

KENWOOD

SERVICE MANUAL

TM-401A FC-10, TU-3(K,M TYPE ONLY)

UHF FM TRANSCEIVER



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CIRCUIT DESCRIPTION

RX SECTION

The input signal from the antenna passes through the transmitter/receiver diode switch on the Final unit before being input to the front end. The front end is comprised of RF amplifier Q1 : GaAs FET (3SK97 Q2), first mixer Q2 (3SK74L), a 3-pole helical resonator having a 10MHz band-pass and a 2-stage MCF (Monolithic crystal filter) to give good sensitivity and two signal characteristics. The first IF signal (21.6MHz), having passed through the MCF, is mixed with the (21.145MHz) second local oscillator signal at the second mixer Q3 (3SK74GR) to produce a second IF signal at 455kHz. This (455kHz) second IF signal is passed through ceramic filter CFW-455F, IF amplified by Q4 (TA7302P), Q5 (2SC2668Y), and Q6 (μ PC577H) and detected by ceramic discriminator CFY-455S. The detected output from the discriminator is divided into an audio frequency component and a noise component and are then coupled into their respective circuits. The audio frequency component is de-emphasised, and preamplified by Q7 (2SC2458Y) before delivery to Q14 (MB3712), which the power amplifier which drives the speaker. The noise component is derived through the BPF (bandpass filter), which detects the noise in the vicinity of 20kHz. This is amplified by Q8 and Q9 (2SC3113B) and rectified by D5 and D6 to achieve squelch control. The squelch control signal is applied by Q10 (2SC2458Y) to control Q7. Q11 (2SA1115E) and Q12 (2SC3113B) are deamplifiers for the busy indicator. Q13 prevents transient "clicks" when the alert function operates.

Item	Rating
Nominal center frequency (fo)	21.600kHz
3dB bandwidth	$\pm 7.5\text{kHz}$ or more
Attenuation bandwidth	$\pm 25\text{kHz}$ or less at 40dB $\pm 45\text{kHz}$ or less at 60dB
Guaranteed attenuation	70dB or more within $\pm 1\text{MHz}$ (Spurious response 35dB or more) 80dB or more within $\pm (910\text{kHz} \pm 20\text{kHz})$
Ripple	1.0dB or less
Loss	2.0dB or less
Input and output impedance	1k Ω //1pF

Table 1 MCF (L71-0227-05) (A unit L4)

Item	Rating
Nominal center frequency (fo)	455kHz $\pm 1\text{kHz}$
6dB bandwidth	$\pm 6\text{kHz}$ or more
50dB bandwidth	$\pm 12.5\text{kHz}$ or less
Ripple (within 455 $\pm 5\text{kHz}$)	3dB or less
Loss	6dB or less
Guaranteed attenuation (within 455 $\pm 100\text{kHz}$)	35dB or more
Input and output impedance	2.0k Ω

Table 2 Ceramic filter (L72-0315-05) CFW455F (A unit L7)

Item	Rating
Center frequency (fo) and deviation	455 $\pm 1\text{kHz}$ or less
Peak separation	15kHz or more
Voltage sensitivity	15 $\pm 3\text{mV/kHz}$
Hump	No hump in the range $\pm 5\text{kHz}$
Linearity	455 $\pm 3\text{kHz}$ or more
Temperature characteristics (-20 $^{\circ}\text{C}$ to +60 $^{\circ}\text{C}$)	$\pm 0.3\%$ or less (center frequency)

Table 3 Ceramic discri (L79-0446-05) CFY455S (A unit L10)

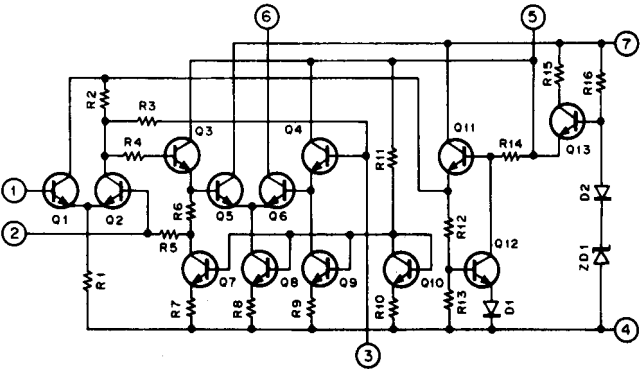


Fig. 1 TA7302P Equivalent circuit (A unit Q4)

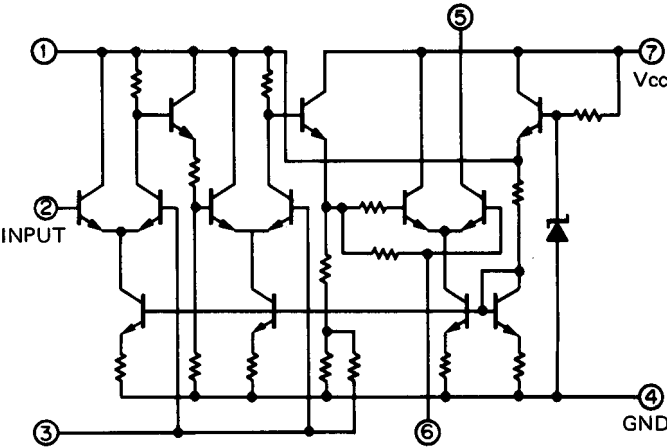


Fig. 2 μ PC577H Equivalent circuit (A unit Q6)

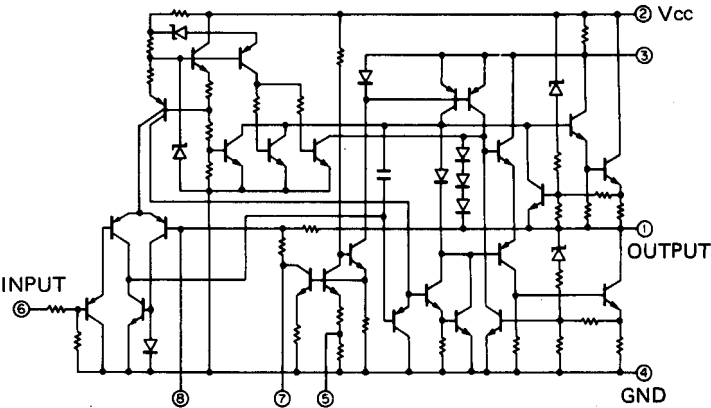


Fig. 3 MB3712 Equivalent circuit (A unit Q14)

CIRCUIT DESCRIPTION

TX SECTION

The signal from the microphone is amplified by Q55 (NJM4558S) on the "B" unit (X53-1350-11) before being diode limited by D39 (MC911) where IDC (instantaneous deviation control) is provided to prevent over-deviation. Then LPF (lowpass filter) Q54 (NJM4558S) filters the higher frequencies and phase-modulated the transmitter PLL loop.

The phase-modulated FM signal is passed through VCO buffer Q45 (2SC2668Y) before being amplified by drive Q46 (2SC2347) and Q47 (2SC2538) to yield the output for the Final unit.

The signal fed to the Final unit (X45-1340-11) is power amplified by power hybrid Q11 (M57752). The signal is then passed through the transmitter/receiver diode switch before going through 3-stage LPF and is then fed to the antenna.

The APC (automatic power control) circuit performs HI/LOW power control selection and SWR protection. The output from the power module is sampled through C8 and detected by D4 before being applied to the "B" unit, where the signal is applied through Q53 (2SC2458Y) and then to differential amplifier Q50 and Q51 (2SC2458Y). The protection circuit detects the reflected wave from the antenna terminal, which is amplified by Q52 (2SC2458Y) on the "B" unit before being applied by differential amplifier pair Q50 and Q51. The differential amplifier controls Q49 (2SA1015Y) and Q48 (2SC880) and varies the voltage at Q1 pin 2 on the Final unit and at Q47 on the "B" unit thereby controlling the output of the transmitter.

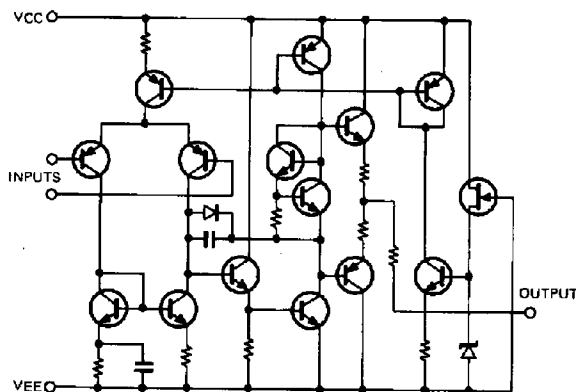


Fig. 4 NJM4558S Equivalent circuit (B unit Q54,55)

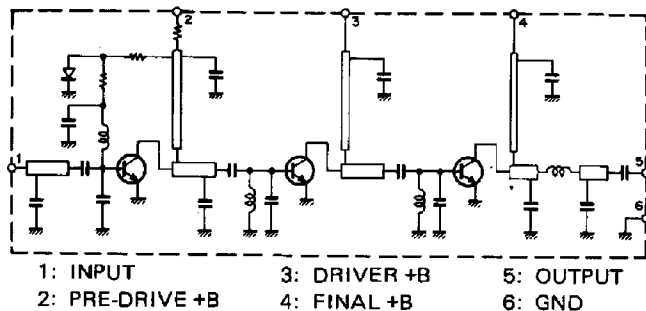


Fig. 5 Power module M57752 Equivalent circuit (Final unit Q1)

Item	Symbol	Tc (°C)	Condition	Rating	Unit
Operating	Vcc	25		17	V
DC current	Icc	25		5	A
Power input	Pin (max)	25	ZG=ZL=50Ω, VCC1≤12.5V	0.4	W
Power output	Po (max)	25	ZG=ZL=50Ω	20	W
Operating case temp.	Tc (op)			-30—+110	°C
Storage temp.	Tstg			-40—+110	°C

Table 4 Power module M57752 Max. Rating

PLL SECTION

The PLL circuit is comprised of two loops: one for transmission and one for reception. The block diagram is given Fig. 6.

Receiver PLL

The signal generated by RX VCO Q27 (2SK125) on the "A" unit (X44-1540-XX) (204.20—209.195MHz : M,T,W) (209.20—214.195MHz : K) is mixed by Q22 (2SC2668Y) to become a PLL signal at 11.10—16.095MHz. This is amplified by Q23 (2SC2668Y) and then input to PD (phase detector) IC Q19 (MC145155P). The 32.1833MHz (M,T,W) 33.016MHz (K) heterodyne signal generated by Q20 (2SC2668Y) is tripled to 193.1MHz (M,T,W) 198.1 MHz (K) by Q21 (2SC2787L) before being input to mixer transistor Q22. When the PLL IF signal is input to Q19 (pin 9), it is divided by a ratio of N=2220—3218, specified by the data from microprocessor Q1 (μPD7508G-534). Simultaneously, the 12.80MHz signal generated by Q19 is then divided by 1/2048 to become the 5kHz (M,T,W) 6.25kHz (K) reference comparison signal.

The phase compared output signal is passed through LPF Q25 and Q26 (2SC2459BL) and is applied as the VCO control voltage to varicap D12 (1SV123), then locked to the desired frequency. If the PLL loop unlocks, the unlock signal from Q19 (pin 8) turns off Q24 (2SC2458Y), which in turn stops the operation of VCO buffer amplifier Q29.

Transmitter PLL

The signal generated by TX VCO Q44 (2SK125) on the "B" unit (215.00—219.995MHz : M,T,W) (220.00—224.995MHz : K) is mixed with the RX PLL output signal (204.20—209.195MHz : M,T,W) (209.20—214.195MHz : K) at mixer Q35 (2SC2668Y) to become a 10.80MHz signal. This is amplified by Q36 (2SC2668Y) before being input to PD IC Q38 (MC145151P) pin 27. Concurrently, the 10.695 MHz reference signal generated by Q37 (2SC2668Y) is divided in PD IC Q38 by 1/512 to become the 21.09kHz phase reference comparison signal.

The compared and phase-locked output signal is passed through LPF Q39—Q41 (2SC2459BL) and applied as the VCO control voltage to varicap D36 (1SV50), to lock the VCO to the desired frequency. If the PLL loop unlocks, the unlock signal from Q38 (pin 28) turns off Q42 (2SC2458Y), which then turns off Q43 (2SA1015Y). The result is that no bias is applied to Q45—Q47 and transmitter output is inhibited.

CIRCUIT DESCRIPTION

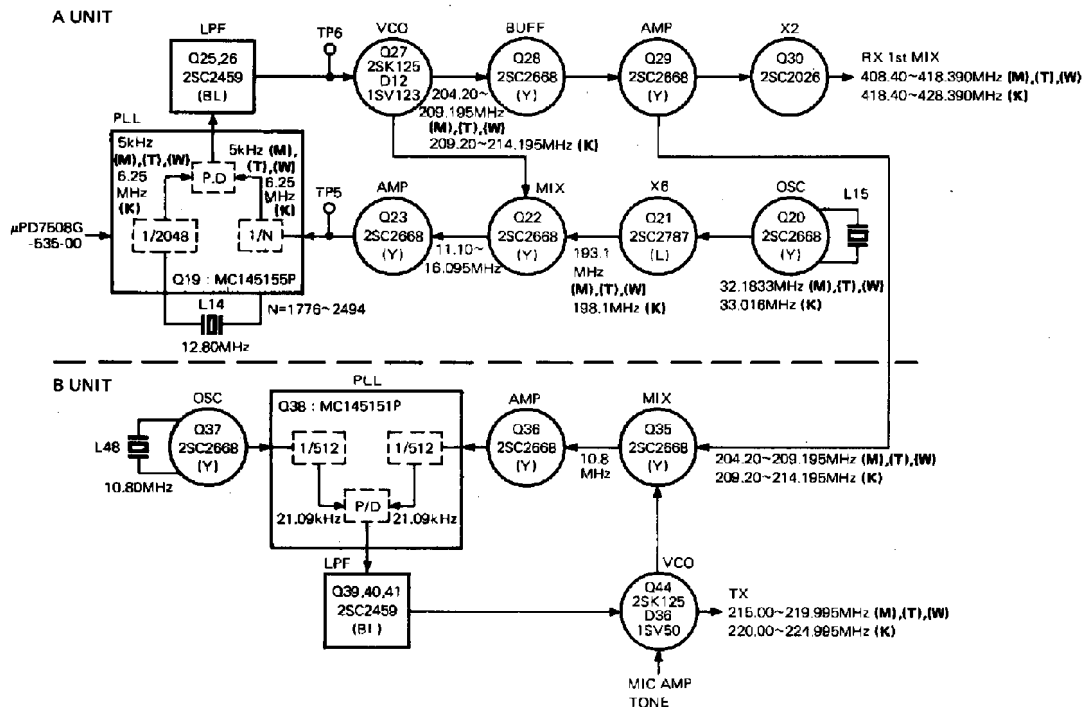


Fig. 6 PLL circuit Block diagram

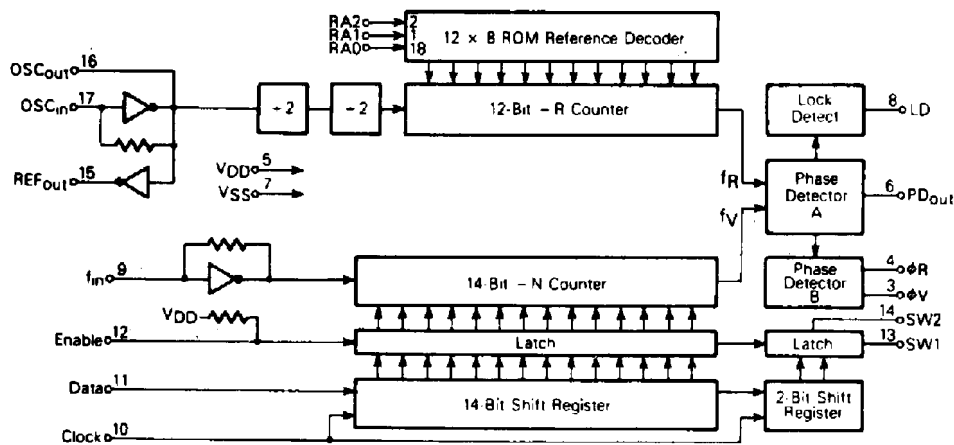


Fig. 7 MC145155P Block diagram (A unit Q19)

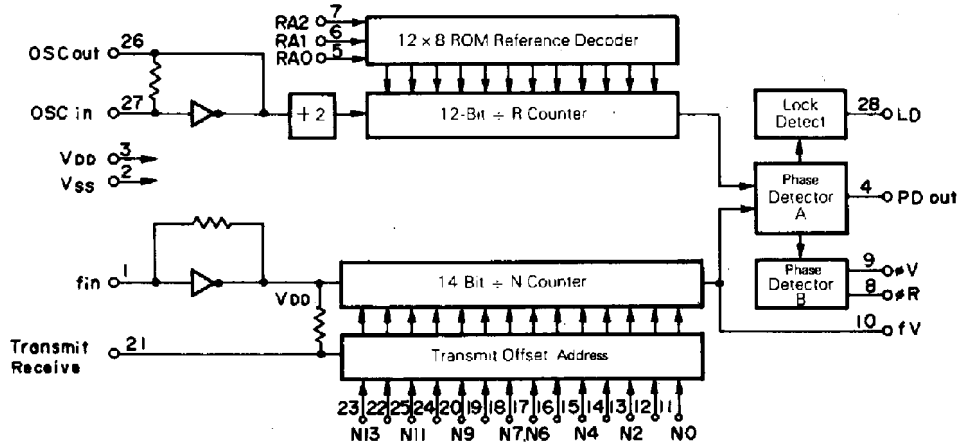


Fig. 8 MC145151P Block diagram (B unit Q38)

CIRCUIT DESCRIPTION

CONTROL CIRCUIT

● Display

The dynamic drive system consists of 4-digit LEDs. The segment signal is output at ports P20–P23 and P40–P43 of the microprocessor Q1 and driven by digital transistors Q10–Q17. The digit signal is output at port P30–P33 and driven by transistor alley Q8. The 2 dots (MHz decimal point and A/B display) of the frequency display and MR and ALARM LEDs are also driven dynamically.

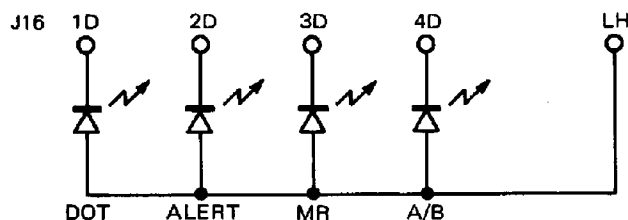


Fig. 9

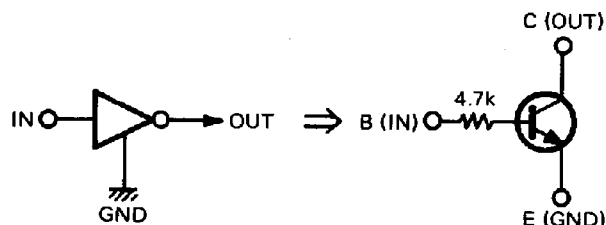


Fig. 10 Digital transistor DTC143T (E) Equivalent circuit (B unit Q10–17)

● Encoder

The mechanical contact system encoder outputs 25 pulses with 50 clicks at one cycle. The chattering component in the encoder output is eliminated by Schmitt circuit Q7 and directly applied to ports P62 and P63 of the microprocessor. The UP/DOWN operation of the encoder are judged by the microprocessor software.

● Switch signal

The key scan output pulse is used in common with the display digit signal and the key return signal is input to ports P10–P13. The key scan signal is stopped by the AND gate Q6 so that it is not output in transmission mode.

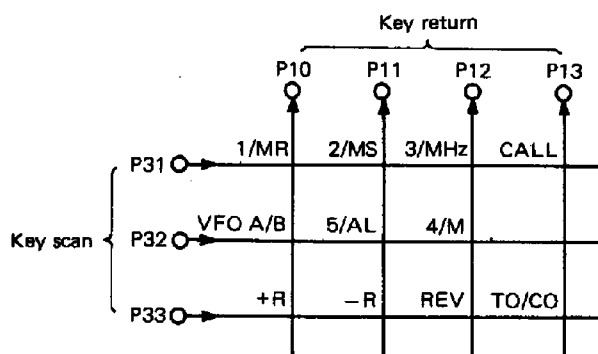


Fig. 11 Key matrix

● Beep sound

The beep signal is switched by the 3-stage inverter Q2 and NAND gate Q3. The oscillation frequency is determined by C7 and R5.

● Back-up circuit

The AVR output of Q5 is switched by Q4 and fed to P00. When the AVR voltage drops and approaches the lithium battery voltage, the P00 becomes L level, the unit enters the back-up mode, clocks CL1 and CL2 stop and the unit enters the low current hold mode.

● Frequency controller FC-10 interface

The LCD display data supplied from the unit to FC-10 is output at ports P01, P02 and P61 and amplified by inverter buffer Q2. The 3-bit keyboard information (R0, R1 and R2 of J21) is supplied from FC-10 and R0 and R1 are combined with the mic UP/DOWN signal and input to port P50–P52.

