

# KENWOOD

# SERVICE MANUAL

## TH-41A/AT/E BT-2,DC-21,EB-2,PB-21, SC-8/8T,SMC-30,HMC-1,TU-6

### 70cm FM HAND-HELD TRANSCEIVER



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Photograph shows TH-41AT type.



### CIRCUIT DESCRIPTION

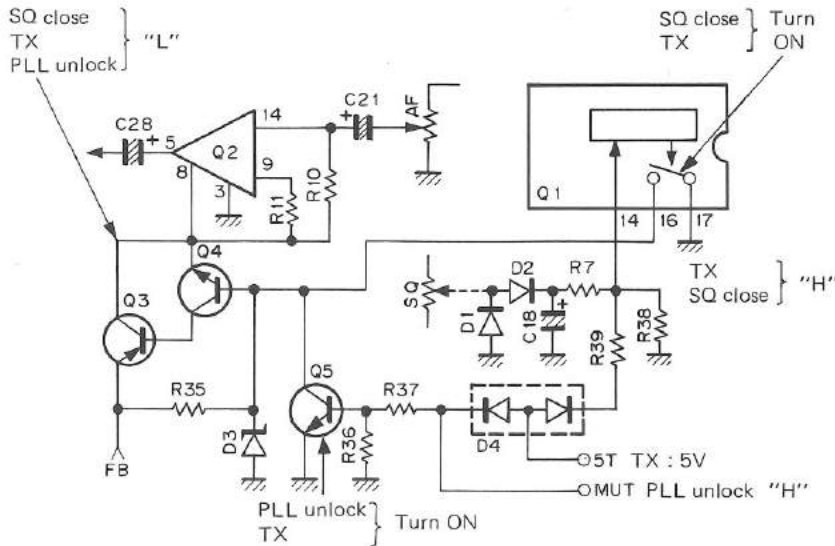


Fig. 2 Squelch-mute circuit

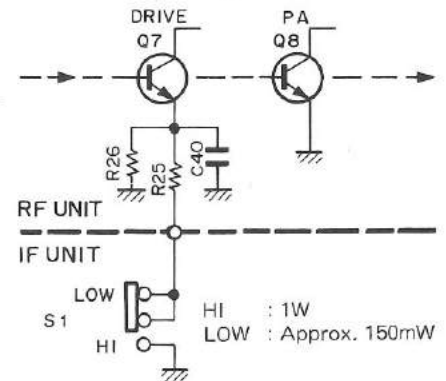


Fig. 3 Power select circuit

#### TX Section

The PLL VCO (Voltage Controlled Oscillator) frequency during transmission mode is 1/3 the actual transmitting frequency. The output of VCO buffer amp Q16 : 2SC2671H is tripled by Q5 : 2SC2671H and fed through BPF L11, L12 to obtain the final transmission frequency. The output from this BPF is fed to pre-driver Q6 : 2SC2671H and driver Q7 : 2SC3019 and is final amplified Q8 : 2SC2671H.

	VCBO	VEBO	VCEO	IC	PC	PC	T <sub>J</sub>	T <sub>stg</sub>	T <sub>a</sub>
Test Conditions			R <sub>BE</sub> = ∞ Ω		T <sub>c</sub> = 25°C				25 ± 3°C
Maximum Rating	35V	4V	17V	1A	10W		+175°C	-55 ~ +175°C	

Table 4 2SC3101 Max. rating (RF unit Q8)

The signals from either the microphone or AF circuits are amplified by mic amp Q6 : NJM4558M and this signal is applied to D14 : 1S2208 in the VCO circuit as modulation. Transmitter section peripheral circuit consist of the power output level selector circuit and generator circuit.

To select the power output level emitter resistor R25 (2.2Ω) for driver Q7 is controlled by Hi/Low switch S1 on IF unit. When R25 is grounded, the output power is about 1W. When R25 is opened, the output power becomes about 150mW (through R24, 26Ω).

The tone circuit is an oscillator circuit for repeater access. The system differs according to country.

- 1) In the AT model type, a DTMF (Dual-Tone Multi Frequency) system is used. When any key is depressed, the unit enters mode with DTMF modulation.
- 2) In the E model type ("W" for continental European countries), when momentary tone switch is pressed, the unit enters transmission mode and a 1750Hz tone signal is output as modulation.
- 3) In the E model type ("T" for the United Kingdom), when the tone switch is pressed, the unit enters transmission mode and a 1750Hz tone signal is output only at the beginning of each transmission.

An optional PROGRAMABLE TONE ENCODER unit TU-6 can be installed in the A and AT model types. With a TU-6 tone encoder installed, one of 37 standard EIA Tone frequencies between 67.00 and 250.3Hz can be output. When the tone switch is on, the pre-programmed tone frequency is continuously output along with any voice or DTMF modulation.

## CIRCUIT DESCRIPTION

### PLL Circuit

In the reception mode, the VCO operates at a frequency of 1/3 of the first local oscillator (139.4666–142.798333MHz [K,M1,M2 : 440.000–449.995MHz] 136.1333–139.4650 MHz [M2,M4,T,W,X : 430.000–439.995MHz]). During reception, D13 turns ON to connect C105 into the oscillator circuit, which causes the oscillation frequency of the VCO to drop. In transmission mode, the VCO operates at a frequency of 1/3 the transmission frequency (146.666–149.99833MHz [K,M1,M2 : 440.000–449.995MHz] 143.3333–146.6650MHz [M2,M4,T,W,X : 430.000–439.995MHz]). The VCO output is amplified by Q15 : 2SC2714(Y) and mixed with the HET oscillator output at PLL mixer Q10 : 2SC2668(Y).

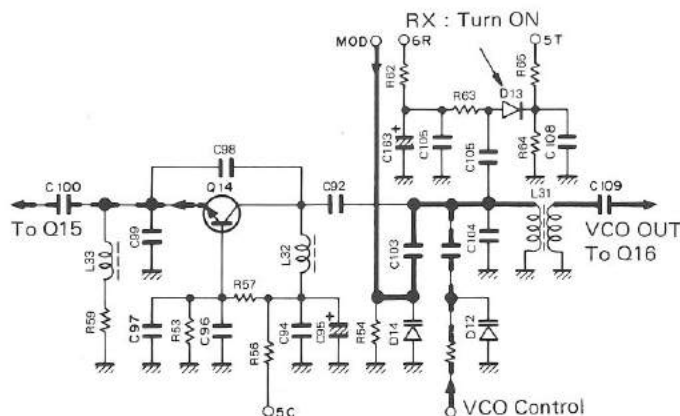


Fig. 4 VCO circuit

The HET oscillator Q9 : 2SC3121 outputs the crystal frequency as selected by the OFF-SET switch. The output from Q9 passes through BPF L26 and L27 and is now tripled the original crystal frequency.

PLL mixer Q10 output next passes through an Low Pass Filter (LPF) to obtain 3.333–6.6633MHz signal. This is amplified by Q11 : 2SC2668Y and input to programmable counter Q3 : TC9122P. The signal input to Q11 is divided by 1/1000 at 440.00MHz K,M1,M2 (430.00MHz M2,M4,T,W,X) and 1/999 at 449.99MHz K,M1,M2 (439.99MHz M2,M4,T,W,X) with the divide ratio being determined by the thumb-wheel frequency selector switch (S2). Q3 output is compared with the comparator reference signal (3.3...kHz) by phase comparator Q13 : TC5081AP. The 6.8266MHz crystal oscillator standard is divided by 1/2048 by Q12 : TC5082P to obtain the reference frequency output.

The DC output from phase comparator Q13 is fed through passive Loop Filter (LPF) and fed to D12 : 1S2208 in the VCO circuit to control the VCO frequency.

PLL circuits peripheral circuits are the +5kHz shift circuit and the unlock detect circuit. The +5kHz shift circuit is used to obtain a 5kHz step for both TX and RX frequencies. When 5K switch S3 is off, D4–D7 in the PLL HET oscillator circuit are on and the TC12–TC15 and C155–C158 are shorted circuit. When the 5K switch is on, the diodes turn off and trimmers TC12–TC15 and capacitors C155–C158 are series connected to their crystals. When the capacitors are connected in series to the crystals, the oscillator frequency increases. The trimmers are now used to adjust the frequency +5kHz.

The unlock circuit will be described in the following Control circuits section.

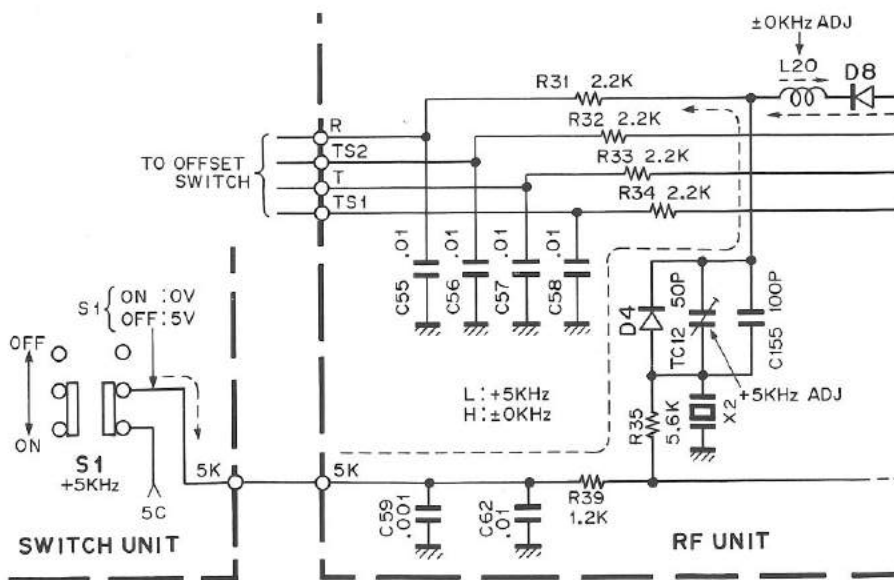


Fig. 5 +5kHz shift circuit (RX simplex mode)

## CIRCUIT DESCRIPTION

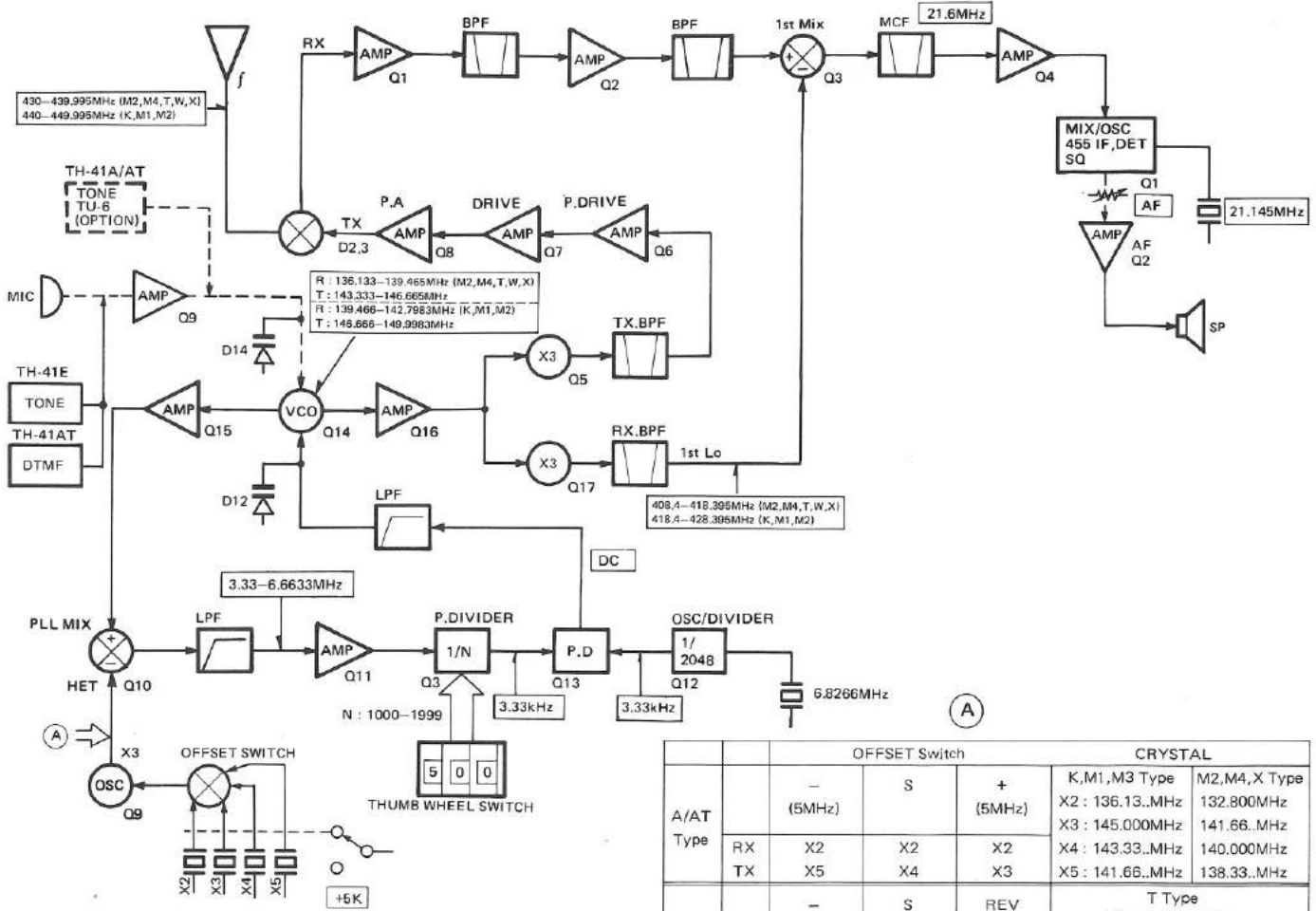
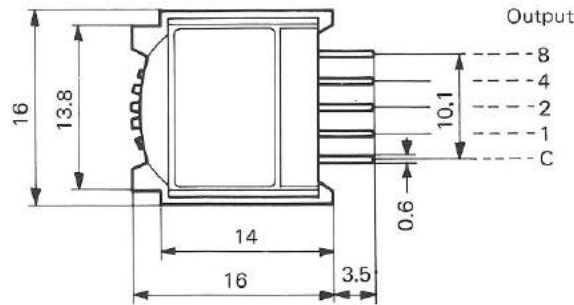
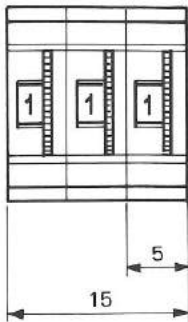


Fig. 6 Frequency configuration

A/AT Type	OFFSET Switch			CRYSTAL	
	- (5MHz)	S	+ (5MHz)	K, M1, M3 Type	M2, M4, X Type
RX	X2	X2	X2	X2 : 136.13..MHz	132.800MHz
	X5	X4	X3	X3 : 145.000MHz	141.66..MHz
TX	X5	X4	X3	X4 : 143.33..MHz	140.000MHz
	X5	X4	X3	X5 : 141.66..MHz	138.33..MHz
E (T) Type	- (1.6MHz)	S	REV	T Type	
				X2 : 132.800MHz	X3 : 133.33..MHz
RX	X2	X2	X3	X4 : 140.000MHz	X5 : 140.53..MHz
				X4	X4
TX	X5	X4	X3	W Type	
				X2 : 132.800MHz	X3 : 139.46..MHz
RX	X2	X2	X2	X4 : 140.000MHz	X5 : 137.46..MHz
				X4	X3



Dial	Output			
	8	4	2	1
0				
1				•
2			•	
3			•	•
4		•		
5		•		•
6		•	•	
7		•	•	•
8	•			
9	•			•

•: Connect to the common pin

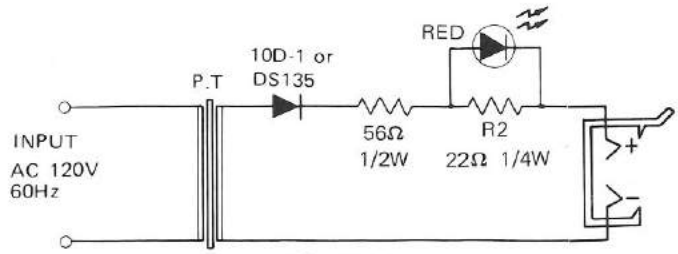
Fig. 7 Thumb wheel switch (S59-3401-05) (Switch unit S2)



