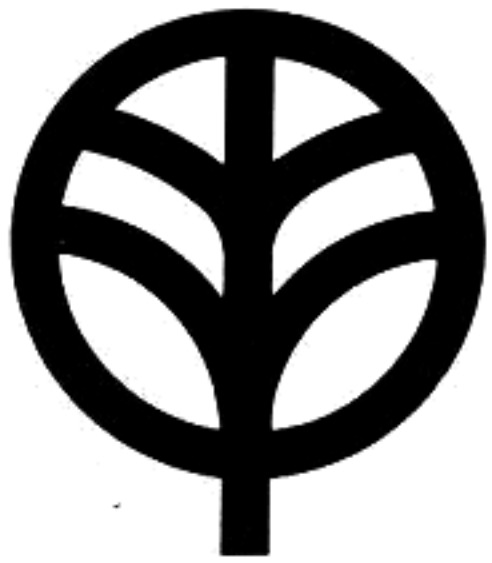
For the Hi-res scan manual contact me
PE3HMP



KENWOOD

SERVICE MANUAL

Model TS-770

http://www.qsl.net/pe3hmp

V-UHF ALL MODE DUO BANDER

CONTENTS / FEATURES

FEATURES 2
CIRCUIT DESCRIPTION 3
SEMICONDUCTOR/FILTER DATA 15
OPTION(BU-1) 16
OUTSIDE VIEWS 17
PACKING 19
PARTS LIST 20
BLOCK DIAGRAM 34
PC BOARD VIEWS 35
DISASSEMBLY 49
TROUBLE SHOOTING 54
ADJUSTMENTS 56
LEVEL DIAGRAM 76
CIRCUIT DIAGRAM 80
REFERENCE DATA 84
MEMO 86
SPECIFICATIONS 89

FEATURES

1. 144/430 MHz, all mode (FM, SSB (USB, LSB), CW) transceiver.
- Microprocessor controlled VFO and full variety of auxiliary functions.
- FM circuitry based on KENWOOD's advanced technology and outstanding SSB quality.
- Built-in VOX.
- Built-in side tone and CW circuitry capable of semi-break-in operation.
- Easy-to-operate 1 band, 1 MHz VFO stops at 999.98 kHz or is continuously adjustable (endless system).

2. Built-in digital display that indicates operating frequency in all modes.
- Digital display equipped with easy-to-read green phosphor tubes.
- 7-digit digital display that directly reads down to 100 Hz.
- Frequency indicator that reads out carrier positions when mode of operation is changed.
- Indicates fixed channel (stores any given frequency) and call channel frequencies, besides VFO A and B frequencies.
- Digital display indicates which VFO (A or B) is in use, fixed channel (stores any given frequency) and call channel numbers (1 through 8).
- The use of display select circuit turns off the 100 Hz digits in FM mode.

3. Dependable electrical and mechanical functions.
- VFO frequencies are switchable in 2 speeds, SLOW (in 20 Hz steps) and FAST (in 200 Hz steps).
- VFO knob equipped with variable torque mechanism.
- Pushbutton band select switches (UP and DOWN) that

- Panel layout based on human engineering.
- Full variety of indicating functions to check operating conditions (Pilot lamps: ON AIR, Hi/LOW (FM transmit), F-LOCK, RIT, SLOW/FAST, Back-up power ON/OFF).
- Amplified type AGC and ALC circuits that maintain receive and transmit outputs at constant level without distortion.

4. A multitude of auxiliary functions for more enjoyable operation.
- The use of RAM memory system microprocessor enables any given frequencies to be stored in or cleared from fixed channels (8 CH).
- Built-in back-up power circuit to keep data stored at all times.
- Built-in scan and search circuits.
- RIT circuit functions on VFO, fixed channels and call channel.
- Adoption of frequency lock circuit.
- KENWOOD's unique noise blanker (NB) circuit to eliminate pulse type noise.
- Equipped with two meters, one is an "S" meter (with RF/ALC selector) and the other is a center meter for use on FM.

services.

enience.

External speaker

venience in transmission with local stat
- Auxiliary (AUX) socket.

5. Designed for fixed and mobile station s
- AC/DC 2-way power operation.
- Equipped with a grip for carrying conve
- Sufficient AF output power (2.5W/4Ω).
- Built-in large sized speaker (7.5 cm).

CIRCUIT DESCRIPTION

GENERAL

This unit is a high class home transceiver having All Mode VHF (2 m) UHF (70 cm) Bands designed for amateur radio stations.

By microcomputer control, it covers the amateur bands of 144 MHz ~ 146 MHz, 430 MHz ~ 440 MHz. The modes of the radio waves are A_1, A_{3j}, and F_3.

FREQUENCY CONFIGURATION

The unit consists of frequency composition shown in Fig. 1. In Table 1, the oscillating frequencies of each oscillating circuit are shown.

Table 1. Oscillator frequency of each oscillator circuit

Unit	Mode/Frequency	Oscillator Frequency
CAR unit	USB, C W – R	8.8315 MHz
	LSB	8.8285 MHz
	FM	8.830 MHz
	CW-T	8.8307 MHz
IF unit	USB, LSB, CW	30.430 MHz
IF unit (MIX unit)	430 MH band	15.8888 × 18 MHz
		16.1666 × 18 MHz
IF unit	FM TX	21.6 MHz
RF unit	FM RX	22.055 MHz
VCO unit	All mode	122.4 ~ 127.4 MHz

With the exception of FM transmission, all modes adopt the double conbersion system.

In SSB or CW transmit mode, the CAR oscillator frequency (8.83 MHz) is modulated by audio signal to obtain 8.83 MHz in the 1st IF. This signal is mixed with 30.43 MHz to obtain 21.6 MHz in the 2nd IF.

In FM transmit mode, the 21.6 MHz crystal oscillator circuit in the IF unit is directly modulated.

The 122.4 MHz band of VCO is mixed with the 21.6 MHz of the 2nd IF to obtain a 144 MHz band heterodyne signal which is fed to the final unit. The 430 MHz band heterodyne signal is mixed with the 286 MHz (or 291 MHz) band, 15.8888 MHz (or 16.1666 MHz) local oscillator frequency multiplied by 18, and the VCO frequency of 122.4-127.4 MHz to obtain a heterodyne signal of 408.4-418.4 MHz. This signal is mixed with 21.6 MHz to obtain a signal of 430 MHz band which is fed to the final unit.

In receive mode, the signal is RF amplified and mixed with the band heterodyne signal to obtain 21.6 MHz in the 1st IF. In SSB or CW mode, the signal is mixed with 30.430 MHz to obtain 8.83 MHz in the 2nd IF.

In FM mode, the signal is mixed with 22.055 MHz to obtain 455 kHz in the 2nd IF.

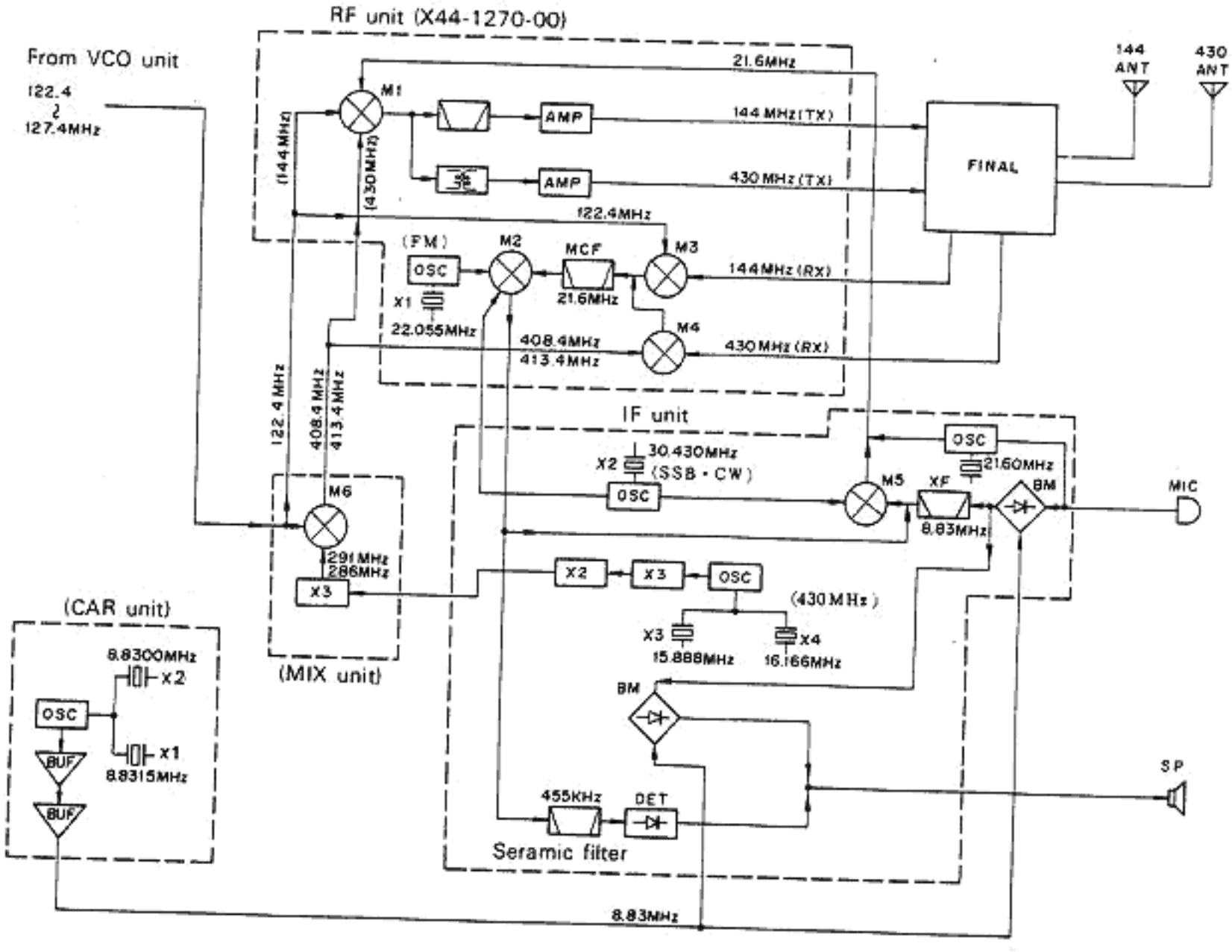


Fig. 1 Frequency configuration

CIRCUIT DESCRIPTION

Table 16. Functions of Digital Unit IC38 MN 9004

Pin No.	Pin	Input signal	Output signal	Description
1	VSS	○		Earth.
2	CO11		○	Count prohibited at FIX channel.
3	CO10		○	H at scan, search, empty FIX channel.
4	CO9		○	H at scan.
5	CO8		○	Buzzer output, FIX channel, figure latch, strobe signal.
6	CO7		○	Buzzer output, FIX channel, figure latch, strobe signal.
7	CO6		○	Delivers output except at 20 μsec selector signal
8	CO5		○	
9～13	CO4～0		○	Strobe signals of 100 kHz, 10 kHz, 1 kHz, 100 Hz, 10 Hz.
14～17	AI 3～0	○		A input
18～21	BI 3～0	○		B input
22～25	EO0～3		○	Data outputs of 100 kHz, 10 kHz, 1 kHz, 100 Hz, 10 Hz.
26	TST	○		Not used, open.
27	RST	○		H level
28	CSLCT	○		Same as pin 3
29	SNSO	○		
30	SNSI	○		Count input
31～34	DO0～3		○	Band data, binary output.
35～38	DO4～7		○	FIX channel figure, binary output.
39	VDD	○		5V
40	OSC	○		Clock signal, 400 kHz

Table 17. Functions of Digital Unit (X54-1460-00)

Pin		Input signal	Output signal	Description
J2	CA		○	Normally grounded.
	F1	○		Open at FIX, normally grounded.
	9B	○		H at display of 9th digit.
			○	L at FIX, VFO A, B at VFO4.
J3	DD		○	Digital display output.
	DC		○	
	DB		○	Data output by time division.
	DA		○	
	B1	○		Frequency disappears at FIX empty.
	SA		○	
	SB		○	Digit scan signal.
	SC		○	
J4	F	○		L at FIX empty.
	PC		○	PLL band data output.
	PB		○	Output of 1～5 at binary port.
	PA		○	
	SN	○		H at scan ON, normally L.
	FM2			
	SD	○		H at FAST + 10 kHz, S/F LED ON.
	SQ	○		L at squelch ON, H at OFF.
	F3	○		L at VFO A, B.
	F1	○		Open at FIX, normally grounded
	8F	○		5V 100V FAST switch.
				Normally open.
	CC	○		Normally grounded.
	LK	○		L at F lock, normally open.
J5	CB	○		VFO end or endless signal.
	SH	○		H at search switch ON.
	ME	○		H at FIX, memory switch ON.
	V5	○		
	V4	○		VFO pulse
	V3	○		
	V2	○		
	V1	○		
J6	ATX		○	
	ST		○	H at FIX empty, scan, search.
	UH		○	100 MHz → 1 and 10 MHz → 4 at L. 100 MHz → 4 and 10 MHz → 3 at H.
	291		○	H at 435～439. 144 MHz band at L.
	286		○	H at 430～434. 144 MHz band at L.
	BZ		○	H at buzzer ON.
	RL	○		8V input at TX.
J7	[illegible]	○		[illegible]
	[illegible]			[illegible]
J8	03～03		○	
	10～13		○	
	20～23		○	Fr
	30～33		○	
	40～43		○	
J9	FC	○		L at
	UD	○		Band
	BD	○		L at
	BU	○		L at

ckup time.

requency data output to PLL.

press of FIX.
d stops at FIX. Open at FIX.
press of band DOWN.
press of band UP.

CIRCUIT DESCRIPTION

(From page 11.)

a. Selector signal output to IC34 and 35.
b. Transmit prohibit signal at scan, search and FIX empty.
c. Latch strobe signal.
d. 10 Hz ~ 100 kHz data output.
e. Band data output.
f. FIX channel figure output.
g. Buzzer pulse output.

ALL ASS'Y UNIT (X60-1050-00)

The PLL circuit includes VCO, A LOOP and B LOOP units.

1. B LOOP Unit

A signal of 13.215 MHz is oscillated by Q4. The 10 and 100 kHz data from the digital unit are converted into an analog signal as a bias signal to D2 by the resistors R25-37 to control the frequency of 0-980 Hz. The frequency is doubled by Q5 as a HET signal to the B LOOP. Q1 is VCO oscillator for B LOOP. The signal from the oscillator passes through the buffer Q3 and is mixed with CAR 8.83 MHz by IC1, then the frequency difference is mixed with HET signal for B LOOP by IC2. The1 kHz-100 kHz data from the digital unit is divided by IC3 to produce 1 kHz signal. This signal is

signal from A LOOP by
ow pass filter Q6-8 to
OOP to control Q1.
e buffer Q2 to produce

by Q1. This signal is
duce HET signal for A
s mixed with the HET
then mixed with the

fed to IC4 so that the
Hz.
This signal is divided
gnals for B LOOP and
C6. The output from
VCO unit.
obtained from IC7.
2 to obtain 5 MHz

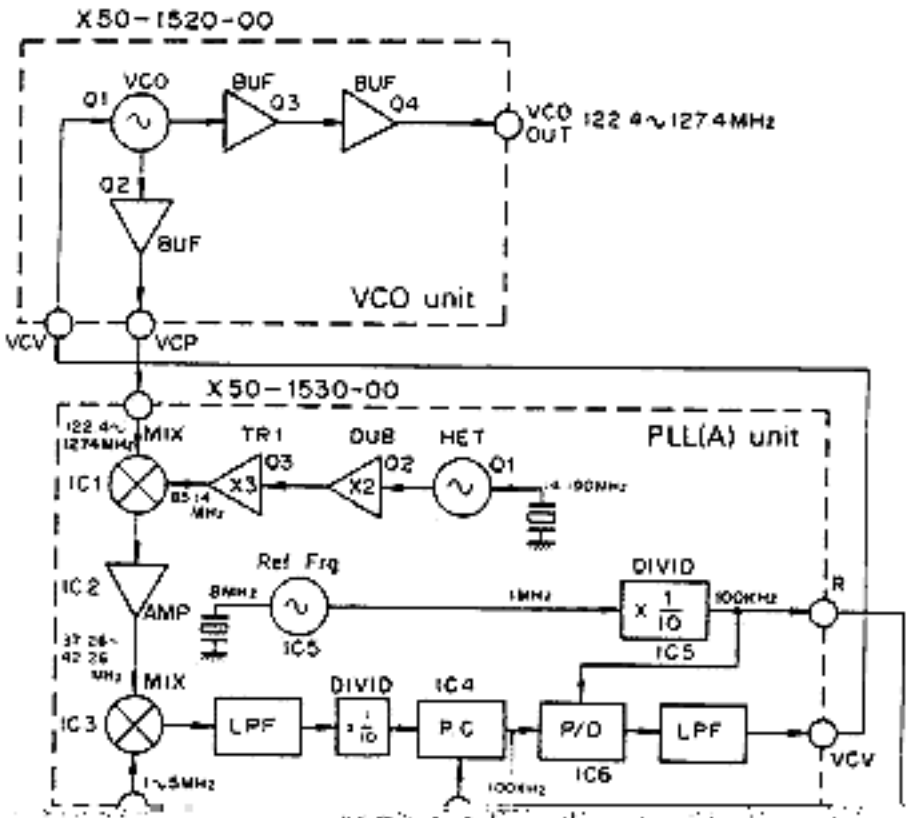
is ON, producing UK

voltage of VCO (Q1).
Q2 and is fed to A

hen the signal is un-
nd turns Q8 to OFF,
tained from the VCO

CV terminal when the

When the signal is unlocked during adjustments or repairs, turn OFF the power switch and then turn ON. The signal will then be locked



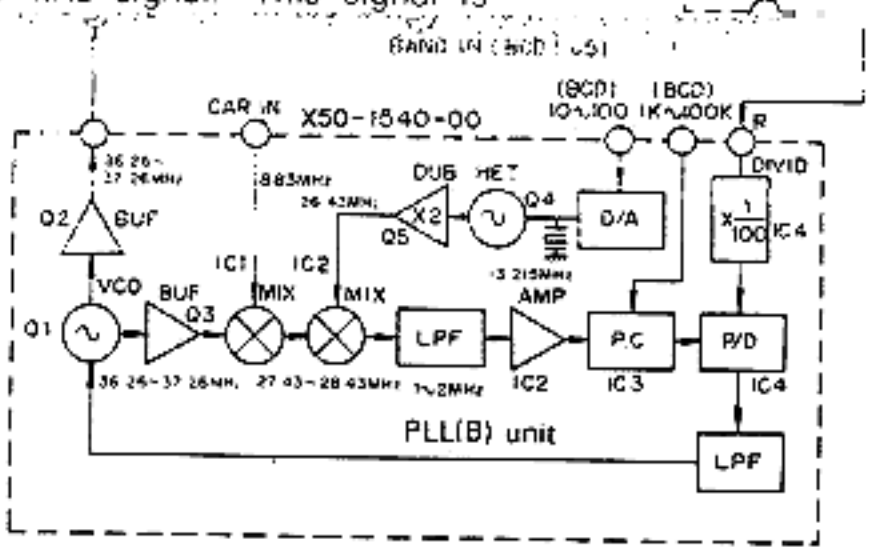


Fig. 18 Block diagram of PLL unite

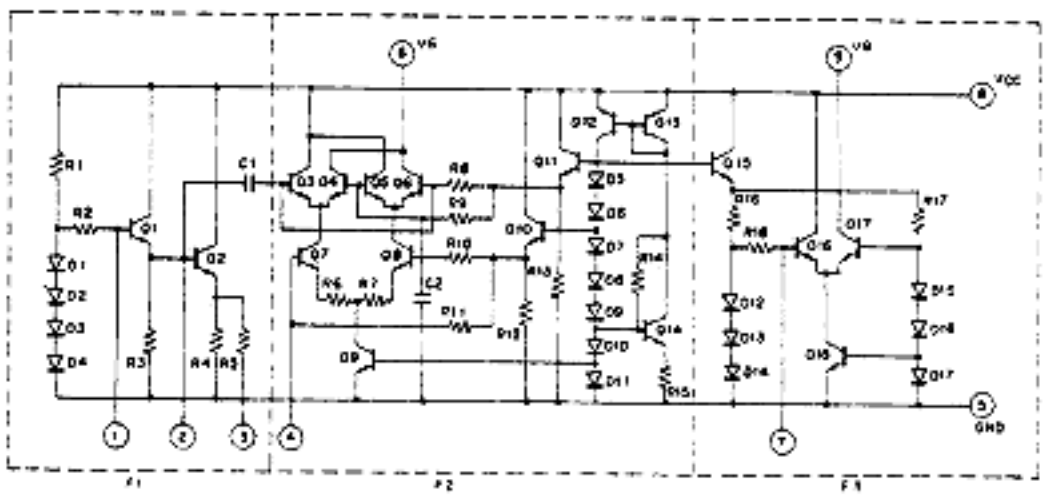


Fig. 19 PLL(A)IC3 PLL(B)IC2(TA7310P)

compared in phase with the reference s
IC4. The output passes through the lo
produce VCO control voltage for B LO
The output from Q1 passes through the
the output to B LOOP.

2. A LOOP

A signal of 14.190 MHz is oscillated
doubled by Q2 and tripled by Q3 to pro
LOOP. The signal from the VCO unit is
signal by IC1, amplified by IC2 and
signal from B LOOP by IC3.
The BAND data from the digital unit is
signal from IC3 is divided into 100 kH
A signal of 8 MHz is oscillated by IC5.
to obtain 100 kHz signal as reference si
A LOOP, and is compared in phase by I
IC6 is VCV which ontrols VCO of the
Analog signal from the BAND data is
This signal is tuned by T1 and T2
bandwidth.
When the signal is unlocked, D4 or D5
signal of H level.

3. VCO Unit (X50-1520-00)

Frequencies are controlled by the VCV v
The signal passes through the buffer
LOOP.
Q3 and Q4 form the buffer of VCO. W
locked, the UK signal turns Q9 to ON a
so the buffer stops and no output is ob
terminal.
Q5 and Q6 form a circuit to short the VC
voltage at PL8 drops momentarily.

CIRCUIT DESCRIPTION

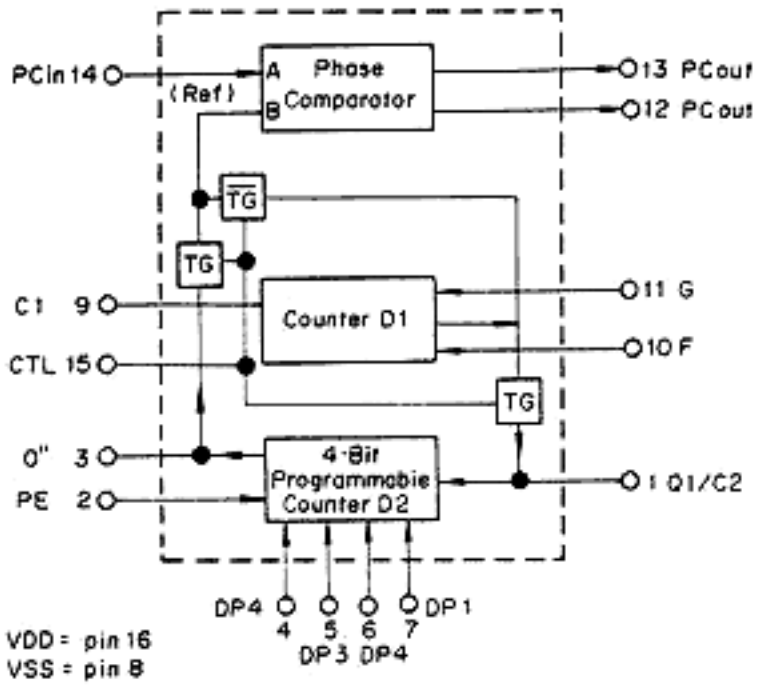
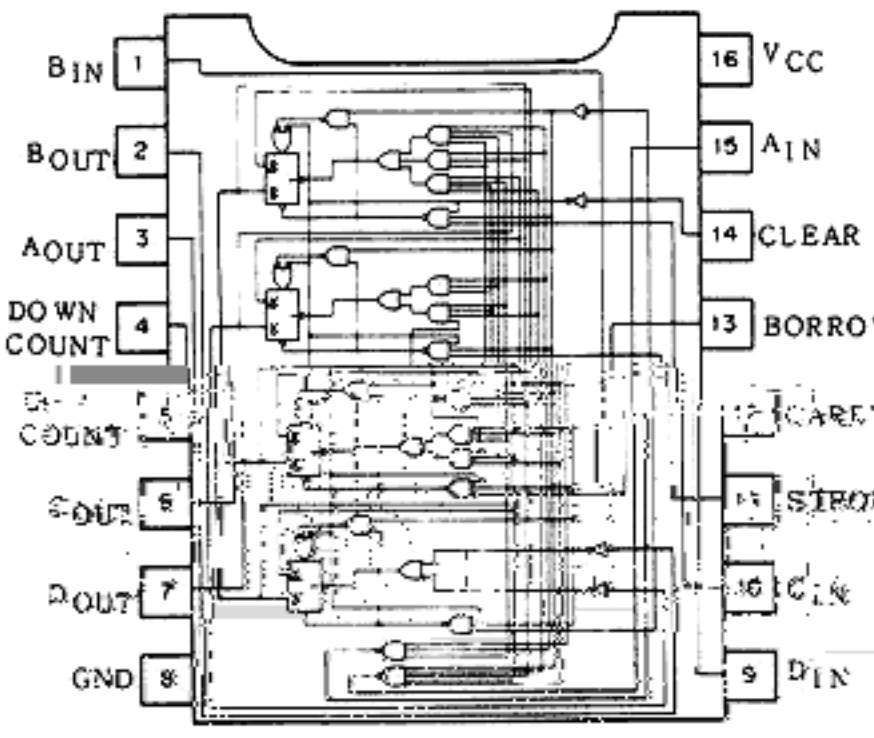
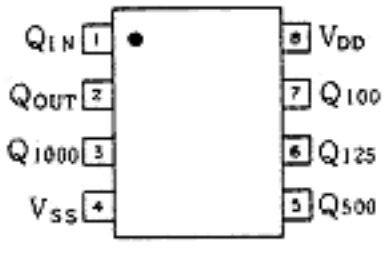


Fig. 20 PLL(B)IC4(MC14568B)



PLL(A)IC4(TD34192BP)



PLL(A)IC5(SM6422A)

Fig. 21

Truth Table TD34192BP

Input t_n								Output t_{n+1}					
Count -up pulse	Count -down pulse	Strobe	Clear	Input				Output				Borrow	Carry
				A	B	C	D	A	B	C	D		
*	*	0	0	A_{IN}	B_{IN}	C_{IN}	D_{IN}	A_{IN}	B_{IN}	C_{IN}	D_{IN}	Note 1	Note 1
*	*	0	0	1	0	0	1	1	0	0	1	Note 1	Note 1
*	*	*	1	*	*	*	*	0	0	0	0	Note 1	Note 1
1	1	1	0	*	*	*	*	1	0	0	0	1	1
2	1	1	0	*	*	*	*	0	1	0	0	1	1
3	1	1	0	*	*	*	*	1	1	0	0	1	1
4	1	1	0	*	*	*	*	0	0	1	0	1	1
5	1	1	0	*	*	*	*	1	0	1	0	1	1
6	1	1	0	*	*	*	*	0	1	1	0	1	1
7	1	1	0	*	*	*	*	1	1	1	0	1	1
8	1	1	0	*	*	*	*	0	0	0	1	1	1
9	1	1	0	*	*	*	*	1	0	0	1	1	0
0	1	1	0	*	*	*	*	0	0	0	0	1	1
1	1	1	0	*	*	*	*	1	0	0	0	1	1
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
8	1	1	0	*	*	*	*	0	0	0	1	1	1
1	8	1	0	*	*	*	*	0	0	0	1	1	1
1	7	1	0	*	*	*	*	1	1	1	0	1	1
1	6	1	0	*	*	*	*	0	1	1	0	1	1
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
1	1	1	0	*	*	*	*	1	0	0	0	1	1
1	0	1	0	*	*	*	*	0	0	0	0	0	1
1	9	1	0	*	*	*	*	1	0	0	1	1	1

Note 1: The state of BORROW Output and CARRY Output will depend on the state of A, B, C, D Output and Down Count/Up Count Inputs.
2: * ; 0 or 1
3: t_n ; Bit time prior to the time the clock input changes from "0" to "1".
4: T_{n+1} : Bit time after the clock input changed from "0" to "1".

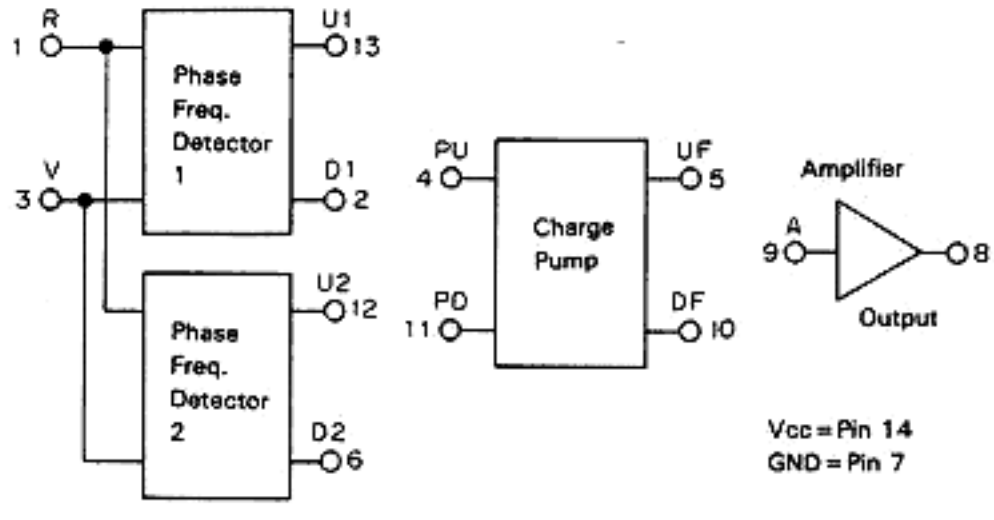


Fig. 22 PLL(A)IC6(MC4044P)

SEMICONDUCTOR/FILTER DATA

* In case of replacing power transistors of the FINAL, always use those based on TRIO Specifications.

