

# DR-140T/E/TE1/TE2

## Service Manual

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**ALINCO, INC.**

# SPECIFICATIONS

## 1) General

TX Frequency Range:	T      144.000 ~ 147.995MHz
	E      144.000 ~ 145.995MHz
	TE1    136.000 ~ 155.000MHz
	TE2    150.000 ~ 173.995MHz
RX Frequency Range:	T      118.000 ~ 135.995MHz (AM), 136.000 ~ 173.995MHz (FM)
	E      144.000 ~ 145.995MHz (FM)
	TE1    136.000 ~ 173.995MHz (FM)
	TE2    136.000 ~ 173.995MHz (FM)
CTCSS Encode:	Standard 50 Tones
CTCSS Decode:	Optional 50 Tones
Microphone:	Electret Cond. with DTMF
Frequency Resolution	5, 10, 12.5, 15, 20, 30, 50kHz steps, user adjustable
Antenna Impedance:	50Ω unbalanced
Power Input:	13.8 V DC ± 10%
Current Drain @13.8V DC:	RX - Squelched: less than 800mA TX - High: approx. 10.5A, Low: approx. 3.5A
Dimensions:	141mm(W) x 41mm(H) x 154mm(D) (without projections)
Weight:	approx. 0.86kg
Memory Channels:	50 Channels plus CALL channel; each stores RX; TX offset, CTCSS encode, optional CTCSS decode and alphanumeric display information
Display:	Alphanumeric, English and Cyrillic alphabets, numbers 0-9, figures, up to 7 characters; backlit LCD
Tone Bursts:	1000, 1450, 1750, 2100 Hz
Time Out Timer:	30 to 450 seconds; selectable in 30 second increments
Busy Channel Lock Out:	Available - Requires Optional EJ20U CTCSS Tone Decode Unit
Penalty Timer:	0 ~ 15 seconds
Scan Function:	Busy or Timed; Up or Down, memory or VFO

## 2) Transmitter

Output Power (approx.):	High 50W / Low 5W (T/E), High 35W / Low 5W (TE1/TE2)
Emission:	F3E FM
Modulation System:	Variable Reactance Frequency Modulation
Max. Frequency Deviation:	± 5kHz
Spurious Emission:	-60dB or under below carrier
Operations:	Simplex or Semi-Duplex Modes
TX/RX Offset Range:	From 0 up to ± 99.995MHz (full tuning range of radio) Offset may be saved as part of information stored in any memory channel

### **3) Receiver**

Receiving System:	Dual Conversion Superheterodyne
IF Frequencies:	First: 30.85MHz; Second: 455kHz
Sensitivity:	12dB SINAD -15dB $\mu$
Selectivity:	More than $\pm$ 6kHz at -6dB; Less than $\pm$ 15kHz at -60dB
Audio Output:	More than 2.5 Watts @10% distortion
Speaker Impedance:	8 $\Omega$

Specifications are subject to change without notice or obligation. Performance specifications apply only to transmit bands. Names of certain products mentioned in this catalog are used for identification purposes only and may be trademarks or registered trademarks of their respective company.

# CIRCUIT DESCRIPTION

## 1) Receiver System

### 1. Antenna Switching Circuit (Main unit)

The signal from the antenna is input to RF amplifier circuit passing through the 5 stages low-pass filter (L15 ~ L18, C76 ~ C80, C148), the antenna switching circuit (D9, D11, L14, C63), T type high-pass filter (L11, L12, C57, C64, C58, C59) and band switch circuit (D20 T, E version only). The antenna switching circuit uses  $\lambda/4$  diode switch circuit.

### 2. RF Amplifier Circuit

#### (Main unit)

RF signal is amplified approximately 20dB by RF amplifier. RF amplifier circuit uses dual gate FET to get good inter-modulation characteristics. The RF amplifier consists of voltage tuned band-pass filter (L1, L2, L4, L5, D2, D3, D5, D6) and RF AMP (Q6). The signal is amplified after eliminating unwanted signals so that image interference characteristics are improved.

### 3. 1st Mixer Circuit

#### (Main unit)

The amplified signal is converted into the first IF signal of 30.85MHz by mixer circuit (Q5). Mixer circuit uses dual gate FET to improve multifrequency characteristics such as inter-modulation. The output signal from mixer circuit is led to 1st IF circuit.

### 4. Air Band Circuit

#### (Main unit / T, E version)

The output signal from band switch circuit is led to low-pass filter circuit (L7, L8, C55, C56) and input to RF amplifier circuit (Q11). There the signal is amplified approximately 20dB and input to the mixer circuit.

### 5. 1st IF Circuit

#### (Main unit)

The output 1st IF signal from mixer circuit is led to crystal filter XF1. Unwanted frequency band of IF signal is eliminated by a crystal filter. The resulting signal is led to the 2nd IF amplifier, and the signal is output to 2nd IF circuit.

### 6. 2nd IF Circuit and Detector Circuit

#### (Main unit)

The 1st IF signal is led to 2nd mixer circuit of IC1, then it is converted into the 2nd IF signal (455kHz) by 2nd local signal. IC1 has the 2nd mixer, 2nd local oscillator circuit, quadrature detector circuit and AM detector circuit. The 2nd local oscillator oscillates 2nd local signal (30.395MHz). The 2nd IF output signal from mixer (pin 3 of IC1) circuit is led to ceramic filter (FL1). Unwanted frequency band of 2nd IF signal is eliminated by a ceramic filter. The resulting FM signal is led to the limiter amplifier (pin 7 of IC1) circuit and quadrature detector circuit (pin 11 of IC1 and ceramic discriminator X1), and the 2nd IF signal is converted to AF signal. The FM AF signal is output from pin 12 of IC1 to AF circuit. The AM signal is input to AM detector circuit (pin 5 of IC1), and the AM AF signal is output from pin 13 of IC1.

## **7. AF and Mute Circuit**

**(Main unit)**

The AF signal from IC1 is filtered by the low-pass filter amplifier (Q2) and led to the high-pass filter amplifier (Q1), and output to the AF gain volume. Q3 and Q4 are switched ON/OFF by AFC signal from CPU, then AF signal is muted when the squelch is ON.

## **8. Squelch Circuit**

**(CPU unit)**

IC1 has the noise amplifier, rectifier circuit and comparator circuit. The noise signal from pin12 of IC1 is input to the noise amplifier (pin19 of IC1) and passed through buffer amplifier (Q28), rectified by D8, then it is input to comparator circuit (pin 21 of IC1). When the noise signal is decreased by the receiving signal, the comparator output SD becomes low.

# **2) Transmitter System**

## **1. Microphone Amplifier Circuit**

**(CPU unit)**

The voice from external microphone is amplified by the microphone amplifier (Q303), and passed through the microphone mute circuit (Q304), the signal is input to the microphone gain potentiometer (VR3) in the main unit.

## **2. Limiter Amplifier Circuit**

**(Main unit)**

The signal from microphone gain potentiometer (VR3) is amplified by limiter amplifier and low-pass (IC4). The resulting signal is passed through the modulation adjustment potentiometer (VR4), then input to VCO unit. IC4A is limiter amplifier with pre-emphasis characteristics. IC4B is low-pass filter.

## **3. Modulation Circuit**

**(VCO unit)**

The adjusted AF signal in VR4 is led to the VCO unit. The frequency modulation is executed when the audio signal is supplied to the D207.

## **4. Drive Amplifier Circuit**

**(Main unit)**

The signal from VCO unit is input to the drive amplifier (IC3). IC3 has high gain of approximately 30dB and high level of approximately 10dBm wide band amplifier.

## **5. RF Younger Amplifier Circuit**

**(Main unit)**

The signal from IC3 is passed through diode switch D12, and input to younger amplifier Q13. Q13 has approximately 15dB gain and output level is 400mW. The output signal of younger amplifier is led to the PA amplifier (IC2).

## **6. RF Power Amplifier Circuit (Main unit)**

IC2 is the power module, which obtains stable output power (50W T/E, 35W TE1/TE2) within the band. The signal of younger amplifier is amplified by the PA amplifier (IC2), and then led to the antenna switch circuit.

## **7. Antenna Switch Circuit (RF unit)**

When transmitting, D11 and D9 are ON in the antenna switch circuit, L14 becomes parallel components. This causes the output signal of IC2 not to go to the RX circuit. The signal is led to the antenna connector passing through the low-pass filter (L15 ~ L18, C76 ~ C80, C148).

## **8. APC Circuit (RF unit)**

When the TX signal is passed through the low-pass filter, matching voltage and mismatching voltage are detected by the D14 and D15. When the antenna impedance is  $50\Omega$ , the detected voltage of D14 and D15 are minimum. But when the antenna impedance is not  $50\Omega$ , the detected voltage becomes higher. The detected voltage is passed through the power setting potentiometer (VR1), and the signal is amplified by Q17, Q16 and Q14. The transmitting power is controlled by the voltage of V1(IC2) and collector voltage of Q13. When the temperature of the unit goes high, the power down circuit (R104, TH2) prevents the device from being damaged.

## **3) PLL Circuit**

### **1. Summary**

The PLL circuit uses PLL IC (IC201) equipped with built-in dual modulus prescaler. The PLL IC serial data is sent from CPU. The VCO output frequency divided by N is compared with reference frequency in the phase comparator.

### **2. Reference Oscillator Circuit (Main unit)**

The reference frequency is obtained by X3 (12.8MHz), and its output is led to the VCO unit.

### **3. Loop Filter Circuit (VCO unit)**

The phase error of phase comparator is integrated to DC voltage by loop filter circuit, and supplied to D201, D202 of varicap diode in VCO unit. The time constant of the active loop filter (consisting of Q202 and Q210) is determined by C211, C212, R228, R210. The output is passed through the lag filter (R213, C208), and input to VCO unit.

### **4. VCO Circuit (VCO unit)**

The circuit is the Hartley oscillator circuit (Q201), and the signal is output passing through the buffer amplifier (Q204). C247 is switched by D205 to vary the capacitance, and the oscillating frequency range is shifted.

#### 4) Terminal function of CPU

No.	Name	Pin Name	I/O	Description	H	L	Hi Z	Pull UP
1	AN7	SD	I	SD signal input	Signal	No signal		
2	AN6	SMT	I	S meter signal input	Analog			
3	AN5	BP1	I	Band plan	Analog			
4	P64	UL	I	Unlock input	Unlock	Lock		
5	P63	TON1	O	Tone output 1	Pulse			
6	P62	TON2	O	Tone output 2	Pulse			
7	P61	TON3	O	Tone output 3	Pulse			
8	P60	TON4	O	Tone output 4	Pulse			
9	P57	AM	O	AM/FM selection	AM	FM		
10	TOUT	BEEP	O	Beep sound output, SCR ON-OFF	Pulse			
11	P55	- HL	O	TX, Squelch level H/L	Power	Low	High	
					Squelch	Low	High	
12	CNTR	TBST	O	Tone burst output / microphone mute	RX	TX. Pulse		
13	P53	T8	O	TX power supply control	TX	OFF		
14	P52	STB2 TICD	O I	Tone unit strobe Tone unit detection input	Pulse None	Normal Equipped		
15	P51	STB1	O	PLL strobe	permitted	Inhibited		
16	INT2	RE2	I	Rotary encoder down input	OFF	ON		
17	P47	CLK	O	Clock signal output	Pulse			
18	P46	DATA	O	Data signal output	Pulse			
19	TXD	CTX	O	Data output for the cloning mode	Pulse			
20	RXD	CRX	I	Data input for the cloning mode	Pulse			
21	INT1	RE1	I	Rotary encoder up input	OFF	ON		O
22	INT0	BU	I	Backup signal input	Normal	Backup		O
23	P41	SQL	O	AF mute		Mute	Normal	
24	P40	TSQD	I	Tone signal detection input	No Tone	Tone		
25	RST	RST	I	Reset signal input	at work			
26	P71	SCL	O	Clock input for E2PROM	Pulse			
27	P70	SDA	IO	Data input for E2PROM	Pulse			
28	XIN	XIN	I	Internal clock input				
29	XOUT	XOUT	O	Internal clock output				
30	VSS	GND	I	GND		0V		
31	P27	PTT	I	PTT key	OFF	ON		O
32	P26	UP	I	UP key	OFF	ON		O
33	P25	DOWN	I	Down key	OFF	ON		O
34	P24	KEY 1	I	Key 1 H/L	OFF	ON		O
35	P23	KEY 2	I	Key 2 SET	OFF	ON		O

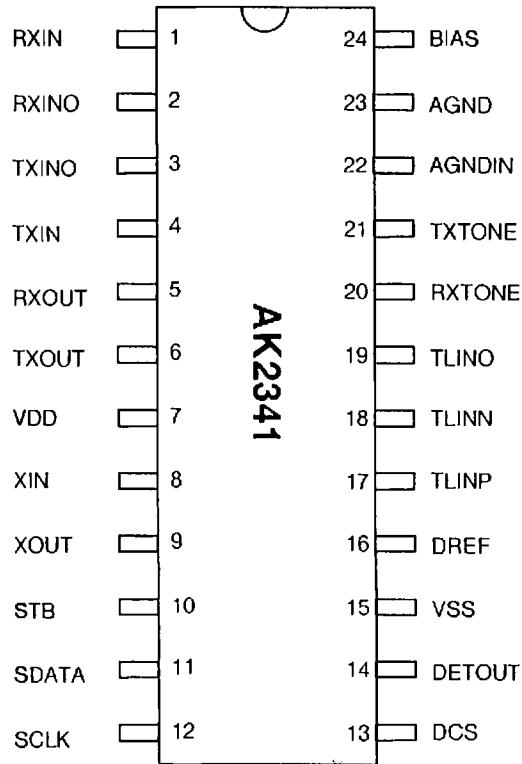
No.	Name	Pin Name	I/O	Description	H	L	Hi Z	Pull UP
36	P22	KEY 3	I	Key 3 CALL	OFF	ON		○
37	P21	KEY 4	I	Key 4 V/M	OFF	ON		○
38	P20	KEY 5	I	Key 5 FUN	OFF	ON		○
39	S31	S31	O	Segment 31 output	Pulse			
40	S30	S30	O	Segment 30 output	Pulse			
41	S29	S29	O	Segment 29 output	Pulse			
42	S28	S28	O	Segment 28 output	Pulse			
43	S27	S27	O	Segment 27 output	Pulse			
44	S26	S26	O	Segment 26 output	Pulse			
45	S25	S25	O	Segment 25 output	Pulse			
46	S24	S24	O	Segment 24 output	Pulse			
47	S23	S23	O	Segment 23 output	Pulse			
48	S22	S22	O	Segment 22 output	Pulse			
49	S21	S21	O	Segment 21 output	Pulse			
50	S20	S20	O	Segment 20 output	Pulse			
51	S19	S19	O	Segment 19 output	Pulse			
52	S18	S18	O	Segment 18 output	Pulse			
53	S17	S17	O	Segment 17 output	Pulse			
54	S16	S16	O	Segment 16 output	Pulse			
55	S15	S15	O	Segment 15 output	Pulse			
56	S14	S14	O	Segment 14 output	Pulse			
57	S13	S13	O	Segment 13 output	Pulse			
58	S12	S12	O	Segment 12 output	Pulse			
59	S11	S11	O	Segment 11 output	Pulse			
60	S10	S10	O	Segment 10 output	Pulse			
61	S9	S9	O	Segment 9 output	Pulse			
62	S8	S8	O	Segment 8 output	Pulse			
63	S7	S7	O	Segment 7 output	Pulse			
64	S6	S6	O	Segment 6 output	Pulse			
65	S5	S5	O	Segment 5 output	Pulse			
66	S4	S4	O	Segment 4 output	Pulse			
67	S3	S3	O	Segment 3 output	Pulse			
68	S2	S2	O	Segment 2 output	Pulse			
69	S1	S1	O	Segment 1 output	Pulse			
70	S0	S0	O	Segment 0 output	Pulse			

No.	Name	Pin Name	I/O	Description	H	L	Hi Z	Pull UP
71	VCC	VDD	I	Power supply				
72	VREF	VREF	I	Reference voltage input				
73	AVSS	GND	I	GND				
74	COM3	COM3	O	LCD common 3 output	Pulse			
75	COM2	COM2	O	LCD common 2 output	Pulse			
76	COM1	COM1	O	LCD common 1 output	Pulse			
77	COM0	COM0	O	LCD common 0 output	Pulse			
78	VL3	VL3	I	LCD power supply input				
79	VL2	VL2	I	LCD power supply input				
80	VL1	VL1	I	LCD power supply input				