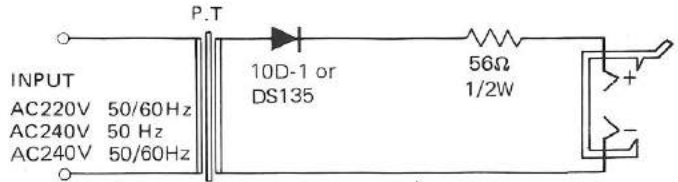
## CIRCUIT DESCRIPTION/PACKING

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**



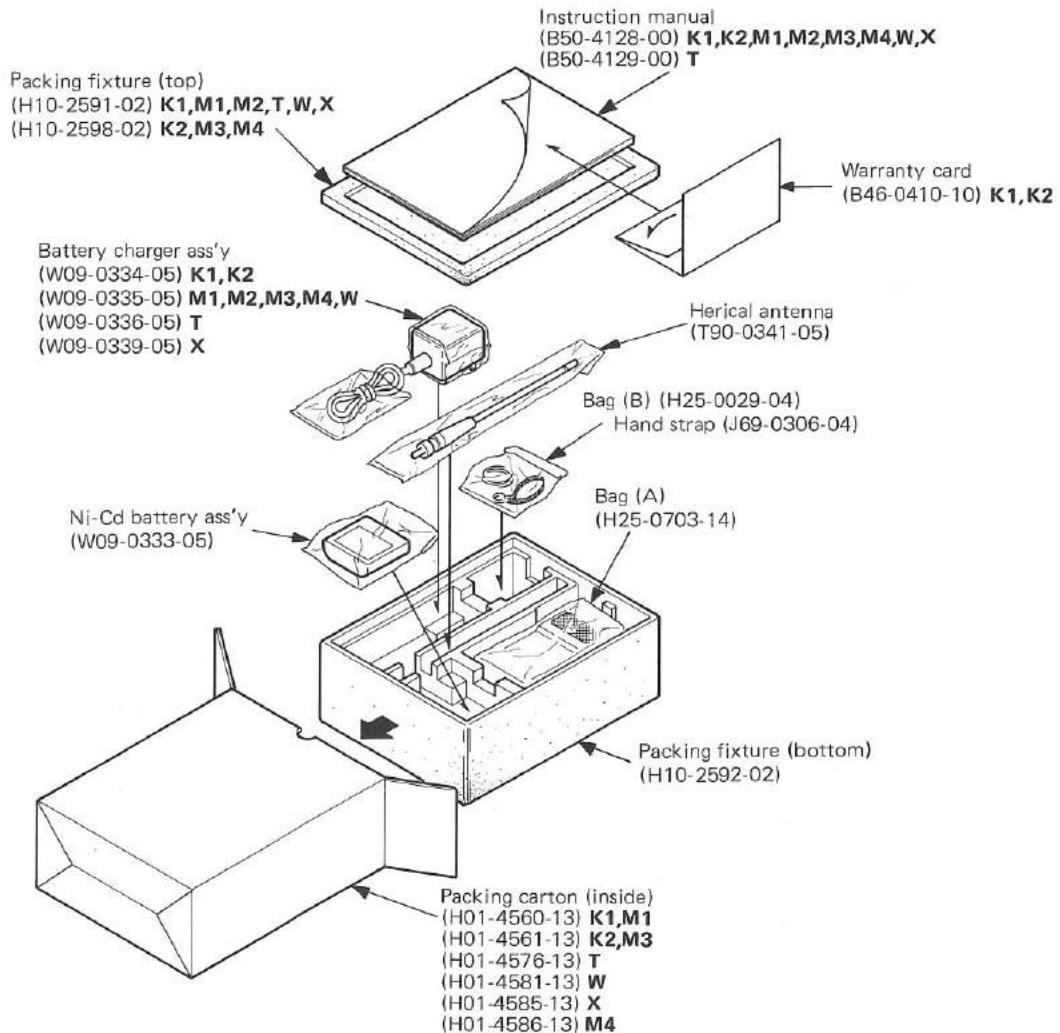
**W09-0334-05**



**W09-0335-05, W09-0336-05, W09-0339-05**

**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

#### • 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

#### • Tolerance

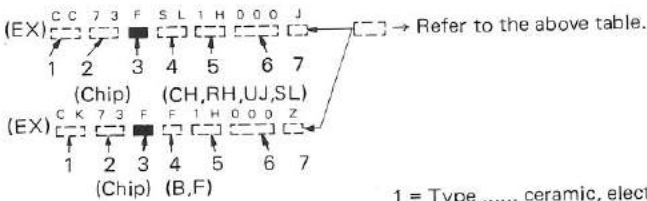
Code	C	D	G	J	K	M	X	Z	P	No code
(%)	± 0.25	± 0.5	± 2	± 5	± 10	± 20	+ 40 - 20	+ 80 - 20	+ 100 - 0	10μF-10~+50 4.7μF-10~+75

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	-	

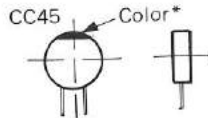
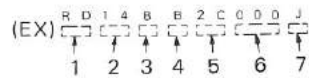
#### • Chip capacitors



#### • Chip resistor (Carbon)



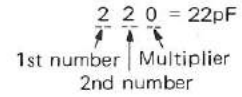
#### • Carbon resistor (Normal type)



#### • 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



Example CC45TH = -470±60 ppm/°C

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

#### Dimension

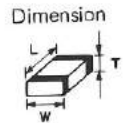
Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
E	3.2 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25

#### 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

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



Model	Destination	Switch unit	RF unit	IF unit	Tone unit	DTMF unit
TH-41A	K1, M1	X41-1590-12	X44-1640-11	X48-1410-12		
	M2, X		X44-1640-71	X48-1410-62		
TH-41AT	K2, M3	X41-1590-12	X44-1640-11	X48-1410-12		A09-0404-05
	M4		X44-1640-71	X48-1410-62		A09-0403-05
TH-41E	T	X41-1590-52	X44-1640-51	X48-1410-51	X41-1270-51	
	W	X41-1590-62	X44-1640-61	X48-1410-62	X41-1270-60	





PARTS LIST

PART. NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY										REFERENCE. NO		
			011	012	021	022	023	024	051	061	071				
E23-0458-04		TERMINAL (INSIDE)	2	2	2	2	2	2	2	2	2	2	2		
F10-1314-04	*	SHIELDING PLATE	1	1	1	1	1	1	1	1	1	1	1		
F19-0637-04	*	SWITCH MASK(A) HI/LO	1	1	1	1	1	1	1	1	1	1	1		
F19-0638-04	*	SWITCH MASK(B) OFFSET	1	1	1	1	1	1	1	1	1	1	1		
F20-0520-04	*	CUSHION(LITHIUM BATTERY TOP)	1	1	1	1	1	1	1	1	1	1	1		
F20-0538-04	*	INSULATING BOARD	1	1	1	1	1	1	1	1	1	1	1		
GL9PR24		LED	1	1	1	1	1	1	1	1	1	1	1		D 101
G13-0626-04	*	CUSHION MIC	1	1	1	1	1	1	1	1	1	1	1		
G13-0802-04	*	CUSHION FOR JUNCTION	2	2	2	2	2	2	2	2	2	2	2		
G13-0803-04	*	CUSHION(B) FOR PTT	1	1	1	1	1	1	1	1	1	1	1		
H01-4560-13	N*	CARTON(INSIDE) TH-41A 440MHZ	1	1											
H01-4561-13	N*	CARTON(INSIDE) TH-41AT 440MHZ			1										
H01-4560-13	N*	CARTON(INSIDE) TH-41A 440MHZ				1									
H01-4585-13	N*	CARTON(INSIDE) TH-41A 430MHZ					1								
H01-4561-13	N*	CARTON(INSIDE) TH-41AT 440MHZ						1							
H01-4586-13	N*	CARTON(INSIDE) TH-41AT 430MHZ							1						
H01-4576-13	N*	CARTON(INSIDE) TH-41E TRIO													
H01-4581-13	N*	CARTON(INSIDE) TH-41E KENWOOD													
H01-4585-13	N*	CARTON(INSIDE) TH-41A 430MHZ													
H10-2591-02	*	PACKING FIXTURE(TOP)	1	1	1	1	1	1	1	1	1	1	1		
H10-2592-02	*	PACKING FIXTURE(BOTTOM)	1	1	1	1	1	1	1	1	1	1	1		
H10-2598-02	*	PACKING FIXTURE(TOP)	1	1	1	1	1	1	1	1	1	1	1		
H25-0703-14	*	BAG(TH-41 BODY)140X190	1	1	1	1	1	1	1	1	1	1	1		
H25-0029-04	*	BAG(ACS) 60X110	1	1	1	1	1	1	1	1	1	1	1		
H25-0096-04	*	BAG(BATTERY) 100X110	1	1	1	1	1	1	1	1	1	1	1		
J25-3251-05		FLEXIBLE PC BOARD RF-IF	1	1	1	1	1	1	1	1	1	1	1		
J32-0785-04		ROUND BOSS M2X6	2	2	2	2	2	2	2	2	2	2	2		
J39-0409-14	*	MIC SPACER	1	1	1	1	1	1	1	1	1	1	1		
J69-0306-04		HAND STRAP (ACS)	1	1	1	1	1	1	1	1	1	1	1		
J69-0309-05		O RING AF.5QL	2	2	2	2	2	2	2	2	2	2	2		
K27-0468-04		PUSH KNOB(A) TONE	1	1	1	1	1	1	1	1	1	1	1		
K27-0469-04		PUSH KNOB(B) +5KHZ	1	1	1	1	1	1	1	1	1	1	1		
K29-3012-04		KNOB(A) AF	1	1	1	1	1	1	1	1	1	1	1		
K29-3013-04		KNOB(B) SQL	1	1	1	1	1	1	1	1	1	1	1		
K29-3014-04		PTT LEVER	1	1	1	1	1	1	1	1	1	1	1		Q 3 X 1
LR40872		IC	1	1	1	1	1	1	1	1	1	1	1		
L78-0010-05		CRISTAL 3.58MHZ	1	1	1	1	1	1	1	1	1	1	1		
N09-0683-05		SPECIAL SCREW M2 X4	2	2	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	1	1		
N33-2005-45		ROUND FLAT SCREW(CASE:TOP)	3	3	3	3	3	3	3	3	3	3	3		
N33-2008-45		ROUND FLAT SCREW(PANEL)	1	1	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	2	2		
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	5	5	5	5	5	5	5	5	5	5	5		R 1, 2, 3, 4, 5
RD73FB2A154J		CHIP RES. 150KOHM 1/10W	1	1	1	1	1	1	1	1	1	1	1		R 6
R12-3449-05		TRIM.POT. 10K OHM	1	1	1	1	1	1	1	1	1	1	1		VR 1
T07-0235-05		SPEAKER (ACS)	1	1	1	1	1	1	1	1	1	1	1		
T18-0054-05		EARPHONE	1	1	1	1	1	1	1	1	1	1	1		
T90-0341-05	N	HERICAL ANTENNA(ACS)	1	1	1	1	1	1	1	1	1	1	1		

PARTS LIST

PART NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY										REFERENCE NO	
			011	012	021	022	023	024	051	061	071			
T91-0312-15		ELECTRIC CONDENSER MIC	1	1	1	1	1	1	1	1	1	1		
W09-0334-05		BATTERY CHARGER ASS'Y 120V	1											
W09-0335-05		BATTERY CHARGER ASS'Y 220V		1	1	1	1	1	1	1	1	1		
W09-0336-05		BATTERY CHARGER ASS'Y 240V												
W09-0335-05		BATTERY CHARGER ASS'Y 220V												
W09-0339-05		BATTERY CHARGER ASS'Y 240V	1	1	1	1	1	1	1	1	1	1		
W09-0333-05		NI-CD BATTERY ASS'Y												
X41-1590-12	N*	SWITCH UNIT	1	1	1	1	1	1	1	1	1	1		
X41-1590-52	N*	SWITCH UNIT												
X41-1590-62	N*	SWITCH UNIT												
X41-1590-12	N*	SWITCH UNIT												
X44-1640-11	N*	RF UNIT	1	1	1	1	1	1	1	1	1	1		
X44-1640-71	N*	RF UNIT												
X44-1640-11	N*	RF UNIT												
X44-1640-71	N*	RF UNIT												
X44-1640-51	N*	RF UNIT												
X44-1640-61	N*	RF UNIT												
X44-1640-71	N*	RF UNIT												
X48-1410-12	N*	IF UNIT	1	1	1	1	1	1	1	1	1	1		
X48-1410-62	N*	IF UNIT												
X48-1410-12	N*	IF UNIT												
X48-1410-62	N*	IF UNIT												
X48-1410-51	N*	IF UNIT												
X48-1410-62	N*	IF UNIT												
X52-1270-51	*	TFONE UNIT												
X52-1270-60	*	TFONE UNIT												
Z9A1037K(Q)		CHIP TR.												
Z9A1162(Y)		CHIP TR.												
Z9C2412K(Q)		CHIP TR.												
Z9C2712(GR)		CHIP TR.												

Item	Re-marks	Part No.
IC		2SC2714(Y) 2SC3121 LR40872 LVC517 MC3359P NJM4558M NJM555M TA7331F TC5081AP TC5082P TC9122P

Item	Re-marks	Part No.
Chip Diode		MA152WA 2SB698(E,F) 2SC2668(Y) 2SC2671(H) 2SC3101 2SC3019
TR		2SA1037K(Q) 2SA1037K(R) 2SA1162(GR) 2SA1162(Y)
Chip TR	N	2SC2412K(Q) 2SC2712(GR) 2SC2712(Y)

Item	Re-marks	Part No.
Diode		1N60A 1S1555 1S2588 1S5133
Vari-cap		BA282 MA856 MI301
Zener Diode		1S2208 MTZ6.8JB
LED		GL9PR24

PARTS LIST

SWITCH UNIT (X41-1590-XX) (-12 : K1,K2,M1,M2,M3,M4,X -52 : T -62 : W)

PART NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY				REFERENCE NO
			012	052	062		
CK73FB1H102K		CHIP CAP. 1000P 50V	14	14	14		R 1, 2, 3, 4, 5, 6, 7 8, 9, 10, 11, 12, 13, 14
L33-0682-05		CHOKO COIL	1	1	1		L 1
L92-0110-05		FERRITE CORE	1	1	1		L 2
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	1	1	1		R 3
RD73FB2A102J		CHIP RES. 1K OHM 1/10W	1	1	1		R 6
R05-3427-15		POTENTIOMETER 10K (B) WITH SW	1	1	1		VR 1
R05-3428-05		POTENTIOMETER 10K (B)	1	1	1		VR 2
R92-0670-05		CHIP RES. 0 OHM	3	3	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	1	1		S 3
S40-2446-05		PUSH SWITCH(NON LOCK)	1	1	1		S 4
S59-3401-05		THUMB WHEEL SWITCH	1	1	1		S 2
TC9122P		IC	1	1	1		Q 3
1SS133		DIODE	2	2	2		D 7, 8
2SC2412K(Q)		CHIP TR.	1	1	1		Q 2
2SC2712(Y)		CHIP TR.					Q 2

PARTS LIST

RF UNIT (X44-1640-XX) (-11 : K1,K2,M1,M3 -51 : T -61 : W -71 : M2,M4,X)