Table 18. 2SC2381 Ratings

Name	2SC2381, TRIO									
Application	UHF band power amplifier									
Construction	NPN Epitaxial planar type									
Absolute maximum rating (T_a = 25°C)	V_{CBO}	V_{CEO}	V_{EBO}	I_C	I_E	P_C	T_j	T_{stg}		
	35	17	3.5	6	−6	50	175	−65~175		
	V	V	V	A	A	W	°C	°C		
Test condition	T_a = 25 ± 1.5 °C									

Test specification

Item	Condition	Code	Max	Min	Unit
Collector cut-off current	V_{CB} = 15 V, I_E = 0	I_{CBO}	—	1	mA
Collector-base breakdown voltage	I_C = 10 mA, I_E = 0	$V_{(BR)CBO}$	40	—	V
Collector-emitter breakdown voltage	I_C = 25 mA, I_B = 0	$V_{(BR)CEO}$	17	—	V
Emitter-base breakdown voltage	I_E = 1 mA, I_C = 0	$V_{(BR)EBO}$	35	—	V
DC amplifier factor	V_{CE} = 5 V, I_C = 3 A	h_{FE}	10	—	—
Collector output capacity	V_{CB} = 10 V, I_E = 0, f = 1 MHz	C_{ob}	—	—	PF
Output power	V_{CC} = 12.6 V, f = 470 MHz, P_i = 10 W, $\eta_C \geq$ 60%	P_O	25	—	W

Table 19. 2SC2380 Ratings

Name	2SC2380, TRIO									
Application	UHF band power amplifier									
Construction	NPN Epitaxial planar type									
Absolute maximum rating (T_a = 25°C)	V_{CBO}	V_{CEO}	V_{EBO}	I_C	I_E	P_C	T_j	T_{stg}		
	35	17	3.5	2.8	2.8	30	175	−65~175		
	V	V	V	A	A	W	°C	°C		
Test condition	T_a = 25 ± 1.5 °C									

Test specification

Item	Condition	Code	Max	Min	Unit
Collector cut-off current	V_{CB} = 15 V, I_E = 0	I_{CBO}	—	1.5	mA
Collector-base breakdown voltage	I_C = 10 mA, I_E = 0	$V_{(BR)CBO}$	40	—	V
Collector-emitter breakdown voltage	I_C = 10 mA, I_B = 0	$V_{(BR)CEO}$	17	—	V
Emitter-base breakdown voltage	I_B = 200 μA, I_C = 0	$V_{(BR)EBO}$	3.5	—	V
DC amplifier factor	V_{CE} = 5 V, I_C = 1.5 A	h_{FE}	10	—	—
Collector output capacity	V_{CB} = 10 V, I_E = 0, f = 1 MHz	C_{ob}	—	40	PF
Output power	V_{CC} = 12.6 V, f = 470 MHz, P_i = 3 W, $\eta_C \geq$ 60%	P_O	11	—	W

Table 20. 2SC2103A Ratings

Name	2SC2103A, TRIO									
Application	UHF band power amplifier									
Construction	NPN Epitaxial planar type									
Absolute maximum rating (T_a = 25°C)	V_{CBO}	V_{CEO}	V_{EBO}	I_C	I_E	P_C	T_j	T_{stg}		
	40	18	4.0	6.0	−6.0	50	175	−65~175		
	V	V	V	A	A	W	°C	°C		
Test condition	T_a = 25 ± 1.5 °C									

Test specification

Item	Condition	Code	Max	Min	Unit
Collector cut-off current	V_{CB} = 15 V, I_E = 0	I_{CBO}	—	1	mA
Collector-base breakdown voltage	I_C = 10 mA, I_E = 0	$V_{(BR)CBO}$	40	—	V
Collector-emitter breakdown voltage	I_C = 25 mA, I_B = 0	$V_{(BR)CEO}$	18	—	V
Emitter-base breakdown voltage	I_E = 1 mA, I_C = 0	$V_{(BR)EBO}$	4	—	V
DC amplifier factor	V_{CE} = 5 V, I_C = 3 A	h_{FE}	10	—	—
Collector output capacity	V_{CB} = 10 V, I_E = 0, f = 1 MHz	C_{ob}	—	80	PF
Output power	V_{CC} = 12.5 V, f = 175 MHz, P_i = 4.2 W, $\eta_C \geq$ 60%	P_O	27	—	W

Table 21. Filter L72-0312-05(CFL-455F2)Ratings

Item	Specification
Nominal center frequency	455 kHz
3 dB bandwidth	±5 kHz or more
6 dB bandwidth (From 455 kHz)	±7.5 kHz or more
70 dB bandwidth	±16 kHz or less
Guaranteed attenuation	55 dB or more 40 dB or more
Ripple	3 dB or less
Loss	4.5 dB or less
Impedance	1.5 kΩ

FILTER/OPTION DATA

Table 22. Ratings of Crystal Filter L71-0209-05(21G20A)

Item	Specification
Nominal center frequency	21.6 MHz
Pass bandwidth	±10 kHz or more at 3 dB
Attenuation bandwidth	±35 kHz or less at 18 dB
Ripple	0.5 dB or less
Loss	2 dB or less
Guaranteed attenuation	30 dB or more at a range within ±1 MHz (The spurious output shall be at 18 dB or more.)
Terminal impedance	2 kΩ±10%//1PF±10%

Table 23. Ratings of Crystal Filter L71-0208-05(YK-88S)

Item	Specification
Nominal center frequency	8830 kHz
Center frequency deviation	Within ±150 Hz at 6 dB
Pass bandwidth	±1.2 kHz or more at 6 dB
Attenuation bandwidth	±1.5 kHz or less at 20 dB ±2.2 kHz or less at 60 dB ±3 kHz or less at 80 dB
Ripple	2 dB or less
Loss	6 dB or less
Guaranteed attenuation	80 dB or more within ±1 MHz.
Impedance	600Ω±5% // 15PF±5% for both input and output

Option

• BU-1 (Outside Battery Case)

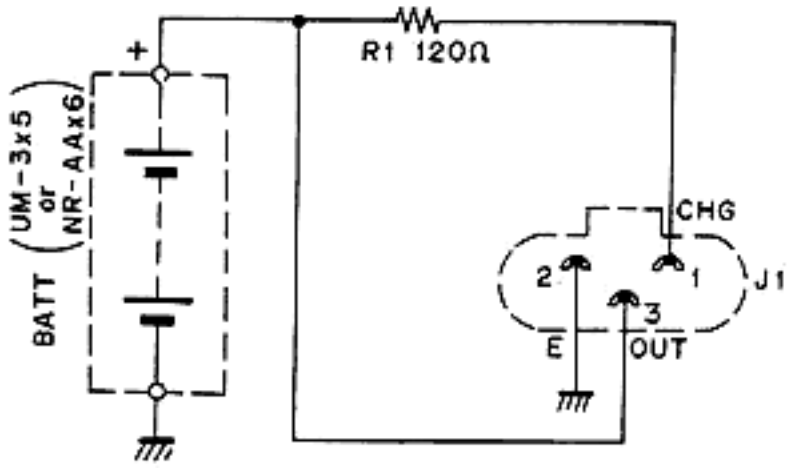


Fig. 26 BU-1 Circuit

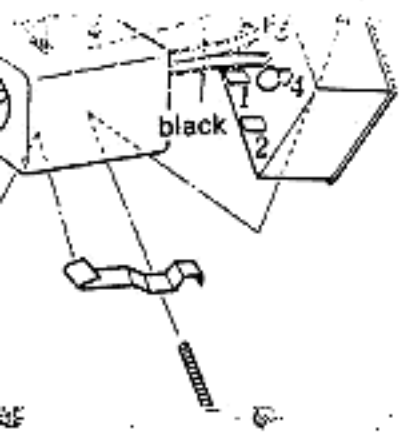


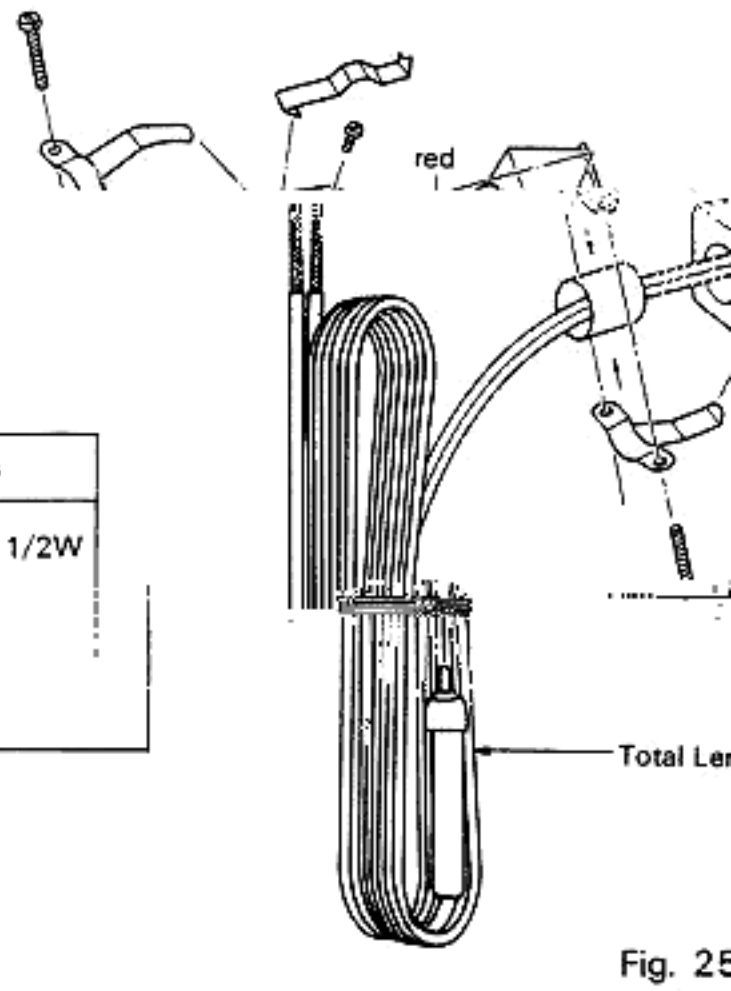
Table 25. BU-1 Parts List

Parts Name	Parts No.	Remarks
Resistor (R1)	RC05GF2H121J	120Ω ±5% 1/2W
Power Jack (J1)	[illegible]	
Power Plug	E 30 — 1824 — 05	
Battery case	J 19 — 1319 — 03	
Dummy cell	W 09 — 0002 — 05	

In order to operate by DC

Since this unit is not equipped with DC power source cable, in case of DC operation, it is necessary to prepare a DC power source cable like the one shown in Fig. 25.
Since this cable is not equipped with a fuse, in case it is used as that for TS-770, insert an 8A fuse.
DC power source cable and fuses are handled by our business offices or service centers.

DC cable ASSY parts No. X42-1210-00



ngth 2 m(50 core 0.18 mm)

5 DC Cable

Fig. 25

OUTSIDE VIEWS

FRONT PANEL

Push knob (C) × 2 CALL (K27 − 0404 − 04)

Knob(H)(K21 − 0309 − 14) RF GAIN

Meter(A) SM (B31 − 0613 − 04)

Dial escutcheon (B07 − 0612 − 05)

Panel escutcheon (B01 − 0617 − 05)

Front glass (B10 − 0614 − 05)

LED SEL − 103W (V11 − 0430 − 05)

Meter (B) CM (B31 − 0614 − 05)

Knob(C) × 3RIT FUNCTION (K21 − 0279 − 14)

Lever knob(A) × 4 (K23 − 0707 − 04)

Knob(G) (K21 − 0308 − 14) AF GAIN × 3

Name plate (B43 − 0622 − 04)

Indicating tube (V40 − 7760 − 86

Lever knob(B)STBY (K23 − 0705 − 04)

Handle (K01 − 0402 − 05)

LED PR2112D (V11 − 7260 − 66)

Push knob(A) (K27 − 0402 − 04)

Ornamental panel (A21 − 0722 − 03)

Switch grill (B07 − 0618 − 05)

4P Metal socket (E06 − 0451 − 15)

Main knob (K21 − 0727 − 13)

Paddle switch (POWER) (S44 − 1404 − 05)

Phone jack (E11 − 0034 − 25)

Tight knob (Brake) (K23 − 0714 − 04)

Band knob(A) (K29 − 0710 − 05)

Knob(MODE) (K21 − 0742 − 04)

LED PR2112D (V11 − 7260 − 66)

Push knob(B) × 5 (K27 − 0403 − 04)

Band knob(B) (K29 − 0711 − 05)

REAR PANEL

Case(B)upper (A01 − 0729 − 01)

Heat sink C

KEY jack (E11 − 0005 − 15

Rear panel (A23 − 1426 − 02)

Speaker jack (E11 − 0003 − 15)

Slide switch (Backup) (S31 − 2027 − 05)

Blind

4P Power socket (E08 − 0409 − 05)

Foots(Small) × 4(φ 15) (J02 − 0022 − 05)

Case(A) Lower (A01 − 0728 − 01)

Foot(Large) × 6(φ20) (J02 − 0049 − 14)

M type receptacle (E04 − 0109 − 15)

DIN Socket (E06 − 0751 − 05)

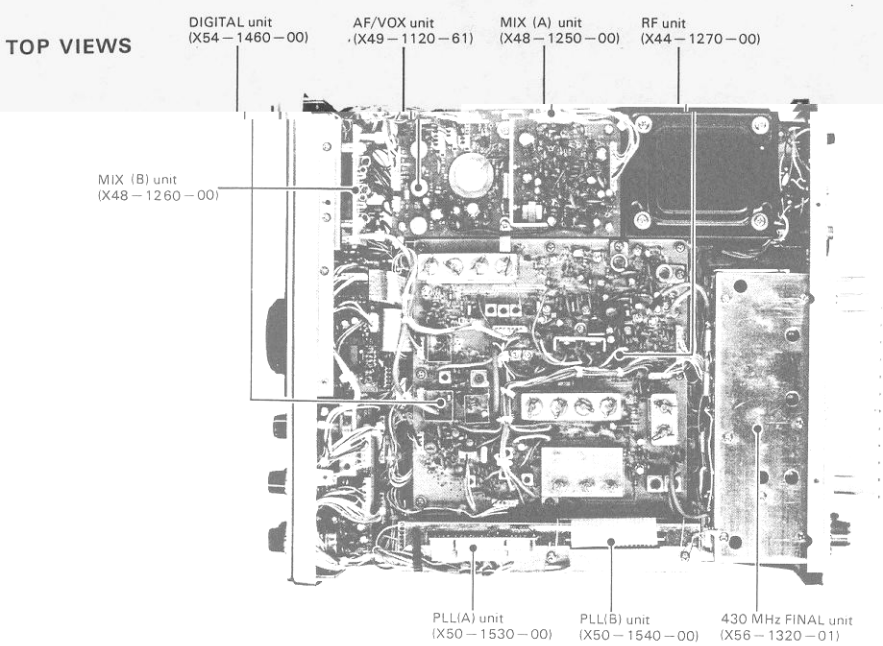
Fuse holder (J13 − 0033 − 15)

Power jack 3P (E08 − 0304 − 05)

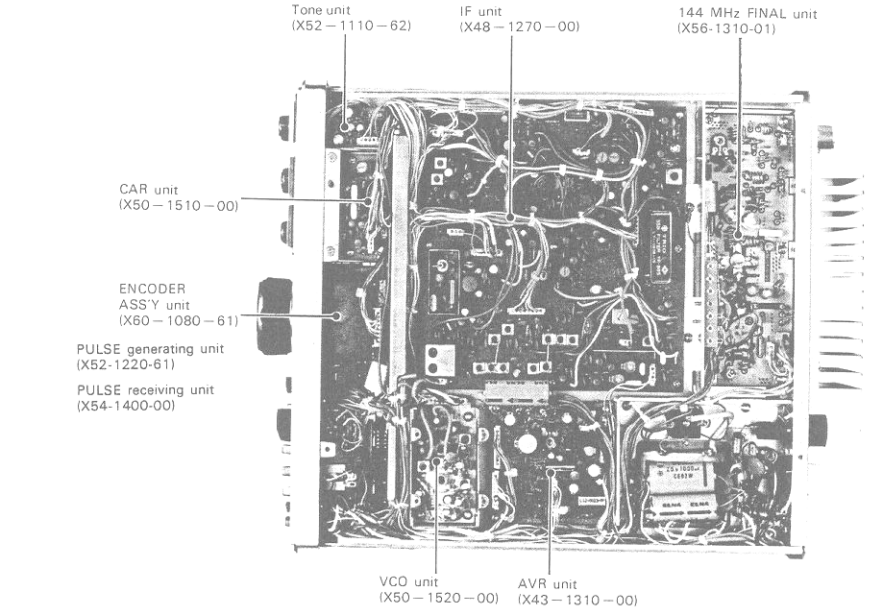
Screw terminal (E21 − 0007 − 05)

INSIDE VIEWS

TOP VIEWS



BOTTOM VIEWS



PACKING

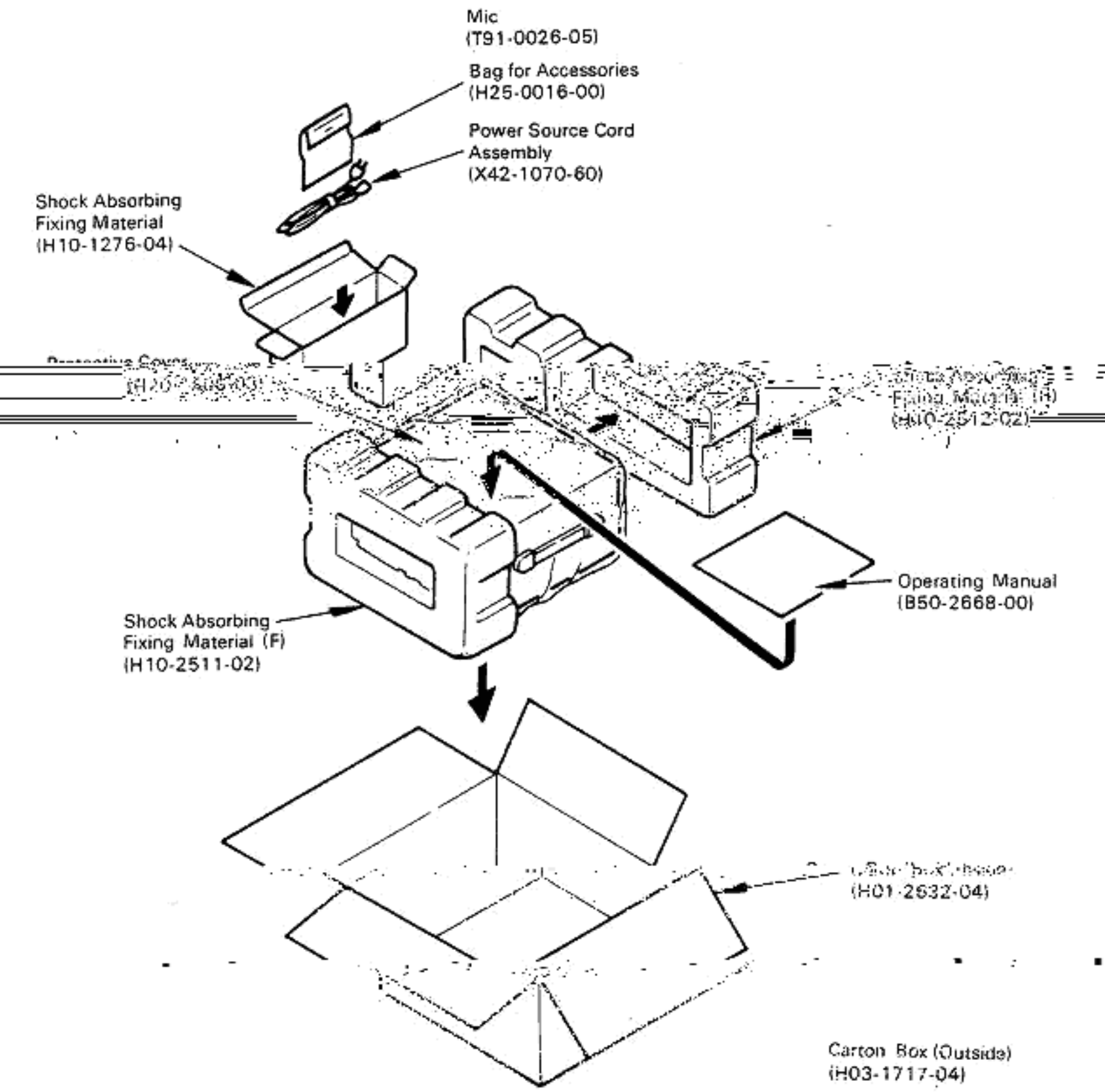
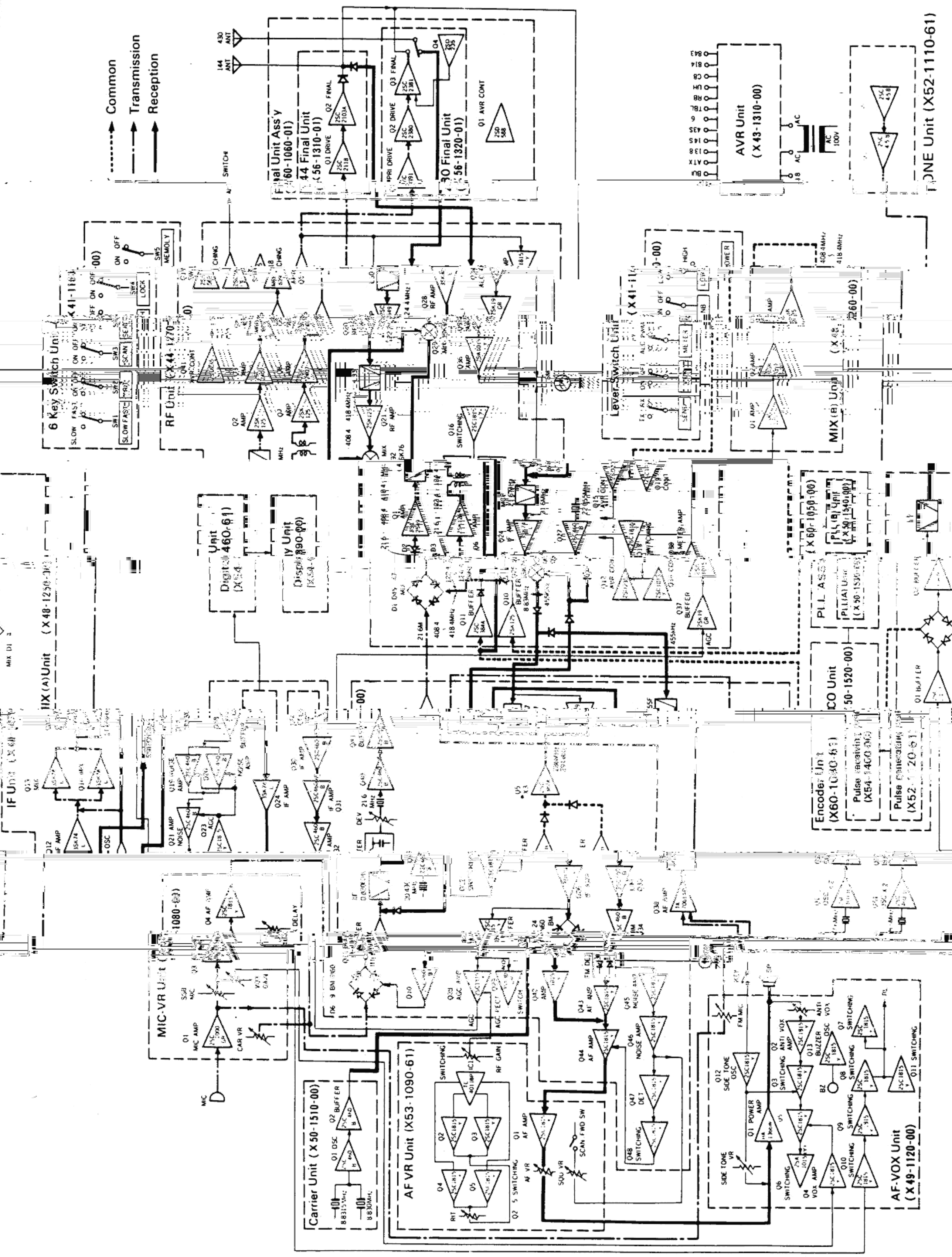


Fig. 23 Packing

Accessories

Name	Parts No.	pcs.
Fuse 2A	F05-2023-05	1
Speaker plug	E12-0001-05	1
Din plug	E07-0751-05	1
Foot	J02-0049-14	2
Screw	N30-4012-41	2

BLOCK DIAGRAM

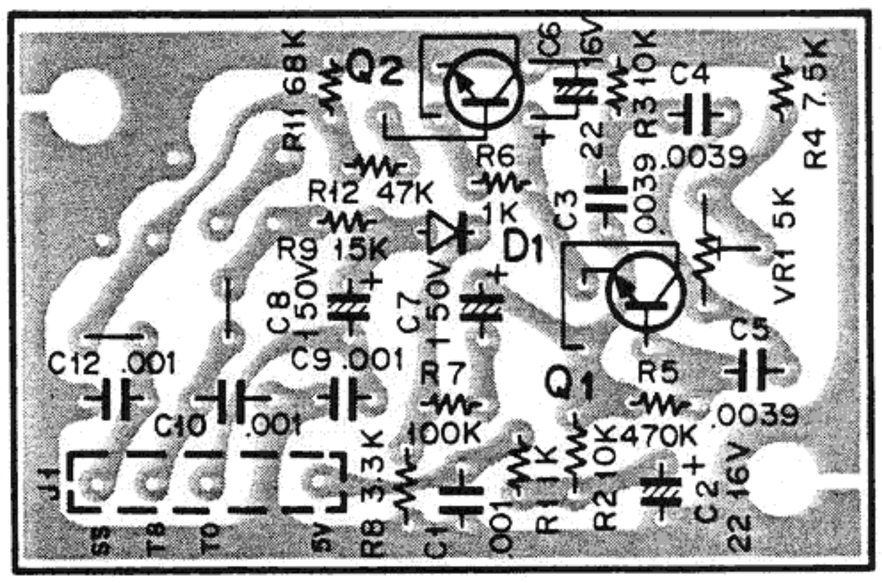


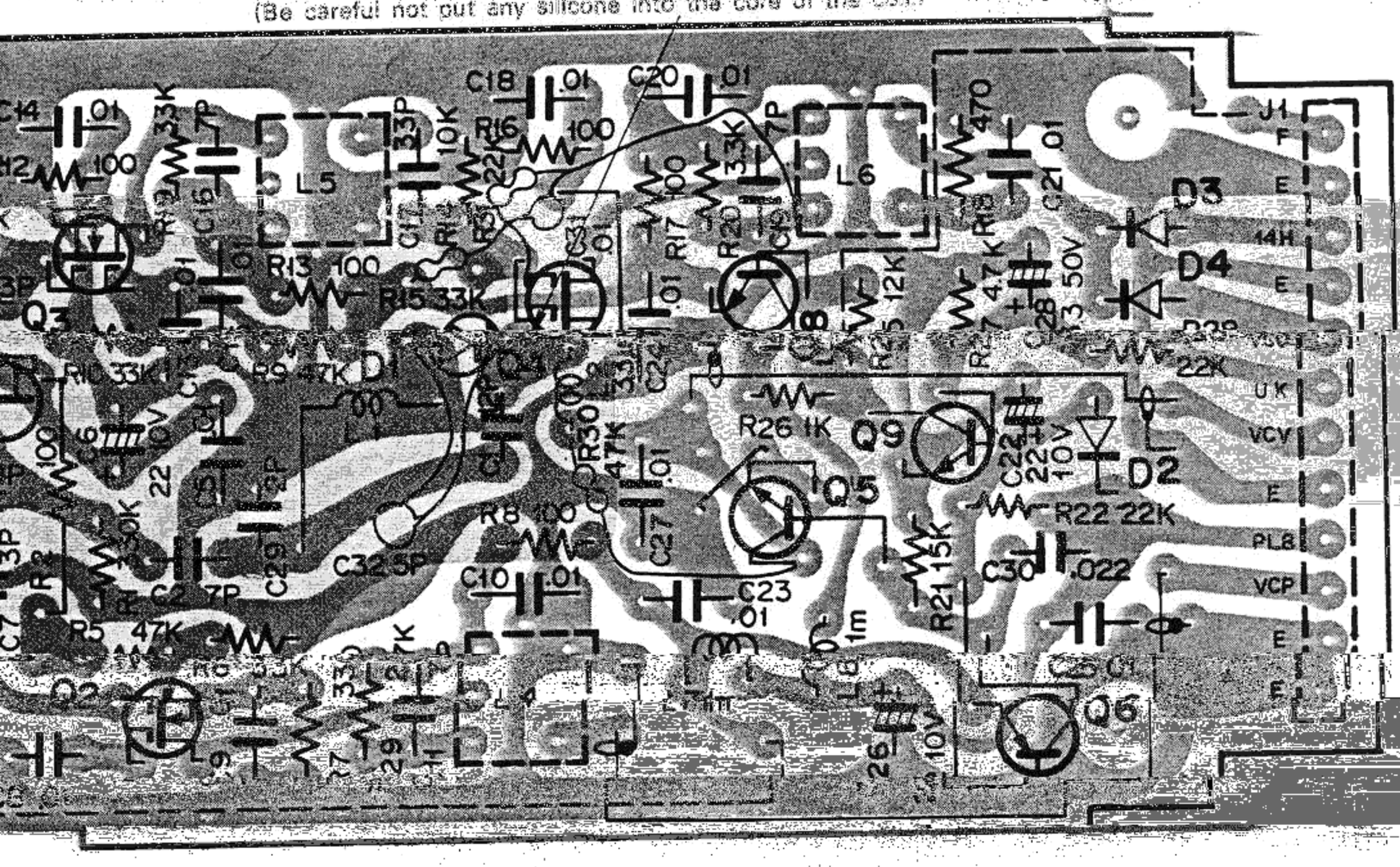
PC BOARD VIEWS

TONE UNIT (X52-1110-62) 35
..... 43
..... 43
..... 43
..... 44
PLL(B) Unit (X50-1540-00) 39
6 Key Unit (X41-1160-00) 40
Lever Switch Unit (X41-1180-00) 40
6 Display Unit (X54-1390-00) 40
6 AVR Unit (X43-1310-00) 41
7 AF VR Unit (X53-1090-61) 41
8 AF VOX Unit (X49-1120-61) 42
MIC VR Unit (X53-1080-00) 42
VCO Unit (X50-1520-00) 35
RF Unit (X44-1270-00) 36
IF Unit (X48-1270-00) 37
PLL(A) Unit (X50-1530-00) 38
CAR Unit (X50-1510-00) .....
Pulse Generating Unit (X52-1120-61) .....
Pulse Receiving Unit (X54-1400-00) .....
MIX(A) Unit (X48-1250-00) .....
MIX(B) Unit (X48-1260-00) 44
Printed Circuit (A) (J25-2699-14) 44
Digital Unit (X54-1460-61) 45
144 Final Unit (X56-1310-01) 46
430 Final Unit (X56-1320-01) 46
IF Unit (X48-1220-00) 47
MIX Unit (X48-1230-00) 48

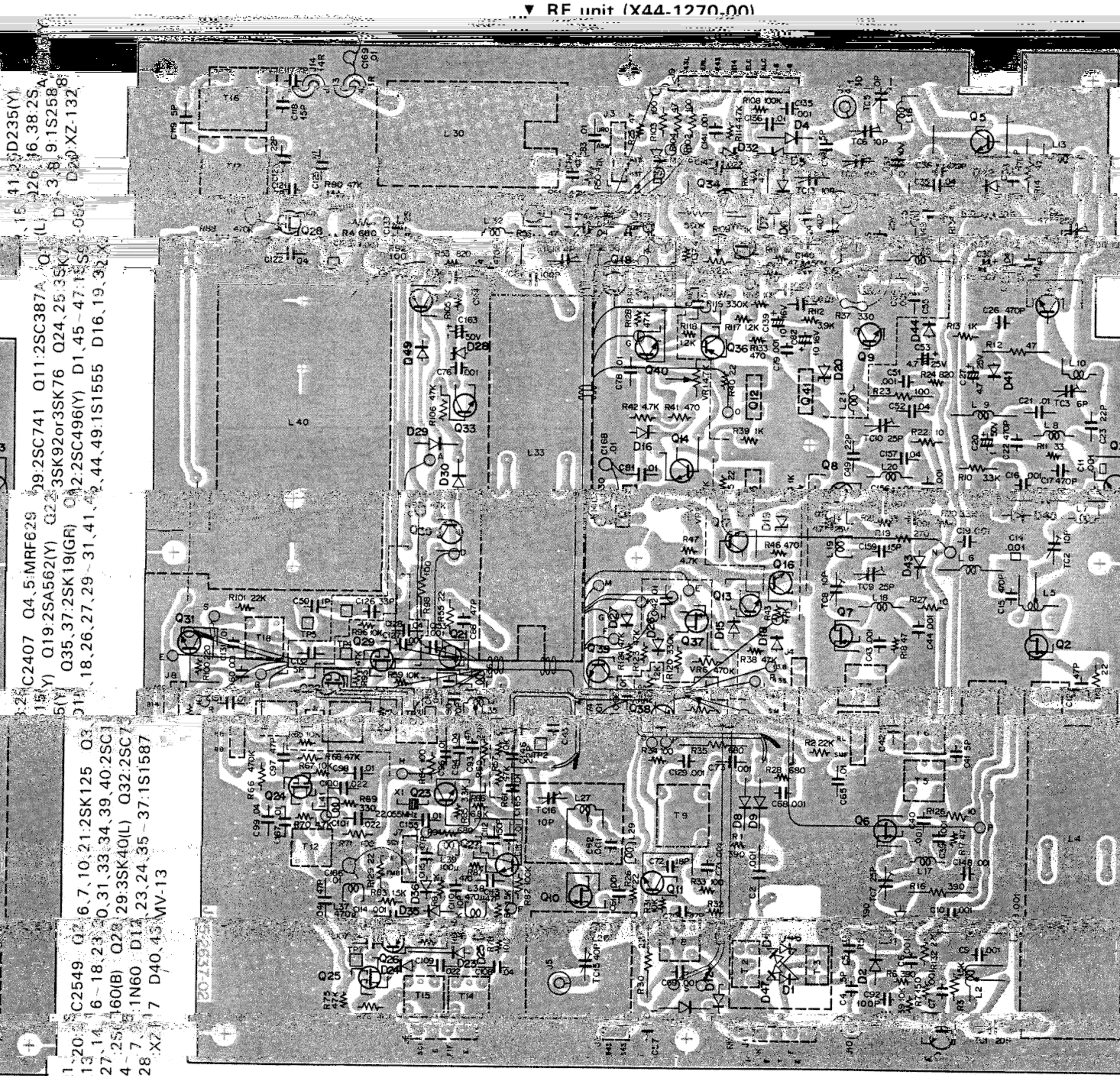
▶ **TONE unit (X52-1110-62)**

Q1,2: 2SC458(B)
D1: 1S1555

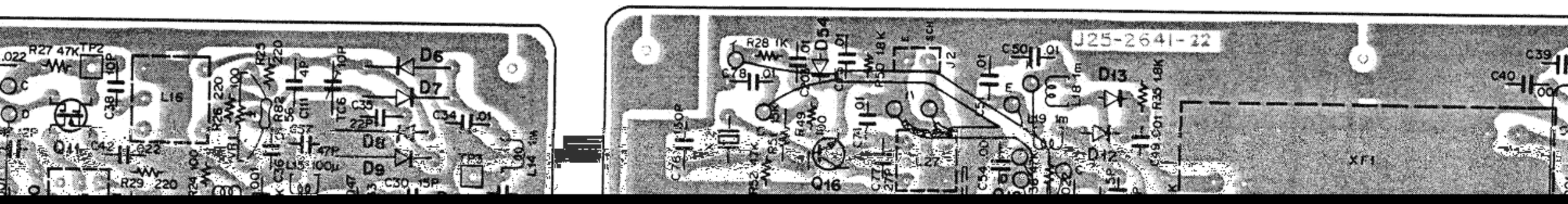




▼ RF unit (X44-1270-00)

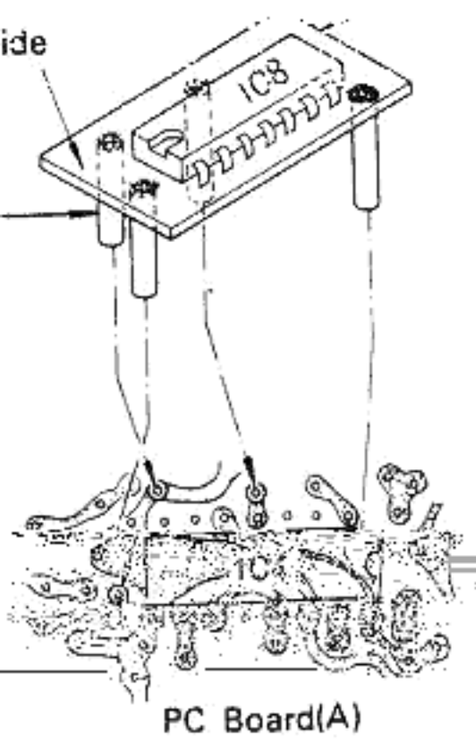


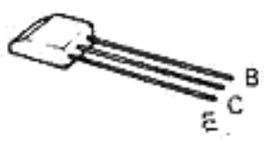
▼ IF unit (X48-1270-00) From S/N 004 .... ~