Connector No.	Terminal name	Functions
(13)	8C	BV Common
	SS	Squelch BUSY input
	SB	Switch B power supply
	AL	Alert keller and NO TX pro
	RT	Tone encoder access
(14)	E3	ENCODER 3 (GND)
	E2	ENCODER 2 (CLOCK)
	E1	ENCODER 1 (DATA)
(15)	31	P31
	32	P32
	33	P33
	KEY SCAN OUTPUT	
(16)	LA	LED Segment a
	LB	LED Segment b
	LC	LED Segment c
	LD	LED Segment d
	LE	LED Segment e
	LF	LED Segment f
	LG	LED Segment g
	LH	LED Segment h
	1D	Digit 1 (1kHz)
	2D	Digit 2 (10kHz)
(17)	UP	MIC UP
	DW	MIC DOWN
	ST	STAND BY
(18)	10	P10
	11	P11
	12	P12
	13	P13
	KEY RETURN OUTPUT	
(19)	DP	PLL Serial data output
	CP	PLL Synchronize clock output
	LP	PLL Latch output
	ST	STAND BY
	BP	Beep sound output
(21)	E	GND
	R2	REMOCON 2
	R1	REMOCON 1
	R0	REMOCON 0
	LL	LCD Latch output
	CL	LCD Synchronize output
	DL	LCD Serial data output
	RCB	Remote control power supply

Table 5 Name and function of connector terminal

CIRCUIT DESCRIPTION

Terminal name	Function	Terminal name	Function	Terminal name	Function
AL	Alert	LA	LED Segment a Data	SO	Squelch
ANT	Antenna	LB	LED Segment b Data	SS	Scan Stop
A1	Top of AF Control	LC	LED Segment c Data	ST	Stand by Switch
A2	Arm of AF control	LD	LED segment d Data	TB	Tone +B
B	+13.8V	LE	LED Segment e Data	TO	Tone Output
BD	Busy Light	LF	LED Segment f Data	UP	MIC UP Switch
BP	Beep Tone Output	LG	LED Segment g Data	1D	LED Digit 1 Data
CB	Common +B	LH	LED Dot point Data	2D	LED Digit 2 Data
CL	LCD Display Data in Remocon	LO	Low Power Switched	3D	LED Digit 3 Data
CP	PLL IC Data	LP	PLL IC Data	4D	LED Digit 4 Data
DB	Drive +B	MC	MIC	8C	+8V Common
DL	LCD Display Data in Remocon	PC	Power Control	8M	+8V at MIC
DO	Drive Output	PR	Protection	8R	+8V in RX
DP	PLL IC Data	RA	RX Antenna	8T	+8V in TX
DW	Mic Down Switch	RCB	Remocon Common +B	10	μ -Proc. port-10
E	GND	RM	RF Meter	11	μ -Proc. port-11
E1	Encoder 1	RT	Repeater Tone	12	μ -Proc. port-12
E2	Encoder 2	R0	Remocon 0	13	μ -Proc. port-13
E3	Encoder 3	R1	Remocon 1	31	μ -Proc. port-31
FB	Final +B	R2	Remocon 2	32	μ -Proc. port-32
HET	Hetero	SB	Switched +B	33	μ -Proc. port-33
HO	Herical Output	SM	Signal Meter		
LL	LCD Display Data in Remocon	SP	Speaker		

Table 6 Terminal function

Terminal No.	Name	Input	Output	Functions	Terminal No.	Name	Input	Output	Functions
1	NC				27	NC			
2	P73		○	No TX pro & alert audio keller signal	28	P42		○	LED Segment c
3	RESET	○		Reset input	29	NC			
4	NC				30	P43		○	LED Segment d
5	CL1			Clock OSC CR connector terminal	31	VSS			GND
6	NC				32	X1			GND
7	VDD			+B power terminal (+5.0V)	33	VDD			NC
8	NC				34	X2			NC
9	CL2			Clock OSC CR connector terminal	35	NC			
10	INT1			GND	36	P20		○	LED Segment e
11	P00/ INT0	○		Back-up detector input	37	P21		○	LED Segment f
12	P01/ SCK		○	PLL, LCD Serial data, Synchronize clock terminal	38	P22		○	LED Segment g
13	NC				39	P23		○	LED Segment h
14	NC				40	NC			
15	P02/S0		○	PLL, LCD Serial data	41	P10	○		KEY Return input (KA)
16	P03/S1	○		Squelch BUSY detector input	42	P11	○		KEY Return input (KB)
17	P60		○	PLL Serial data, Latch output	43	P12	○		KEY Return input (KC)
18	P61		○	LCD Serial data, Latch output	44	P13	○		KEY Return input (KD)
19	P62	○		ENCODER E1 (CLOCK)	45	NC			
20	P63	○		ENCODER E2 (DATA)	46	P30		○	KEY SCAN output & LED digit output (1kHz)
21	P50	○		REMOCON R0 Remote Control Keyboard input	47	P31		○	KEY SCAN output & LED digit output (10kHz)
22	P51	○		REMOCON R1 Remote Control Keyboard input	48	P32		○	KEY SCAN output & LED digit output (100kHz)
23	P52	○		REMOCON R2 Remote Control Keyboard input	49	P33		○	KEY SCAN output & LED digit output (1MHz)
24	P53	○		TX, RX discrimination input	50	P70		○	Beep signal output
25	P40		○	LED Segment a	51	P71		○	KEY SCAN shut off signal
26	P41		○	LED Segment b	52	P72		○	Tone encoder access signal

Table 7 μ PD7508G-535-00 Terminal function (B unit Q1)

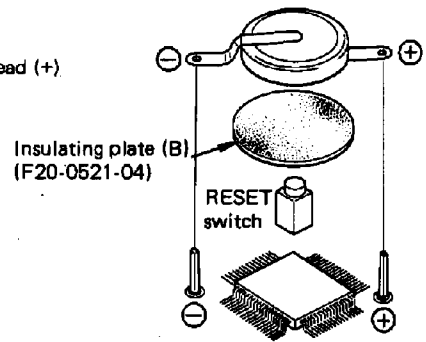
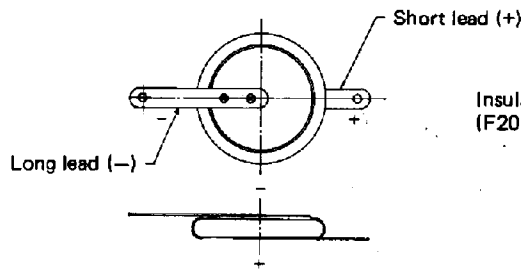
CIRCUIT DESCRIPTION

LITHIUM BATTERY (W09-0323-05)

SPECIFICATIONS

Model and Efficiency

Model	CR2032
Nominal Voltage	3V
Nominal Capacity	170m Ah
Discharge Stop Voltage	2.0V
Dimensions	Diameter 20.2 mm
	High 3.2 mm
Weight	3g



Replacement procedure

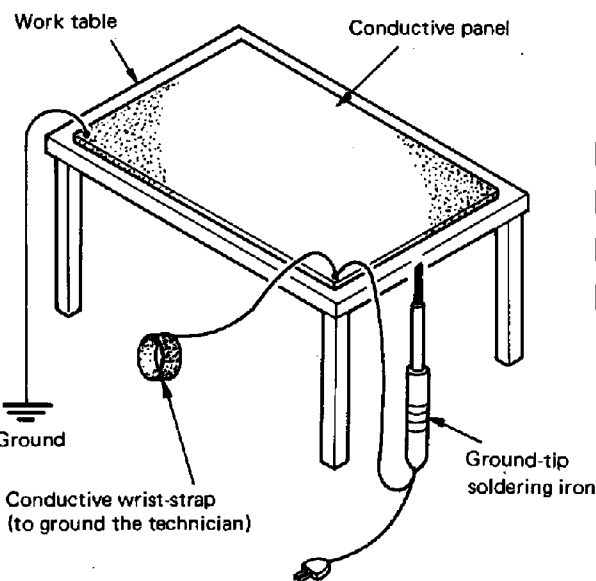
When replace the back-up battery read as follows.

1. Remove the lower case.
2. Take care not to damage parts on the PC board since they are soldered battery.
3. Remount cell again (conform to cell pole).
4. After power switch is on, push the reset switch is on.

PRECAUTIONS FOR HANDLING GALLIUM ARSENIDE FET'S

The gallium arsenide FET (3SK97) used in this device is easily damaged by static electricity. Take careful note of the following points when soldering and handling this device.

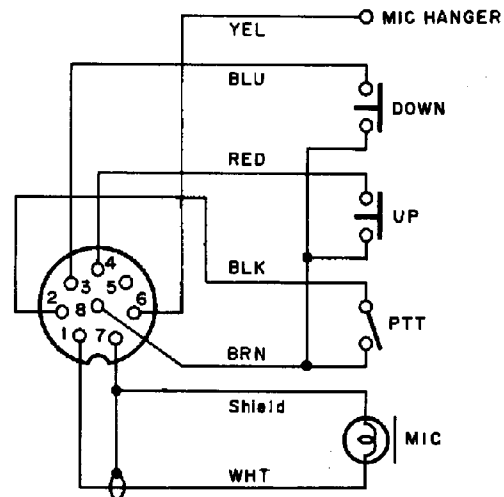
1. When handling this FET separated from the radio, make sure to first discharge yourself to ground.
2. Use a grounded-tip soldering iron.
3. Ground the FET while soldering-in.
4. Cover the work table with a conductive, grounded panel to insure an adequate static discharge path.



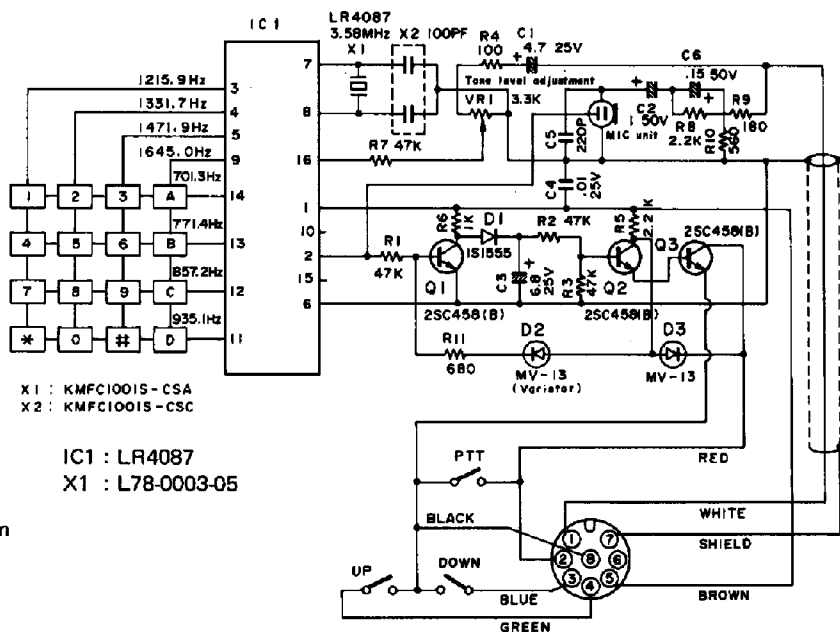
ACCESSORY MICROPHONE

(T91-0331-05) M,W type

(T91-0335-05) T type



(T91-0332-05) K type



PARTS LIST

CAPACITORS

CC 45 TH 1H 220 J
 1 2 3 4 5 6
 1 = Type ceramic, electrolytic, etc 4 = Voltage rating
 2 = Shape round, square, etc 5 = Value
 3 = Temp coefficient 6 = Tolerance

● Temperature coefficient

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

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

Example CC45TH = -470 ± 60 ppm/°C

● Tolerance

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

Less than 10 pF

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

Abbreviation		Abbreviation	
Cap	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

Resistors not listed in this parts list are standard, fixed carbon composition, 1/4W or 1/8W. The resistance values, in ohms, are indicated on the schematic diagram.

● Rating voltage

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

● Capacitor value

0 1 0 = 1pF

1 0 0 = 10pF

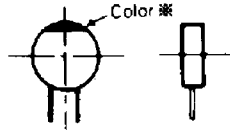
1 0 1 = 100pF

1 0 2 = 1000pF = 0.001μF

1 0 3 = 0.01μF

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

CC45



Symbol	Destination
K	U.S.A.
W	Europe
T	Britain
M	General market

SEMICONDUCTOR

N : New parts

Δ : Please note that parts are same times not in stock and it takes much time to deliver.

Name	Re- marks	Part No.	Name	Re- marks	Part No.	Name	Re- marks	Part No.
Diode	N	1N60	FET	N	2SC2458(Y)	N		MC145151P
		1S1555			2SC2459(BL)			MC145155P*K
		1SS101			2SC2668(Y)			NE555P T,W
		MC911			2SC2787(L)			NJM78L05K
		MI308			2SC3019			NJM4558S
Vari-cap		U05B			2SC3113(B)			TA7302P
		1SV50			2SD880(Y)			TC4011BP
		1SV123			2SK125			TC4049BP
Varistor		MV13			3SK73(GR)			TC4081BP
					3SK97(Q2)			μPC78M05H
Zener diode		XZ-039	Digital TR	N	3SK97(Q2)*J			μPC78M08H
		XZ-055			DTC143T(F)			μPC577(E)
Thermistor		112-102-2	Power module	N	M57752 M,T,W	N		μPC577(F)
					M57752-H K			
TR		2SA1015(Y)	IC	N	LR4087 (MC-48)			
		2SA1115(E)			LB1258			
					LB1409			
		2SC1959(Y)			MB3712	Micro processor	N	
		2SC2026			MC14069UBCP			μPD7508G-535-00

PARTS LIST

Part No.	Re- marks	Description	Ref. No.	Part No.	Re- marks	Description	Ref. No.
GENERAL				J21-2799-13	N	SP mounting hardware Accessory	
A01-0967-03	N	Case (upper) K,M,W		J21-2800-04	N	Angle mounting hardware x 2 Accessory	
A01-0968-03	N	Case (upper) T		J29-0409-04	ΔN	Switch guide x 3	
A01-0969-03	N	Case (lower)		J30-0526-04	N	Spacer Slide knob	
A02-0637-08	N	Speaker's case (upper) K,M,W		J32-0775-04	N	Angle boss x 4 Accessory	
A02-0638-08	N	Speaker's case (lower)		J32-0776-04	N	Round boss x 2 B unit	
A02-0642-08	N	Speaker's case (upper) T		J39-0418-08	N	Spacer	
A13-0640-12	N	Mounting bracket ass'y Accessory		J61-0408-05	N	Nylon band x 6	
A20-2486-03	N	Front panel K,M		K21-0771-05	N	Main knob	
A20-2487-03	N	Front panel T		K23-0757-05	N	AF knob x 2 AF, SQL	
A20-2488-03	N	Front panel W		K27-0443-05	N	Key knob (A) MR	
A22-0735-03	ΔN	Sub panel		K27-0444-05	N	Key knob (B) x 5 MS,MHz,A/B,A,L,M	
B01-0652-03	N	Panel escutcheon		K27-0445-05	N	Square knob (A) COM K,M	
B07-0641-03	N	Remote grill		K27-0445-05	N	Square knob (A) TONE T,W	
B07-0642-14	N	Side escutcheon (R)		K37-0446-05	N	Square knob (B) HI/LOW	
B07-0643-14	N	Side escutcheon (L)		K27-0447-05	N	Round knob REV	
B10-0655-04	N	Front glass		K29-0782-05	N	Slide knob OFFSET	
B40-2666-04	ΔN	Model name plate K,M		N09-0008-04		Round screw x 4 Accessory	
B40-2667-04	ΔN	Model name plate W		N09-0632-05		Tapping screw (A) x 4 Accessory	
B40-2668-04	ΔN	Model name plate T		N09-0659-05		TP screw x 2 (M2 x 4) Display	
B42-1782-04	N	Indicating plate		N10-2040-41		Hex. nut x 2 SP	
B43-0697-04	N	Badge (B) K,M,W		N13-0310-04	N	Dressed nut x 2 AF, SQL	
B43-0698-04	N	Badge (B) T		N14-0510-04		Flange nut x 4 Accessory	
B45-0701-00		Sticker M,W		N15-1050-46		Flat washer x 4 Accessory	
B46-0058-10		Warranty card K		N15-1060-46		Flat washer x 4 Accessory	
B50-4060-00	N	Instructiton manual K,M,W		N16-0026-48		Spring washer A unit	
B50-4062-00	N	Instruction manual T		N16-0060-46		Spring washer x 4 Accessory	
E06-0858-05	N	8P metal socket Mic jack	J101	N19-0631-05		Flat washer x 4 Angle Accessory	
E06-0857-05	N	8P DIN socket REMOTE	J102	N29-0301-04		Stopper ring A x 6	
E07-0852-05		8P metal socket Microphone		N30-2606-41		Round screw x 2 B unit	
E30-1689-15		DC cord ass'y Accessory		N30-4010-41		Round screw x 2 SP Accessory	
E30-1729-08		Cable with plug SP ass'y		N32-2604-41		Flat screw x 8 Sub panel, Heat sink	
E31-2171-05	N	Connector with coax. HET	J103	N32-2605-45		Flat screw x 5 Side escutcheon	
F05-5022-05		Fuse 5A Accessory		N32-3014-41		Flat screw x 4 Angle boss Accessory	
F20-0521-04		Insulating plate (B) Lithium cell		N33-2606-41		Round flat screw x 7 Case	
G01-0821-04		Coil spring x 9		N35-2004-41		Bind screw x 2 Display	
G02-0505-05		Knob fitting spring x 2 AF, SQL		N35-2604-41		Bind screw x 3 A unit	
G10-0626-04	N	Cushion Case (upper)		N35-3006-45		Bind screw x 4 Angle Accessory	
G13-0679-04		Cushion T,W		N87-2605-41		Self tapping screw x 15 A,B unit	
G13-0680-04	N	Cushion SP Accessory		N87-4008-41		Self tapping screw x 4 SP Accessory	
G13-0683-04		Cushion Angle Accessory		N88-4008-41		Flat tapping screw x 2 SP Accessory	
G13-0684-04		Cushion Case (lower)		S50-1406-05		Tact switch x 2 M,T,W	
G13-0685-04	N	Cushion A unit		T07-0226-08	N	Speaker	
G13-0686-04		Cushion x 2 Angle Accessory		T19-0101-05	N	Speaker ass'y Accessory K,M,W	
G13-0687-04		Cushion T,W		T19-0102-05	N	Speaker ass'y Accessory T	
H01-4509-03	ΔN	Packing carton (inside) K,M,W		T91-0331-05		Microphone Accessory M,W	
H01-4510-03	ΔN	Packing carton (inside) T		T91-0332-05		Microphone Accessory K	
H10-2572-04	ΔN	Packing fixture (upper)		T91-0335-05		Microphone Accessory T	
H10-2573-04	ΔN	Packing fixture (lower)		W02-0334-05		Rotary encoder	
H12-1332-04	ΔN	Cushion (B)		W09-0323-05		Lithium cell CR2032	
H12-1338-04	ΔN	Cushion (C)		X44-1540-11	N	A unit K	
H12-1344-14	ΔN	Cushion (A)		X44-1540-61	N	A unit M,T,W	
H25-0029-04	Δ	Protective bag x 3 Screw, Boss		X45-1340-11	N	Final unit K	
H25-0049-03	Δ	Protective bag x 3 Cord		X45-1340-21	N	Final unit M	
H25-0103-04	Δ	Protective bag MIC		X45-1340-61	N	Final unit T,W	
H25-0112-04	Δ	Protective bag TM-401A		X52-1250-50		Tone unit T	
H25-0116-04	Δ	Protective bag Screw		X52-1250-61		Tone unit W	
				X53-1350-11	N	B unit K	

PARTS LIST

Part No.	Re- marks	Description	Ref. No.
X53-1350-21	N	B unit M	
X53-1350-51	N	B unit T	
X53-1350-61	N	B unit W	
X54-1740-01	N	Display unit K,M	
X54-1740-51	N	Display unit T	
X54-1740-61	N	Display unit W	

Part No.	Re- marks	Description	Ref. No.	Q'ty
A UNIT (X44-1540-XX) -11: K -61: M,T,W				
C05-0067-05		Ceramic trimmer 25P	TC1	1
C05-0308-05		Ceramic trimmer 4P	TC2,3	2
CC45CH1H020C	C	2P K	C8,9	2
CC45CH1H020C	C	2P M,T,W	C9	1
CC45CH1H030C	C	3P	C103,104	2
CC45CH1H040C	C	4P M,T,W	C8	1
CC45CH1H050C	C	5P	C72	1
CC45CH1H0R5C	C	0.5P	C82	1
CC45CH1H100D	C	10P	C13,99	2
CC45CH1H150J	C	15P	C106,110	2
CC45CH1H220J	C	22P	C44,69,78,84,86	5
CC45CH1H270J	C	27P	C68	1
CC45CH1H330J	C	33P	C14,46,114	3
CC45SL1H101J	C	100P	C1,4,56,75,77,94,115	7
CC45SL1H121J	C	120P	C41	1
CC45SL1H221J	C	220P	C116	1
CC73ECH1H060D		Chip cap. 6P	C97	1
CC73ECH1H080D		Chip cap. 8P	C98	1
CC73ECH1H680J		Chip cap. 68P	C74	1
CE04W1A101M	E	100 10V	C55	1
CE04W1A470M	E	47 10V	C31,36,47,59,65,71,102	7
CE04W1E4R7M	E	4.7 25V	C26,52	2
CE04W1H010M	E	1 50V	C39,89,92	3
CE04W1HR47M	E	0.47 50V	C53	1
CK45B1H102K	C	0.001	C7,10,11,32,33,48,54,66,67,73,79,80,81,83,101,105,107,108,113	19
CK45B1H182K	C	0.0018	C45	1
CK45B1H471K	C	470P	C21,24,85,109,112	5
CK73EB1H102K	N	Chip cap. 0.001	C3,5,6,95,111,118	6
CQ92M1H473K		ML 0.047	C57	1
CQ92M1H563K		ML 0.056	C37	1
CS15E1A2R2M	T	2.2 10V	C49,91	2
CS15E1A4R7M	T	4.7 10V	C96	1
CS15E1E010M	T	1 25V	C50	1
CS15E1ER68M	T	0.68 25V	C51	1

Part No.	Re- marks	Description	Ref. No.	Q'ty
C90-0820-05		E 470 16V	C61	1
C90-0834-05		E 0.15 25V	C58	1
C90-0849-05		E 220 16V	C62	1
C90-0867-05	N	E 100 25V	C60	1
C91-0117-05		Cap. 0.01 (SR)	C12,20,25,63,64,76,88,117	8
C91-0457-05		Cap. 0.022 (SF)	C16,19,22,70	4
C91-0473-05	N	ML 0.033	C34,35,38	3
C91-0474-05	N	ML 0.068	C42	1
C91-0475-05		ML 0.022	C90,93	2
C91-0667-05		Cap. 0.0047 (SR)	C40,43,87	3
C91-1008-05	N	Cap. 0.022 (SR)	C15,17,18,23,27-30	8
E04-0154-05	Δ	Coax. connector		1
E23-0512-05	Δ	Terminal		2
E40-0211-05	Δ	Mini connector 2P		2
E40-3007-05	Δ	Pin connector 2P		2
E40-3008-05	Δ	Pin connector 3P		3
E40-3009-05	Δ	Pin connector 4P		1
E40-3011-05	Δ	Pin connector 6P		1
E40-3013-05	Δ	Pin connector 8P		1
F11-0818-14	Δ	Shield case (top)		1
G02-0535-04	N	GND spring		2
L15-0016-05		Choke coil	L13	1
L30-0503-05		IFT 455kHz	L6,9	2
L30-0504-05		IFT 455kHz	L8	1
L30-0508-05		IFT 21.6MHz	L3,5	2
L32-0660-05	N	VCO coil	L22	1
L33-0002-05		Choke coil 1μH	L16,17,24	3
L33-0605-05		Choke coil 0.47μH	L23	1
L33-0668-05		Ferri-inductor 3.3μH	L21	1
L34-0824-05		Coil	L25	1
L34-2049-05		Turning coil	L18,19	2
L40-1021-03		Ferri-inductor 1mH	L11,12	2
L40-3391-03		Ferri-inductor 3.3μH	L20	1
L71-0227-05		MCF 21.6MHz	L4	1A
L72-0315-05		Ceramic filter CFW455F	L7	1
L77-0996-05	N	Crystal 32.183MHz M,T,W	L15	1
L77-0997-05	N	Crystal 21.145MHz	L26	1
L77-1201-05	N	Crystal 33.016MHz K	L15	1
L77-1207-05	N	Crystal 12.8MHz	L14	1
L79-0446-05		Ceramic discr CFY455S	L10	1
L79-0619-05	N	Helical resonator M,T,W	L1	1
L79-0620-05	N	Helical resonator M,T,W	L2	1
L79-0626-05	N	Helical resonator K	L1	1
L79-0627-05	N	Helical resonator K	L2	1
N30-3004-46		Round screw		2
N88-2606-46		Flat tapping screw		5
R12-3430-05		Trim pot. 10kΩ	VR1	1
R92-0150-05		Short jumper		2