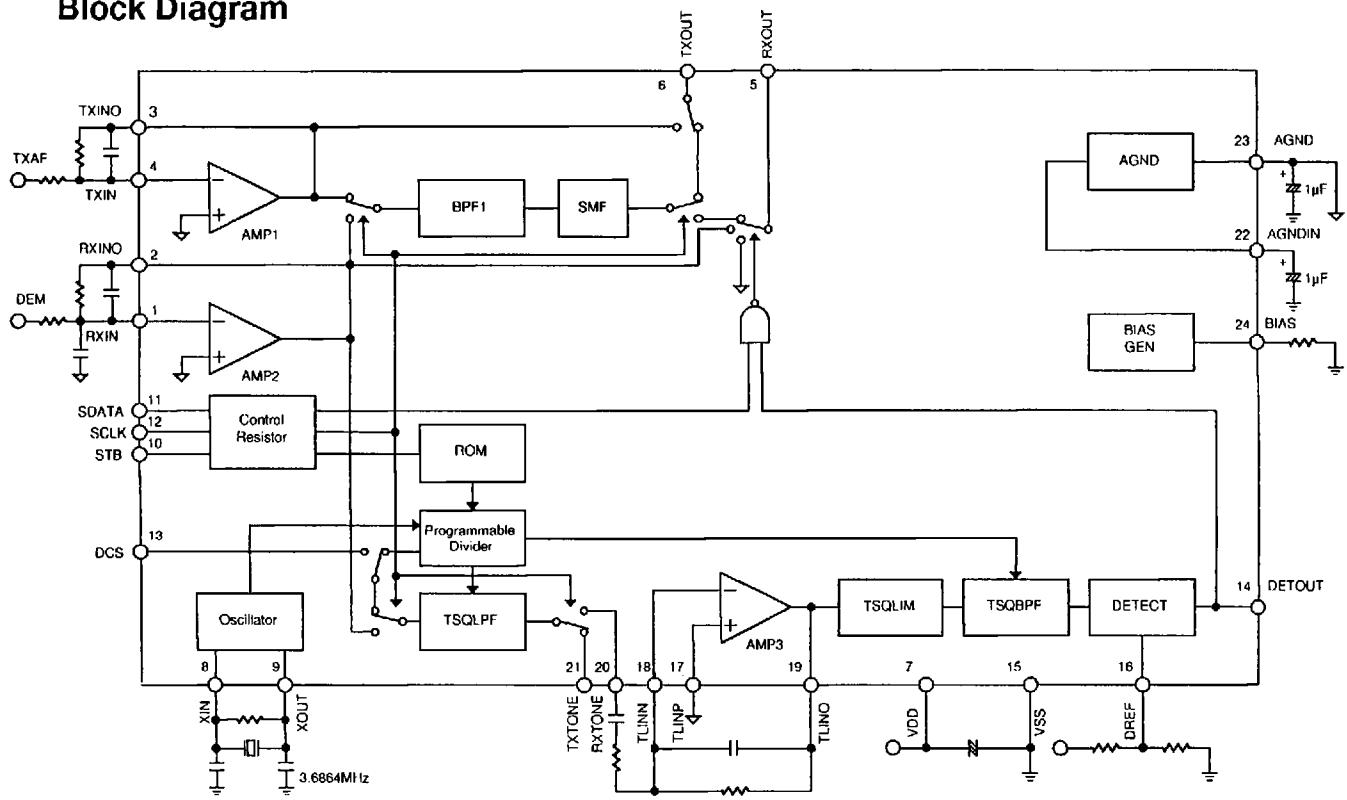
# SEMICONDUCTOR DATA

## 1) AK2341 (XA0239) CTCSS Encoder/Decoder

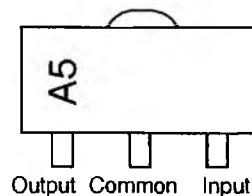
Pin No.	Pin Name	I/O	Function
1	RXIN	I	RX Signal Input
2	RXINO	O	AMP2 Output
3	TXINO	O	AMP1 Output
4	TXIN	I	TX Audio Input
5	RXOUT	O	RX Audio Output
6	TXOUT	O	TX Audio Output
7	VDD	-	Power Supply (1.8 ~ 5.5V)
8	XIN	I	Crystal Terminal (3.6864MHz)
9	XOUT	O	Crystal Terminal (3.6864MHz)
10	STB	I	Strobe for Serial Data
11	SDATA	I	Serial Data
12	SCLK	I	Serial Clock
13	DCS	I	DCS Input
14	DETOUT	O	Tone Detection Output (Detect: Low)
15	VSS	-	Ground
16	DREF	I	Tone Detection Level Adjust Input
17	TLINP	I	RX Tone Signal Reference Input
18	TLINN	I	RX Tone Signal Input
19	TLINO	O	AMP3 Output
20	RXTONE	O	RX Tone Signal Output
21	TXTONE	O	TX Tone Signal Output
22	AGNDIN	I	Analog Ground Input
23	AGND	O	Analog Ground Output
24	BIAS	I	Bias Input



### Block Diagram



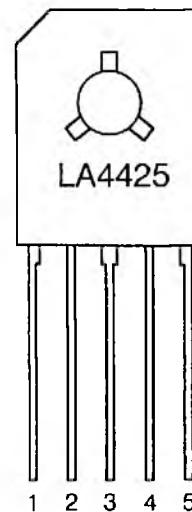
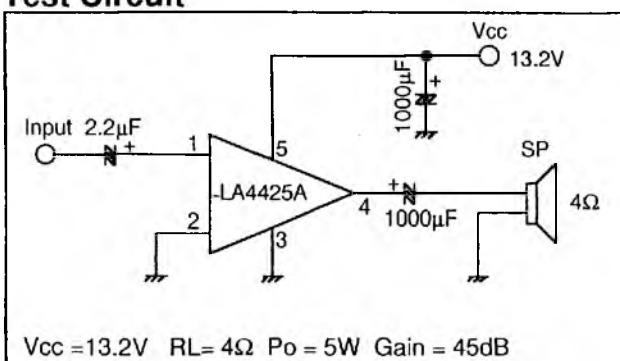
**2) AN78L05M (XA0238)**  
5V Voltage Regulator



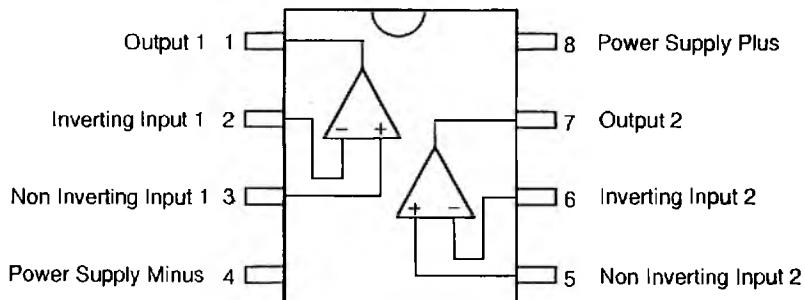
AN78L05M

**3) LA4425A (XA0410)**  
5W Audio Power Amplifiers

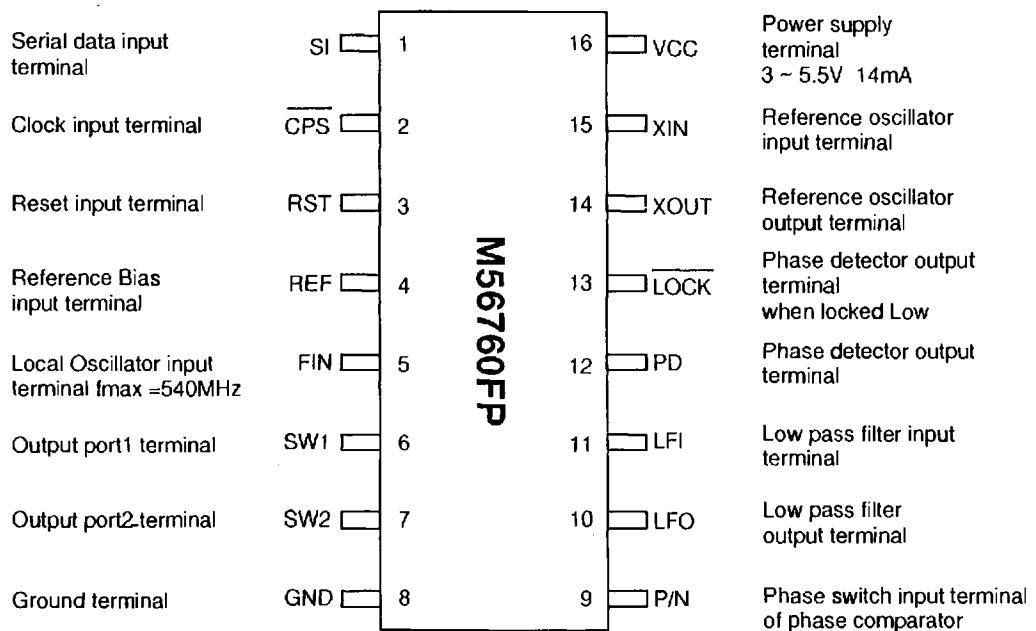
**Test Circuit**



**4) M5218FP (XA0068)**  
Dual Low Noise  
Operational Amplifiers



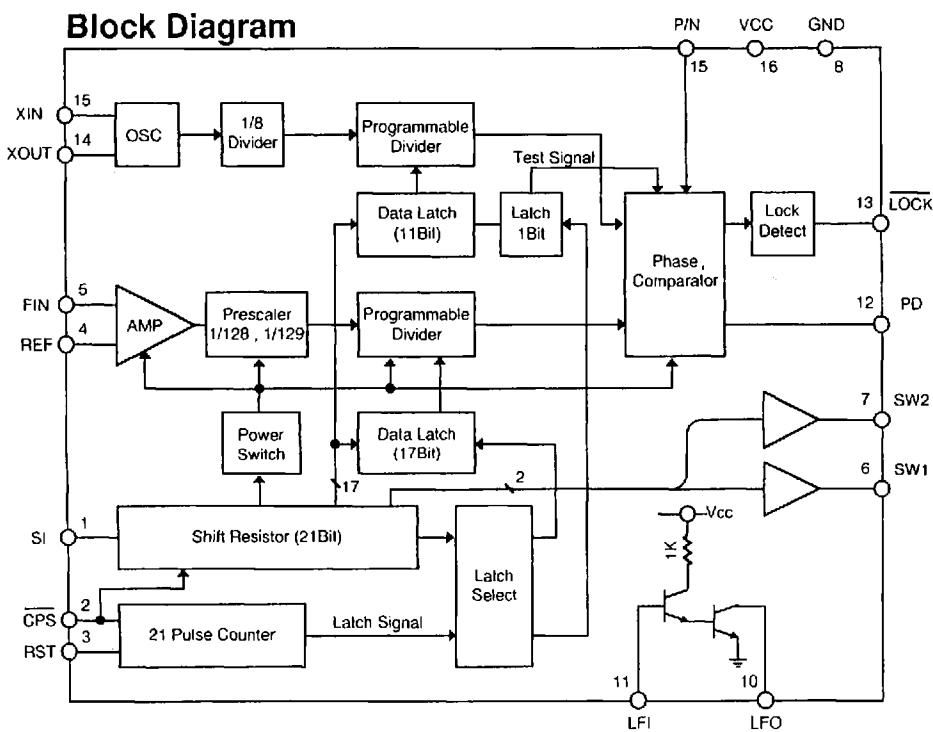
## 5) M56760FP (XA0235) 540MHz Frequency Synthesizer



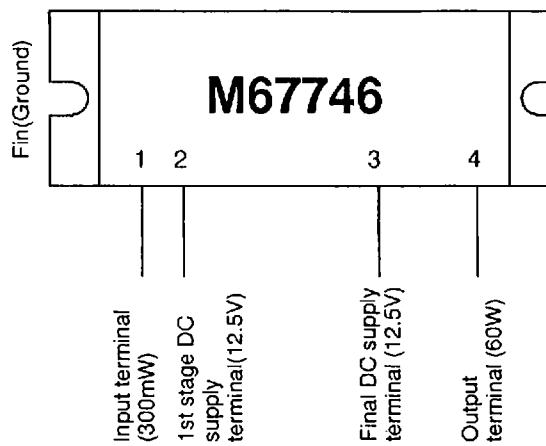
**Function Table**

P/N input	Phase	PD output
High or Low	Locked	Hi-Z
High	Lead	High
High	Lag	Low
Low	Lead	Low
Low	Lag	High

**Block Diagram**



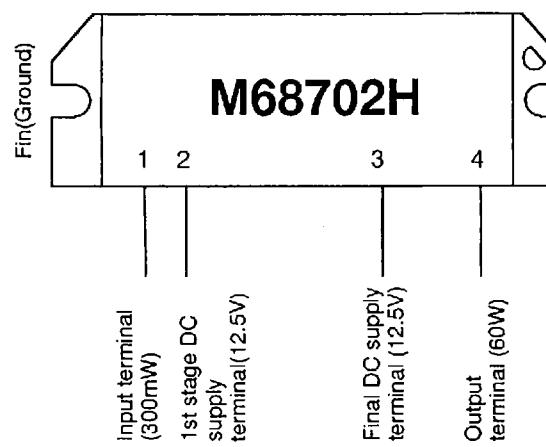
**6) M67746 (XA0412)**  
 144 ~ 148MHz 60W  
 RF Power Module



Ratings	Symbol	Ratings	Unit
Supply voltage	Vcc	17	V
Total current	Icc	20	A
Input power	Pin(max)	600	mW
Output power	Po(max)	70	W
Operation case temperature	Tc(op)	-30 to +110	°C
Storage temperature	Tstg	-40 to +110	°C

Zg=Zl=50Ω

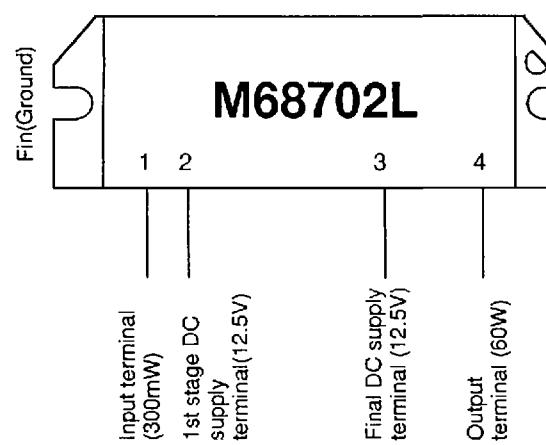
**7) M68702H (XA0444)**  
 150 ~ 175MHz 60W  
 RF Power Module (TE2)



Ratings	Symbol	Ratings	Unit
Supply voltage	Vcc	17	V
Total current	Icc	20	A
Input power	Pin(max)	600	mW
Output power	Po(max)	75	W
Operation case temperature	Tc(op)	-30 to +110	°C
Storage temperature	Tstg	-40 to +110	°C

Zg=Zl=50Ω

**8) M68702L (XA0445)**  
 135 ~ 160MHz 60W  
 RF Power Module (TE1)

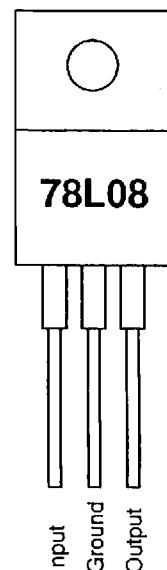
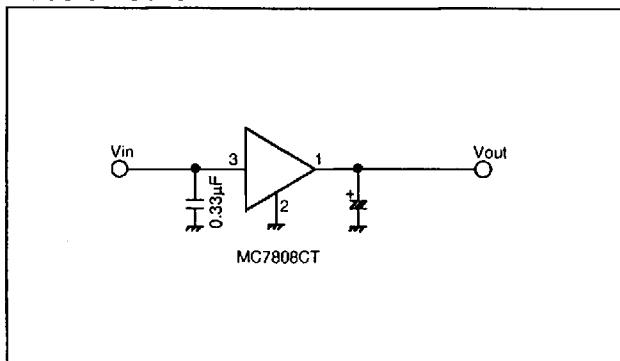