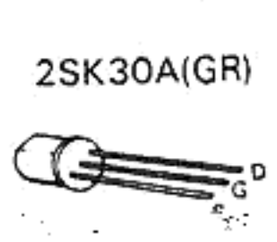


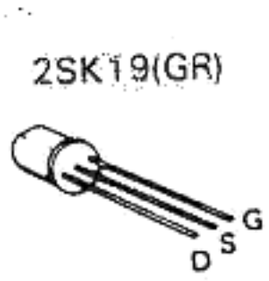
PC BOARD VIEWS

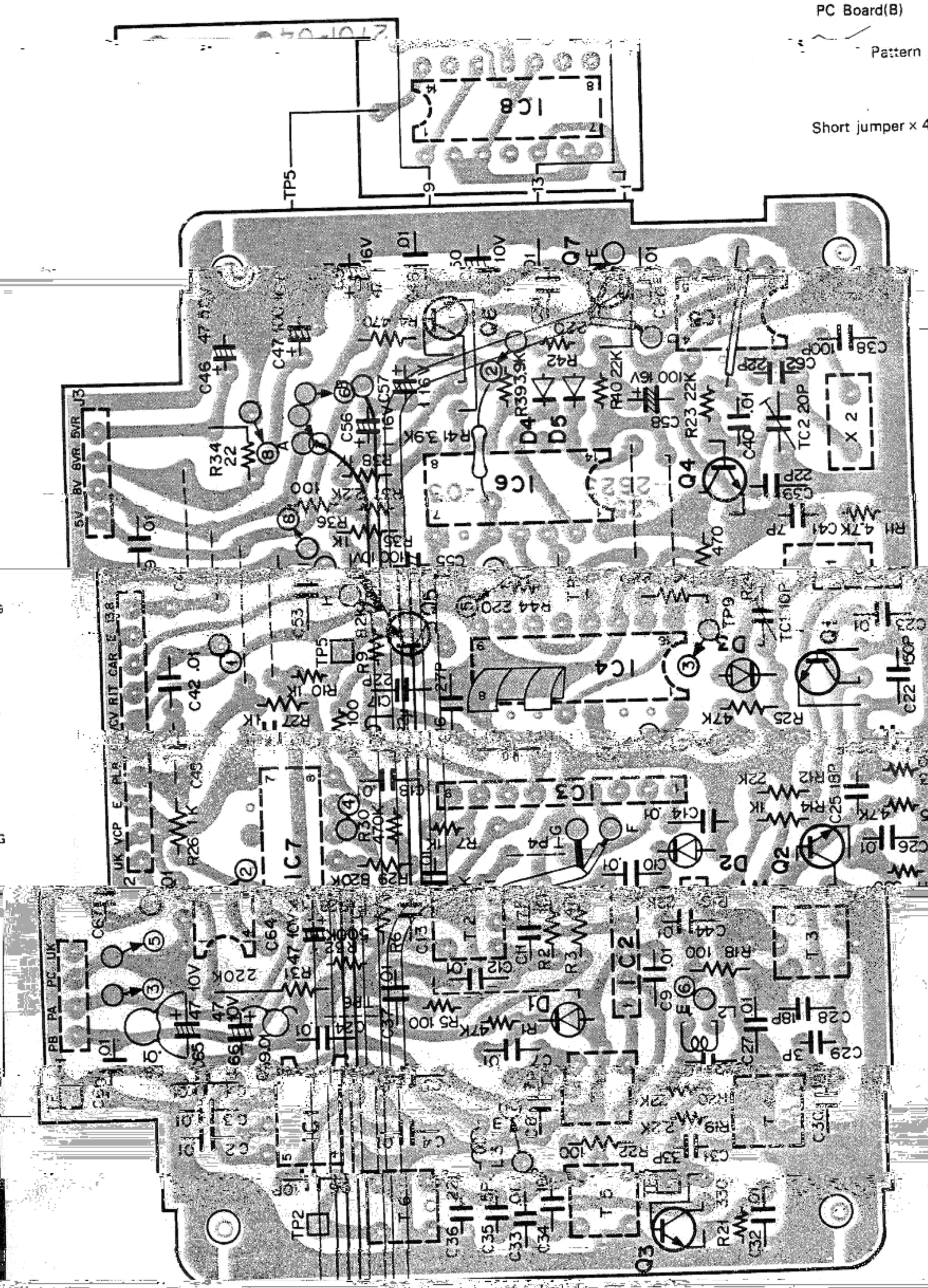
▼ PLL(A) unit (X50-1530-00)



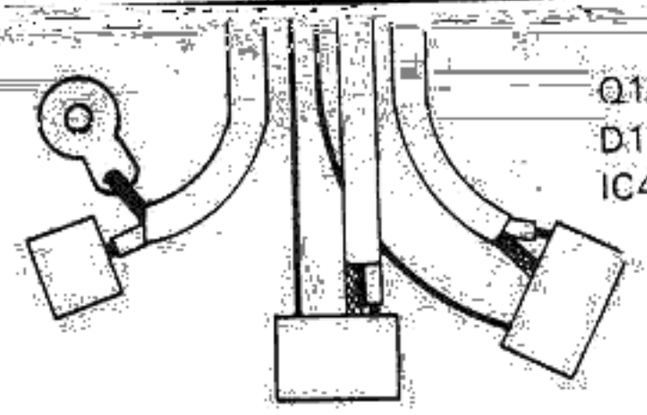








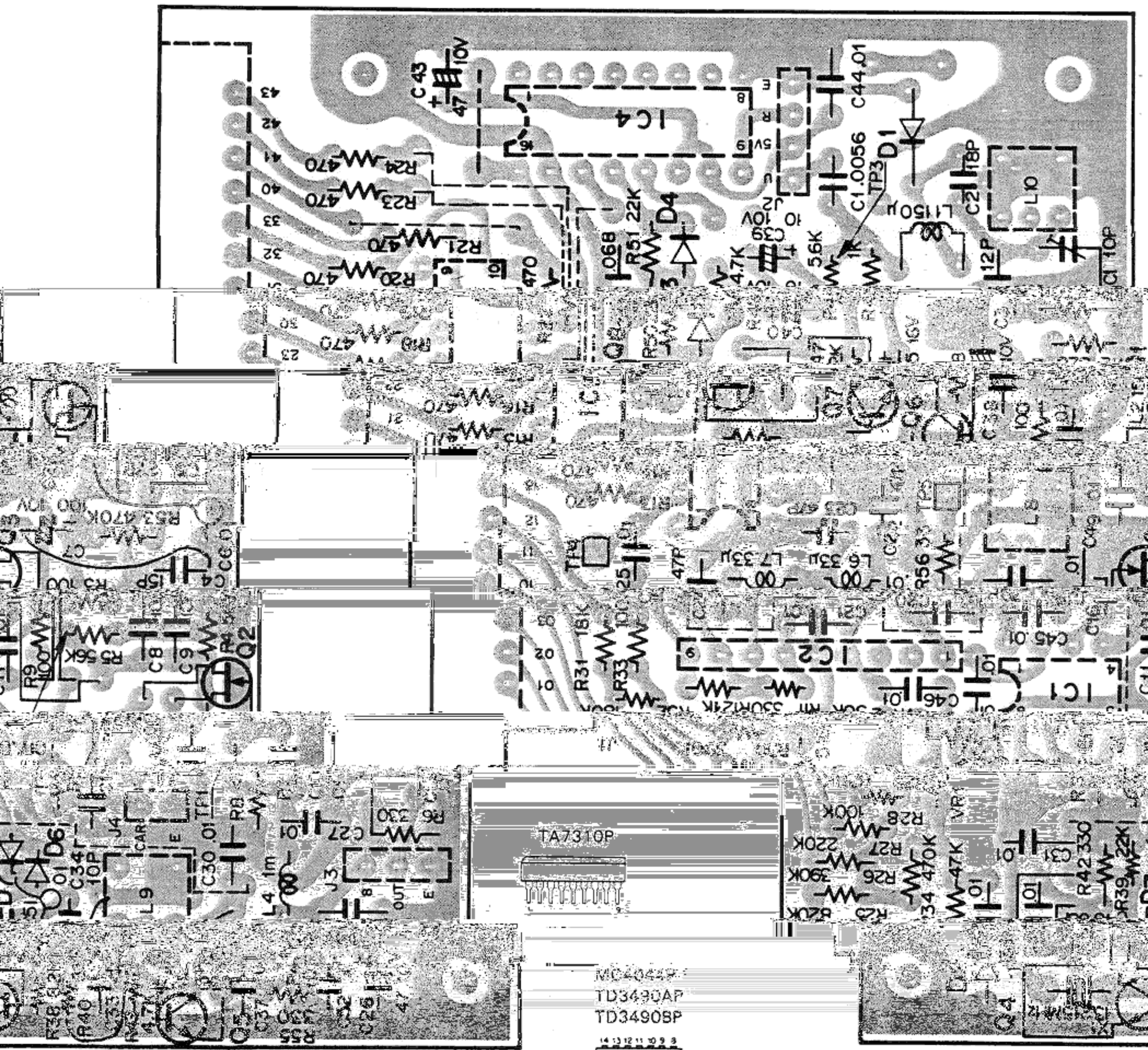
35(Y) Q6:2SC1000(GR)
16913P IC2:TA7060P IC3:TA7310P
IC6:MC4044P IC7:TD3409AP IC8:TD3490BP



Q1 ~ 3:2SC460(B) Q4, 5, 7:2SC7
D1 ~ 3:1S2208 D4, 5:1N60 IC
IC4:TD34192BP IC5:SM6422A

PC BOARD VIEWS

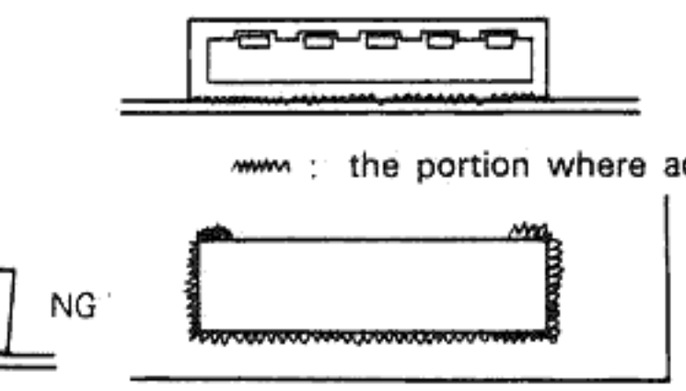
▼ PLL(B)unit (X50-1540-00)



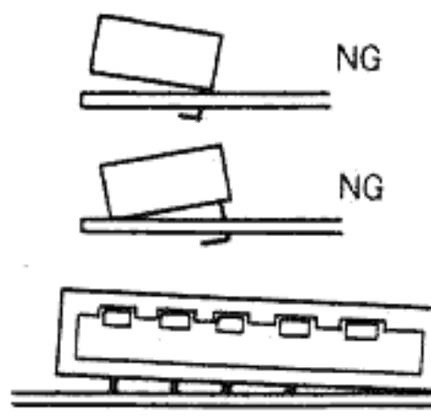
Q6、7:2SC1000(GR) Q8:2SK30A(GR)
、7:1N60
TC9122P IC4:MC14568B

Q1～3:2SK19(GR) Q4、5:2SC460(B)
D1:1S1658-2 D2:1S2208 D3、4、6
IC1:SN16913P IC2:TA7310P IC3:

<Attachment method of the J1>



: the portion where adhesives are applied>

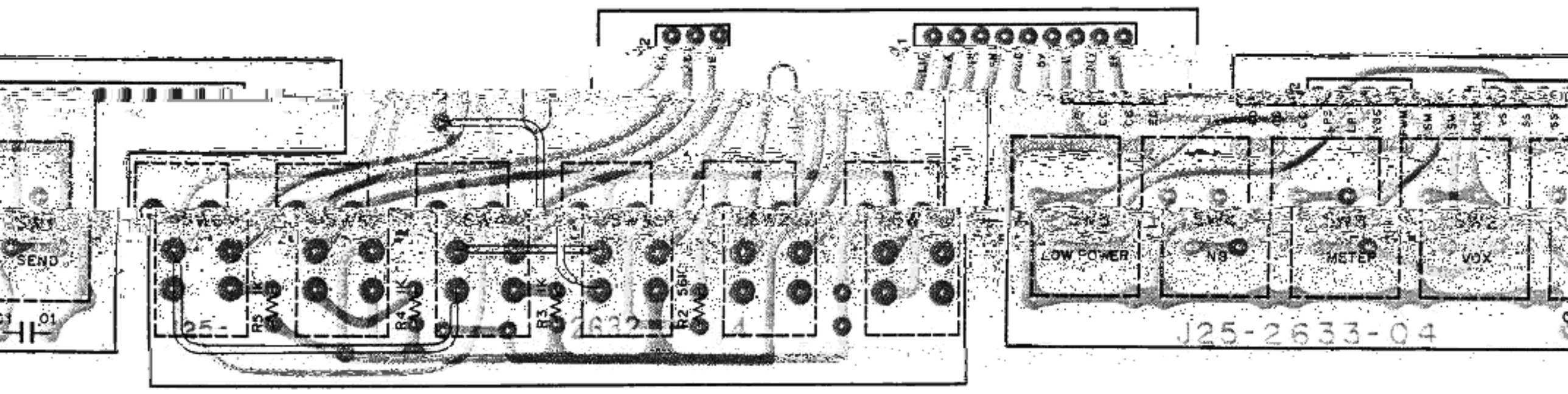


After soldering the J1, apply adhesives around the connector portion and fix it.

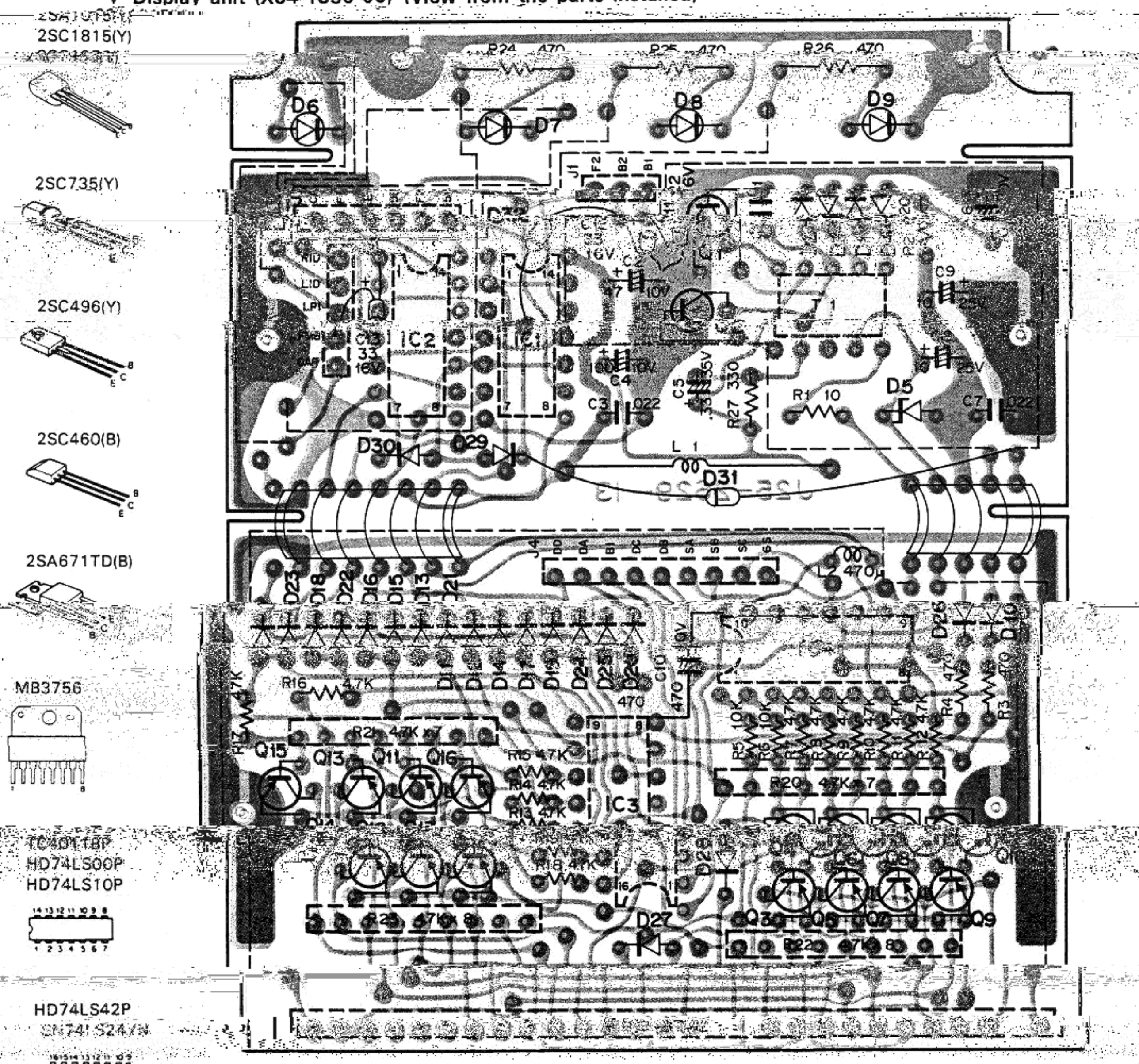
1180-00)

▼ 6 key unt (X41-1160-00)

▼ Lever switch unit (X41-



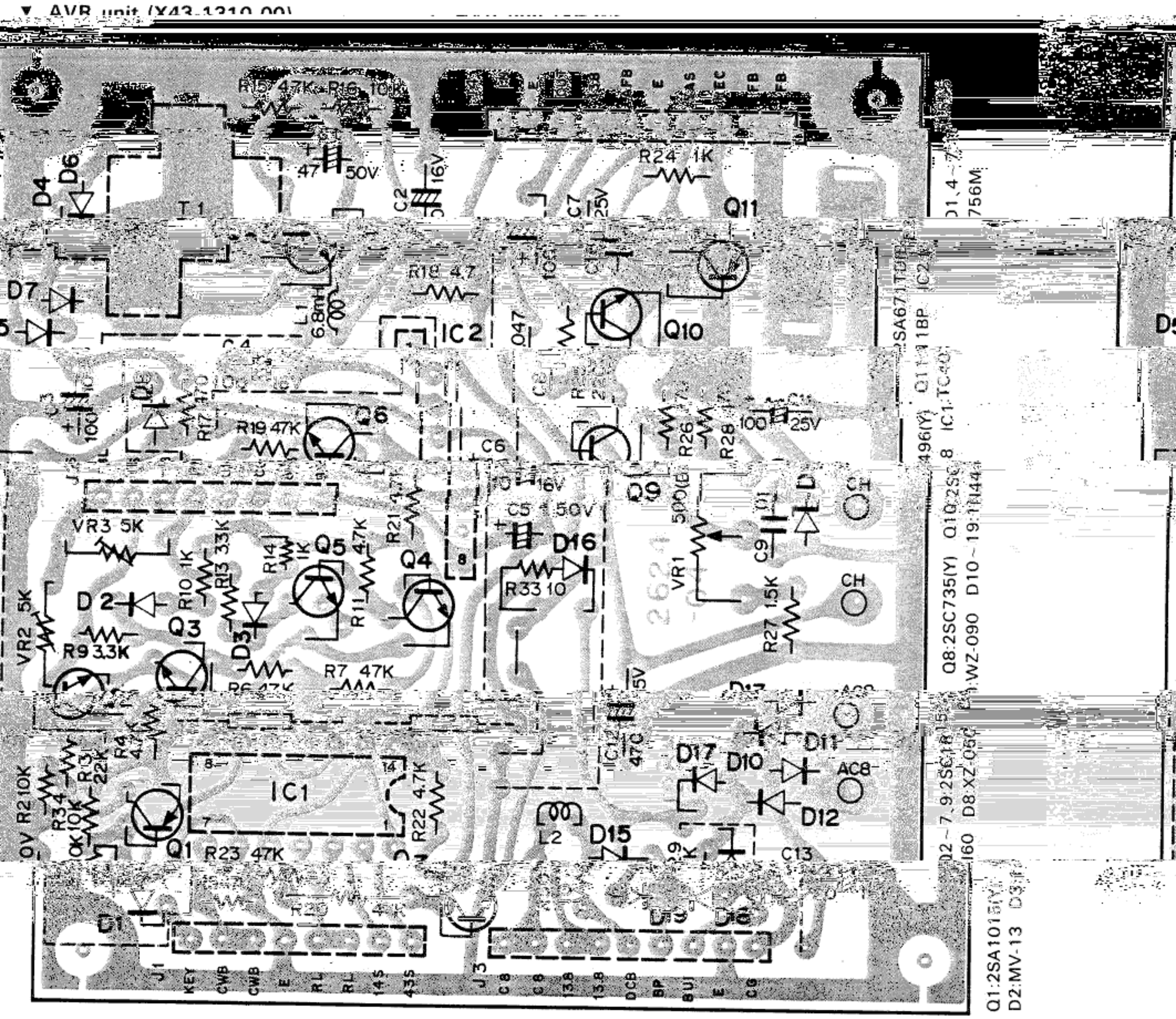
▼ Display unit (X54-1390-00) (View from the parts installed)



Q1、2:2SC1959(Y) Q3~17:2SC1815(Y) D1~4、10~32:1S1555 D5:WZ-071 D6~9:SEL103W
IC1:HD74LS10P IC2:HD74LS00P IC3:SN74LS247N IC4:HD74LS42P

PC BOARD VIEWS

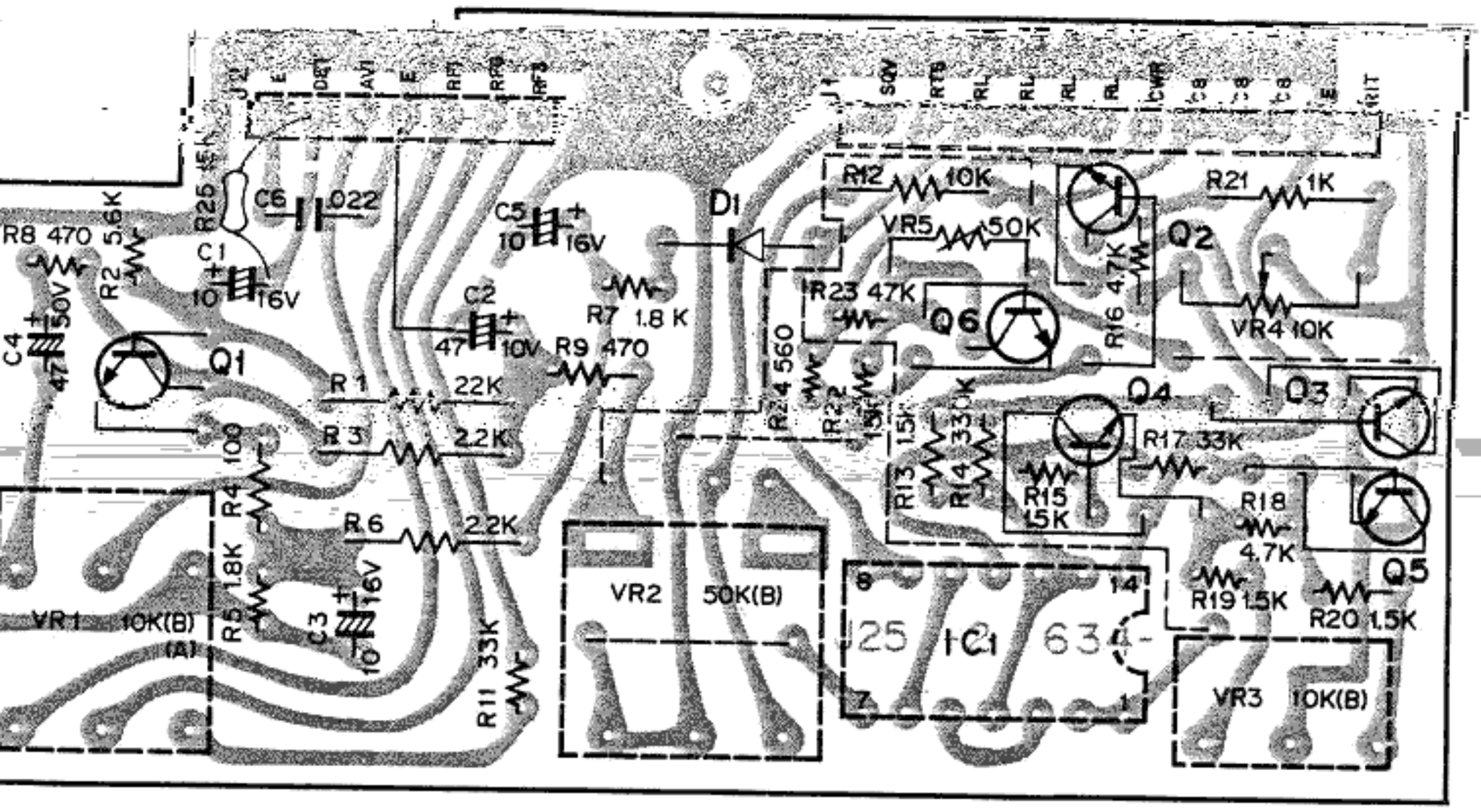
▼ AVR unit (X43-1310-00)



VR unit (X53-1090-61)

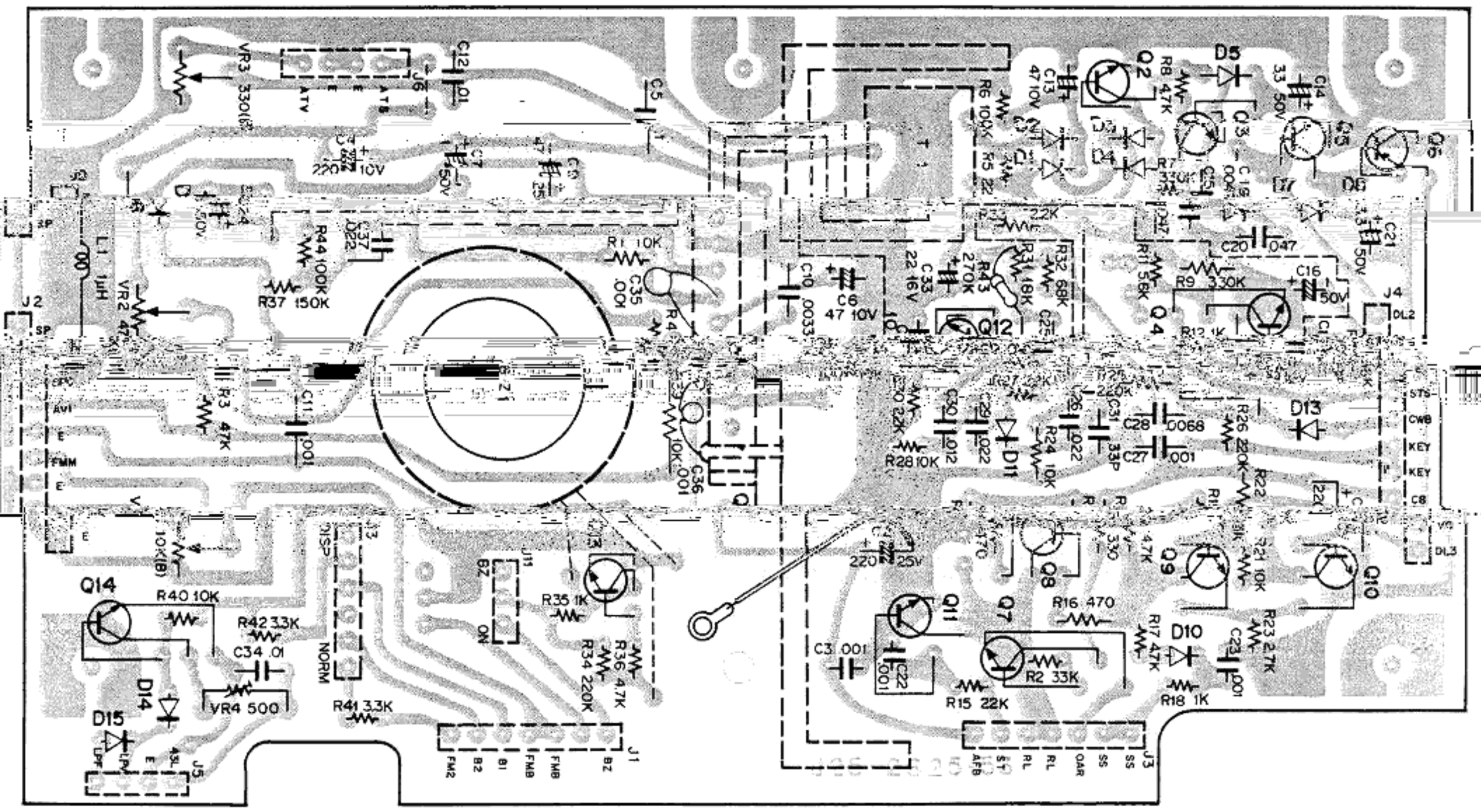
▼ AF·V

Q1~6:2SC1815(Y) D1:1S1555 IC1:TC4011BP



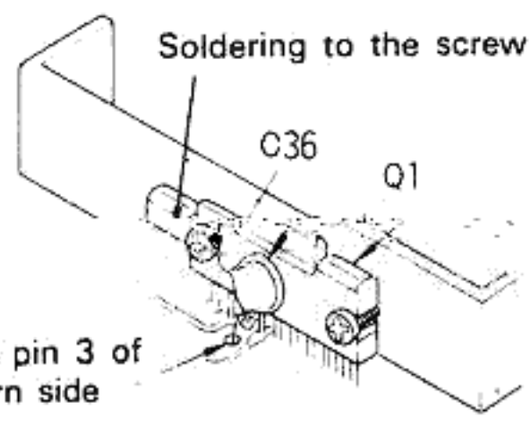
PC BOARD VIEWS

▼ AF·VOX unit (X49-1120-61)

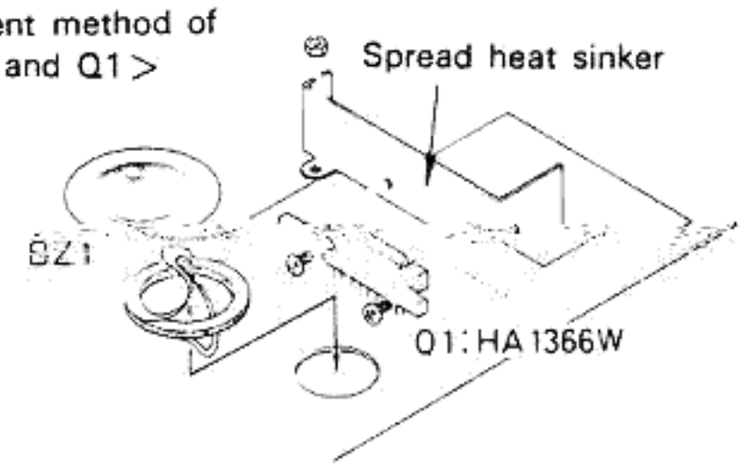


Q1:HA1366W Q2~5,7,9~14:2SC1815(Y) Q6,8:2SA1015(Y) D1~4,7,13:1N60 D5,8,10,11,14,15:1S1555 D6:1S2588

<Attachment method of the C36>

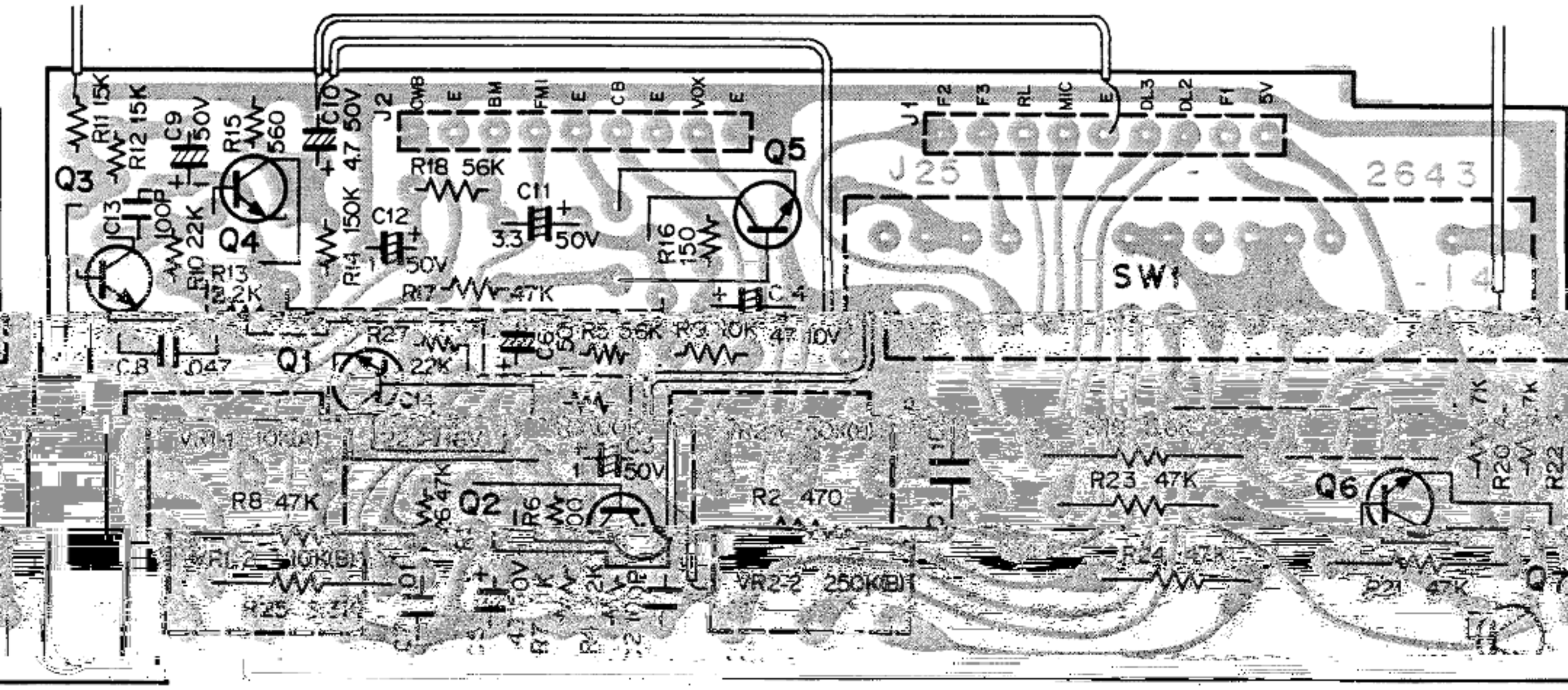


<Attachment method of the buzzer and Q1>



▼ MIC·VR unit (X53-1080-00)

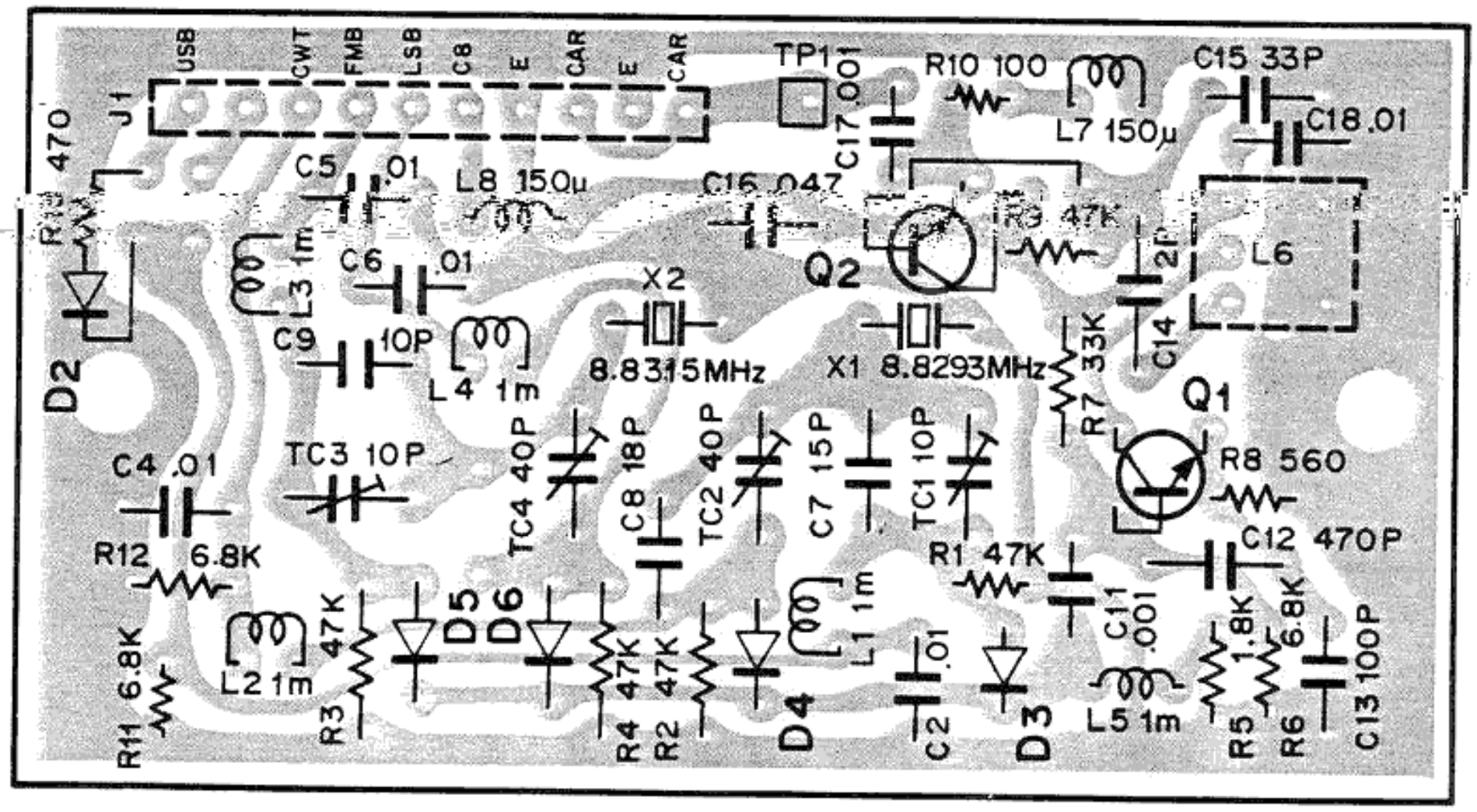
Q1:2SC1000(GR) Q2~7:2SC1815(Y)