PARTS LIST

Part No.	Re- marks	Description	Ref. No.	Q'ty	Part No.	Re- marks	Description	Ref. No.	Q'ty
FINAL UNIT (X45-1340-XX) -11: K -21: M -61: T, W					B UNIT (X53-1350-XX) -11: K -21: M -51: T -61: W				
CC45CH1H040C		C 4P	C9	1	C05-0030-15		Ceramic trimmer 20P	TC1	1
CC45SL2H020C		C 2P 500V	C5	1	C05-0308-05		Ceramic trimmer 4P	TC2-4,6	4
CC45SL2H040C		C 4P 500V	C15	1	CC45CH1H020C		C 2P	C37,72	2
CC45SL2H050C		C 5P 500V	C8	1	CC45CH1H030C		C 3P	C63	1
CC45SL2H080D		C 8P 500V	C17	1	CC45CH1H050C		C 5P	C36	1
CC45SL2H100D		C 10P 500V	C11	1	CC45CH1H060D		C 6P	C60	1
CC45SL2H120J		C 12P 500V M,T,W	C11	1	CC45CH1H070D		C 7P K	C60	1
CC45SL2H150J		C 15P 500V	C10	1	CC45CH1H101J		C 100P M,T,W	C45	1
CC45SL2H220J		C 22P 500V	C12	1	CC45CH1H220J		C 22P	C39	1
CK45B1H471K		C 470P	C18,20,21	3	CC45CH1H330J		C 33P	C15,43	2
CK73EB1H471K		Chip cap. 470P	C1,3,6,7,14,19	6	CC45SL1H390J		C 39P	C96	1
CM73F2H160J		MC 16P 500V	C16	1	CC73ECH1H020C		Chip cap. 2P	C59	1
C90-0868-05	N	E (Small) 10 16V	C2,4	2	CC73ECH1H030C		Chip cap. 3P	C62	1
C91-1011-05		C 0.51P	C13	1	CC73ECH1H070D		Chip cap. 7P	C57	1
E11-0401-05		Earphone jack		1	CC73ECH1H080D		Chip cap. 8P	C55	1
E23-0512-05		Terminal		1	CK45B1H102K		C 0.001	C1,6,7,9,10,20, 21,41,47,53, 64-66,68,70,73, 74,78-80,83,85, 86,88,90 106-108	29
E30-1730-05	N	Power cable		1	CK45B1H152K		C 0.0015	C95	1
E31-2066-05	Δ	Cable with terminal	DO	1	CK45B1H222K		C 0.0022	C14	1
E31-2172-05	N	Coax. cable with connector	K,M	1	CK45B1H331K		C 330P	C94,98	2
E31-2175-05	N	Cable with terminal	RA	1	CK45B1H471K		C 470P	C5,22,23,38,44	5
E31-2194-05	N	Coax. cable with connector	T,W	1	CK45B1H561K		C 560P	C97	1
F01-0796-15		Heat sink		1	CK73EB1H102K		Chip cap. 0.001	C58,71,75,122,123	5
F05-5022-05		Fuse 5A		1	CK73EB1H103K		Chip cap. 0.01	C110-121	12
J19-1375-04	N	Coax. cable fixed plate		1	CS15E1A100M		T 10 10V	C13	1
J41-0006-05		Cord bushing		1	CS15E1C1R5M		T 1.5 16V	C52,54	2
J41-0024-15		Power supply		1	CS15E1E010M		T 1 25V	C84,92,93	3
J41-0024-15		Cord bushing ANT		1	CS15E1V0R1M		T 0.1 35V K,M	C91	1
J61-0408-05		Nylon band		1	CS15E1VR47M		T 0.47 35V	C42,105	2
L34-0908-05		Coil	L1	1	C90-0838-05		E 1 50V	C99-101,103	4
L34-1032-05		Coil	L3	1	C90-0840-05		E 10 16V	C49,67,76	3
L34-1052-05		Coil	L2,4,5	3	C90-0871-05	N	E 220 15V	C18,19	2
L40-1091-03		Ferri-inductor 1μH	L6	1	C90-0872-05	N	E 33 16V	C11	1
N09-0626-04		Sems screw M3 x 10		2	C90-0873-05	N	E 47 10V	C12,26,104	3
N87-2606-41		Self tapping screw		6	C90-0874-05	N	E 100 10V	C61	1
R12-0541-05		Trim. pot. 100Ω	VR1	1	C90-0875-05	N	E 100 16V	C16,17,81	3
TONE UNIT (X52-1250-XX) -50: T -61: W					C91-0117-05		Cap. 0.01 (SR)	C8,46	2
C90-0478-05		E 10 16V T	C6	1	C91-0460-05		Laminated cap. 0.068	C50	1
C90-0480-05		E 47 10V	C1	1	C91-0498-05		C 0.35P	C56	1
C91-0433-05		Laminated cap. 0.0039	C5	1	C91-0667-05		Cap. 0.0047 (SR)	C40,48,87,89,102	5
C91-0473-05		ML 0.033	C4	1	C91-1008-05		Cap. 0.022 (SR)	C2,3,24,25,35,51	6
C91-0484-05		ML 0.01	C2,3	2	E04-0157-05		Mini pin jack A	DO	1
E40-3010-05		Mini connector 5P		1	E23-0512-05		Terminal		3
R12-3521-05		Trim. pot. 20kΩ	VR1	1	E29-0440-04		GND plate		1
RN14BK289102F		MF 91kΩ 1/8W	R3	1	E40-3007-05	N	Pin connector 2P		3
R92-0150-05		Short jumper W		1	E40-3008-05	Δ	Pin connector 3P		5
					E40-3009-05	Δ	Pin connector 4P		2
					E40-3010-05	Δ	Pin connector 5P		2
					E40-3013-05	Δ	Pin connector 8P		1
					E40-3017-05	Δ	Pin connector 12P		1

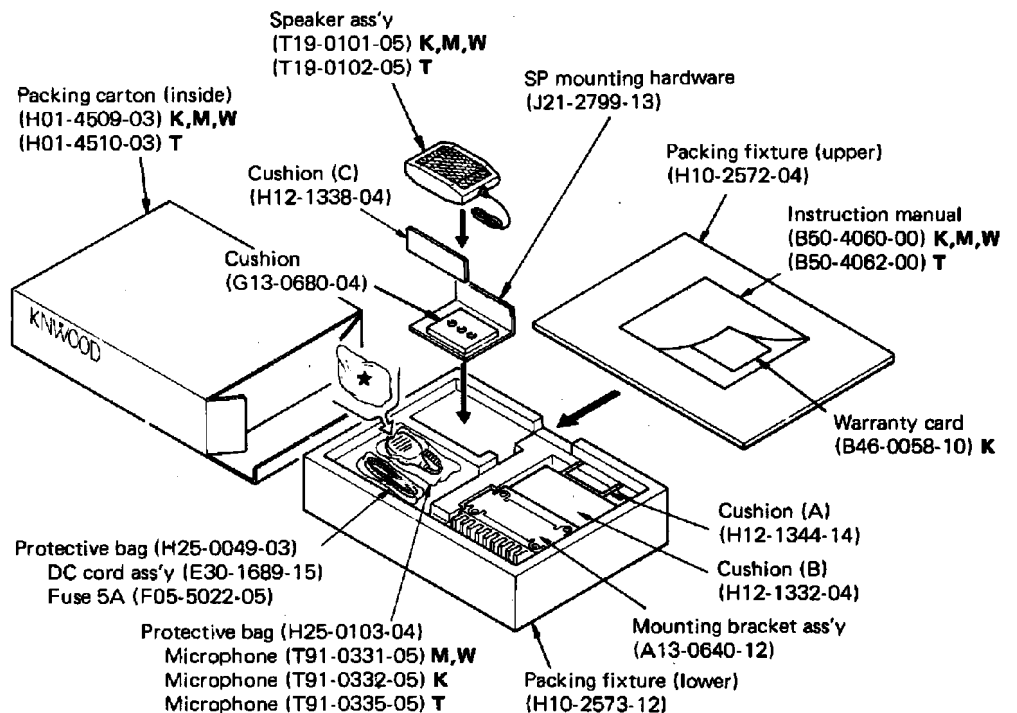
PARTS LIST/PACKING

Part No.	Re- marks	Description	Ref. No.	Q'ty	Part No.	Re- marks	Description	Ref. No.	Q'ty
F10-1306-04	ΔN	Shield plate		1	DISPLAY UNIT (X54-1740-XX)				
F11-0831-04	ΔN	Shield case cover		1	-01 : K,M -61 : T -61 : W				
F20-0078-05	Δ	Insulating sheet		1	CK45B1H102K	C	0.001	K,M,W	C1,3,5
F20-0533-04	ΔN	Insulating sheet		1	CK45B1H102K	C	0.001	T	C1,3,5-7
F29-0014-05	Δ	Shoulder washer		1	CK73EB1H102K		Chip cap. 0.001		C4
L32-0659-05	N	VCO coil	L38	1	CS15E1E010M	T	1 25V		C2
L34-0895-05	N	Coil	L35	1					
L34-1052-05	N	Coil	L41,42,44,46	4	E23-0512-05		Terminal		1
L34-1083-05	N	Coil	L40,45	2	E40-3011-05		Pin connector 6P		1
L40-1091-03		Ferri-inductor 1μH	L39	1	J32-0774-04	N	Round boss		2
L40-3391-03		Ferri-inductor 3.3μH	L36,37	2	J61-0408-05		Nylon band		1
L77-0995-05	N	Crystal 10.8MHz	L47	1	N35-2004-41		Bind screw		4
N35-3006-41		Bind screw Q48		1	R05-3417-05	N	Pot. with SW 10kΩ(K)AF	VR2	1
R12-3430-05		Trim. pot. 10kΩ	VR2,4,5	3	R05-4408-05	N	Pot. 50kΩ(B) SQL	VR1	1
R12-4408-05		Trim. pot. 50kΩ	VR1,3	1	R92-4408-05		Short jumper	K,M	J3,6
RS14AB3A220J		MF 22Ω 1W	R24	1	R92-4408-05		Short jumper	T,W	J6
R90-0564-05	N	Resister block 10kΩx6	R1	1	S31-2405-05	N	Slide switch OFFSET		S10
R90-0565-05	N	Capacitor block 470Px7	C4	1	S40-2443-05		Push switch HI/LOW,REV	K,M,W	S8,9
R90-0566-05	N	Resister block 27kΩx3	R22	1	S40-2443-05		Push switch		S7-9
S59-0415-05		Key board switch RESET		1	S40-2444-05		HI/LOW,REV,TONE T		S7
					S40-2444-05		Push switch COM	K,M	S7
					S40-2444-05		Push switch TONE	W	S7
					S50-1412-05		Tact switch MR,MS,MHz, M, AL, A/B		S1-6
					W02-0335-05	N	Display ass'y	Q1	1A

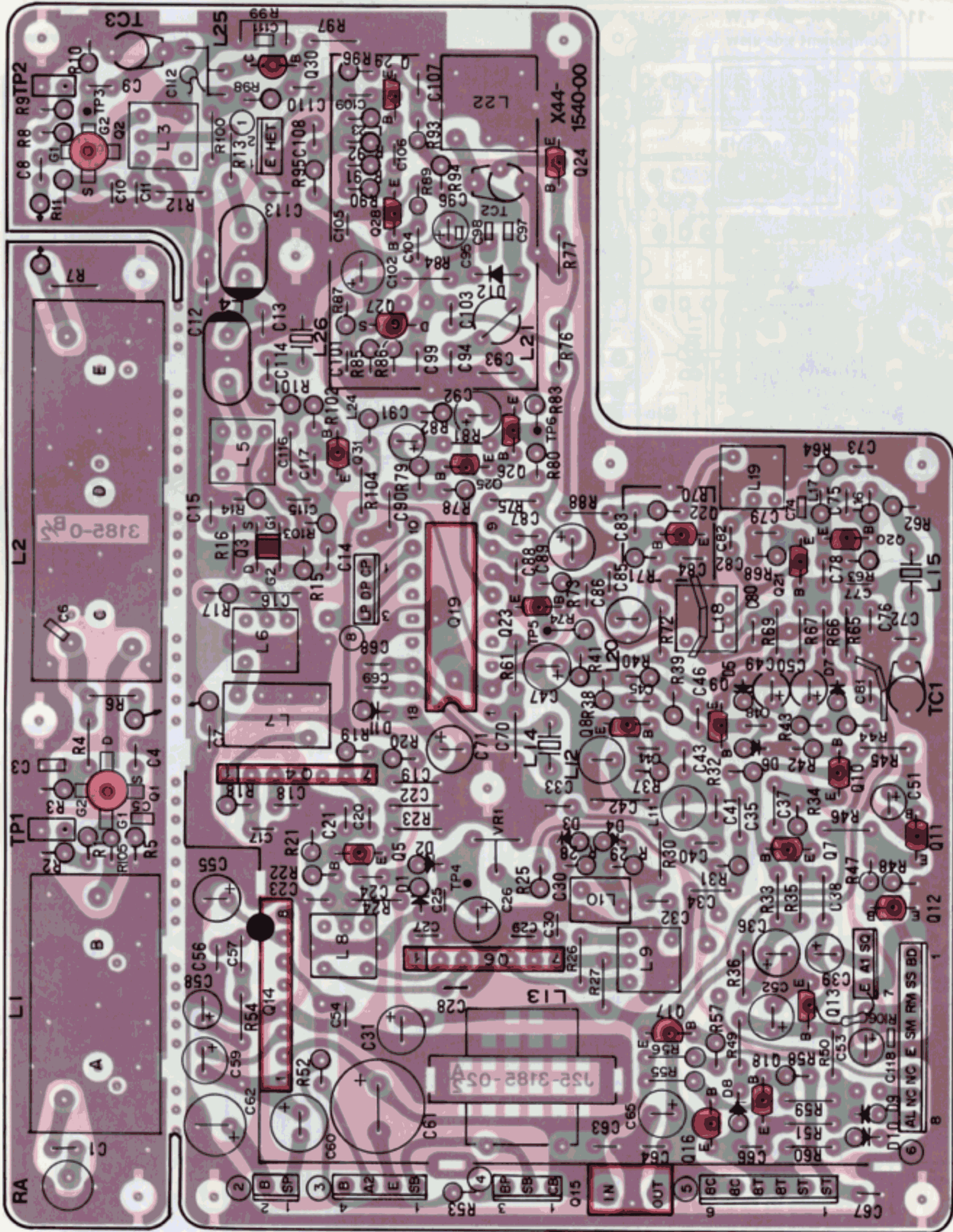
PACKING

★Protective bag (H25-0116-04)

- Cushion (G13-0683-04)
- Cushion x 2 (G13-0686-04)
- Mounting boss x 4 (J32-0775-04)
- Flat washer x 4 (N19-0631-05)
- Flat screw x 4 (N32-3014-41)
- Protective bag (H25-0029-04)
- Round screw x 4 (N09-0008-04)
- Tapping screw (A) x 4 (N09-0632-05)
- Flange nut x 4 (N14-0510-04)
- Flat washer x 4 (N15-1050-46)
- Flat washer x 4 (N15-1060-46)
- Spring washer x 4 (N16-0060-46)
- Protective bag (H25-0029-04)
- Hex. nut x 2 (N10-2040-41)
- Round screw x 2 (N30-4010-41)
- Self tapping screw x 4 (N87-4008-41)
- Flat tapping screw x 2 (N88-4008-41)

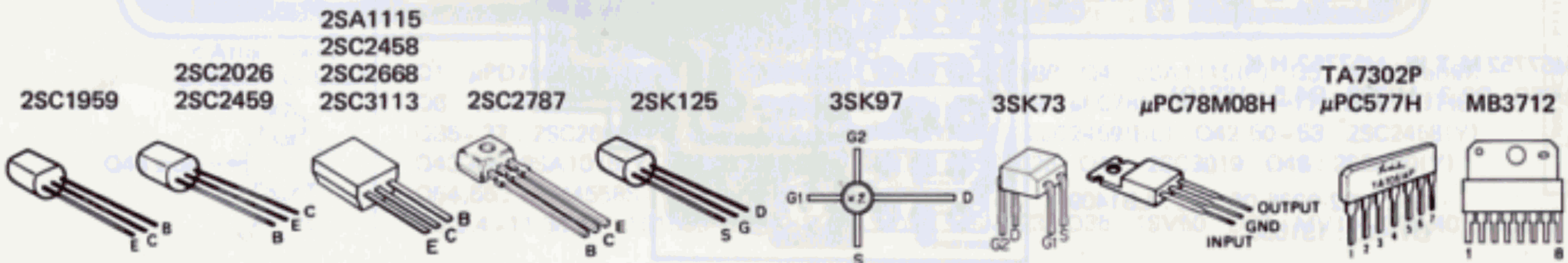


A UNIT (X44-1540-11, -61) -11 : K -61 : M,T,W Component side view



Q1 : 3SK97(Q2)•J Q2 : 3SK97(Q2) Q3 : 3SK73(GR) Q4 : TA7302P Q5,21 : 2SC2787(L) Q6 : μ PC577H (E or F) Q7,10,13,18,24 : 2SC2458(Y) Q8,9,12 : 2SC3113(B)
Q11 : 2SA1115(E) Q14 : MB3712 Q15 : MB3712 Q16,17 : 1SC1959(Y) Q19 : MC145155P•K Q20,22,23,28,29,31 : 2SC2668(Y) Q25,26 : 2SC2459(BL)

D1,2,5-10 : 1S1555 D3,4 : 1N60 D11 : XZ-055 D12 : 1SV123

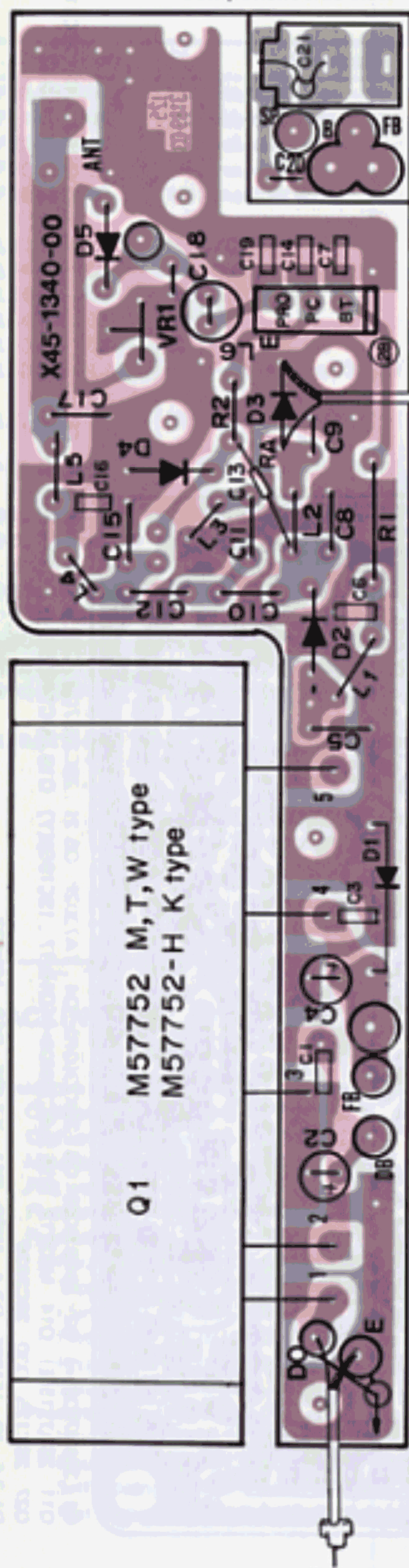


TM-401A PC BOARD VIEWS

FINAL UNIT (X45-1340-11, -21, -61)

-11 : K, -21 : M, -61 : T, W

Component side view



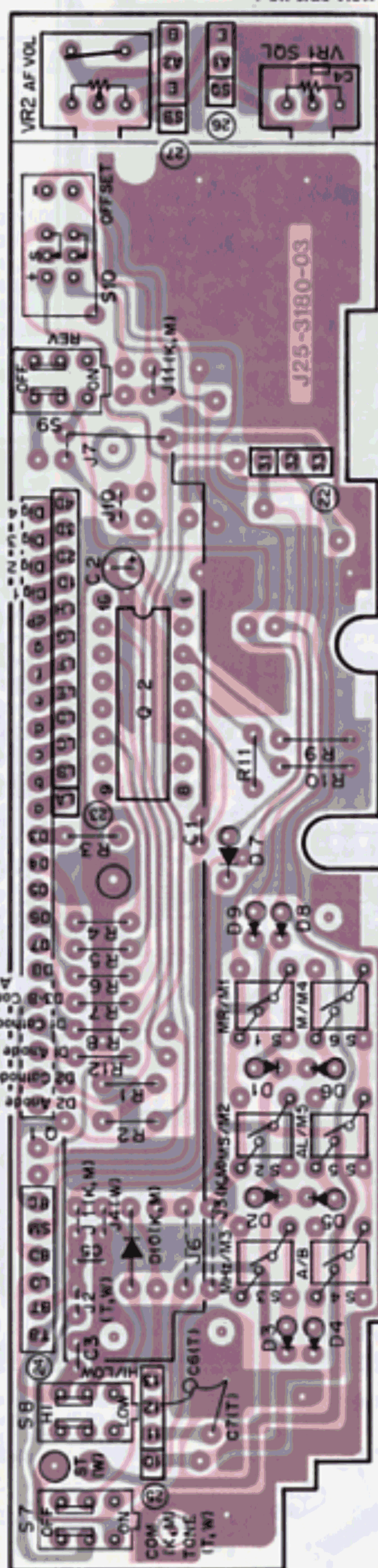
Q1 : M57752 M,T,W M57752-H K
D1 : U05B D2,3 : M1308 D4,5 : 1SS101

Q1 : W02-0335-05 Q2 : LB1409
D1-10 : 1S1555

DISPALY UNIT (X54-1740-01, -51, -61)