Ratings	Symbol	Ratings	Unit
Supply voltage	Vcc	17	V
Total current	Icc	20	A
Input power	Pin(max)	600	mW
Output power	Po(max)	75	W
Operation case temperature	Tc(op)	-30 to +110	°C
Storage temperature	Tstg	-40 to +110	°C

Zg=Zl=50Ω

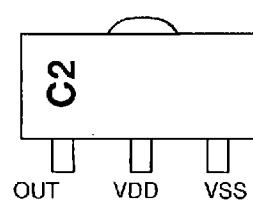
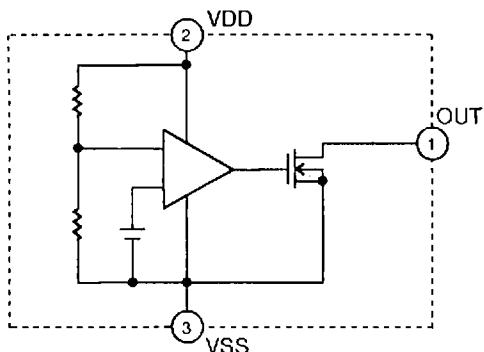
**9) MC7808CT (XA0082)**  
8V Voltage Regulator

Test Circuit



**10) RH5VL32AA-T1 (XA0198)**  
C-MOS Voltage Detector

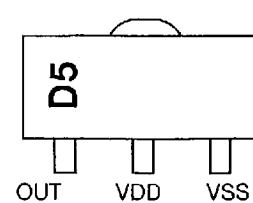
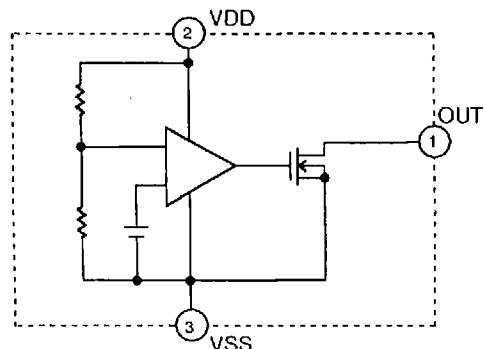
Equivalent Circuit



RH5VL32AA

**11) RH5VL45AA-T1 (XA0208)**  
C-MOS Voltage Detector

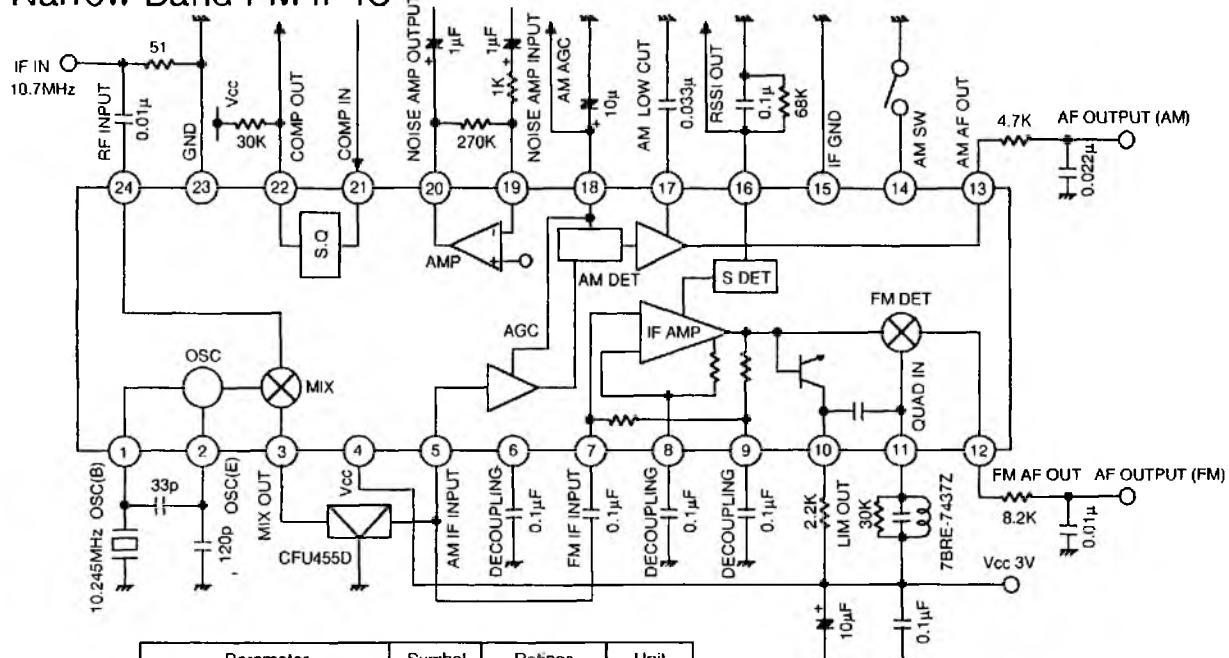
Equivalent Circuit



RH5VL45AA

## 12) TK10930VTL (XA0223)

### Narrow Band FM IF IC



Parameter	Symbol	Ratings	Unit
Supply voltage	Vcc max	10.0	V
Power dissipation	Pd	400	mW
Storage temperature	Tstg	-55~+150	°C
Operating temperature	Top	-30~+75	°C
Operating voltage	Vop	2.5~8.5	V
Operating frequency	fop	~60	MHz

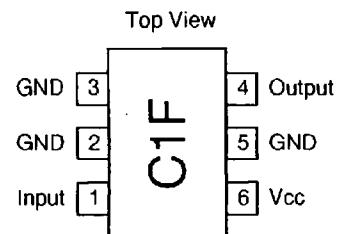
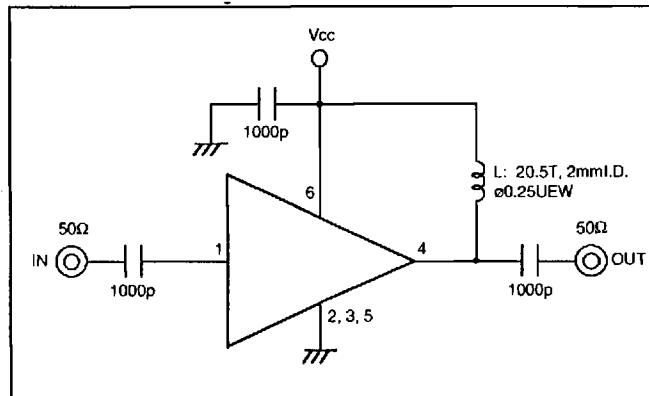
Ta=25°C Vcc=3V

Parameter	Symbol	Ratings			Unit	Condition
		Min	Typical	Max		
Supply Current 1	Icc1		6.8	8.9	mA	No signal, AM ON
Supply Current 2	Icc2		3.9	5.3	mA	No signal, AM OFF
Mixer Conversion Gain	Mg		20		dB	
Mixer Input Impedance	Mz		3.6		kΩ	DC Test
FM						
Limiting Sensitivity	Limit		2.0	8.0	µV	-3.0dB
Output Voltage	Vo1	85	150	230	mVrms	10mVin +/-3kHz DEV
Distortion	THD1		1.0	2.0	%	10mVin +/-3kHz DEV
Output Impedance	Zo		800		Ω	10mVin
Filter Gain	Gf	30	38		dB	Fin=30kHz, Vo=100mV
Scan Control Hi Voltage	SH	2.3			V	Squelch input=2.5V
Scan Control Low Voltage	SL		0.3		V	Squelch input=0V
Squelch Hysteresis	Hys		30		mV	
S meter Output Voltage	S0		0.05	0.5	V	Vin=0mV, RS=68kΩ
S meter Output Voltage	S1	0.05	0.5	0.9	V	Vin=0.01mV, RS=68kΩ
S meter Output Voltage	S2	0.7	1.2	1.7	V	Vin=0.1mV, RS=68kΩ
S meter Output Voltage	S3	1.2	1.8	2.5	V	Vin=1mV, RS=68kΩ
S meter Output Voltage	S4	1.6	2.3	2.9	V	Vin=10mV, RS=68kΩ
S meter Output Voltage	S5	1.8	2.4	2.9	V	Vin=100mV, RS=68kΩ
AM						
Sensitivity	US	20	15		µV	required input level to get 20mV rms output
Output Voltage	Vo2	60	120	160	mVrms	1kHz, 30%, Vin=1mV
Distortion-1	THD2		1.0	2.0	%	1kHz, 30%, Vin=1mV
Distortion-2	THD3		2.0	4.0	%	1kHz, 30%, Vin=1mV
S/N	S/N	40	48		dB	1kHz, 30%, Vin=1mV
AM OFF	Vo	-0.3		0.3	%	

### 13) μPC2710T (XA0449) RF Amplifier

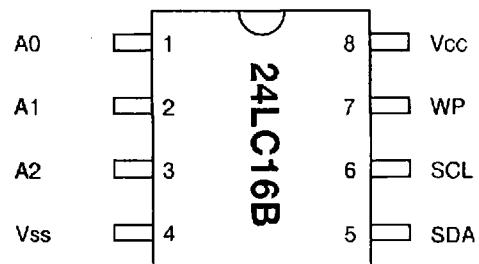
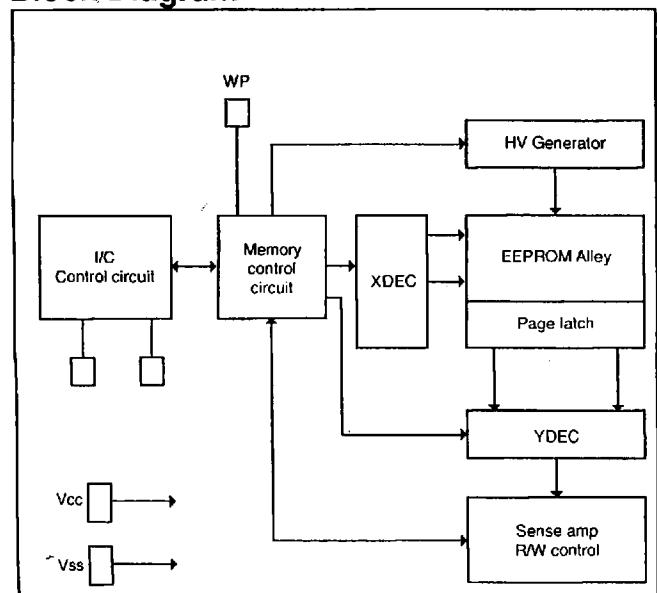
Parameter	Symbol	Condition	Ratings	Unit
Supply voltage	Vcc		5.0	V
Circuit current	Icc	Vcc=5V, no signal	22	mA
Power gain	GP	Vcc=5V, f=500MHz	33	dB
Saturated output power	Po(sat)	Vcc=5V, f=500MHz, Pin=-8dBm	+13.5	dBrn
Noise figure	NF	Vcc=5V, f=500MHz	3.5	dB
Upper frequency (-3dB)	fu	Vcc=5V, Reference freq. =100MHz	1000	MHz
Isolation	ISL	Vcc=5V, f=500MHz	39	dB
Input return loss	RLin	Vcc=5V, f=500MHz	6	dB
Output return loss	RLout	Vcc=5V, f=500MHz	12	dB
Gain flatness	ΔGp	Vcc=5V f=0.1 ~ 0.6GHz	± 0.8	dB

#### Test Circuit



### 14) 24LC16B (XA0351) 16K bits CMOS Serial EEPROM

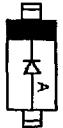
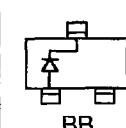
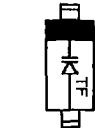
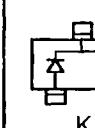
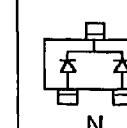
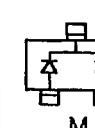
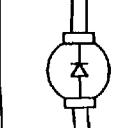
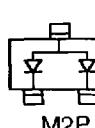
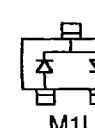
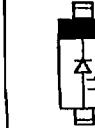
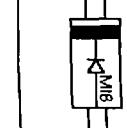
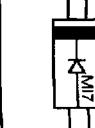
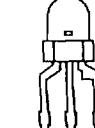
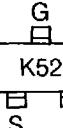
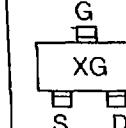
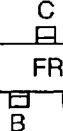
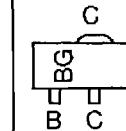
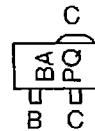
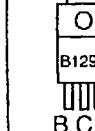
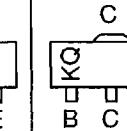
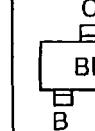
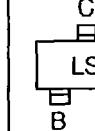
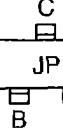
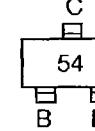
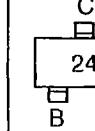
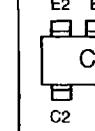
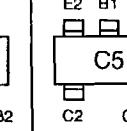
#### Block Diagram



Pin Name	Description
Vss	GND terminal
SDA	Serial address/data I/O
SCL	Serial clock
WP	Write protect
Vcc	+2.5V-5.5V power supply
A0, A1, A2	No connection

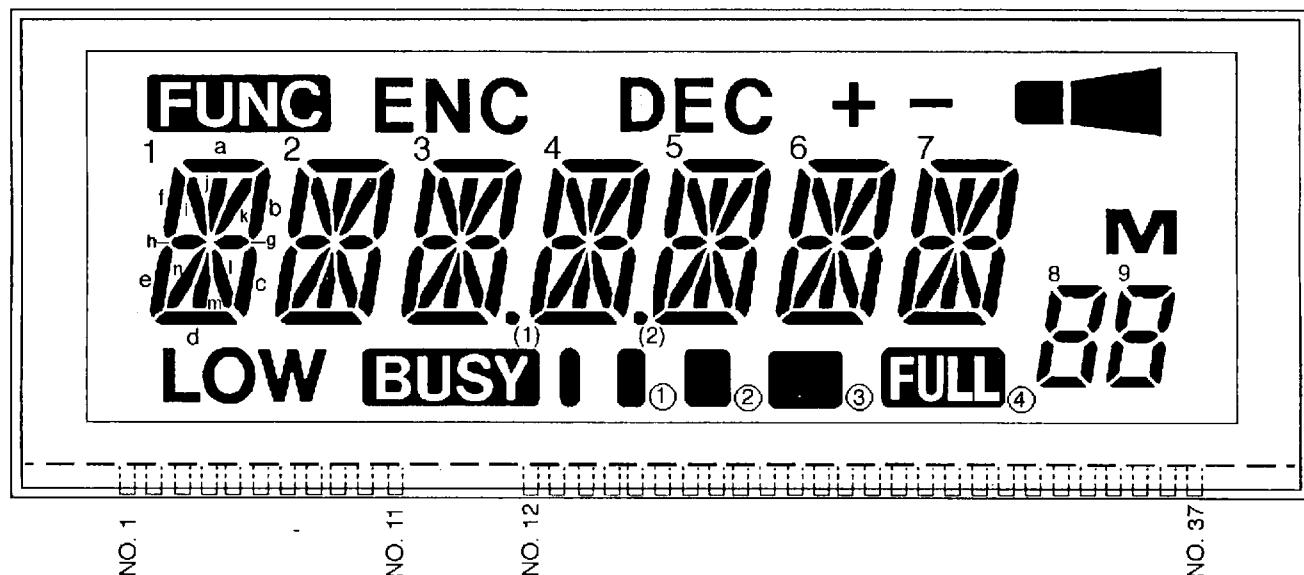
## 15) Transistor, Diode and LED Outline Drawings

Top View

1SS355 XD0254	1SV128 XD0112	1SV215 XD0132	1SV273 XD0298	DA204U XD0130	DAN202U XD0230	DAN235U XD0246	DTZ2.2A XD0145
	 BB	 T2	 T	 K	 N	 M	 1
DTZ5.1B XD0165	G3B XD0107	MA704WA XD0127	MA742 XD0250	MA8110H XD0255	MI308 XD0014	MI407 XD0013	VRPG3312X XL0051
 A2		 M2P	 M1U	 113	 M16	 M17	 Anode (Red) Cathode Anode (Green)
2SK508 XE0010	2SK880GR XE0021	3SK131V12 XE0028					
 G K52 S D	 G XG S D	 G2 G1 V12 D S					
2SA1576 XT0094	2SB1124 XT0148	2SB1132 XT0061	2SB1292F XT0112	2SC2873Y XT0113	2SC2954 XT0084	2SC4081 XT0095	2SC4081LNT XT0111
 C FR B E	 C BG B C E	 C ABPQ B C E	 O B1292 BCE	 MO B C E	 OY B C E	 BR B E	 LS B E
2SC4099 XT0096		DTA114YU XU0112	DTC114EU XU0131	UMC2 XU0060	UMC5 XU0152		
 C JP B E		 54 B E	 24 B E	 C E2 B E1 C2 C1/B2	 C5 E2 B1 E1 C2 C1/B2		

