, 72,103
CC73FCH1H030C		CHIP CAP.	3P	50V	1	1	1	C , 49
CC73FCH1H680J		CHIP CAP.	68P	50V	2	2	2	C , 40, 69
CC73FCH1H050C		CHIP CAP.	5P	50V	5	5	5	C , 73, 75, 76,100,105
CC73FCH1H150J		CHIP CAP.	15P	50V	2	2	2	C ,104,158
CC73FSL1H121J		CHIP CAP.	120P	50V	3	3	3	C , 3, 5,119
CC73FCH1H070D		CHIP CAP.	7P	50V	2	2	2	C , 4, 14
CC73FCH1H180J		CHIP CAP.	18P	50V	3	3	3	C , 86, 87, 98
CC73FCH1H090D		CHIP CAP.	9P	50V	1	1	1	C , 34
CC73FCH1H220J		CHIP CAP.	22P	50V	1	1	1	C , 94
CC73FCH1H270J		CHIP CAP.	27P	50V	2	2	2	C , 39, 50
CE04CW1A330M		ELECTRO	33	10V	1	1	1	C ,133
CE04CW1A101M		ELECTRO	100	10V	2	2	2	C ,132,155
CE04CW1C100M		ELECTRO	10	16V	1	1	1	C , 88
CE04CW1C4R7M		ELECTRO	4.7	16V	2	2	2	C , 45,159
CE04CW1C470M		ELECTRO	47	16V	1	1	1	C ,120
CE04CW1E3R3M		ELECTRO	3.3	25V	1	1	1	C ,134
CE04CW1V2R2M		ELECTRO	2.2	35V	1	1	1	C ,156
CE04CW0J100M		ELECTRO	10	6.3V	1	1	1	C , 91
CE04CW1H010M		ELECTRO	1	50V	1	1	1	C ,121
CE04CW0J470M		ELECTRO	47	6.3V	1	1	1	C ,122
CE04CW1E4R7M		ELECTRO	4.7	25V	1	1	1	C ,128
CK73FB1H102K		CHIP CAP.	1000P	50V	64	64	64	C , 1, 7, 9, 10, 18, 19, 21 , 23, 24, 29, 30, 31, 36, 37 , 38, 41, 44, 46, 47, 57, 67 , 68, 71, 77, 78, 82, 84, 85 , 89, 90, 93, 95, 96, 97,106 ,107,108,110,111,112,114,115 ,125,126,129,130,131,135,136 ,137,138,139,140,141,142,144 ,145,146,147,148,149,152,153 ,157
CK73FB1H102K		CHIP CAP.	1000P	50V				
CK73FB1H102K		CHIP CAP.	1000P	50V				
CK73FB1H102K		CHIP CAP.	1000P	50V				
CK73FB1H102K		CHIP CAP.	1000P	50V				
CK73FB1H222K		CHIP CAP.	2200P	50V	1	1	1	C , 83
CK73FB1H472K		CHIP CAP.	4700P	50V	4	4	4	C , 15, 17,101,102
CK73FB1E103K		CHIP CAP.	0.01	25V	10	10	10	C , 53, 54, 55, 56, 58, 59, 60 , 65, 66,154
CK73FB1E223K		CHIP CAP.	0.022	25V	2	2	2	C , 20,150
CK73FB1H471K		CHIP CAP.	470P	50V	2	2	2	C , 6, 81
C05-0327-05		TRIMMER	20P		2	2	2	TC , 2, 3
C05-0320-05		TRIMMER	30P		5	5	5	TC , 1, 4, 5, 6, 7
C90-0891-05		TANTALUM	4.7	16V	1	1	1	C ,151

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY												REFERENCE.NO
			011	061	071										
E13-0165-05	N	RCA RECEPTACLE ANT.J	1	1	1										J , 1
F11-0873-04	N*	SHIELD COVER (VCO)	1	1	1										
ITT310TE		VOLTAGE VARIABL	1	1	1										D , 14
LVC517		IC	1	1	1										Q , 19
L19-0354-05	N	WIDE BAND TRANS 12T	1	1	1										L , 33
L32-0672-05		OSC COIL	4	4	4										L , 19, 20, 21, 22
L34-2226-05	N	TUNING COIL VCO 70MHZ	1	1	1										L , 30
L34-2223-05	N	TUNING COIL 140MHZ	11	11	11										L , 6, 7, 8, 10, 11, 12, 13 , 25, 26, 35, 36
L34-2224-05	N	TUNING COIL 16.3MHZ	1	1	1										L , 9
L34-2225-05	N	TUNING COIL 140MHZ	1	1	1										L , 5
L34-0892-05		COIL 2 10T	1	1	1										L , 4
L34-0893-05		COIL 3 4T	1	1	1										L , 2
L34-0894-05		COIL 3 5T	2	2	2										L , 16, 17
L34-0895-05		COIL 3 6T	1	1	1										L , 14
L34-1061-05		COIL 3 2T	1	1	1										L , 15
L34-1105-05	N	COIL 3 4T ANT	1	1	1										L , 1
L40-3382-17		INDUCTOR 0.33UH	1	1	1										L , 34
L40-1092-17		INDUCTOR 1UH	2	2	2										L , 3, 18
L40-3391-17		INDUCTOR 3.3UH	1	1	1										L , 32
L40-5691-17		INDUCTOR 5.6UH	1	1	1										L , 31
L40-1501-17		INDUCTOR 15UH	1	1	1										L , 28
L40-4701-17		INDUCTOR 47UH	5	5	5										L , 29, 40, 41, 42, 43
L40-1011-17		INDUCTOR 100UH	2	2	2										L , 27, 37
L71-0246-05	N	MCF 16.3MHZ	1	1	1										F , 1
L77-1234-05	N	XTAL 10.24MHZ	1	1	1										X , 1
L77-1235-05	N	XTAL 30.925MHZ RX(S)	1	1	1										X , 2
L77-1236-05	N	XTAL 35.000MHZ TX(S)	1	1	1										X , 4
L77-1239-05	N	XTAL 35.150MHZ TX(+)	1												X , 3
L77-1237-05	N	XTAL 30.775MHZ RX(-)		1											X , 3
L77-1239-05	N	XTAL 35.150MHZ TX(+)			1										X , 3
L77-1238-05	N	XTAL 34.850MHZ TX(-)	1	1	1										X , 5
L92-0110-05		FERRITE CORE	2	2	2										L , 38, 39
MA152WA		CHIP DIODE	2	2	2										D , 17, 21
MA856		DIODE	5	5	5										D , 6, 7, 8, 9, 15
MI301		DIODE	1	1	1										D , 4
RD14CB2C220J		RES. CARBON 22 OHM 1/6W	1	1	1										R , 26
RD14CB2C470J		RES. CARBON 47 OHM 1/6W	1	1	1										R , 22
RD14BB2C560J		RES. CARBON 56 OHM 1/6W	2	2	2										R , 9, 47
RD14CB2C223J		RES. CARBON 22K OHM 1/6W	1	1	1										R , 58
RD14BB2C822J		RES. CARBON 8.2KOHM 1/6W	1	1	1										R , 13
RD14CB2C103J		RES. CARBON 10K OHM 1/6W	1	1	1										R , 56
RD14BB2C222J		RES. CARBON 2.2KOHM 1/6W	1	1	1										R , 34
RD14BB2C392J		RES. CARBON 3.9KOHM 1/6W	1	1	1										R , 35
RD14BB2C223J		RES. CARBON 22K OHM 1/6W	1	1	1										R , 16
RD14CB2C472J		RES. CARBON 4.7KOHM 1/6W	2	2	2										R , 99,100
RD14BB2C104J		RES. CARBON 100KOHM 1/6W	1	1	1										R , 93
RD14BB2C334J		RES. CARBON 330KOHM 1/6W	1	1	1										R , 14
RD73FB2A330J		CHIP RES. 33 OHM 1/10W	1	1	1										R , 20
RD73FB2A271J		CHIP RES. 270 OHM 1/10W	1	1	1										R , 27
RD73FB2A222J		CHIP RES. 2.2KOHM 1/10W	6	6	6										R , 3, 8, 12, 49, 57, 66
RD73FB2A103J		CHIP RES. 10K OHM 1/10W	8	8	8										R , 48, 55, 62, 63, 78, 79, 85

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY 011	061	071	REFERENCE.NO
						, 88
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	4	4	4	R , 52, 83, 84, 94
RD73FB2A331J		CHIP RES. 330 OHM 1/10W	2	2	2	R , 15, 29
RD73FB2A563J		CHIP RES. 56K OHM 1/10W	1	1	1	R , 43
RD73FB2A470J		CHIP RES. 47 OHM 1/10W	1	1	1	R , 17
RD73FB2A123J		CHIP RES. 12K OHM 1/10W	2	2	2	R , 89, 92
RD73FB2A560J		CHIP RES. 56 OHM 1/10W	1	1	1	R , 7
RD73FB2A471J		CHIP RES. 470 OHM 1/10W	4	4	4	R , 4, 6, 46, 50
RD73FB2A104J		CHIP RES. 100KOHM 1/10W	1	1	1	R , 54
RD73FB2A272J		CHIP RES. 2.7KOHM 1/10W	2	2	2	R , 2, 67
RD73FB2A153J		CHIP RES. 15K OHM 1/10W	2	2	2	R , 19, 59
RD73FB2A154J		CHIP RES. 150KOHM 1/10W	1	1	1	R , 72
RD73FB2A332J		CHIP RES. 3.3KOHM 1/10W	1	1	1	R , 77
RD73FB2A101J		CHIP RES. 100 OHM 1/10W	7	7	7	R , 1, 10, 18, 21, 64, 73, 73 , 90
RD73FB2A681J		CHIP RES. 680 OHM 1/10W	1	1	1	R , 11
RD73FB2A821J		CHIP RES. 820 OHM 1/10W	2	2	2	R , 45, 70
RD73FB2A183J		CHIP RES. 18K OHM 1/10W	1	1	1	R , 44
RD73FB2A224J		CHIP RES. 220KOHM 1/10W	2	2	2	R , 51, 82
RD73FB2A472J		CHIP RES. 4.7KOHM 1/10W	3	3	3	R , 76, 80, 86
RD73FB2A334J		CHIP RES. 330KOHM 1/10W	1	1	1	R , 65
RD73FB2A223J		CHIP RES. 22K OHM 1/10W	2	2	2	R , 81, 87
RD73FB2A2R2J		CHIP RES. 2.2 OHM 1/10W	1	1	1	R , 96
RD73FB2A122J		CHIP RES. 1.2KOHM 1/10W	3	3	3	R , 42, 91, 61
RD73FB2A562J		CHIP RES. 5.6KOHM 1/10W	7	7	7	R , 38, 39, 40, 41, 61, 68, 95
RD73FB2A121J		CHIP RES. 120 OHM 1/10W	2	2	2	R , 25, 69
RD73FB2A151J		CHIP RES. 150 OHM 1/10W	1	1	1	R , 24
RD73FB2A100J		CHIP RES. 10 OHM 1/10W	1	1	1	R , 23
RD73FB2A220J		CHIP RES. 22 OHM 1/10W	1	1	1	R , 28
RD73FB2A822J		CHIP RES. 8.2KOHM 1/10W	3	3	3	R , 5, 36, 37
R92-0670-05		CHIP RES. 0 OHM	2	2	2	R , 97, 98
R92-0150-05		JUMPER WIRE	1	1	1	JP , 1
S50-1425-05	N	TACT SWITCH PTT	1	1	1	S , 1
TC5082P		IC	1	1	1	Q , 12
TC5081AP	N	IC	1	1	1	Q , 13
1SS133		DIODE	4			D , 2, 19, 20, 24
1SS133		DIODE		6	6	D , 2, 18, 19, 20, 22, 24
1S1555		DIODE	1	1	1	D , 3
1S2588		DIODE	1	1	1	D , 5
1S2208		VOLTAGE VARIABL	1	1	1	D , 16
2SA1037K(Q)	N	CHIP TR.	2	2	2	Q , 20, 26
2SA1162(Y)		CHIP TR.				Q , 20, 26
2SA1037K(R)		CHIP TR.	2	2	2	Q , 22, 24
2SA1162(GR)		CHIP TR.				Q , 22, 24
2SB698(E,F)		TR	1	1	1	Q , 18
2SC2714(Y)		CHIP TR.	4	4	4	Q , 4, 9, 14, 15
2SC1947		TR	1	1	1	Q , 8
2SC2053		TR	1	1	1	Q , 7
2SC2347		TR	1	1	1	Q , 6
2SC2668(Y)		TR	5	5	5	Q , 2, 5, 10, 11, 17
2SC2671(H)		TR	2	2	2	Q , 1, 16
2SC2412K(Q)		CHIP TR.	4	4	4	Q , 21, 23, 25, 27
2SC2712(Y)		CHIP TR.				Q , 21, 23, 25, 27
2SK192A(Y)		FET	1	1	1	Q , 3

IF UNIT (X48-1410-XX) (-11 : K1,K2,M1,M2,M3,M4,X -61 : T,W)