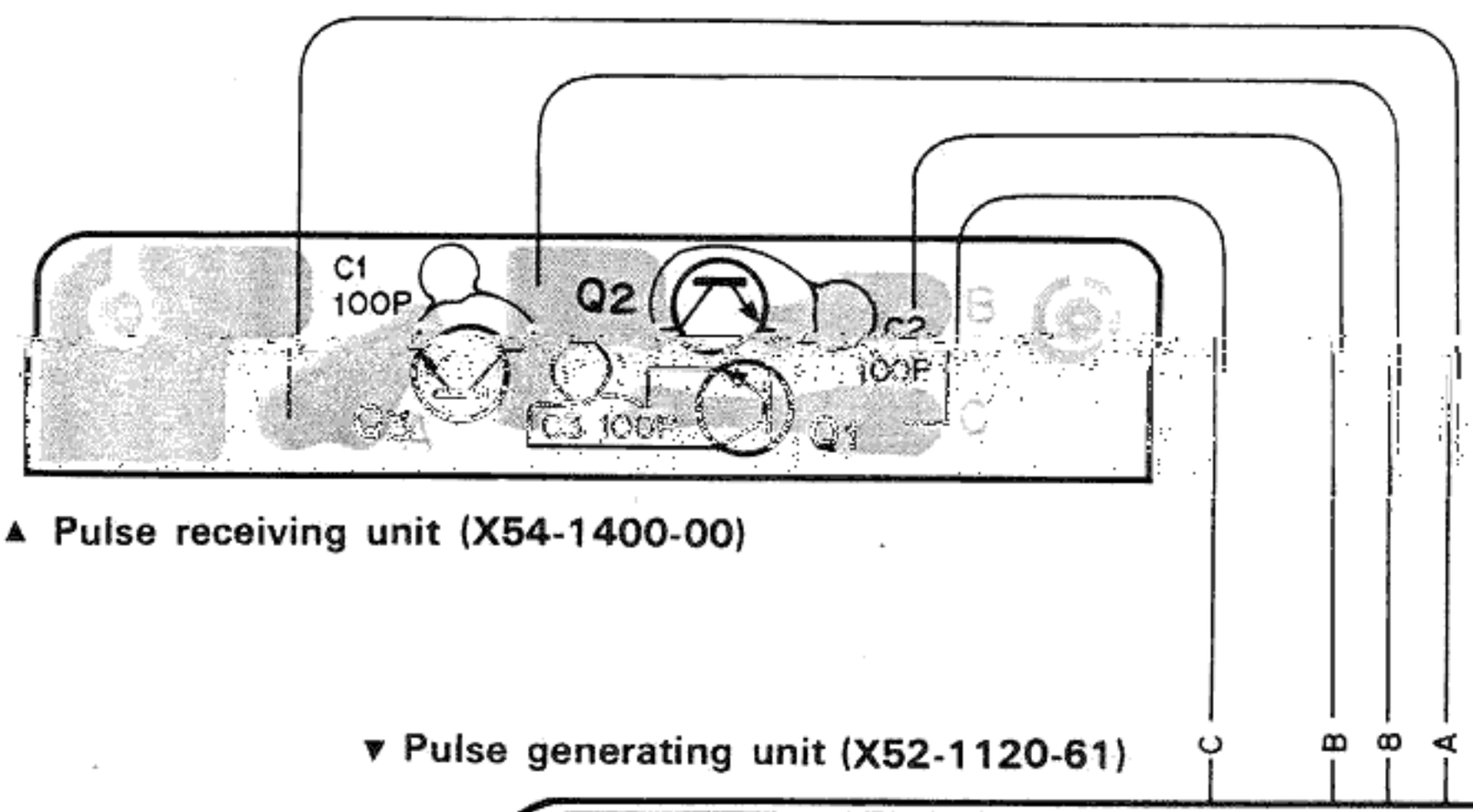


PC BOARD VIEWS

▼ CAR unit (X50-1510-00)

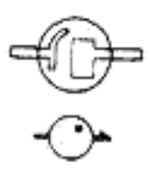
Q1,2: 2SC460(B) D2～6: 1S1555



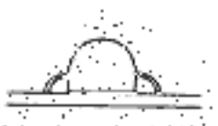


▲ Pulse receiving unit (X54-1400-00)

<Ploarity of Q1～3>

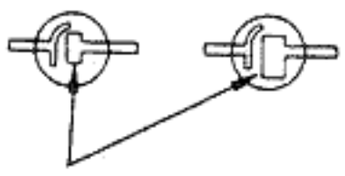


<Attachment method of Q1～3>



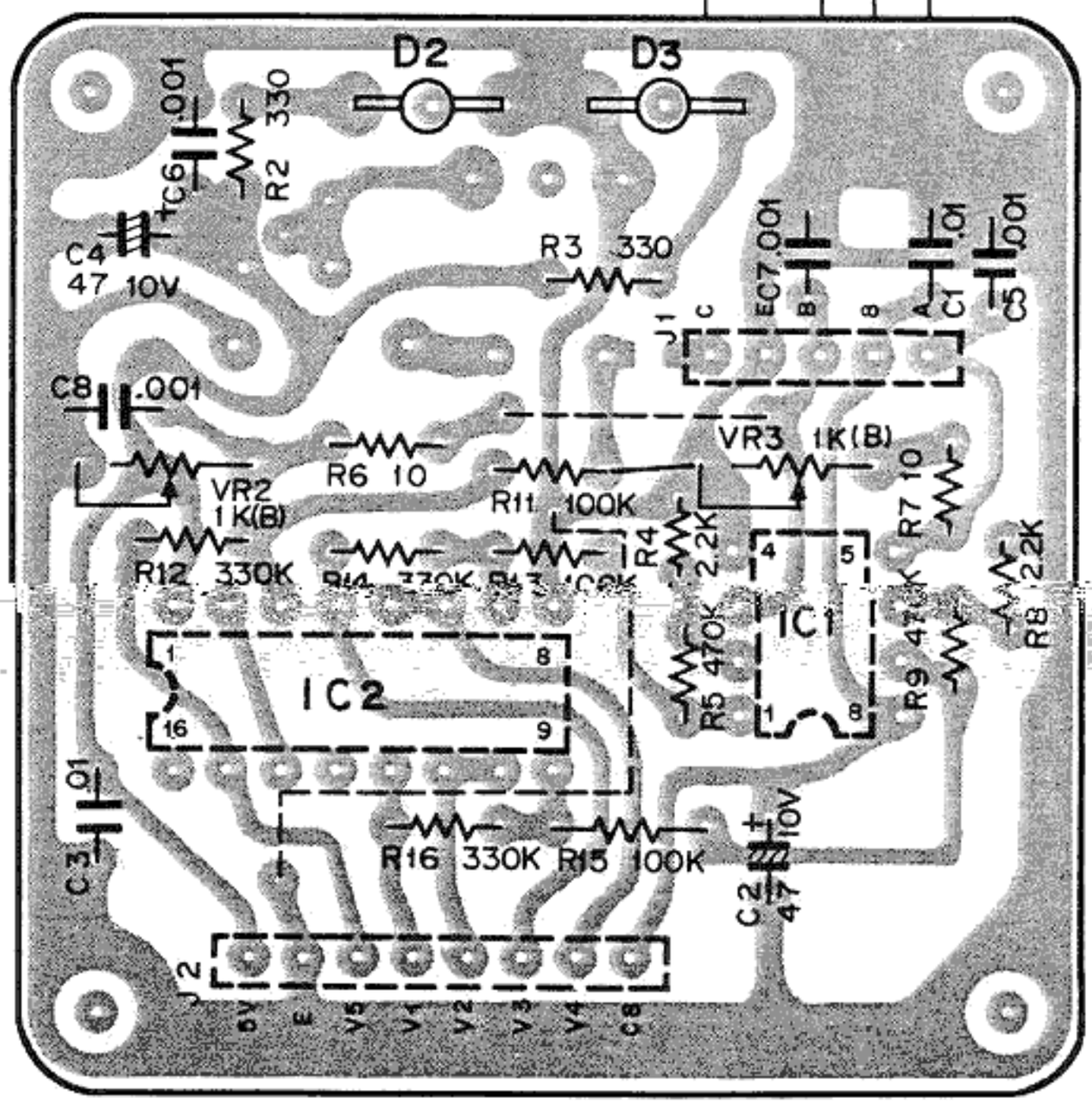
Make it come into close contact with the PC board.

<Differences between Q1 and Q2, 3>

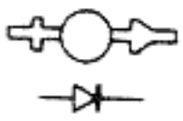


This portion of Q1 is bigger than Q2,3.

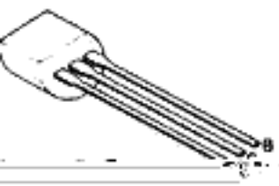
▼ Pulse generating unit (X52-1120-61)



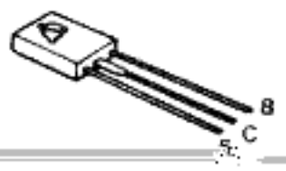
<Polarity of D1～3>



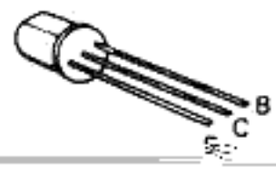
2SA1015(Y)
2SC1815(Y)



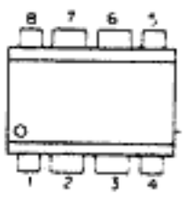
2SC496



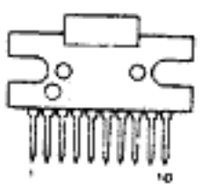
2SC1000(GR)



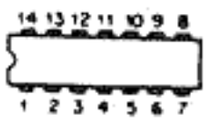
LM358P



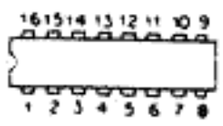
HA1366W



TC4011BP



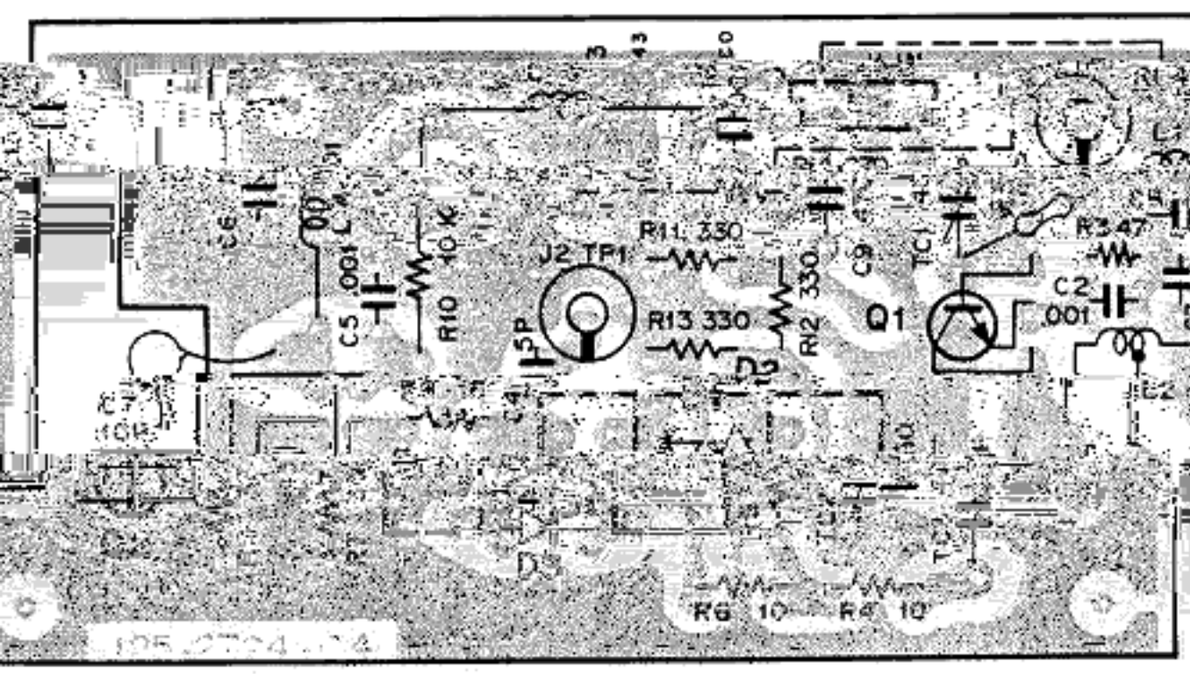
MC14049UBCP



D1～3:SEL101R(BorC) IC1:LM358P IC2:MC14049UBCP

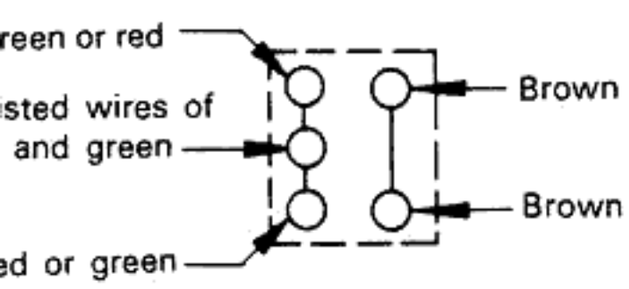
PC BOARD VIEWS

▼ MIX(A) unit (X48-1250-00)



:2SC2407 Q2:3SK76or3SK92 D1~4:1SS97

<Attachment direction of T1,2>



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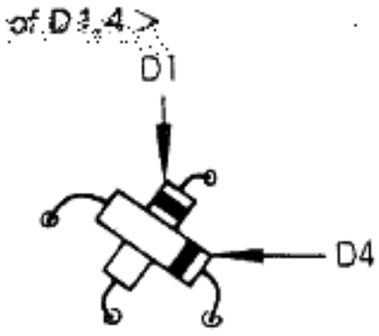
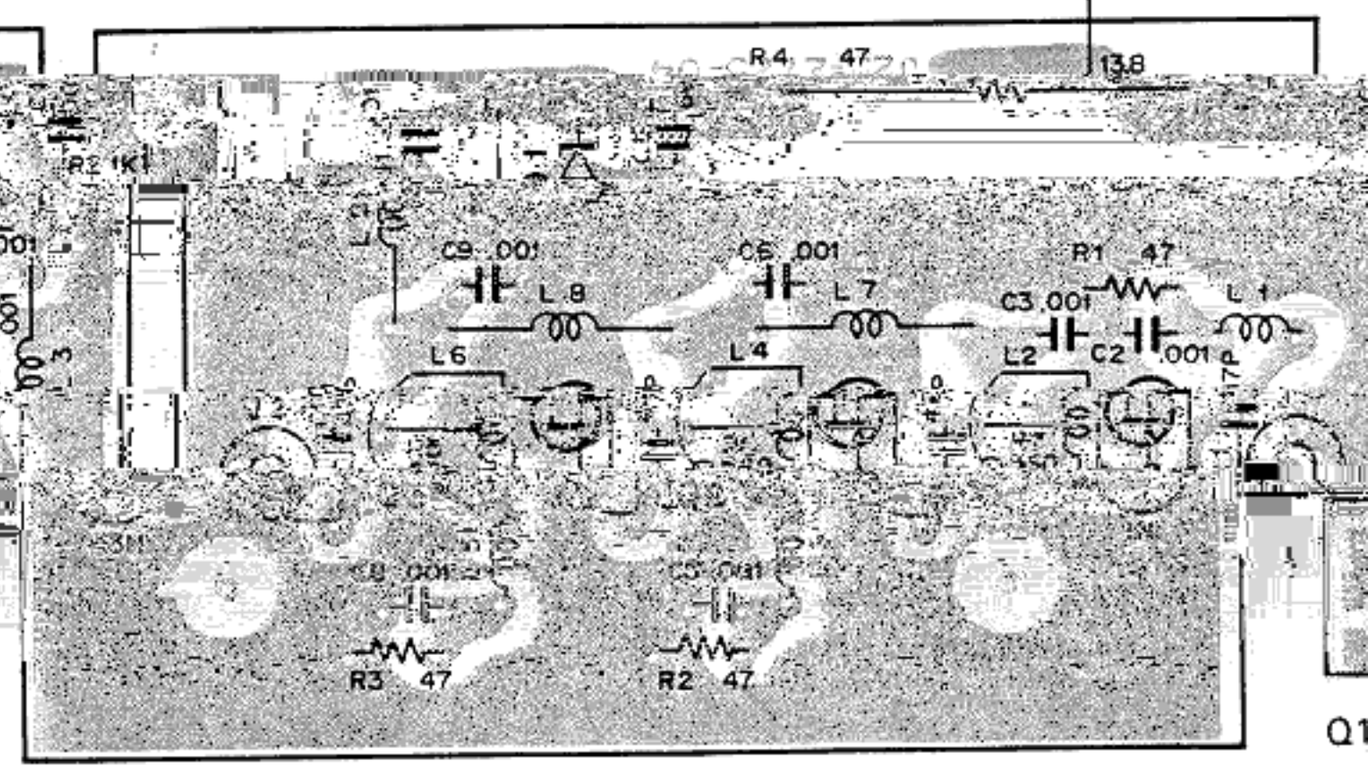


▼ MIX(B) unit (X48-1260-00)



Q1~3:2SK125 D1:BZ-090

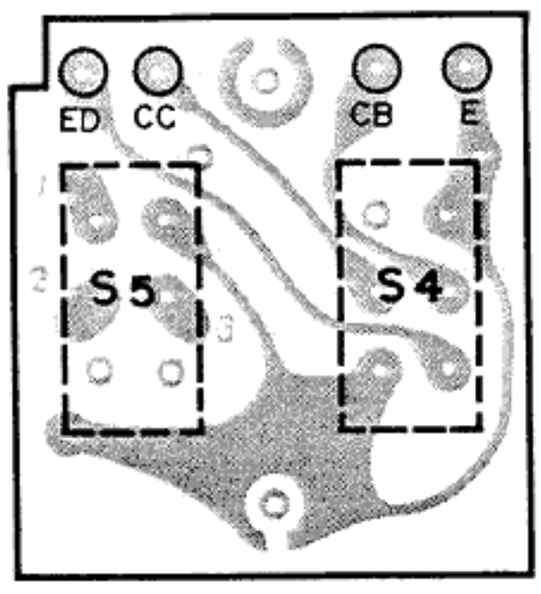
Q1

G

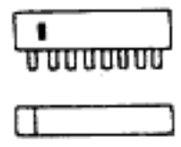
Twi
red

Re

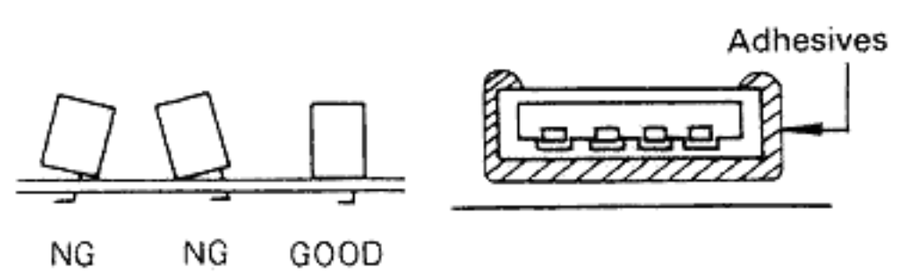
▼ PC Board(A) (J25-2699-14)



<Attachment direction of the composite resisters.>



<Attachment method of the J2,3,8>



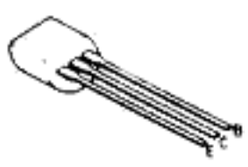
In case of J2, 3, 8, after inserting them into the printed circuit plate, bend the pins at the back side and make them come into close contact with the printed circuit plate.

Furthermore, after dipping, apply sufficient amount of adhesives (Rubber type adhesives such as "Sony Bond" or "Cemedine Hi-Contact") around the connector portion, and fix it in place.

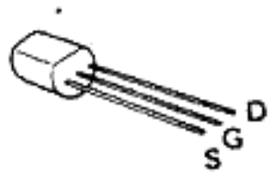
HD74LS00P HD74LS11P
HD74LS03P HD74LS20P
HD74LS04P HD74LS30P
HD74LS08P HD74LS32P
HD74LS10P HD74LS132P
HD7404P

HD74LS75P HD74221P
HD74LS151P MN1201A
HD74LS157P MSM5507RS

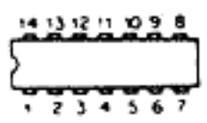
2SA1015(Y)
2SC1815(Y)



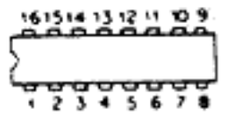
2SK125



3SK76
3SK92

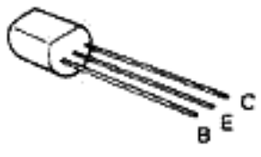


HD74154P

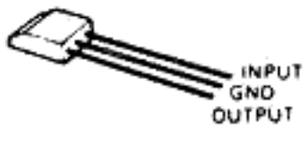


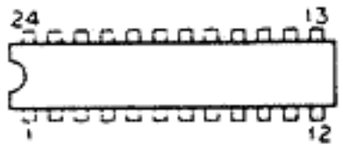
MN9004

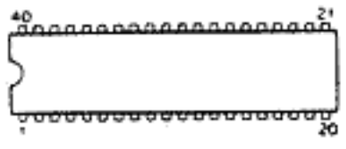
2SC2407



μPC78L05A



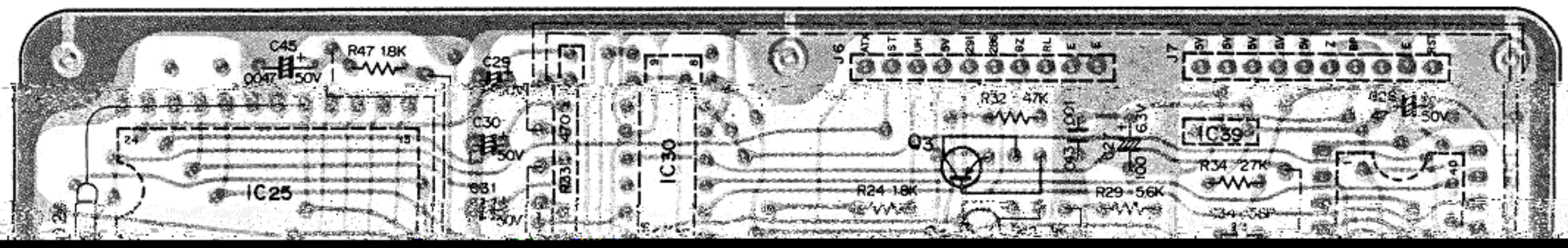




Q1,3~5:2SA1015(Y) Q2,6,7:2SC1815(Y) D1~3,5,7,8,11~15,17~24:1S1555 D4,6,25,26:1N60 IC1,2:HD74LS03P
IC14:HD74LS02P IC15,16,21:HD74LS20P IC17:HD7404P IC18:MSM5507RS IC20:HD74LS11P IC22~24:HD74LS30P
IC25:HD74154P IC26~29:HD74LS151P IC30,31:HD74LS75P IC32,33:MN1201A IC34,35:HD74LS157P IC37:HD74221P
IC38:MN9004 IC39:μPC78L05A

PC BOARD VIEWS

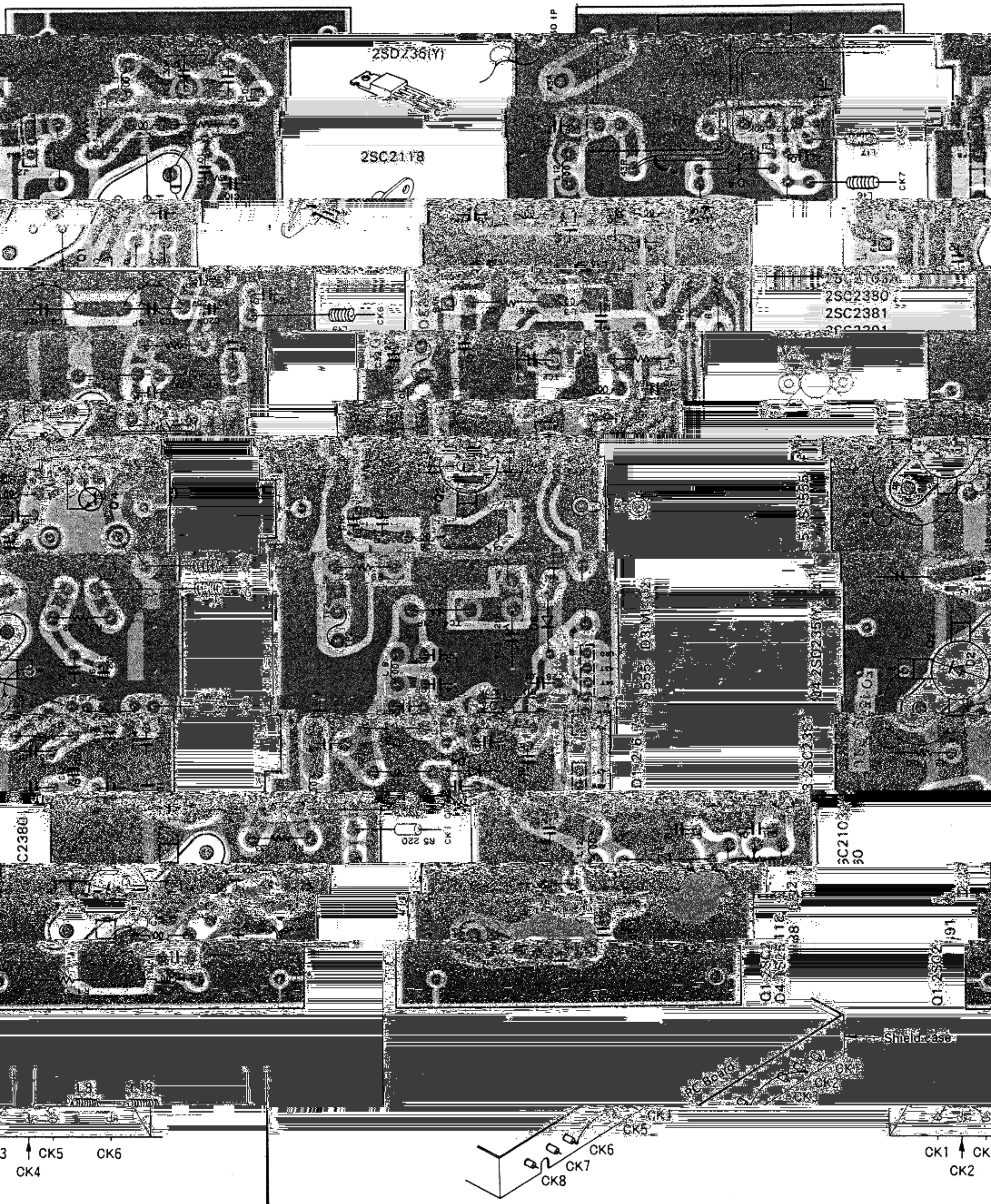
▼ **Digital Unit (X54-1460-61) (View from the parts installed)**



PC BOARD VIEWS

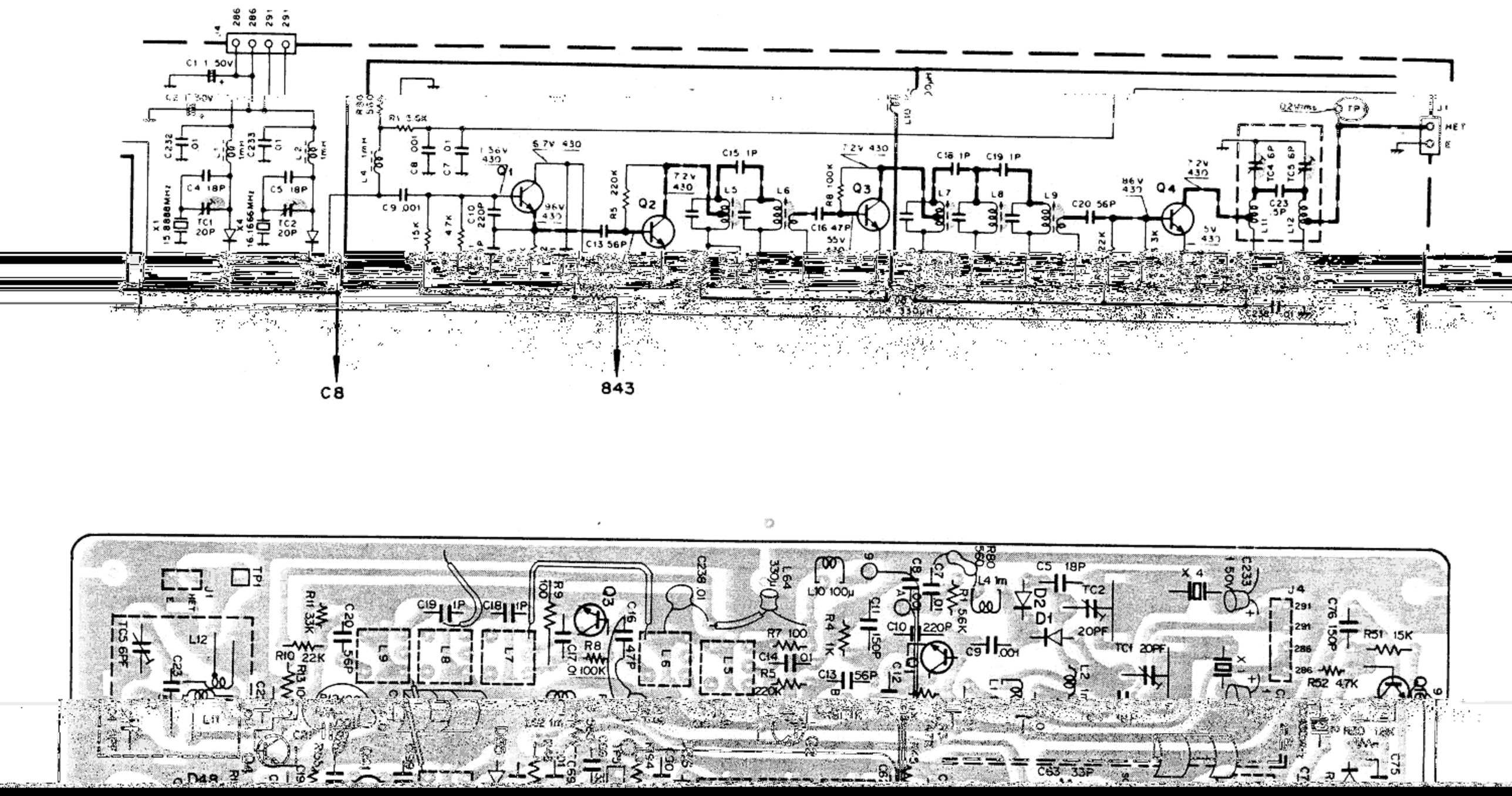
▼ 144 Final Unit (X56-1310-01)

▼ 430 Final Unit (X56-1320-01)



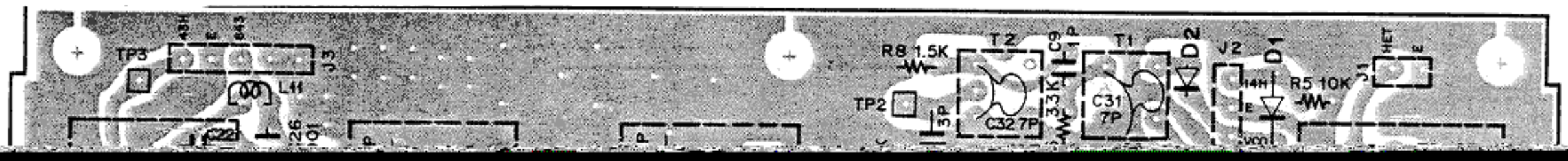
PC BOARD VIEWS

▼ IF Unit (X48-1220-00) ONLY S/N 94○○○○



PC BOARD VIEWS

▼ **MIX Unit (X48-1230-00) ONLY S/N 94 ○○○○**



DISASSEMBLY

1. How to remove the cases

A. How to remove the top case

1) Remove the four screws above the top case, and remove the six screws on both sides.
2) Lift up the upper case located towards the back side of the set. At this time, since the speaker cord is in a connected state, pay special attention to the speaker cord when the case is lifted.
3) Remove the protective sheet attached to the volume knob on top of the AF/VOX unit.
4) Remove the speaker cord from the connector of the AF/VOX unit.

B. How to remove the lower case

1) Remove the upper case in accordance with the procedure outlines in A.
2) Remove the 4 screws located on both sides and the 4 screws located at the bottom.
3) Lift up the case and make the removal.

C. Precautions for mounting the upper case

1) Firmly insert the speaker cord into the designated terminal of the AF/VOX unit.
2) Attach the upper case while paying attention to the 3 volume knobs located at the top of the set.