-01 : K,M, -51 : T, -61 : W

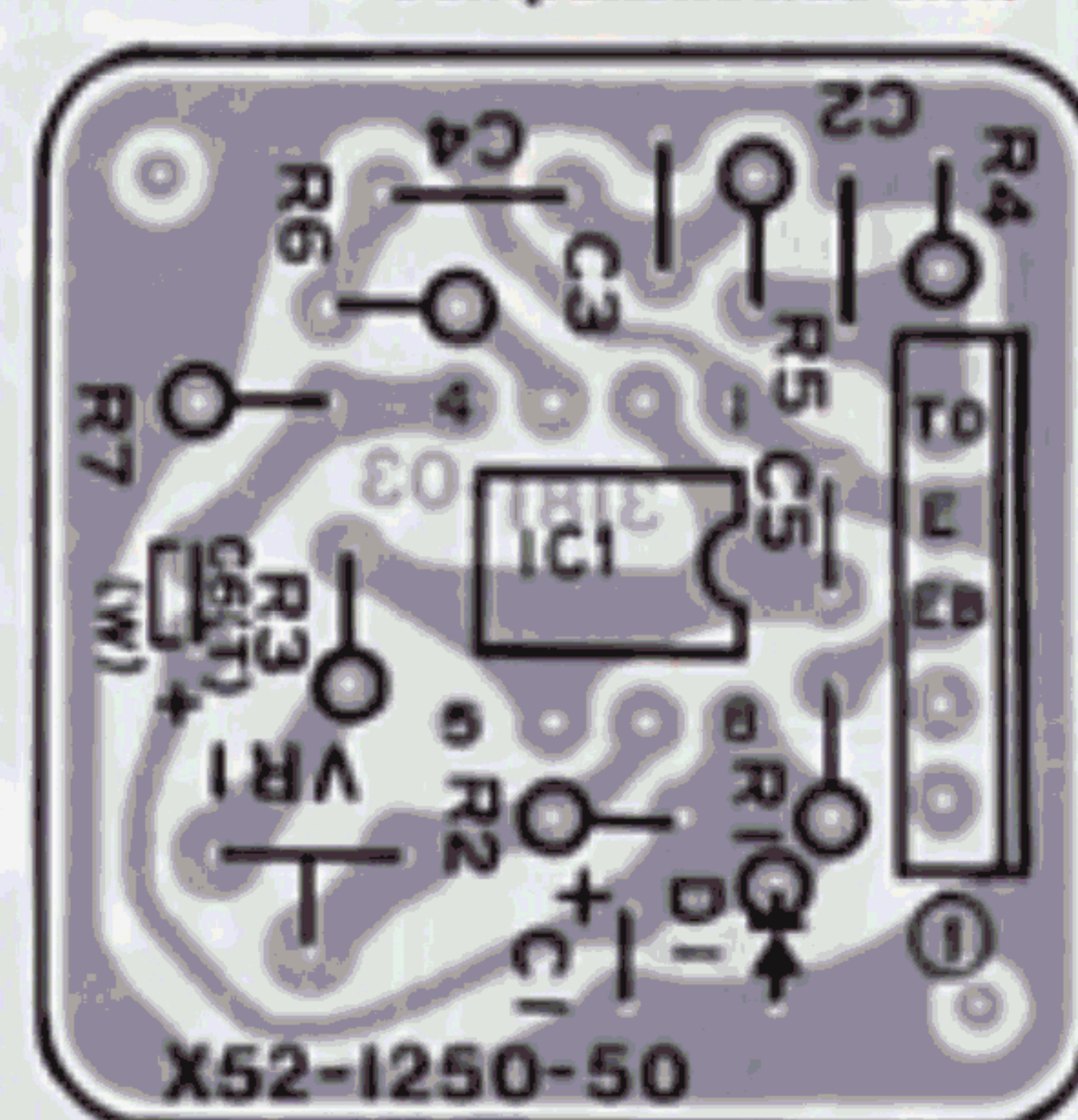
Foil side view



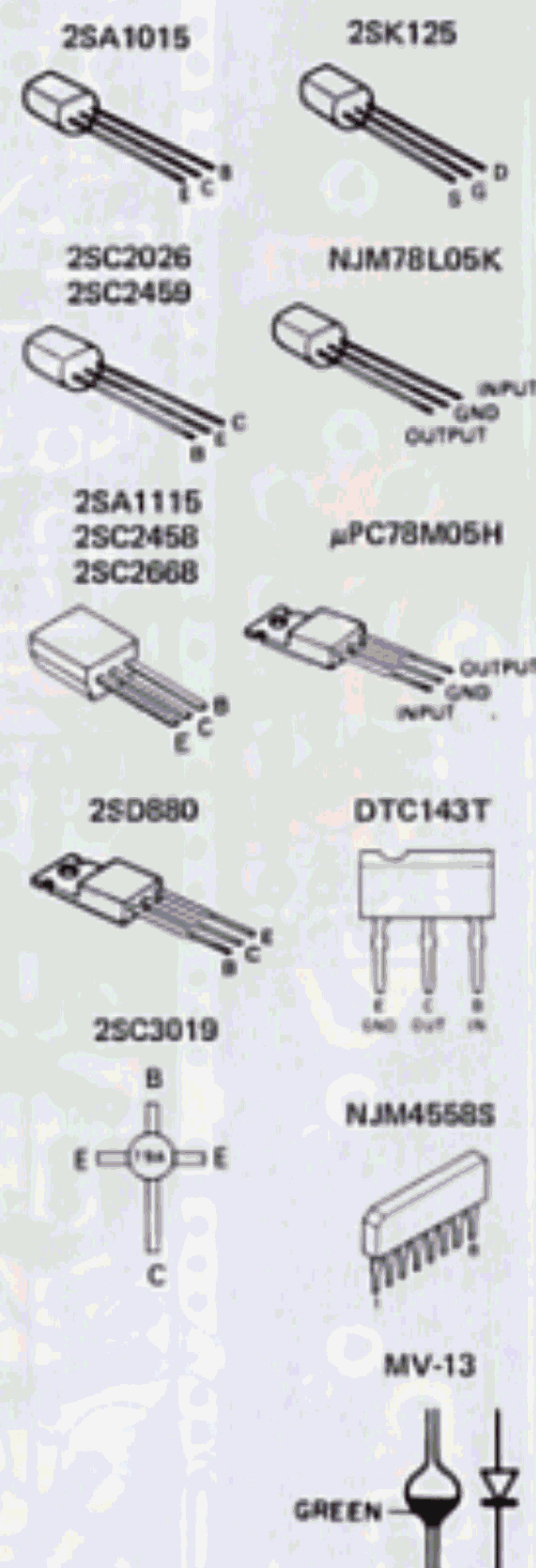
TONE UNIT (X52-1250-50, -61)

-50 : T, -61 : W

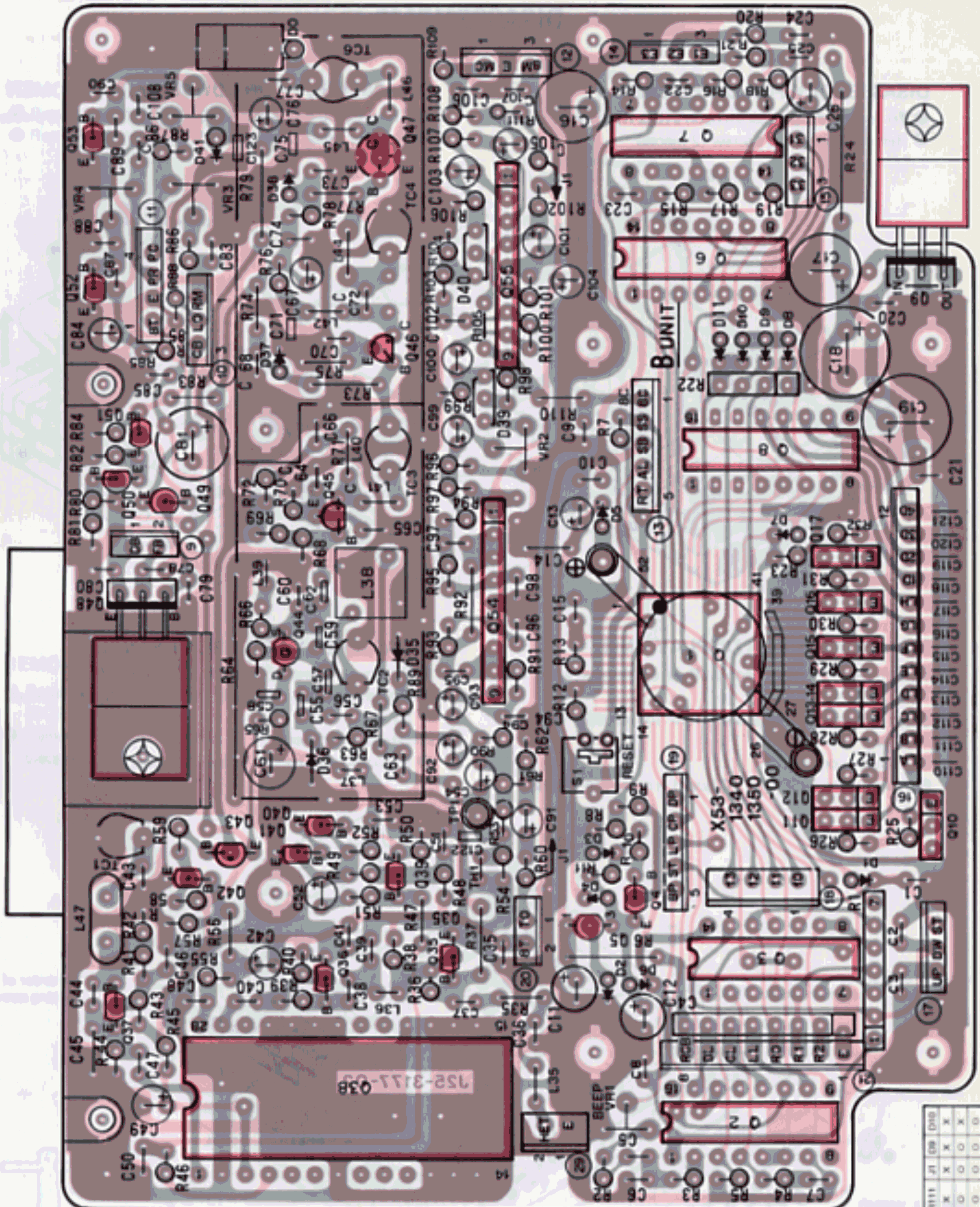
Component side view



IC1 : NE555P D1 : XZ-055



B UNIT (X53-1350-11, -21, -51, -61) -11 : K, -21 : M, -51 : T, -61 : W Component side view



<Attachment direction of L38>



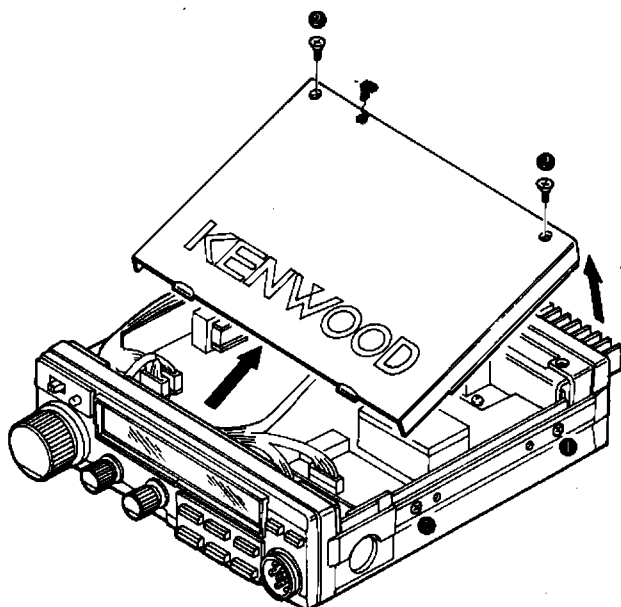
Q1 : μ PD7508G-535-00 Q2 : TC4044BP Q3 : TC4011BP Q4 : 2SA1115(E) Q5 : NJM78L05K
 Q6 : TC4081BP Q7 : MC14064UBCP Q8 : LB1258 Q9 : μ PC78M05H Q10-17 : DTC143T(E)
 Q35-37 : 2SC2668(Y) Q38 : MC145151P Q39-41 : 2SC2459(BL) Q42,50-53 : 2SC2458(Y)
 Q43,49 : 2SA1015(Y) Q44 : 2SK125 Q45,46 : 2SC2026 Q47 : 2SC3019 Q48 : 2SD680(Y)
 Q54,55 : NJM4558S
 D1,2,4-11,38,41 : 1S1555 D3 : XZ-031 D35 : 1SV123 D36 : 1SV50 D37 : MV13 D39,40 : MC911

	R50	C91	R111	J1	C9	D19
K	0	0	0	0	0	0
M	0	0	0	0	0	0
T	0	0	0	0	0	0
W	0	0	0	0	0	0

DISASSEMBLY

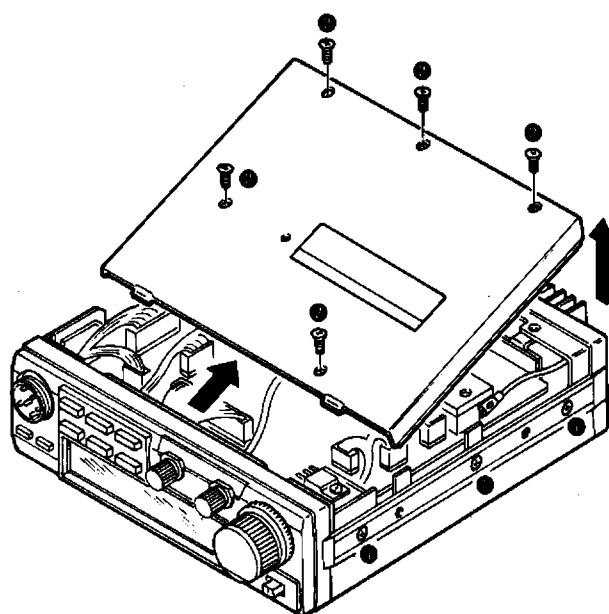
DISASSEMBLY FOR UPPER CASE

- ❶ To loosen the side escutcheon's (L & R) screw (5 pieces).
- ❷ Remove upper case's screw (2 pieces).



DISASSEMBLY FOR LOWER CASE

- ❶ To loosen the side escutcheon's (L & R) screw (5 pieces).
- ❷ Remove lower case's screw (5 pieces).

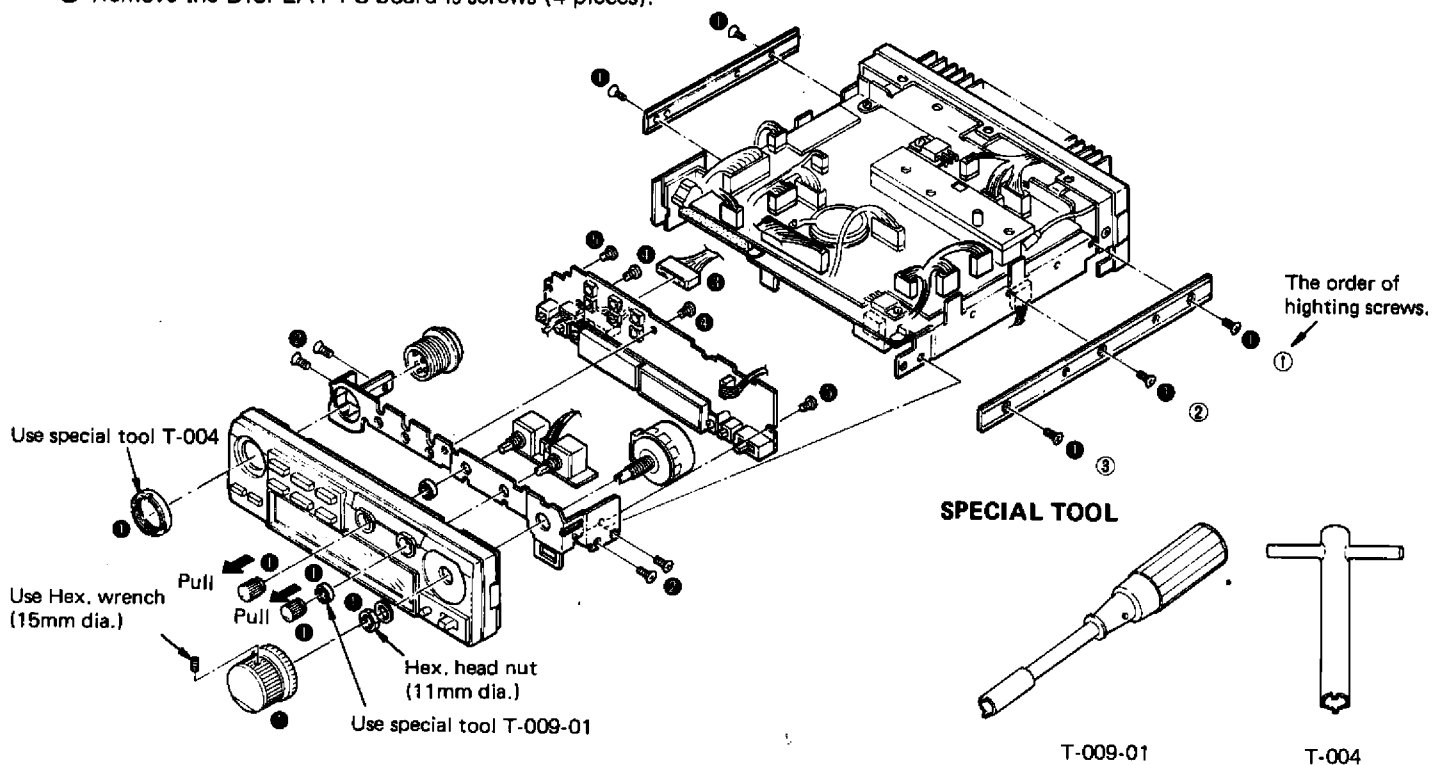


DISASSEMBLY FOR DISPLAY UNIT

- ❶ Remove side escutcheon's (R & L), remove knob (AF, SQ, MAIN).
- ❷ To remove the subpanel from the chassis, remove 4 screw.
- ❸ Remove connector.
- ❹ Remove the DISPLAY PC board is screws (4 pieces).

DISASSEMBLY FOR FRONT PANEL

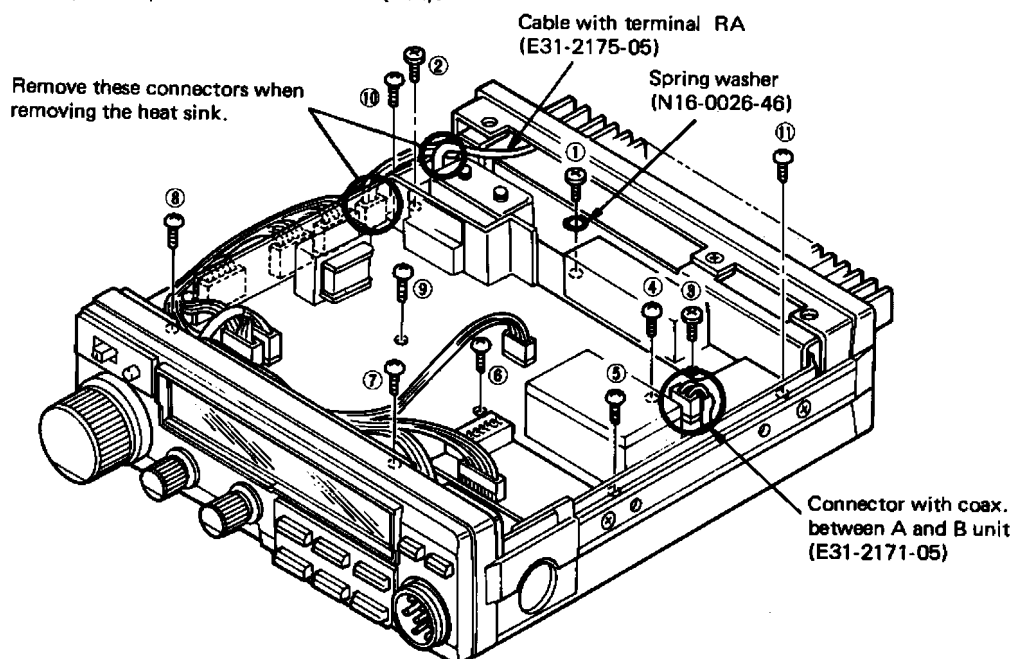
- ❶ Remove side escutcheon's (L & R) knob & nut.
- ❷ To remove the sub-panel from the chassis. Remove 4 screws.
- ❸ Remove connector.
- ❹ Remove front panel's screws (2 pieces).



DISASSEMBLY

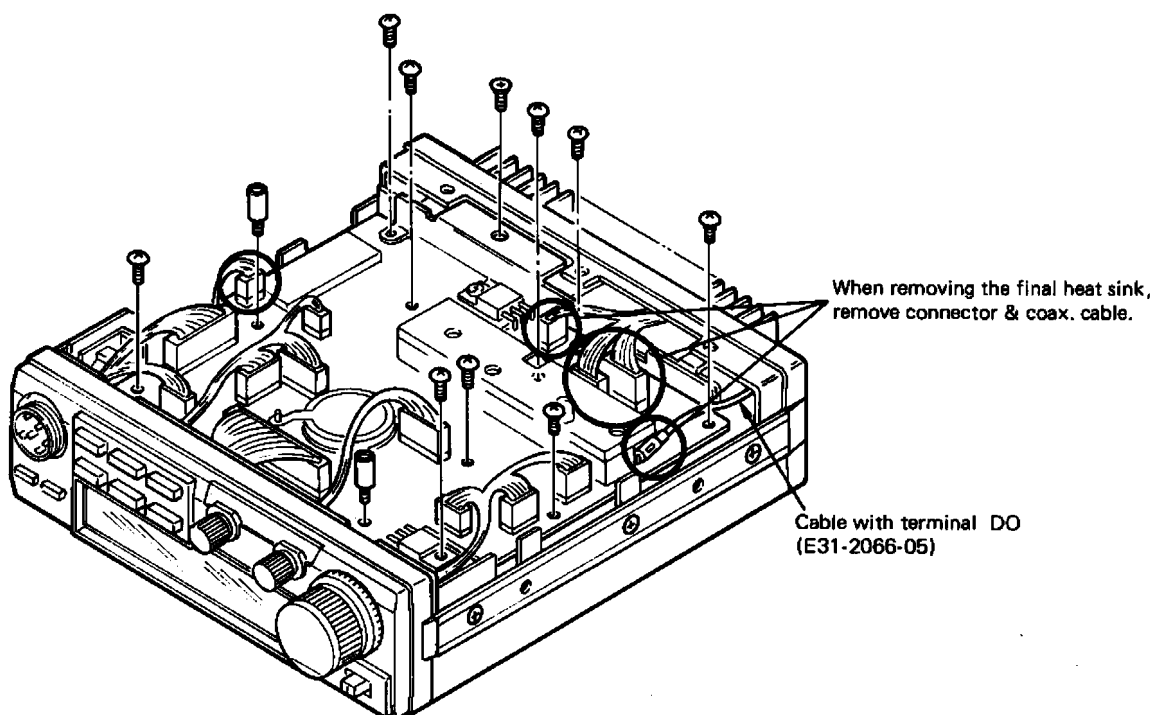
REMOVING THE "A" UNIT

- ① Remove the A PC board's screws (11 pieces).
- ② Remove connector (No. 3) and coax. cable (RA).

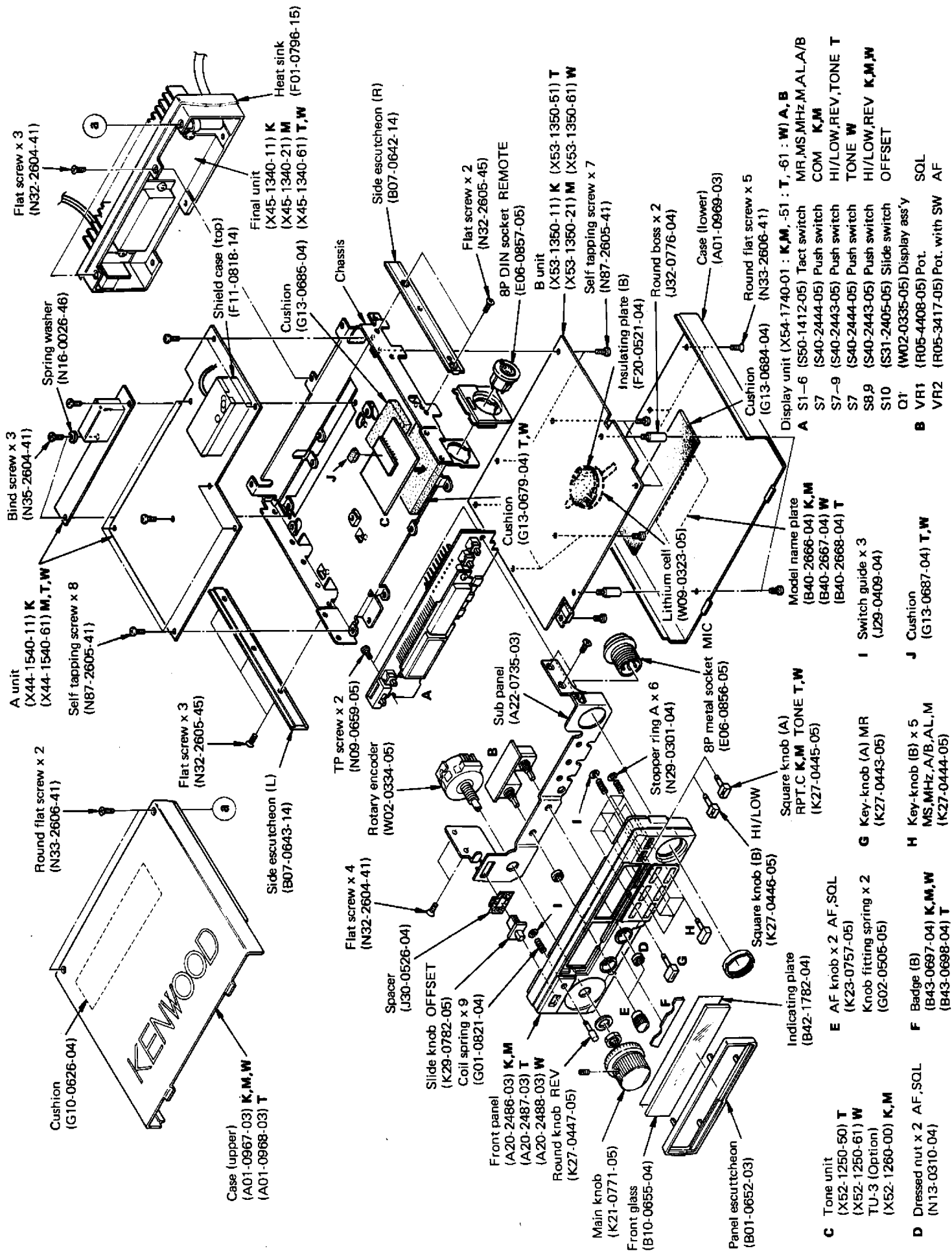


REMOVING THE "B" UNIT

- ① Remove connector (No. 9, 10, 11, 29) and coax. cable (DO).
- ② Remove PC board's screw (8 pieces) and round boss (2 pieces).