PART.NO	NOTE	NAME & DESCRIPTION			DISTINCTION & QUANTITY 011	061	REFERENCE.NO
CC73FCH1H270J		CHIP CAP.	27P	50V	1	1	C , 3
CC73FSL1H101J		CHIP CAP.	100P	50V	5	5	C , 2, 16, 36, 37, 38
CC73FSL1H151J		CHIP CAP.	150P	50V	1	1	C , 9
CC73FSL1H391J		CHIP CAP.	390P	50V	1	1	C , 47
CE04CW0J330M		ELECTRO	33	6.3V	1	1	C , 43
CE04CW1A100M		ELECTRO	10	10V	2	2	C , 40, 52
CE04CW1C4R7M		ELECTRO	4.7	16V	1	1	C , 33
CE04CW1V2R2M		ELECTRO	2.2	35V	4	4	C , 19, 21, 34, 44
CK45B1H102K		CERAMIC	1000P	50V	1	1	C , 1
CK73FB1H102K		CHIP CAP.	1000P	50V	20	20	C , 7, 12, 14, 15, 20, 29, 30 , 31, 32, 35, 42, 49, 50, 51 , 53, 54, 55, 56, 57, 58
CK73FB1E273K		CHIP CAP.	0.027	25V	1	1	C , 23
CK73FB1H272K		CHIP CAP.	2700P	50V	1	1	C , 45
CK73FF1E473Z		CHIP CAP.	0.047	25V	3	3	C , 4, 8, 11
CK73FB1H682K		CHIP CAP.	6800P	50V	1	1	C , 46
CK73FB1E223K		CHIP CAP.	0.022	25V	2	2	C , 13, 17
C90-0888-05		TANTALUM	0.1	16V	1	1	C , 39
C90-0889-05		TANTALUM	0.22	16V	1	1	C , 10
C90-2006-05	N	TANTALUM	0.33	16V	1	1	C , 48
C90-0894-05		TANTALUM	0.47	16V	1	1	C , 18
C90-2007-05	N	TANTALUM	3.3	16V	1	1	C , 22
C90-2012-05		ELECTRO	100	10V	3	3	C , 25, 26, 28
C90-0891-05		TANTALUM	4.7	16V	1	1	C , 24
C91-0488-05		CERAMIC	0.1		2	2	C , 5, 6
C91-0430-05		LAYER CAP.	0.047		1	1	C , 41
C91-1035-05		FILM CAP.	0.22	63V	1	1	C , 27
E11-0420-05	N	MIC JACK			1	1	J , 2
E11-0421-05	N	PHONE JACK			1	1	J , 1
L34-2217-05		TUNING COIL	455KHZ		1	1	L , 1
L72-0335-05		CERAMIC FILTER	CFU-455E		1	1	F , 1
L77-1240-05	N	CRYSTAL	15.845MHZ		1	1	X , 1
MA152WA	N	CHIP DIODE			1	1	D , 4
MC3359P		IC			1	1	Q , 1
MTZ6.8JB		ZENER DIODE	6.8V		1	1	D , 3
NJM4558M		IC			1	1	Q , 6
RD14CB2C472J		RES. CARBON	4.7KOHM	1/6W	2	2	R , 30, 31
RD14CB2C103J		RES. CARBON	10K OHM	1/6W	2	2	R , 15, 17
RD14CB2C104J		RES. CARBON	100KOHM	1/6W	1	1	R , 9
RD14CB2C684J		RES. CARBON	680KOHM	1/6W	1	1	R , 20
RD73FB2A102J		CHIP RES.	1K OHM	1/10W	3	3	R , 14, 16, 19
RD73FB2A152J		CHIP RES.	1.5KOHM	1/10W	1	1	R , 29
RD73FB2A473J		CHIP RES.	47K OHM	1/10W	4	4	R , 18, 36, 38, 39
RD73FB2A222J		CHIP RES.	2.2KOHM	1/10W	4	4	R , 4, 26, 33, 34
RD73FB2A823J		CHIP RES.	82K OHM	1/10W	1	1	R , 13
RD73FB2A273J		CHIP RES.	27K OHM	1/10W	1	1	R , 35
RD73FB2A470J		CHIP RES.	47 OHM	1/10W	1	1	R , 12
RD73FB2A104J		CHIP RES.	100KOHM	1/10W	1	1	R , 10
RD73FB2A822J		CHIP RES.	8.2KOHM	1/10W	1	1	R , 5
RD73FB2A334J		CHIP RES.	330KOHM	1/10W	1	1	R , 6
RD73FB2A103J		CHIP RES.	10K OHM	1/10W	4	4	R , 1, 7, 8, 27
RD73FB2A101J		CHIP RES.	100 OHM	1/10W	1	1	R , 11

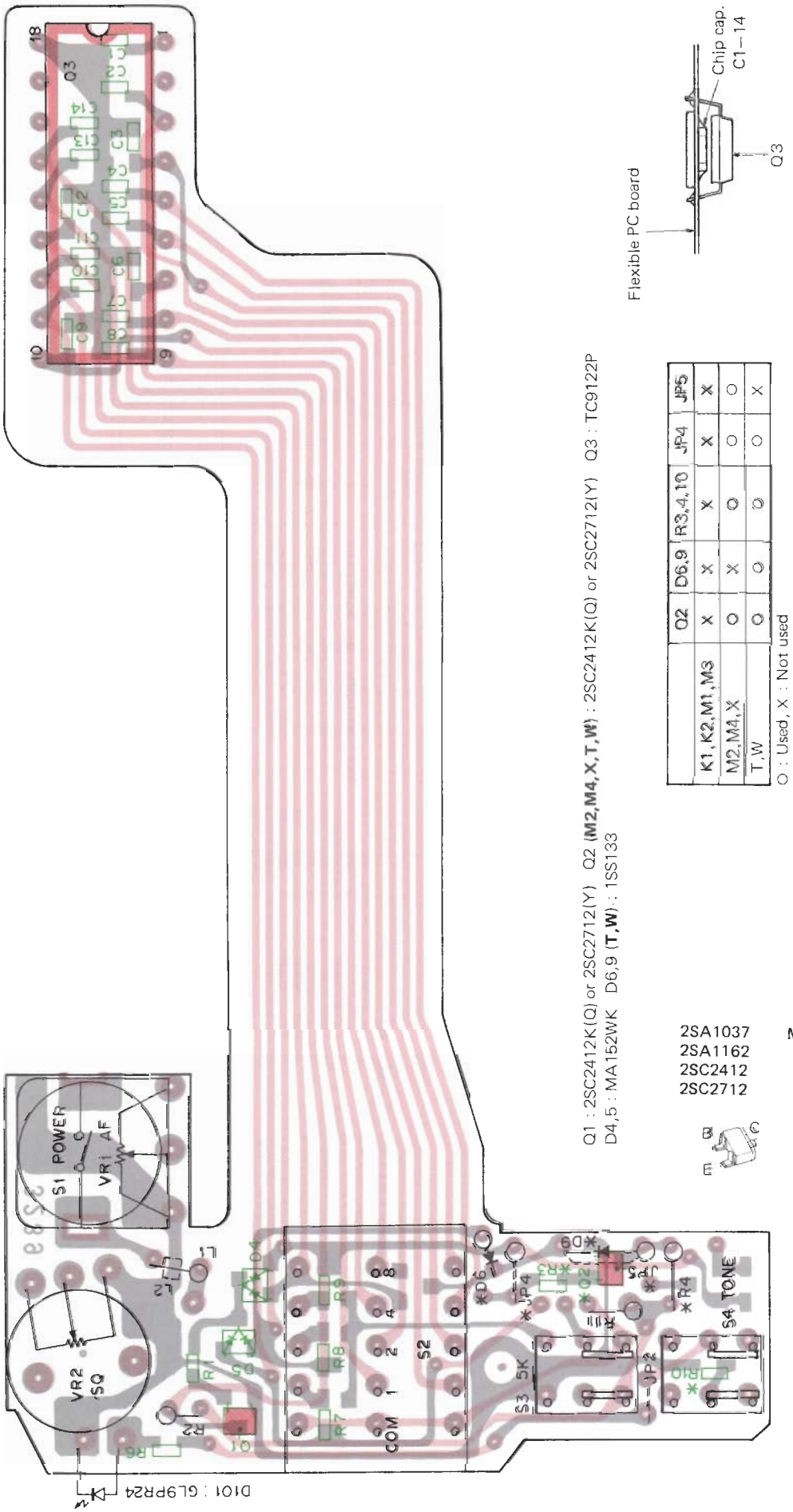
PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY 011	061	REFERENCE.NO
RD73FB2A223J		CHIP RES. 22K OHM 1/10W	6	6	R , 2, 3, 22, 23, 24, 37
RD73FB2A221J		CHIP RES. 220 OHM 1/10W	2	2	R , 25, 32
RD73FB2A333J		CHIP RES. 33K OHM 1/10W	2	2	R , 21, 28
R12-3449-05	N	TRIM.POT 10K	1	1	VR , 1
R90-0526-05		RESISTOR BLOCK 27K OHM X4	1	1	RB , 1
R92-1061-05		JUMPER WIRE	5		JP , 1, 2, 6, 7, 8
R92-1061-05		JUMPER WIRE		5	JP , 3, 4, 6, 7, 8
S31-1414-05		SLIDE SWITCH HI - LO	1	1	S , 1
S31-2409-05	N	SLIDE SWITCH OFFSET	1	1	S , 2
TA7331F	N	IC	1	1	Q , 2
1N60A		DIODE	2	2	D , 1, 2
2SA1037K(Q)	N	CHIP TR.	1	1	Q , 7
2SA1162(Y)		CHIP TR.			Q , 7
2SB698(E,F)		TR	1	1	Q , 3
2SC2412K(Q)	N	CHIP TR.	3	3	Q , 4, 5, 8
2SC2712(Y)	N	CHIP TR.			Q , 4, 5, 8

TONE UNIT (X41-1270-XX) (-51 : T -60 : W)

PART.NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY 051	060	REFERENCE.NO
CE04CW1C100M		ELECTRO 10 16V	1		C , 7
CK73FB1H392K		CHIP CAP. 3900P 25V	1	1	C , 6
CK73FB1E103K		CHIP CAP. 0.01 25V	3	3	C , 2, 4, 5
CK73EB1E333K		CHIP CAP. 0.033 25V	1	1	C , 3
NJM555M	N	IC	1	1	Q , 1
RD73FB2A472J		CHIP RES. 4.7KOHM 1/10W	1	1	R , 2
RD73FB2A123J		CHIP RES. 12K OHM 1/10W	2	2	R , 4, 6
RD73FB2A333J		CHIP RES. 33K OHM 1/10W	1	1	R , 7
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	1	1	R , 5
RD73FB2A913J		CHIP RES. 91K OHM 1/10W	1	1	R , 3
R12-3452-05	N	TRIM.POT 20K	1	1	VR , 1
R92-0670-05		CHIP RES. 0 OHM		1	R , 8

TH-21A/AT/E PC BOARD VIEW

SWITCH UNIT (X41-1590-XX) (-11 : K1,K2,M1,M3
-51 : T -61 : W -71 : M2,M4,X) Component side view



	Q2	D6,9	R3,4,10	JP4	JP5
K1,K2,M1,M3	X	X	X	X	X
M2,M4,X	O	X	O	O	O
T,W	O	O	O	O	X

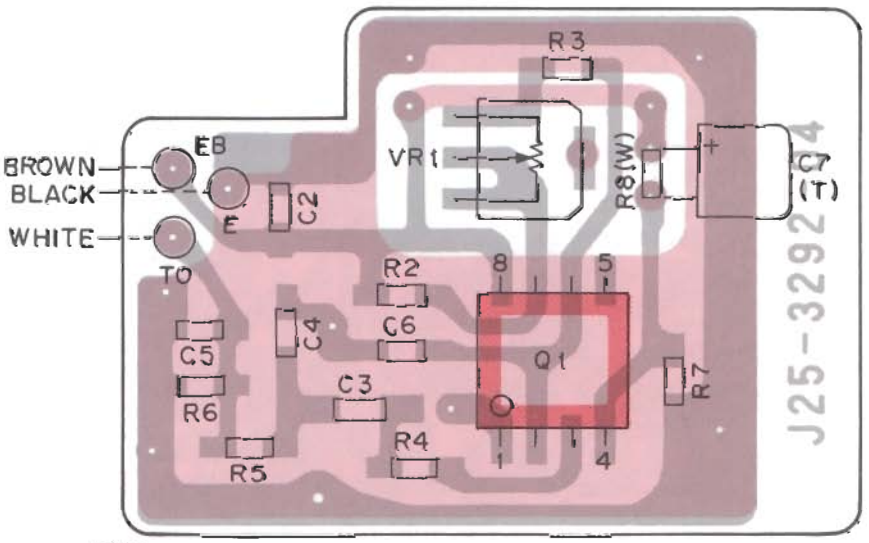
O : Used, X : Not used

Q1 : 2SC2412K(Q) or 2SC2712(Y) Q2 **(M2,M4,X,T,W)** : 2SC2412K(Q) or 2SC2712(Y) Q3 : TC9122P
D4,5 : MA152WK D6,9 **(T,W)** : 1SS133