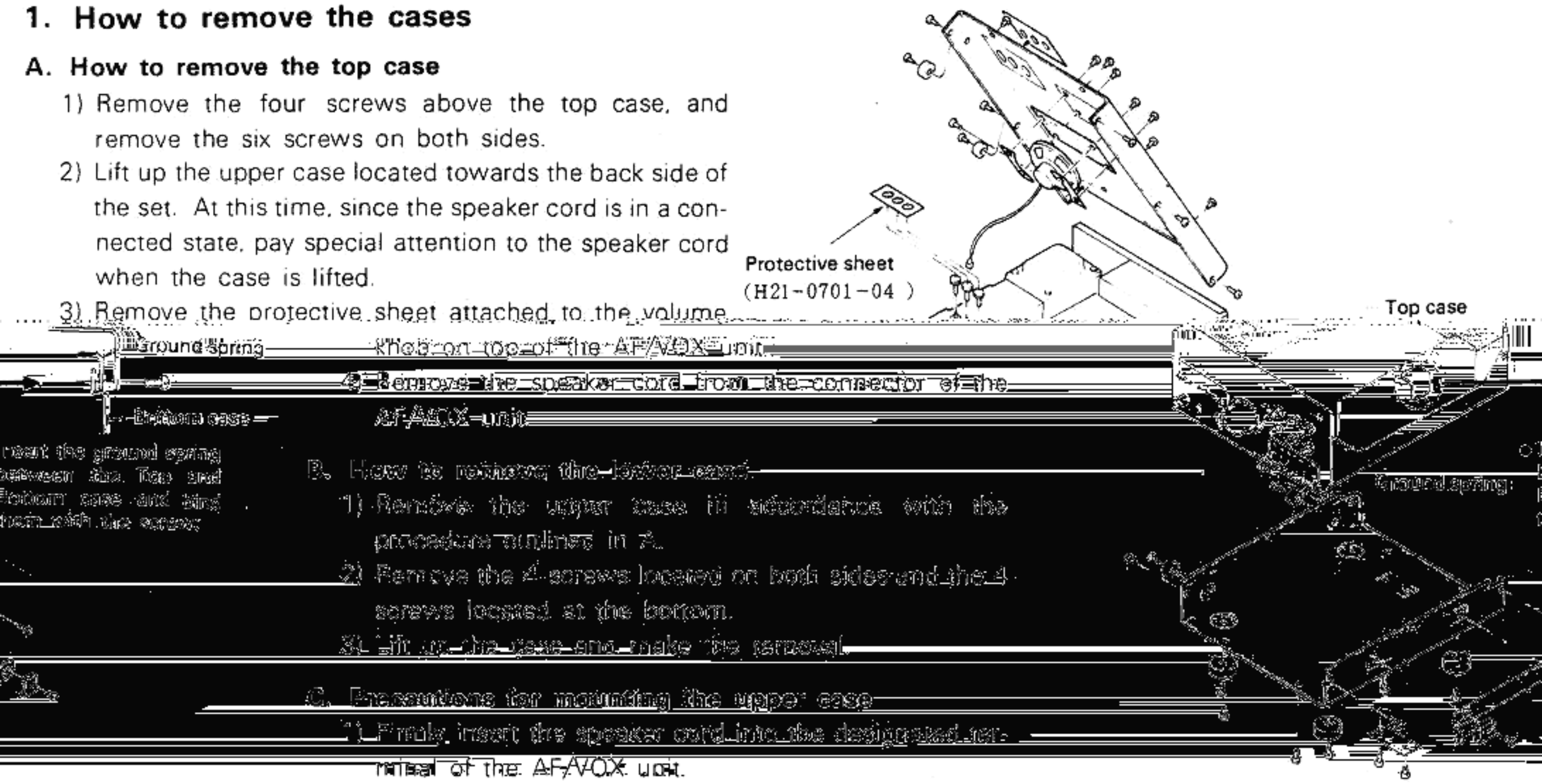


Fig. 1

2. How to incline the front panel

http://www.qsl.net/pe3hmp

1) Remove the top and bottom cases.
2) Remove the screws of the RF Unit side, and remove the earth wire located between the RF Unit and the MIC VR Unit.
3) Remove the 4 screws located on both sides, then incline the front panel forward (In case the front panel is erected and the screws are tightened, pay special attention so that the wires will not be pinched in between.)
4) Pull out the IN of MIX (B) Unit and the connector of 43 H.
5) Remove the flat cable located between the display unit and the digital unit from the digital unit side.

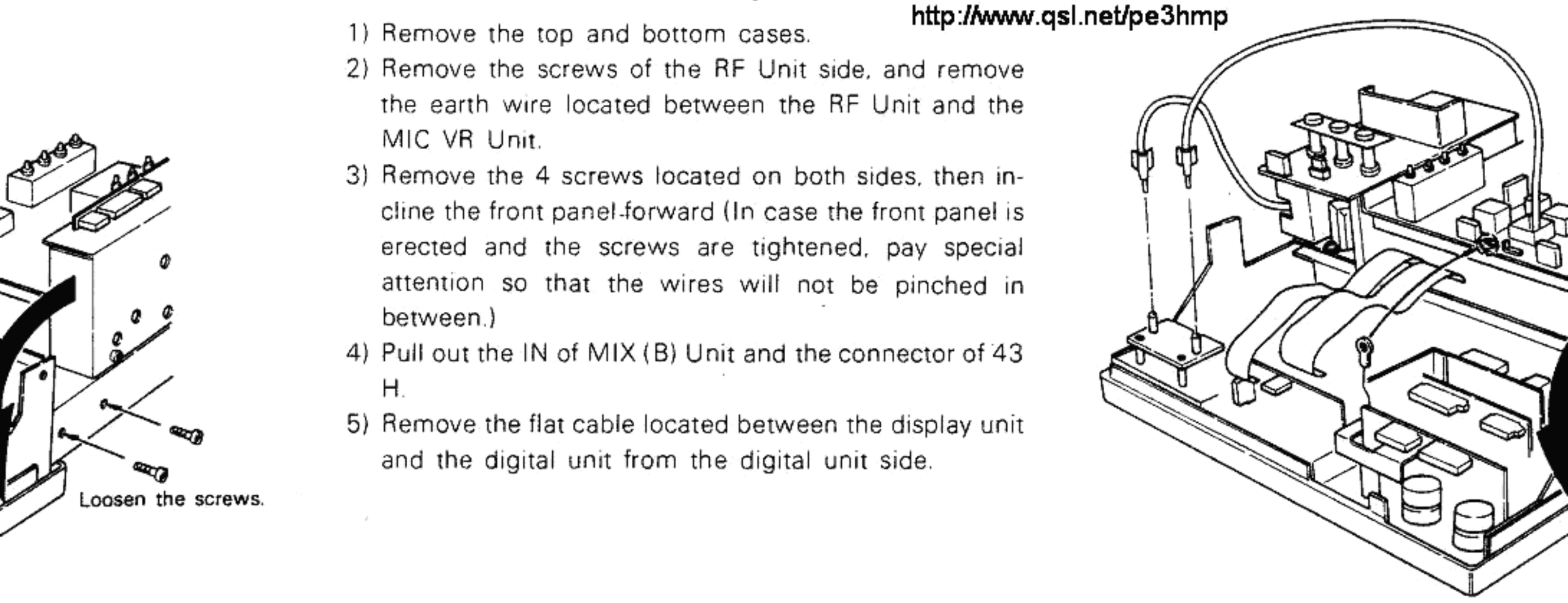


Fig. 2

DISASSEMBLY

3. Inspection and repairing of MIC VR Unit/AF VR Unit

1) Remove each knob/nut of MIC VR Unit or AF VR Unit.
2) Incline the front panel.
3) It can be removed from the front panel with the connector still attached to it.

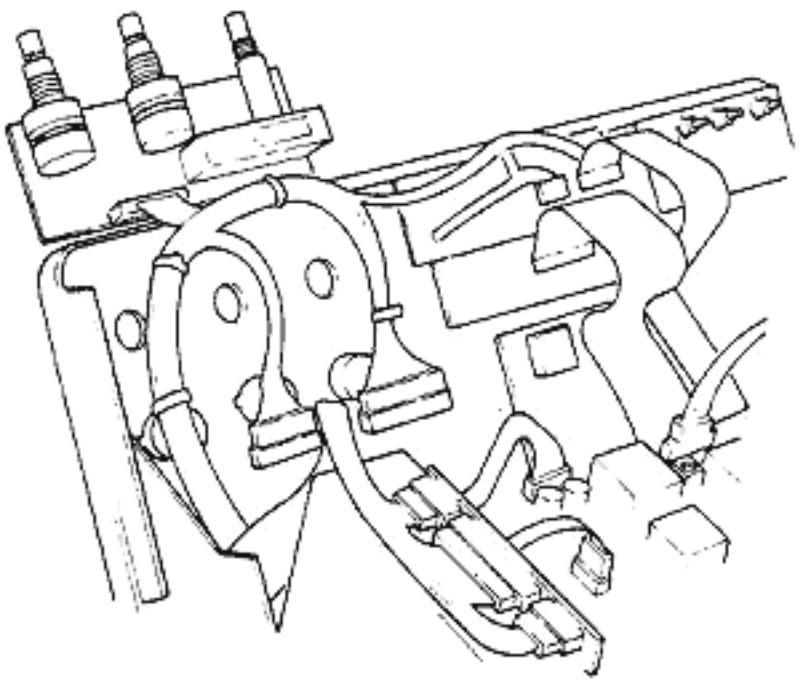


Fig. 3

4. How to remove the 6 key switch unit/band switch

1) Incline the front panel.
2) Remove the connector of the 6 Key Switch ASSY.
3) Remove the 3 screws shown in Fig. 4, then remove the 6 Key Switch Unit.
4) Remove the nut which holds the Band Switch ASSY in place as shown in Fig. 4.
5) Remove the Band Switch ASSY by sliding it slightly sidewise.

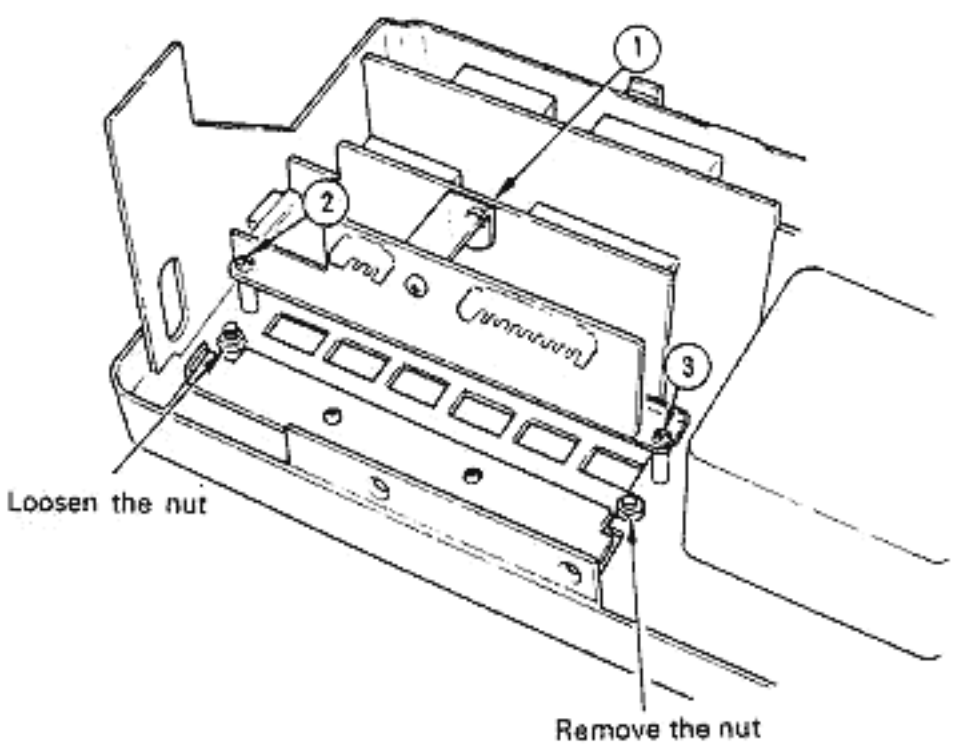


Fig. 4

5. How to remove the encoder unit

1) After removing the top and bottom cases, incline the front panel.
2) Remove the VFO knob with a 2.0 mm hexagonal spanner.
3) Remove the assembled nut of the Encoder Unit.
4) Remove the J2 Connector (55) of the Pulse Generating Unit.

6. Confirmation of the Tact Switch Stroke

1) Make certain that there is no play when the knob is touched.
2) Make certain that the stroke adjustment screw is in contact with the tact switch, but not pushing it.
3) Make certain the operation advances precisely one step each when the band knob is pressed.

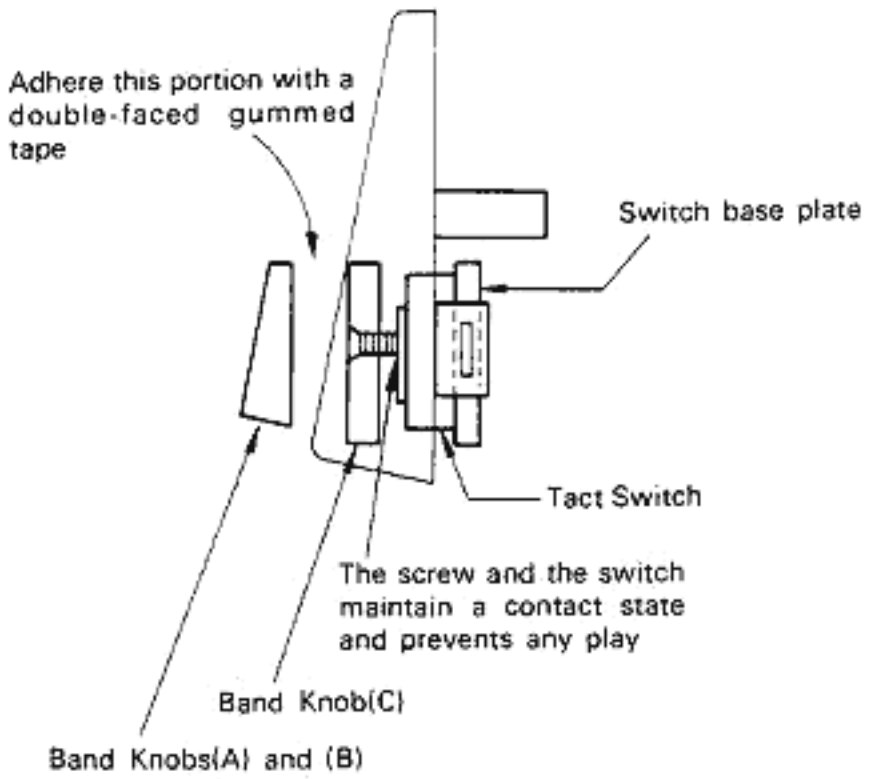


Fig. 5

7. Removing the RF unit

A. Removing the RF PC Board

1) Remove the all connector from RF unit.
2) Remove the condenser soldered to the FB terminal of the 430 MHz Final.
3) Remove the twelve screws (1 ~ 12) (as shown in Fig. 6)

B. Remove the RF PC Board with mounting bracket

1) Remove the all connector from RF unit
2) Remove the condenser soldered to the FB terminal of the 430 MHz Final.
3) Remove the screw (1, 5 ~ 11) (as shown in Fig. 6)

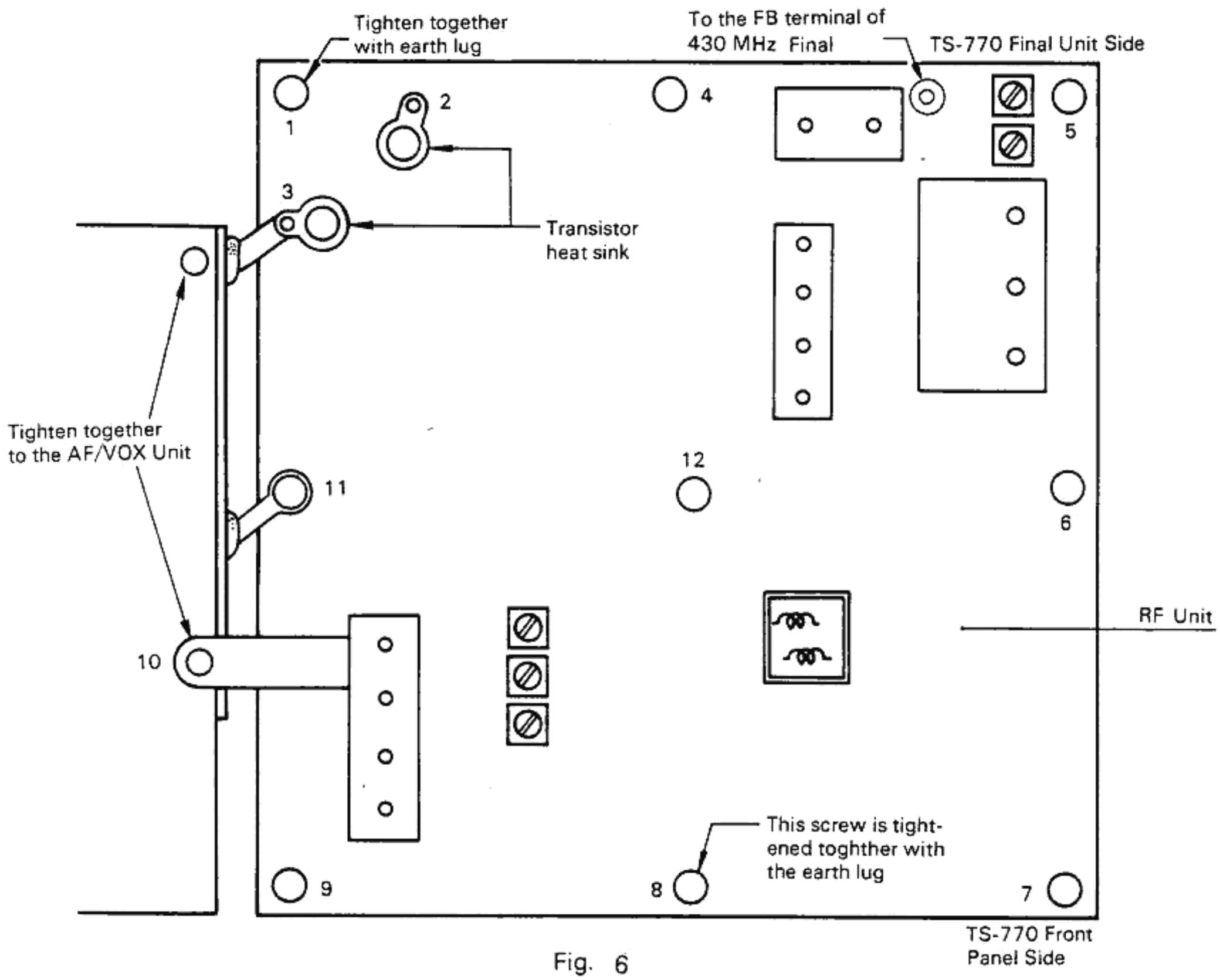


Fig. 6

8. How to remove the Final Unit

1) Remove the earth wire between the 430 unit and the PLL unit by removing the screw on the 430 unit side.
2) Disconnect the wire of FB terminal on the 430 unit.
3) Pull out the connector of the 144 unit.
4) Pull out the 14D, 43D, 14R, 43R connectors of the RF unit.
5) Remove the screw which holds the heat sink in place.
6) Remove the final unit from the back panel.

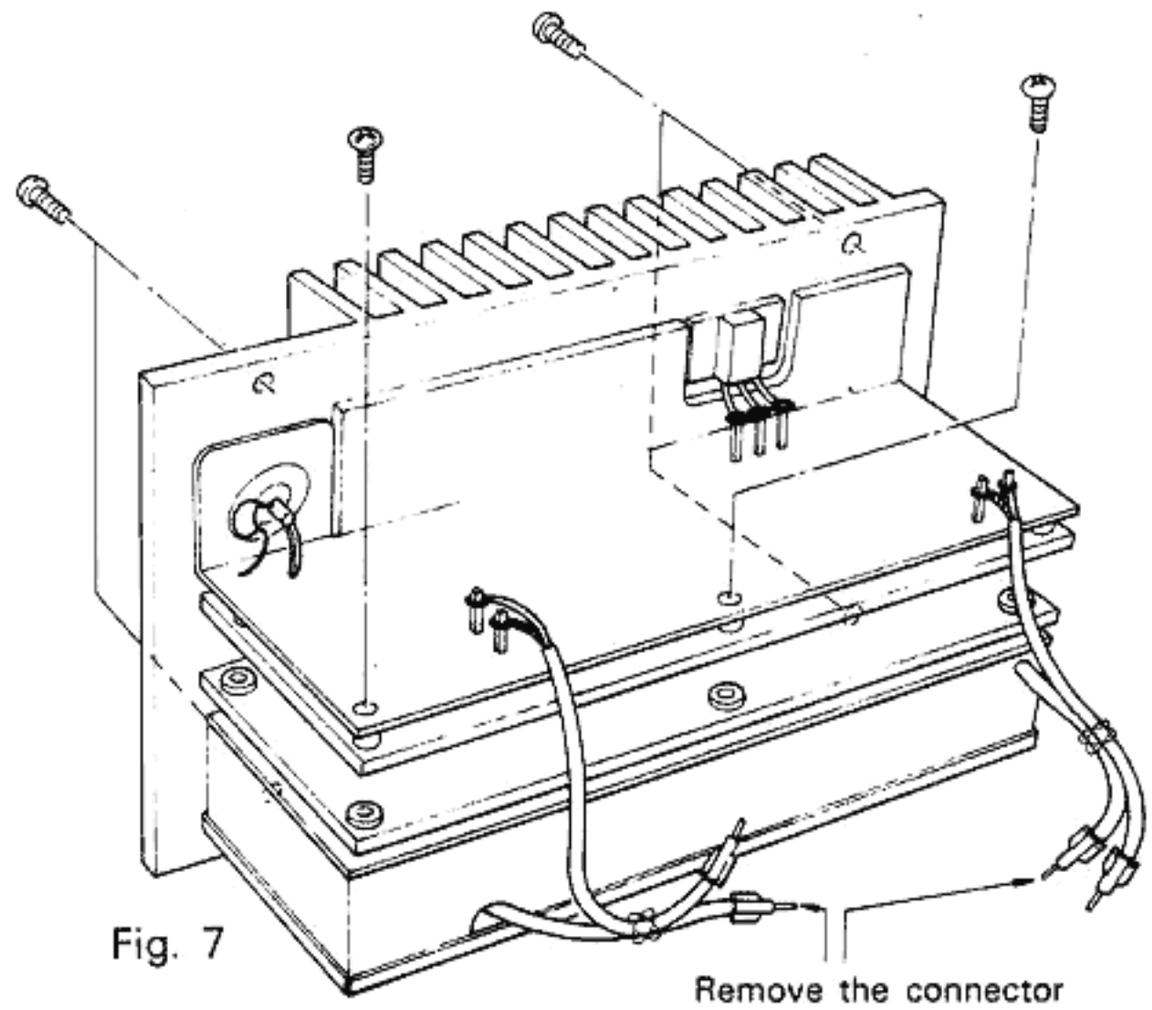


Fig. 7

9. How to remove the Flat Cable

1) The flat cable is removed by pulling slightly on the left side and right side alternately, as shown in Fig. 8.

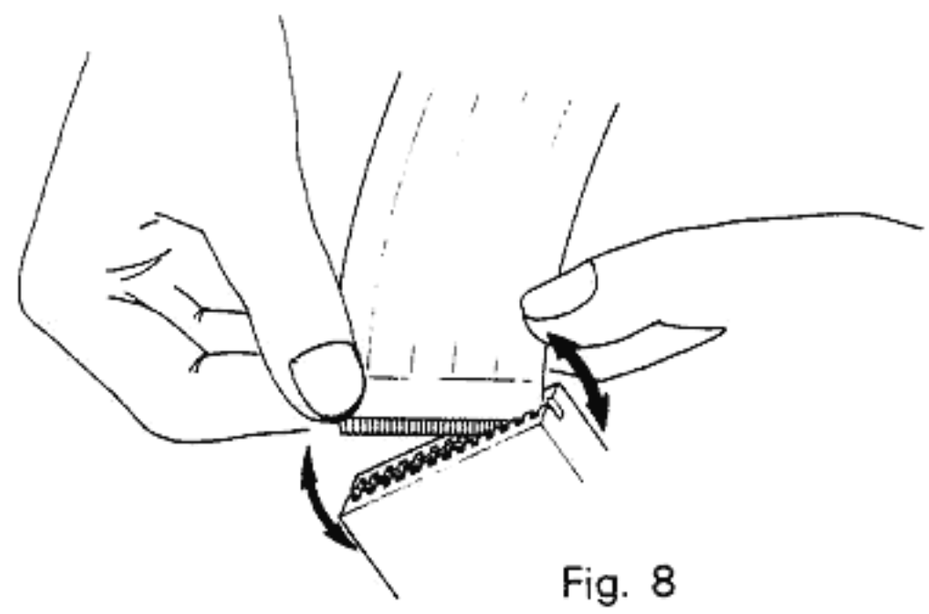


Fig. 8

ADJUSTMENTS

Testing Instruments

1. **Tester**
   - High input impedance
2. **RF VTVM (RF V.M)**
   - Input impedance: 1MΩmin., 2pF max
   - Voltage range: F.S = 10 mV ~ 300V
   - Frequency range: Up to 450 MHz
3. **Frequency Counter (F count)**
   - Input sensitivity: Approx. 50 mV
   - Frequency range: Up to 450 MHz
4. **DC Power**
   - Voltage: 10V ~ 17V, variable
   - Current: 8A min.
5. **Power Meter**
   - Measurement range: Approx. 20W
   - Input impedance: 50 Ω
   - Frequency range: 450 MHz
6. **AF VTVM (AF V.M)**
   - Input impedance, 1MΩmin.
   - Voltage range: F.S = 1 mV ~ 30V
   - Frequency range: 50 Hz ~ 10 kHz
7. **AF Generator (AG)**
   - Output frequency: 100 Hz ~ 10 kHz
   - Output voltage: 0.5 mV ~ 1V
8. **Linear Detector**
   - Frequency range: 450 MHz
9. **Field Strength Meter**
   - Frequency range: 450 MHz
10. **Directional Coupler**
11. **Oscilloscope**
    - High sensitivity oscilloscope with horizontal input ter-
    minal

12. **SSG**
    - Frequency range: 144 MHz and 430 MHz band.
    - Modulation: AM and FM (400 Hz)
    - Output level: −13 dB to −120 dB
13. **Dummy load**
    - 50 Ω/5W (Power)
14. **Noise Generator**
    - Must generate pulses the noise containing harmonics beyond 430 MHz.
15. **Sweep Generator**
    - Sweep range 144 MHz and 430 MHz bands

Preparation

1) Unless otherwise specified, knobs and switches should be set as follows:

POWER SW	ON
SEND/REC SW	REC
VOX/MAN SW	MAN.
ALC/RF SW	RF
LOW/HI SW	HI
TONE SW	OFF
VFO SW	SIR
MODE SW	CW
FUNCTION SW	A
RF GAIN VR	MAX(FULL COUNTER CLOCKWISE)
SQUELCH VR	MIN
S/F SW	OFF(SLOW)
SCAN SW	OFF
SEARCH SW	OFF
F.LOCK SW	OFF

2) Adjustments (trimmers, coils, etc.) should be made using an insulated rod such as a bakelite rod.
3) Original power supply diagram cannot be used because the stand-by switch is SEND or works will damage the SSG.
4) After connecting the power cord, be sure to set the power switch and VOX switch to OFF.

   Note: When the power switch is turned ON in the ON position of the VOX switch, the transceiver is momentarily set in transmit mode. Special care should be taken when adjusting the receiver section.
5) The output level of SSG is indicated as SSG's open circuit.

ADJUSTMENTS

A. TX/RX SECTION (COMMON)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
1. Resistance measurement	1) MEMORY B.U SW on rear panel: ON	Ohm-meter	FINAL (144)	COL				More than 3MΩ	
				FB				More than 1MΩ	
			AVR	CS				More than 1MΩ	
				B14				More than 30Ω	
				B43				More than 10Ω	
			RE	ASW				Not satisfied	Check
				14T					
				43T					
				L18					
				L36					
			PLL (A)	8V				Not satisfied	
				5V					
			MIC VR	5V				Not satisfied	
2. AVR	1) POWER SW: OFF POWER terminal: AC P.S. (220V) SEND/REC SW: REC	DC V.M	AVR	BP				More than 7.0V	Check
		B.U lamp						ON	Check
	2) MEMORY B.U SW	B.U lamp						OFF	Check
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ADJUSTMENTS

TX/RX SECTION (COMMON)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instrument	Unit	Terminal	Unit	Parts	Method		
AVR	5) BAND SW: 430								
	• SEND/REC SW: SEND	DC V.M	RF	TP8	RF	VR2	Set to 8.0V		
	• SEND/REC SW: REC	DC V.M	RF	TP8				Less than 0.3V	Check
	10) SEND/REC SW: REC	DC V.M	PLL (A)	8V				8V ± 0.3V	Check
				5V				5V ± 0.25V	
3. LAMP	1) Continued from previous item	Meter lamp						All 3 lamps are ON.	Check
		DISPLAY						All 8 digits are ON	
		ON AIR lamp						OFF	
	2) HI/LOW SW: HI MODE SW: FM, USB, LSB, CW	LOW lamp						OFF	Check
	3) HI/LOW SW: LOW								
	• MODE SW: CW,LSB,USB	LOW lamp						OFF	Check
	• MODE SW: FM	LOW lamp						ON	
	4) F.LOCK SW: ON	F. LOCK lamp						ON	Check
	OFF	F. LOCK lamp						OFF	
	5) RIT SW: ON	RIT lamp						ON	Check
	OFF	RIT lamp						OFF	
	6) S/F SW: ON (FAST)	FAST lamp						ON	Check
	OFF (SLOW)	FAST lamp						OFF	
4. VCO	1) MODE SW: USB FUNCTION SW: A	Synchro-scope	PLL (B)	TP4	PLL (B)	L9, 8	Adjust L9 and L8 to obtain		

ADJUSTMENTS

Item	Condition	Check point			Adjusting point			Standard	Remarks
		Testing instruments	Unit	Terminal	Unit	Parts	Method		
5. CAR	1) SEND/REC SW: REC MODE SW: CW	RF V.M	CAR	TP1	CAR	L8	MAX	More than 0.4V	OK
	2) MODE SW: LSB,USB,FM	RF V.M	CAR	TP1				More than 0.4V	Check OK
	3) MODE SW: FM	F. Count	CAR	TP1	CAR	TC3	8.8300 MHz	±300 Hz *Coarse adjustment.	
	USB					TC1	8.8515 MHz		
	LSB					TC4	8.8285 MHz		
	4) MODE SW: CW CAR VR: MIN SEND/REC SW: SEND	F. Count	CAR	TP1	CAR	TC2	8.83070 MHz	±100 Hz	
6. OSC	1) MODE SW: FM SEND/REC SW: SEND	F. Count	IF	TP2	IF	TC9	21.8000 MHz		
	2) MODE SW: USB	F. Count	IF	TP3	IF	L27	30.4300 MHz	±20 Hz	
7. VCO	1) VFO SW: CIR BAND SW: 145 • VFO dial: 000.0 • BAND SW: 144 VFO dial: 999.9	F. Count	RF	TP4	PLL(B)	VR1	Set the VR1 for frequency difference within 20 Hz between VFO dial 000.0 and 999.9.	20 Hz	VR2: Coarse adjustment. VR1: Fine adjustment.
	2) VFO dial: 000 MODE SW: USB	RF V.M	RF	TP4	RF	T18	MAX		
8. RIT	1) RIT SW: ON RIT VR: 12 o'clock position	F. Count	RF	TP4			Check counter frequency.		
	2) RIT SW: OFF	F. Count	RF	TP4	AF VR	VR4	Set to the frequency in item 1).	±20 Hz	
	3) RIT SW: ON • RIT VR: MIN • RIT VR: MAX	F. Count	RF	TP4				Check the frequency varies more than ±2 kHz from the frequency in item 1).	Check
	4) SEND/REC SW: SEND RIT VR: Turn to left and right.	F. Count	RF	TP4				Frequency should remain unchanged	Check
9. VCO	1) MODE SW: USB SEND/REC SW: SEND BAND SW: 145	RF V.M	RF	D6 cathode	RF	T5, 6	MAX * Little core of T9 comes off the bobbin, set it on top of the bobbin.	1V	
[illegible]	[illegible]								
[illegible]									

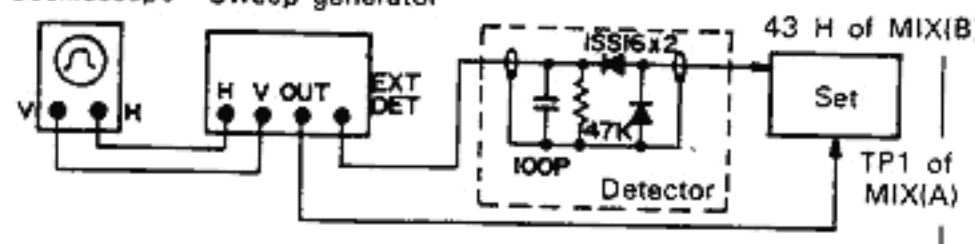
B. TX SECTION (144M BAND)

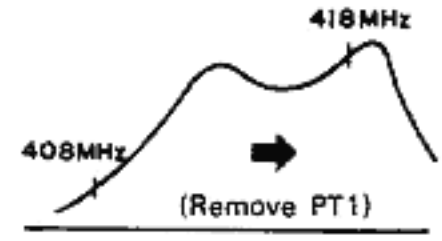
Item	Conditions	Check point: Testing Instruments	Check point: Unit	Check point: Terminal	Adjusting point: Unit	Adjusting point: Parts	Adjusting point: Method	Standard	Remarks
1. Setting	1) Rear panel 144 ANT terminal: POWER M POWER terminal DC 13.8 (13.8V)								
	2) RF U 40D terminal: Remove coaxial cable TC9: MIN TC10, 12, 13: MAX								
2. Bias adjustment	1) BAND SW: 145	DC A.M	FINAL (144)	TP1	FINAL (144)	VR2		25 mA	Remov jumpe and co amper in serie
3. Power setting	1) MODE SW: CW POWER SW: ON BAND SW: 145 VFO dial: 000 SEND/REC SW: SEND	RF V.M	IF	TP4	IF	L16,17	MAX (repeat)	(0.03V)	
				TP6	IF	L20,21 L22,23 L24,26	MAX (repeat)	(0.3V) ○V	
	2) RF U 14D terminal: Connect coaxial cable.	POWER.M (DC A.M)			RF	TC7 T5,6,7 TC8,9 TC10, TC11	MAX (repeat) * Precisely adjust the final TC1 ~ 4	More than 18W	[Note for adjustme of TC8 a Set the capacity TC9 to n and adju TC8 and in that o
					FINAL (144)	TC1,2 TC3,4			
4. ALC	1) Continued from previous item.	POWER.M			RF	TC13	Set to 12W		
	2) ALC/RF SW: ALC CAR VR: Adjust so that the ALC meter pointer indicates the ALC zone.	ALC.M			IF	L16,17 L20,21 L22,23 L24,26	Adjust each coil and trimmer until the ALC meter reads max. Repeat this procedure.		If ALC r deflects cessivel adjust C
					RF	TC7 T5,6,7 TC8,9 TC10,11			[Note fo adjustm of TC8 a Set the capacity TC9 to n and adju TC8 and in that o
	3) CAR VR: MAX	POWER.M DC A.M						Power: 12W DC.A: Less than 6A	Check
		ALC.M			RF	VR4	Set to "10" on RF scale.		
5. RF.M	1) ALC/RF SW: RF	RF.M			FINAL (144)	VR1	Set to "8" on RF scale.	±2	
6. Band edge	1) BAND SW: 144 ALC/RF SW: ALC	POWER.M DC A.M ALC.M						POWER: 10W DC.A: Less than 6A ALC.M: More than "9" on RF scale	Check
	2) BAND SW: 145 VFO dial: 999	POWER.M DC A.M ALC.M						POWER: 10W DC.A: Less than 6A ALC.M: More than "9" on RF scale	Check
7. Low power	1) VFO dial: 000 MODE SW: FM LOW/HI SW: LOW	POWER.M						Output is reduced.	Check

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
	2) SEND/REC SW: REC 144 ANT terminal on rear panel: POWER M(3W)								
	3) SEND/REC SW: SEND	POWER.M			IF	VR7	Set to 1.2W		
	4) BAND SW: 144	POWER.M						0.5W ~ 2W	
	5) BAND SW: 146 VFO dial: 899	POWER.M						0.5W ~ 3W	

C. TX SECTION (430M BAND)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
1. Setting	1) Rear panel POWER terminal: DC P.S (13.8V)								
	2) RF unit 43D terminal: Remove coaxial cable								
2. MIX	1) IF.U J4 connector: Remove POWER SW: ON BAND SW: 432 VFO dial: 500	RF V.M	MIX (A)	TP2	VCO	L5.6	MAX (repeat)	More than 0.09V	
	2) IF.U J4 connector: Connect								
	3) BAND SW: 434	RF V.M	MIX (A)	TP3	IF	L2.4. L6.7	MAX (repeat)		
	4) BAND SW: 435	RF V.M	MIX (A)	TP3	IF	L65.66 L68.69	MAX (repeat)		
	5) BAND SW: 434	RF V.M	MIX (A)	TP3	IF	TC1.2	MAX (repeat)		
	6) BAND SW: Set the level of MIX (A) to lower band with 434 or 435	RF V.M	MIX (A)	TP3	MIX (A)	TC1.2 TC3	MAX (repeat)	More than 0.25V	
3. BPF (1)	1) MODE SW: LSB SEND/REC SW: REC IF.U J4 connector: Remove MIX (A).U TP1 terminal: Connect the Sweep generator	Detector Oscilloscope	MIX (B) 43H Sweep generator		MIX (A) L6				
					MIX (A)	PT1	Turn the trimmer and the helical wave deflects as shown in Fig. A. Adjust so that the wave enters the 408 ~ 418 MHz band.		