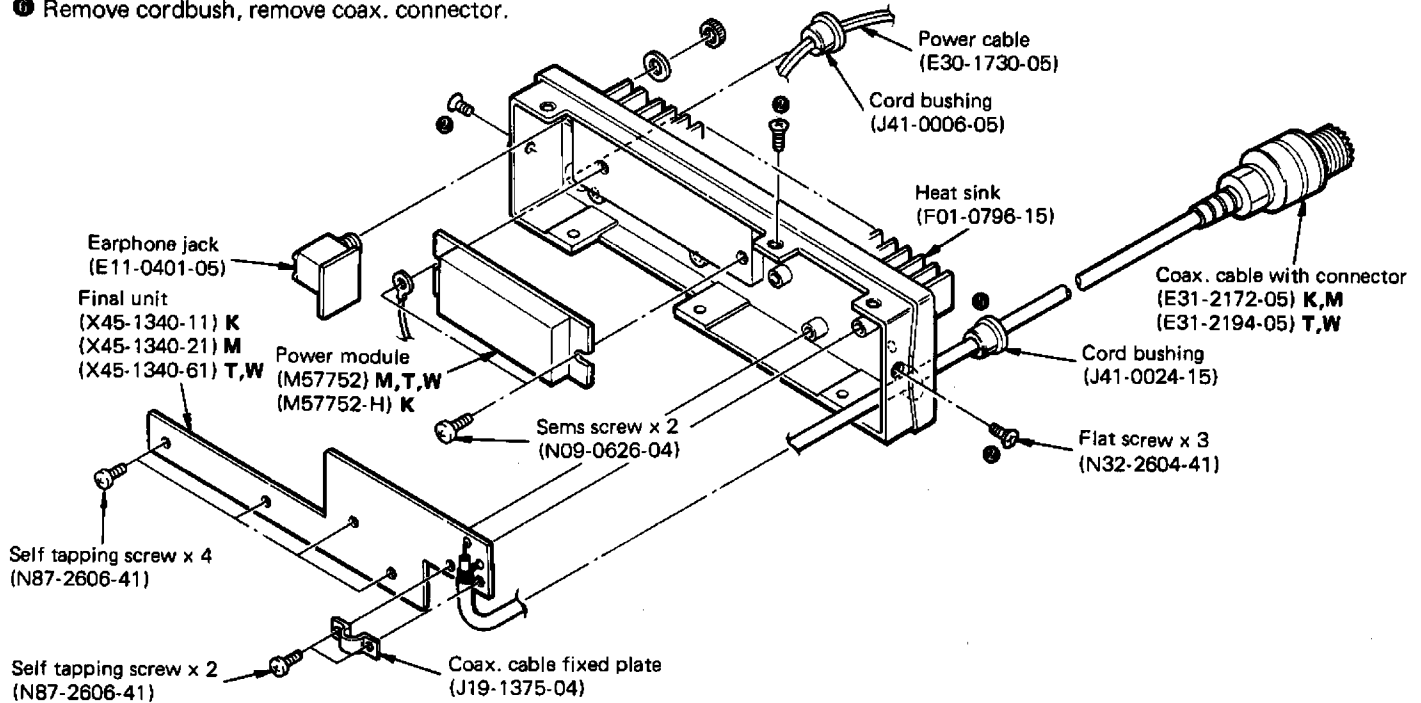
TM-401A DISASSEMBLY



DISASSEMBLY/DIMENSIONS

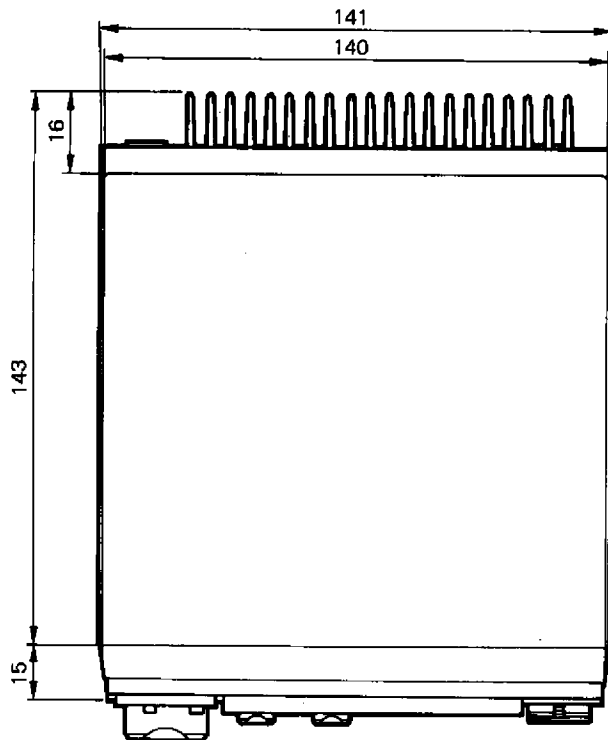
COAX. CONNECTOR REPLACEMENT

- ① Remove side escutcheon (L & R).
- ② Remove final heat sink's screw (3 pieces).
- ③ Remove connector.
- ④ Remove the coax. fitting hardware on final unit.
- ⑤ Resolder coax. cable.
- ⑥ Remove cordbush, remove coax. connector.

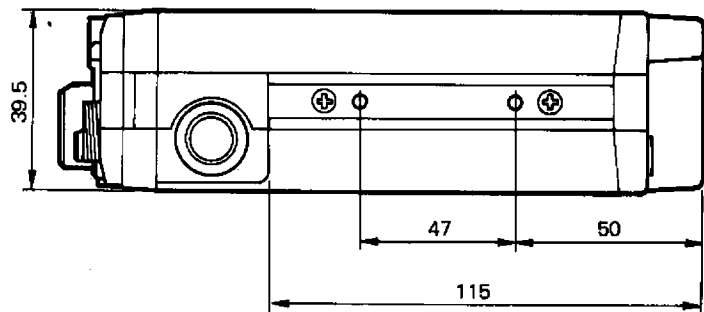


DIMENSIONS

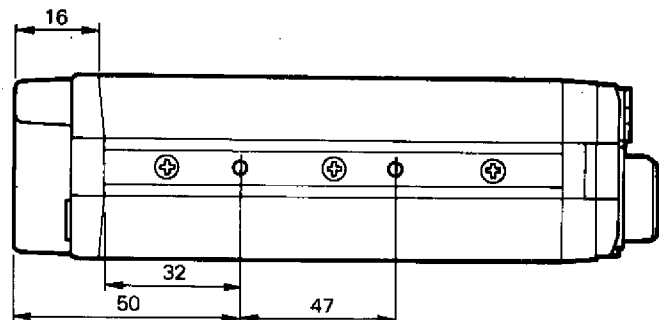
View from top



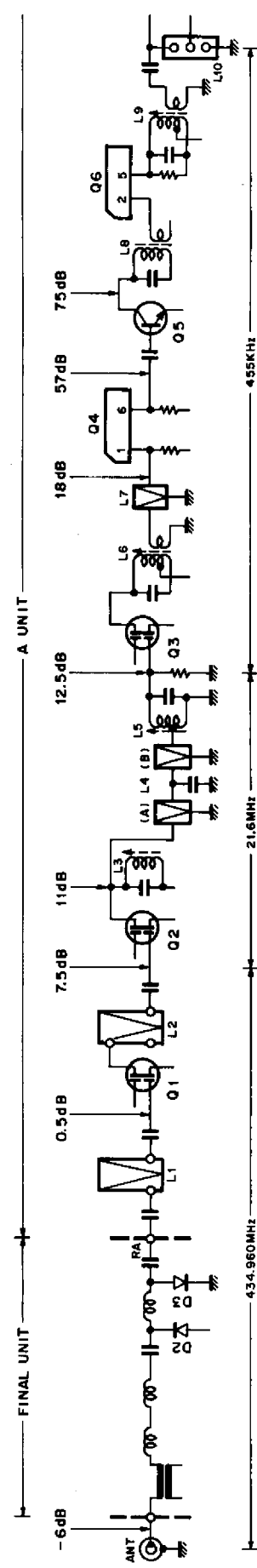
Right side view



Left side view



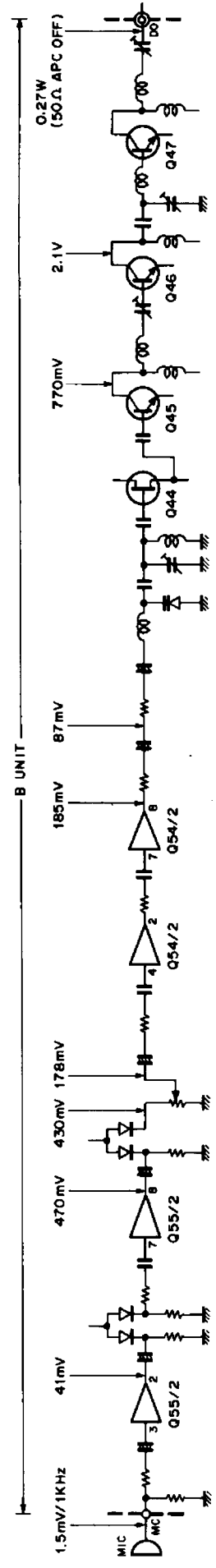
RX SECTION



Note:

1. In measuring the circuit from the ANT terminal to the collector of Q5 an unmodulated signal of 434.960MHz, $-6\text{dB}\mu$ from an SSG was applied to the ANT terminal to obtain a reference NQ sensitivity. Then, the SSG output was measured when the NQ sensitivity at each SSG signal input point became equal to the reference NQ sensitivity.
The SSG output was measured through a $0.01\mu\text{F}$ capacitor.
2. In measuring the circuit from the base of Q7 to the SP terminal, an SSG signal of 434.960MHz, $-6\text{dB}\mu$, 1kHz MOD, 5kHz DEV was applied to the ANT terminal, and the AF VR was adjusted to obtain an AF output of $0.63/8\Omega$. The signal voltage at each point was measured with an audio V.V.

TX SECTION



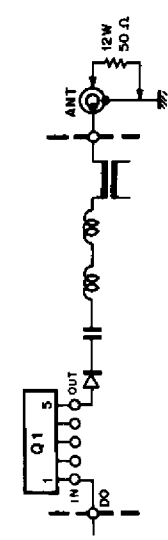
Note:

1. The signal level before DO was measured with the coaxial cable disconnected from DO and the final unit. The signal level after the IN terminal was the level under normal operating conditions.
2. The AF unit was measured using audio V.V. and the RF unit was measured using an RF V.V. (1/100 attenuator used for levels of more than 3V.)
3. The RF voltages shown in round parentheses () are reference values since they are subject to change according to the positions of the probes.

< REFERENCE >

Japanese "SG"	American "SG"
-6dB	$0.25\mu\text{V}$
0dB	$0.5\mu\text{V}$
6dB	1 μV
12dB	2 μV
24dB	8 μV
30dB	15.8 μV
40dB	50 μV
50dB	158 μV
60dB	500 μV
70dB	1.58 mV
80dB	5 mV
90dB	15.8 mV
100dB	50 mV
120dB	0.5 V

FINAL UNIT



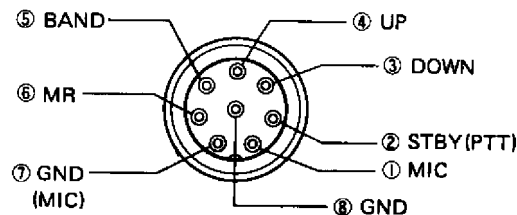
ADJUSTMENT

PREOPERATION

Unless otherwise specified. Set the controls as follows.

POWER SW ON
VOL MIN
SQL VOL MIN
HI/LOW SW HI
TX OFFSET S
REV OFF

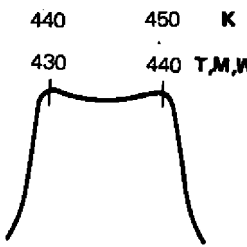
- When adjusting the trimmers or coils, use a non-induced adjusting rod of bakelite, etc.
- When adjusting the RX section never transmit to prevent SSG damage.
- Connect MIC connector as shown in Fig. 18.



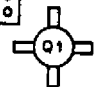
MIC terminals (view from front panel side)

- The output level of SSG is indicated as SSG's open circuit.

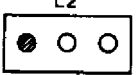
RX SECTION

Item	Condition	Measurement			Adjustment			Specification/Remarks		
		Test equipment	Unit	Terminal	Unit	Part	Method			
1. Reset	1) Push switch S1 : ON on B unit (near Lithium cell)	Display						0.000		
2. Voltage check	1) DC SUPPLY : 13.8V POWER SW : ON	DC VTVM	A	8R				7.6V~8.2V		
				8C				7.7~8.3V		
				8T				0.3V or less		
	2) Transmit			8T				7.6~8.2V		
				8R				0.1V or less		
3. A unit PLL	1) DISPLAY : 5.00	RF VTVM	A	TP5 (near Q15)	A	L18,19	MAX Repeat 2~3 times.	1.2V or more		
	2) DISPLAY : 9.975	DC VTVM	A	TP6	A	TC2	2.0V	±0.1V		
	3) DISPLAY : 0.00							6.5V or less		
	4) DISPLAY : 5.00	f.counter	A	HET	A	TC1	206.70000MHz M,T,W 211.70000MHz K	±100Hz ±100Hz		
4. Helical	1) Connect the sweep generator to ANT. (435MHz) M,T,W (445MHz) K Preset L2 core (Q1 side) to top level before come off.	Oscillo- scope Detec- tor	A	TP1 (near Q1)	A	L1	Adjust L1,2 until the band response shown at the right is obtained.			
	2) TC3 : MAX capacity									

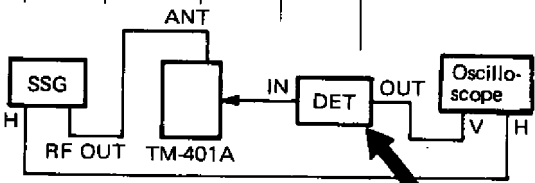
TP1



L2



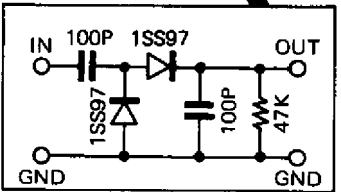
ANT



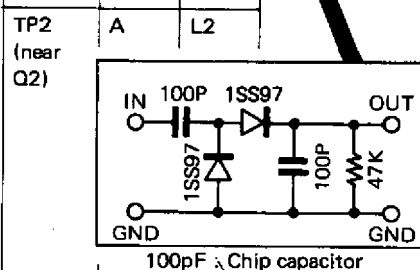
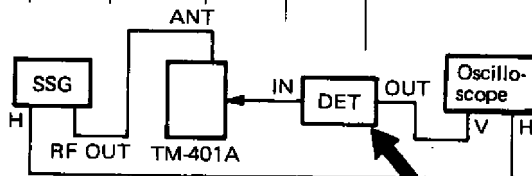
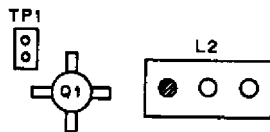
TP2
(near
Q2)

A

L2



100pF Chip capacitor



ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
5. IF GAIN	1) DISPLAY : 5.00 Connect the sweep generator to ANT. f : 435.00MHz M,T,W f : 445.00MHz K MOD : 1kHz DEV : 5kHz OUT : 10dBμ	DC VTVM	A	TP4 (near Q6)	A	TC3 L3 L5 L6	MAX 1) Repeat 2-3 times.	Meter MAX 2) Adjust L3 and L5 for peak voltage. 3) Adjust TC3 for 435.000MHz M,T,W 445.000MHz K
6. Discriminator	1) SSG OUT : 60dBμ	AF VTVM Oscilloscope	Rear panel	SP	A	L9	MAX	
7. S meter	1) SSG OUT : 20dBμ	S-LED	Front panel		A	VR1	All LED's light. (S10 LED should off at 19dBμ input)	
8. Bias	1) Beep level adj.	Oscilloscope	Rear panel	SP	B	VR1		(0.25Vp-p)
9. S/N	1) DISPLAY : 5.00 Connect the sweep generator to ANT. f : 430.00MHz M,T,W f : 445.00MHz K MOD : 1kHz DEV : 5kHz OUT : -8dBμ	AF VTVM Oscilloscope	Rear panel	SP				S/N 20dB or more
	2) DISPLAY : 0.00 SSG f : 430.00MHz M,T,W SSG f : 440.00MHz K SSG OUT : -8dBμ							
	3) DISPLAY : 9.975 SSG f : 439.975MHz M,T,W SSG f : 449.975MHz K SSG PIT : -8dBμ SSG OUT							

- * 1) When adjusting PLL or B unit, must be transmit.
2) When transmitting, encoder are not change frequency.

TX SECTION *

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. B unit PLL	1) DISPLAY : 0.00 Transmit	DC VTVM	B	TP1	B	TC2	2.5V	±0.1V
	2) DISPLAY : 9.975							6.5V or less
2. DRIVE	1) Disconnect DO cable on B unit. Then connect power meter to DO jack on B unit. 2) DISPLAY : 4.00 3) Transmit	0.6W Power meter	B	DO	B	TC3, 4,6	MAX Repeat 2-3 times.	0.15-0.25W

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
3. MAX POWER	1) DISPLAY : 5.00 VR4,5 (B unit) : MAX Connect coax. cable to D0 terminal on the B unit, and transmit.	Power meter DC A.M	Rear panel	ANT	B	TC6	MAX	16W or more
4. RF METER	1) DISPLAY : 5.00 Transmit	Power meter	Rear panel	ANT	B	VR5	Adjust VR5 for 7W	At 7W
	2)	RF-LED	Front panel		B	VR3	Adjust VR3 for "10 digit" on.	All RF-LED's should light.
5. RF output	1) Transmit	Power meter	Rear panel	ANT	B	VR5	14W	±0.2W 3.0-3.3A
	2) DISPLAY : 9.975 Transmit	DC A.M						12W or more 3.5A or less
	3) DISPLAY : 0.00 Transmit							
6. LOW POWER	1) HI/LOW SW : LOW DISPLAY : 5.00 Transmit	Power meter DC A.M	Rear panel	ANT				0.5-2.5W 1.6A or less
	2) HI/LOW SW : HI	RF-LED						2-4 digits light on.
7. FREQ. ADJ.	1) DISPLAY : 5.00 Transmit	f. counter Power meter	Rear panel	ANT	B	TC1	435.00MHz M,T,W	±100Hz
							445.000MHz K	±100Hz
8. DEV	1) Connect Audio generator to MIC jack. 30mV/1kHz DISPLAY : 5.00 Transmit Disconnect the AG after check.	Linear detector			B	VR2	±4.6kHz	±100Hz
9-1. TONE DEV (T type)	1) TONE SW : ON Shorted between R2 and R7 on the Tone unit. Transmit	f. counter Linear detector Oscilloscope			TONE	VR1		Tone f : 1750Hz±10Hz DEV : 2.5kHz or more
	2) After check TONE SW : OFF							Tone burst time 0.5-1.0 second.
9-2 TONE DEV (W type)	1) TONE SW : ON				TONE	VR1		Tone f : 1750Hz±10Hz DEV : 2.5kHz or more
10. Protection	1) DISPLAY : 5.00 Transmit	DC tester	Final	TP1 (D5 cathode)	Final	VR1	Set full power output, Adjust VR1 (clockwise) for dip point.	Dip point
	2) Shorted to ANT	DC A.M			B	VR4	1.5A	

ADJUSTMENT

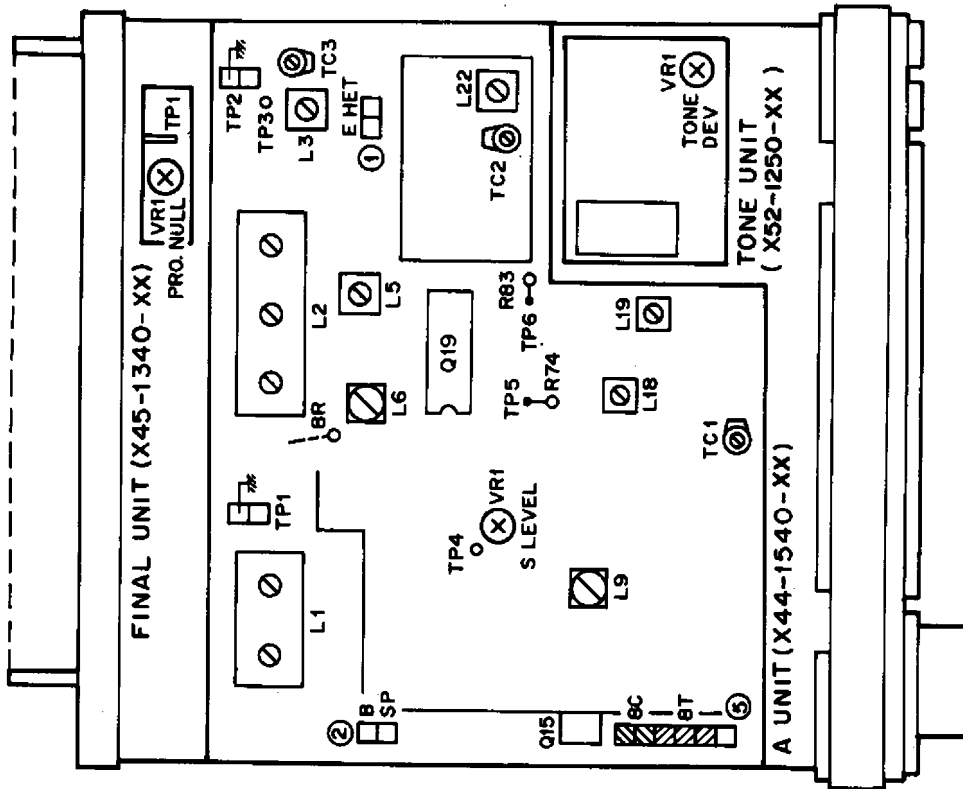
OPERATION CHECKS

Item	Condition	Operation check
1. Reset	1) RESET SW : ON AF VOL : Center SQL VOL : MAX	0.000
2. Main dial	1) Main dial : Clockwise	Display increases 25kHz.
	2) Main dial : Counter-clockwise	Display decreases 25kHz.
3. VFO A/B	1) A/B : ON	0.000. * means VFO B Tone sounds.
	2) A/B : ON DISPLAY : 0.000	Tone sounds.
4. Memory write	1) M/M4 knob is depressed make a continuous deep sounds. MS/M2 knob is depressed during deep sounds.	Tone sounds, memory write already. ex. 5.000 memory write already.
5. Memory check	1) MR : ON	0.000 MR LED light on. Tone sounds.
	2) MS/M2 : ON	5.000 MR LED light on. Tone sounds.
6. COM	1) COM : ON	0.000 Tone sounds.
	2) COM : ON	5.000 MR LED light on. Tone sounds.
7. TX OFFSET	1) A/B : ON	0.00 .
	2) TX OFFSET : + K,M,T TX OFFSET : D-B W Transmit	5.00 . ON AIR LED light on.
	3) TX OFFSET : - K,M,T TX OFFSET : D-A W Received	0.00 .
	4) Transmit	0.00 . ON AIR LED light on. Piping sounds.
	5) Received	0.00 .