2SA1037
2SA1162
2SC2412
2SC2712

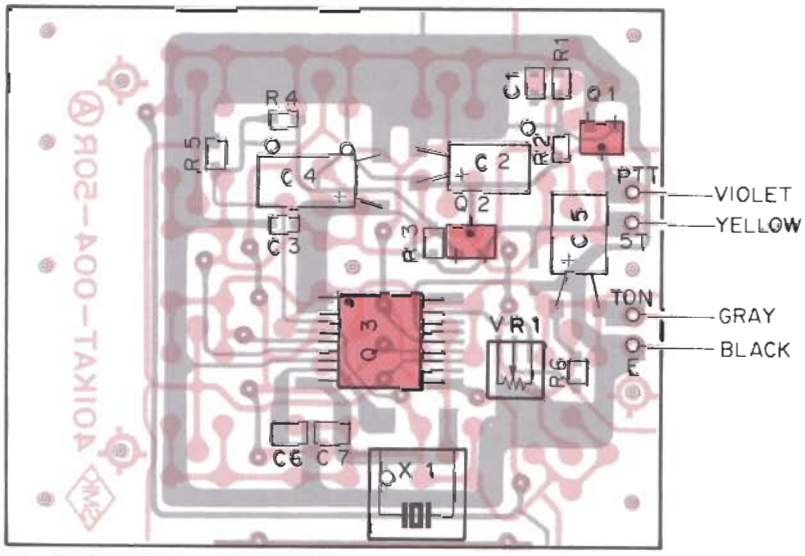
MA152WK

TONE UNIT (X52-1270-XX) (-51 : T -60 : W) Foil side view



Q1 : NJM555M

DTMF UNIT (TH-21AT ONLY) Foil side view

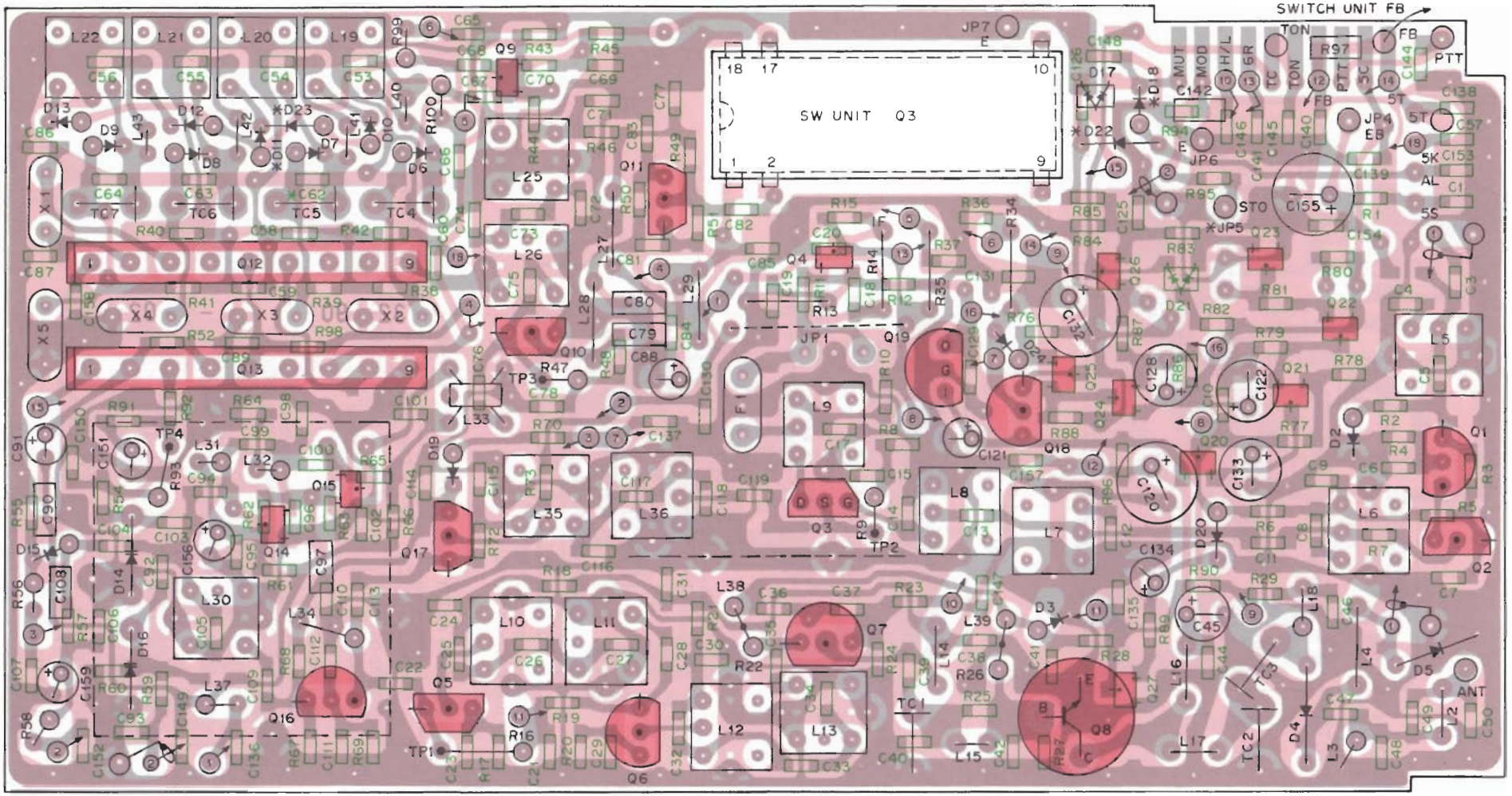


Q1 : 2SC2412K(Q) or 2SC2712(Y)
Q2 : 2SA1037K(Q) or 2SA1162(Y)
Q3 : LR40872

CASE (TOP) ASS'Y (A09-0402-05) WITH DTMF

Parts No.	Re-marks	Description			Q'ty	Ref. No.
A09-0672-01	N*	Case (Top)	146MHz, KENWOOD			
B42-2344-08	N*	Key board plate				
CC73CH1H300J		Chip cap.	30P	50V	2	C6,7
CE04CW0J100M		Electro	10	6.3V	2	C2,4
CE04CE1C4R7M		Electro	4.7	16V	1	C5
CK73FB1E103K		Chip cap.	0.01	25V	2	C1,3
LR40872	N	IC			1	Q3
L78-0010-05	N	Crystal	3.58MHz		1	X1
RD73FB2A473J		Chip res.	47kΩ	1/10W	5	R1–5
RD73FB2A154J		Chip res.	150kΩ	1/10W	1	R6
R12-3449-05		Trim. pot.	10kΩ		1	VR1
2SA1037K(Q) or 2SA1162(Y)		Chip TR.			1	Q2
2SC2412K(Q) or 2SC2712(Y)		Chip TR.			1	Q1

RF UNIT (X44-1630-XX) (-11 : K1,K2,M1,M3 -61 : T,W -71 : M2,M4,X) Component side view



Q1,16 : 2SC2671(H) Q2,5,10,11,17 : 2SC2668(Y) Q3 : 2SK192A(Y) Q4,9,14,15 : 2SC2714(Y) Q6 : 2SC2347 Q7 : 2SC2053 Q8 : 2SC1947 Q12 : TC5082P
Q13 : TC5081AP Q18 : 2SB698(E,F) Q19 : LVC517 Q20,26 : 2SA1037K(Q) or 2SA1162(Y) Q21,23,25,27 : 2SC2412K(Q) or 2SC2712(Y)
Q22,24 : 2SA1037K(R) or 2SA1162(G)
D2,19,20 : 1SS133 D3,24 : 1S1555 D4 : MI301 D5 : 1S2588 D6–9,15 : MA856 D10,12,13 : BA282 D11 (**K1,K2,M1,M2,M3,M4,X**) : BA282 D14 : ITT310TE
D16 : 1S2208 D17,21 : MA152WA D18,22 (**M2,M4,X,T,W**) : 1SS133 D23 (**T,W**) : BA282

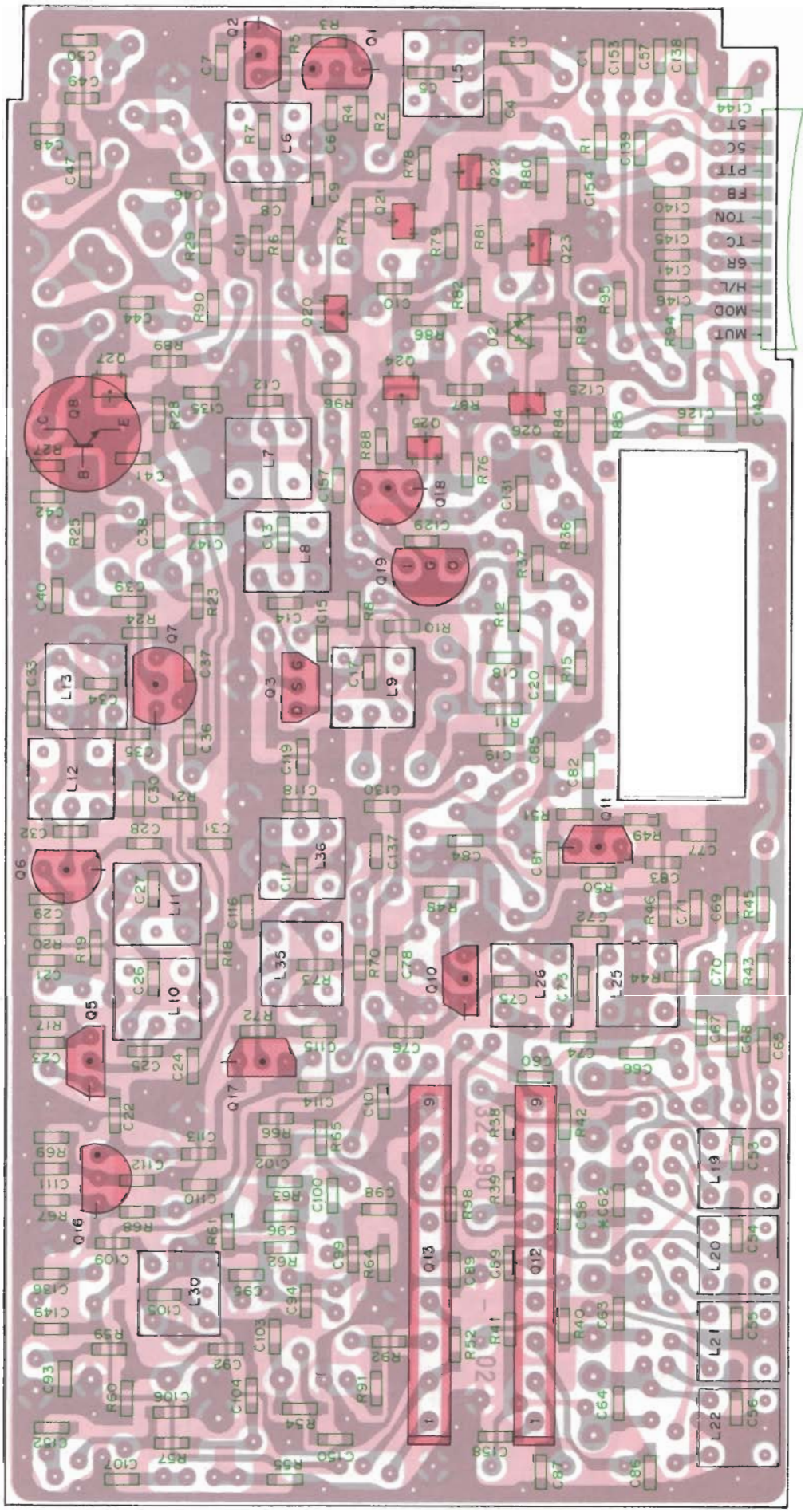
TC1,4~7

TC2,3

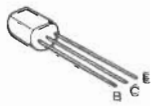
	D11	D18,22	D23	JP5	C62
K1,K2,M1,M3	O	X	X	O	O
M2,M4,X	O	O	X	O	O
T,W	X	O	O	X	X

O : Used, X : Not used

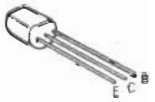
RF UNIT (X44-1630-XX) (-11 : K1,K2,M1,M3 -61 : T,W -71 : M2,M4,X) Foil side view