PART. NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY							REFERENCE. NO
			011	051	061	071				
BA282	DIODE		4	4	4	4				D 8, 9, 10, 11
BA282	DIODE									D 8, 10, 11, 21
CC45CH1H080D	CERAMIC	8P 50V	1	1	1	1				C 54
CC73FSL1H470J	CHIP CAP.	47P 50V	1	1	1	1				C 155
CC73FSL1H470J	CHIP CAP.	47P 50V	2							C 155, 156
CC73FSL1H680J	CHIP CAP.	68P 50V	3	3	3	3				C 156, 157, 158
CC73FSL1H680J	CHIP CAP.	68P 50V	2							C 157, 158
CC73FCH1H0R5C	CHIP CAP.	0.5P 50V	3							C 6, 21, 91
CC73FCH1H0R5C	CHIP CAP.	0.5P 50V	3							C 6, 91
CC73FCH1H070D	CHIP CAP.	7P 50V	5	5	5	5				C 29, 70, 71, 73, 98
CC73FSL1H101J	CHIP CAP.	100P 50V	1	1	1	1				C 165
CC73FCH1HR75C	CHIP CAP.	0.75P 50V	2							C 72, 117
CC73FCH1HR75C	CHIP CAP.	0.75P 50V	5	5	5	5				C 13, 72, 117
CC73FCH1H080D	CHIP CAP.	8P 50V	5	5	5	5				C 7, 14, 52, 118
CC73FCH1H010C	CHIP CAP.	1P 50V	1	1	1	1				C 28
CC73FCH1H100D	CHIP CAP.	10P 50V	6	6	6	6				C 30, 37, 92, 99, 103, 109
CC73FCH1H020C	CHIP CAP.	2P 50V	2	2	2	2				C 16, 100
CC73FCH1H150J	CHIP CAP.	15P 50V	3	3	3	3				C 8, 53, 162
CC73FCH1H030C	CHIP CAP.	3P 50V	6	6	6	6				C 12, 23, 35, 42, 74, 164
CC73FCH1H220J	CHIP CAP.	22P 50V	4	4	4	4				C 3, 44, 87, 88
CC73FCH1H330J	CHIP CAP.	33P 50V	1	1	1	1				C 15
CC73FCH1H390J	CHIP CAP.	39P 50V	2	2	2	2				C 77, 78
CC73FCH1H040C	CHIP CAP.	4P 50V	3	3	3	3				C 1, 105, 116
CC73FCH1H050C	CHIP CAP.	5P 50V	6	6	6	6				C 5, 27, 49, 50, 51, 113
CC73FCH1H060D	CHIP CAP.	6P 50V	1							C 36
CC73FCH1H060D	CHIP CAP.	6P 50V	1							C 36, 104
CC73FTH1H220J	CHIP CAP.	22P 50V	1	1	1	1				C 68
CC73FTH1H470J	CHIP CAP.	47P 50V	1	1	1	1				C 67
CE04CWOJ100M	ELECTRO	10 6.3V	2	2	2	2				C 90, 134
CE04CW1A101M	ELECTRO	100 10V	2	2	2	2				C 139, 148
CE04CW1C100M	ELECTRO	10 16V	1	1	1	1				C 84
CE04CW1C4R7M	ELECTRO	4.7 16V	2	2	2	2				C 46, 163
CE04CW3V2R2M	ELECTRO	2.2 35V	1	1	1	1				C 95
CE04CW3H010M	ELECTRO	1 50V	1	1	1	1				C 122
CE04CW1C470M	ELECTRO	47 16V	1	1	1	1				C 121
CK73FB1H102K	CHIP CAP.	1000P 50V	65	65	65	65				C 4, 9, 10, 11, 19, 20, 22
CK73FB1H102K	CHIP CAP.	1000P 50V								C 24, 25, 26, 31, 32, 33, 34
CK73FB1H102K	CHIP CAP.	1000P 50V								C 38, 39, 40, 41, 43, 43, 47
CK73FB1H102K	CHIP CAP.	1000P 50V								C 59, 69, 75, 76, 81, 82, 83
CK73FB1H102K	CHIP CAP.	1000P 50V								C 85, 89, 93, 94, 96, 97, 106
CK73FB1H102K	CHIP CAP.	1000P 50V								C 107, 108, 110, 111, 112, 114, 115
CK73FB1H102K	CHIP CAP.	1000P 50V								C 120, 127, 129, 130, 131, 132, 135
CK73FB1H222K	CHIP CAP.	2200P 50V	1	1	1	1				C 140, 141, 142, 143, 144, 145, 146
CK73FB1H472K	CHIP CAP.	4700P 50V	2	2	2	2				C 147, 149, 150, 151, 152, 153, 159
CK73FB1E103K	CHIP CAP.	0.01 25V	13	13	13	13				C 160, 161
CK73FB1H471K	CHIP CAP.	470P 50V	1	1	1	1				C 80
CK73FB1E223K	CHIP CAP.	0.022 25V	1	1	1	1				C 101, 102
C05-0318-05	TRIMMER	6PF	6	6	6	6				C 18, 55, 56, 57, 58, 60, 61
C05-0319-05	TRIMMER	10PF	5	5	5	5				C 62, 63, 64, 65, 66, 137
C05-0326-05	TRIMMER	10PF	1	1	1	1				C 79
C05-0327-05	TRIMMER	20PF	1	1	1	1				C 21
C05-0328-05	TRIMMER	50P	4	4	4	4				TC 1, 2, 3, 6, 7, 9

PARTS LIST

PART NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY						REFERENCE NO
			011	051	061	1071			
C90-2012-05		ELECTRO 100 10V	1	1	1	1		C 123	
C90-0891-05		TANTALUM 4.7 16V	1	1	1	1		C 136	
E13-0165-05		RCA RECEPTACLE ANT J	1	1	1	1		J 1	
F11-0873-04	*	SHIELD COVER (VCO)	1	1	1	1			
LVC517		IC	1	1	1	1		Q 19	
L19-0355-05	N	WIDE BAND TRANS 6.5T	1	1	1	1		L 34	
L32-0637-05	N	OSCILLATING COI	4	4	4	4		L 20, 21, 22, 23	
L34-2328-05	N	TUNING COIL 21.6MHZ	1	1	1	1		L 10	
L34-1053-05	N	COIL 4T	1	1	1	1		L 3	
L34-2329-05	N	TUNING COIL 14.0MHZ	2	2	2	2		L 26, 27	
L34-1059-05	N	COIL 3 VCO 2.5T	1	1	1	1		L 4	
L34-2230-05	N	TUNING COIL	1	1	1	1		L 31	
L34-1083-05	N	COIL 1.25T	2	2	2	2		L 16, 18	
L34-1100-05	N	COIL 3 1.75T	1	1	1	1		L 5, 11	
L34-1102-05	N	COIL 3 1.75T	1	1	1	1		L 1	
L34-1101-05	N	COIL 3 1.5T	7	7	7	7		L 6, 7, 8, 9, 12, 36, 37	
L34-1103-05	N	COIL 3 2.25T	5	5	5	5		L 13, 14, 15, 17, 35	
L34-1107-05	N	COIL 3 2.25T	1	1	1	1		L 2	
L34-1112-05	N	COIL 2 9.33T	1	1	1	1		L 19	
L40-1092-17	N	INDUCTOR 1UH	1	1	1	1		L 33	
L40-3391-17	N	INDUCTOR 3.3UH	1	1	1	1		L 32	
L40-1501-17	N	INDUCTOR 15UH	1	1	1	1		L 29	
L40-4701-17	N	INDUCTOR 47UH	1	1	1	1		L 30	
L40-1011-17	N	INDUCTOR 100UH	2	2	2	2		L 28, 38	
L40-2282-17	N	INDUCTOR 0.22UH	1	1	1	1		L 40	
L71-0247-05	N	MCF 21.6MHZ	1	1	1	1		F 1	
L77-1241-05	N	XTAL 6.826MHZ	1	1	1	1		X 1	
L77-1249-05	N	XTAL 47.222MHZ TX(+5MHZ)	1	1	1	1		X 5	
L77-1247-05	N	XTAL 46.844MHZ TX(+1.6MHZ)	1	1	1	1		X 5	
L77-1245-05	N	XTAL 45.822MHZ TX(-7.6MHZ)	1	1	1	1		X 5	
L77-1248-05	N	XTAL 46.111MHZ TX(-5MHZ)	1	1	1	1		X 5	
L77-1250-05	N	XTAL 45.377MHZ RX(S)	1	1	1	1		X 2	
L77-1242-05	N	XTAL 44.266MHZ RX(S)	1	1	1	1		X 2	
L77-1252-05	N	XTAL 48.333MHZ TX(+5MHZ)	1	1	1	1		X 3	
L77-1244-05	N	XTAL 44.444MHZ RX(+1.6MHZ)	1	1	1	1		X 3	
L77-1246-05	N	XTAL 46.488MHZ TX(-1.6MHZ)	1	1	1	1		X 3	
L77-1249-05	N	XTAL 47.222MHZ TX(+5MHZ)	1	1	1	1		X 3	
L77-1251-05	N	XTAL 47.777MHZ TX(S)	1	1	1	1		X 4	
L77-1243-05	N	XTAL 46.666MHZ TX(S)	1	1	1	1		X 4	
L92-0110-05		FERRITE CORE	1	1	1	1		L 39	
MA152WA		CHIP DIODE	2	2	2	2		D 15, 18	
MA856		DIODE	5	5	5	5		D 4, 5, 6, 7, 13	
MI301		DIODE	1	1	1	1		D 2	
RD73FB2A101J		CHIP RES. 100 OHM 1/10W	5	5	5	5		R 21, 75, 76, 93, 94	
RD73FB2A221J		CHIP RES. 220 OHM 1/10W	1	1	1	1		R 59	
RD73FB2A222J		CHIP RES. 2.2KOHM 1/10W	3	3	3	3		R 50, 61, 63	
RD73FB2A151J		CHIP RES. 150 OHM 1/10W	1	1	1	1		R 29	
RD73FB2A153J		CHIP RES. 15K OHM 1/10W	2	2	2	2		R 55, 96	
RD73FB2A331J		CHIP RES. 330 OHM 1/10W	3	3	3	3		R 17, 30, 88	
RD73FB2A183J		CHIP RES. 18K OHM 1/10W	1	1	1	1		R 45	
RD73FB2A272J		CHIP RES. 2.7KOHM 1/10W	3	3	3	3		R 1, 5, 70	
RD73FB2A104J		CHIP RES. 100KOHM 1/10W	1	1	1	1		R 69	

PARTS LIST

PART-NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY					REFERENCE NO
			011	051	061	071		
RD73FB2A332J		CHIP RES. 3.3KOHM 1/10W	3	3	3	3	R 11, 67, 79	
RD73FB2A223J		CHIP RES. 22K OHM 1/10W	2	2	2	2	R 83, 90	
RD73FB2A154J		CHIP RES. 150KOHM 1/10W	1	1	1	1	R 74	
RD73FB2A472J		CHIP RES. 4.7KOHM 1/10W	5	5	5	5	R 2, 4, 78, 82, 89	
RD73FB2A724J		CHIP RES. 220KOHM 1/10W	1	1	1	1	R 84	
RD73FB2A330J		CHIP RES. 33 OHM 1/10W	1	1	1	1	R 6	
RD73FB2A471J		CHIP RES. 470 OHM 1/10W	3	3	3	3	R 13, 47, 52	
RD73FB2A273J		CHIP RES. 27K OHM 1/10W	1	1	1	1	R 44	
RD73FB2A274J		CHIP RES. 270KOHM 1/10W	1	1	1	1	R 51	
RD73FB2A821J		CHIP RES. 820 OHM 1/10W	3	3	3	3	R 8, 46, 66	
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	4	4	4	4	R 53, 85, 86, 95	
RD73FB2A334J		CHIP RES. 330KOHM 1/10W	1	1	1	1	R 60	
RD73FB2A2R2J		CHIP RES. 2.2 OHM 1/10W	2	2	2	2	R 25, 97	
RD73FB2A562J		CHIP RES. 5.6KOHM 1/10W	8	8	8	8	R 35, 36, 37, 38, 54, 71, 92, 102	
RD73FB2A100J		CHIP RES. 10 OHM 1/10W	1	1	1	1	R 23	
RD73FB2A563J		CHIP RES. 56K OHM 1/10W	1	1	1	1	R 10	
RD73FB2A220J		CHIP RES. 22 OHM 1/10W	1	1	1	1	R 27	
RD73FB2A122J		CHIP RES. 1.2KOHM 1/10W	2	2	2	2	R 39, 56	
RD73FB2A822J		CHIP RES. 8.2KOHM 1/10W	2	2	2	2	R 42, 43	
RD73FB2A470J		CHIP RES. 47 OHM 1/10W	4	4	4	4	R 3, 19, 20, 22	
RD73FB2A560J		CHIP RES. 56 OHM 1/10W	1	1	1	1	R 72	
RD73FB2A103J		CHIP RES. 10K OHM 1/10W	8	8	8	8	R 49, 57, 58, 64, 80, 81, 87, 91	
RD73FB2A680J		CHIP RES. 68 OHM 1/10W	1	1	1	1	R 26	
RD73FB2A152J		CHIP RES. 1.5KOHM 1/10W	1	1	1	1	R 14	
R92-0670-05		CHIP RES. 0 OHM	3	3	3	3	R 98, 99, 103	
S50-1425-05		TACT SWITCH PTT	1	1	1	1	S 1	
TC5082P		IC	1	1	1	1	Q 12	
TC5081AP		IC	1	1	1	1	Q 13	
1S5133		DIODE	3	3	3	3	D 17, 20, 22	
1S5133		DIODE	1	1	1	1	D 16, 17, 19, 20, 22	
1S1555		DIODE	1	1	1	1	D 1	
1S2588		DIODE	1	1	1	1	D 3	
1S2208		VOLTAGE VARIABLE	2	2	2	2	D 12, 14	
2SA1037K(Q)		CHIP TR.	2	2	2	2	Q 20, 26	
2SA1162(Y)		CHIP TR.	2	2	2	2	Q 20, 26	
2SA1037K(R)		CHIP TR.	2	2	2	2	Q 22, 24	
2SA1162(GR)		CHIP TR.	1	1	1	1	Q 22, 24	
2SB698(E,F)		TR	1	1	1	1	Q 18	
2SC2714(Y)		CHIP TR.	2	2	2	2	Q 4, 9	
2SC3121	N	CHIP TR.	2	2	2	2	Q 14, 15	
2SC2668(Y)		TR	3	3	3	3	Q 10, 11, 17	
2SC2671(CH)		TR	6	6	6	6	Q 1, 2, 3, 5, 6, 16	
2SC3019		TR	1	1	1	1	Q 7	
2SC2412K(Q)		CHIP TR.	4	4	4	4	Q 21, 23, 25, 27	
2SC3101		TR	1	1	1	1	Q 8	
2SC2712(Y)		CHIP TR.	1	1	1	1	Q 21, 23, 25, 27	

PARTS LIST

IF UNIT (X48-1410-XX) (-12 : K1,K2,M1,M3 -51 : T -62 : M2,M4,X,W)

PART. NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY				REFERENCE NO
			012	051	062		
CC73FCH1H270J		CHIP CAP. 27P 50V	1	1	1		C 3
CC73FSL1H101J		CHIP CAP. 100P 50V	5	5	5		C 2, 16, 36, 37, 38
CC73FSL1H151J		CHIP CAP. 150P 50V	1	1	1		C 9
CC73FSL1H391J		CHIP CAP. 390P 50V	1	1	1		C 47
CE04CWOJ330M		ELECTRO 33 6.3V	1	1	1		C 43
CE04CWA100M		ELECTRO 10 10V	2	2	2		C 40, 52
CE04CW1E3R3M		ELECTRO 3.3 25V	1	1	1		C 33
CE04CW1H010M		ELECTRO 1 50V	1	1	1		C 34
CE04CW1V2R2M		ELECTRO 2.2 35V	3	3	3		C 19, 21, 44
CK45BH102K		CERAMIC 1000P 50V	1	1	1		C 1, 64
CK45BH102K		CERAMIC 1000P 50V	1	2	2		C 7, 12, 14, 15, 20, 29, 30
CK73FB1H102K		CHIP CAP. 1000P 50V	20	20	20		C 31, 32, 35, 42, 49, 50, 51
CK73EB1H273K		CHIP CAP. 0.027 50V	1	1	1		C 23
CK73FB1H102K		CHIP CAP. 1000P 50V	4	4	4		C 60, 61, 62, 63
CK73FB1H102K		CHIP CAP. 1000P 50V	1	3	3		C 60, 62, 63
CK73FB1H272K		CHIP CAP. 2700P 50V	1	1	1		C 45
CK73FF1E473Z		CHIP CAP. 0.047 25V	3	3	3		C 4, 8, 11
CK73FB1H682K		CHIP CAP. 6800P 50V	1	1	1		C 46
CK73FB1E223K		CHIP CAP. 0.022 25V	2	2	2		C 13, 17
C90-0888-05		TANTALUM 0.1 16V	1	1	1		C 39
C90-0889-05		TANTALUM 0.22 16V	1	1	1		C 10
C90-2006-05		TANTALUM 0.33 16V	1	1	1		C 48
C90-0894-05		TANTALUM 0.47 16V	1	1	1		C 18
C90-2007-05		TANTALUM 3.3 16V	1	1	1		C 22
C90-2012-05		ELECTRO 100 10V	3	3	3		C 25, 26, 28
C90-0891-05		TANTALUM 4.7 16V	1	1	1		C 24
C91-0488-05		CERAMIC 0.1	2	2	2		C 5, 6
C91-0430-05		LAYER CAP. 0.047	1	1	1		C 41
C91-1035-05		FILM CAP. 0.22 63V	1	1	1		C 27
E11-0420-05		MIC JACK	1	1	1		J 2
E11-0421-05		PHONE JACK	1	1	1		J 1
L34-2217-05		TUNING COIL 455KHZ	1	1	1		L 1
L72-0335-05		CERAMIC FILTER CFU-435E	1	1	1		F 1
L77-1253-05	N	XTAL 21.145MHZ	1	1	1		X 1
MA152WA		CHIP DIODE	1	1	1		D 4
MC3359P		IC	1	1	1		Q 1
MTZ6.8JB		ZENER DIODE 6.8V	1	1	1		D 3
NJM4558M		IC	1	1	1		Q 6
RD73FB2A102J		CHIP RES. 1K OHM 1/10W	3	3	3		R 14, 16, 19
RD73FB2A152J		CHIP RES. 1.5KOHM 1/10W	1	1	1		R 29
RD73FB2A473J		CHIP RES. 47K OHM 1/10W	4	4	4		R 18, 36, 38, 39
RD73FB2A222J		CHIP RES. 2.2KOHM 1/10W	4	4	4		R 4, 26, 33, 34
RD73FB2A154J		CHIP RES. 150KOHM 1/10W	1	1	1		R 13
RD73FB2A273J		CHIP RES. 27K OHM 1/10W	1	1	1		R 35
RD73FB2A470J		CHIP RES. 47 OHM 1/10W	1	1	1		R 12
RD73FB2A104J		CHIP RES. 100KOHM 1/10W	1	1	1		R 10
RD73FB2A822J		CHIP RES. 8.2KOHM 1/10W	1	1	1		R 5
RD73FB2A334J		CHIP RES. 330KOHM 1/10W	1	1	1		R 6
RD73FB2A103J		CHIP RES. 10K OHM 1/10W	4	4	4		R 1, 7, 8, 27
RD73FB2A101J		CHIP RES. 100 OHM 1/10W	1	1	1		R 11