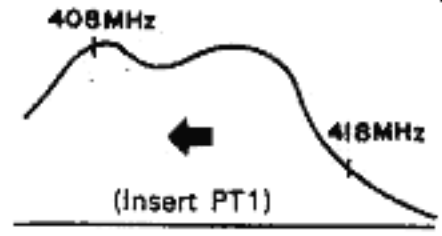
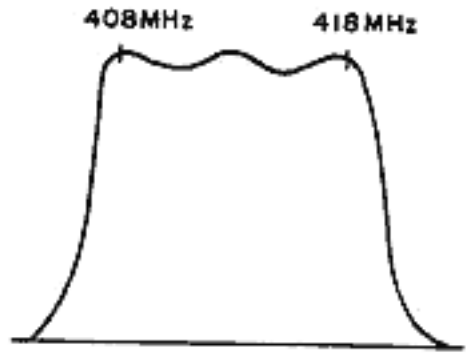
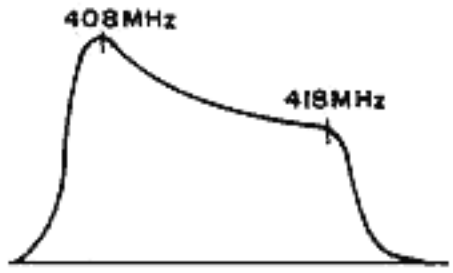
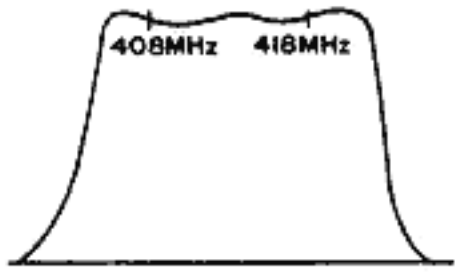
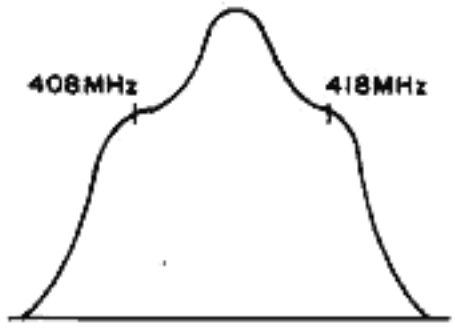
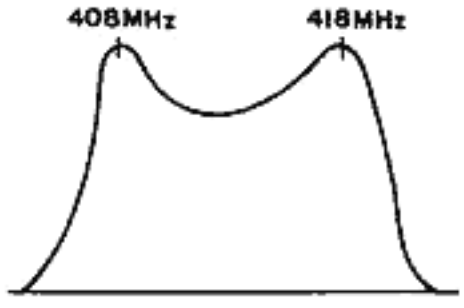


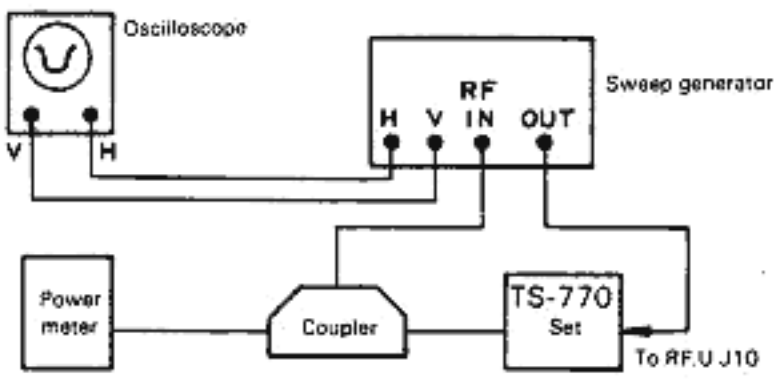
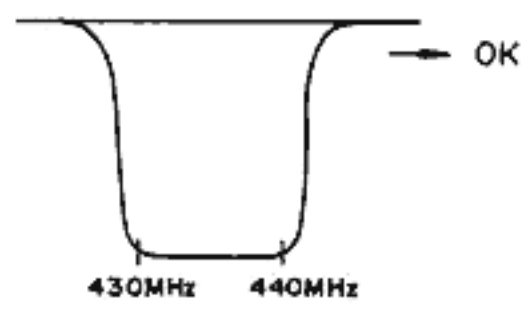
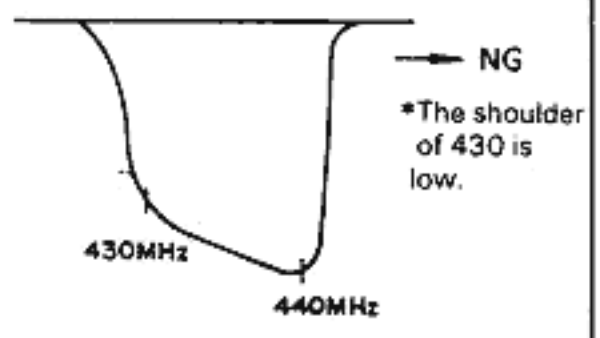
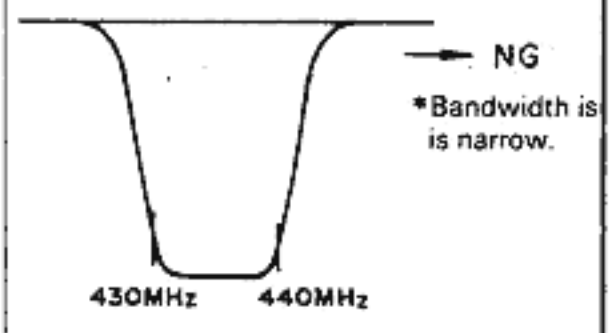
Fig. A

ADJUSTMENTS

'X SECTION (430M BAND)

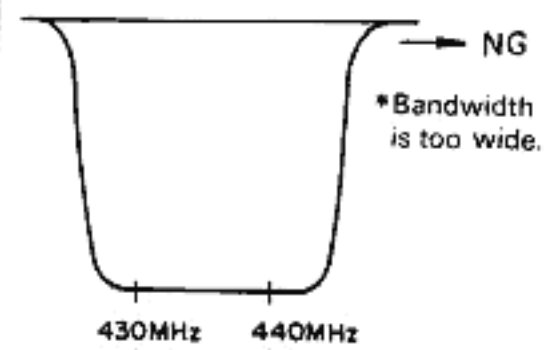
Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
BPF(1)					MIX (A)	PT2.3	These two trimmers adjust gain and bandwidth. Adjust them so that the markers of 408 MHz and 418 MHz are on the shoulder of the helical wave at maximum gain. *		
							* While adjusting PT 2.3. adjust PT 1 ~ 3 alternately until the wave is stabilized.	(1) the wave should have sufficient height (gain). (2) Top of wave should be as flat as possible. (3) Marker should be on the shoulder of wave.	
						No good	Bandwidth is good but the peak on one side is too low.		
							Waveform is good but marker is deviated to left.		
							Waveform is good but bandwidth is too wide.		
							The center of wave is too high. It should be flat.		
							Bandwidth is good but the center of wave is too low.		

ADJUSTMENTS

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
	2) IF.U J4 connector: Insert MIX (A) TP1 terminal: Remove Sweep MIX (B) 43H terminal: Remove detector BAND SW: 437 VFO dial: 000	RF V.M	RF	TP3	RF	TC15, TC16	MAX		
	3) BAND SW: 430～439 (all bands)	RF V.M	RF	TP3				More than 0.4V	Check
				TP9				More than 0.25V	
4. Bias adjustment	1) BAND SW: 433	DC A.M	FINAL (430)	*1 CK6 CK4 CK2	FINAL (430)	VR1 VR4 VR3		50 mA 40 mA 25 mA	*Remve the pass-through capacitor lead and connect ampare meter in series.
5. Power setting	1) RF.U 43D terminal: Connect coaxial cable BAND SW: 433 VFO dial: 500 MODE SW: CW CAR VR: MAX SEND/REC SW: SEND	POWER.M (DC A.M)			RF	TC1.2 TC3,17 TC5,6	MAX (repeat)	More than 15W	
					FINAL (430)	TC1.2.3 TC4,5	* Precisely adjust the final trimmer.		
6. BPF (2)	1) SEND/REC SW: REC RF.U J2 connector: Remove MODE SW: LSB RF.U J10 connector: Connect the Sweep generator								
	2) SEND/REC SW: SEND Sweep output: Level which does not saturate BPF wave. * *Reference ... Proper Sweep generator output derives about 2W output from TS-770.				RF	TC1.2.3 L4,TC17 TC5.6	Adjust these trimmers so that the markers of 430 MHz and 440 MHz are on the shoulder of the wave and that the height is maximum and uniform as shown at right.	  *The shoulder of 430 is low.  *Bandwidth is is narrow.	

ADJUSTMENTS

TX SECTION (430M BAND)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
BPF(2)									
	3) SEND/REC SW: REC RF. U J2 connector: Insert RF.U J10 connector: Remove Sweep generator								
	4) SEND/REC SW: SEND BAND SW: 430～439 (all bands)	POWER.M						More than 15W	Check
7. ALC	1) BAND SW: 433 VFO dial: 000	POWER.M			RF	TC13	Set to 13W		
	2) BAND SW: 430～439 (all bands) VFO dial: 000 ALC/RF SW: ALC	POWER.M ALC.M						More than 10W More than "7" on RF scale	Check
	3) BAND SW: 439 VFO dial: 999	POWER.M ALC.M						10W More than "7" on RF scale	Check
8. RF.M	1) BAND SW: 433 VFO dial: 500 ALC/RF SW: RF	RF.M			FINAL (430)	VR2	Set to "6" on RF scale	3.2	
9. Low power	1) MODE SW: FM LOW/HI SW: LOW	POWER.M						Output is reduced	Check
	2) SEND/REC SW: REC 430 ANT terminal on rear panel: POWER.M (3W)								
	3) SEND/REC SW: SEND	POWER.M			AF/ VOX	VR4	Set to 1.5W		
	4) VFO dial: 000 BAND SW: 430～439 (all bands)	POWER.M						0.3W ～ 5W	Check

D. TX SECTION (144/430M BAND)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
1. Setting	1) Rear panel POWER terminal: AC P.S (220V) 144 ANT terminal: POWER.M (20W)								
2. Spurious	1) CAR VR: MAX MODE SW: CW BAND SW: 144 VFO dial: 000 SEND/REC SW: SEND	Spectrum analyzer			IF	VR2	Set 144.76 MHz adjacent spurious to minimum.	Less than −60 dB.	
3. Carrier suppression	1) BAND SW: 145 CAR VR: MIN VFO dial: 000	Spectrum analyzer			IF	VR1 TC6	Adjust alternately to set the indication of analyzer to less than −40 dB.	Less than −40 dB	
	2) SSB MIC VR: MIN MODE SW: LSB.USB	Spectrum analyzer						Less than −40 dB	Check
4. SSB frequency response	1) MODE SW: USB MIC terminal: AG (2 mV/1500 Hz) SSB MIC VR: Set transmit output to 8W.								
	2) MIC terminal: AG (2 mV/400 Hz and 2600 Hz) MODE SW: USB	POWER.M			CAR	TC1	Change alternately the frequency of AG to 400Hz and 2600 Hz to obtain the same output.	More than 1W	
	3) MODE SW: LSB MIC terminal: AG (2 mV/400 Hz and 2600 Hz)	POWER.M			CAR	TC4	Change alternately the frequency of AG to 400Hz and 2600 Hz to obtain the same output.	More than 1W	
5. ALC M	1) MODE SW: USB	ALC M			BF	VR4	Set to "10"		
	[illegible]	[illegible]							Check
	[illegible]	POWER.M							More than 50W
	3) MODE SW: LSB SSB MIC VR: 3 o'clock position BAND SW: 144 VFO dial: 000	ALC M							ALC meter should center beyond ALC zone.
6. Frequency setting	1) BAND SW: 145 MODE SW: CW VFO dial: 000.0	F. Count			PLL (A)	TC1	145.000.00 MHz	±30 Hz	
	2) MODE SW: FM	F. Count			CAR	TC3	145.000.00 MHz	±100 Hz	
	3) MODE SW: CW	F. Count	PLL (A)	TP1			Check frequency obtained.		
	4) SEND/REC SW: REC	F. Count	PLL (A)	TP1	AF VR	VR5	Set to frequency 800 Hz lower than "f" in Item 3).		

ADJUSTMENTS

TX SECTION (144/430M BAND)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing instruments	Unit	Terminal	Unit	Parts	Method		
7 DEV (145 MHz)	1) MIC terminal: AG (20 mV/1,000 Hz) FM MIC VR: MAX SEND/REC SW: SEND	Linear detector			IF	VR6	Set to ±5.0 kHz		
	2) MIC terminal: AG (2 mV/1000 Hz)	Linear detector						Setting to ±3.5 kHz with FM MIC VR should be possible	Check
	3) MIC terminal: Remove AG SEND/REC SW: REC TONE SW: ON	Connect freq. counter to output terminal of linear detector			TONE	VR1	Set to 1750 Hz	±5 Hz	
		Linear detector						(1) Attn is over 2.5 kHz (2) Transceiver should be set in transmit mode only when TONE SW is pressed	Check
8 DEV (433 MHz)	1) SEND/REC SW: REC MIC terminal: AG (20 mV/1,000 Hz) 430 ANT terminal on rear panel: POWER-N								
	2) BAND SW: 433 VFO dial: 000 FM MIC VR: MAX. SEND/REC SW: SEND	Linear detector						±4.0 kHz ~ ±6.0 kHz	Check
	3) IF-U jumper connector: Change from "N" to "W"	Linear detector			IF	VR3	Set to ±7.5 kHz		
	4) IF-U jumper connector: Change from "W" to "N"								
9 SSB	1) MODE SW: LSB SSB MIC VR: MAX BAND SW: 430 VFO dial: 000 MIC terminal: AG (2 mV/1000 Hz)	POWER-N						More than 10W	Check
	2) ALC/RF SW: ALC SSB MIC VR: 10 o'clock position	ALC-W						ALC indicating deflection beyond ALC zone.	
10 Frequency setting	1) MODE SW: CW CAR VR: MAX BAND SW: 433 VFO dial: 000.0	F. Count			IF	L1	433.000.00 MHz	±100 Hz	
	2) BAND SW: 435	F. Count			IF	L64	435.000.00 MHz	±100 Hz	
11 Side tone	1) SEND/REC SW: REC AF GAIN VR: MIN SIDE TONE VR: MAX EXP. SP terminal on rear panel: Connect speaker. KEY terminal on rear panel: Connect key	AF-W-M						Side tone output of 0.7V is obtained by pressing key.	Check

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
	2) SEND REC SW SEND	POWER M						Side tone output and transmit output are obtained by pressing key	Check
	3) SEND REC SW REC VOX MAN SW VOX DELAY VR MIN	POWER M						Side tone output and transmit output are obtained by pressing key Transceiver is set in receive mode by releasing key	Check

E. RX SECTION (144M BAND)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
1 Setting	1) Rear panel POWER terminal AC P S (220V) EXT SP terminal Connect speaker								
2 S meter zero point	1) RF GAIN VR MAX BAND SW 145 VFO dial: 050	S M			RF	VR5	Set VR5 for S meter zero		
	2) RF GAIN VR MIN	S M						S meter deflects off scale.	Check
3 BPF	1) 144 ANT terminal on rear panel: Connect Sweep gen. MODE SW: FM RF GAIN VR: MAX PLL (A) U J3 connector: Remove RF U TP5 terminal: Connect detector	Oscillo-scope			RF	T16,17 L40	Adjust coil and trimmer for maximum gain and bandwidth	144 MHz 146 MHz	
4 Sensitivity adjustment	1) 144 ANT terminal on rear panel: SSG PLL (A) U J3 connector: Insert MODE SW: FM VFO dial: With 145.05 MHz signal applied from SSG, turn dial to receive signal and set S meter for maximum deflection.	DEV ..... ±5 kHz MOD ..... 1 kHz OUTPUT .... 10～20 dB							
	2) SSG OUTPUT: After receiving signal, reduce output as small as possible within the range of S meter	S.M			RF	T10,11 T12,13 T14	MAX (repeat)		
	[illegible]	[illegible]							
	3) SSG OUTPUT: 20 dB (without attenuation)	S.M				IF	MOD	Set to "9" on S meter scale	

ADJUSTMENTS

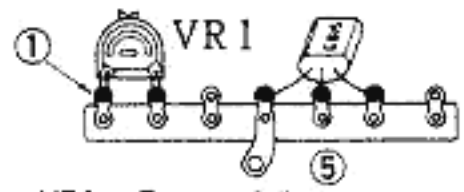
RX SECTION (144M BAND)

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
5. C.M	1) SSG OUTPUT: 0 dB (with modulation) VFO dial: Set to optimum receive wave-form.	AF V.M			IF	L53	MAX	Repeat Items 1) and 2)	
	2) SSG OUTPUT: OFF (no signal)	C.M			IF	L54	Set to "0"		
	3) SSG OUTPUT: 20 dB (without modulation) VFO dial: Shift freq. in plus direction.	C.M						Center meter deflects beyond "E" of the second letter in "CENTER"	Check
	4) VFO dial: Shift freq. in minus direction.	C.M						Center meter deflects beyond "E" of the fifth letter in "CENTER"	Check
6. Squelch	1) SSG OUTPUT: −6 dB (with modulation) VFO dial: Receive signal and set AF VTVM for maximum reading.								
	2) BAND SW: 144 SQUELCH VR: Adjust until squelch is closed.							Squelch VR is in 9 ~ 12 o'clock position when squelch is closed.	Check
	3) BAND SW: 145							Receive signal again	Check
7. FM sensitivity	1) SSG OUTPUT: 0 dB BAND SW / VFO dial 145 / 050 144 / 050 145 / 950						Receive signals at each point at left and measure sensitivity.	More than 26 dB	Check
8. SSB sensitivity adjustment	1) MODE SW: USB BAND SW: 145 VFO dial: 050 Apply 145.05 MHz, 10 dB signal from SSG and	S.M			RF IF	T15 L28,29 L30,31 L32,38 L40	MAX (repeat)		
9. S.M	1) SSG OUTPUT: −3 dB VFO dial: Set S meter for maximum reading.	S.M			IF	L38	Set the S meter for one division of the scale by turning the core counterclockwise direction		
	2) SSG OUTPUT: 20 dB	S.M			RF	VR6	Set S meter for "9"		
10. NB	1) Continued from the previous Item	DCV.M	IF	TP8	IF	L35,36	MIN (repeat)		

F. RX SECTION (430M BAND)

Item	Conditions	Check-point			Adjusting point			Standard	Remarks
		Testing instruments	Unit	Terminal	Unit	Parts	Method		
1. Setting	1) Rear panel POWER Terminal: AC P.S (220V) 430.ANT terminal: Coaxial Sweep								

G. OPERATION CHECK OF MICRO COMPUTER SECTION

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
1. Reset	1) Rear panel POWER terminal: DC P.S (13.8V) MEMORY B.U SW: OFF								
	2) AF/VOX.U BZ connector: ON DISP connector: All indicate								
	3) Reset lug terminal (see figure at right) ① terminal: Connect digital voltmeter. ⑤ terminal: Connect oscilloscope.						 VR1: Turn to full clockwise direction		Input selector on oscilloscope: DC
	4) POWER SW: ON Adjust DC power voltage to obtain 3.70 V reading on digital voltmeter.	Oscilloscope	Reset lug terminal	⑤ terminal	Reset lug terminal	VR1	Set VR1 to obtain 0V on oscilloscope.		
	5) Adjust DC power voltage to increase oscilloscope voltage.	Oscilloscope	Reset lug terminal	⑤' terminal					
	6) Adjust DC power voltage for 0V on oscilloscope and check the reading of digital voltmeter.	Oscilloscope	Reset lug terminal	⑤ terminal				Reading of digital voltmeter at 0V of oscilloscope voltage: 3.70V ± 0.01V	Check
	7) POWER SW: OFF ① terminal: Remove digital voltmeter. ⑤ terminal: Remove oscilloscope.								
	8) Set DC power voltage to 13.8V								
2. DISP SW	1) POWER SW: ON MODE SW: FM FMS.SB.DSB CW	DISPLAY						(A 144.000.0) is displayed in mode	
	2) AF/VOX.U DISP SW: NORM MODE SW: CW LSB DSB	DISPLAY						(A 144.000.0) is displayed.	
	3) MODE SW: FM	DISPLAY						(A 144.000.0) is displayed	
3. VFO SW	1) MODE SW: USB VFO dial: Counterclockwise	DISPLAY						(A 144.000.0) remains unchanged	
	2) VFO SW: CIR VFO dial: Turn to counter-clockwise direction	DISPLAY						(A 144.999.9) is displayed.	

Item	Conditions	Check point				Adjusting point		Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
4. Digit UP	1) VFO dial: Slowly turn clockwise.	DISPLAY						(1) Each digit changes normally: 0→1→2→3→4 · 8→9 (2) Frequency changes by 10 kHz at each turn of VFO dial	
5. F. LOCK	1) F LOCK SW: ON VFO dial: Turn clockwise and counterclockwise.	DISPLAY						Display remains unchanged	
	2) F LOCK SW: OFF								
6. S/F SW	1) VFO dial: 00 S/F SW: ON (FAST)	DISPLAY						(A 144.01) is displayed	
	2) MODE SW: USB VFO dial: Slowly turn clockwise.	DISPLAY						(1) Digits of 100 kHz changes as follows: 0→2→4→6→8→0. (2) Frequency changes by 100 kHz at each turn of VFO dial.	
	3) S/F SW: OFF (SLOW)								
7. BAND SW	1) BAND SW (UP): Press intermittently	DISPLAY						(1) Digits of MHz counts up as follows 144→145→430 · 431→432→433 · 434→435→436 · 437→438→439 · (2) Buzzer sounds each time freq. is changed.	
	2) BAND SW (DOWN): Press intermittently.	DISPLAY						Digits of MHz counts down in 1 MHz steps reversing the preceding Item 1)	
	3) BAND SW (UP): Press and hold	DISPLAY						Digits of MHz counts up in 1 MHz steps automatically each time buzzer sounds	
	4) BAND SW (DOWN): Press and hold	DISPLAY						Digits of MHz counts down in 1 MHz steps automatically each time buzzer sounds	
	5) BAND SW: Press UP and DOWN at the same time	DISPLAY						Same as when UP is pressed	UP takes precedence
8. BZ SW	1) AF/VOX.U BZ SW: OFF BAND SW (UP): Press and hold							Digits of MHz change but buzzer will not sound	
	2) AF/VOX.U BZ SW: ON								
9. SCAN	1) MODE SW: FM SCAN SW: ON	DISPLAY						Frequency counts up in 5 kHz steps.	
	2) S/F SW: ON (FAST)	DISPLAY						Frequency counts up in 20 kHz steps. not in 5 kHz steps	

http://www.qsl.net/pe3hmp

OPERATION CHECK OF MICRO COMPUTER SECTION

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
	3) S/F SW: OFF (SLOW)								
	4) SCAN SW: OFF								
10. MEMORY	1) BAND SW: 145 VFO dial: 000.0 (FUNCTION SW: A)	DISPLAY						(A 145.000 0) is displayed	
	2) FUNCTION SW: B	DISPLAY						(b 144 000 0) is displayed	
	3) FUNCTION SW: FIX	DISPALY						(1) is displayed	
	4) FUNCTION SW: A MEMORY SW: ON								
	5) FUNCTION SW: FIX	DISPLAY						(1 145 000 0) is displayed	
	6) BAND SW: Press UP and DOWN	DISPLAY						Display in Item 5) remains unchanged	
11. FIX CH	1) FIX CH SW: Press intermittently	DISPLAY						(1) Display changes as follows 1 145.000.0 ↓ 2 ↓ 3 ↓ 4 ↓ 5 ↓ 6 ↓ 7 ↓ 8 ↓ 1 145.000.0 (2) Buzzer sounds at change of channel	
	2) FIX CH SW: Press and hold	DISPLAY						Channel changes automatically each time buzzer sounds	
	3) MODE SW: FM SCAN SW: ON	DISPLAY						Same as Item 2), but buzzer will not sound.	
	4) SCAN SW: OFF								
12. MEMORY B.U	1) MODE SW: USB FUNCTION SW: A POWER SW: OFF								
	2) POWER SW: ON (MEMORY B.U SW: OFF)	DISPLAY						(A 144.000 0) is displayed	
	3) MEMORY B.U SW: ON BAND SW: 145								

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
	4) POWER SW: OFF 5) POWER SW: ON	DISPLAY						(A 145 000 0) is displayed	
13 FUNCTION	1) FUNCTION SW: A-B	DISPLAY						(A 145 000 0) is displayed	
	2) SEND/REC SW: [illegible]	DISPLAY						(b 144 000 0) is displayed	
	3) SEND/REC SW: REC FUNCTION SW: B-A	DISPLAY						(b 144 000 0) is displayed	
	4) SEND/REC SW: SEND	DISPLAY						(A 145 000 0) is displayed	
	5) SEND/REC SW: REC								
14 SEARCH	1) SEARCH SW: ON 144 100 0	DISPLAY						Display counts up repeatedly from [illegible]	
	Operation in item [illegible] is repeated							SEARCH takes precedence	
	Operation in item [illegible] is repeated							SEARCH takes precedence	
mp	Scanning (UP scan in 5 kHz steps)							SCAN takes precedence	
	2) SCAN SW: ON	DISPLAY							
	3) F LOCK SW: ON	DISPLAY							
	4) SEARCH SW: OFF	DISPLAY							
	5) SCAN SW: OFF POWER SW: OFF								

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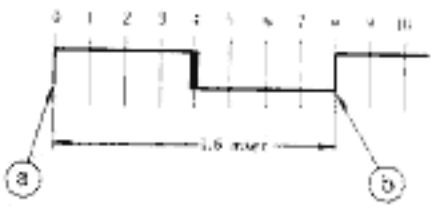
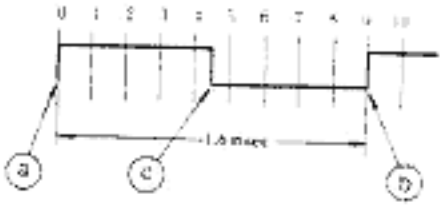
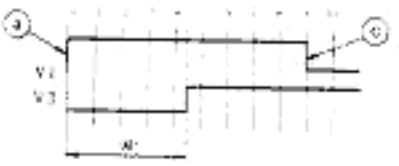
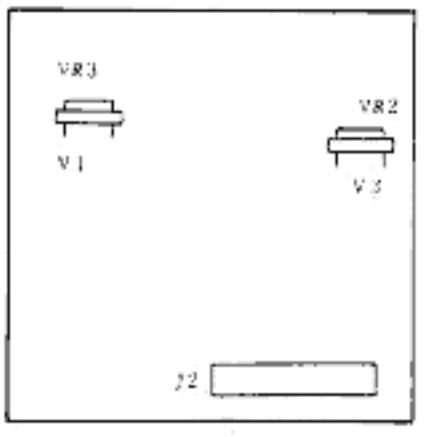
H. OPERATION CHECK OF ENCODER ASSEMBLY

Item	Conditions	Check point			Adjusting point			Standard	Remarks
		Testing Instruments	Unit	Terminal	Unit	Parts	Method		
1 Setting	1) POWER terminal on rear panel: AC 220V Use motor instead of VFO knob.	Oscilos-scope	Digital	J5-V1			Set the sweep knob of oscilloscope to 0.2 msec/DIV. Set motor speed for 8 div. between "a" and "b".	Motor speed- 300 rpm  When checking the duty ratio without using the moter, turn the VFO knob by hand.	
2. V1 duty ratio	1) Set sweep knob of oscilloscope to 0.1 msec/DIV	Oscillo-scope	Digital	J5-V1			Set the variable knob of oscilloscope to 9 div.		
	2)				Encoder	VR3	Set the position "c" to 4.5 div.	4.5 div ±0.5 div 	
3 V3 duty ratio	1) Continued from Item 1)	Oscillo-scope	Digital	J5-V3	Encoder	VR2	Set the position "c" to 4.5 div	4.5 div ±1.5 div	
4 V1 - V3 phase difference	1) Set the sweep knob of oscilloscope to 50 μsec/DIV. Do not touch variable knob.	Oscillo-scope	Digital	J5-V1 J5-V3				V1 – V3 phase difference: 4.5 div. ±1 div. 	Check