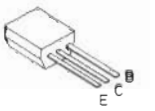
2SC2053



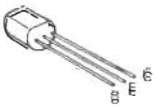
2SB698
2SC2347



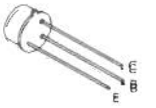
2SC2668



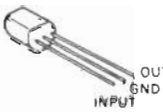
2SC2671



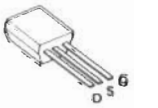
2SC1947



LVC517



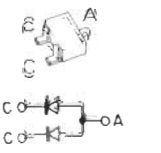
2SK192A



TC5081AP
TC5082P

2SA1037K
2SA1162
2SC2412K
2SC2712
2SC2714

MA152WA



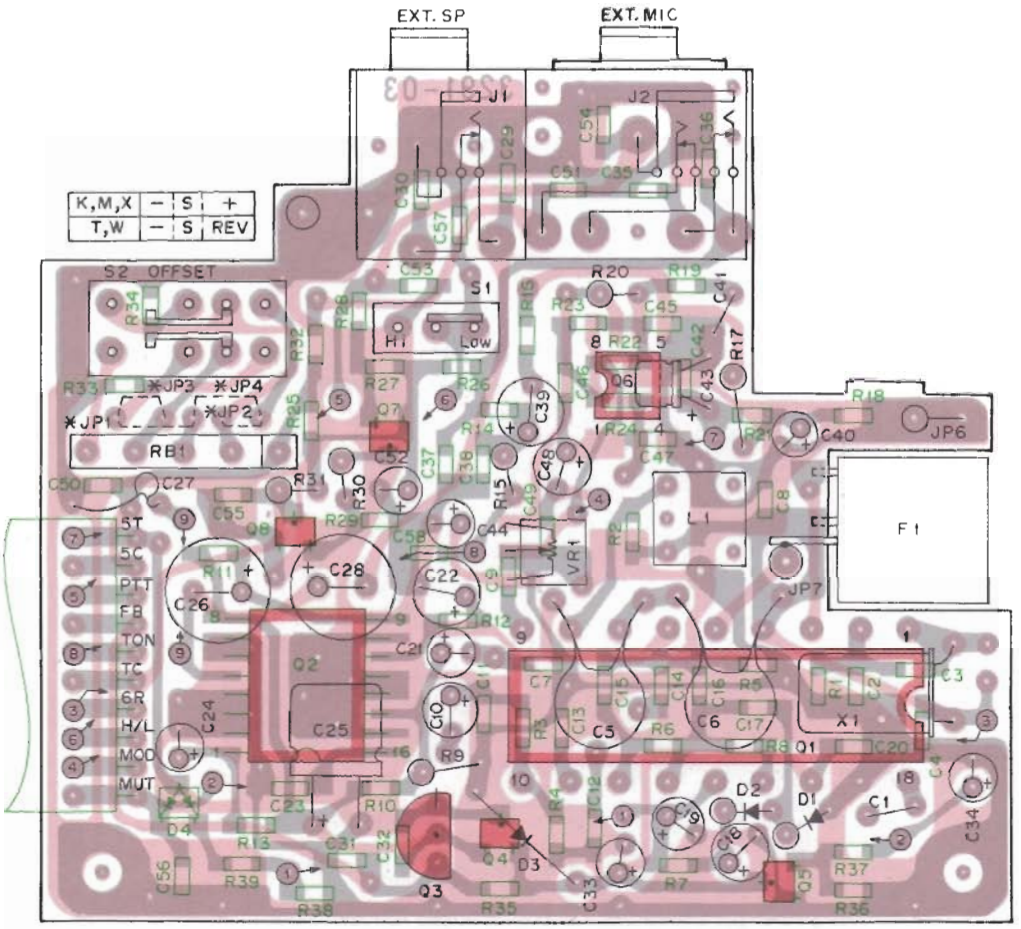
IF UNIT (X48-1410-XX) (-11 : K1,K2,M1,M2,M3,M4,X -61 : T,W) Component side view

Q1 : MC3359P
Q2 : TA7331F
Q3 : 2SB698(E,F)
Q4,5,8 : 2SC2412k(Q) or 2SC2712(Y)
Q6 : NJM4558M
Q7 : 2SA1037K(Q) or 2SA1162(Y)

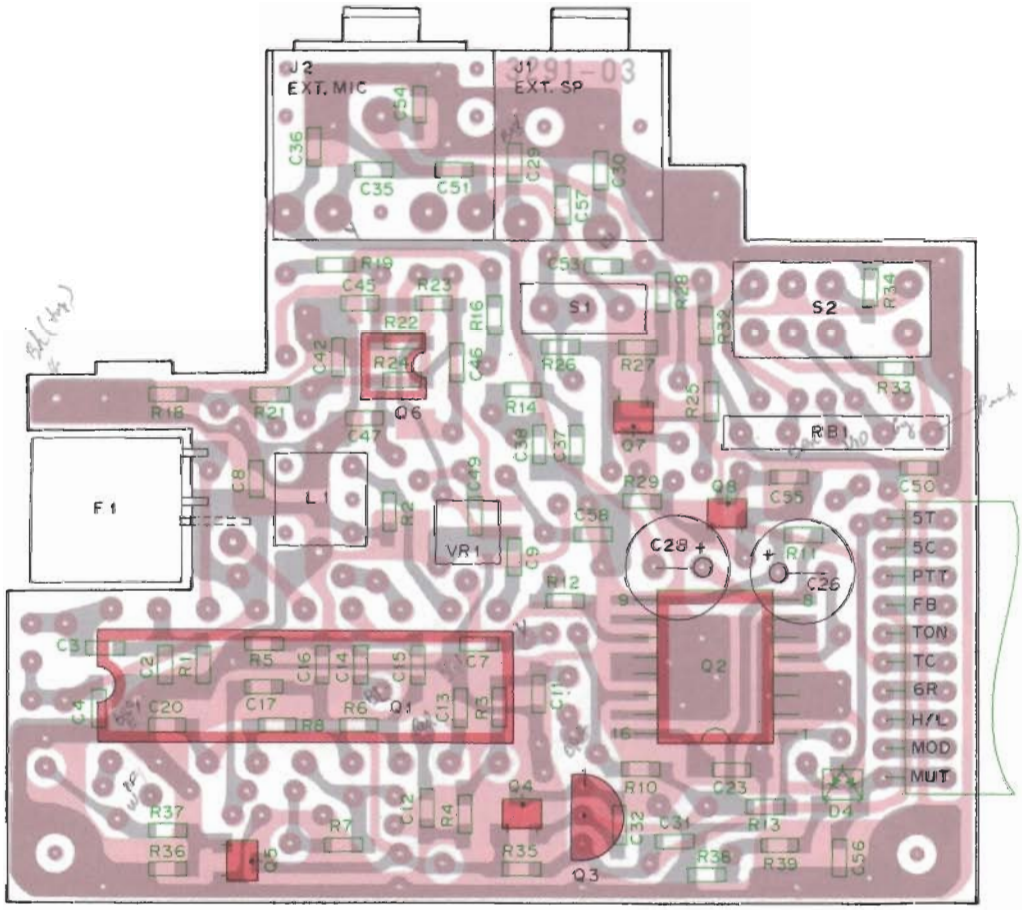
D1,2 : 1N60A
D3 : MTZ6.8JB
D4 : MA152WA

	JP1,2	JP3,4
K,M,X	O	X
T,W	X	O

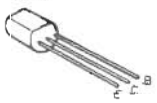
O : Used, X : Not used



IF UNIT (X48-1410-XX) (-11 : K1,K2,M1,M2,M3,M4,X -61 : T,W) Foil side view

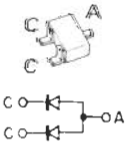


2SB698



2SA1037K
2SA1162
2SC2412K
2SC2712

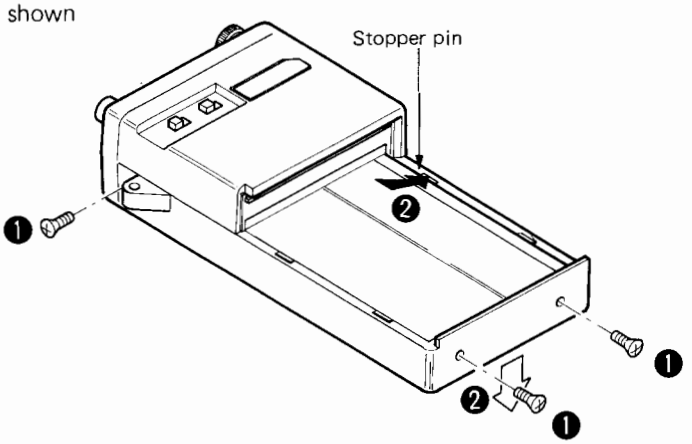
MA152WA



DISASSEMBLY

TOP CASE REMOVE METHOD

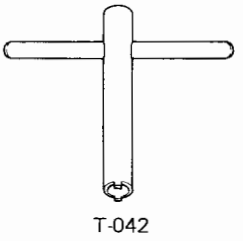
❶ Remove screw (M2 x 5) 3.
❷ Remove front case as allow mark direction holding the stop pin with something ⊖ screw driver as shown right.



FRONT PANEL REMOVE METHOD

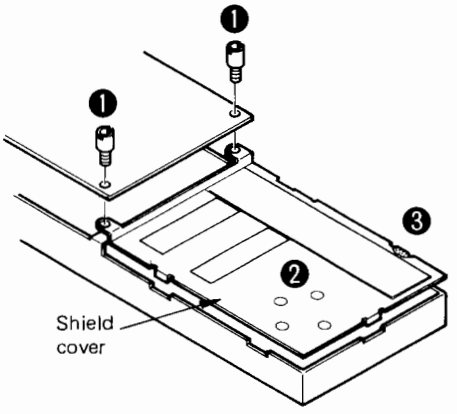
❶ Remove screw on RCA connector and AF, SQ knob.
❷ Remove screw (M2 x 8) 1.
❸ Remove front panel by push stopper with screw driver as shown below.

TOOL

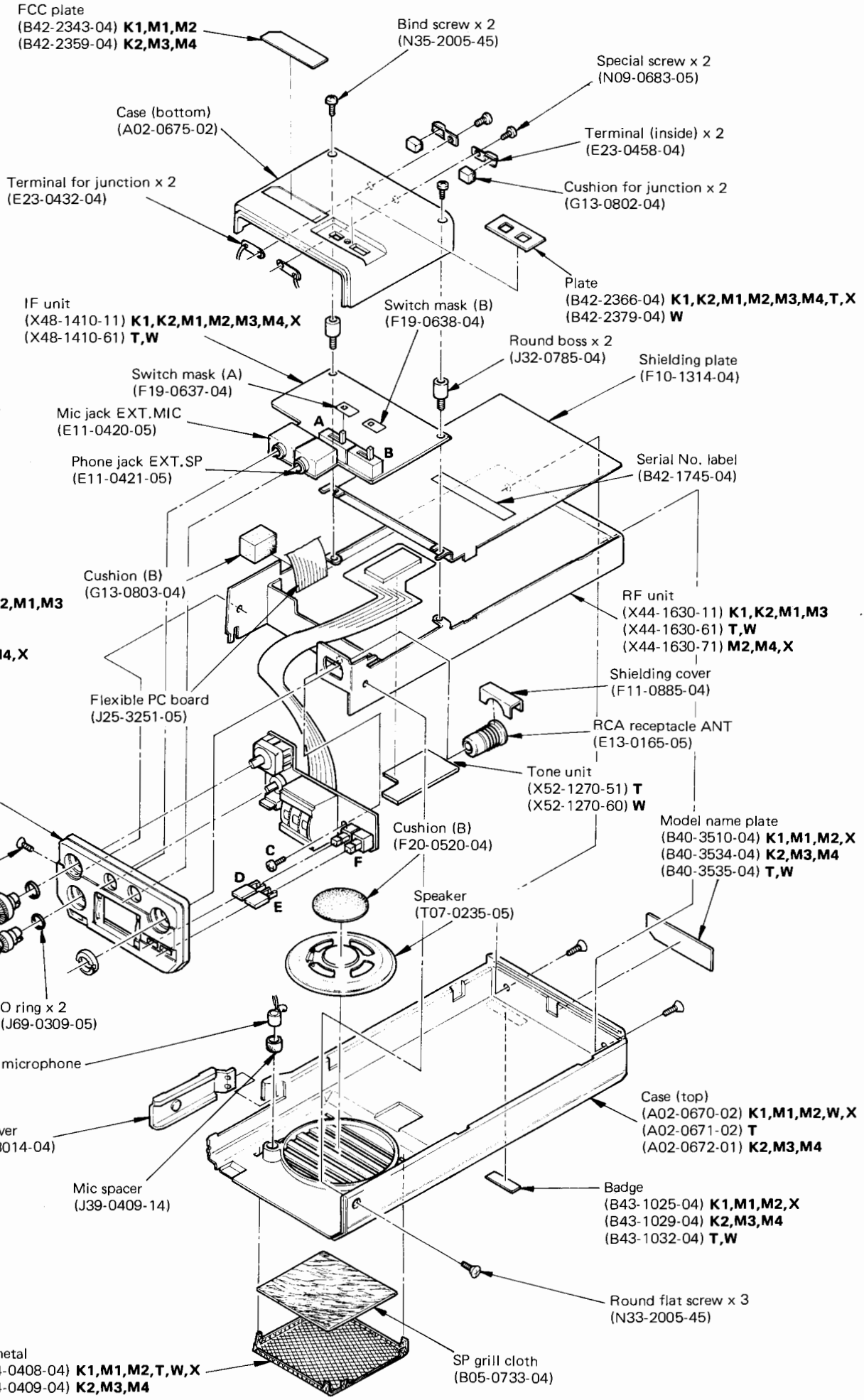


SHIELD COVER REMOVE METHOD

❶ Remove the top boss which tightened the IF unit.
❷ Remove solder at four spots with solder wick.
❸ Remove solder heating spot with solding iron.