## 16) LCD

### LCD Pattern



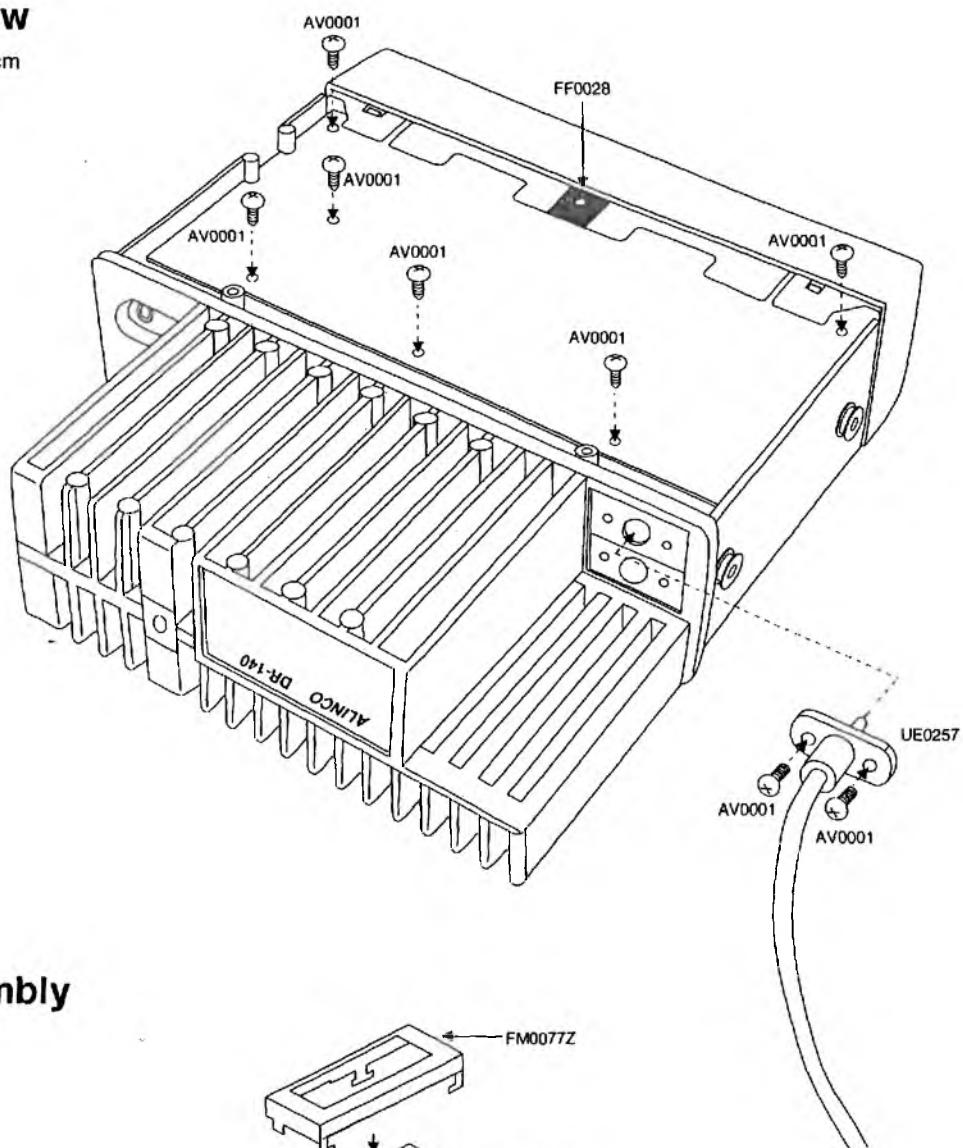
### LCD connection table

No.	COM.0	COM.1	COM.2	COM.3	No.	COM.0	COM.1	COM.2	COM.3
1	COM.0				21	8a	8b	8g	8c
2		COM.1			22	M	9f	9e	9d
3			COM.2		23	9a	9b	9g	9c
4				COM.3	24	7i	7h	7n	7m
5	COM.0				25	—	7f	7e	7d
6	1j	1k	1g	1l	26	6i	6h	6n	6m
7	1a	1b	1c	LOW	27	+	6f	6e	6d
8	2j	2k	2g	2l	28	5i	5h	5n	5m
9	2a	2b	2c	BUSY	29	DEC	5f	5e	5d
10	3j	3k	3g	3l	30	4i	4h	4n	4m
11	3a	3b	3c	● (1)	31	■ ②	4f	4e	4d
12	4j	4k	4g	4l	32	3i	3h	3n	3m
13	4a	4b	4c	● (2)	33	■ ①	3f	3e	3d
14	5j	5k	5g	5l	34	2i	2h	2n	2m
15	5a	5b	5c	■ ③	35	ENC	2f	2e	2d
16	6j	6k	6g	6l	36	1i	1h	1n	1m
17	6a	6b	6c	■ ④	37	FUNC	1f	1e	1d
18	7j	7k	7g	7l					
19	7a	7b	7c	FULL					
20	■ ①	8f	8e	8d					

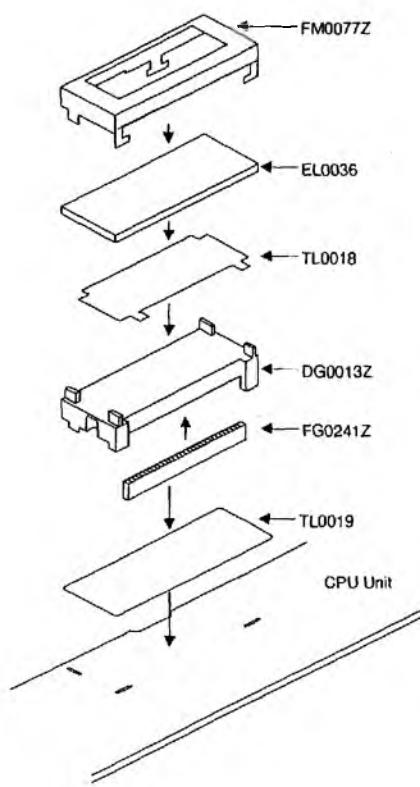
# EXPLODED VIEW

## 1) Bottom View

Screw Torque: 5kgcm

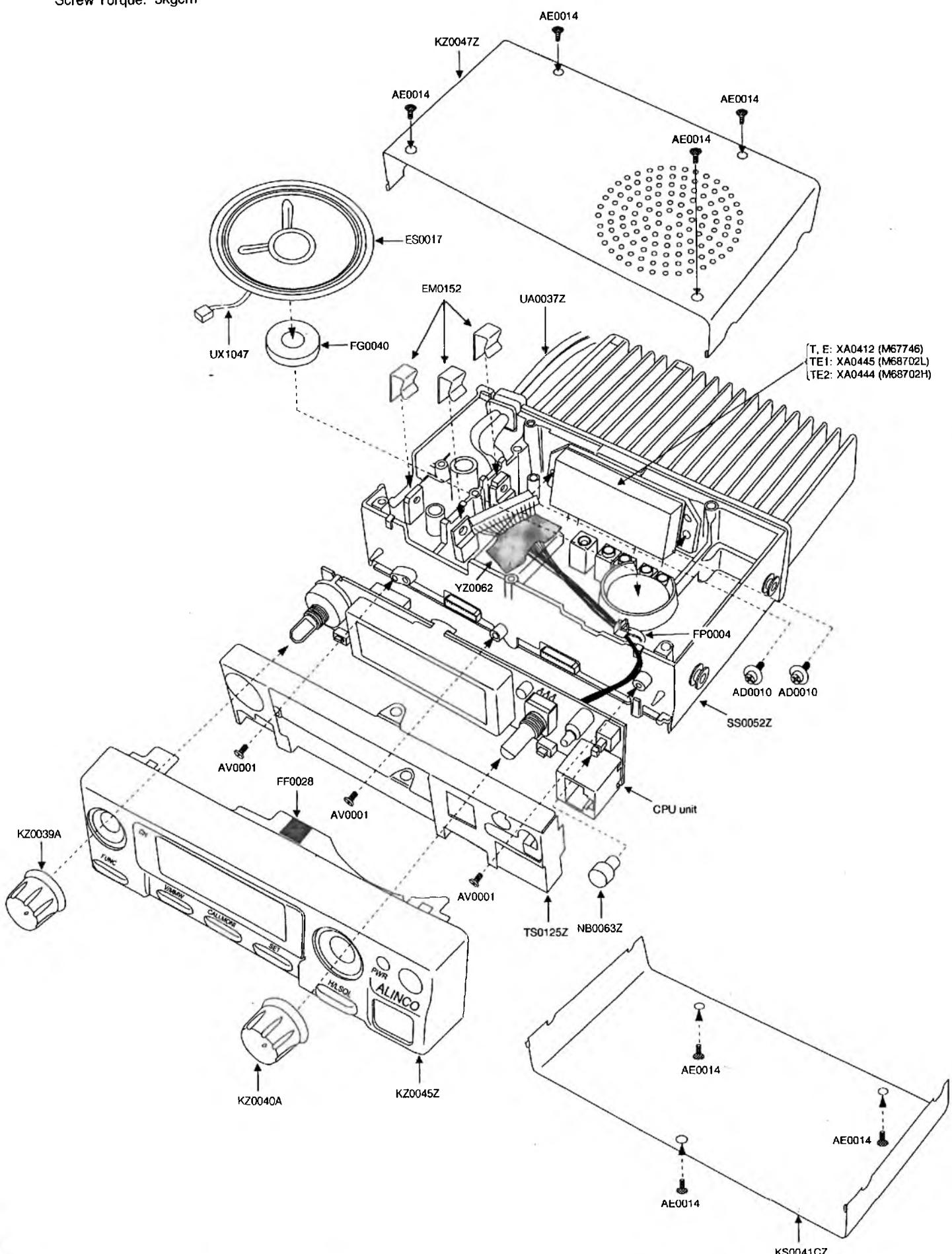


## 2) LCD Assembly



### **3) Top and Front Views**

Screw Torque: 5kgcm



# PARTS LIST

Main Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.	Ref. No.	Parts No.	Description	Parts Name	Ver.
C1	TZ0049	Silicon dumper 48LU	C1608CH1H102KTA	T/E	D1	XD0165	Diode	DT25.1B TT11	
	TZ0056	Silicon dumper UM1	C1608JB1H102KTA	T/E	D2	XD0132	Diode	1SV215 TPH4	
TT1002	C1608CH1H020CTA	Tube 1.0.7mm	C1608CH1H470JTA	T/E	D3	XD0132	Diode	1SV215 TPH4	
C1	CE0339	Electrolytic C.	C1608CH1H470JTA	T/E	D4	XD0130	Diode	DA204U T106	
C2	CE0339	Electrolytic C.	C1608CH1H20JUTA	T/E	D5	XD0132	Diode	1SV215 TPH4	
C3	CE0339	Electrolytic C.	C1608CH1H20JUTA	T/E	D6	XD0132	Diode	1SV215 TPH4	
C4	CU0307	Chip C.	C1608CH1H102KTA	T/E	D7	XD0132	Diode	DA204U T106	
C5	CU0307	Chip C.	C1608CH1H102KTA	T/E	D8	XD0130	Diode	MI407	
C6	CU0309	Chip C.	C1608CH1H102KTA	T/E	D9	XD0013	Diode	MI407	
C7	CE0339	Electrolytic C.	C1608CH1H102KTA	T/E	D10	XD0165	Diode	DT25.1B TT11	
C8	CU0344	Chip C.	C1608CH1H102KTA	T/E	D11	XD0013	Diode	MI407	
C9	CU0344	Chip C.	C1608CH1H150JTA	T/E	D12	XD0246	Diode	DAN235UT 106	
C10	CU3100	Chip C.	C1608JB1H102KTA	T/E	D13	XD0254	Diode	1SS335 TE17	
C11	CU3007	Chip C.	C1608JB1H102KTA	T/E	D14	XD0250	Diode	MA742 TX	
C12	CU3002	Chip C.	C1608JB1H102KTA	T/E	D15	XD0250	Diode	MA742 TX	
C13	CU3058	Chip C.	C1608CH1H102KTA	T/E	D16	XD0254	Diode	1SS335 TE17	
C14	CU3059	Chip C.	C1608CH1H102KTA	T/E	D17	XD0254	Diode	1SS335 TE17	
C15	CU3059	Chip C.	C1608CH1H150JTA	T/E	D18	XD0130	Diode	DA204U T106	
C16	CU3102	Chip C.	C1608CH1H102KTA	T/E	D19	XD0107	Diode	G3B	
C17	CU3047	Chip C.	C1608CH1H102KTA	T/E	D20	XD0246	Diode	DAN235UT 106	T/E
C18	CU3035	Chip C.	C1608CH1H102KTA	T/E	D21	XD0246	Diode	DAN235UT 106	T/E
C19	CU3017	Chip C.	C1608CH1H102KTA	T/E	D22	XD0254	Diode	1SS335 TE17	
C20	CU3049	Chip C.	C1608CH1H102KTA	T/E	D23	XD0130	Diode	DA204U T106	
C21	CU3018	Chip C.	C1608CH1H103KTA	T/E	D24	XC0022	Ceramic Filter	KSF455RL-12A	
C22	CU3018	Chip C.	C1608CH1H103KTA	T/E	D25	XD0130	Diode	DA204U T106	
C23	CU3049	Chip C.	C1608CH1H103KTA	T/E	D26	XC0022	Ceramic Filter	KSF455RL-12A	
C24	CU3008	Chip C.	C1608CH1H020CTA	T/E	D27	XA0223	IC	TK10930V/TL	
C25	CU3059	Chip C.	C1608JB1E104ZTA	T/E	D28	XA0412	IC	M87745	
C26	CU3047	Chip C.	TMC5A1C105MTR	T/E	D29	XA0444	IC	WB8702H	2
C27	CU3055	Chip C.	Chip C.	T/E	D30	XA0445	IC	WB8702L	1
C28	CU3047	Chip C.	Chip C.	T/E	D31	XA0449	IC	UPC2710T	
C29	CU3059	Chip C.	Chip C.	T/E	D32	XA0088	IC	M83218AFP/600E	
C30	CU3047	Chip C.	Chip C.	T/E	D33	XA0088	IC	MAC7808CT	
C31	CS0232	Chip C.	Chip C.	T/E	D34	XA0410	IC	LA4425A	
C32	CU3012	Chip C.	Chip C.	T/E	D35	XJ0038	Jack	HSJ2006-01-Q10	
C33	CU3047	Chip C.	Chip C.	T/E	D36	XJ0038	Jack	HSJ2006-01-Q10	
C34	CU3047	Chip C.	Chip C.	T/E	D37	XJ0038	Jack	HSJ2006-01-Q10	
C35	CU3036	Chip C.	Chip C.	T/E	D38	XJ0038	Jack	HSJ2006-01-Q10	
C36	CU3059	Chip C.	Chip C.	T/E	D39	XJ0038	Jack	HSJ2006-01-Q10	
C37	CU3015	Chip C.	Chip C.	T/E	D40	XJ0038	Jack	HSJ2006-01-Q10	
C38	CU3015	Chip C.	Chip C.	T/E	D41	XJ0038	Jack	HSJ2006-01-Q10	
C39	CU3049	Chip C.	Chip C.	T/E	D42	XJ0038	Jack	HSJ2006-01-Q10	
C40	CU3036	Chip C.	Chip C.	T/E	D43	XJ0038	Jack	HSJ2006-01-Q10	
C41	CU3035	Chip C.	Chip C.	T/E	D44	XJ0038	Jack	HSJ2006-01-Q10	
C42	CE0339	Electrolytic C.	16MV 10SW+TS	T/E	D45	XJ0038	Jack	HSJ2006-01-Q10	
C43	CU3059	Chip C.	16MV 10SW+TS	T/E	D46	XJ0038	Jack	HSJ2006-01-Q10	
C44	CU3047	Chip C.	16MV 10SW+TS	T/E	D47	XJ0038	Jack	HSJ2006-01-Q10	
C45	CU3049	Chip C.	16MV 10SW+TS	T/E	D48	XJ0038	Jack	HSJ2006-01-Q10	
C46	CU3021	Chip C.	16MV 10SW+TS	T/E	D49	XJ0038	Jack	HSJ2006-01-Q10	
C47	CU3059	Chip C.	16MV 10SW+TS	T/E	D50	XJ0038	Jack	HSJ2006-01-Q10	
C48	CU3035	Chip C.	16MV 10SW+TS	T/E	D51	XJ0038	Jack	HSJ2006-01-Q10	
C49	CU3035	Chip C.	16MV 10SW+TS	T/E	D52	XJ0038	Jack	HSJ2006-01-Q10	
C50	CU3047	Chip C.	16MV 10SW+TS	T/E	D53	XJ0038	Jack	HSJ2006-01-Q10	
C51	CU3019	Chip C.	16MV 10SW+TS	T/E	D54	XJ0038	Jack	HSJ2006-01-Q10	
C52	CU3023	Chip C.	16MV 10SW+TS	T/E	D55	XJ0038	Jack	HSJ2006-01-Q10	