Pulse generator unit

ADJUSTMENTS

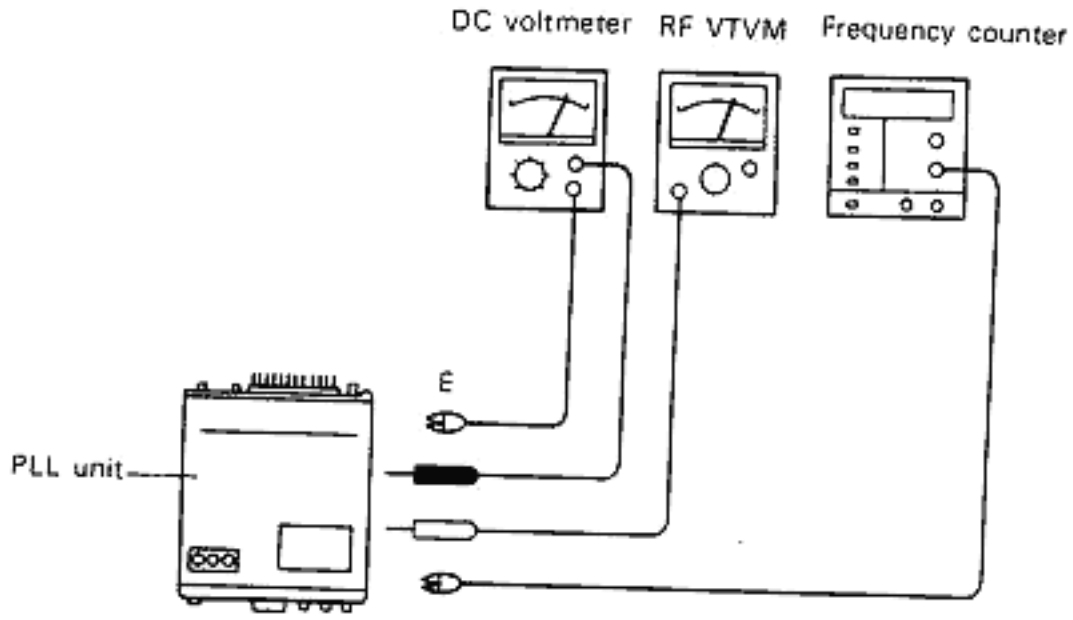


Fig. 1 Adjustment of PLL unit

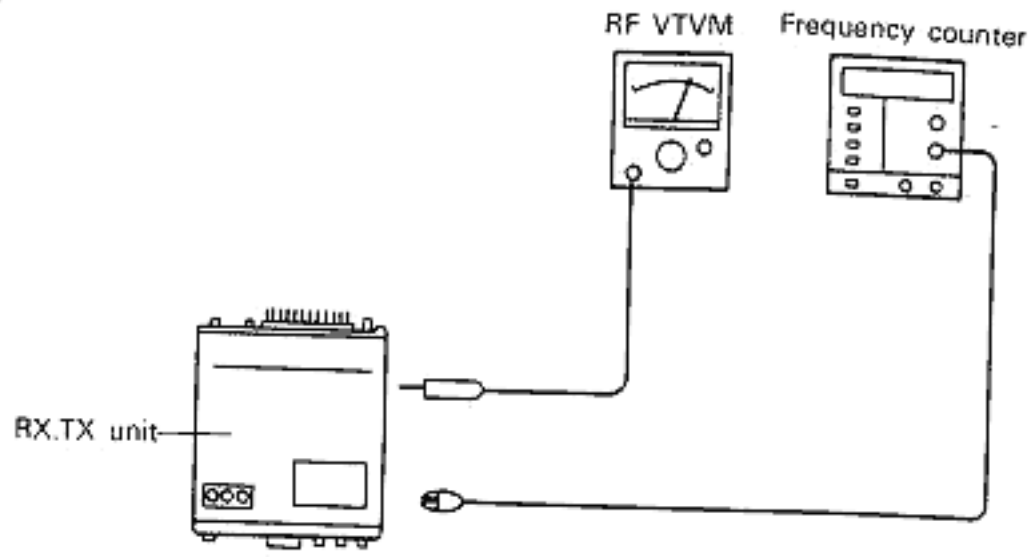


Fig. 4 Adjustment of 10.7 MHz and drive

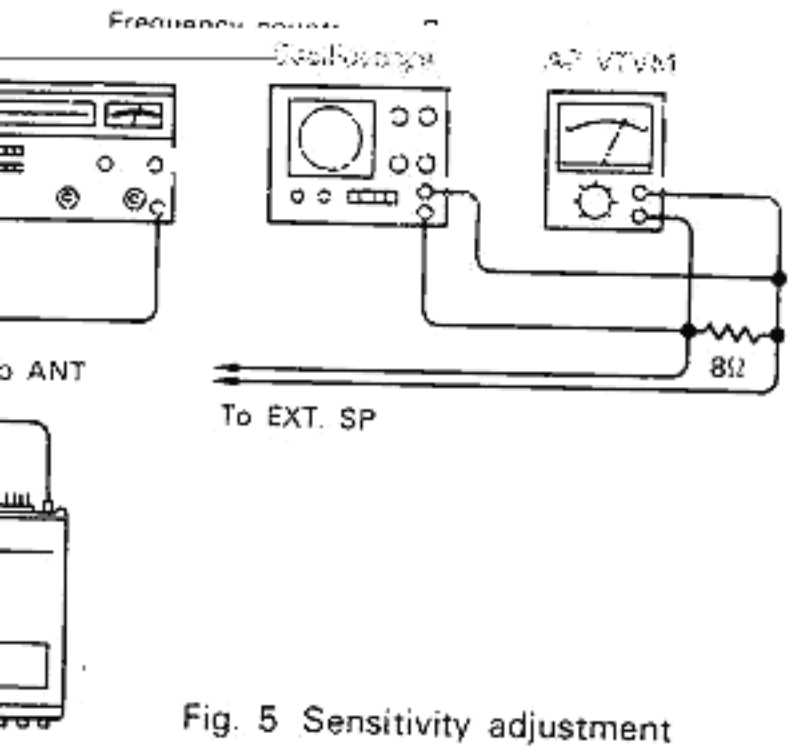


Fig. 5 Sensitivity adjustment

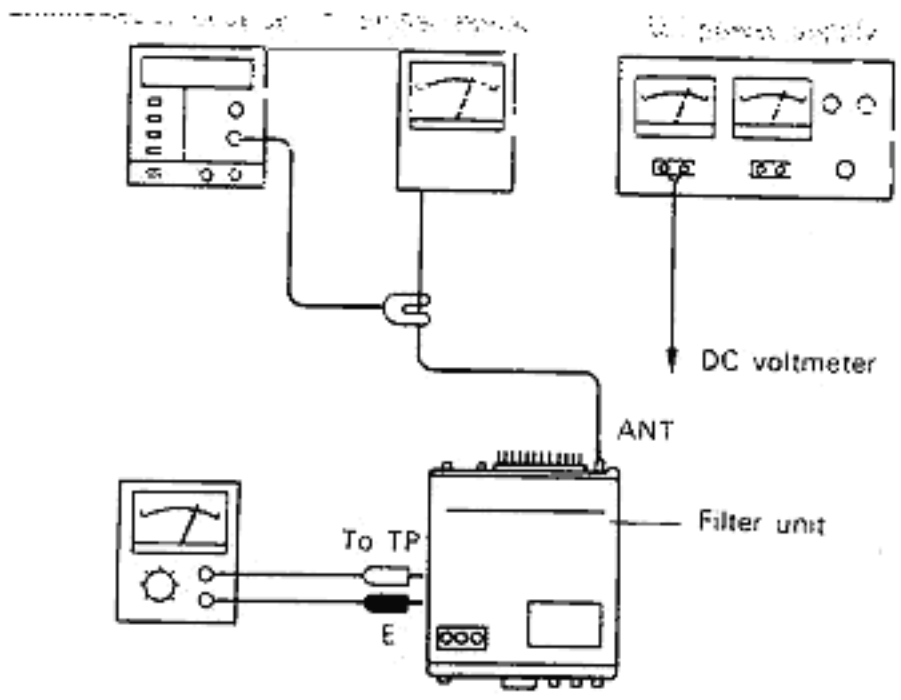


Fig. 2 Adjustment of PA unit and check of TX frequency

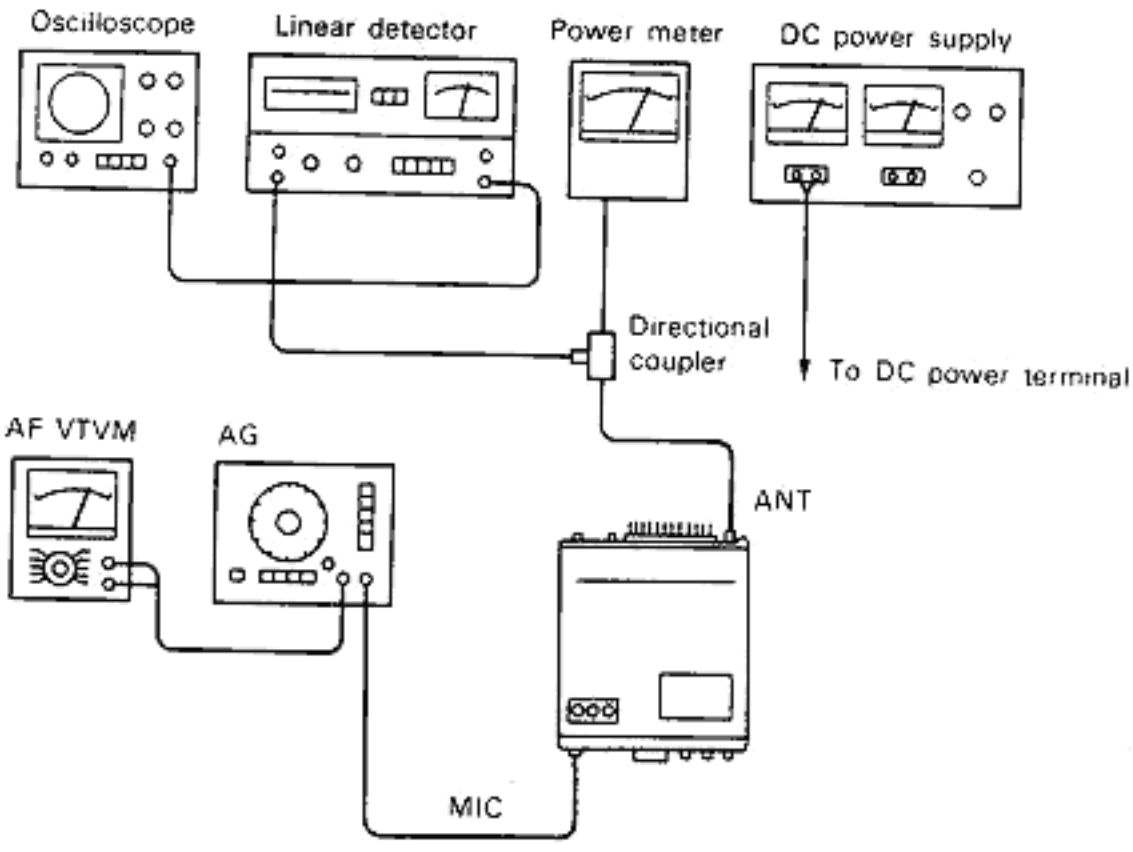
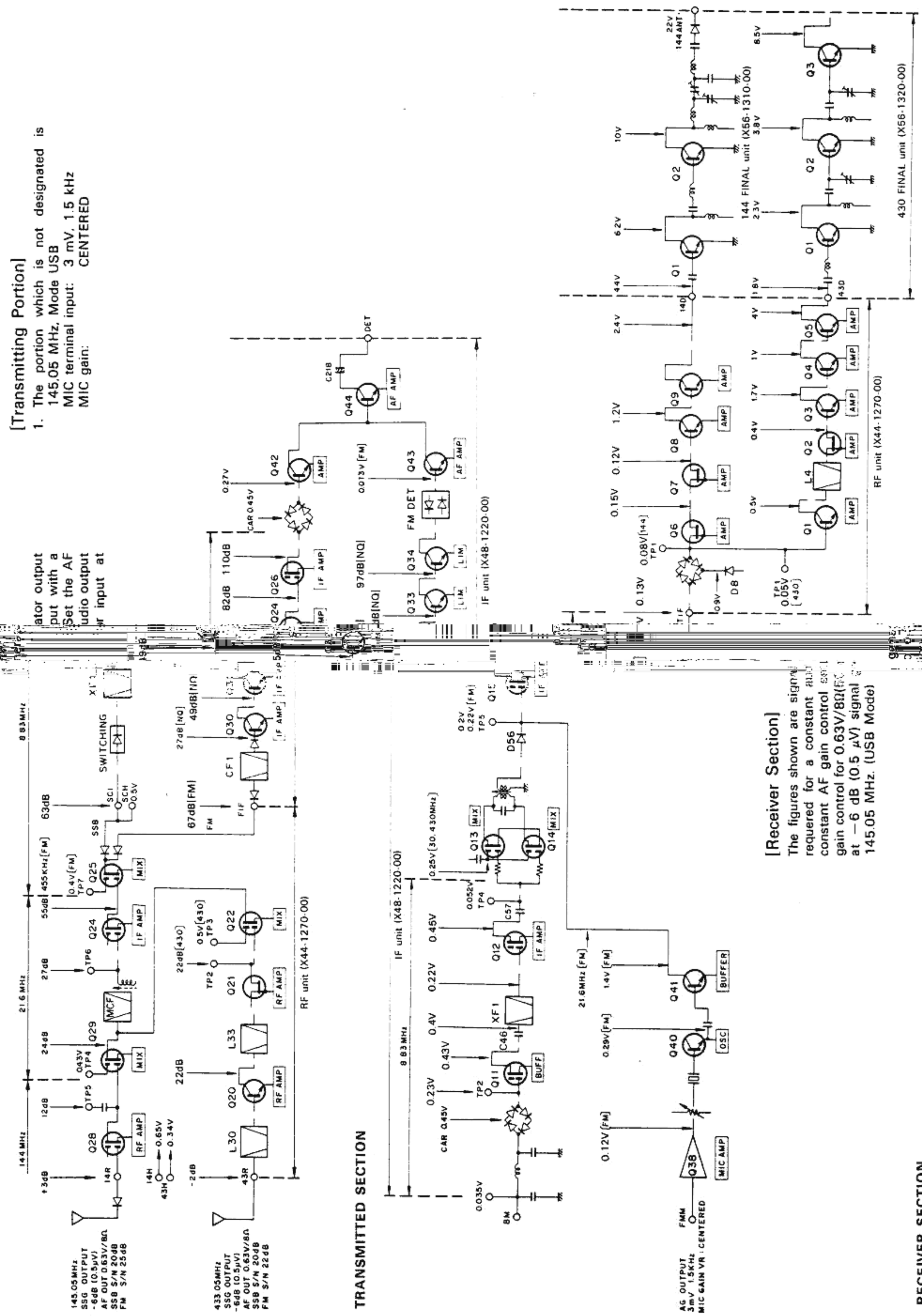


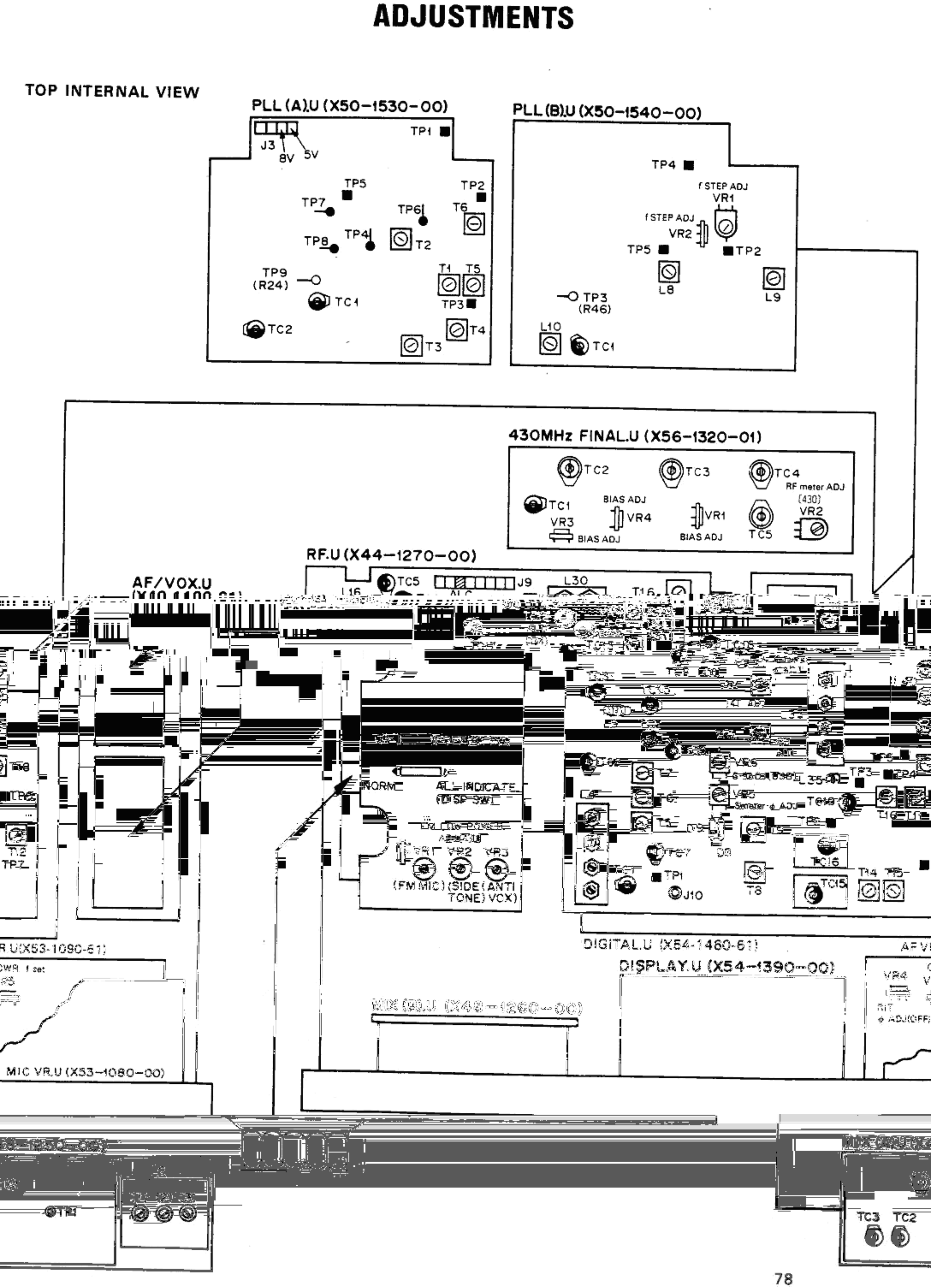
Fig. 3 Deviation adjustment

LEVEL DIAGRAM

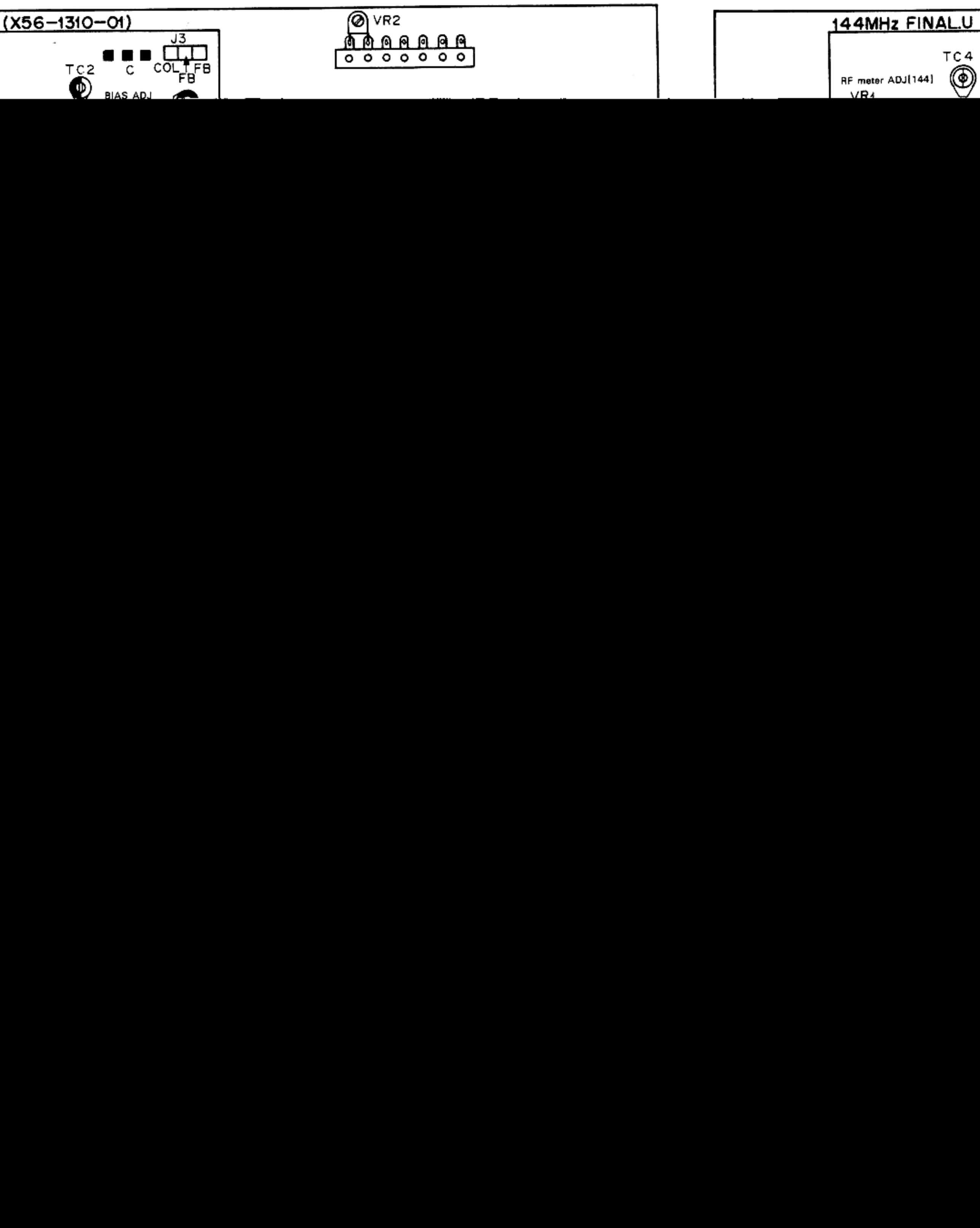


ADJUSTMENTS

TOP INTERNAL VIEW

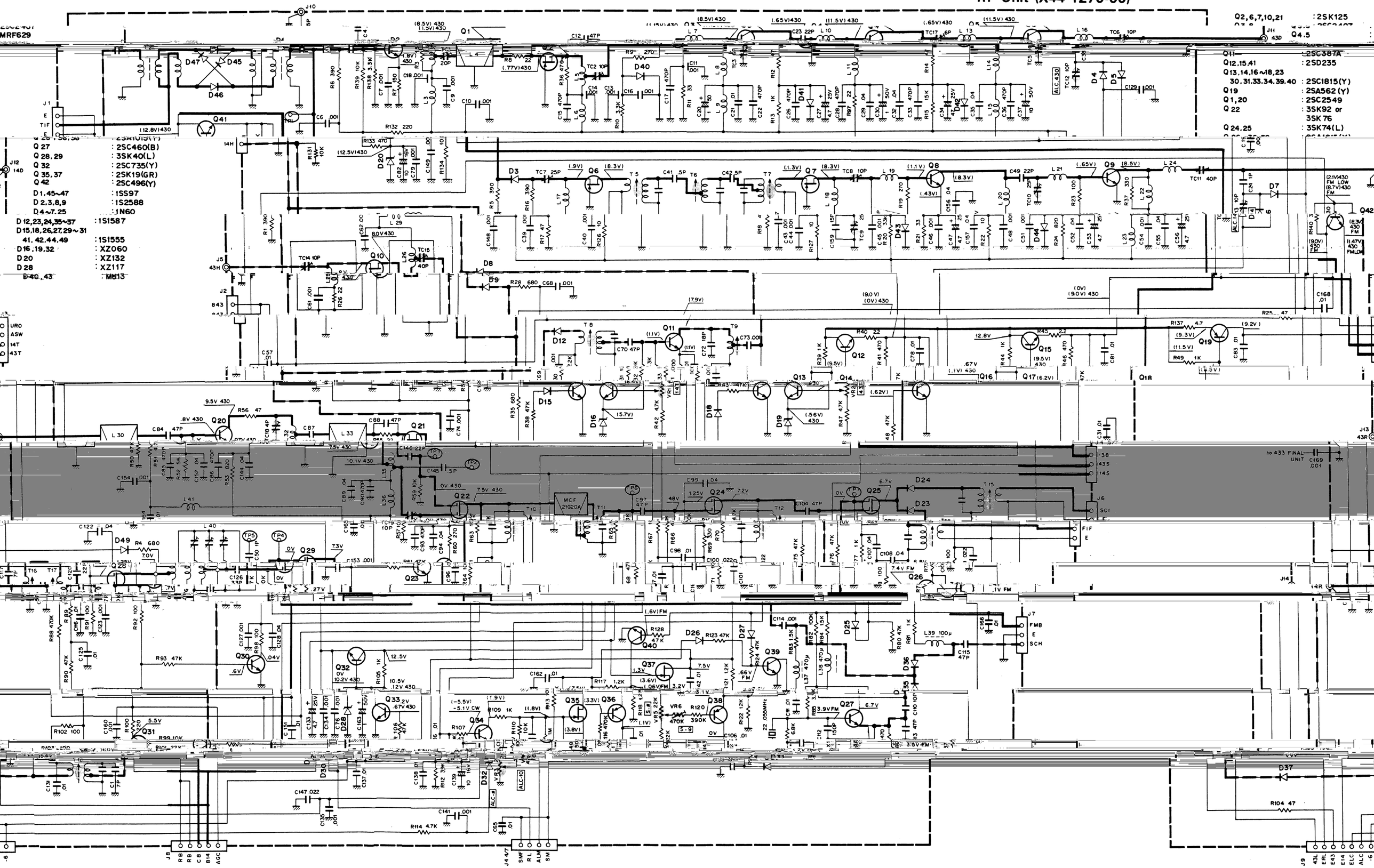


BOTTOM INTERNAL VIEW

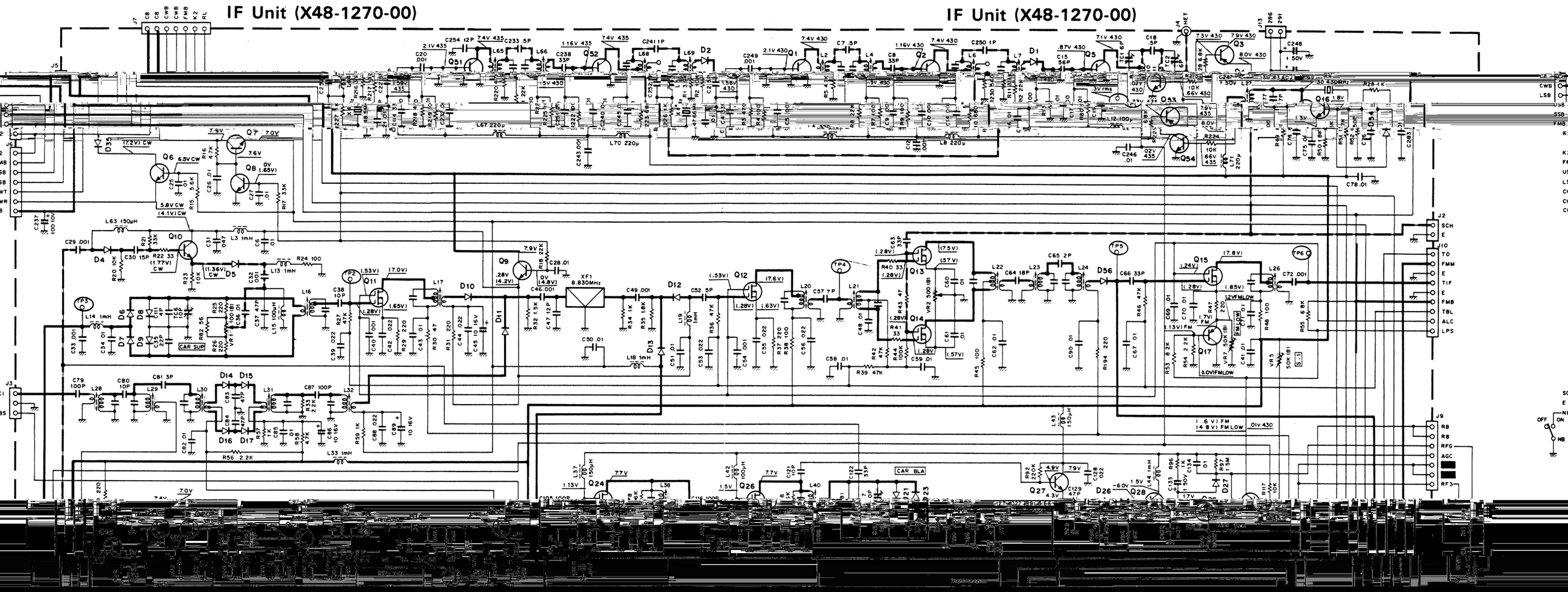


CIRCUIT DIAGRAM

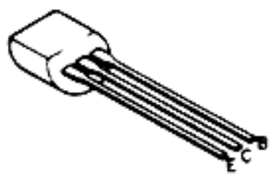
RF Unit (X44-1270-00)



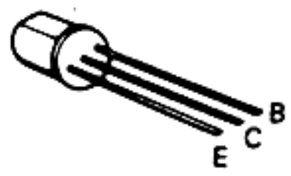
CIRCUIT DIAGRAM



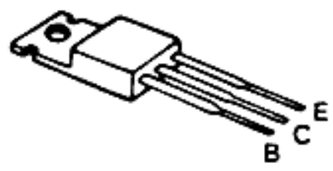
2SA1015(Y)
2SC1815(Y)
2SC1959(Y)



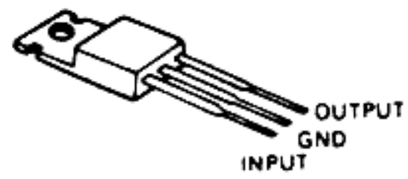
2SA562(Y)
2SC387A
2SC735(Y)
2SC1000(GR)



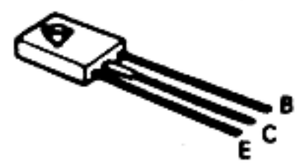
2SA671TD(B)
2SD235(Y)



FS-7805M
FS-7808M
μPC14305H



2SC496(Y)



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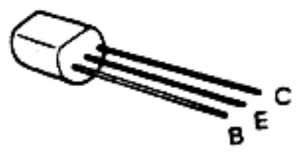
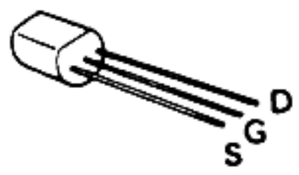
2SK30A(GR)

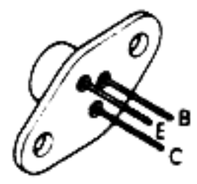
2SC2407
2SC2549



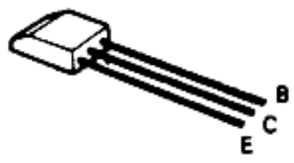
2SK125



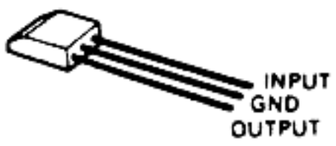
2SC2118



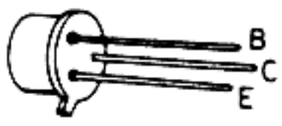
2SC460(B)
2SC1345(E)



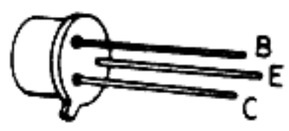
μPC78L05



2SC741

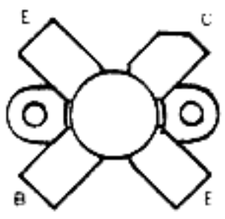


MRF629

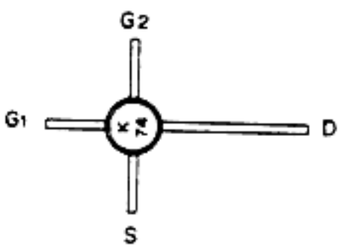


3SK40(L,M)
3SK76
3SK92

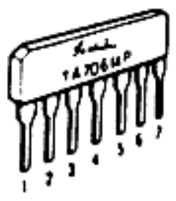
2SC2103A
2SC2380
2SC2381
2SC2391



3SK74(L)



TA7060P
TA7061AP



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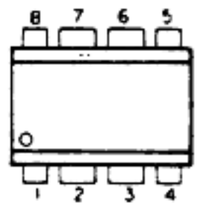
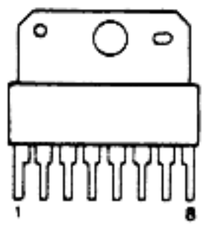
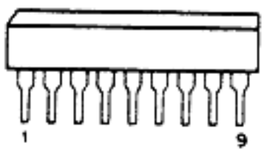
SM6422A
SN16913P



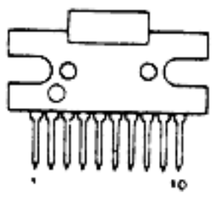
MB3756



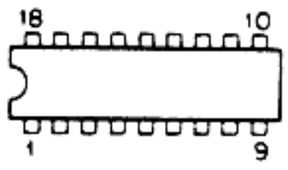
TA7310P



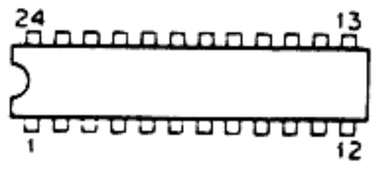
HA1366W



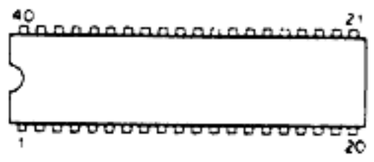
TC9122P



HD74154P



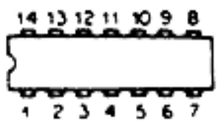
MN9004



TC4011BP
HD74LS00P
SN74LS03N
HD74LS08P
HD74LS132P
HD74LS02P

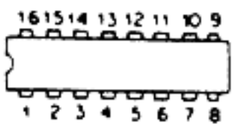
HD7404P
HD74LS30P
TD3409AP
SN74LS02N
HD74LS10P
HD74LS03P

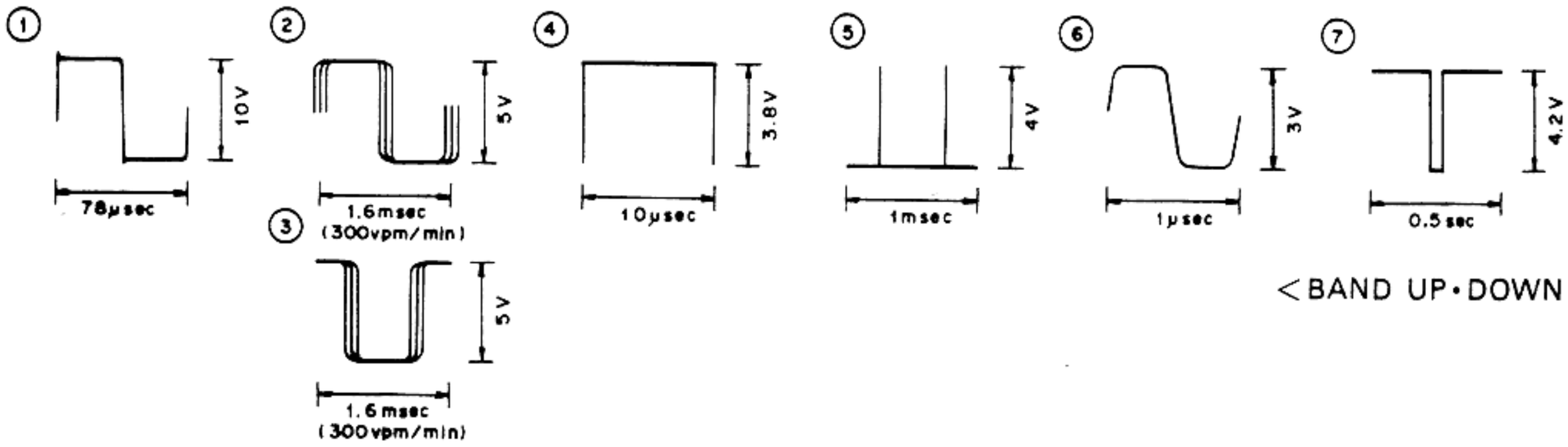
SN74LS00N
HD74LS04P
HD74LS32P
HD74LS20P
HD74LS11P
MC4044P
TD3490BP



SN74LS247N
MC14049B
HD74LS151P
MN1201A
HD74221P
TD34192BP

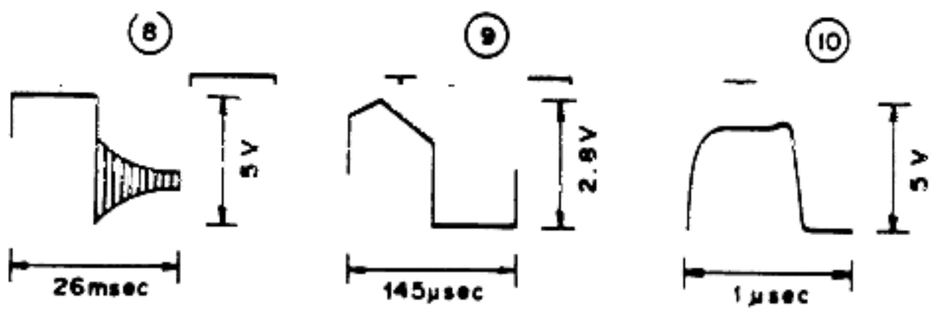
HD74LS42P
HSM5507RS
HD74LS75P
HD74LS157P
SN74221N
MC14568B