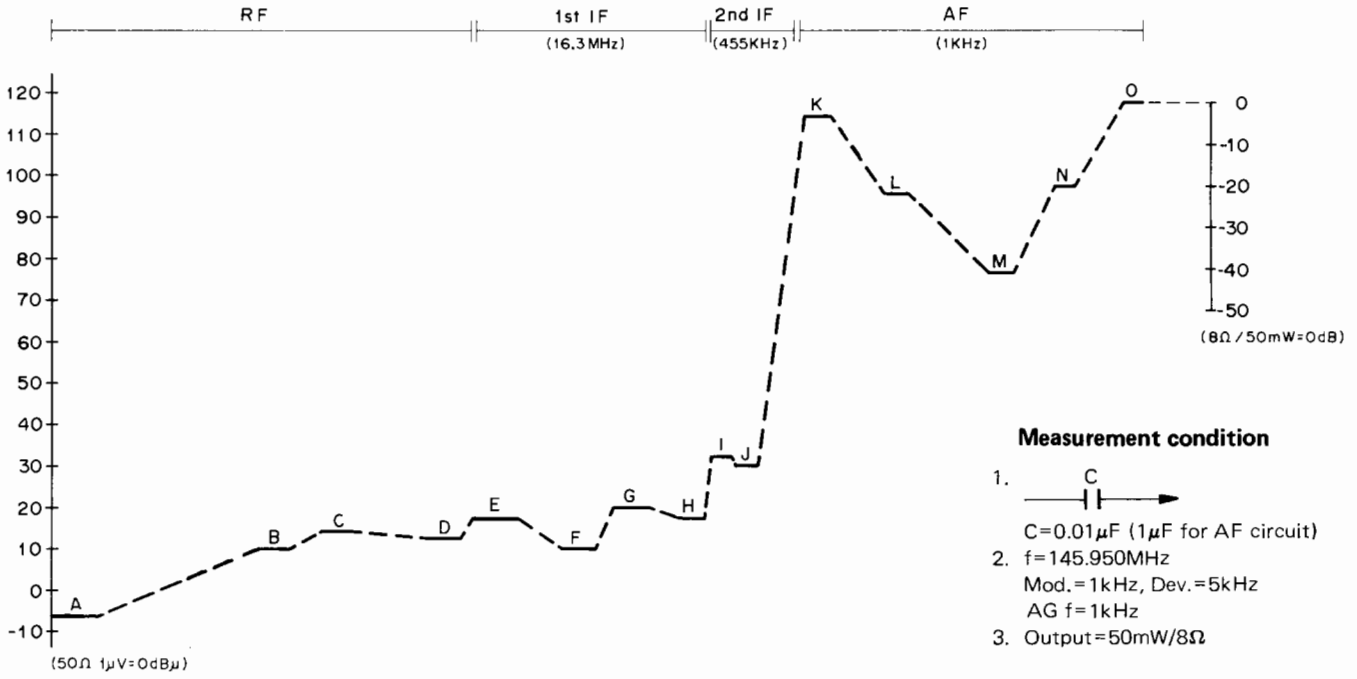


TH-21A/AT/E DISASSEMBLY



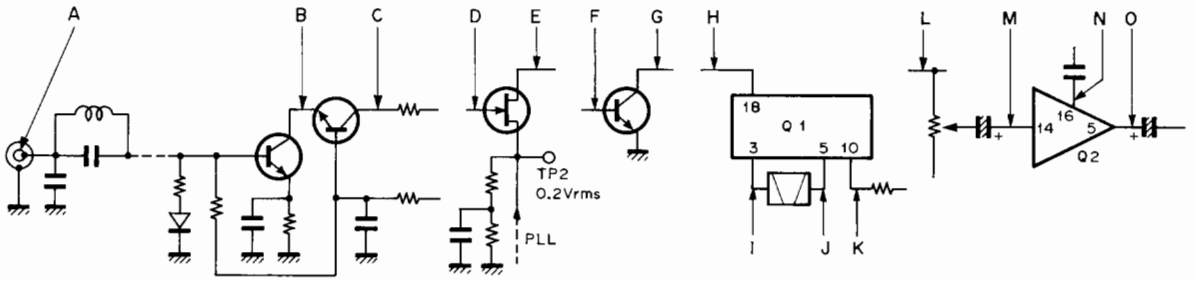
LEVEL DIAGRAM

RX SECTION

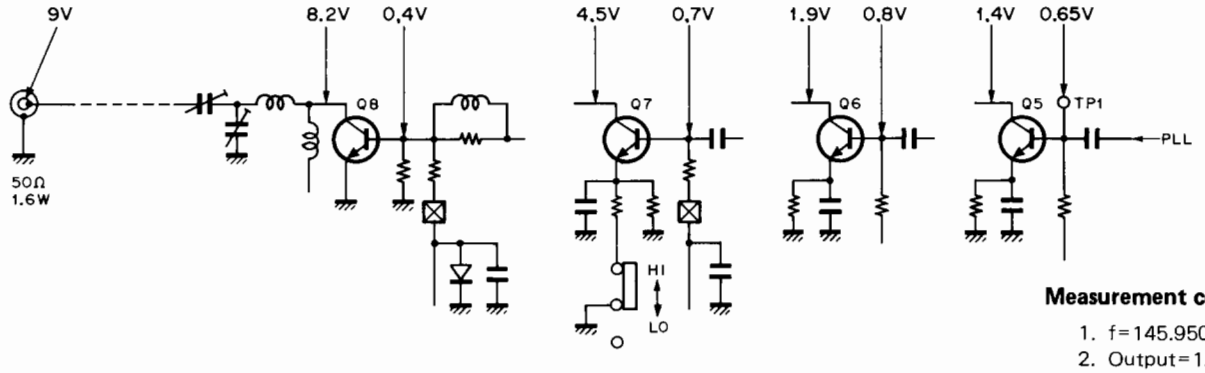


Measurement condition

1. C
   C=0.01μF (1μF for AF circuit)
2. f=145.950MHz
   Mod.=1kHz, Dev.=5kHz
   AG f=1kHz
3. Output=50mW/8Ω



TX SECTION



Measurement condition

1. f=145.950MHz
2. Output=1.6W

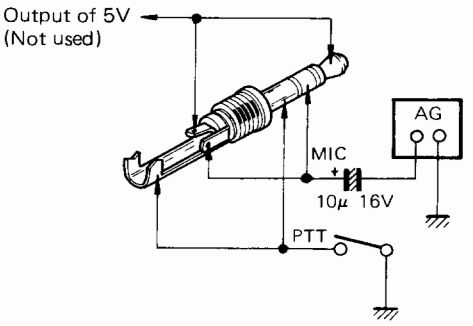
ADJUSTMENT

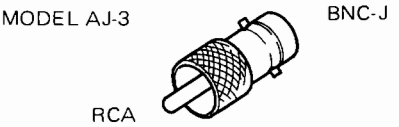
PREOPERATION

Unless otherwise specified. Set the controls as follows.

POWER/VOL ..... OFF
HI/LOW ..... HI
SQL ..... MIN

- When adjusting the trimmers or coils, use a non-induced adjusting rod of bakelite, etc.
- When adjusting the RX section never transmit to prevent SSG damage.
- Connect MIC connector as shown right.
- Uses following RCA-BNC adaptor plug (MODEL AJ-3) for ANT connection.
- The output level of SSG is indicated as SSG's open circuit.



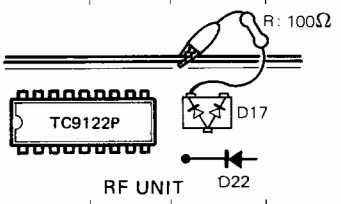


TX/RX Section (Common)

Item	Condition	Measurement			Adjustment			Specification/ Remarks
		Test-equipment	Unit	Ter-minal	Unit	Part	Method	
1. Voltage check	1) DC power supply : 7.2V	DC V.M	RF	FB				7.2V
	2) 5C			5C				5.0V
	3) 6R			6R				5.7V
	4) 5T PTT : ON			5T				4.9V
	5) Receiver							

PLL Section

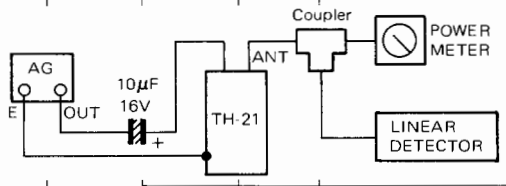
Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method	
1. HET	1) f : any • Cut wire No.1 or connect to GND at Q15 collector on RF unit. • Turn L26 slug all the way inside. L26 OFFSET switch : "S"	RF VTVM	RF	TP3	RF	L25, 26	MAX Repeat couple times.	Approx. 7mVrms
	2) Connect D17 (or D22) cathode to GND via 100Ω resistor as shown right. Repeat each on TX/RX.					L26	Adjust to equal level on TX/RX.	Approx. 4.5mVrms
2. PLL voltage setting	1) f = 141.00MHz	DC VM	RF	TP4	RF	L30	0.9V	0.9V±0.1V
	2) f = 144.00MHz, Transmit						Confirm	1.6V±0.2V
	3) Receive							
3. RX. f adjustment	1) f = 145.00MHz **(T,W)** f = 146.00MHz **(K,M,X)** OFF SET switch : "S"	f.counter	RF	TP2	RF	L19	128.700MHz **(T,W)** 129.700MHz **(K,M,X)** (f−16.3MHz)	Within ±100Hz
	2) 5kHz switch : ON				RF	TC4	128.705MHz **(T,W)** 129.705MHz **(K,M,X)**	
	3) REV **(T,W)** only f = 145.00MHz OFF SET switch : REV 5kHz Switch : OFF				RF	L20	128.100MHz	
	4) 5kHz switch : ON				RF	TC5	128.105MHz	

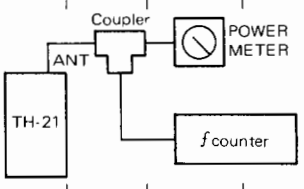


ADJUSTMENT

TX Section

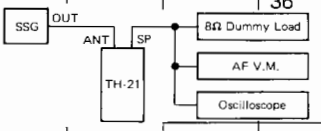
Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test-equipment	Unit	Ter-minal	Unit	Part	Method	
1. Power output adjustment	1) f = 145.00MHz **(T,W)** f = 146.00MHz **(K,M,X)** ANT : Connect a power meter HI/LO : HI Transmit Power supply : 7.2V	DC AM			RF	L10–13 TC1	MAX	
		Power meter DC AM (1A)		ANT	RF	TC1–3	MAX	1.2W or more 600mA or less
	2) f = 144.00MHz HI/LO : HI	Power meter					Confirm	1.0W or more 600mA or less
	HI/LO : LO						Confirm	0.1–0.2W Approx. 300mA
	3) f = 145.96MHz **(T,W)** f = 147.96MHz **(K,M,X)** HI/LO : HI	Power meter					Confirm	1.0W or more 600mA or less
	HI/LO : LO						Confirm	0.1–0.2W Approx. 300mA
2. Deviation adjustment	1) ANT : Power meter and linear detector, use capacitor 10μF/16V between AG output to MIC terminal f = 145.00MHz **(T,W)** f = 146.00MHz **(K,M,X)** AG : 1kHz, 50mV Transmit	Power meter Linear detector			IF	VR1	4.5kHz	4.5kHz±0.1kHz
	2) AG : 1kHz, 5mV						Confirm	3–3.5kHz
3. Tone encoder **(K2,M3,M4)** Type only	1) Push the "3" and "6" key.	Linear detector f. counter			DTMF	VR1	3.0kHz	Within ±0.5kHz
			DTMF	TON			Confirm. freq.	1471.9Hz±5Hz
	2) Push the "2" and "3" key.						Confirm. DEV	1.2kHz±0.5kHz
4. Tone **(T,W)** type only	1) **(T)** type only : Shorted C7 (Tone unit) Transmit Tone switch : ON		TONE	TON	TONE	VR1	1750Hz	Within ±17.5Hz
							Confirm. DEV	2.5kHz or more
5. Option tone unit (TU-6) used **(K,M,X)**	1) Transmit Tone switch : ON				(TU-6)	VR1	0.5kHz	0.5–0.6kHz
6. TX f adjustment	1) f = 145.00MHz **(T,W)** f = 146.00MHz **(K,M,X)** OFF SET switch : "S" Transmit	Power meter f. counter			RF	L21	145.00MHz **(T,W)** 146.00MHz **(K,M,X)**	Within ±100Hz
	2) 5kHz switch : ON					TC6	145.005MHz **(T,W)** 146.005MHz **(K,M,X)**	
	3) f = 145.00MHz **(T,W)** f = 146.00MHz **(K,M,X)** OFF SET switch : "–" Transmit					L22	144.400MHz **(T,W)** 145.400MHz **(K,M,X)**	
	4) 5kHz Switch : ON					TC7	144.405MHz **(T,W)** 145.405MHz **(K,M,X)**	
	5) **(K,M,X)** type only f = 146.00MHz OFF SET switch : "+" Transmit					L20	146.600MHz	
	6) 5kHz switch : ON					TC5	146.605MHz	