Ref. No.	Parts No.	Description	Parts Name	Ver.	Ref. No.	Parts No.	Description	Parts Name	Ver.
C1	CU3021	Chip C.	C1608CH1H102KTA	T/E	C102	CU0301	Chip C.	C1608JB1H102KTA	T/E
	CU3035	Chip C.	C1608JB1H102KTA	T/E	C103	CU0328	Chip C.	C1608CH1H102KTA	T/E
	CU3019	Chip C.	C1608CH1H102KTA	T/E	C104	CU0335	Chip C.	C1608JB1H102KTA	T/E
	CU3019	Chip C.	C1608CH1H102KTA	T/E	C105	CU0335	Chip C.	C1608JB1H102KTA	T/E
	CU3016	Chip C.	C1608CH1H102KTA	T/E	C106	CS0049	Chip C.	C1608CH1H102KTA	T/E
	CU3013	Chip C.	C1608CH1H102KTA	T/E	C107	CU0335	Chip C.	C1608CH1H102KTA	T/E
	CU3016	Chip C.	C1608CH1H102KTA	T/E	C108	CS0049	Chip C.	C1608CH1H102KTA	T/E
	CU3016	Chip C.	C1608CH1H102KTA	T/E	C109	CU0335	Chip C.	C1608JB1H102KTA	T/E
	CU3035	Chip C.	C1608JB1H102KTA	T/E	C110	CS0049	Chip C.	C1608CH1H102KTA	T/E
	CU3035	Chip C.	C1608JB1H102KTA	T/E	C111	CS0049	Chip C.	C1608CH1H102KTA	T/E
	CU3035	Chip C.	C1608JB1H102KTA	T/E	C112	CU0335	Chip C.	C1608JB1H102KTA	T/E
	CU3011	Chip C.	C1608CH1H100CTA	T/E	C113	CE0339	Electrolytic C.	16MV 10SW+TS	
	CU3024	Chip C.	C1608CH1H121JTA	T/E	C114	CU0335	Chip C.	C1608JF1E104ZTA	
	CU3013	Chip C.	C1608CH1H150JTA	T/E	C115	CE0338	Electrolytic C.	25MV 4RTSW+TS	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C116	CU0359	Chip C.	C1608JF1E104ZTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C117	CE0343	Electrolytic C.	16MV 1000HC-T	
	CU3013	Chip C.	C1608CH1H102KTA	T/E	C118	CU0335	Chip C.	C1608JB1H102KTA	
	CU3013	Chip C.	C1608CH1H150JTA	T/E	C119	CU0335	Chip C.	C1608JF1E104ZTA	
	CU3013	Chip C.	C1608CH1H150JTA	T/E	C120	CU0331	Chip C.	C1608JB1H102KTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C121	CU0327	Chip C.	C1608CH1H221JTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C122	CU0335	Chip C.	C1608JB1H102KTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C123	CU0335	Chip C.	C1608JB1H102KTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C124	CU0323	Chip C.	C1608CH1H101JTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C125	CU0323	Chip C.	C1608JB1H101JTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C126	CU0323	Chip C.	C1608CH1H102KTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C127	CU0327	Chip C.	C1608CH1H221JTA	
	CU3035	Chip C.	C1608CH1H102KTA	T/E	C128	CU0329	Chip C.	C1608JF1E104ZTA	
	CU3065	Chip C.	C1608CH1H102KTA	T/E	C129	CU0329	Chip C.	C1608JB1C133KTA	
	CU3065	Chip C.	C1608CH1H102KTA	T/E	C130	CU0342	Electrolytic C.	16MV 470HC-TS	
	CC5062	Ceramic C.	RCC055SL180J-146AE	T/E	C131	CU0342	Electrolytic C.	16MV 10SW+TS	
	CC5064	Ceramic C.	RCC055SL120J-146AE	T/E	C132	CU0325	Chip C.	C1608JB1H102KTA	
	CC5059	Ceramic C.	RCC055SL270J-143AE	T/E	C133	CU0325	Chip C.	C1608CH1H221JTA	
	CC5065	Ceramic C.	RCC055SL270J-146AE	T/E	C134	CU0325	Chip C.	C1608CH1H221JTA	
	CC5065	Ceramic C.	RCC055SL180J-146AE	T/E	C135	CU0325	Chip C.	C1608CH1H221JTA	
	CC5065	Ceramic C.	RCC055SL270J-146AE	T/E	C136	CU0325	Chip C.	C1608CH1H221JTA	
	CC5059	Ceramic C.	RCC055SL120J-146AE	T/E	C137	CU0325	Chip C.	C1608CH1H221JTA	
	CC5060	Ceramic C.	RCC055SL120J-146AE	T/E	C138	CU0325	Chip C.	C1608CH1H221JTA	
	CC5060	Ceramic C.	RCC055SL120J-146AE	T/E	C139	CU0347	Chip C.	C1608CH1H221JTA	
	CC5060	Ceramic C.	RCC055SL120J-146AE	T/E	C140	CU0359	Chip C.	C1608CH1H221JTA	
	CC5062	Chip C.	C1608CH1H010CTA	T/E	C141	CU0311	Chip C.	C1608CH1H100CTA	
	CC5062	Chip C.	C1608CH1H010CTA	T/E	C142	CU0305	Chip C.	C1608CH1H221JTA	
	CC5062	Chip C.	C1608CH1H020CTA	T/E	C143	CU0305	Chip C.	C1608CH1H221JTA	
	CC5062	Chip C.	C1608CH1H020CTA	T/E	C144	CU0305	Chip C.	C1608CH1H221JTA	
	CC5062	Chip C.	C1608CH1H020CTA	T/E	C145	CU0323	Chip C.	C1608CH1H221JTA	
	CC5062	Chip C.	C1608CH1H020CTA	T/E	C146	CS0235	Chip C.	C1608CH1H102KTA	
	CC5062	Chip C.	C1608CH1H020CTA	T/E	C147	CU0359	Chip C.	C1608CH1H102KTA	
	CC5052	Ceramic C.	RCC055SL040C-L46AE	T/E	L1	QA0084	Coil L.	QKA85A	
	CU3035	Chip C.	C1608JB1H102KTA	T/E	L2	QA0084	Coil L.	QKA35D	
	CU3035	Chip C.	C1608JB1H102KTA	T/E	L3	QA0043	Coil L.	QKA45E	
	CU3015	Chip C.	C1608JB1H103KTA	T/E	L4	QA0084	Coil L.	QKA45E	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L5	QA0084	Coil L.	QKA45E	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L6	QA0084	Coil L.	QKA45E	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L7	QA0055	Coil L.	QKA056	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L8	QA0055	Coil L.	QKA057	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L9	QA0055	Coil L.	QKA057	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L10	QA0055	Coil L.	QKA057	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L11	QA0055	Coil L.	QKA057	
	CU3025	Chip C.	C1608JB1H104ZTA	T/E	L12	QA0055	Coil L.	QKA057	
	CU3025	Chip C.	C160						

## Main Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.	Ref. No.	Parts No.	Description	Parts Name	Ver.
L21	QKA95D	Air Core Coil	MR3.0 9.5T 0.6	T/E/2	R22	RK3038	Chip R.	ERJ3GSYJ102V	
L21	QKA75G	Air Core Coil	MRS.0 7.5T 0.6	1	R23	RK3054	Chip R.	ERJ3GSYJ223V	
L22	QC0063	Chip L.	NL322522T047J		R24	RK3030	Chip R.	ERJ3GSYJ221V	
L23	QL0012	Coil	QL0012	E	R25	RK3045	Chip R.	ERJ3GSYJ392V	
Q1	XT0095	Transistor	2SC4081 T106R		R26	RK3046	Chip R.	ERJ3GSYJ472V	
Q2	XT0095	Transistor	2SC4081 T106R		R27	RK3062	Chip R.	ERJ3GSYJ104V	
Q3	XT0095	Transistor	2SC4081 T106R		R28	RK3026	Chip R.	ERJ3GSYJ101V	
Q4	XT0095	Transistor	2SC4081 T106R		R29	RK3054	Chip R.	ERJ3GSYJ223V	
Q5	XE0028	FET	3SK131V12-T1		R30	RK3050	Chip R.	ERJ3GSYJ103V	
Q6	XE0028	FET	3SK131V12-T1		R31	RK3052	Chip R.	ERJ3GSYJ153V	
Q7	XT0095	Transistor	2SC4099 T106N	T/E	R32	RK3036	Chip R.	ERJ3GSYJ681V	
Q8	XU0131	Transistor	DTCl14EU T106	T/E	R33	RK3082	Chip R.	ERJ3GSYJ104V	
Q9	XE0021	FET	2SK880GR TE85L	T/E	R34	RK3062	Chip R.	ERJ3GSYJ104V	
Q10	XU0152	Transistor	UMCSTR	T/E	R35	RK3021	Chip R.	ERJ3GSYJ390V	
Q11	XT0095	Transistor	2SC4099 T106N	T/E	R36	RK3022	Chip R.	ERJ3GSYJ470V	
Q12	XU0112	Transistor	DTA114YU T106		R37	RK3038	Chip R.	ERJ3GSYJ102V	
Q13	XT0084	Transistor	2SC2954 T1		R38	RK3042	Chip R.	ERJ3GSYJ222V	
Q14	XT0112	Transistor	2SB1292F		R39	RK3058	Chip R.	ERJ3GSYJ473V	T/E
Q15	XE0021	FET	2SK880GR TE85L		R40	RK3062	Chip R.	ERJ3GSYJ104V	T/E
Q16	XT0095	Transistor	2SC4081 T106R		R41	RK3054	Chip R.	ERJ3GSYJ223V	
Q17	XT0094	Transistor	2SA1576 T106R		R42	RK3062	Chip R.	ERJ3GSYJ104V	
Q18	XT0061	Transistor	2SB1132T 100Q		R43	RK3082	Chip R.	ERJ3GSYJ104V	
Q19	XU0131	Transistor	DTCl14EU T106		R44	RK3057	Chip R.	ERJ3GSYJ393V	
Q20	XU0131	Transistor	DTCl14EU T106		R45	RK3050	Chip R.	ERJ3GSYJ103V	T/E
Q22	XU0131	Transistor	DTCl14EU T106		R46	RK3026	Chip R.	ERJ3GSYJ101V	T/E
Q23	XT0148	Transistor	2SB1124-TD		R47	RK3074	Chip R.	ERJ3GSYJ105V	
Q24	XU0152	Transistor	UMCSTR		R49	RK3047	Chip R.	ERJ3GSYJ562V	
Q25	XT0095	Transistor	2SC4081 T106R		R50	RK3034	Chip R.	ERJ3GSYJ471V	T/E
Q26	XU0131	Transistor	DTCl14EU T106		R51	RK3066	Chip R.	ERJ3GSYJ224V	T/E
Q27	XU0152	Transistor	UMCSTR		R52	RK3074	Chip R.	ERJ3GSYJ105V	T/E
Q28	XT0095	Transistor	2SC4081 T106R	T/E	R53	RK3001	Chip R.	ERJ3GSY0R00V	
R1	RK3026	Chip R.	ERJ3GSYJ101V		R54	RK3001	Chip R.	ERJ3GSYJ101V	
R2	RK3030	Chip R.	ERJ3GSYJ221V		R55	RK3026	Chip R.	ERJ3GSYJ101V	
R3	RK3026	Chip R.	ERJ3GSYJ101V		R56	RK4018	Chip R.	ERJ-12YJ220U	
R4	RK3042	Chip R.	ERJ3GSYJ222V		R57	RK3014	Chip R.	ERJ3GSYJ100V	
R5	RK3043	Chip R.	ERJ3GSYJ272V		R58	RK3026	Chip R.	ERJ3GSYJ011V	
R6	RK3043	Chip R.	ERJ3GSYJ272V		R59	RK3026	Chip R.	ERJ3GSYJ101V	
R7	RK3026	Chip R.	ERJ3GSYJ101V		R60	RK4024	Chip R.	ERJ-12YJ680V	
R8	RK3026	Chip R.	ERJ3GSYJ101V		R61	RK3014	Chip R.	ERJ3GSYJ100V	
R9	RK3071	Chip R.	ERJ3GSYJ564V		R62	RK0020	Chip R.	ERJ6GEYJ151V	
R10	RK3054	Chip R.	ERJ3GSYJ223V		R63	RK3017	Chip R.	ERJ3GSYJ180V	
R11	RK3026	Chip R.	ERJ3GSYJ101V		R64	RK3034	Chip R.	ERJ3GSYJ471V	
R12	RK3058	Chip R.	ERJ3GSYJ473V		R65	RK3062	Chip R.	ERJ3GSYJ104V	
R13	RK3071	Chip R.	ERJ3GSYJ564V		R66	RK3017	Chip R.	ERJ3GSYJ180V	
R14	RK3038	Chip R.	ERJ3GSYJ102V		R68	RK0001	Chip R.	ERJ6GEYJ100V	
R15	RK3058	Chip R.	ERJ3GSYJ473V		R69	RK3031	Chip R.	ERJ3GSYJ271V	
R16	RK3058	Chip R.	ERJ3GSYJ473V		R70	RK3031	Chip R.	ERJ3GSYJ271V	
R17	RK3057	Chip R.	ERJ3GSYJ393V		R71	RK3031	Chip R.	ERJ3GSYJ271V	
R18	RK3054	Chip R.	ERJ3GSYJ223V		R72	RK3031	Chip R.	ERJ3GSYJ271V	
R19	RK3034	Chip R.	ERJ3GSYJ471V		R73	RK3062	Chip R.	ERJ3GSYJ104V	
R20	RK3064	Chip R.	ERJ3GSYJ154V		R74	RK3050	Chip R.	ERJ3GSYJ103V	
R21	RK3042	Chip R.	ERJ3GSYJ222V		R75	RK3051	Chip R.	ERJ3GSYJ123V	
					R76	RK3038	Chip R.	ERJ3GSYJ102V	
					R77	RK3050	Chip R.	ERJ3GSYJ103V	