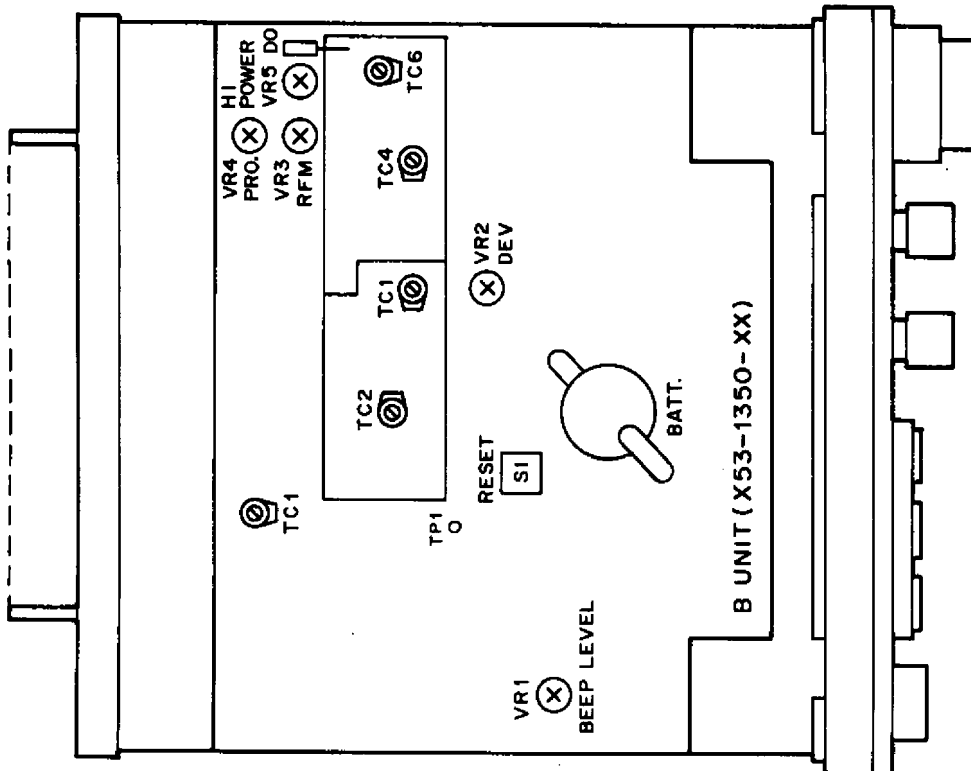
Item	Condition	Operation check
8. REV	1) REV : ON	0.00 . Piping sounds.
	2) REV : OFF TX OFFSET : + K,M,T TX OFFSET : D-B W REV : ON	5.00 .
	3) Transmit	0.00 . ON AIR LED light on.
	4) Received REV : OFF A/B : ON	5.000
9. Memory scan	1) MS/M2 : ON	→ 0.000 → 5.000 MR LED light on. MHz dot is flashed. Tone sounds.
	2) A/B : ON	0.000 or 5.000 MR LED light on. Tone sounds. Scan stopped.
	3) A/B : ON	5.000 Tone sounds.
10. ALERT	1) AL/M5 : ON SQL VOL : MIN	5.000 ALERT LED light on. Piping sounds each 6 seconds, at the same time the noise should stop 0.3 seconds.
	2) AL/M5 : ON SQL VOL : MAX	5.000
11. Program scan	1) MIC(UP position) is depressed during 2 seconds, then leave UP switch.	Tone sounds. Scan will start increases by 20kHz. MHz dot is flashed.
	2) SQL VOL : MIN	Scan stopped after 6 seconds, will start increases by 20kHz.
	3) SQL VOL : MAX	Scan again.
	4) MIC PTT : ON	Scan stopped.

ADJUSTMENT

TOP VIEW



BOTTOM VIEW

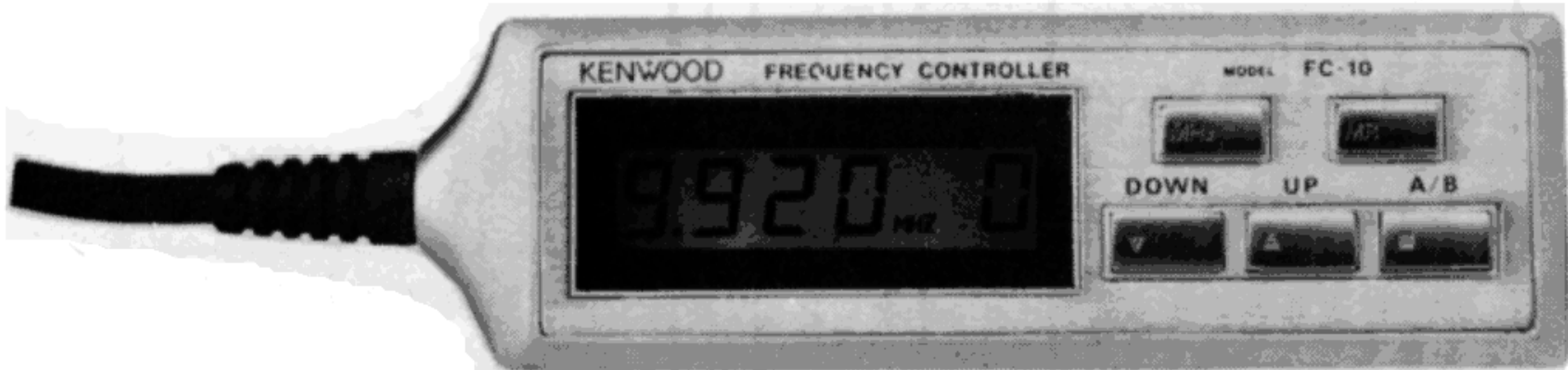


SPECIFICATIONS

Dimensions: W112mm (4-13/32") x H35mm
(1-13/32") x D22.5mm (29/32")
Weight: 100g
Cable length: 1.5m

APPLICATION

TM-201A: 2m transceiver
TM-401A: 70cm transceiver

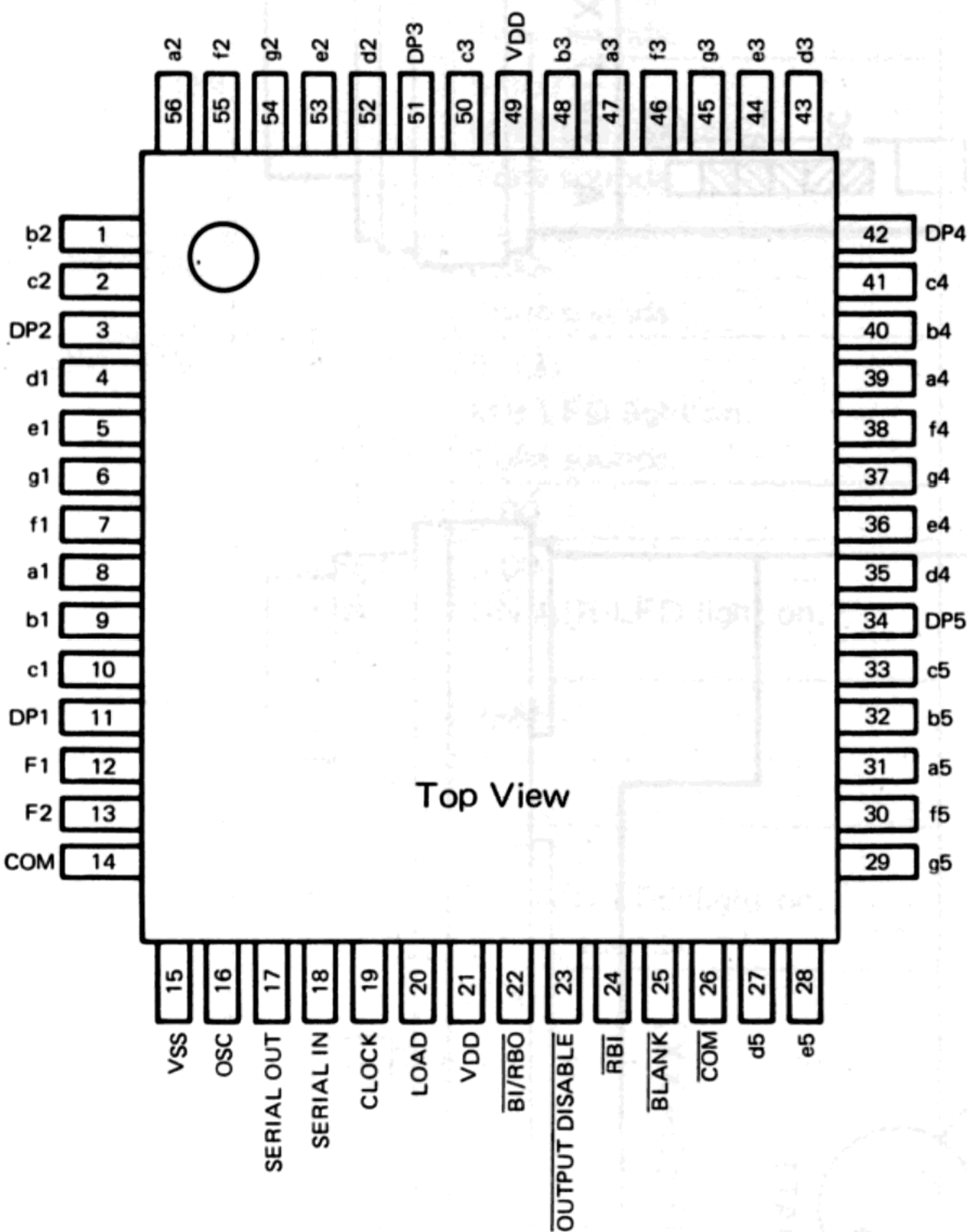


CIRCUIT DESCRIPTION

In the switch unit, a diode matrix is constructed with D2–D4 in order to convert 5 keys into a 3-bit cord. The output of the matrix is fed to the main unit after it is turned over and amplified by the inverter Q1.
In the LCD unit, the LCD display data is reshaped in wave form by the Schmit inverter Q102 and fed to Q101. The LCD data is a serial data of 3-bit and 32 bits are transferred at a time. The Q101 has a latch storing data is changed. The LCD display employs a static illumination system.

	R0	R1	R2
MR	L	H	L
MHz	L	L	H
UP	H	L	H
DOWN	H	H	L
A/B	L	H	H

Key matrix signal



MSM58292GS (LCD unit Q101)

Hex. No.	RBI	BI/RBO	SEGMENT OUT							Display
			a	b	c	d	e	f	g	
*	*	L	L	L	L	L	L	L	L	Note 3
0	*	Note 2	L	L	L	L	L	L	L	Note 4
0	*	H	H	H	H	H	H	H	L	0
1	*	H	L	H	H	L	L	L	L	1
2	*	H	H	H	L	H	H	L	H	2
3	*	H	H	H	H	L	L	H	H	3
4	*	H	L	H	H	L	L	H	H	4
5	*	H	H	L	H	H	L	H	H	5
6	*	H	H	L	H	H	H	H	H	6
7	*	H	H	H	H	L	L	L	L	7
8	*	H	H	H	H	H	H	H	H	8
9	*	H	H	H	H	H	L	H	H	9
A	*	H	H	H	H	L	H	H	H	A
B	*	H	L	L	H	H	H	H	H	B
C	*	H	H	L	L	H	H	H	L	C
D	*	H	L	H	H	H	H	L	H	D
E	*	H	H	L	L	H	H	H	H	E
F	*	H	H	L	L	L	H	H	H	F

Notes: 1. H: Display state. The phase of this output is opposite to that of the COM pin output.
L: Nondisplay state. The phase of this output is the same as that of the COM pin output.
2. BI/RBO is "L" only when RBI is "L" and all digits are 0 (blank display). When BI/RBO pin is forced to logic "H", 0 is displayed at the least significant digit.
3. When BI/RBO is forced to logic "L", only the least significant digit blanks.
4. When RBI is set to logic "L", the leading zeros are suppressed, i.e., the continuous zeros, if any, at the most significant digit down are blanked.

MSM58292GS Function

FC-10

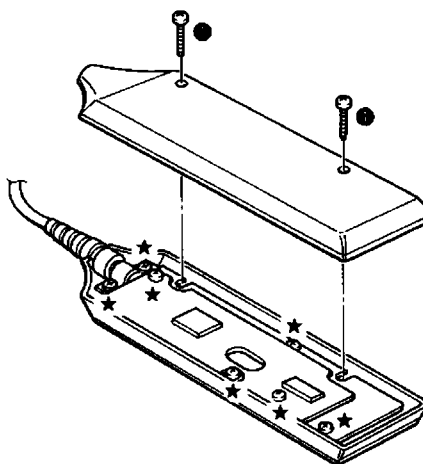
PARTS LIST

Part No.	Remarks	Description	Ref. No.
GENERAL			
A02-0640-02	N	Case (Upper)	
A02-0641-03	N	Case (Lower)	
A13-0647-03	N	Mounting fitting hardware Accessory	
B10-0657-04	N	Front glass	
B11-0415-04	N	LCD guiding plate	
B41-0635-04	N	Caution plate	
B42-1795-04	N	Name plate	
B50-4056-00	N	Instruction manual Accessory	
E30-1738-05	N	Cable with 8P plug	
E31-2179-05	N	Flat cable	
G01-0819-04	N	Cable fitting spring Accessory	
G13-0688-04	N	Cushion	
H01-4500-03	ΔN	Carton	
H12-1339-04	ΔN	Packing fixture	
H25-0029-04	Δ	Protective bag Accessory	
H25-0049-03	Δ	Protective bag FC-10	
J19-1379-04	ΔN	Fitting hardware	
J19-1381-04	N	Bothside tape Accessory	
J30-0529-04	ΔN	Spacer (Tact switch)	
J39-0412-04	N	Spacer (A)	
J42-0439-05	N	Cable bush	
J69-0305-04	N	Magic fastener Accessory	
K27-0449-04	N	Key-knob (A) MHz	
K27-0450-04	N	Key-knob (B) MR	
K27-0451-04	N	Key-knob (C) DOWN (▼)	
K27-0452-04	N	Key-knob (D) UP (▲)	
K27-0453-04	N	Key-knob (E) A/B (■)	
N10-2030-41		Allen nut x 2 Accessory	
N15-1030-41		Flat washer x 2 Accessory	
N30-2008-41		Screw x 2	
N30-3016-41		Screw x 2 Accessory	
N89-2006-48	N	Bind tap tight screw x 7 PC board	
N89-3012-41	N	Bind tap tight screw x 2 Accessory	
X41-1510-00	N	Switch unit	
X54-1760-00	N	LCD unit	

Part No.	Remarks	Description	Ref. No.	Q'ty
SWITCH UNIT (X41-1510-00)				
B30-0828-05		Lamp with cap	LP1,2	2
C90-0876-05	N	E(small) 22 16V	C1	1
C91-0117-05		Cap. 0.01 (SR)	C2	1
R90-0565-05		Capacitor block 470p x 7	C3	1
R90-0566-05		Resistor block 27kΩ x 3	R2,3	2
S50-1412-05		Tact switch	S1-5	5
DAN201	N	Diode	D2-3	2
XZ-051		Zener diode	D1	1
TC4049BF		IC	Q1	1
LCD UNIT (X54-1760-00)				
CS15E1V0R1M		T 0.1 35V	C101	1
C91-0117-05		Cap. 0.01 (SR)	C102	1
F39-0402-04		LCD reinforced sheet		1
J25-3136-05		Flexible PC board		1
J30-0519-04		Spacer (A)		1
FTS1212		LCD		1
MSM58292GS		IC	Q101	1
μPD4584BG	N	IC	Q102	1

DISASSEMBLY

- 1 Remove lower case screw (x 2)
- 2 Remove seven screws on PC board.



TU-3

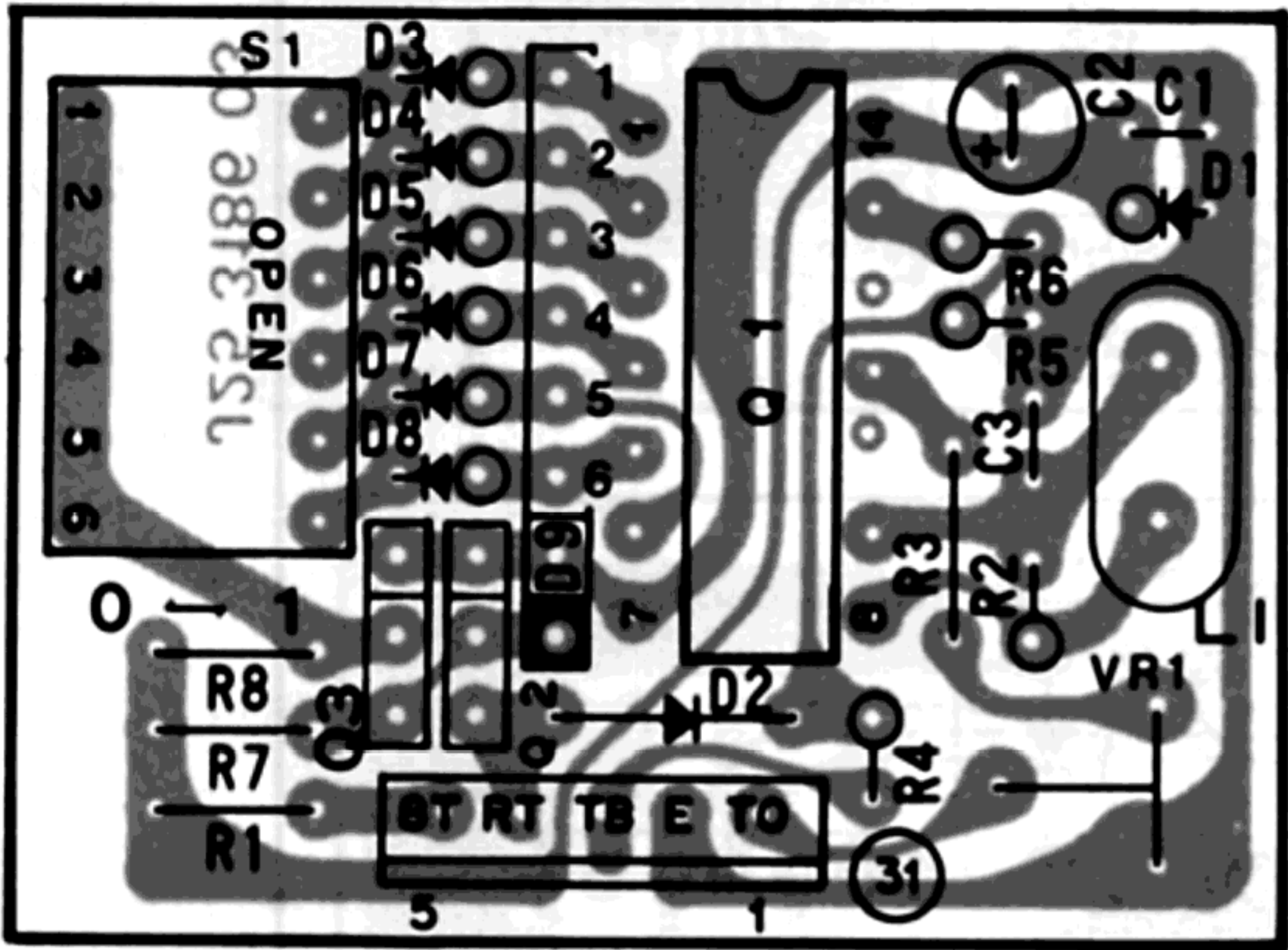
TU-3 SPECIFICATION

Tone modulation ±0.5kHz—±1.0kHz
Tone distortion Less than 10%

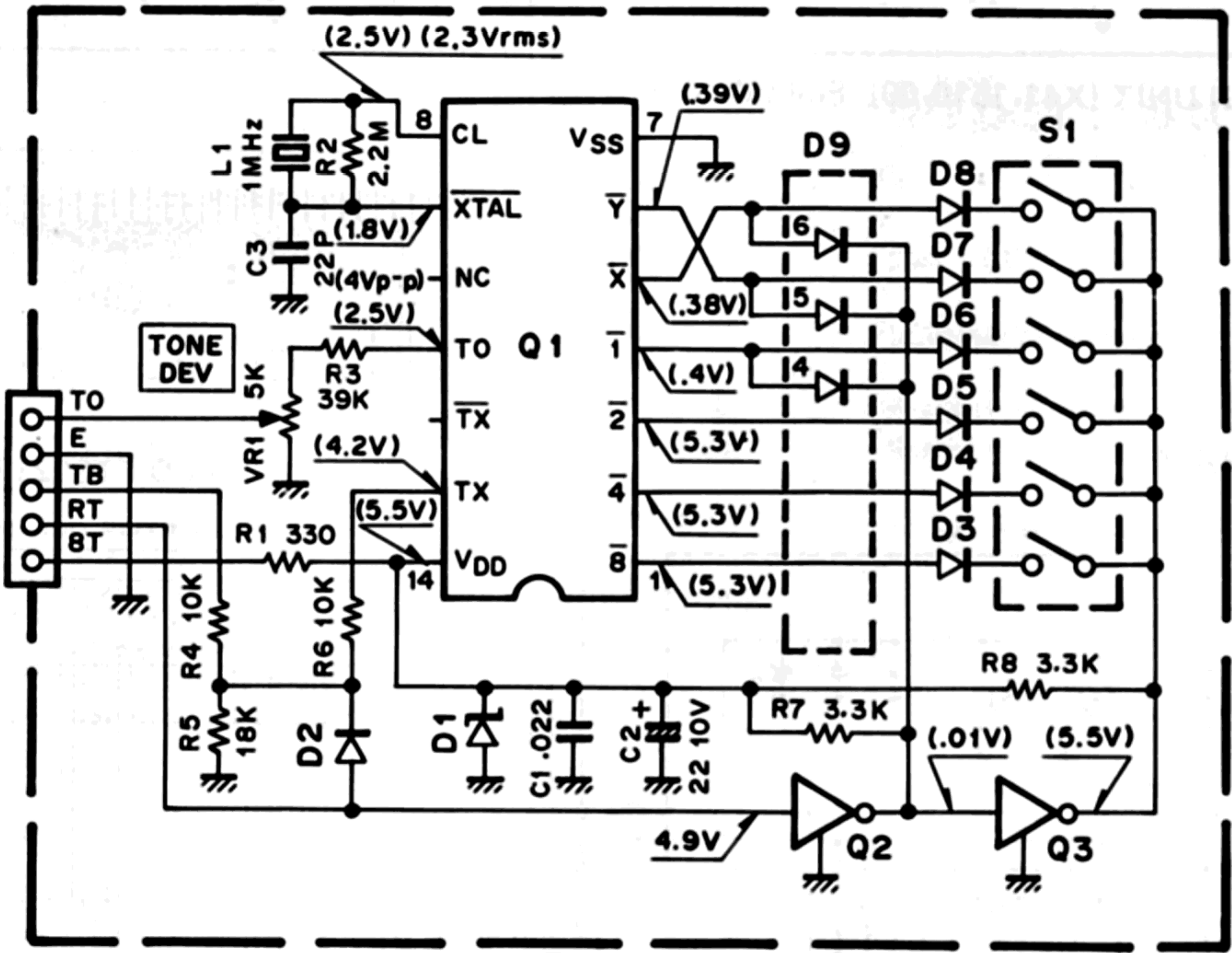
TU-3 PARTS LIST

Parts No.	Re- marks	Description	Ref. No.	Q'ty
CC45CH1H220J		C 22P	C3	1
C90-0845-05		E 22 10V	C2	1
C91-1008-05		Cap. 0.022 (SR)	C1	1
E40-3010-05	Δ	Pin connector		1
L77-0983-05		Crystal 1 MHz	L1	1
R12-2409-05		Trim. pot. 5kΩ	VR1	1
R90-0567-05	N	Inline block 88.5Hz	D9	1
R90-0568-05	N	Inline block		
S31-6401-05		DIP switch	S1	1
MX315		IC	Q1	1
DTC124 (F)		Digital TR	Q2,3	2
1S1555		Diode	D2-8	7
XZ-055		Zener diode	D1	1