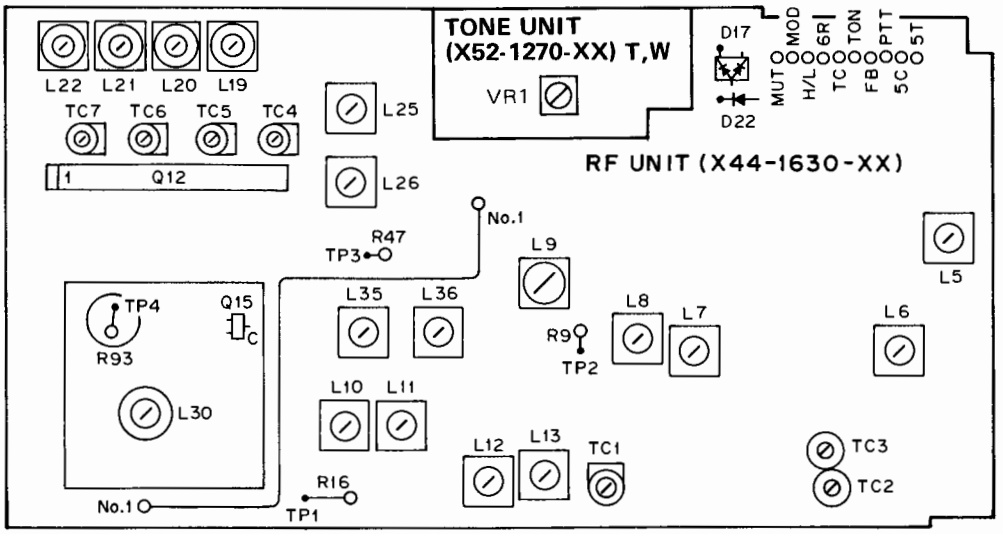


ADJUSTMENT

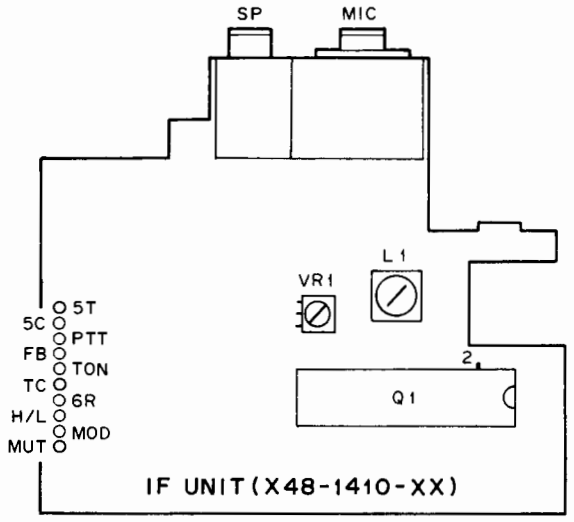
RX Section

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test-equipment	Unit	Ter-minal	Unit	Part	Method	
1. Sensitivity	1) f : any	f.counter	IF	Q1– 2			Confirm	15.845MHz±240Hz
	2) SSG : 145.04MHz **(T,W)** 146.04MHz **(K,M,X)** –4~–6dBμ MOD : 1kHz DEV, 5kHz	SSG AF V.M Oscillo-scope 8Ω Dummy load		EXT.SP	RF	L5–8 L9,35,36	MAX	
	SSG : 0dBμ				IF	L1	MAX	
S/N	3) f = 144.00–147.99MHz **(K,M,X)** f = 144.00–145.99MHz **(T,W)**						Confirm	S/N 28dB or more

TOP VIEW



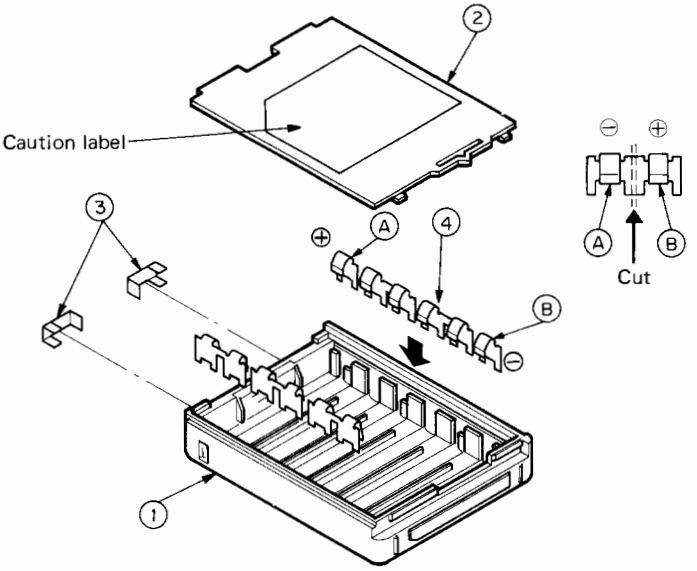
BOTTOM VIEW



BT-2 (AAA MANGANESE/ALKALINE BATTERY CASE)/ EB-2 (EXTERNAL C MANGANESE/ALKALINE BATTERY CASE)/ PB-21 (Ni-Cd BATTERY)

BT-2 OUTSIDE VIEW

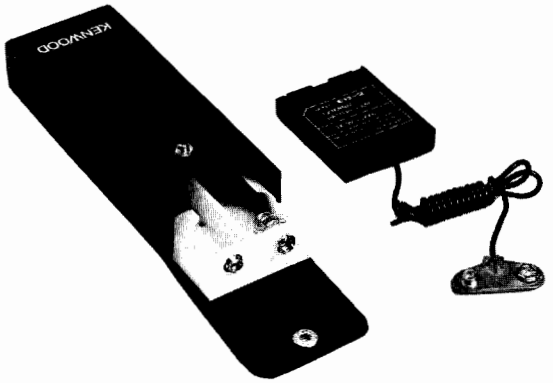
BT-2 DISASSEMBLY



BT-2 PARTS LIST

Parts No.	Re-marks	Description	Ref. No.
A02-0677-02	*	Battery case	1
A02-0678-03	*	Battery case cover	2
E23-0451-04		Terminal board (A) x 2	3
E23-0452-04		Terminal board (B) x 6	4

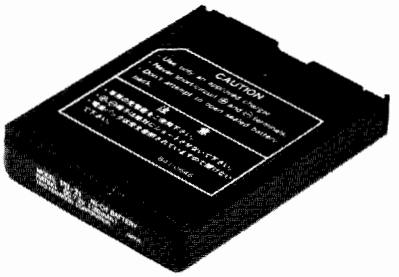
EB-2 OUTSIDE VIEW



EB-2 PARTS LIST

Parts No.	Re-marks	Description	Ref. No.
A02-0677-02	*	Battery case	
A02-0678-03	*	Battery case cover	
E23-0451-04		Terminal board (A) x 2	
E30-1793-05	N*	Cord ass'y	
H25-0103-04		Protective bag (Hard case)	
H25-0096-04		Protective bag (Battery case)	
J21-4154-04	N*	Fied plate (Cord bushing)	

PB-21 OUTSIDE VIEW

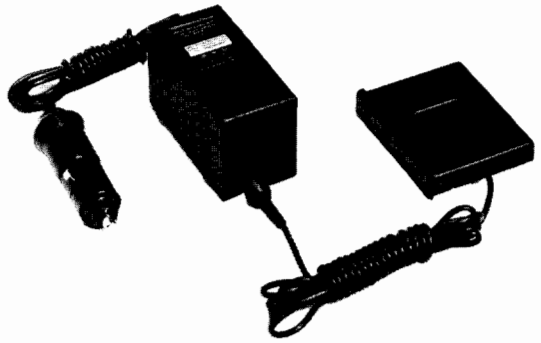


PB-21 SPECIFICATIONS

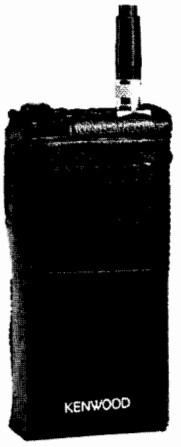
Output voltage 7.2V
Charging current . . . . . 36mA (ordinary charging for approx. 8hrs.)
Charging current 180mAH
Dimensions . . . . . 57 (W) x 71 (H) x 14 (D) mm
Weight . . . . . Approx. 80g

DC-21 (DC-DC CONVERTER)/SC-8/8T (SOFT CASE)

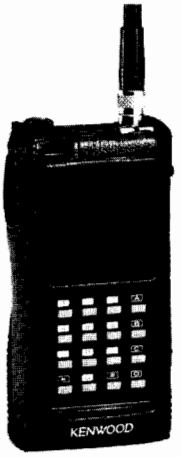
DC-21 OUTSIDE VIEW



SC-8 OUTSIDE VIEW



SC-8T OUTSIDE VIEW



DC-21 SPECIFICATIONS

Input voltage . . . . . 13.8V DC (12—16V)
Output voltage . . . . . 8V DC ±5%
Output current . . . . . 900mA (at input voltage of 13.8V DC with max. load)
Weight . . . . . Approx. 260g

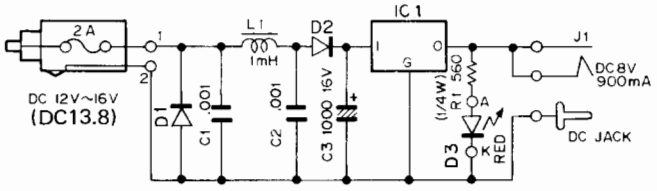
DC-21 PARTS LIST

Parts No.	Re-marks	Description	Ref. No.
A02-0677-02	*	Battery case	
A02-0678-03	*	Battery case cover	
E03-0203-05		DC jack	J1
E23-0451-04		Terminal board (A) x 2	
E30-1791-05	N	Cord with plug	
E30-1796-05		Cord with cigarette plug and fuse	
F05-2023-05		Fuse 2A	
J42-0439-05		Cord bushing	
L15-0305-05		Choke coil 1mH	L1
NJM7808A		IC	IC1
SLH-34-VC3		LED (Red)	D3
U05B		Diode	D1
V06C		Diode	D2

SC-8/8T PARTS LIST

Parts No.	Re-marks	Description	Ref. No.
J19-1408-04	N	Belt hook	

DC-21 SCHEMATIC DIAGRAM



IC1 :NJM7808A D1 :U05B
D2 :V06B
D3 :SLH34-VC3

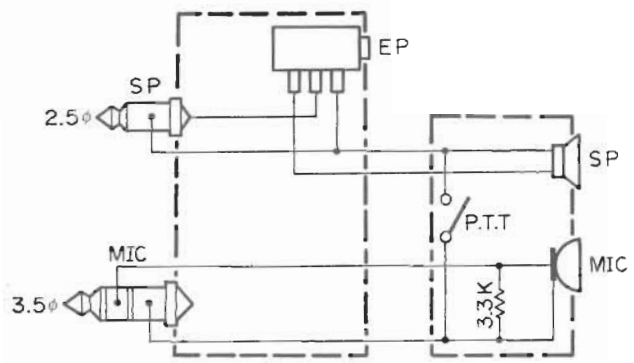
SMC-30 (SPEAKER MICROPHONE)/ TU-6 (PROGRAMABLE TONE ENCODER) TH-21A/AT ONLY

SMC-30 OUTSIDE VIEW

SMC-30 PARTS LIST

Parts No	Re-marks	Description	Ref. No
E30-1789-05	N	Curled cord ass'y	
J19-1360-08 J42-0429-08		Clip metal fitting Cord bushing	
K29-3035-08	N	PTT knob	
S50-1408-08		Micro switch	
T07-0219-08 T97-1024-08		Speaker Electret microphone	

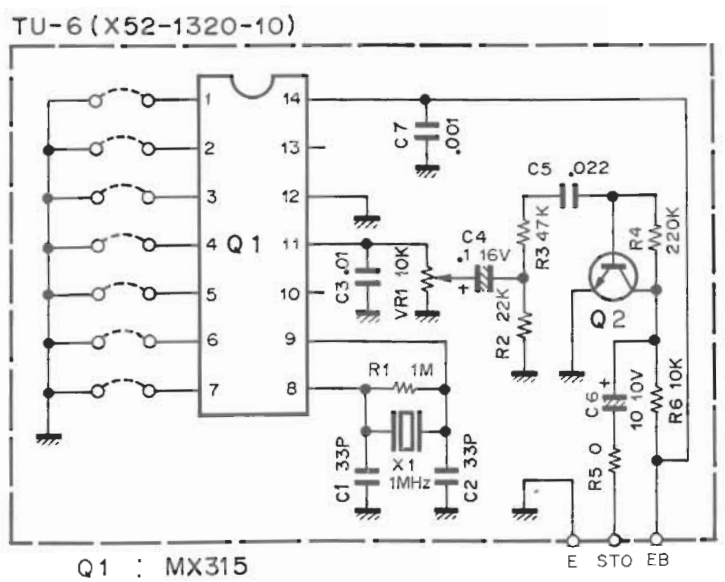
SMC-30 SCHEMATIC DIAGRAM



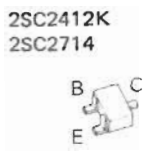
SMC-30 SPECIFICATIONS

- **SPEAKER**
  - **Speaker** 40mmφ
  - **Max. Input** 0.5W
  - **Input impedance** 8Ω
- **MICROPHONE**
  - **Type** ..... Electret condensor
  - **Sensitivity** ..... −67dB
  - **Output impedance** 2kΩ
  - **Frequency response** ... 200Hz~5kHz
  - **Operating temperature** .. −20°C~ +60°C
  - **Dimensions** ..... 51W x 73H x 33D (mm) (Projections excluded)
  - **Weight** ..... 130g (Code included)

TU-6 SCHEMATIC DIAGRAM



Q1 : MX315
Q2 : 2SC2412K(Q) or 2SC2712(Y)



TU-6 (PROGRAMABLE TONE ENCODER) TH-21A/AT ONLY

TU-6 SPECIFICATIONS

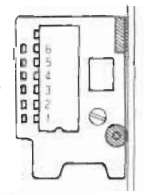
Oscillator frequency ..... 1MHz ± 0.1%
Usable frequency range ..... 37 EIA Specification Group Frequencies (67.0–250.3Hz)
Weight 3g

TU-6 TONE FREQUENCY CHART

Setting the frequency

Cut and connect pins 1–6 of the IC to the PC board pattern by soldering to set the frequency.