Main Unit / Packing

Ref. No.	Parts No.	Description	Parts Name	Ver.	Ref. No.	Parts No.	Description	Parts Name	Ver.
R78	RK3052	Chip R.	ERJ3GSYJ153V		R133	RD1013	Resistor	RD1013	T/1/2
R79	RK4026	Chip R.	ERJ-12YJ101V		R134	RD1013	Resistor	RD1013	T/1/2
R80	RK3050	Chip R.	ERJ3GSYJ103V		R136	RK3052	Chip R.	ERJ3GSYJ153V	
R81	RK3050	Chip R.	ERJ3GSYJ103V		R137	RK3054	Chip R.	ERJ3GSYJ223V	
R82	RK3062	Chip R.	ERJ3GSYJ104V		R140	RH0039	Chip R.	ERJ6GEYJ222V	2
R83	RK3043	Chip R.	ERJ3GSYJ272V		TC1	CT0012	Trimmer	CTZ10AW	
R84	RK3042	Chip R.	ERJ3GSYJ222V		TH2	XS0013	Thermistor	TD5-C268DH	
R85	RK3060	Chip R.	ERJ3GSYJ683V		VR1	RH0108	Trim Pot	EVM1YSX50B15	
R86	RK3060	Chip R.	ERJ3GSYJ683V		VR2	RH0103	Trim Pot	EVM1YSX50B14	
R87	RK3042	Chip R.	ERJ3GSYJ222V		VR3	RH0050	Trim Pot	MVR32HXBRN473	
R88	RK3042	Chip R.	ERJ3GSYJ222V		VR4	RH0103	Trim Pot	EVM1YSX50B14	
R89	RK4034	Chip R.	ERJ-12YJ471U		VR5	RH0103	Trim Pot	EVM1YSX50B14	
R90	RK3049	Chip R.	ERJ3GSYJ822V		VR6	RH0061	Trim Pot	MVR32HXBRN472	
R91	RK3057	Chip R.	ERJ3GSYJ393V		X1	XK0001	Ceramic Disc	CDB455C7	
R92	RK3062	Chip R.	ERJ3GSYJ104V		X2	XQ0058A	Crystal	UM5 30.395MHz	
R93	RK3050	Chip R.	ERJ3GSYJ103V		X3	XQ0054Z	Crystal	HC49U 12.8MHz	
R94	RK3026	Chip R.	ERJ3GSYJ101V		XF1	XF0014Z	Crystal Filter	UM1 30.85MHz	
R95	RK3038	Chip R.	ERJ3GSYJ102V		SD0034			Earth Spring	
R95	RK3050	Chip R.	ERJ3GSYJ103V	T/E/1	UE0257			Antenna Cable	
R97	RK3054	Chip R.	ERJ3GSYJ223V						
R98	RK3023	Chip R.	ERJ3GSYJ560V						
R99	RK3030	Chip R.	ERJ3GSYJ221V						
R100	RK3062	Chip R.	ERJ3GSYJ104V						
R101	RK3001	Chip R.	ERJ3GSYJ000V						
R102	RK3044	Chip R.	ERJ3GSYJ332V						
R103	RK3050	Chip R.	ERJ3GSYJ103V						
R104	RK3001	Chip R.	ERJ3GSYJ000V						
R105	RK3053	Chip R.	ERJ3GSYJ183V						
R106	RK3054	Chip R.	ERJ3GSYJ223V						
R107	RK3038	Chip R.	ERJ3GSYJ022V						
R108	RK3041	Chip R.	ERJ3GSYJ182V						
R109	RK3046	Chip R.	ERJ3GSYJ472V						
R110	RK3044	Chip R.	ERJ3GSYJ332V						
R111	RK3050	Chip R.	ERJ3GSYJ103V						
R112	RK4034	Chip R.	ERJ-12YJ471U						
R113	RK3043	Chip R.	ERJ3GSYJ272V						
R115	RK3050	Chip R.	ERJ3GSYJ103V						
R116	RK3050	Chip R.	ERJ3GSYJ103V						
R117	RK3042	Chip R.	ERJ3GSYJ222V	T/E					
R118	RK3001	Chip R.	ERJ3GSYJ000V	1/2					
R119	RK3042	Chip R.	ERJ3GSYJ222V	T/E					
R120	RK3042	Chip R.	ERJ3GSYJ222V	T/E					
R121	RK3001	Chip R.	ERJ3GSYJ000V	1/2					
R122	RK3042	Chip R.	ERJ3GSYJ222V	T/E					
R123	RK3042	Chip R.	ERJ3GSYJ222V	T/E					
R124	RK3001	Chip R.	ERJ3GSYJ000V						
R125	RK3062	Chip R.	ERJ3GSYJ104V	T/E					
R126	RK3050	Chip R.	ERJ3GSYJ103V	T/E					
R127	RK3050	Chip R.	ERJ3GSYJ103V						
R128	RK3038	Chip R.	ERJ3GSYJ102V						
R129	RK3058	Chip R.	ERJ6GEYJ473V						
R130	RK3026	Chip R.	ERJ3GSYJ101V						
R131	RK3038	Chip R.	ERJ3GSYJ102V						
R132	RK3067	Chip R.	ERJ3GSYJ274V						

## CPU Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.	Ref. No.	Parts No.	Description	Parts Name	Ver.
CPU Unit									
	FM0077Z		LCD Holder DR130		IC304	XA0238	IC	AN78L05M E1	
	DG0013Z		LCD Light DR130		IC305	XA0208	IC	RH5VA34AA T1	
	FG0241Z		LCD Rubber Connector		IC306	XA0198	IC	RH5VA32AA T1	
	TL0018		LCD Filter		JK301	UJ0037	Jack	C4T-U1-PC	
	TL0019		LCD Filter		JW301	MPAL05GG	Wire	#30PH1-050-H1	1/2
	FP0110		LED Spacer		JW302	MPAL05GG	Wire	#30PH1-050-H1	1/2
	TT1002		Tube 1.0 6mm		JW303	MPAL05GG	Wire	#30PH1-050-H1	1/2
C301	CU3035	Chip C.	C1608JB1H102KTA		JW304	MACL04GG	Wire	#30AH1-040-H1	T
C302	CU3035	Chip C.	C1608JB1H102KTA		LP301	EP0003	Lamp	BQ031 30403A	
C303	CU3035	Chip C.	C1608JB1H102KTA		LP302	EP0003	Lamp	BQ031 30403A	
C304	CU3047	Chip C.	C1608JB1H103KTA		Q301	XU0112	Transistor	DTA114YU T106	
C305	CS0237	Chip Tantal	TMCM1A475MTR		Q302	XU0112	Transistor	DTA114YU T106	
C306	CU3101	Chip C.	C1608JB1C473KTA		Q303	XT0095	Transistor	2SC4081 T106R	
C307	CU3101	Chip C.	C1608JB1C473KTA		Q304	XT0095	Transistor	2SC4081 T106R	
C308	CU3035	Chip C.	C1608JB1H102KTA		Q305	XU0060	Transistor	UMC2 TR	
C309	CU3035	Chip C.	C1608JB1H102KTA		Q306	XT0113	Transistor	2SC2873Y TE12R	
C310	CS0237	Chip Tantal	TMCM1A475MTR		Q307	XT0095	Transistor	2SC4081 T106R	
C311	CU3085	Chip C.	C1608CH1H300JT-A		Q308	XU0131	Transistor	DTC114EU T106	
C312	CE0308	Electrolytic C.	6.3CV 100BS		R301	RK3001	Chip R.	ERJ3GSY0R00V	
C313	CU3059	Chip C.	C1608JF1E104ZTA		R302	RK3038	Chip R.	ERJ3GSYJ102V	
C314	CU3085	Chip C.	C1608CH1H300JT-A		R304	RK3038	Chip R.	ERJ3GSYJ102V	
C315	CU3047	Chip C.	C1608JB1H103KTA		R305	RK3026	Chip R.	ERJ3GSYJ101V	
C316	CU3049	Chip C.	C1608JB1E153KTA		R306	RK3038	Chip R.	ERJ3GSYJ102V	
C317	CU3049	Chip C.	C1608JB1E153KTA		R307	RK3034	Chip R.	ERJ3GSYJ471V	
C318	CU3043	Chip C.	C1608JB1H472KTA		R308	RK3038	Chip R.	ERJ3GSYJ102V	
C319	CU3043	Chip C.	C1608JB1H472KTA		R309	RK3058	Chip R.	ERJ3GSYJ473V	
C320	CU3047	Chip C.	C1608JB1H103KTA		R310	RK3038	Chip R.	ERJ3GSYJ102V	
C321	CU3111	Chip C.	C1068JB1C104MTA		R311	RK3043	Chip R.	ERJ3GSYJ272V	
C322	CU3059	Chip C.	C1608JF1E104ZTA		R312	RK3038	Chip R.	ERJ3GSYJ102V	
C323	CU3051	Chip C.	C1608JB1E223KTA		R313	RK3034	Chip R.	ERJ3GSYJ471V	
C324	CE0312	Electrolytic C.	ECEV1CA100R		R314	RK3072	Chip R.	ERJ3GSYJ684V	
C325	CU3035	Chip C.	C1608JB1H102KTA		R315	RK3038	Chip R.	ERJ3GSYJ102V	
C325	CE0312	Electrolytic C.	ECEV1CA100R		R316	RK3038	Chip R.	ERJ3GSYJ102V	
C327	CU3051	Chip C.	C1608JB1E223KTA		R317	RK3038	Chip R.	ERJ3GSYJ102V	
C328	CU3059	Chip C.	C1608JF1E104ZTA		R318	RK3050	Chip R.	ERJ3GSYJ103V	
C329	CS0372	Chip Tantal	TMCMB1C106MTR		R319	RK3059	Chip R.	ERJ3GSYJ563V	
C330	CU3019	Chip C.	C1608CH1H470JTA		R320	RK3046	Chip R.	ERJ3GSYJ472V	
C331	CS0220	Chip Tantal	TMCM1A225MTR		R321	RK3074	Chip R.	ERJ3GSYJ105V	
C332	CS0220	Chip Tantal	TMCM1A225MTR		R322	RK3026	Chip R.	ERJ3GSYJ101V	
C333	CU3031	Chip C.	C1608JB1H471KTA		R323	RK3050	Chip R.	ERJ3GSYJ103V	
C334	CU3031	Chip C.	C1608JB1H471KTA		R324	RK3046	Chip R.	ERJ3GSYJ472V	
CN301	UX1201	Wire	Wire DR140TE1.	1/2	R325	RK3038	Chip R.	ERJ3GSYJ102V	
CN302	UE0192	Connector	11R JE		R326	RK3001	Chip R.	ERJ3GSY0R00V	
CN303	UE0192	Connector	11R JE		R327	RK3074	Chip R.	ERJ3GSYJ105V	
CN304	UE0170	Connector	B9B ZR		R328	RK3046	Chip R.	ERJ3GSYJ472V	
D301	XL0051	LED	VRPG3312X		R329	RK3044	Chip R.	ERJ3GSYJ332V	
D302	XD0254	Diode	1SS355 TE17		R330	RK3062	Chip R.	ERJ3GSYJ104V	
D303	XD0127	Diode	MA704WA TX		R331	RK3038	Chip R.	ERJ3GSYJ102V	
D304	XD0255	Diode	MA8110H TX		R332	RK3050	Chip R.	ERJ3GSYJ103V	
D305	XD0254	Diode	1SS355 TE17		R333	RK3038	Chip R.	ERJ3GSYJ102V	
EL301	EL0036	LCD	LCD HLC8943-013400		R334	RK3050	Chip R.	ERJ3GSYJ103V	
IC302	XA0446	IC	M38223M4-08H		R335	RK3001	Chip R.	ERJ3GSY0R00V	
IC303	XA0351	IC	24LC16BT-VSN		R337	RK3054	Chip R.	ERJ3GSYJ223V	
					R338	RK3068	Chip R.	ERJ3GSYJ334V	

DR140T: T, DR140E: E, DR140TE1: 1, DR140TE2: 2

## CPU Unit / SP unit / VCO Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.	Ref. No.	Parts No.	Description	Parts Name	Ver.
R339	RK3062	Chip R.	ERJ3GSYJ104V		C201	TS116AZ	Casa	VCO Case	
R341	RK3001	Chip R.	ERJ3GSYR00V	T/E	C202	CU3103	Chip C.	C1608UJ1H150JTA	
R342	RK3038	Chip R.	ERJ3GSYJ102V		C203	CU3106	Chip C.	C1608UJ1H390JTA	
R343	RK3046	Chip R.	ERJ3GSYJ472V		C204	CU3035	Chip C.	C1608JB1H102KTA	
R344	RK3050	Chip R.	ERJ3GSYJ103V		C205	CU3035	Chip C.	C1608JB1H102KTA	
R345	RK3054	Chip R.	ERJ3GSYJ223V		C206	CU3101	Chip C.	C1608BIC473KTA	
R346	RK3050	Chip R.	ERJ3GSYJ103V		C207	CU3035	Chip C.	C1608JB1H102KTA	
R347	RK3062	Chip R.	ERJ3GSYJ104V		C208	CS0235	Chip Tantal	TMCSA1V334MTR	
R348	RK3038	Chip R.	ERJ3GSYJ102V	E	C209	CU3043	Chip C.	C1608JB1H472KTA	
R349	RK3001	Chip R.	ERJ3GSYR00V		C210	CU3043	Chip C.	C1608JB1H472KTA	
R350	RK3001	Chip R.	ERJ3GSYJ0R00V	T	C211	CS0371	Chip Tantal	TMCMCA1C335MTR	
R353	RK3102	Chip R.	ERJ3GSYJ203V		C212	CS0371	Chip Tantal	TMCMCA1C335MTR	
R355	RK3102	Chip R.	ERJ3GSYJ203V		C213	CU3023	Chip C.	C1608CH1H101JTA	T/E
R356	RK3050	Chip R.	ERJ3GSYJ103V		C213	CU3025	Chip C.	C1608CH1H151JTA	1
R357	RK3050	Chip R.	ERJ3GSYJ103V		C213	CU3024	Chip C.	C1608CH1H121JTA	2
R358	RK3062	Chip R.	ERJ3GSYJ104V		C214	CU3043	Chip C.	C1608JB1H472KTA	
R360	RK3102	Chip R.	ERJ3GSYJ203V		C216	CU3035	Chip C.	C1608JB1H102KTA	
R361	RK3050	Chip R.	ERJ3GSYJ103V		C217	CS0217	Chip Tantal	TMCMCA1A226MTR	
R363	RK3058	Chip R.	ERJ3GSYJ473V		C218	CU3003	Chip C.	C1608CH1H020CTA	
R364	RK3055	Chip R.	ERJ3GSYJ474V		C219	CU3035	Chip C.	C1608JB1H102KTA	
R365	RK3070	Chip R.	ERJ3GSYJ474V		C221	CU3031	Chip C.	C1608JB1H471KTA	
R366	RK3058	Chip R.	ERJ3GSYJ473V		C223	CU3015	Chip C.	C1608CH1H220JTA	
R368	RK3102	Chip R.	ERJ3GSYJ203V		C224	CU3035	Chip C.	C1608JB1H102KTA	
R369	RK3050	Chip R.	ERJ3GSYJ103V		C225	CU3035	Chip C.	C1608JB1H102KTA	
R370	RK3102	Chip R.	ERJ3GSYJ203V		C226	CU3059	Chip C.	C1608F1E104ZTA	
R371	RK3038	Chip R.	ERJ3GSYJ102V		C229	CU3035	Chip C.	C1608JB1H102KTA	
R372	RK0014	Chio R.	ERJ6GEYJ680V		C230	CS0216	Chip Tantal	TMCMCA1A06MTR	
R373	RK3042	Chip R.	ERJ3GSYJ222V		C232	CU3035	Chip C.	C1608JB1H102KTA	
R375	RK3070	Chip P.	ERJ3GSYJ474V		C233	CU3035	Chip C.	C1608JB1H102KTA	
R376	RK3046	Chip R.	ERJ3GSYJ472V		C245	CU3035	Chip C.	C1608JB1H102KTA	
R377	RK3055	Chip R.	ERJ3GSYJ273V		C246	CS0220	Chip Tantal	TMCMCA1C225MTR	
R378	RK3070	Chip R.	ERJ3GSYJ474V		C247	CU3007	Chip C.	C1608CH1H060CTA	1
R379	RK3001	Chip R.	ERJ3GSYR00V		C247	CU3005	Chip C.	C1608CH1H040CTA	2
R380	RK3058	Chip R.	ERJ3GSYJ473V		C247	CU3006	Chip C.	C1608CH1H050CTA	T/E
R381	RK3070	Chip R.	ERJ3GSYJ474V		C248	CU3001	Chip C.	C1608CH1H0R5CTA	
R382	RK3034	Chip R.	ERJ3GSYJ471V		C249	CU3022	Chip C.	C1608CH1H820JTA	
R383	RK3034	Chip R.	ERJ3GSYJ471V		CN201	UE0188	Connector	B9P-BC-2	
RE301	UR0002	Encoder	EVOWQGF1524B		CN202	UE0185	Connector	B6P-BC-2	
SW301	UU0025	Switch	SKQMAL		D201	XD0298	Diode	1SV273(TPH3)	
SW302	UU0015	Switch	SKQD 901		D202	XD0298	Diode	1SV273(TPH3)	
SW303	UU0015	Switch	SKQD 901		D205	XD0112	Diode	1SV128 TE85L	
SW304	UU0015	Switch	SKQD 901		D206	XD0230	Diode	DAN202U T106	
SW305	UU0025	Switch	SKQMAL		D207	XD0298	Diode	1SV273(TPH3)	
SW306	UQ0011	Switch	ESB64801		IC201	XA0235	IC	M56760FP	
VR301	RV0035	Trim Pot	EVUF2JKF4B14		L203	QC0042	Chip L.	NL322522T1RBJ	
X301	XQ0091	Crystal	38C 4.9152MHZ		L204	QC0042	Chip L.	NL322522T1R&J	
	UP0317A		DR140 P.C.B.		L205	QC0045	Chip L.	NL322522T3R3J	
					L202	QA0067	Coil	100M OSC-2-T	