PARTS LIST

PART NO	NOTE	NAME & DESCRIPTION	DISTINCTION & QUANTITY			REFERENCE NO
			012	051	062	
RD73FB2A223J		CHIP RES. 22K OHM 1/10W	6	6	6	R / 2, 3, 22, 23, 24, 37
RD73FB2A221J		CHIP RES. 220 OHM 1/10W	2	2	2	R / 25, 32
RD73FB2A333J		CHIP RES. 33K OHM 1/10W	2	2	2	R / 21, 28
R12-3449-05		TRIM.POT. 10K OHM	1	1	1	VR / 1
R90-0526-05		RESISTOR BLOCK 27K OHM X4	1	1	1	RB / 1
S31-1414-05		SLIDE SWITCH TXSTOP,KEYLOOK	1	1	1	S / 1
S31-2409-05		SLIDE SWITCH OFFSET	1	1	1	S / 2
TA7331F	N	IC	1	1	1	Q / 2
1N60A		DIODE	2	2	2	D / 1, 2
1SS133		DIODE	1	1	1	D / 5
2SA1037K(Q)		CHIP TR.	1	1	1	Q / 7
2SA1162(Y)		CHIP TR.	1	1	1	Q / 7
2SB698(E,F)		TR	1	1	1	Q / 3
2SC2412K(Q)		CHIP TR.	3	3	3	Q / 4, 5, 8
2SC2712(Y)		CHIP TR.	3	3	3	Q / 4, 5, 8

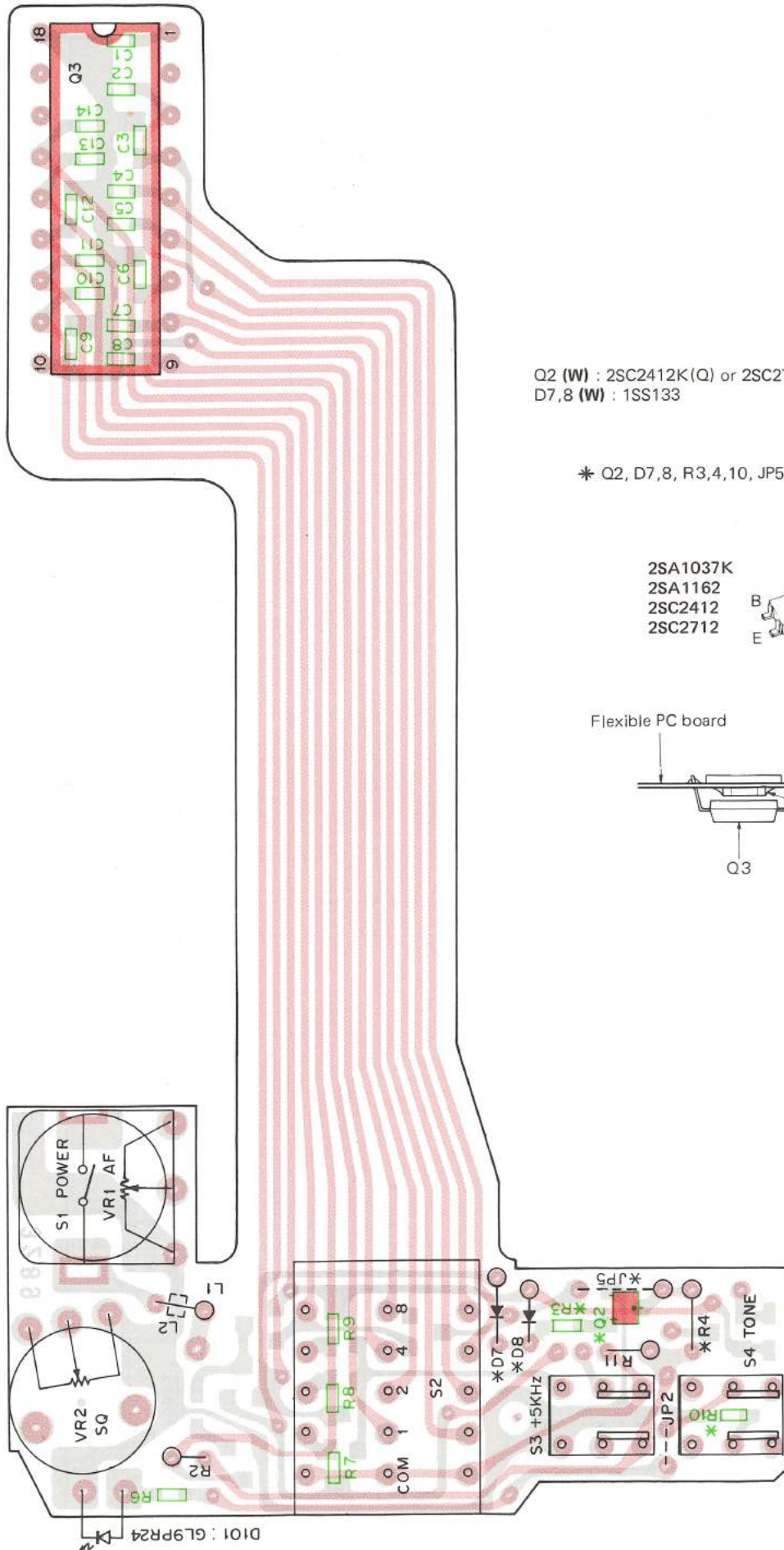
TONE UNIT (X52-1270-XX) (-51 : T -60 : W)

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

# TH-41A/AT/E PC BOARD VIEW

SWITCH UNIT (X41-1590-XX)

(-12 : K1,K2,M1,M2,M3,M4,X -52 : T -62 : W) Component side view



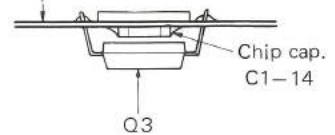
Q2 (W) : 2SC2412K(Q) or 2SC2712(Y) Q3 : TC9122P  
D7,8 (W) : 1SS133

\* Q2, D7,8, R3,4,10, JP5 : W TYPE ONLY

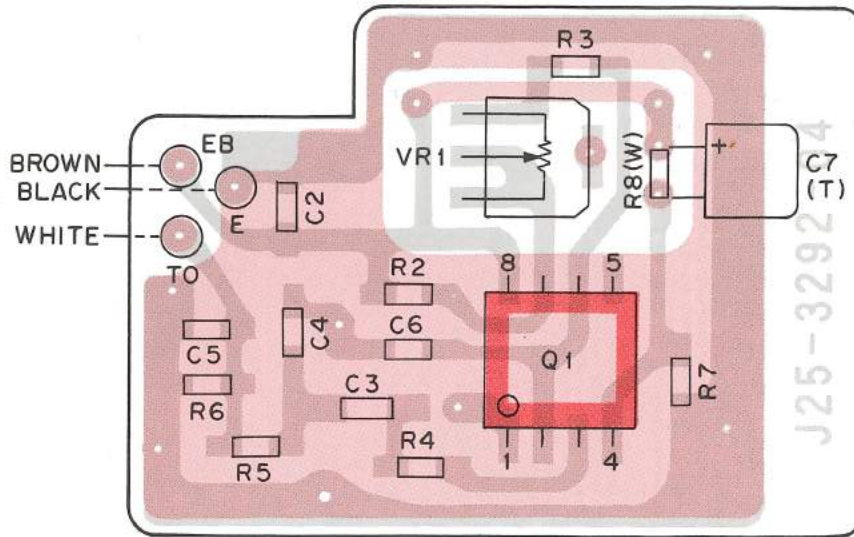
2SA1037K  
2SA1162  
2SC2412  
2SC2712



Flexible PC board

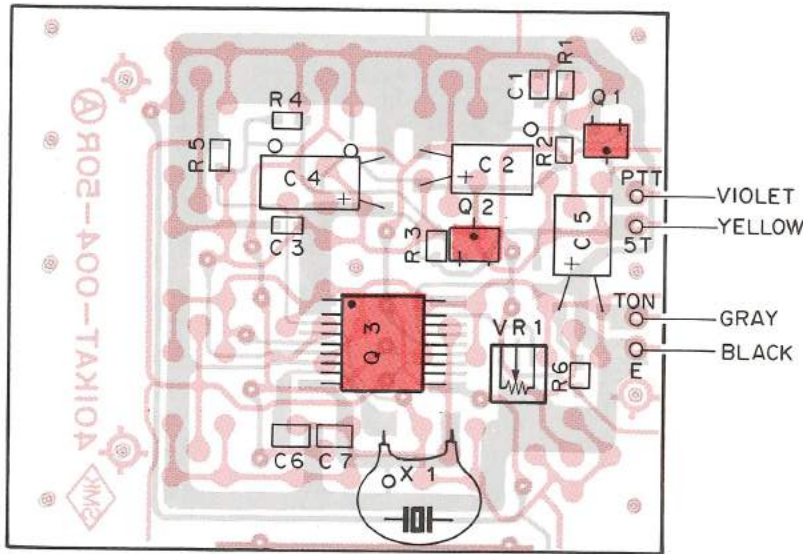


TONE UNIT (X52-1270-XX) (-51 : T -60 : W) Foil side view



Q1 : NJM555M

DTMF UNIT (TH-41AT ONLY) Foil side view



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

Q2 : 2SA1037K(Q) or 2SA1162(Y)

Q3 : LR40872

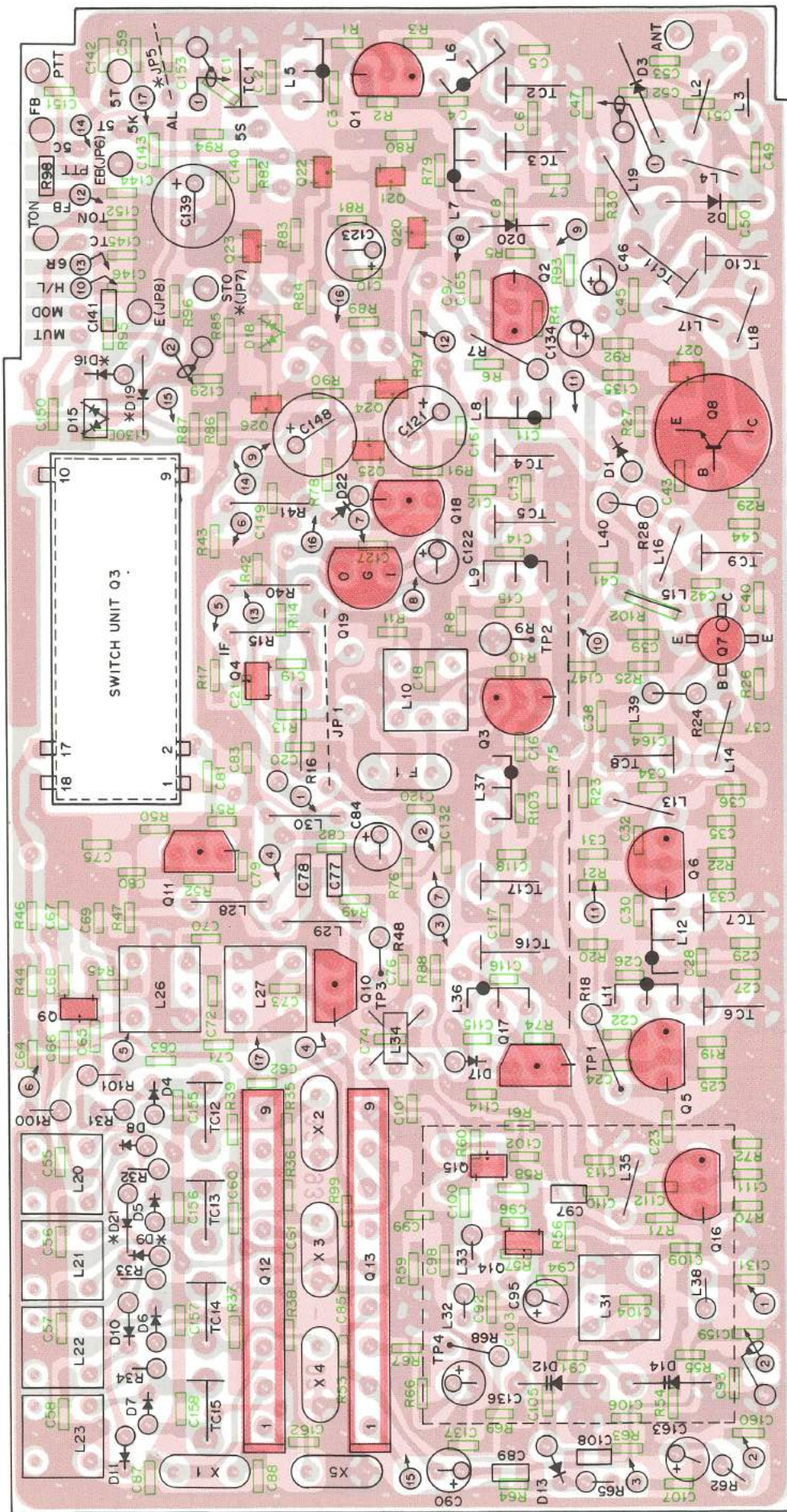
CASE (TOP) ASS'Y (A09-0403-05) WITH DTMF : M4

(A09-0404-05) WITH DTMF : K2,M3

Parts No.	Remarks	Description	Q'ty	Ref. No.
A02-0703-01	N*	Case (Top) 440MHz KENWOOD : K2,M3		
A02-0704-01	N*	Case (Top) 430MHz KENWOOD : M4		
B42-2344-08	*	Key board plate	1	
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		IC	1	Q3
L78-0010-05		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

# TH-41A/AT/E PC BOARD VIEW

RF UNIT (X44-1640-XX) (-11 : K1,K2,M1,M3 -51 : T -61 : W -71 : M2,M4,X) Component side view