TONE UNIT (X52-1260-00) Component side view



TONE UNIT (X52-1260-00)

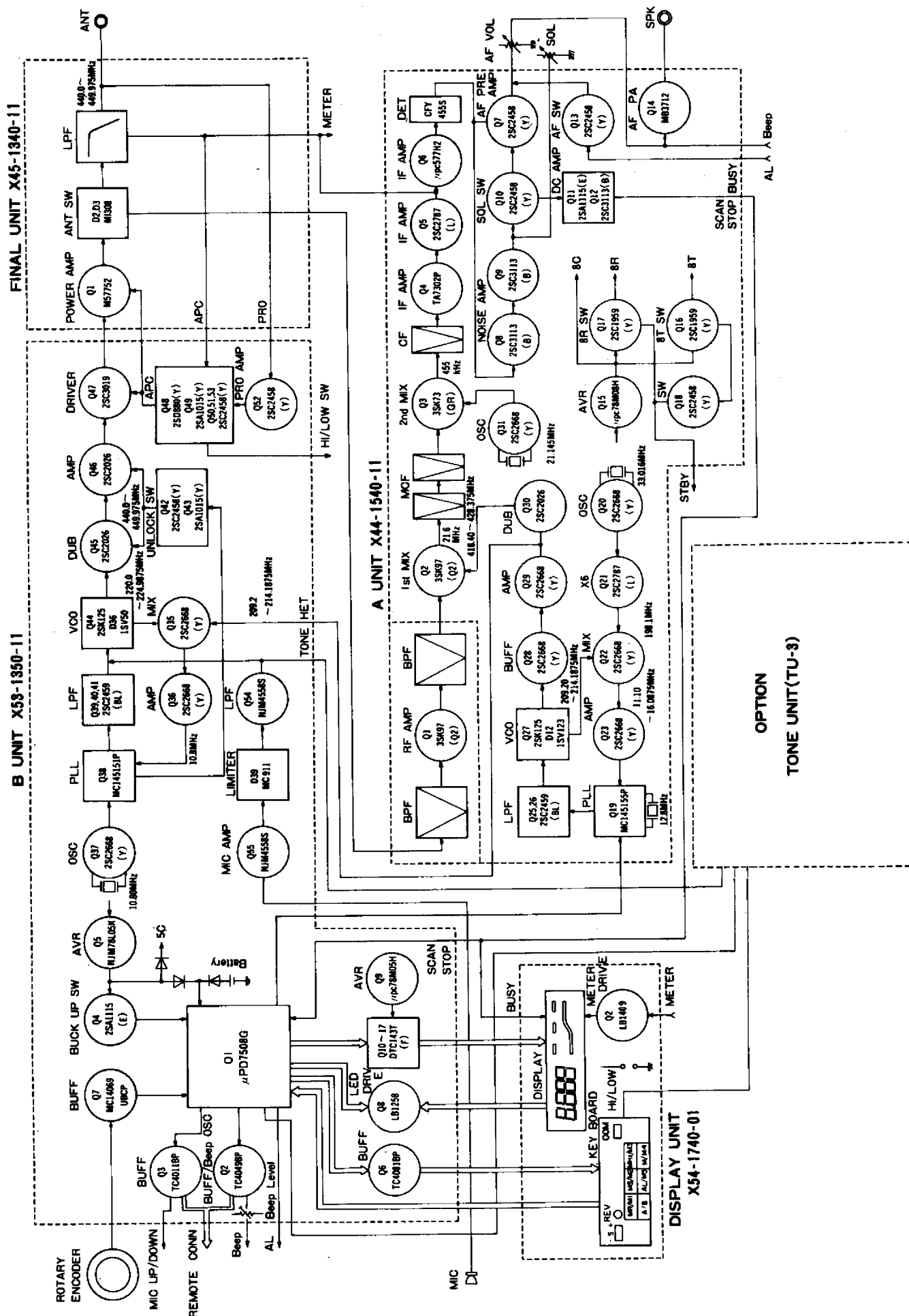


Q1 : MX315
Q2,3 : DTC124 (F)
D1 : XZ-055
D2~8 : 1S1555
D9 : R90-0567-05

Tone Frequency

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

BLOCK DIAGRAM (K TYPE)



A

B

C

D

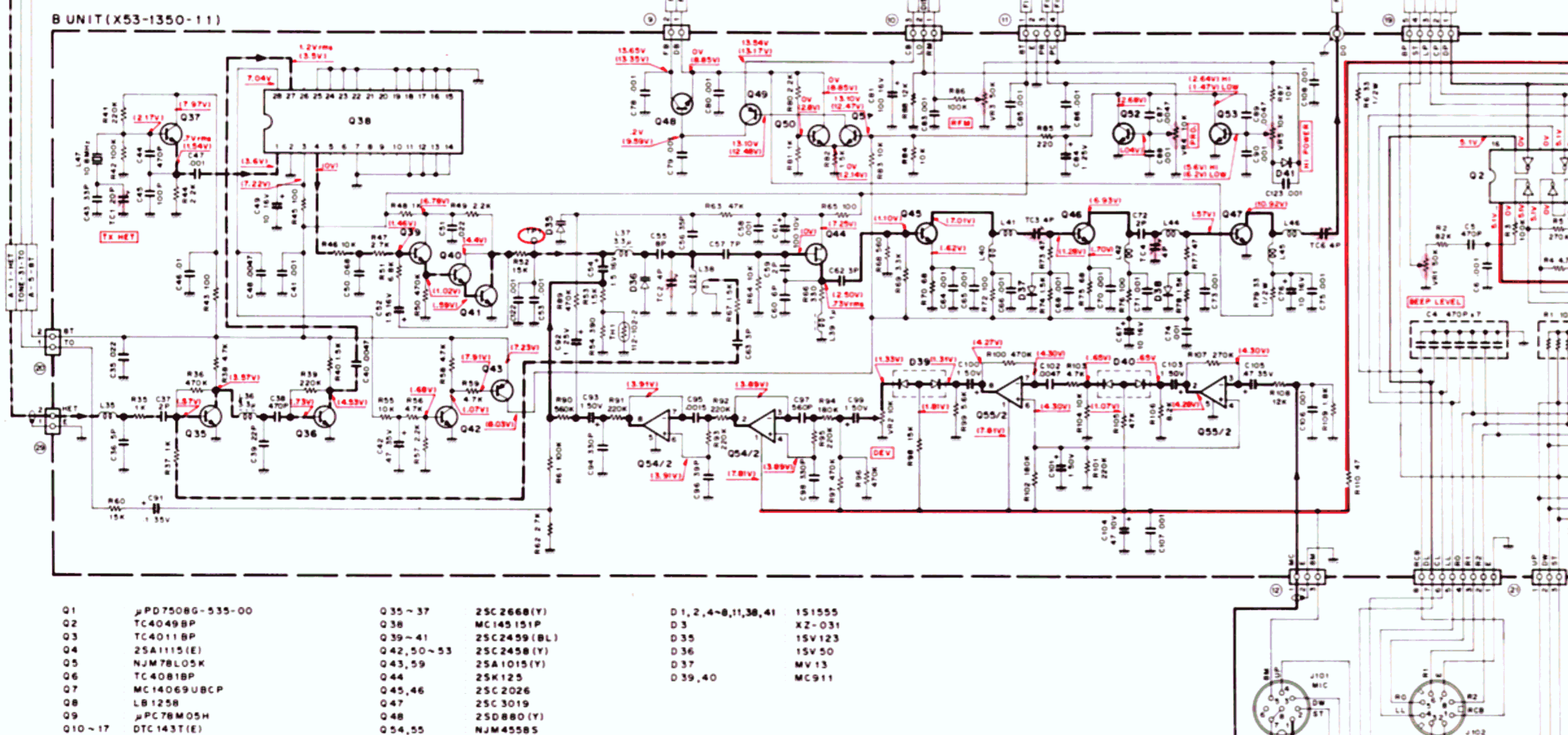
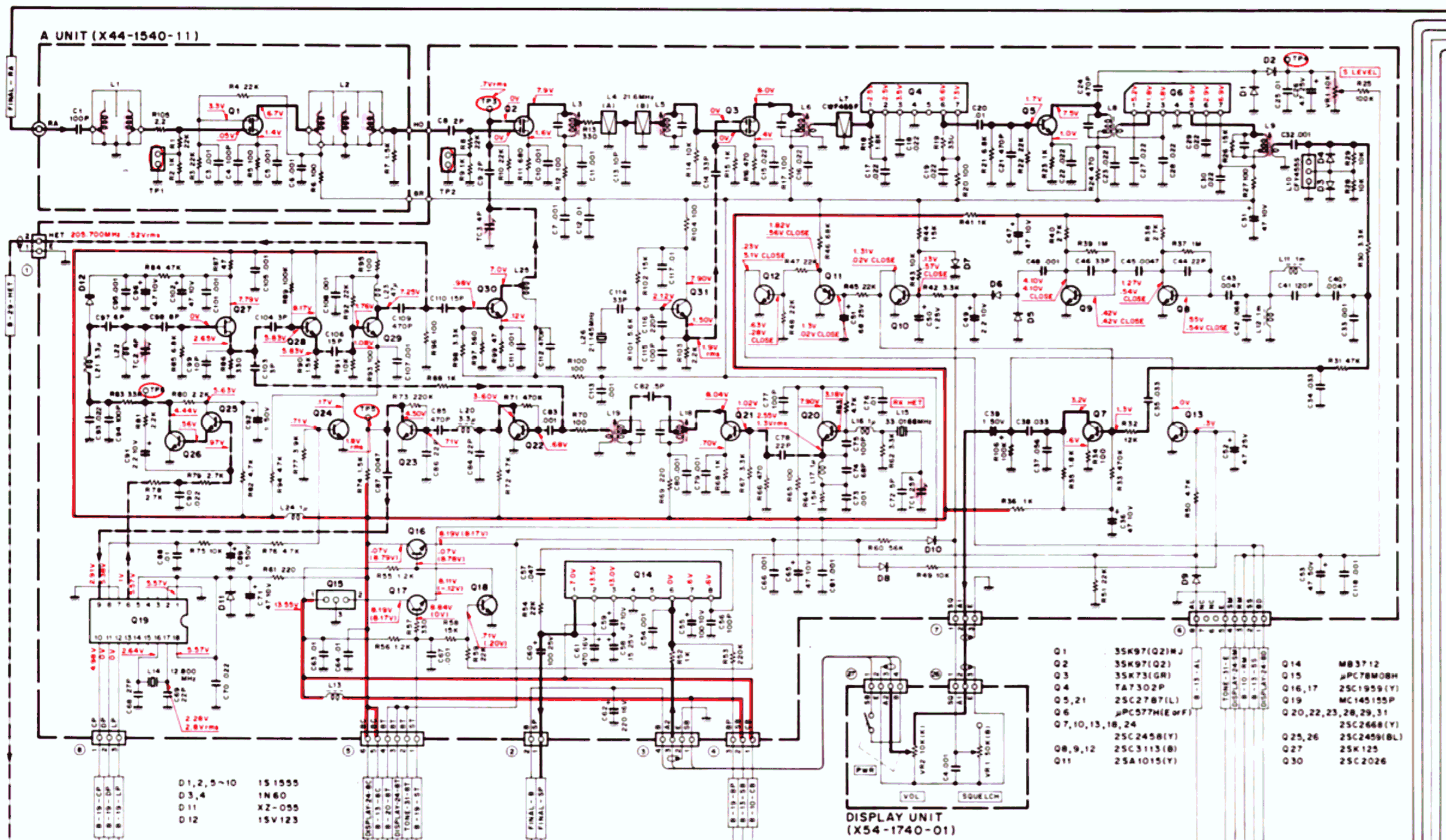
E

Signal Line

Control Line

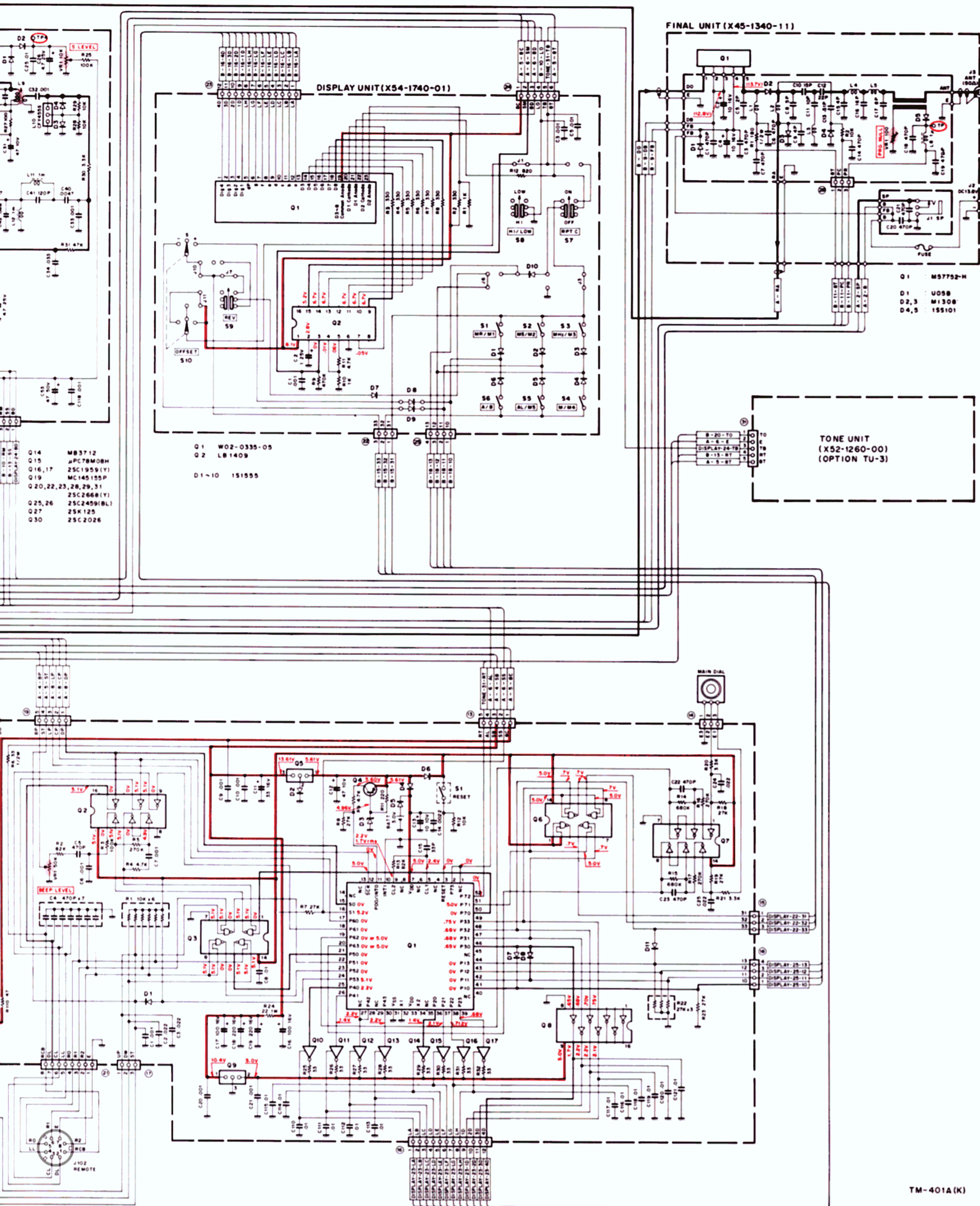
Common DC Line

The voltages are measured when receiving 445.



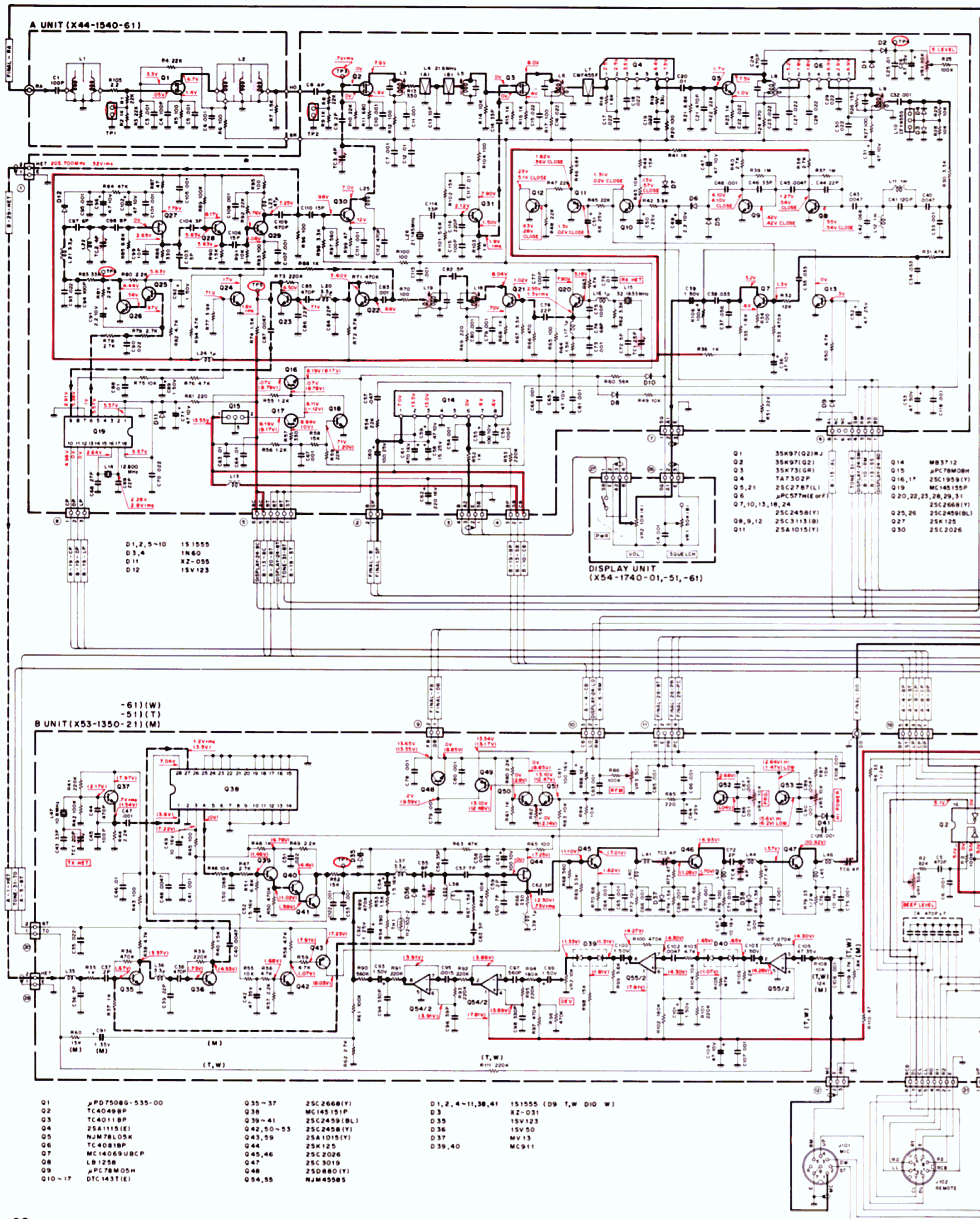
and when receiving 445.00MHz. () : in TX.