## SP Unit

ES0017	Speaker	VS-57-0814-1.5W	
FG0040		Speaker Cushion	
UX1047	Wire	Harness DR130	

DR140T: T, DR140E: E, DR140TE1: 1, DR140TE2: 2

## VCO Unit / Mechanical Parts / EJ-20u

Ref. No.	Parts No.	Description	Parts Name	Ver.
Q201	XE0010	FET	2SK508K52 T2B	
Q202	XT0111	Transistor	2SC4081LN T106S	
Q203	XT0111	Transistor	2SC4081LN T106S	
Q204	XT0096	Transistor	2SC4099 T106N	
Q207	XU0131	Transistor	DTC114EU T106	
Q208	XU0131	Transistor	DTC114EU T106	
Q206	XU0060	Transistor	UMC2 TR	
R201	RK3038	Chip R.	ERJ3GSYJ102V	
R202	RK3038	Chip R.	ERJ3GSYJ102V	
R203	RK3038	Chip R.	ERJ3GSYJ102V	
R206	RK3046	Chip R.	ERJ3GSYJ472V	
R207	RK3058	Chip R.	ERJ3GSYJ473V	
R208	RK3034	Chip R.	ERJ3GSYJ471V	
R210	RK3040	Chip R.	ERJ3GSYJ152V	
R212	RK3030	Chip R.	ERJ3GSYJ221V	
R213	RK3041	Chip R.	ERJ3GSYJ182V	
R214	RK3022	Chip R.	ERJ3GSYJ470V	
R216	RK3026	Chip R.	ERJ3GSYJ101V	
R217	RK3018	Chip R.	ERJ3GSYJ220V	
R218	RK3050	Chip R.	ERJ3GSYJ103V	
R219	RK3038	Chip R.	ERJ3GSYJ102V	
R221	RK3001	Chip R.	ERJ3GSY0R00V	
R224	RK3034	Chip R.	ERJ3GSYJ471V	
R225	RK3054	Chip R.	ERJ3GSYJ223V	
R226	RK3026	Chip R.	ERJ3GSYJ101V	
R228	RK3041	Chip R.	ERJ3GSYJ182V	
R229	RK3026	Chip R.	ERJ3GSYJ101V	
R231	RK3058	Chip R.	ERJ3GSYJ473V	
R232	RK3058	Chip R.	ERJ3GSYJ473V	
R233	RK3040	Chip R.	ERJ3GSYJ152V	
R234	RK3046	Chip R.	ERJ3GSYJ472V	
R235	RK3026	Chip R.	ERJ3GSYJ101V	
R236	RK3046	Chip R.	ERJ3GSYJ472V	
R237	RK3066	Chip R.	ERJ3GSYJ224V	
R238	RK3058	Chip R.	ERJ3GSYJ473V	

## Mechanical Parts

	AD0010		D3+8FeNi	
	AE0014		B2.6+8FeBC	
	AV0001		B2.6+6FeNi	
	FF0028		Nonwovens	
	FM0152		IC Spring	
	KS0041CZ		Bottom Case	
	KZ0039A		Dial Knob	
	KZ0040A		Volume Knob	
	KZ0045Z		Front Panel	
	KZ0047Z		Top Case	
	NB0063Z		Power Switch Knob	
	SS0052Z		Chassis	
	TS0125Z		Front Shield Case	
	FP0004		Cable Tie	
				1/2

Ref. No.	Parts No.	Description	Parts Name	Ver.
EJ-20u				
C501	CS0236	Chip Tantal	TMCMAOJ885MTR	
C502	CU3059	Chip C.	C1608JF1E104ZTA	
C503	CS0230	Chip Tantal	TMCMA1E105MTR	
C504	CU3059	Chip C.	C1608JF1E104ZTA	
C505	CS0230	Chip Tantal	TMCMA1E105MTR	
C506	CS0230	Chip Tantal	TMCMA1E105MTR	
C507	CS0230	Chip Tantal	TMCMA1E105MTR	
C508	CU3023	Chip C.	C1608CH1H101JTA	
C509	CS0237	Chip Tantal	TMCMA1A475MTR	
C510	CU3019	Chip C.	C1608CH1H470JTA	
C511	CU3035	Chip C.	C1608JB1H102KTA	
C512	CU3015	Chip C.	C1608CH1H220KTA	
C513	CU3015	Chip C.	C1608CH1H220KTA	
CN501	UX1050	Wire	EJ20u	
IC501	XA0239	IC	AK2341	
Q501	XT0095	Transistor	2SC4081 T106R	
R501	RK3040	Chio R.	ERJ3GSYJ152V	
R502	RK3022	Chip R.	ERJ3GSYJ470V	
R503	RK3067	Chip R.	ERJ3GSYJ274V	
R504	RK3038	Chip R.	ERJ3GSYJ102V	
R505	RK3051	Chip R.	ERJ3GSYJ123V	
R506	RK3049	Chip R.	ERJ3GSYJ822V	
R507	RK3067	Chip R.	ERJ3GSYJ274V	
R508	RK3047	Chip R.	ERJ3GSYJ562V	
R509	RK3068	Chip R.	ERJ3GSYJ334V	
R510	RK3054	Chip R.	ERJ3GSYJ223V	
R511	RK3054	Chip R.	ERJ3GSYJ223V	
R512	RK3055	Chip R.	ERJ3GSYJ273V	
R513	RK3074	Chip R.	ERJ3GSYJ105V	
R514	RK3065	Chip R.	ERJ3GSYJ184V	
R515	RK3048	Chip R.	ERJ3GSYJ682V	
R516	RK3056	Chip R.	ERJ3GSYJ333V	
VR501	RH0106	Trim. Pot	EVM1YSX50BQ4	
X501	XQ0077	Crystal	38C 3.68640MHz	
	HK0305		Carton	
	HP0029		Protection Bag	
	FG0057		Rubber Cushion	
	UP0243		P.C.B.	
	YZ0042	Adhesion	Bond G17	

# ADJUSTMENT

## 1) Required Test Equipment

### 1. Digital Multimeter

### d. Distortion Meter

Measurable frequency: 1kHz

Input level: Up to 40dB

Distortion level: 1% ~ 100%

### 2. Regulated Power Supply

Supply voltage: 13.8VDC

Current: 15A or more

### e. Audio Generator

Output frequency: 1kHz ~ 10kHz

Output impedance: 600Ω

### 3. Oscilloscope

Measurable frequency: Audio Frequency

### f. Linear Detector

### 4. Spectrum Analyzer

Measuring range: Up to 2GHz or more

### 5. Tracking Generator

Output frequency: Up to 2GHz or more

### 6. Dummy Load

Measurable frequency: Up to 500MHz

Impedance: 50Ω

Power: 60W or more

### 7. Speaker

Impedance: 8Ω

### 8. SSG

Output frequency: Up to 1GHz

Output level: -20dB/0.1μV to 120dB/1V

Modulation: AM/FM

### 9. Transceiver Tester

Up to 500MHz

#### a. Frequency Counter

#### b. Power Meter

Impedance: 50Ω

Measuring range: 60W or more

#### c. Audio Voltmeter

Measurable frequency: 50Hz ~ 10kHz

Sensitivity: 1mV ~ 10V

## Test Equipment

1. All SSG output is indicated by EMF.
2. Audio Output level: 50mW~100mW at 8Ω
3. Power supply voltage: 13.8V
3. Test frequency can be variable ±100kHz.

## 2) PLL Adjustment

Item	Condition	Measurement		Adjustment		Specifications
		Equipment	Terminal	Parts	Method	
Reference Frequency	f=145.00MHz (T, E, TE1) f=162.00MHz (TE2) TX	Freq. Counter Power Meter	ANT	TC1	145.00MHz (T, E, TE1) 162.00MHz (TE2)	± 100Hz
VCO	f=173.99MHz RX	Digital Multimeter	PD	VCO L302	7.0V	± 0.1V

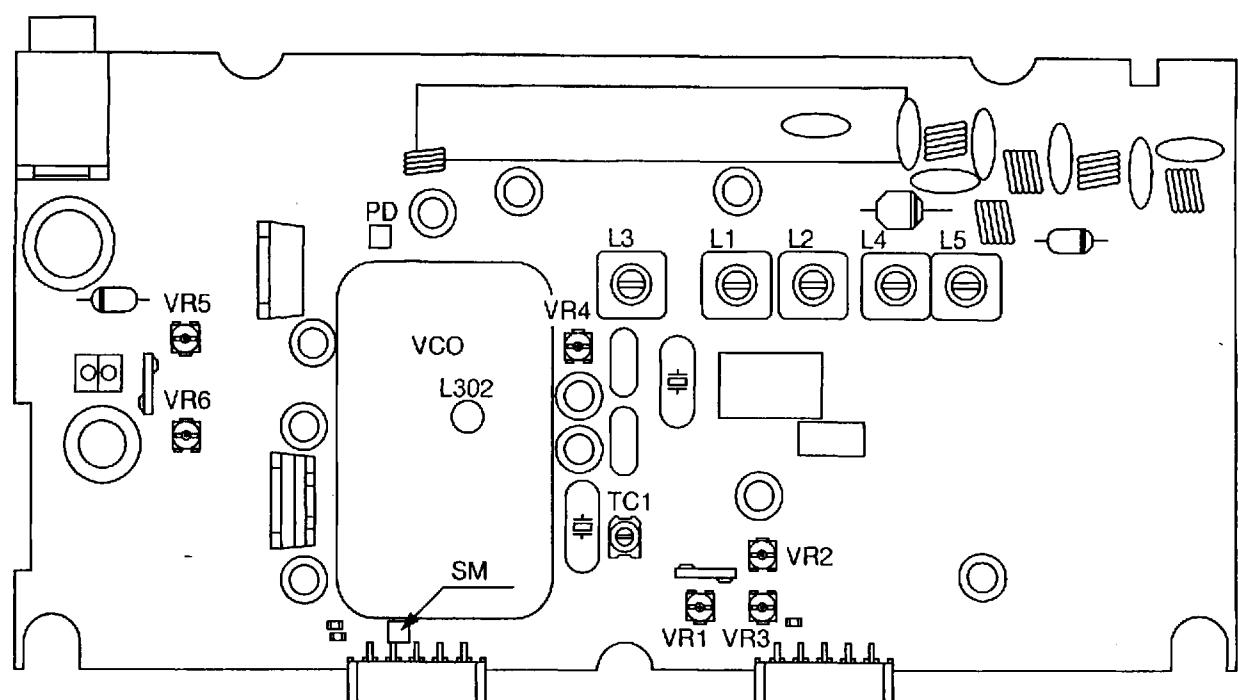
## 3) TX Adjustment

High Power	f=145.00MHz (T, E, TE1) f=162.00MHz (TE2) High TX	Power Meter Current Meter	ANT	VR5	52W (T, E) 36W (TE1, TE2)	± 1.0W 10.5A or below (T, E) 8.5A or below (TE1,2)
Low Power	f=145.00MHz (T, E, TE1) f=162.00MHz (TE2) Low TX			VR6	5.5W	5.5 ± 0.5W
Deviation	f=145.00MHz (T,E,TE1) f=162.00MHz (TE2) Low TX AG: 1kHz 40mV emf	Linear Det. Oscilloscope Power Meter AG		VR4	4.7kHz/DEV	4.7kHz ± 0.2kHz/DEV
MIC Gain	AG: 1kHz 4mV emf			VR3	3.0kHz/DEV	3.0kHz ± 0.2kHz/DEV
CTCSS Tone Level	f=145.00MHz (T,E,TE1) f=162.00MHz (TE2) Low TX AG: OFF TONE SW: ENC 88.5Hz				Check	0.6 ~ 1.1kHz/DEV
Tone Burst	TBST ON 1750Hz				Check	2.5 ~ 3.9kHz/DEV

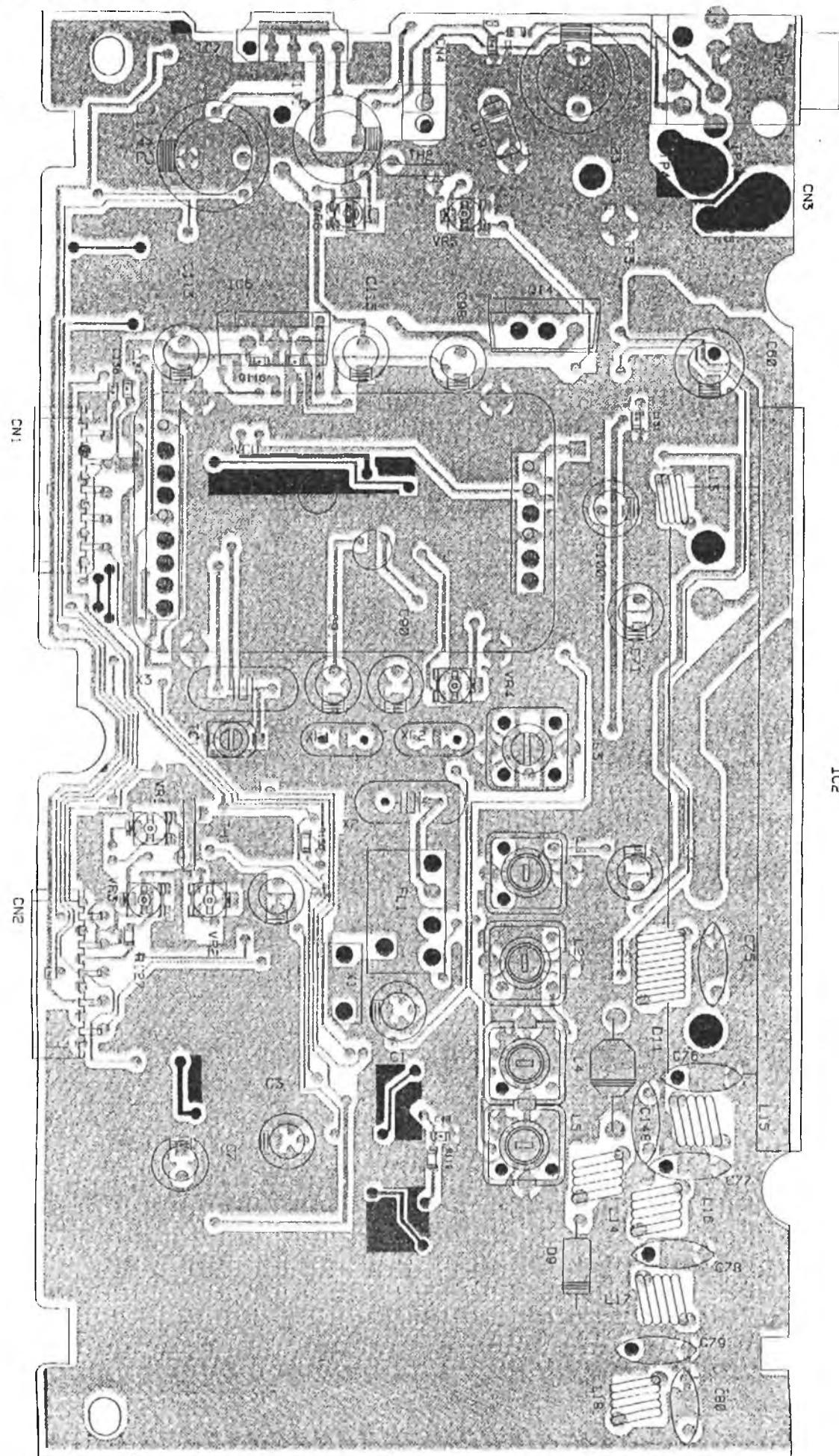
## 4) RX Adjustment

Item	Condition	Measurement		Adjustment		Specifications
		Equipment	Terminal	Parts	Method	
Sensitivity	f=144.00MHz (T, E) f=137.00MHz (TE1) f=150.00MHz (TE2) SSG OUT: -10dB $\mu$ 1kHz 3.5kHz/Dev	SSG SINAD Meter Oscilloscope (0.2V/Dev) Level Meter	SM	L1~L5	Turn the coils L5, L4, L2, L1, L3 to the max. in order. Adjust the coils repeatedly.	
	f=144.00MHz (T, E) f=137.00MHz (TE1) f=150.00MHz (TE2) SSG OUT: -8.5dB $\mu$ 1kHz 3.5kHz/Dev				Check	SINAD is 12dB or more.
S Meter	f=145.00MHz (T, E, TE1) f=162.00MHz (TE2) SSG OUT: 18.0dB $\mu$ Mod: OFF	LCD S Meter	VR1	Set to the point where all segments start flashing.		
	SSG OFF			Check		Does not light.
SQL level	f=145.00MHz (T, E, TE1) f=162.00MHz (TE2) SSG OUT: -12dB $\mu$ Mod: OFF	LCD Busy	VR2	Set to the threshold point to close the squelch.		Busy OFF SQL L mode
	SSG OFF			Busy OFF	Check	Busy OFF