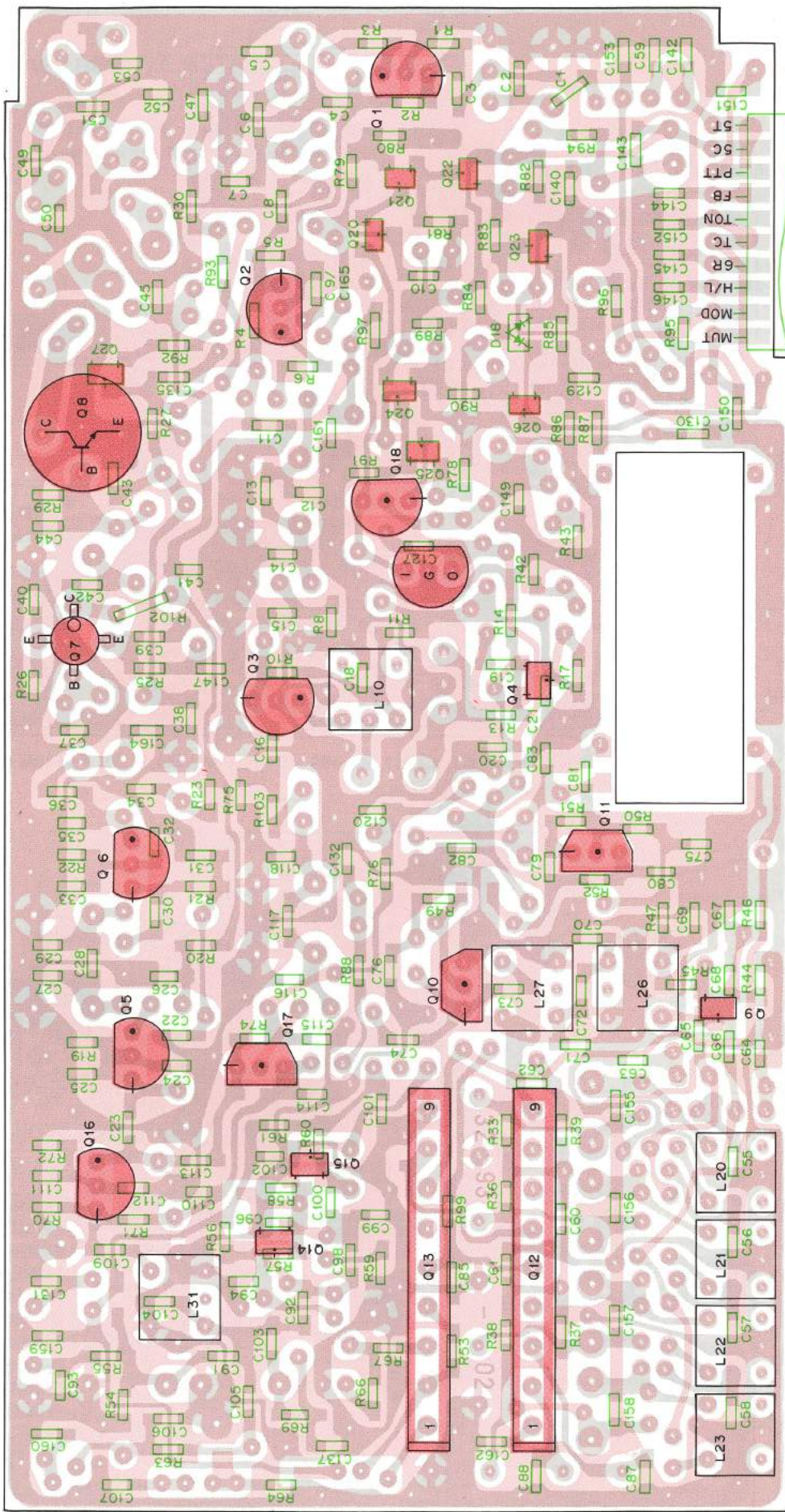
- Q1-3,5,6,16 : 2SC2671(H) Q4,9 : 2SC2714(Y) Q7 : 2SC3019 Q8 : 2SC3101 Q10,11,17 : 2SC2668(Y) Q12 : TC5082P Q13 : TC5081AP Q14,15 : 2SC3121  
 Q18 : 2SB698(E,F) Q19 : LVC517 Q20,26 : 2SA1037K(O) or 2SA1162(Y) Q21,23,25,27 : 2SC2412K(O) or 2SC2712(Y) Q22,24 : 2SA1037K(R) or 2SA1162(G)  
 D1 : 1S1555 D2 : MI301 D3 : 1S2588 D4-7,13 : MA856 D8,10,11 : BA282 D9 (K1,K2,M2,M3,M4,X,W) : BA282 D12,14 : 1S2208 D15,18 : MA152WA  
 D16,19 (W) : 1SS133 D17,20,22 : 1SS133 D21 (T) : BA282

	D9	D16,19	D21	JP5	JP7
K1,K2,M1,M3	O	X	X	X	O
M2,M4,X	O	X	X	X	O
T	X	X	O	X	X
W	O	O	O	O	X

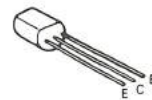
O : Used, X : Not used



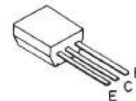
RF UNIT (X44-1640-XX) (-11 : K1,K2,M1,M3 -51 : T -61 : W -71 : M2,M4,X) Foil side view



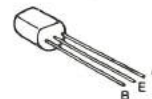
2SB698



2SC2668



2SC2671



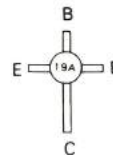
2SC3101



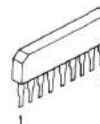
LVC517



2SC3019



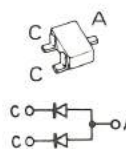
TC5081AP  
TC5082P



2SA1037K  
2SA1162  
2SC2412K  
2SC2712  
2SC2714  
2SC3121



MA152WA



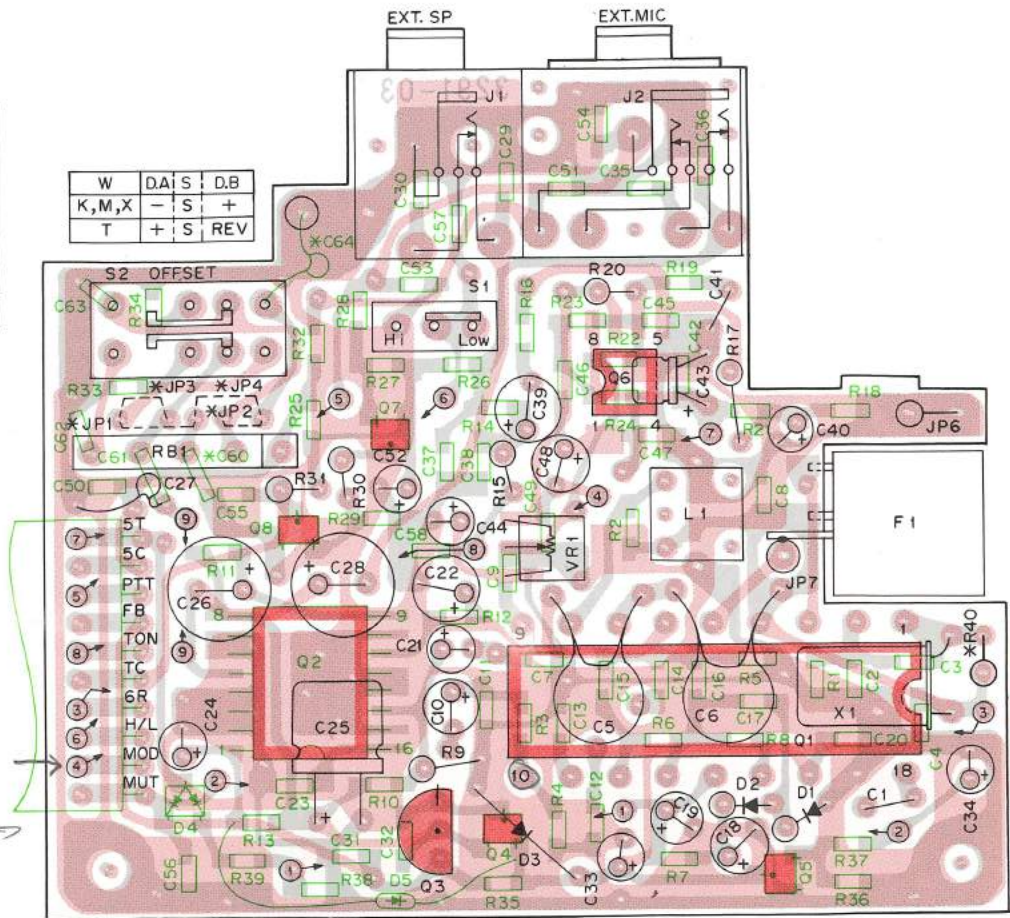
# TH-41A/AT/E PC BOARD VIEWS

IF UNIT (X48-1410-XX) (-12 : K1,K2,M1,M3 -51 : T -62 : M2,M4,X,W) Component side view

	K1,K2, M1,M3	M2,M4, X,W	T
R40	○	X	X
C60	○	○	X
C64	X	X	○
JP1,2	○	○	X
JP3,4	X	X	○

○ : Used, X : Not used

W	DA	S	D.B
K,M,X	-	S	+
T	+	S	REV



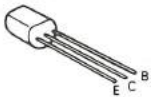
- Q1 : MC3359P
- Q2 : TA7331F
- Q3 : 2SB698(E,F)
- Q4,5,8 : 2SC2412K(Q) or 2SC2712(Y)
- Q6 : NJM4558M
- Q7 : 2SA1037K(Q) or 2SA1162(Y)

- D1,2 : 1N60A
- D3 : MTZ6.8JB
- D4 : MA152WA
- D5 : 1SS133

AFSK IN  
AFSK OUT  
Q Pin 10

IF UNIT (X48-1410-XX) (-12 : K1,K2,M1,M3 -51 : T -62 : M2,M4,X,W) Foil side view

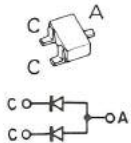
2SB698



2SA1037K  
2SA1162  
2SC2412K  
2SC2712



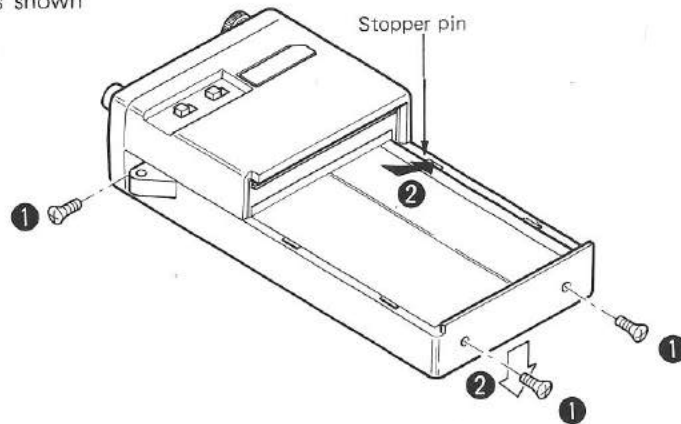
MA152WA



## DISASSEMBLY

### TOP CASE REMOVE METHOD

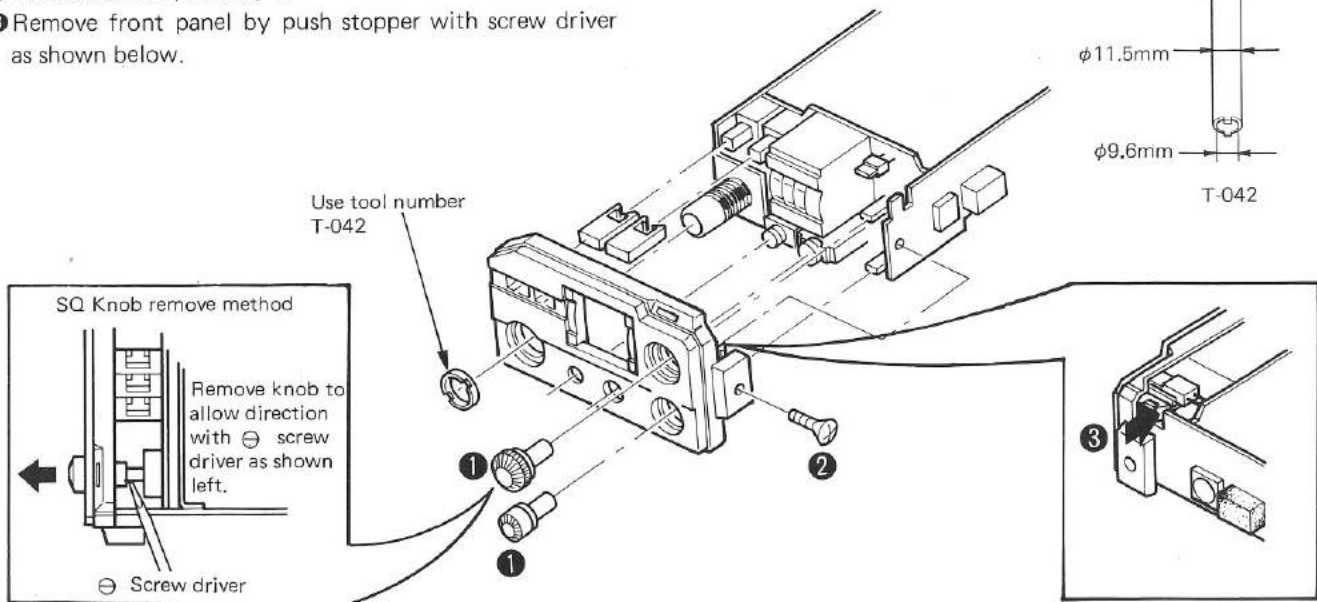
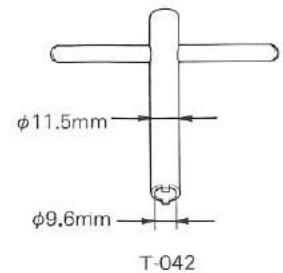
- ① Remove screw (M2 x 5) 3.
- ② Remove front case as allow mark direction holding the stopper pin with something, ⊖ screw driver as shown right.



### FRONT PANEL REMOVE METHOD

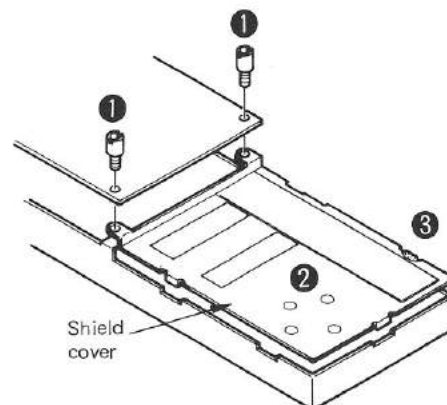
- ① Remove screw on RCA connector and AF, SQ knob.
- ② Remove screw (M2 x 8) 1.
- ③ Remove front panel by push stopper with screw driver as shown below.