- "0" in the table indicates the connection.
- "1" in the table indicates the disconnection.



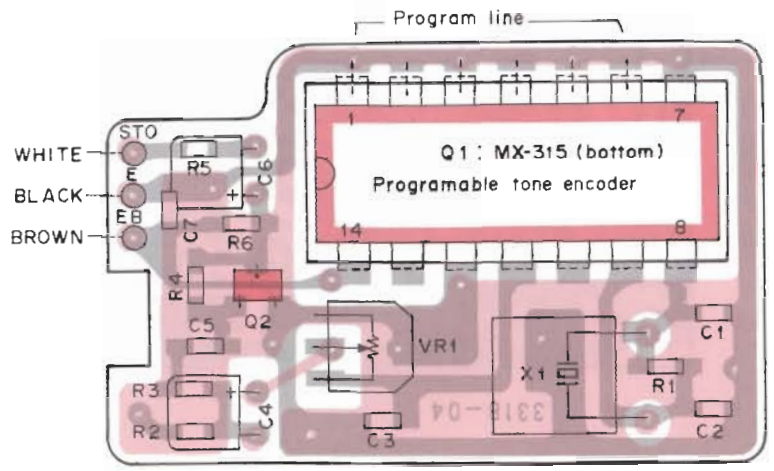
#	EIA Specification Group	Hz	Program Lines (ON...1, OFF...0) 1	2	3	4	5	6
1	A	67.0	1	1	1	1	1	1
2	B	71.9	1	1	1	1	0	1
3	C	74.4	1	1	1	0	1	1
4	A	77.0	1	1	1	1	0	0
5	C	79.7	1	1	0	1	1	1
6	B	82.5	1	1	1	0	0	1
7	C	85.4	1	1	0	0	1	1
8	A	88.5	1	1	1	0	0	0
9	C	91.5	1	0	1	1	1	1
10	B	94.8	1	1	0	1	0	1
11	A	100.0	1	1	0	1	0	0
12	B	103.5	1	1	0	0	0	1
13	A	107.2	1	1	0	0	0	0
14	B	110.9	1	0	1	1	0	1
15	A	114.8	1	0	1	1	0	0
16	B	118.8	1	0	1	0	0	1
17	A	123.0	1	0	1	0	0	0
18	B	127.3	1	0	0	1	0	1
19	A	131.8	1	0	0	1	0	0
20	B	136.5	1	0	0	0	0	1
21	A	141.3	1	0	0	0	0	0
22	B	146.2	0	1	1	1	0	1
23	A	151.4	0	1	1	1	0	0
24	B	156.7	0	1	1	0	0	1
25	A	162.2	0	1	1	0	0	0
26	B	167.9	0	1	0	1	0	1
27	A	173.8	0	1	0	1	0	0
28	B	179.9	0	1	0	0	0	1
29	A	186.2	0	1	0	0	0	0
30	B	192.8	0	0	1	1	0	1
31	A	203.5	0	0	1	1	0	0
32	B	210.7	0	0	1	0	0	1
33	A	218.1	0	0	1	0	0	0
34	B	225.7	0	0	0	1	0	1
35	A	233.6	0	0	0	1	0	0
36	B	241.8	0	0	0	0	0	1
37	A	250.3	0	0	0	0	0	0

TU-6 PARTS LIST

Parts No.	Re-marks	Description		Ref. No.	Q'ty
TU-6 GENERAL					
B50-4178-00	N	Instruction manual			1
G13-0806-04	N	Cushion			1
H25-0029-04		Protective bag			1
X52-1320-10	N	Tone unit			1
TONE UNIT (X52-1320-10)					
CC73FCH1H330J		Chip cap.	33P	C1, 2	2
CE04CW1A100M		Electro	10 10V	C6	1
CK73FB1E103K		Chip cap.	0.01	C3	1
CK73FB1E223K		Chip cap.	0.022	C5	1
CK73FB1H102K		Chip cap.	0.001	C7	1
C90-0888-05		Tantalum	0.1 16V	C4	1
L77-0982-05		Crystal	1MHz	X1	1
RD73FB2A103J		Chip resistor	10kΩ	R6	1
RD73FB2A105J		Chip resistor	1MΩ	R1	1
RD73FB2A223J		Chip resistor	22kΩ	R2	1
RD73FB2A224J		Chip resistor	220kΩ	R4	1
RD73FB2A473J		Chip resistor	47kΩ	R3	1
R12-3449-05		Trim. pot.	10kΩ(B)	VR1	1
R92-0670-05		Chip resistor	0Ω	R5	1
MX315		IC		Q1	1
2SC1412K(Q) or 2SC2712(Y)		TR		Q2	1

TU-6 PC BOARD VIEW

TONE UNIT (X52-1320-10) Foil side view

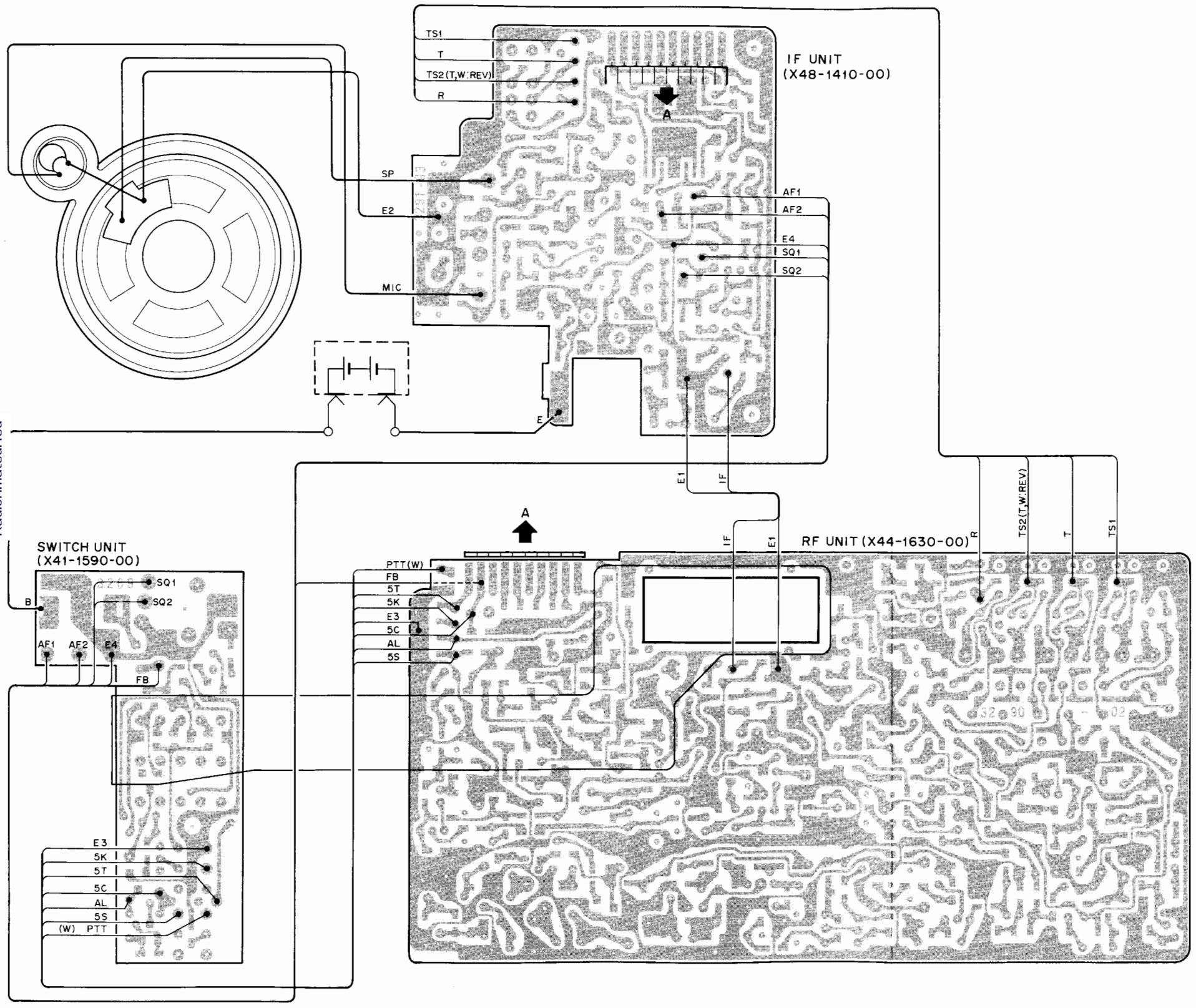


Q1 : MX315 Q2 : 2SC2412K(Q) or 2SC2712(Y)

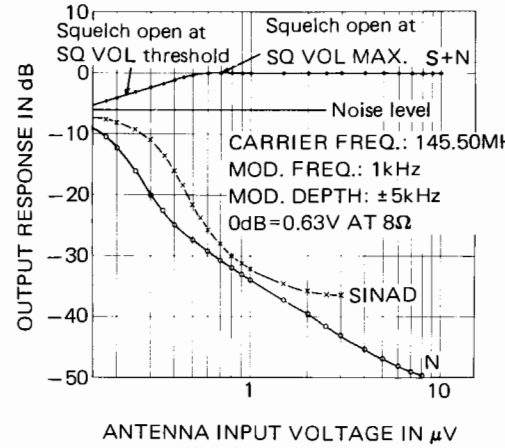
MX-315

$\overline{8}$	1	14	Vdd
$\overline{4}$	2	13	Tx ENABLE
$\overline{2}$	3	12	$\overline{\text{Tx ENABLE}}$
$\overline{1}$	4	11	Tx OUTPUT
$\overline{x}$	5	10	NC
$\overline{y}$	6	9	$\overline{\text{XTAL}}$
Vss	7	8	CLOCK

WIRING/REFERENCE DATA

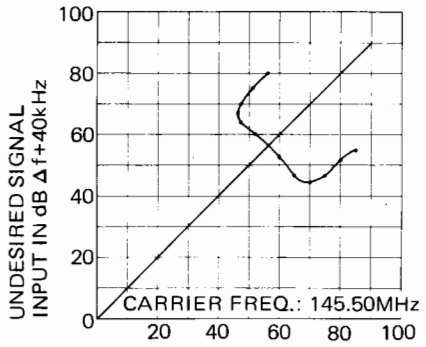


RX SENSITIVITY



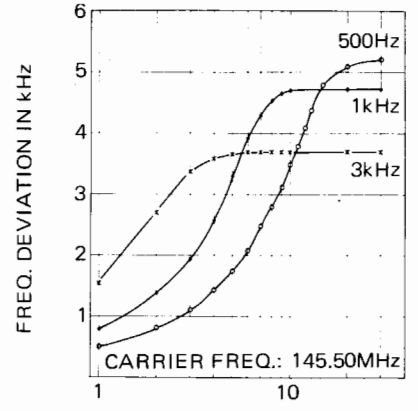
ANTENNA INPUT VOLTAGE IN μV

INTER MODULATION



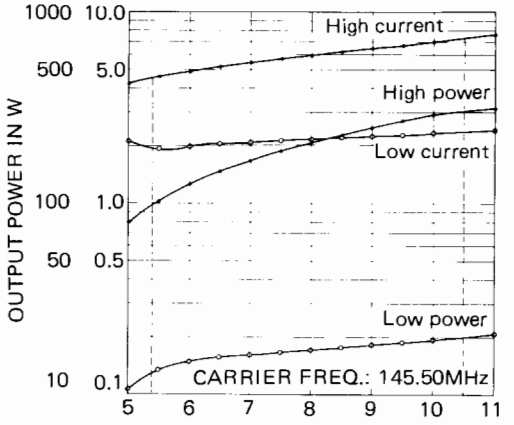
FREQUENCY DIFFERENCE IN kHz
UNDESIRED SIGNAL
INPUT LEVEL IN dB Δf +20kHz

DEVIATION



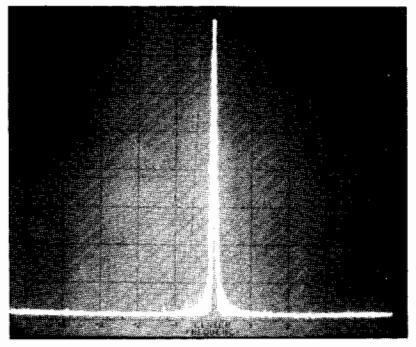
MIC INPUT LEVEL IN mV

OUTPUT POWER



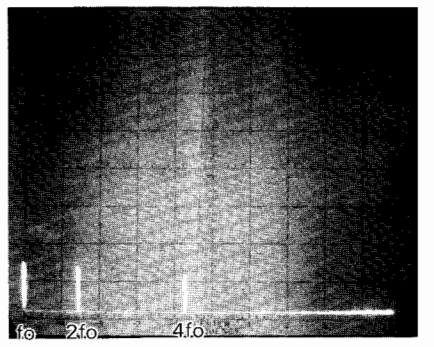
SOURCE VOLTAGE IN V
CARRIER REQUENCY IN MHz

NEAR SPURIOUS RESPONSE



CARRIER FREQ.:	145.50MHz
RF POWER:	1.6W
SCAN WIDTH:	2MHz/DIV
BAND WIDTH:	30kHz
SCAN TIME:	0.1 SEC
VIDEO FILTER:	10kHz
INPUT ATT.:	0dB
LOG REF LEVEL:	−10dBm
	10dB/DIV

HARMONICS SPURIOUS RESPONSE



CARRIER FREQ.:	145.50MHz
RF POWER:	1.6W
SCAN WIDTH:	100MHz/DIV
BAND WIDTH:	30kHz
SCAN TIME:	2 SEC
VIDEO FILTER:	10kHz
INPUT ATT.:	0dB
LOG REF LEVEL:	−10dBm
	10dB/DIV

The fundamental signal is reduced by HPF. (fc : 240MHz)

TH-21A/AT SCHEMATIC DIAGRAM

Signal line — Control line — Common DC line — Voltage measurement conditions f = 145.50MHz, RX no signal, ( ) : TX.