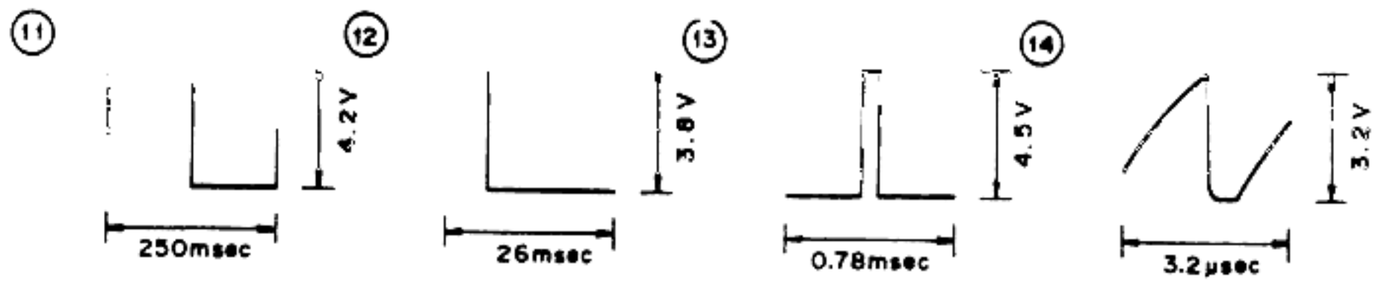




<V1, V3 PHASE DIFFERRENCE 90°>

<BAND UP•DOWN FUNCTION>





UP•DOWN FUNCTION>

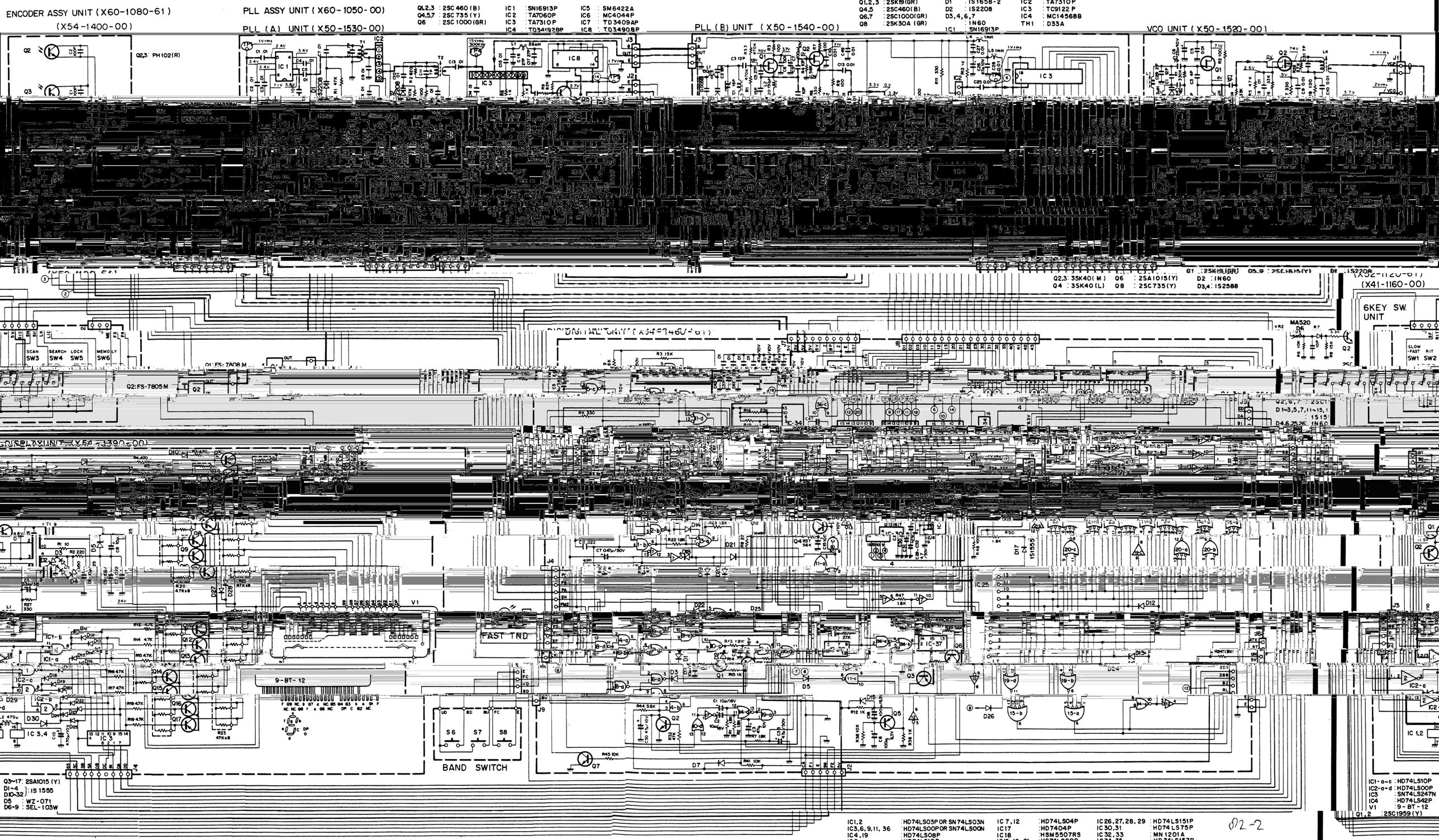
<SCAN FUNCTION> <BAND UP•DOWN FUNCTION>

<BAND

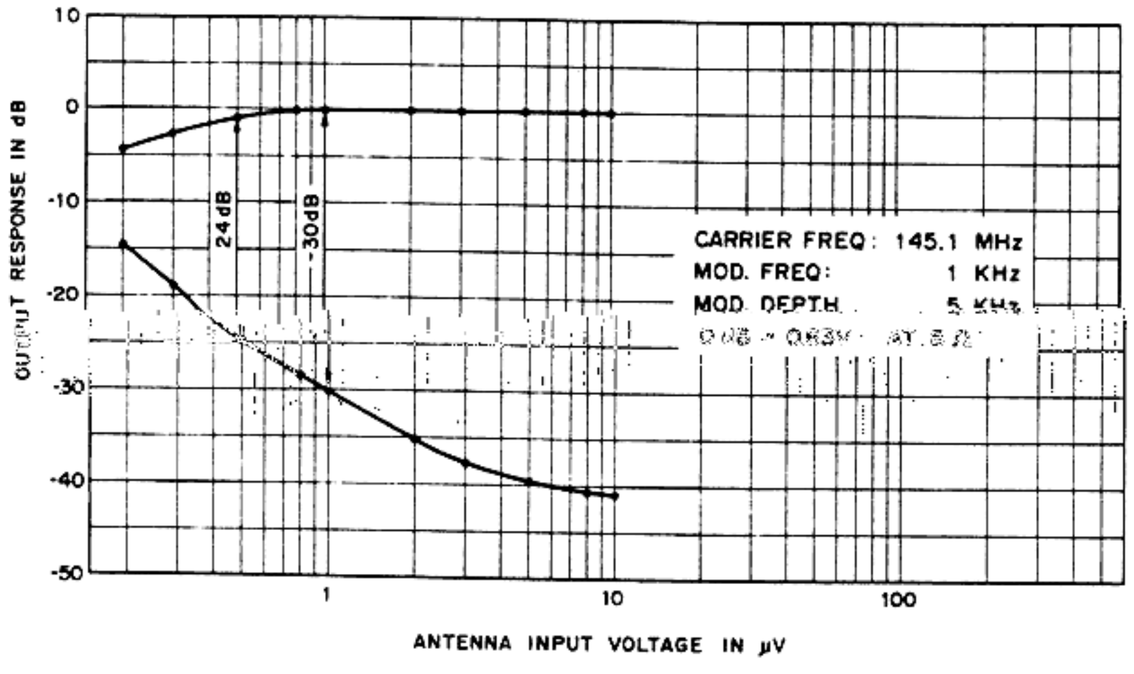
CIRCUIT DIAGRAM

Signal — Control — Common DC line

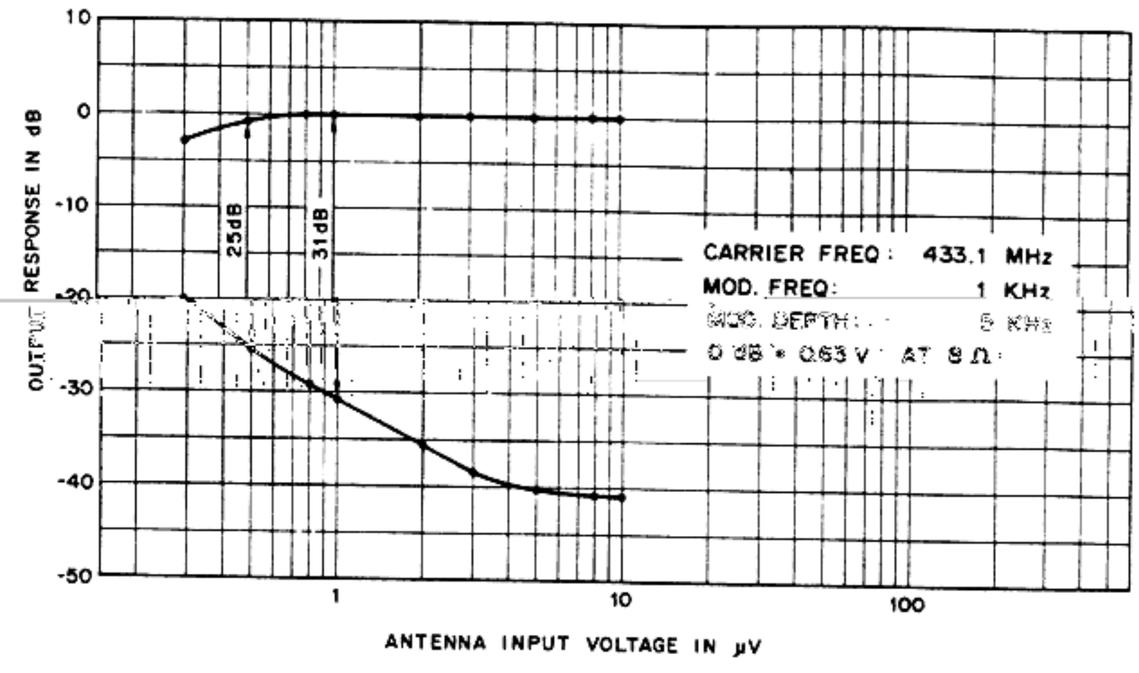
PLL ASS'Y, ENCODER ASS'Y, DIGITAL, DISPLAY and 6KEY SW Unit.



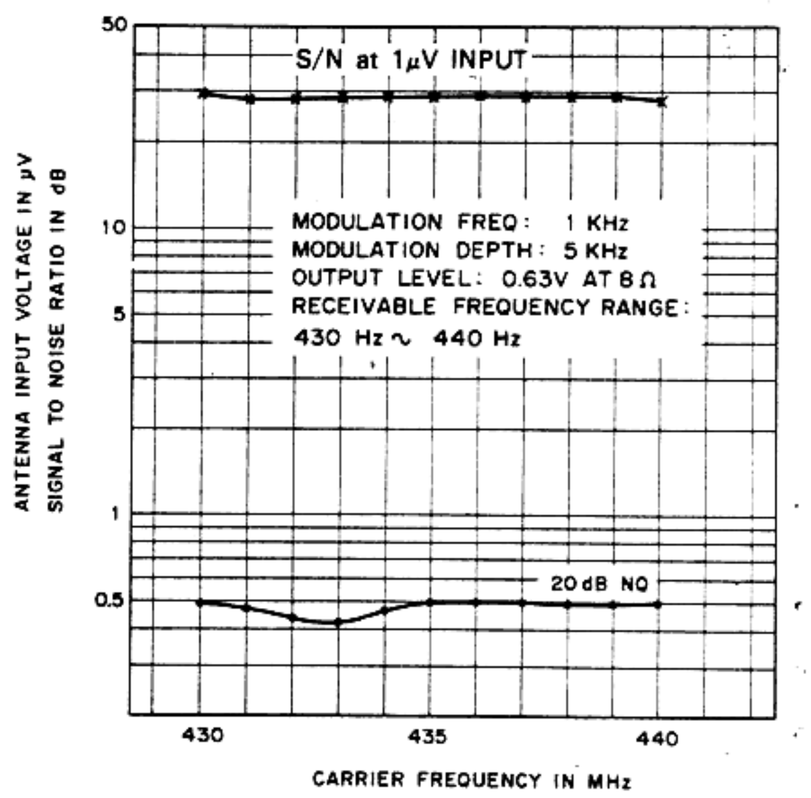
REFERENCE DATA(EXAMPLE)



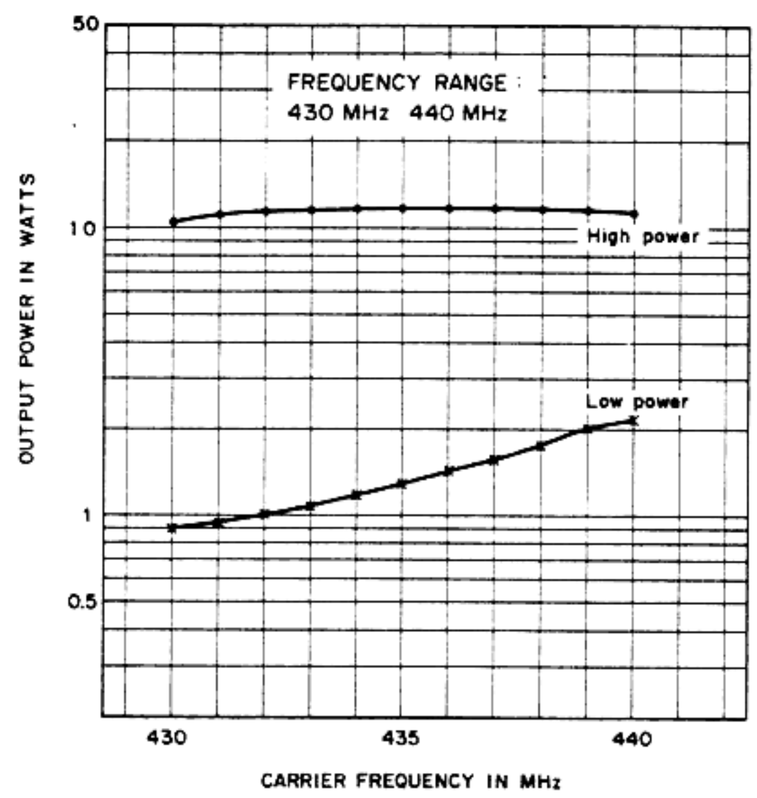
Signal to Noise Ratio and Output
VS Antenna Voltage (**144MHz**) (**FM**)



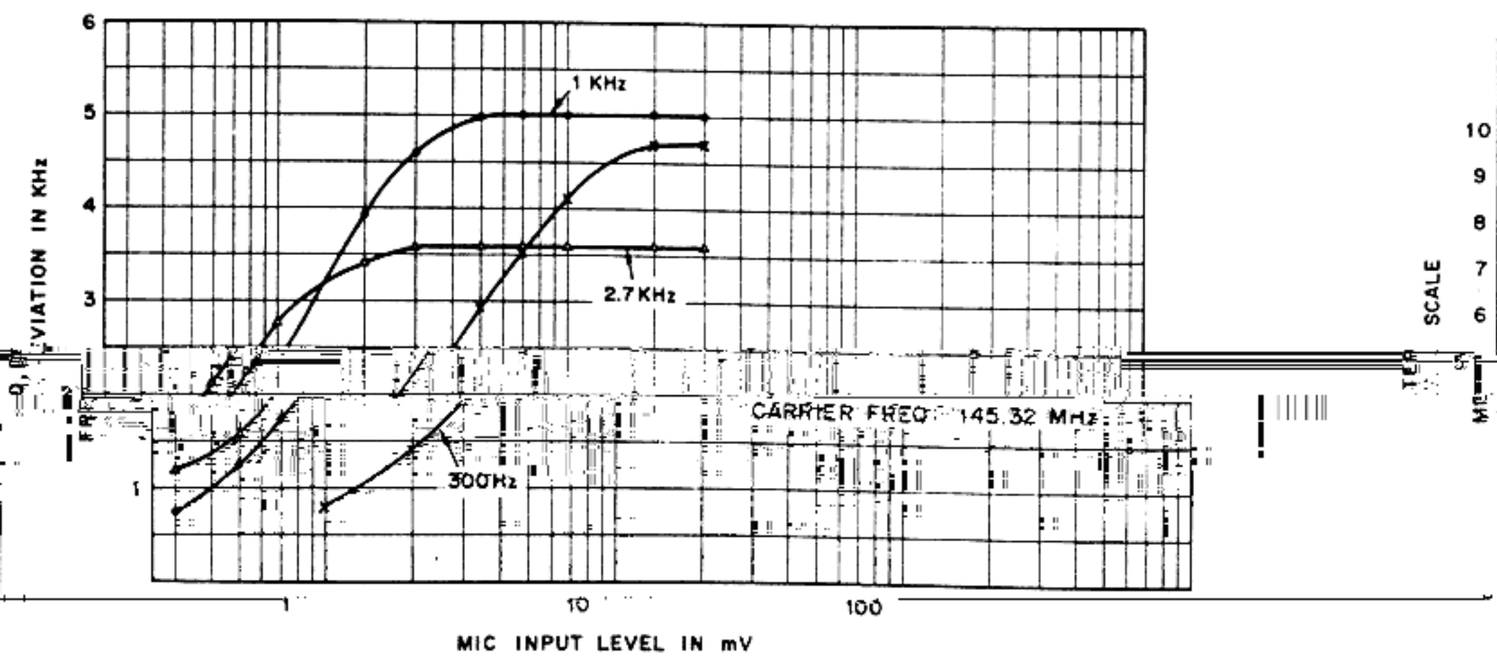
Signal to Noise Ratio and Output Level
VS Antenna Input Voltage (**430MHz**) (**FM**)



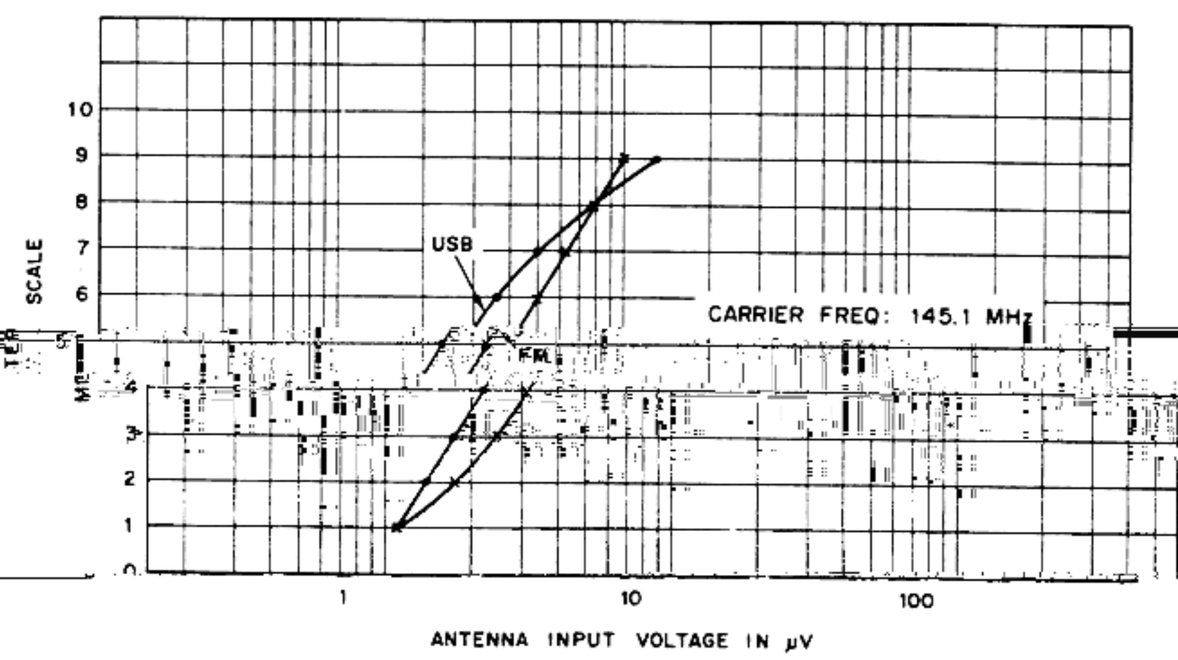
RX Sensitivity
(**20dB NQ**) (**430MHz**)



Example of Transmission Output
(**430MHz**)



Deviation VS MIC input (**144MHz**)



S meter sensitivity (**144MHz**)

SPECIFICATIONS

GENERAL

Frequency Range	144.0 ~ 146.0 MHz 430.0 ~ 440.0 MHz
Mode	SSB (USB, LSB), CW, FM
Voltage Requirements	220V AC, 50/60 Hz 12.0 ~ 16.0V DC (13.8V DC nominal)
Power Consumption	Receive (no signal): 45 watts (220V AC), 1.5A (13.8V DC) Transmit: 130 watts (220V AC), 6A (13.8V DC)
Semiconductor Complement	Transistors: 161 FETs: 31 ICs: 63 Diodes: 224
Dimensions	290 (W) × 124 (H) × 320 (D) mm (11"-7/16) × (4"-7/8) × (12"-5/8)
Weight	11 kg (24.2 lbs)

TRANSMITTER SECTION

RF Power Output	SSB, CW, FM: 10 watts FM (LOW): Approx. 1 watt
Modulation	SSB: Balanced modulation FM: Variable reactance frequency shift
Maximum frequency deviation (FM)	±5 kHz
Carrier Suppression	Better than 40 dB
Unwanted Sideband Suppression	Better than 40 dB
Suprious Radiation	Better than −60 dB
Microphone Impedance	500 ~ 600Ω
Antenna Impedance	50Ω
AF Response of Transmitter (SSB)	400 ~ 2600 Hz (−9 dB)
RPT Tone Frequency	1750 Hz

RECEIVER SECTION

Receiver Sensitivity	SSB, CW: 0.25 μV for 10 dB (S+N)/N FM: 1 μV for 30 dB (S+N)/N 0.4 μV for 20 dB
Intermediate Frequency	1st: 21.6 MHz 2nd: 8.83 MHz (144 MHz FM 455 kHz)
Image Rejection	1st IF: Better than 60 dB 2nd IF: Better than 50 dB
IF Rejection	Better than 70 dB
Squelch Sensitivity	0.25 μV
Audio Output	2.5 watts (with less than 10% distortion) into a 4 ohm load
Receiver Selectivity	SSB, CW: 2.4 kHz (−6 dB) 4.8 kHz (−60 dB) FM: 12 kHz (−6 dB) 24 kHz (−60 dB)
Frequency Stability	Within ±1 kHz during the first hour after 1 minute of warmup Within 150 Hz during any 30 minute period after warmup.

The above specifications are subject to change without notice for improvement.

A product of
TRIO-KENWOOD CORPORATION
6-17, 3-chome, Aobadai, Meguro-ku, Tokyo 153, Japan

TRIO-KENWOOD COMMUNICATIONS, INC.
1111, West Walnut Street, Compton, California, 90220, U.S.A.
TRIO-KENWOOD COMMUNICATIONS, GmbH
D-6374 Steinbach TS, Industriestrasse 8A, West Germany
TRIO-KENWOOD (AUSTRALIA) PTY. LTD.
30 Whiting Street, Artarmon, Sydney N.S.W. Australia 2064

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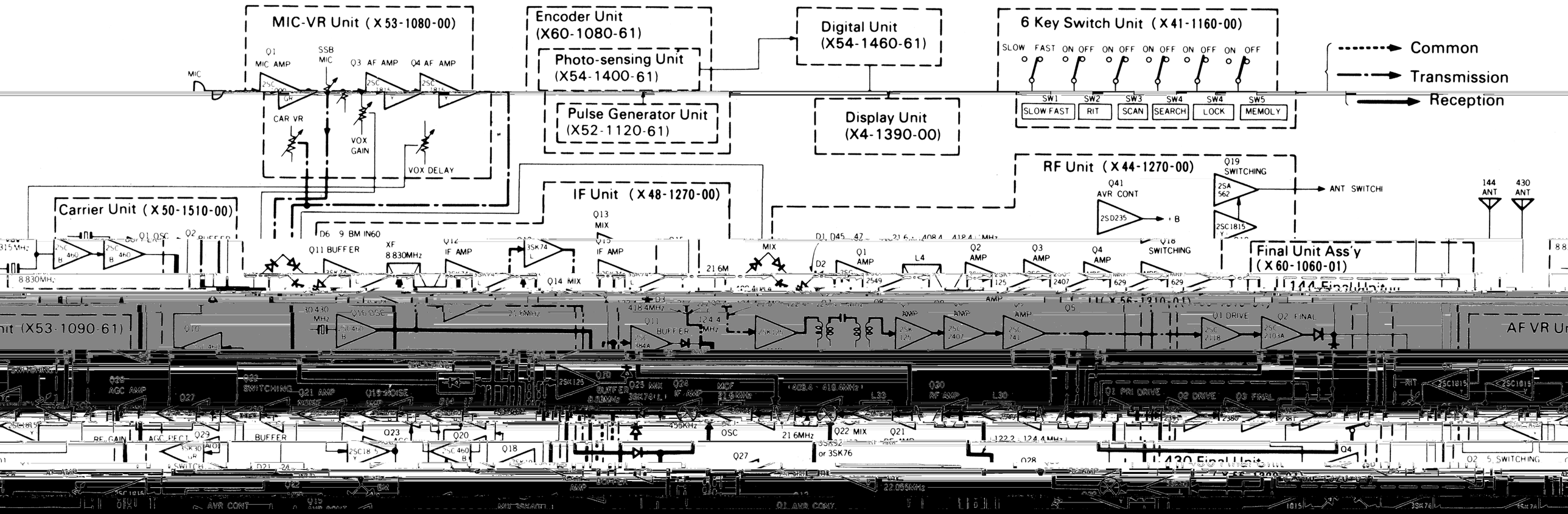
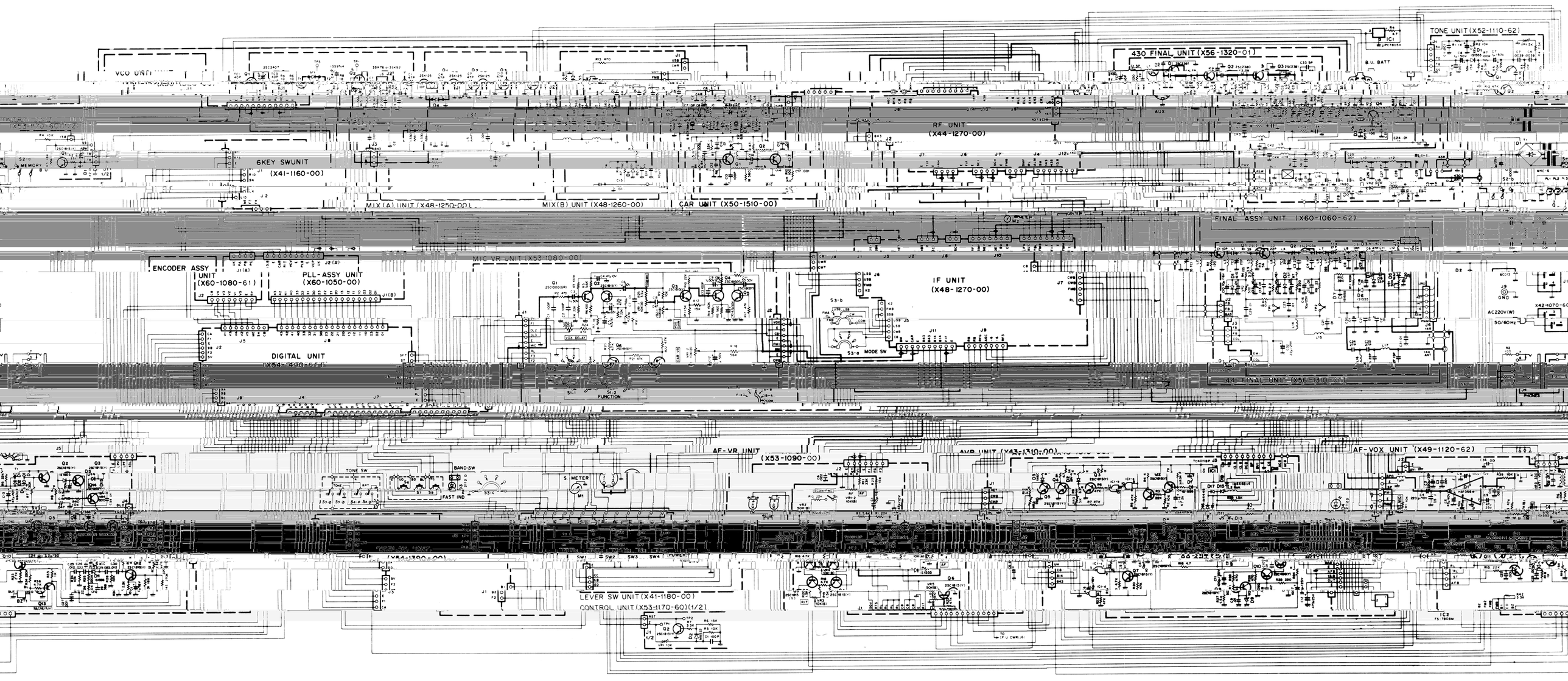
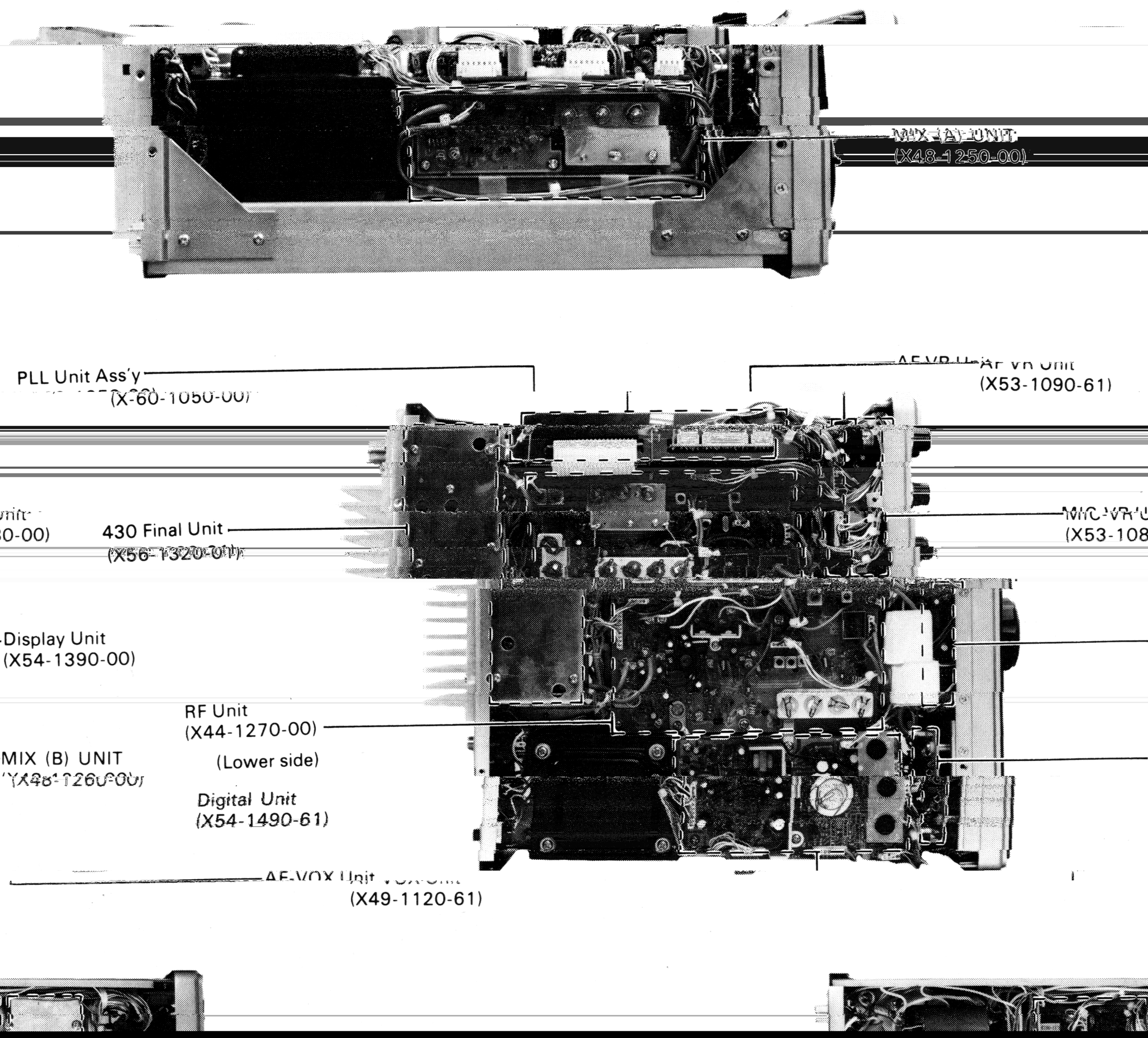

MIC-VR Unit (X53-1080-00)
Q1 MIC AMP
SSB MIC
Q3 AF AMP
Q4 AF AMP
MIC
CAR VR
VOX GAIN
VOX DELAY
Encoder Unit (X60-1080-61)
Photo-sensing Unit (X54-1400-61)
Pulse Generator Unit (X52-1120-61)
Digital Unit (X54-1460-61)
Display Unit (X4-1390-00)
6 Key Switch Unit (X41-1160-00)
SLOW FAST ON OFF ON OFF ON OFF ON OFF ON OFF
SW1 SLOW FAST
SW2 RIT
SW3 SCAN
SW4 SEARCH
SW4 LOCK
SW5 MEMOLY
Common
Transmission
Reception
RF Unit (X44-1270-00)
Q41 AVR CONT
Q19 SWITCHING
ANT SWITCHI
144 ANT
430 ANT
Carrier Unit (X50-1510-00)
IF Unit (X48-1270-00)
Q13 MIX
Q11 BUFFER
XF 8.830MHz
Q12 IF AMP
Q15 IF AMP
Q14 MIX
Q1 AMP
Q2 AMP
Q3 AMP
Q4 AMP
Q18 SWITCHING
Final Unit Ass'y (X60-1060-01)
Q1 DRIVE
Q2 FINAL
AF VR Unit (X53-1090-61)
Q27 AGC AMP
Q32 SWITCHING
Q21 AMP
Q19 NOISE
Q23 MIX
Q24 IF AMP
Q30 RF AMP
Q31 PRI DRIVE
Q32 DRIVE
Q33 FINAL
Q29 BUFFER
Q20
Q18
Q22 MIX
Q21
Q27
Q28
Q4
Q25 SWITCHING
Q22 AVR CONT
Q21 AVR CONT
455KHz
OSC
21.6MHz
22.055MHz
144 Final Unit
430 Final Unit

SCHEMATIC DIAGRAM (IF Unit)

SCHEMATIC DIAGRAM (RF Unit)


VCO UNIT
6KEY SWUNIT
(X41-1160-00)
MIX(A) UNIT (X48-1250-00)
MIX(B) UNIT (X48-1260-00)
CAR UNIT (X50-1510-00)
RF UNIT
(X44-1270-00)
430 FINAL UNIT (X56-1320-01)
TONE UNIT (X52-1110-62)
B.U. BATT
FINAL ASSY UNIT (X60-1060-62)
MIC VR UNIT (X53-1080-00)
ENCODER ASSY
UNIT
(X60-1080-61)
PLL-ASSY UNIT
(X60-1050-00)
DIGITAL UNIT
(X54-1490-61)
IF UNIT
(X48-1270-00)
MODE SW
FUNCTION
AC220V(W)
50/60Hz
144 FINAL UNIT (X56-1310-01)
AF-VR UNIT
(X53-1090-00)
AVR UNIT (X43-1210-00)
AF-VOX UNIT (X49-1120-62)
TONE SW
BAND SW
FAST IND
S METER
LEVER SW UNIT (X41-1180-00)
CONTROL UNIT (X53-1170-60)(1/2)


MIX (A) UNIT
(X48-1250-00)
PLL Unit Ass'y
(X-60-1050-00)
AF VR Unit
(X53-1090-61)
430 Final Unit
(X56-1320-01)
Display Unit
(X54-1390-00)
RF Unit
(X44-1270-00)
(Lower side)
MIX (B) UNIT
Digital Unit
(X54-1490-61)
(X49-1120-61)