#### TOOL

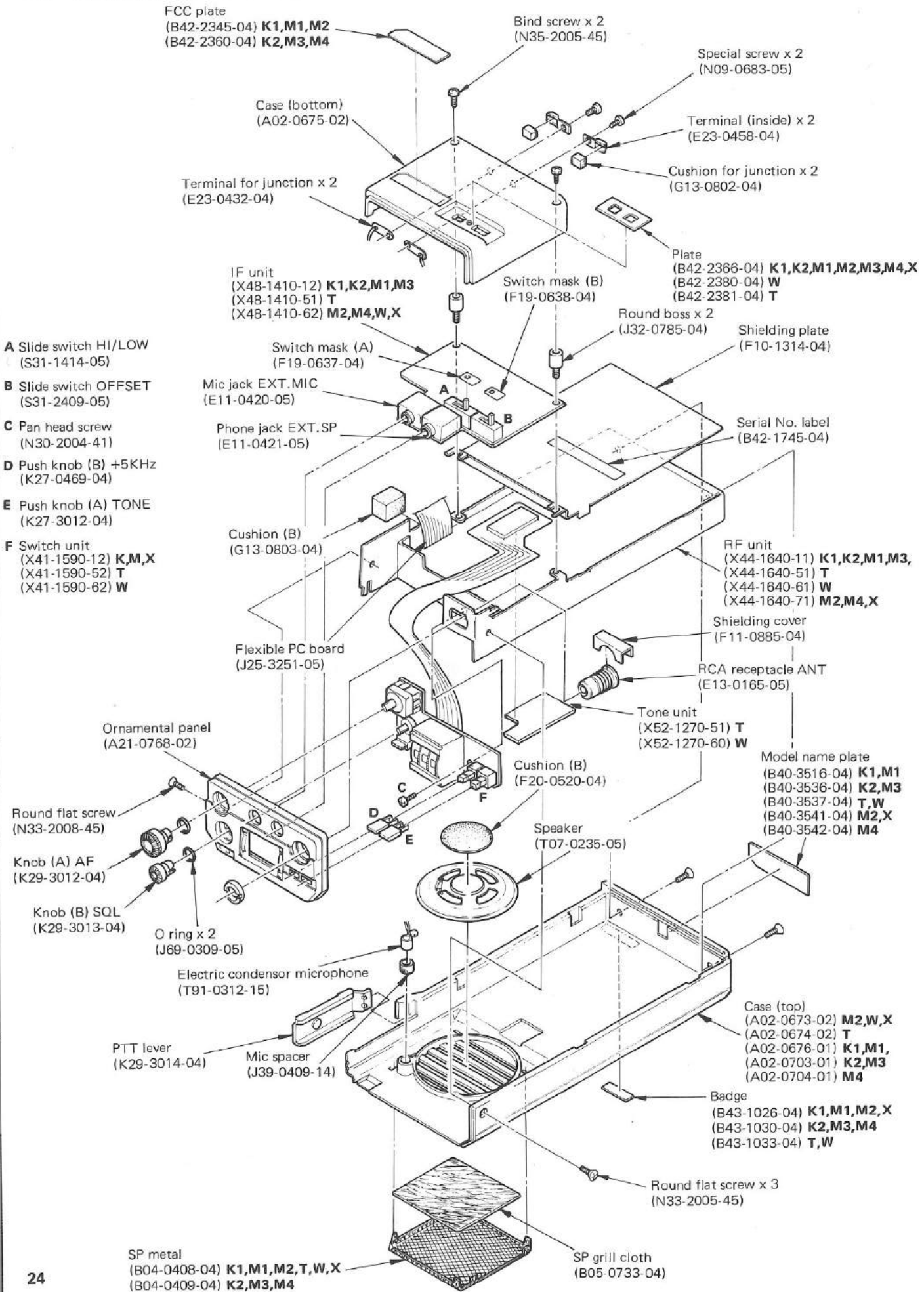


### SHIELD COVER REMOVE METHOD

- ① Remove the top boss which tightened the IF unit.
- ② Remove solder at four spots with solder wick.
- ③ Remove solder heating spot with soldering iron.

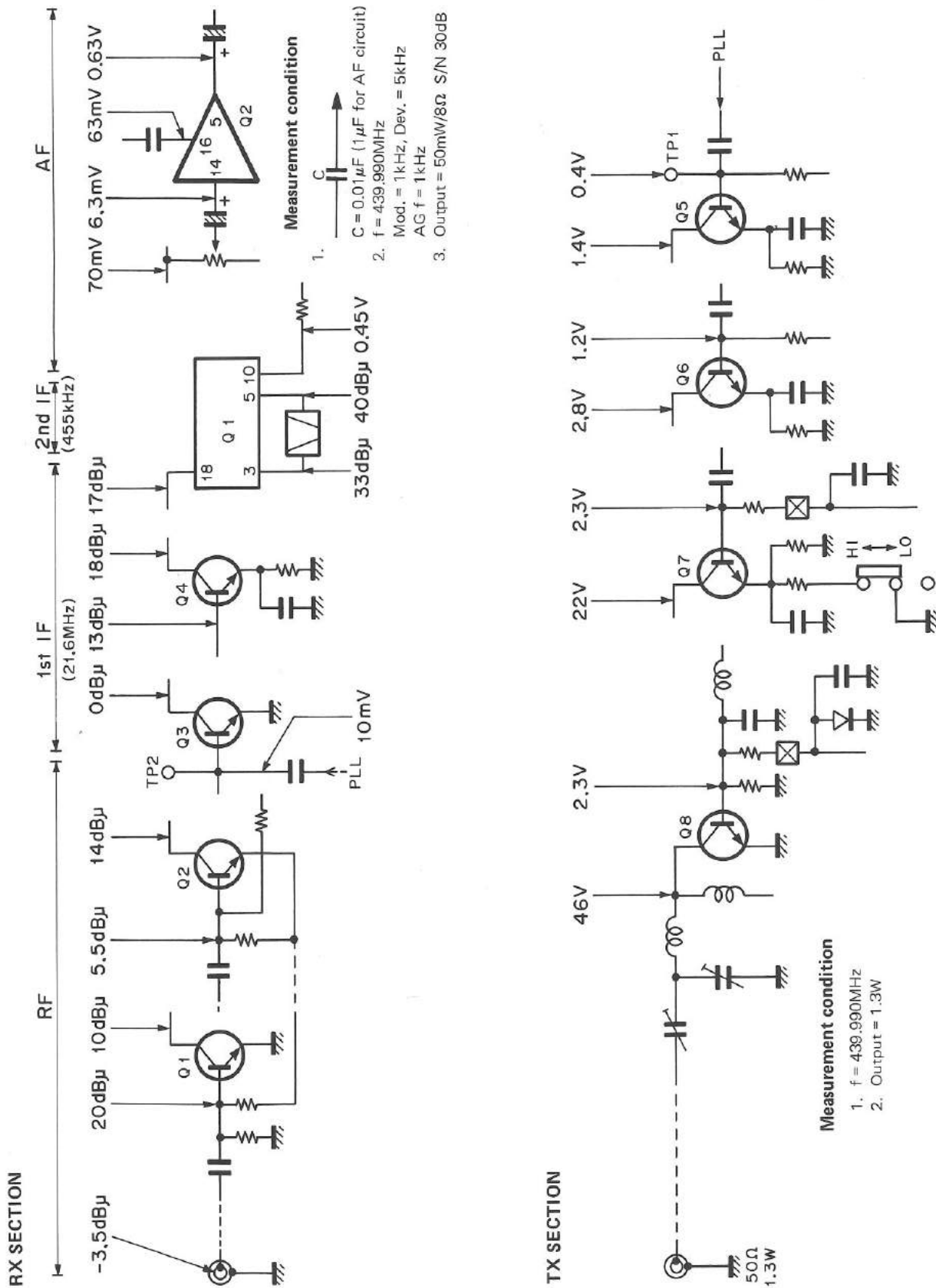


# TH-41A/AT/E DISASSEMBLY





LEVEL DIAGRAM



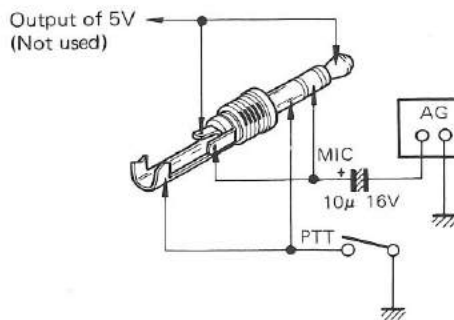
## ADJUSTMENT

### 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.



MODEL AJ-3

BNC-J

RCA

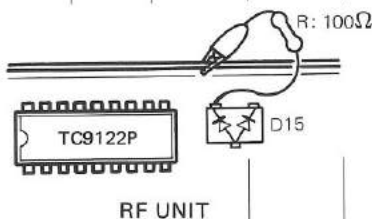


### TX/RX Section (Common)

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 L27 slug all the way inside.	RFVTVM	RF	TP3	RF	L26, 27	MAX Repeat couple times.	Approx. 17mVrms
	2) Connect D15 cathode to GND via 100Ω resistor as shown right. Repeat each on TX/RX.							
2. PLL voltage setting	1) f = 430.00MHz (M2,M4,T,W,X) f = 440.00MHz (K,M,M3)	DC V.M	RF	TP4	RF	L31	1.1V	±0.1V
	2) Transmit						Confirm	1.6V (M2,M4,T,W,X) 1.2V (K,M,M3) ±0.2V
	3) f = 439.99MHz (M2,M4,T,W,X) f = 449.99MHz (K,M1,M3)							4V or less
	4) Transmit							4.1V or less

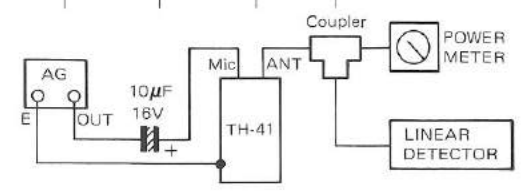
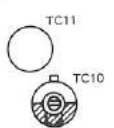


# ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Part	Method	
3. RX. f adjustment	1) OFFSET switch : "S" f = 435.00MHz <b>(M2,M4,T,W,X)</b> f = 445.00MHz <b>(K,M1,M3)</b>	f. counter	RF	TP2	RF	L20	413.400MHz <b>(M2,M4,T,W,X)</b> 423.400MHz <b>(K,M1,M3)</b> f-21.6MHz	±100Hz
	TC12					413.405MHz <b>(M2,M4,T,W,X)</b> 423.405MHz <b>(K,M1,M3)</b>		
	L21					415.000MHz (f-21.6)+1.6MHz		
	TC13					415.005MHz		
	2) +5kHz switch : ON							
	3) REV (T) only f = 435.00MHz OFFSET switch : "REV"							
	4) +5kHz switch : ON							

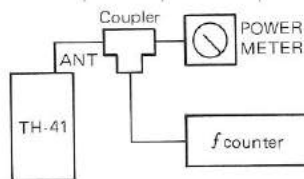
## TX Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Part	Method	
1. Power output adjustment	1) f = 430.00MHz <b>(M2,M4,T,W,X)</b> f = 440.00MHz <b>(K,M1,M3)</b> ANT : Connect a power meter HI/LO : HI Transmit Power supply : 7.2V	Power meter			RF	TC6, 7	MAX	
	2) f = 435.00MHz <b>(K2,M4,T,W,X)</b> f = 445.00MHz <b>(K,M1,M3)</b> TC10 Min position					TC8-11	MAX	1.2W or more 650mA or less
	3) f = 430.00MHz <b>(M2,M4,T,W,X)</b> f = 440.00MHz <b>(K,M2,M3)</b> HI/LO : HI HI/LO : LO						Confirm	1.0W or more 650mA or less
	4) f = 439.99MHz <b>(M2,M4,T,W,X)</b> f = 449.99MHz <b>(K,M1,M3)</b> HI/LO : HI HI/LO : LO							50mW or more 350mA or less
								1.0W or more 650mA or less
2. Deviation adjustment	1) ANT : Power meter and linear detector, use capacitor. 10µF/16V between AG output to MIC terminal f = 435.00MHz <b>(M2,M4,T,W,X)</b> f = 445.00MHz <b>(K,M1,M3)</b> AG : 1kHz, 50mV Transmit	Power meter Linear detector			IF	VR1	4.5kHz	4.5kHz±0.1kHz
	2) AG : 1kHz, 5mV						Confirm	3-3.5kHz



## ADJUSTMENT

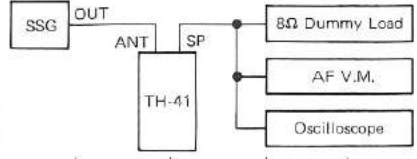
Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test- equipment	Unit	Ter- minal	Unit	Part	Method	
3. Tone encoder (K2,M3,M4) Type only	1) f = 435.00MHz (M4) f = 445.00MHz (K2,M3) Transmit Push the "3" and "6" key.				DTMF	VR1	3.0kHz	±0.5kHz
	2) Push the "2" and "3" key. Transmit		DTMF	T0			Confirm frq'	1471.9Hz±5Hz
	3) Push the "1" and "2" key.			T0			Confirm frq'	701.3Hz±5Hz
4. Tone (T,W) type only	1) (T) type only : Shorted C7 (Tone unit) Transmit Tone switch : ON				TONE	VR1	1750Hz	±17.5Hz
			TONE	T0			Confirm Dev'	2.5kHz or more
5. Option tone unit (TU-6) used (K,M,X)	1) Transmit Tone switch : ON Linear detector : LPF (3kHz) ON				(TU-6)	VR1	0.5kHz	0.5-0.6kHz
6. TX. f adjustment	1) f = 435.00MHz (M2,M4,T,W,X) f = 445.00MHz (K,M1,M3) OFFSET switch : "S" Transmit	Power meter f. counter			RF	L22	435.00MHz (M2,M4,T,W,X) 445.00MHz (K,M1,M3)	Within ±100Hz
	2) +5kHz switch : ON				TC14	435.005MHz (M2,M4,T,W,X) 445.005MHz (K,M1,M3)		
	3) f = 439.98MHz (M2,M4,X) f = 449.98MHz (K,M1,M3) OFFSET switch : "-" Transmit				L23	434.98MHz (M2,M4,X) 444.98MHz (K,M1,M3) (f-5MHz)		
	4) +5kHz switch : ON				TC15	434.985MHz (M2,M4,X) 444.985MHz (K,M1,M3)		
	5) f = 430.00MHz (M2,M4,X) f = 440.00MHz (K,M1,M3) OFFSET switch : "+" Transmit				L21	435.00MHz (M2,M4,X) 445.00MHz (K,M1,M3) (f + 5MHz)		
	6) +5kHz switch : ON				TC13	435.005MHz (M2,M4,X) 445.005MHz (K,M1,M3)		
	7) (W) type only f = 439.98MHz OFFSET switch : "D-A"				L23	432.380MHz (f-7.6MHz)		
	8) +5kHz switch : ON				TC15	432.385MHz		
	9) (W) type only f = 439.98MHz OFFSET switch : "D-B"				L21	438.380MHz (f-1.6MHz)		
	10) +5kHz switch : ON				TC13	438.385MHz		
	11) (T) type only f = 435.00MHz OFFSET switch : "+"				L23	436.600MHz (f + 1.6MHz)		
	12) +5kHz switch : ON				TC15	436.605MHz		



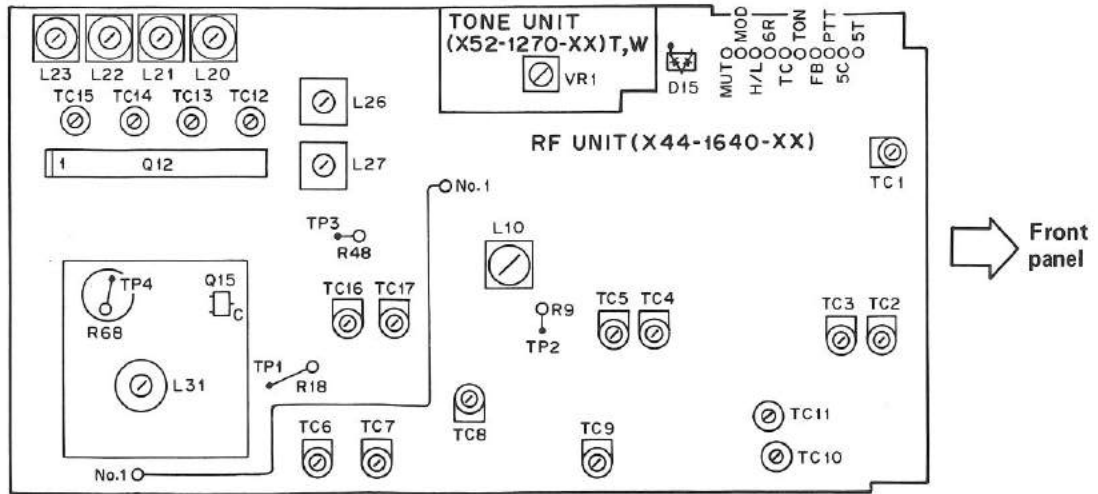
# ADJUSTMENT

## RX Section

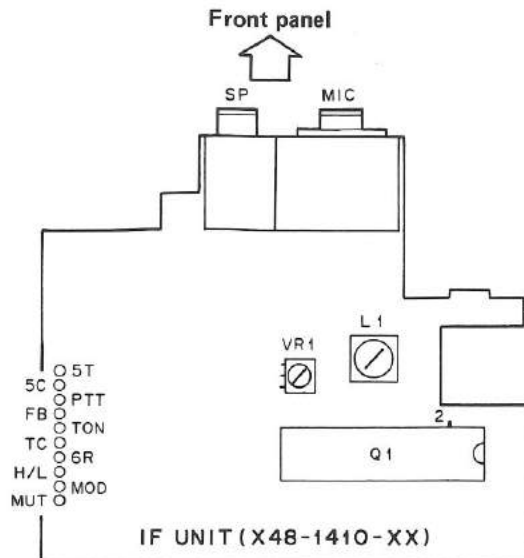
Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test-equipment	Unit	Terminal	Unit	Part	Method	
1. Sensitivity	1) f : any	f. counter	IF	Q1-2			Confirm	21.145MHz±320Hz
	2) SSG : 435.10MHz (M2,M4,T,W,X) 445.100MHz (K,M1,M3) -6dBμMOD : 1kHz DEV, 5kHz	SSG AF V.M Oscillo- scope 8Ω Dummy load		EXT.SP	RF	TC1- 5 TC17, 16 L10	MAX.	
	SSG : 0dBμ				IF	L1	MAX.	
S/N	3) f = 430.04, 435.10, 439.94MHz (M2,M4,T,W,X) f = 440.04, 445.10 449.94 MHz (K,M1,M3)						Confirm	S/N 26dB or more