IF UNIT (X48-1410-11)

RF UNIT (X44-1630-XX) (-11 : K1, K2, M1, M3 -71 : X, M2, M4)

Q1	: MC3359P	Q7	: 2SA1037K(Q) or 2SA1162(Y)
Q2	: TA7331F		
Q3	: 2SB698(E,F)		
Q4,5,8	: 2SC2412K(Q) or 2SC2712(Y)	D1,2	: 1N60A
		D3	: MTZ6.8JB
Q6	: NJM4558M	D4	: MA152WA

Q1,16	: 2SC2671(H)	D2,19,20,24	: 1SS133
Q2,5,10,11,17	: 2SC2668(Y)	D3	: 1S1555
Q3	: 2SK192A(Y)	D4	: MI301
Q4,9,14,15	: 2SC2714(Y)	D5	: 1S2588
Q6	: 2SC2347	D6~9,15	: MA856
Q7	: 2SC2053	D14	: ITT310TE
Q8	: 2SC1947	D16	: 1S2208
Q12	: TC5082P	D17,21	: MA152WA
Q13	: TC5081AP	D18,22 (X,M2,M4)	: 1SS133
Q18	: 2SB698(E,F)		
Q19	: LVC517	D10~13	: BA282
Q20,26	: 2SA1037K(Q) or 2SA1162(Y)	Q22,24	: 2SA1037K(R) or 2SA1162(G)
Q21,23,25,27	: 2SC2412K(Q) or 2SC2712(Y)		

SWITCH UNIT (X41-1590-XX) (-11 : K1, K2, M1, M3 -71 : X, M2, M4)

Q1	: 2SC2412K(Q) or 2SC2712(Y)	D4,5	: MA152WK
Q2(X,M2,M4)	: 2SC2412K(Q) or 2SC2712(Y)		
Q3	: TC9122P		

DTMF UNIT (TH-21AT ONLY)

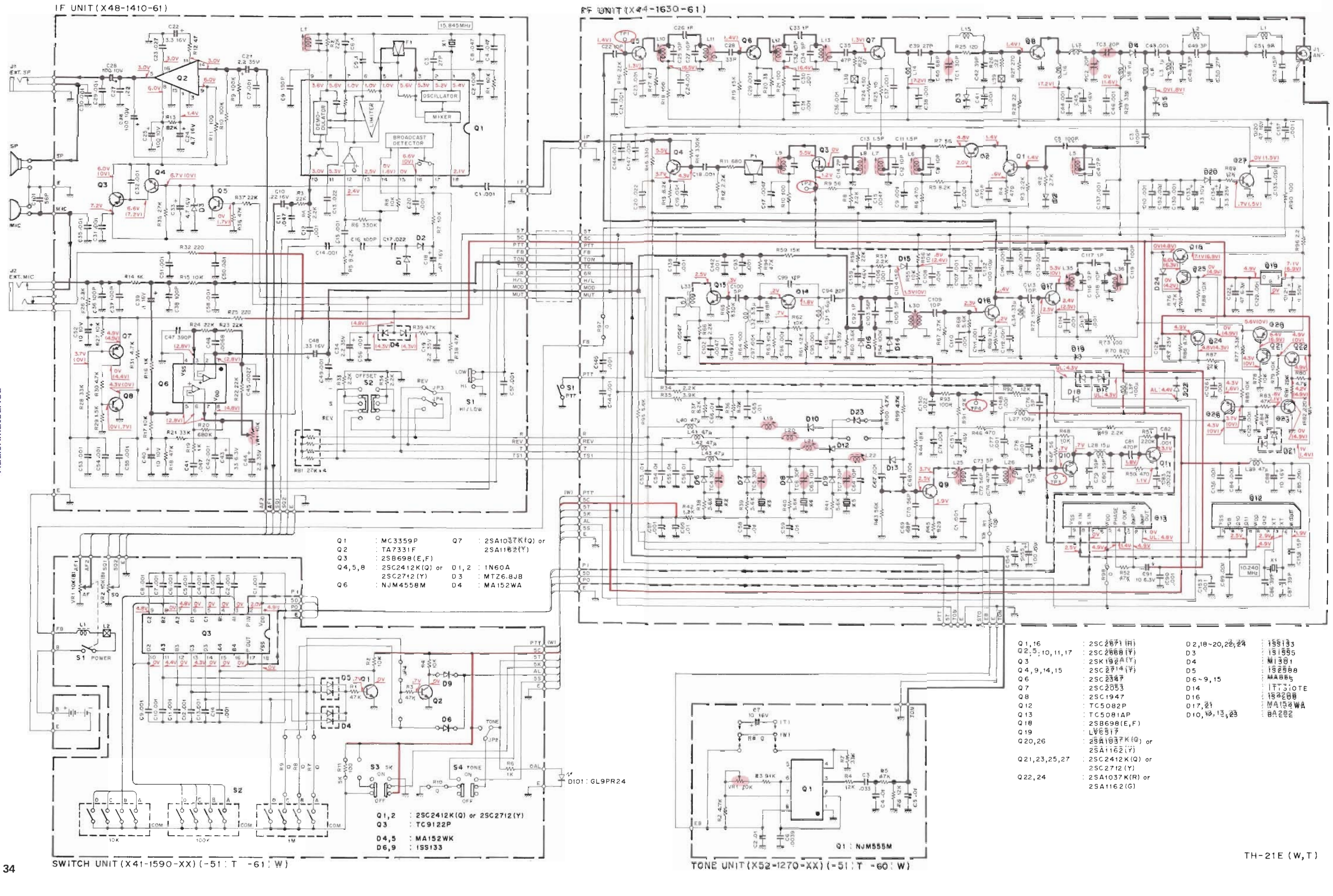
Q1	: 2SC2412K(Q) or 2SC2712(Y)
Q2	: 2SA1037K(Q) or 2SA1162(Y)
Q3	: LR40872

TONE UNIT TU-6 (OPTION)

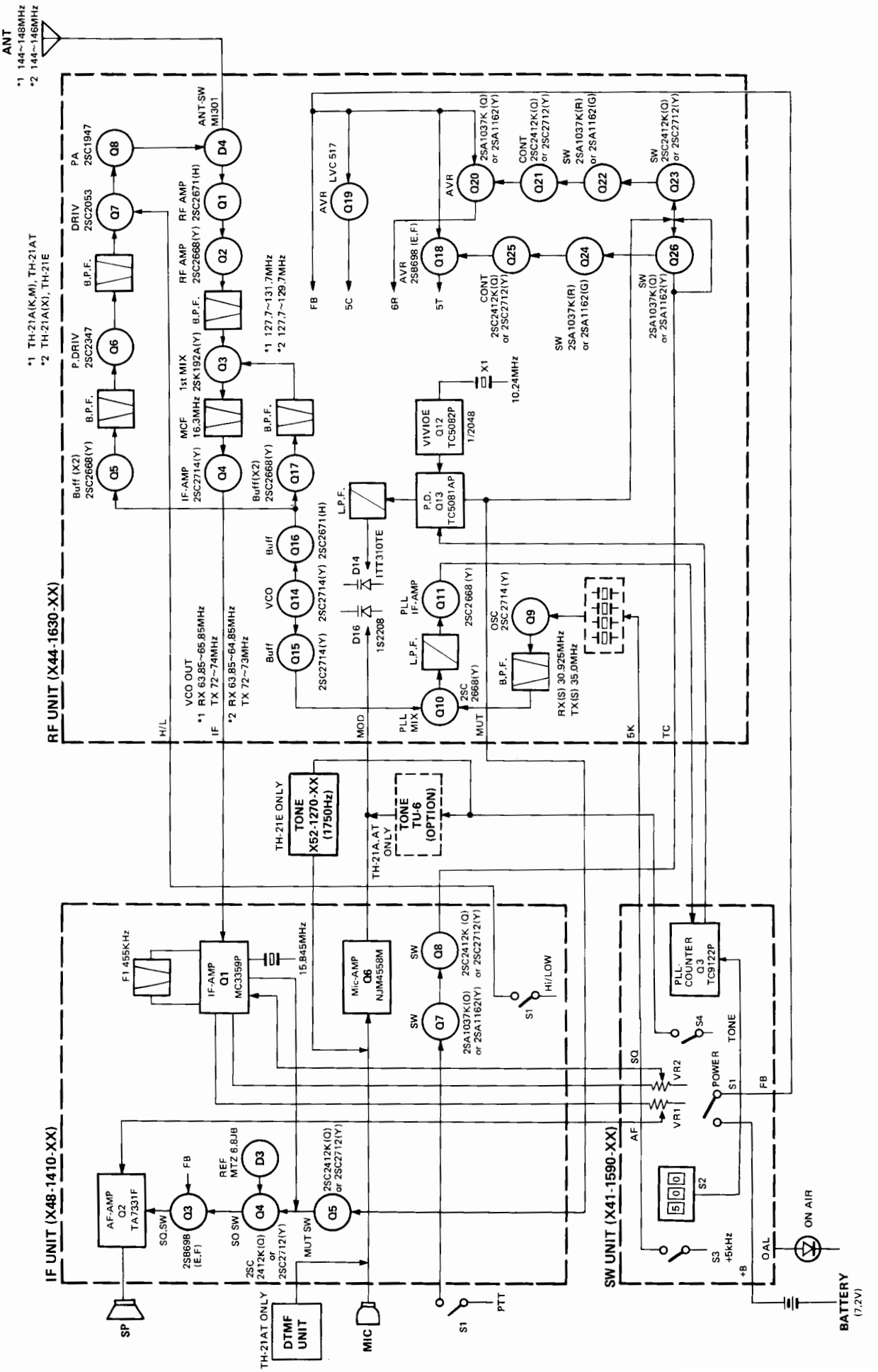
TH-21A, 21AT (K1, 2, X, M1~M4)

TH-21E SCHEMATIC DIAGRAM

Signal line — Control line — Common DC line — Voltage measurement conditions, f= 145.50MHz, RX no signal, ( ) : TX.



TH-21E (W,T)



SPECIFICATIONS

General

Frequency range	144 – 146MHz ; TH-21E, TH-21A (Ociania version only) 144 – 148MHz ; TH-21A/AT
Signal type	F3 (FM)
Operating temperature	−20°C ~ +50°C
Antenna impedance	50Ω
Power supply voltage	5.8V – 10.0V (rating voltage ; 7.2V)
Power consumption	At reception standby ; Less than 28mA At transmission (Hi) ; Less than 600mA (Low) ; About 300mA
Dimensions	57 (65.5) W x 120 (127.5) H x 28 (32) D mm The numbers in the parenthesis include projections parts.
Weight	Approx. 290g (including antenna and Ni-Cd batteries)

Transmitter section

Output power	Hi ; 1.0W, Low ; approx. 150mW
Modulation system	Reactance modulation
Max. frequency deviation	±5kHz
Unwanted reflection	Less than −60dB
Microphone	Condenser type

Receiver section

Reception system	Double superheterodyne
Intermediate frequency	1st ; 16.3MHz, 2nd ; 455kHz
Sensitivity	S/N more than 28dB at −6dBμ (0.5μV) input 12dB SINAD ; less than −12dBμ (0.25μV)
Squelch sensitivity	Less than 0.25μV
Selectivity	−6dB at more than 12kHz −40 dB at less than 28kHz
AF output	More than 250mW (8Ω load, distortion 10%)

Design and specifications subject to change without notice.

TRIO-KENWOOD CORPORATION

Shionogi Shibuya Building, 17-5, 2-chome Shibuya, Shibuya-ku, Tokyo 150, Japan

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street,Compton,California 90220,U.S.A.

TRIO-KENWOOD COMMUNICATIONS, GmbH
Rembrücker Str. 15, 6056 Heusenstamm West Germany

TRIO-KENWOOD ELECTRONICS, N.V.
Leuvensesteenweg 504 B-1930 Zaventem, Belgium

TRIO-KENWOOD (AUSTRALIA) PTY. LTD. (INCORPORATED IN N.S.W.)
4E Woodcock Place, Lane Cove, N.S.W. 2066, Australia

070-54175011