SCHEMATIC DIAGRAM (K TYPE) TM-401A



TM-401A SCHEMATIC DIAGRAM (M,T,W TYPE)

Signal Line

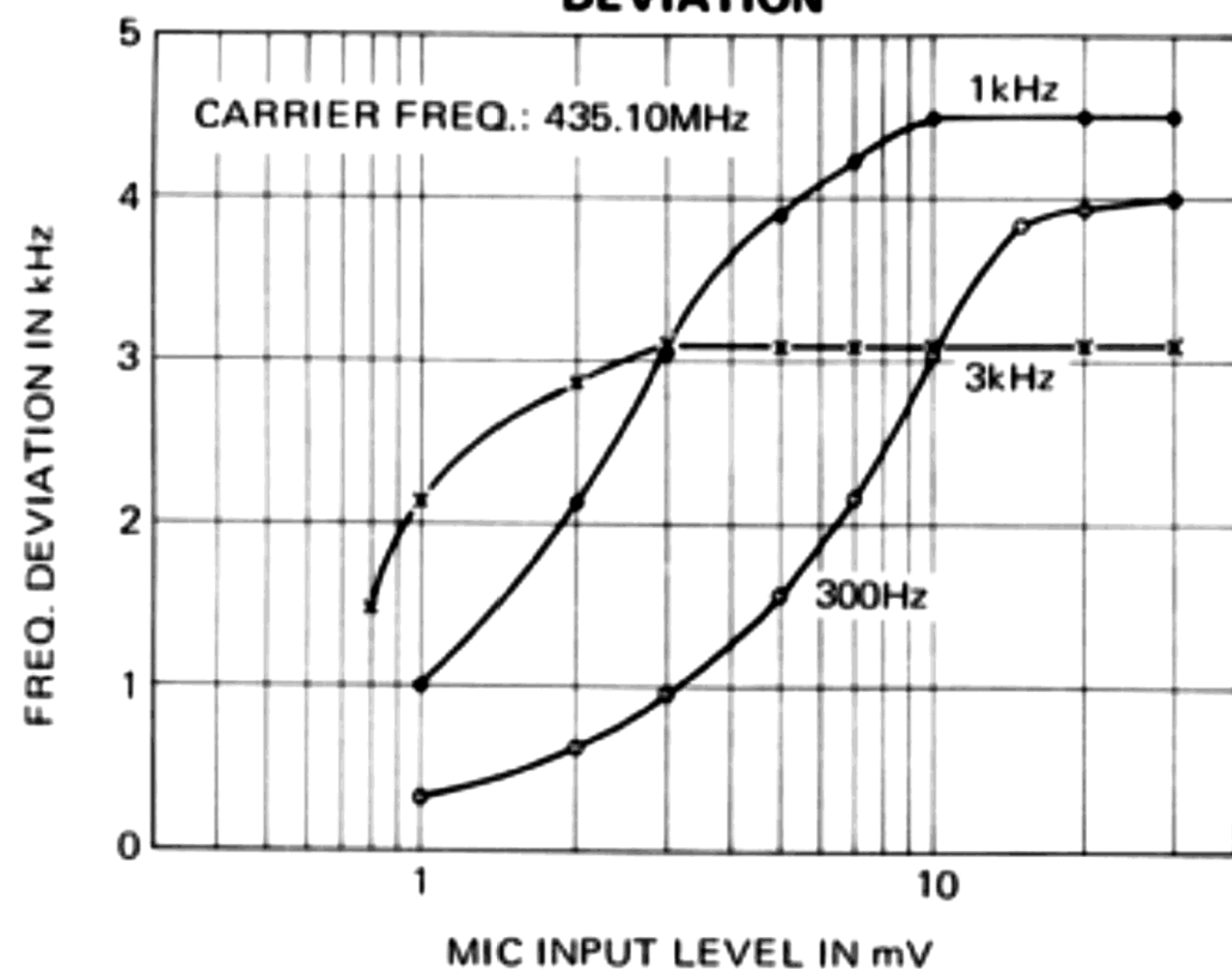


The voltages are measured when receiving 435.00MHz. (): in TX.

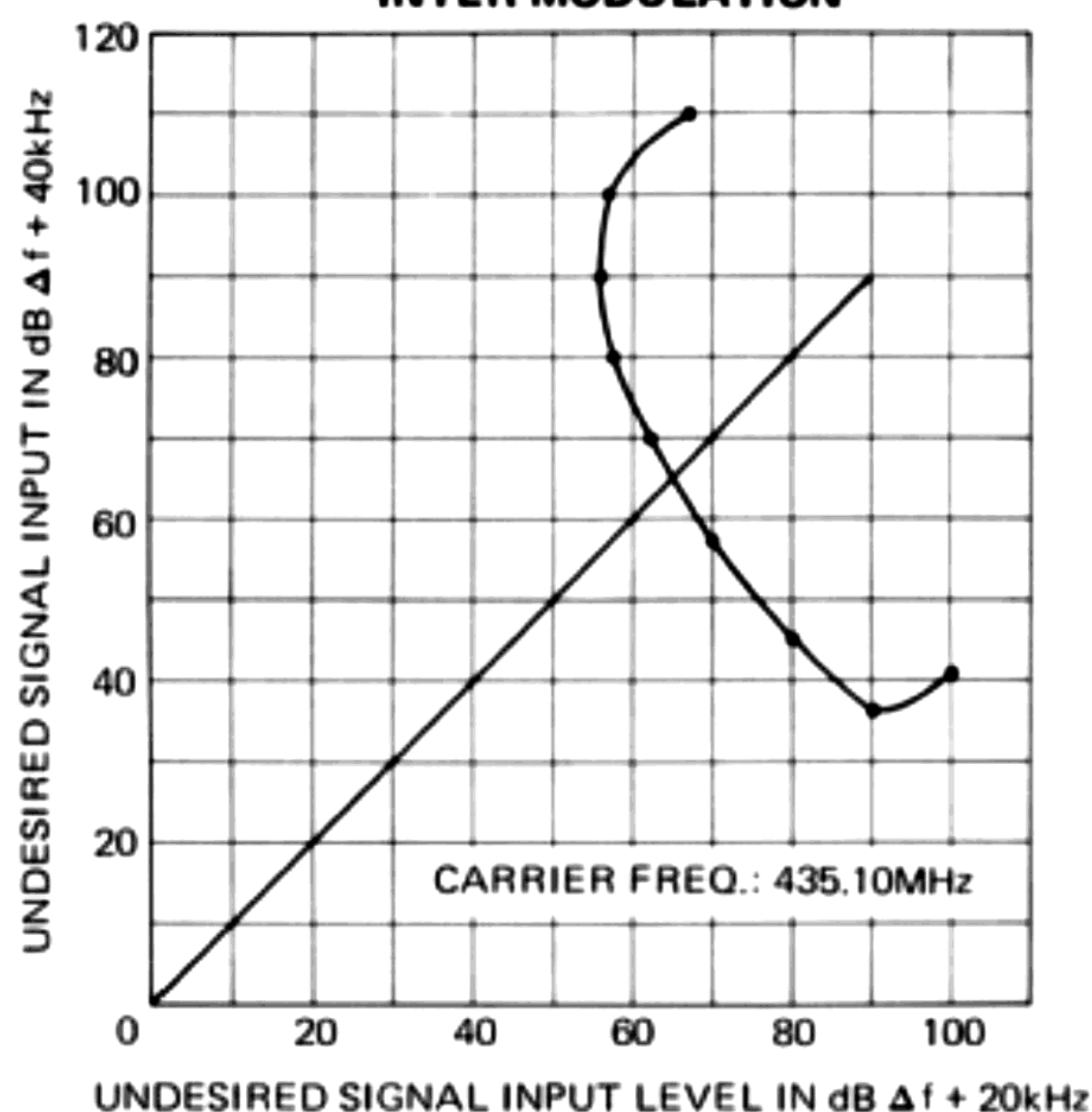


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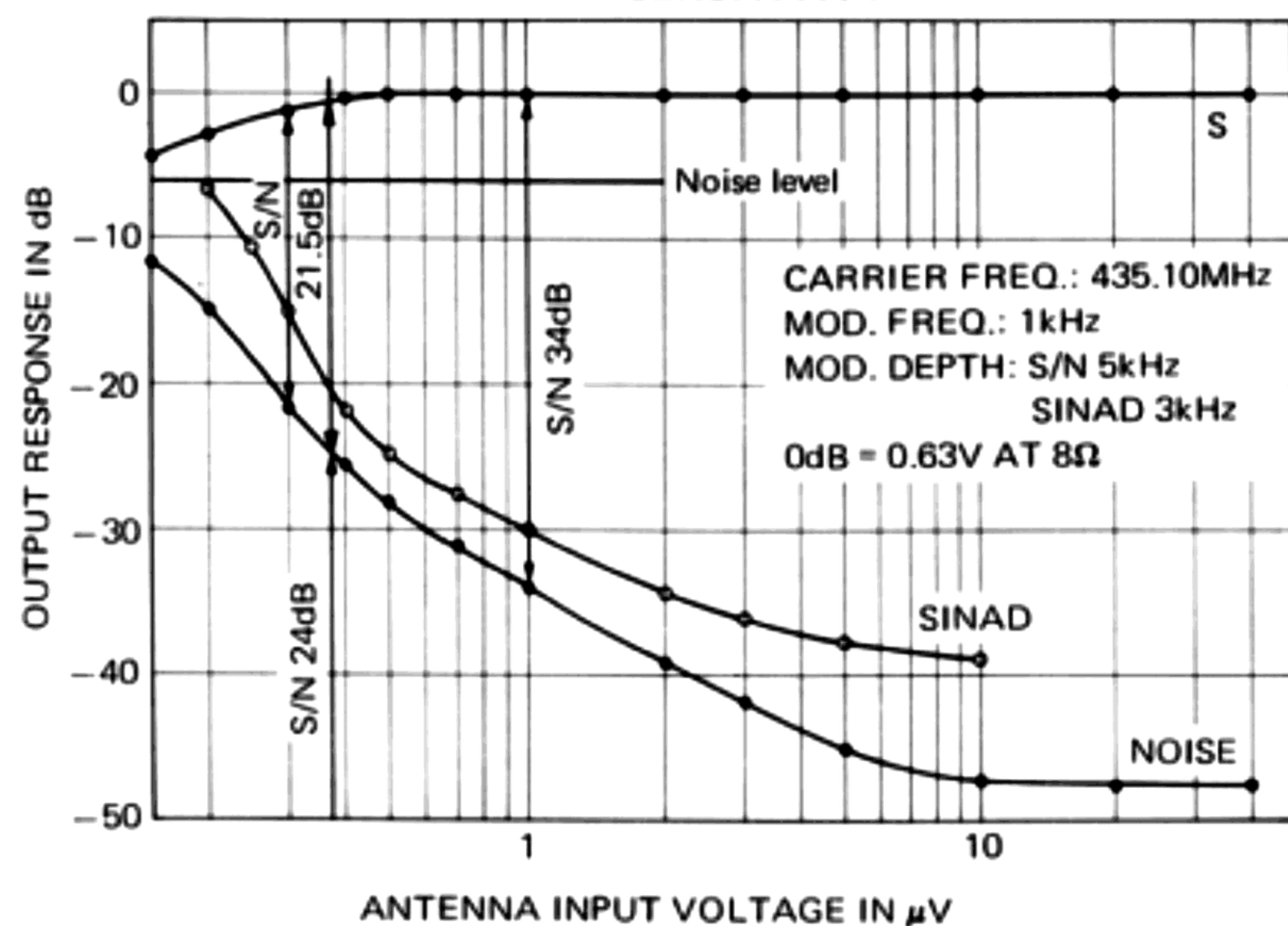
DEVIATION



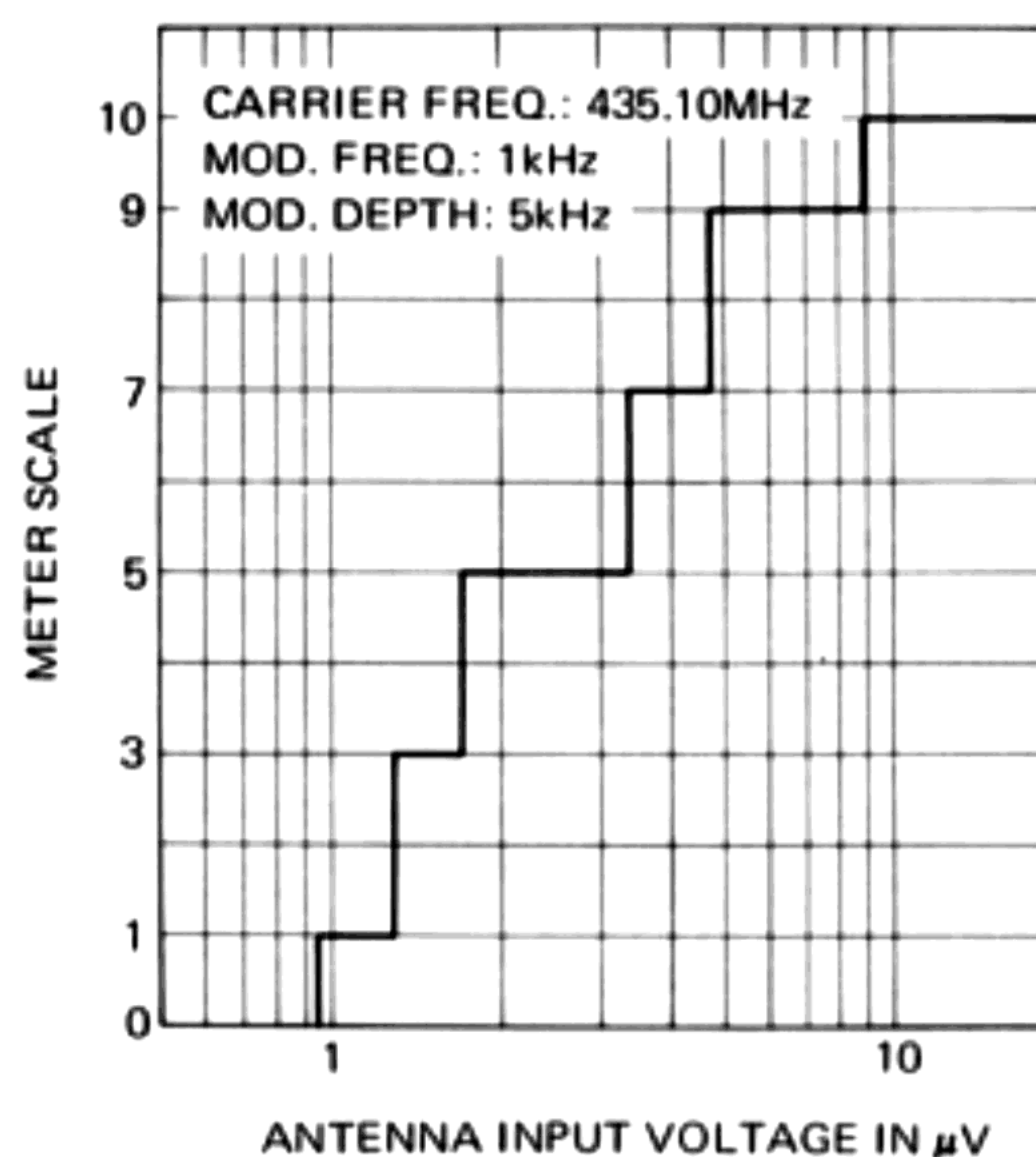
INTER MODULATION



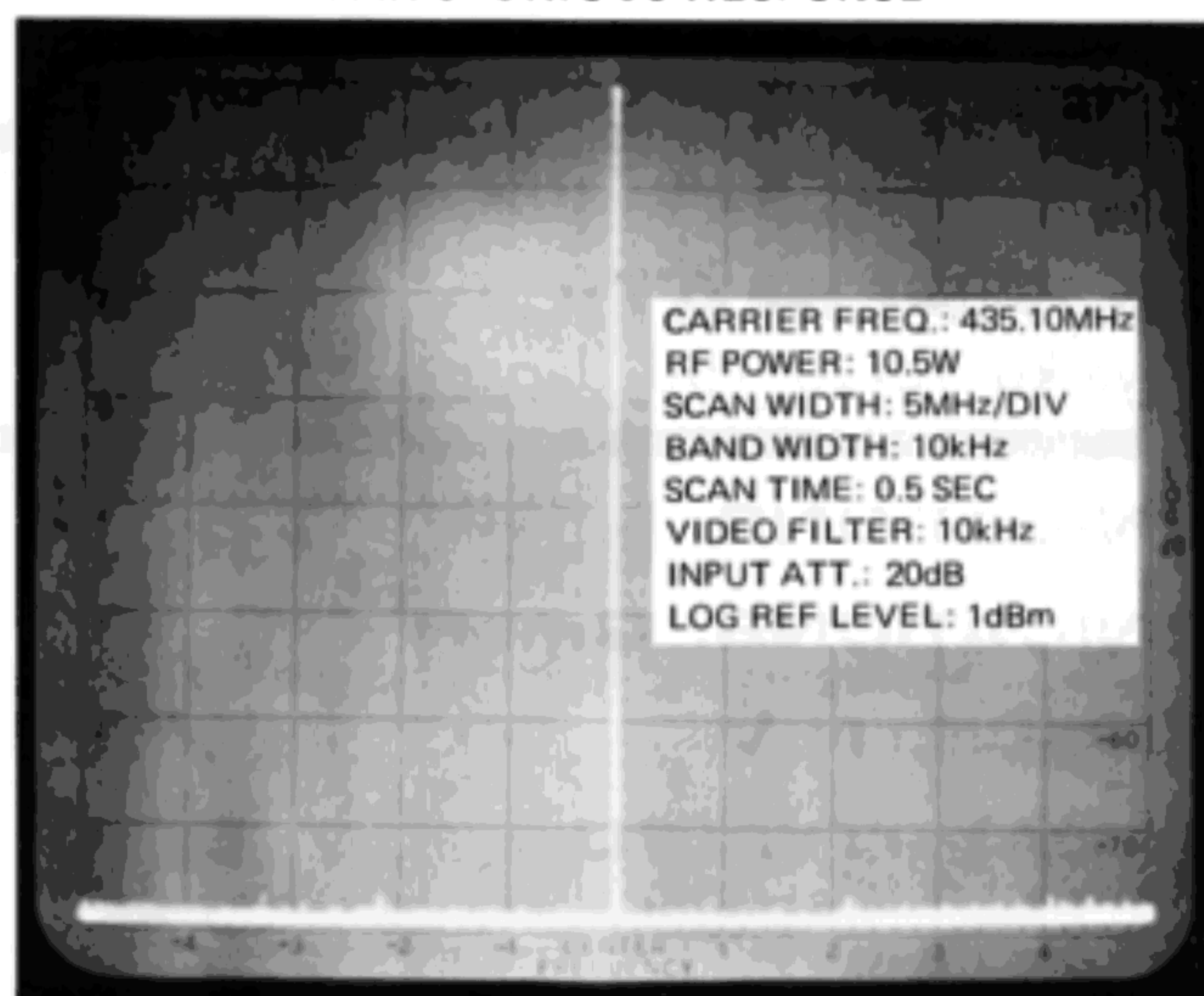
RX SENSITIVITY



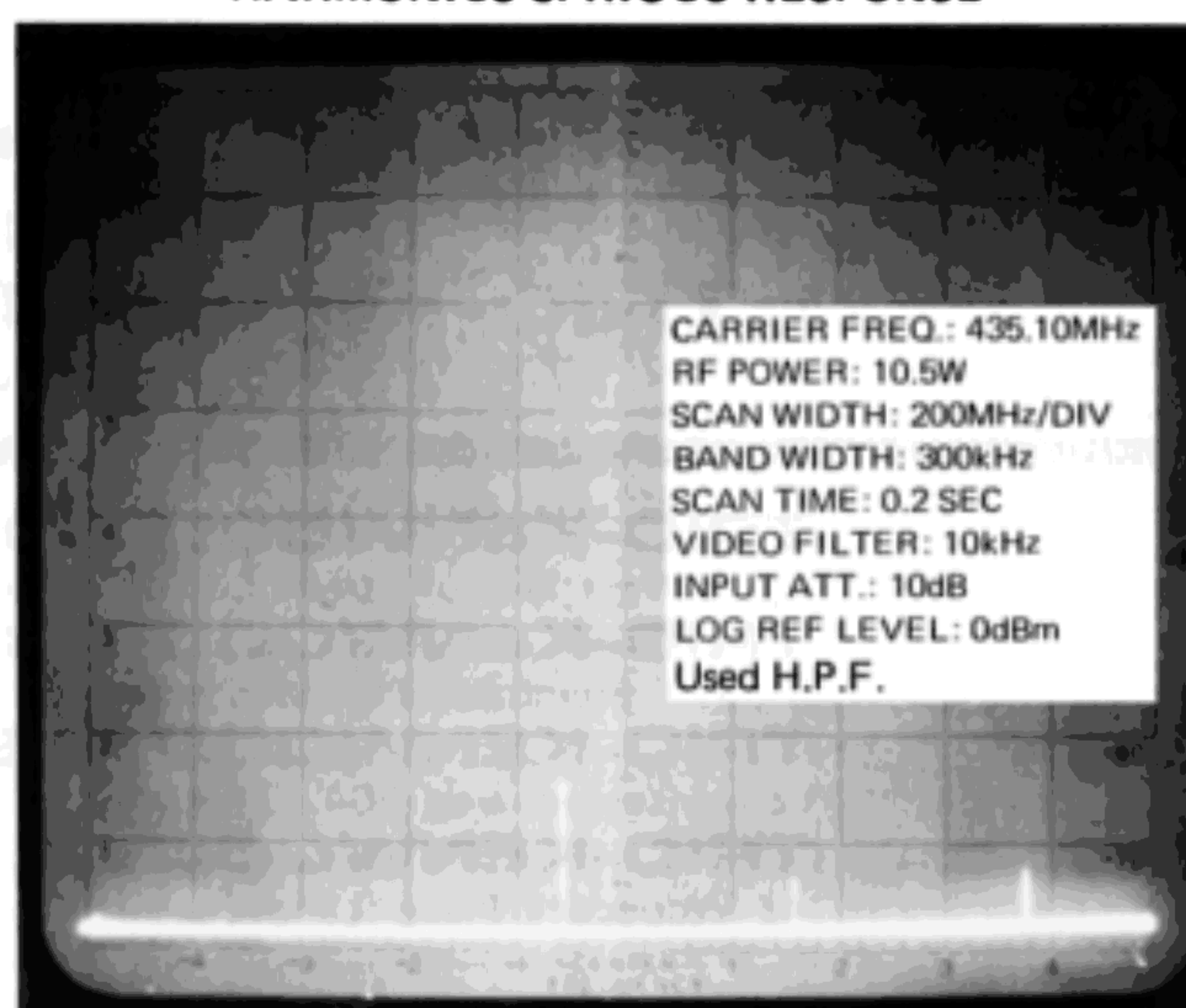
S LEVEL SENSITIVITY



NEAR SPURIOUS RESPONSE



HARMONICS SPRIIOUS RESPONSE



SPECIFICATIONS

[General]

Semiconductors	MPU	1
	ICs	18 (K,M) 19 (T,W)
	Transistors	48
	FETs	5
	Diodes	43 (K,M) 45 (T,W)
Frequency range	430.0 to 440.0 MHz (440.0 to 450.0 MHz for USA)	
Mode	FM (F3) (F3E: in Germany)	
Antenna impedance	50 ohms	
Power requirement	13.8V DC $\pm$ 15%	
Grounding	Negative	
Operating temperature	-20°C to +50°C	
External speaker impedance	8 ohms	
Current drain	Less than 0.5 A in receive mode with no input signal	
	Max. 3.8 A in HI transmit mode	
	1.6 A in LOW transmit mode (Approx.)	
Dimensions	141 mm wide (5-17/32")	
	39.5 mm high (1-17/32")	
	183 mm deep (7-3/16")	
	projections not included	
Weight	1.25 kg (2.75 lbs)	

[Transmitter]

RF output power (at 13.8V DC, 50 Ω load)	HI 12 Watts min.
	Low 1 Watt approx.
Modulation	Reactance
Frequency tolerance (-20°C ~ +60°C)	Less than $\pm 15 \times 10^{-6}$
Spurious radiation	HI Less than -60 dB
	LOW Less than -60 dB
Maximum frequency deviation (FM)	± 5 kHz
Audio distortion (at 60% modulation)	Less than 3% (300 Hz ~ 3000 Hz)

[Receiver]

Circuitry	Double superheterodyne
Intermediate frequency	1st 21.60 MHz
	2nd 455 kHz
Receiver sensitivity	SINAD 12 dB less than 0.2 μ V
	S + N/N more than 60 dB at 1.0 mV input
Receiver selectivity	More than 12 kHz (-6 dB)
	Less than 24 kHz (-60 dB)
Spurious response	Better than 65 dB (except fd-1F/2)
Squelch sensitivity	Less than 0.16 μ V (threshold)
Auto scan stop level	Less than 0.2 μ V (threshold)
Audio output	More than 2.0 watts across 8 ohms load (5% dist.)

[Auto patch microphone (MC-48) supplied] — For U.S.A. version only

Semiconductors	IC	1
	Transistors	3
	Diodes	3
Impedance	500 ohms	

Note: Circuit and ratings are subject to change without notice due to developments in technology.

A product of

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