## TOP VIEW



## BOTTOM VIEW

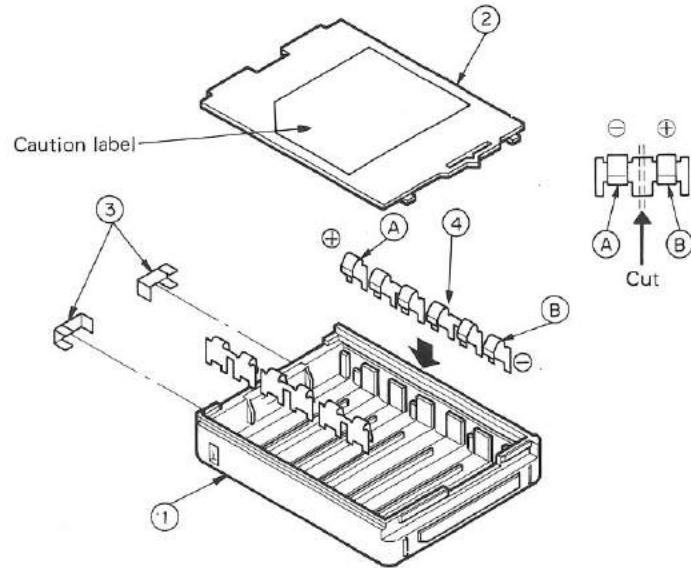


## BT-2 (AAA MANGANESE/ALKALINE BATTERY CASE)/ EB-2 (EXTERNAL C MANGANESE/ALKALINE BATTERY CASE)/ PB-21 (Ni-Cd BATTERY)

**BT-2 OUTSIDE VIEW**



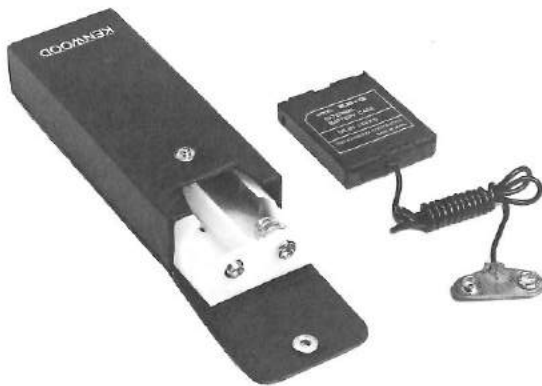
**BT-2 DISASSEMBLY**



**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**



**PB-21 OUTSIDE VIEW**



**EB-2 PARTS LIST**

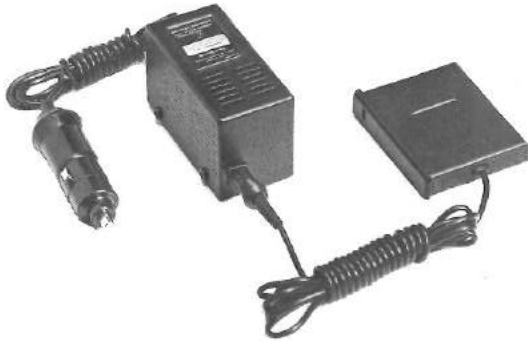
Parts No.	Re- marks	Description	Ref. No.
A02-0677-02	*	Battery case	
A02-0678-03	*	Battery case cover	
E23-0451-04		Terminal board (A) x 2	
E30-1793-05	N*	Cord ass'y	
H25-0103-04		Protective bag (Hard case)	
H25-0096-04		Protective bag (Battery case)	
J21-4154-04	N*	Fied plate (Cord bushing)	

**PB-21 SPECIFICATIONS**

Output voltage . . . . . 7.2V  
 Charging current . . . . . 36mA (ordinary charging for approx. 8hrs.)  
 Charging current . . . . . 180mA  
 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



### DC-21 SPECIFICATIONS

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

### SC-8T OUTSIDE VIEW



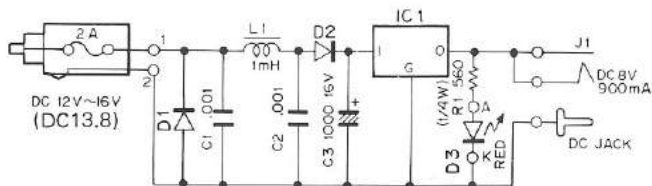
### DC-21 PARTS LIST

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

# HMC-1 (HEADSET WITH VOX)

## HMC-1 OUTSIDE VIEW



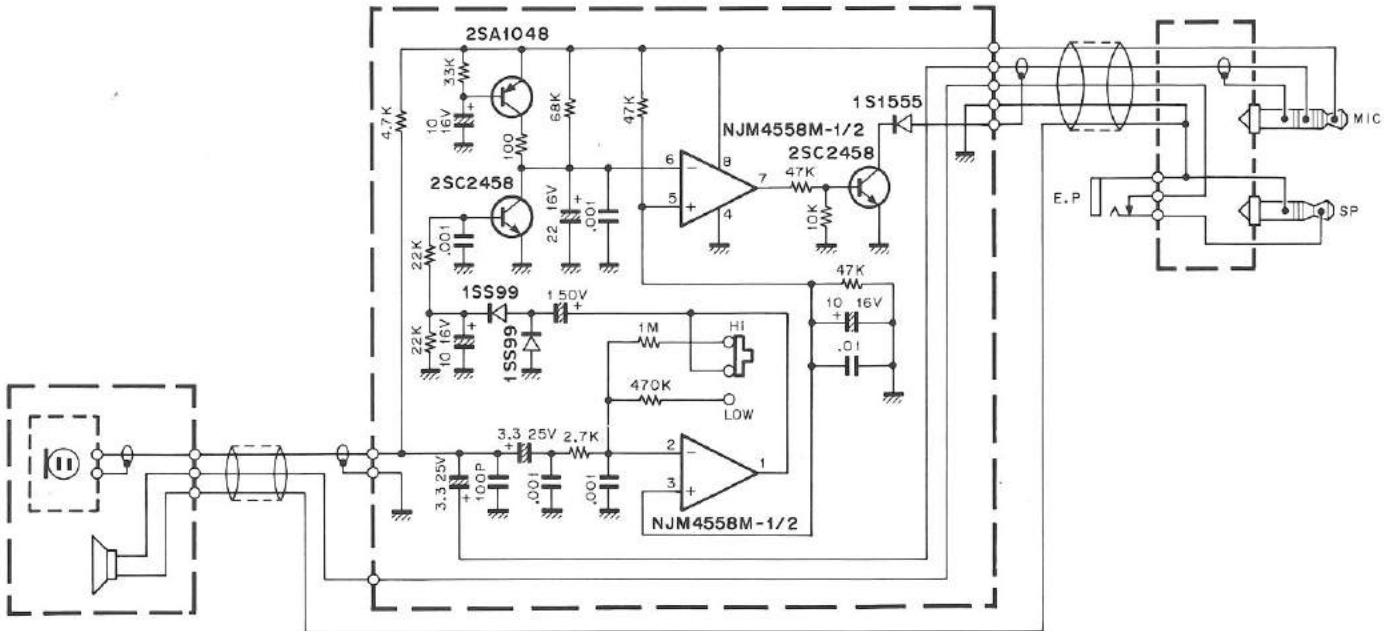
## HMC-1 PARTS LIST

Part NO.	Re- marks	Description	Ref. NO.
E30-1790-08		Cord with plug	
CK73FB1E103K		Chip cap. 0.01	C1,11
CK73FB1H102K		Chip cap. 0.001	C7,8
CC73FSL1H102K		Chip cap. 0.001	C13
RD73FB2A103J		Chip resistor, 10k $\Omega$	R1,13
RD73FB2A473J		Chip resistor, 47k $\Omega$	R2,3,12,14
RD73FB2A101J		Chip resistor, 100 $\Omega$	R4
RD73FB2A333J		Chip resistor, 33k $\Omega$	R5
RD73FB2A183J		Chip resistor, 18k $\Omega$	R6
RD73FB2A472J		Chip resistor, 4.7k $\Omega$	R7
RD73FB2A223J		Chip resistor, 22k $\Omega$	R8
RD73FB2A224J		Chip resistor, 220k $\Omega$	R9
RD73FB2A332J		Chip resistor, 3.3k $\Omega$	R11

## HMC-1 SPECIFICATIONS

Mic input sensitivity ..... 1.5mV (1kHz)  
 Delay time ..... Approx. 1.2 sec.  
 DC current ..... 3.5mA

## HMC-1 SCHEMATIC DIAGRAM





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

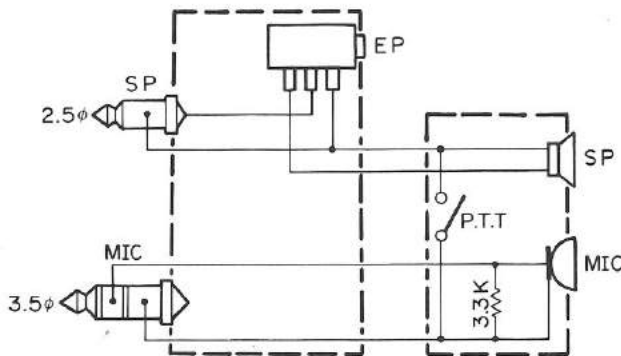
SMC-30 OUTSIDE VIEW



SMC-30 PARTS LIST

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

SMC-30 SCHEMATIC DIAGRAM

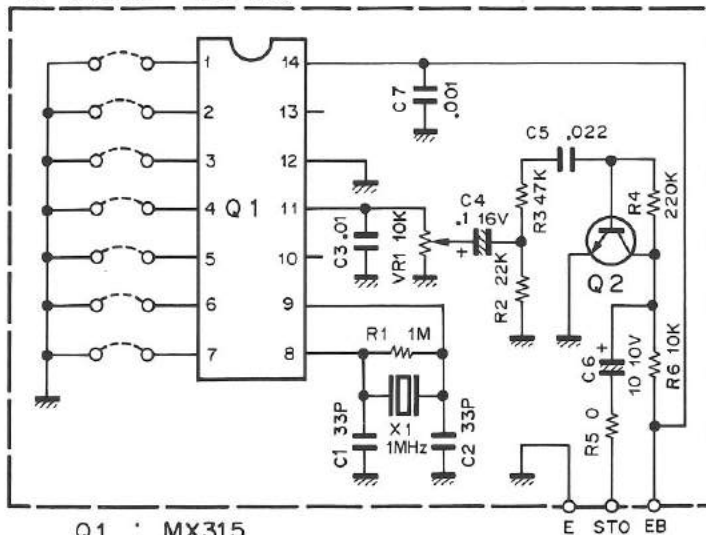


SMC-30 SPECIFICATIONS

- **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

TU-6 (X52-1320-10)



Q1 : MX315

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

2SC2412K  
2SC2714



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

### TU-6 SPECIFICATIONS

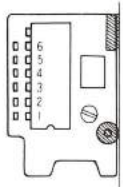
Oscillator frequency . . . . . 1MHz ± 0.1%  
 Usable frequency range . . . . . 37 EIA  
 Specification Group Frequencies  
 (67.0–250.3Hz)  
 Weight . . . . . 3g

### 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.



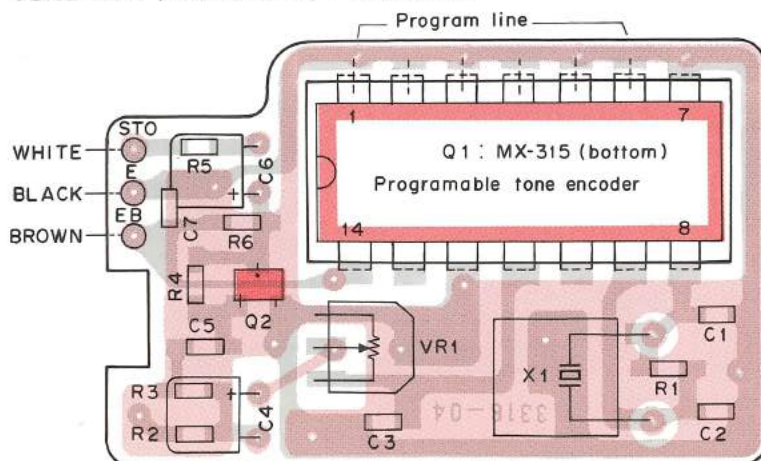
#	EIA Specification Group	Hz	Program Lines (ON...1, OFF...0)						#	EIA Specification Group	Hz	Program Lines (ON...1, OFF...0)					
			1	2	3	4	5	6				1	2	3	4	5	6
1	A	67.0	1	1	1	1	1	1	21	A	141.3	1	0	0	0	0	0
2	B	71.9	1	1	1	1	0	1	22	B	146.2	0	1	1	1	0	1
3	C	74.4	1	1	1	0	1	1	23	A	151.4	0	1	1	1	0	0
4	A	77.0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

### TU-6 PARTS LIST

Parts No.	Re- marks	Description	Ref. No.	Q'ty
<b>TU-6 GENERAL</b>				
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
<b>TONE UNIT (X52-1320-10)</b>				
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

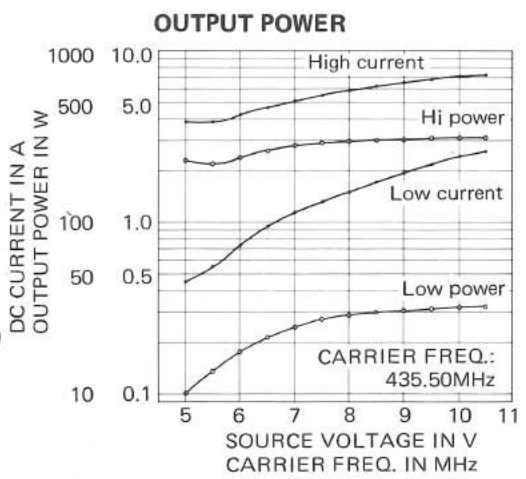
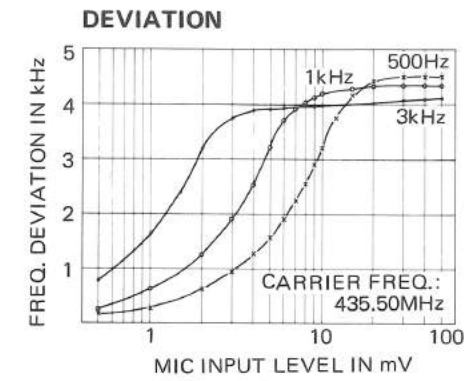
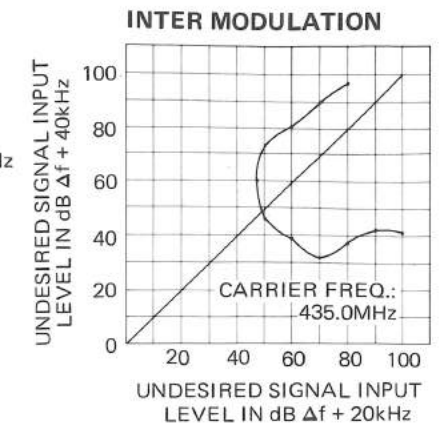
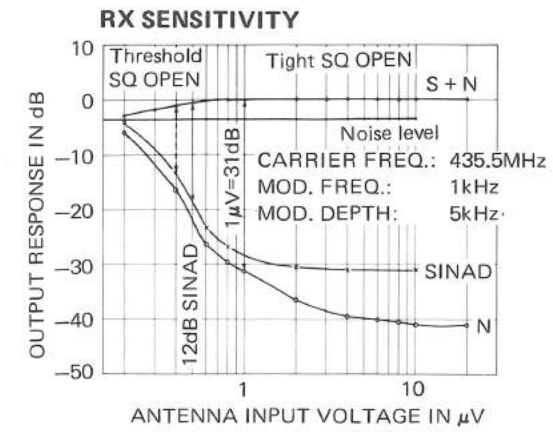
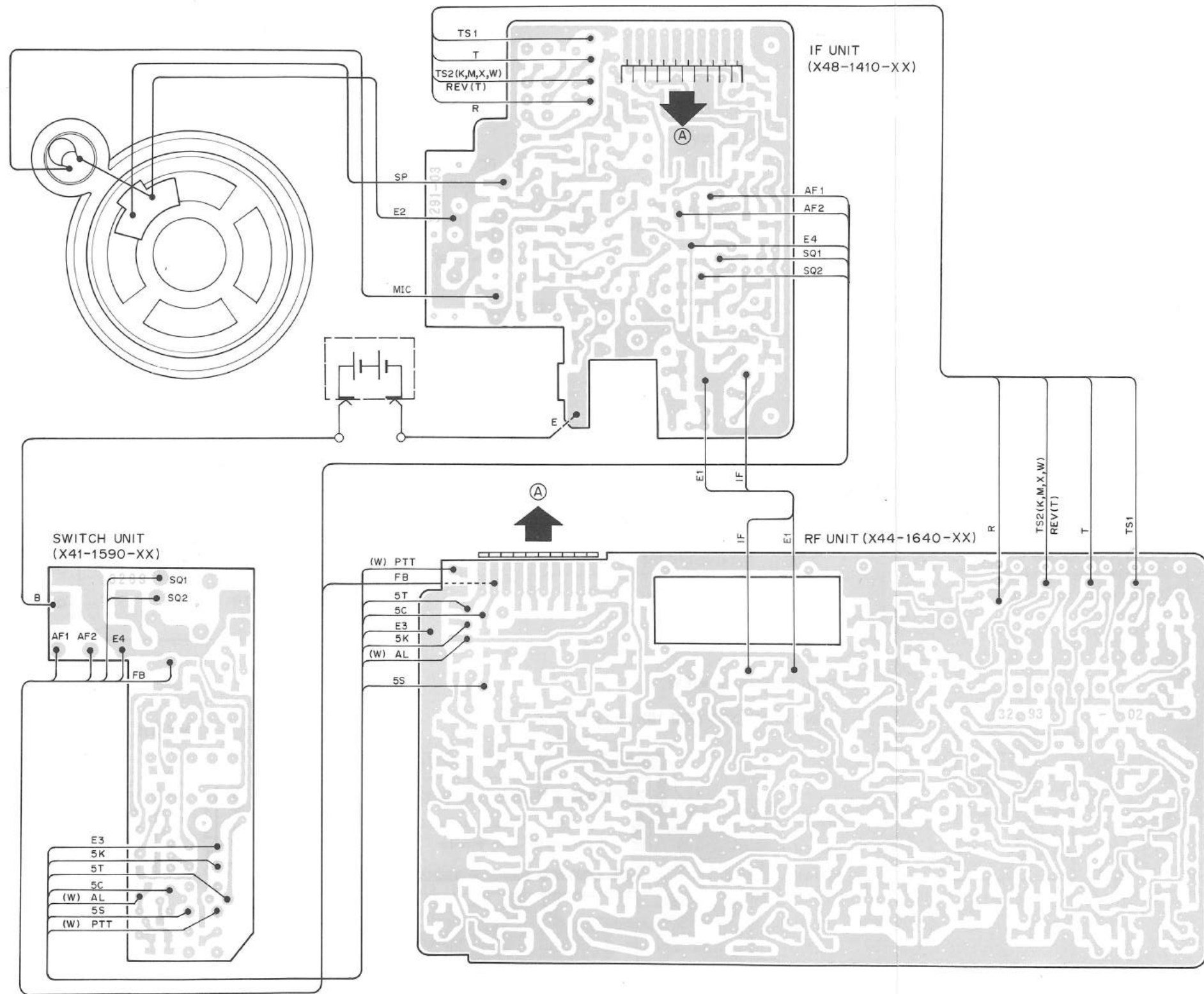


Q1 : MX315 Q2 : 2SC2412K(Q) or 2SC2712(Y)

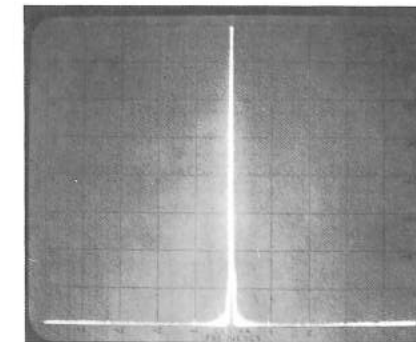
#### MX-315

8	1	14	Vdd
4	2	13	Tx ENABLE
2	3	12	Tx ENABLE
1	4	11	Tx OUTPUT
X	5	10	NC
y	6	9	XTAL
Vss	7	8	CLOCK

WIRING/REFERENCE DATA

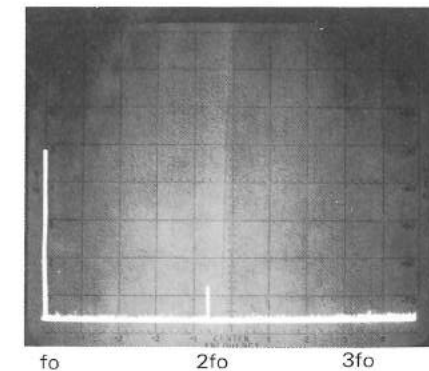


NEAR SPURIOUS RESPONSE



CARRIER FREQ.: 435.00MHz  
 RF POWER: 1.3W  
 SCAN WIDTH: 5MHz/DIV  
 BAND WIDTH: 30kHz  
 SCAN TIME: 0.5 SEC  
 VIDEO FILTER: 10kHz  
 INPUT ATT.: 0dB  
 LOG REF LEVEL: -18dBm  
 10dB/DIV

HARMONICS SPURIOUS RESPONSE

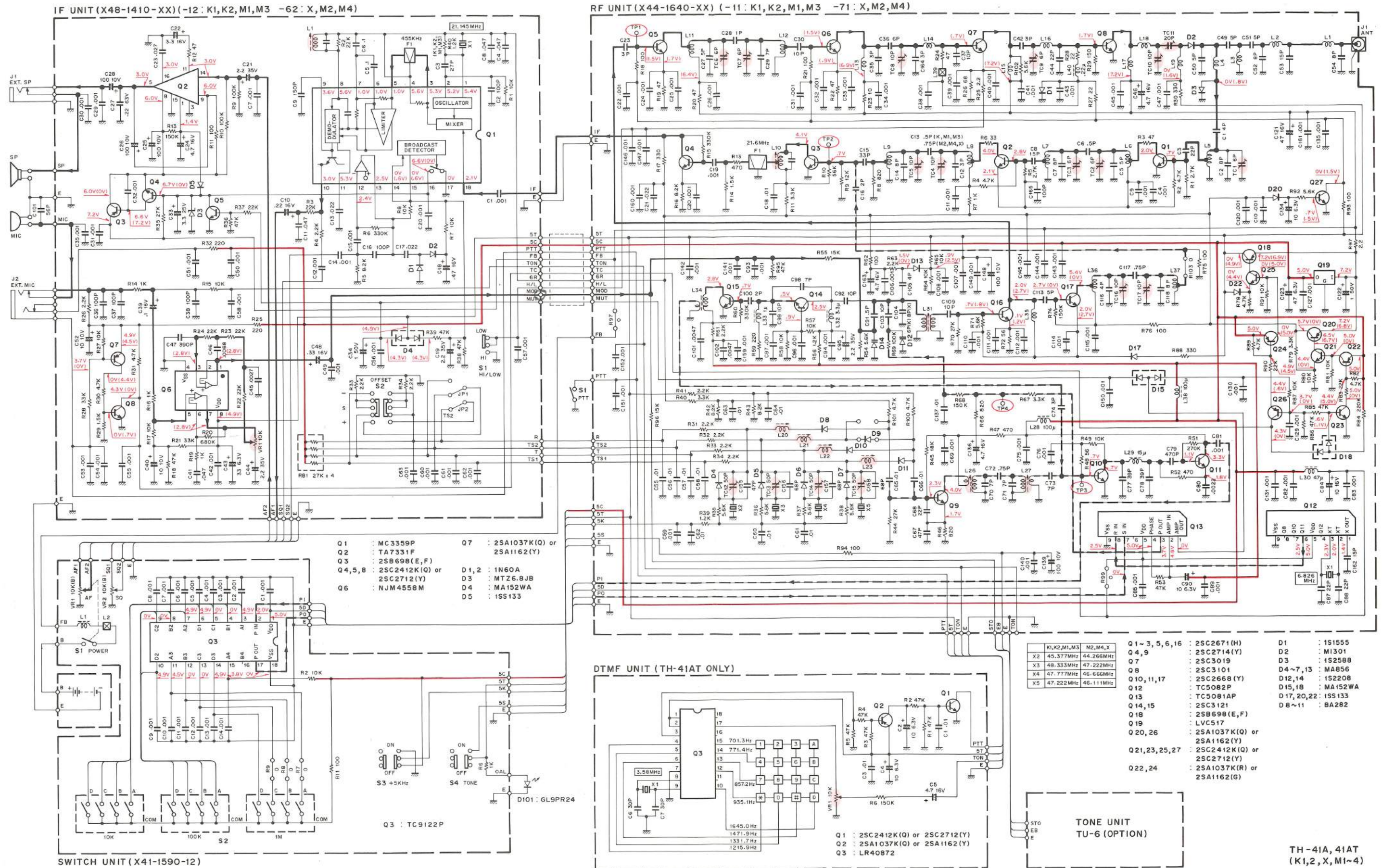


CARRIER FREQ.: 435.00MHz  
 RF POWER: 1.3W  
 SCAN WIDTH: 100MHz/DIV  
 BAND WIDTH: 30kHz  
 SCAN TIME: 2 SEC  
 VIDEO FILTER: 10kHz  
 INPUT ATT.: 0dB  
 LOG REF LEVEL: -18dBm  
 10dB/DIV

The fundamental signal is reduced by HPF.  
 ( $f_c$ : 550MHz)

# TH-41A/AT SCHEMATIC DIAGRAM

Signal line — Control line — Common DC line Voltage measurement conditions f = 439.99MHz, RX no signal. ( ): TX.



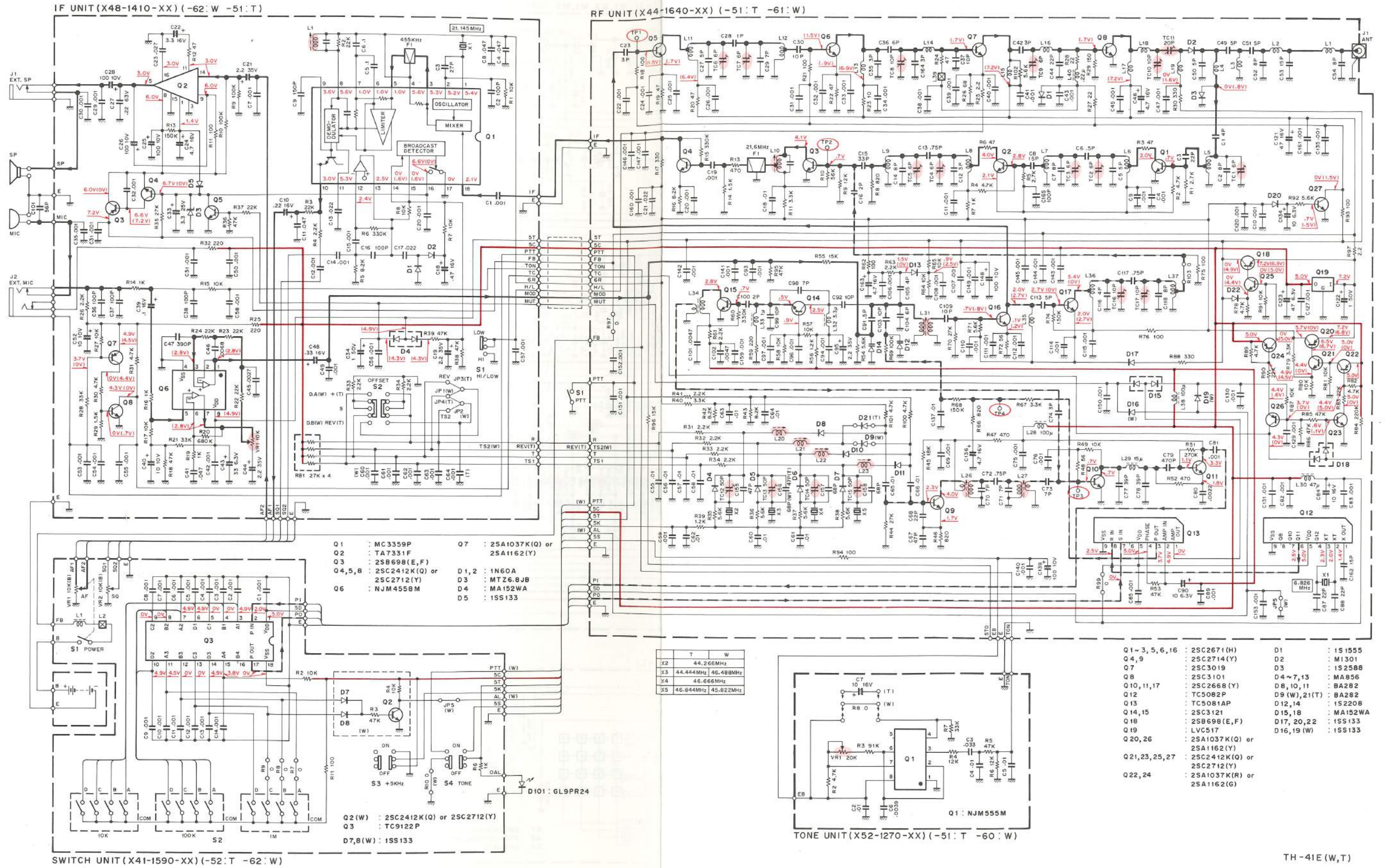
- Q1 : MC3359P
- Q2 : TA7331F
- Q3 : 2S8698(E,F)
- Q4,5,8 : 2SC2412(K) or 2SC2712(Y)
- Q6 : NJM4558M
- Q7 : 2SA1037K(Q) or 2SA1162(Y)
- D1,2 : 1N60A
- D3 : MT26.8JB
- D4 : MA152WA
- D5 : 1SS133

- |                |           |                  |                           |             |         |
|----------------|-----------|------------------|---------------------------|-------------|---------|
| K1, K2, M1, M3 | M2, M4, X | Q1 ~ 3, 5, 6, 16 | 2SC2671(H)                | D1          | 1S1555  |
| X2             | 45.377MHz | 44.266MHz        | 2SC2714(Y)                | D2          | M1301   |
| X3             | 48.333MHz | 47.222MHz        | 2SC3019                   | D3          | 1S2588  |
| X4             | 47.777MHz | 46.666MHz        | 2SC3101                   | D4 ~ 7, 13  | MA856   |
| X5             | 47.222MHz | 46.111MHz        | 2SC2668(Y)                | D12, 14     | 1S2208  |
|                |           |                  | TC5082P                   | D15, 18     | MA152WA |
|                |           |                  | TC5081AP                  | D17, 20, 22 | 1SS133  |
|                |           |                  | 2SC3121                   | D8 ~ 11     | BA282   |
|                |           |                  | 2S8698(E,F)               |             |         |
|                |           |                  | LVC517                    |             |         |
|                |           |                  | 2SA1037K(Q) or 2SA1162(Y) |             |         |
|                |           |                  | 2SC2412(K) or 2SC2712(Y)  |             |         |
|                |           |                  | 2SA1037K(R) or 2SA1162(G) |             |         |

TH-41A, 41AT (K1, 2, X, M1-4)

# TH-41E SCHEMATIC DIAGRAM

Signal line — Control line — Common DC line Voltage measurement conditions f = 439.99MHz, RX no signal. ( ): TX.





**SPECIFICATIONS****General**

Frequency range	430 – 440MHz (430MHz version) 440 – 450MHz (440MHz version)
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 30mA At transmission (Hi) ; Less than 650mA (Low) ; About 350mA
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. 290h (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 ; 21.6MHz, 2nd ; 455kHz
Sensitivity	S/N more than 26dB at -6dBμ (0.5μV) input 12dB SINAD ; less than -12dBμ (0.25μV)
Squelch sensitivity	Less than 0.25μV
Selectivity	-6dB at more than 12kHz -40dB at less than 28kHz
AF output	More than 250mW (8Ω load, distortion 10%)

Design and specifications subject to change without notice.

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