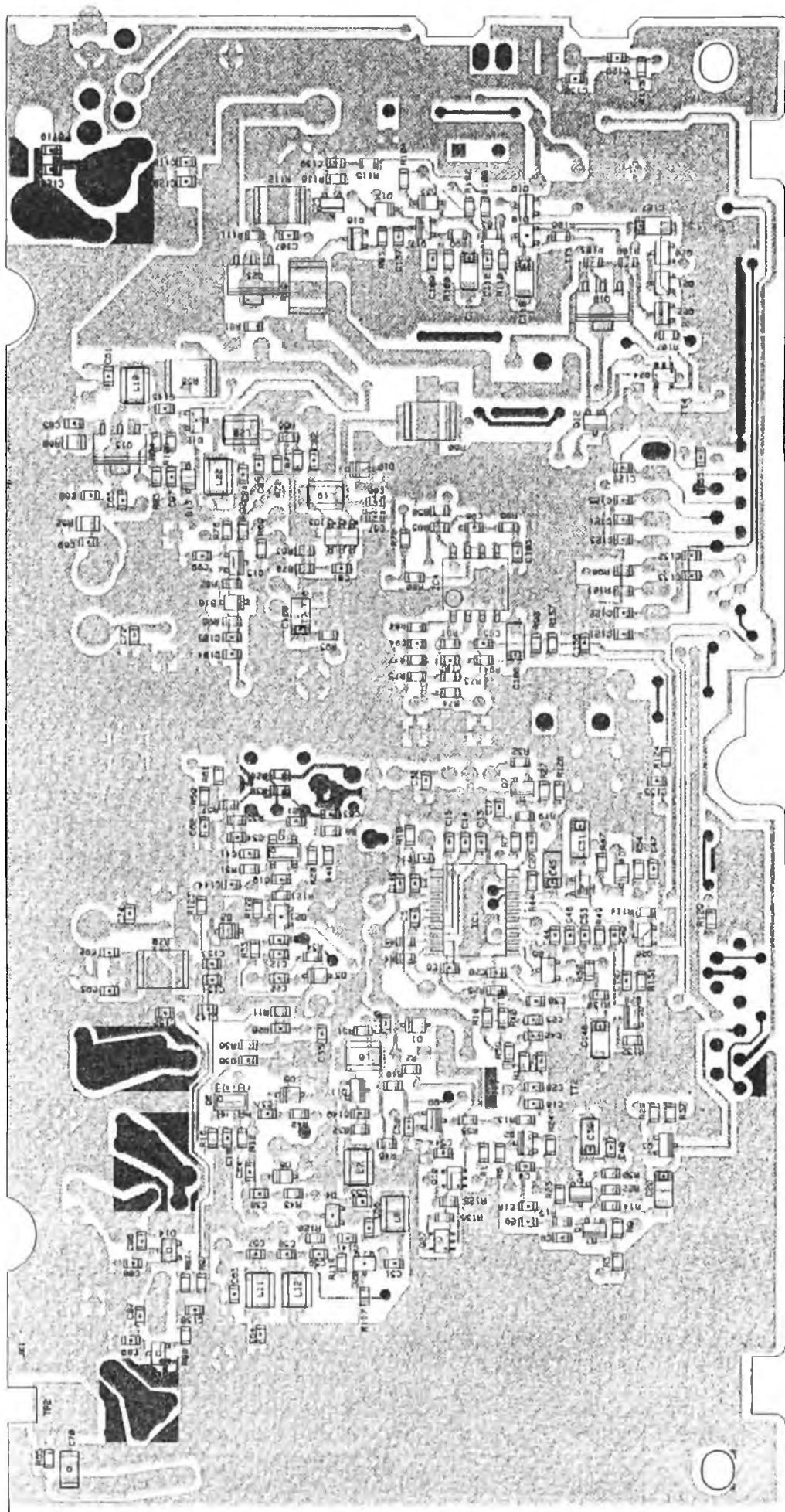
## 5) Adjustment Points



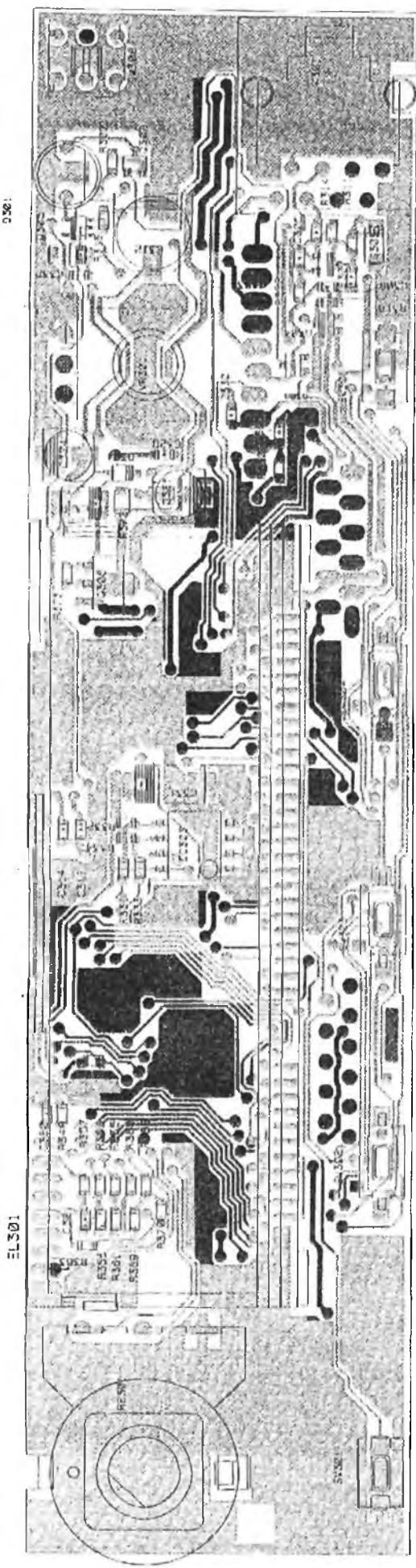
### **1) Main Unit Side A**



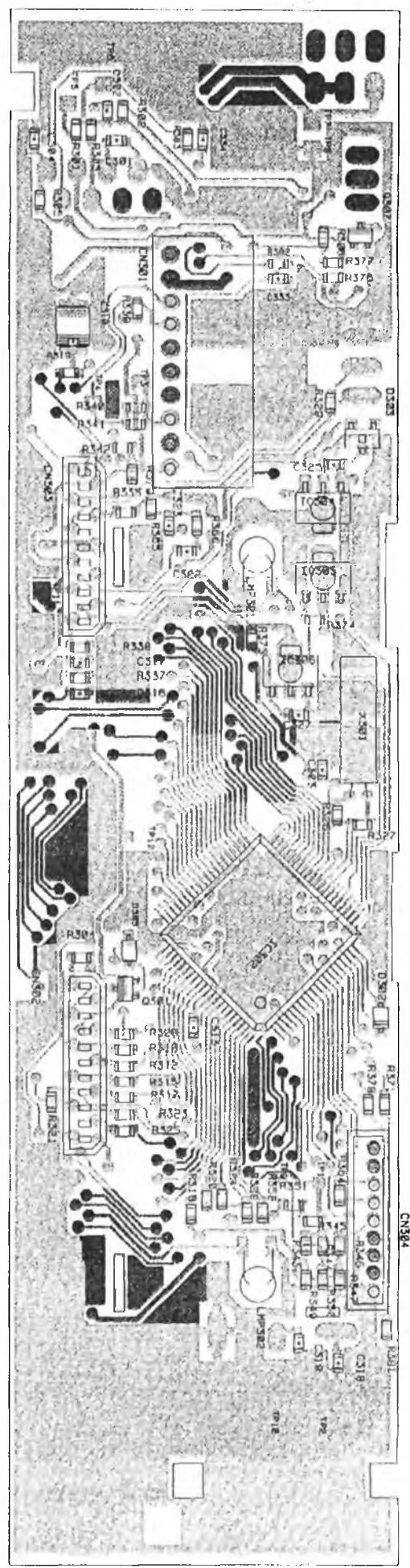
## 2) Main Unit Side B



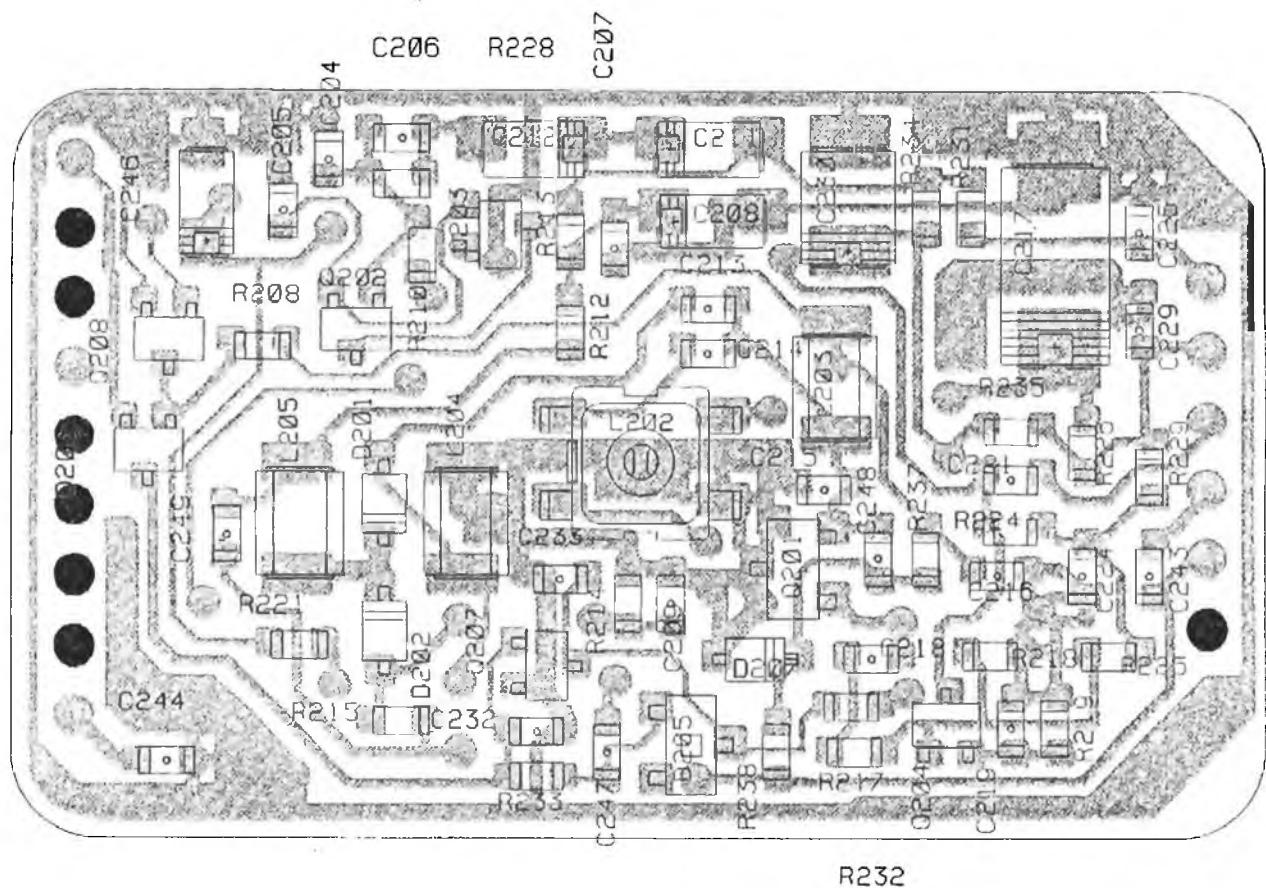
### **3) CPU Unit Side A**



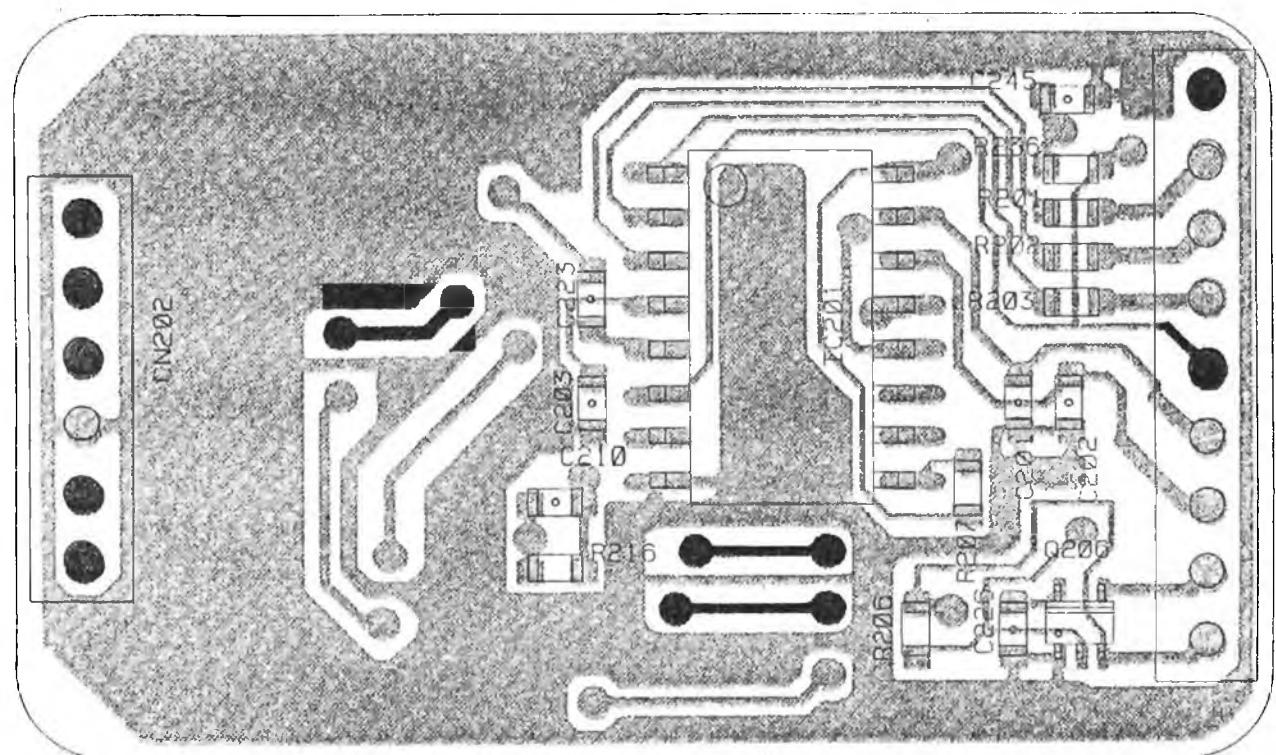
#### **4) CPU Unit Side B**



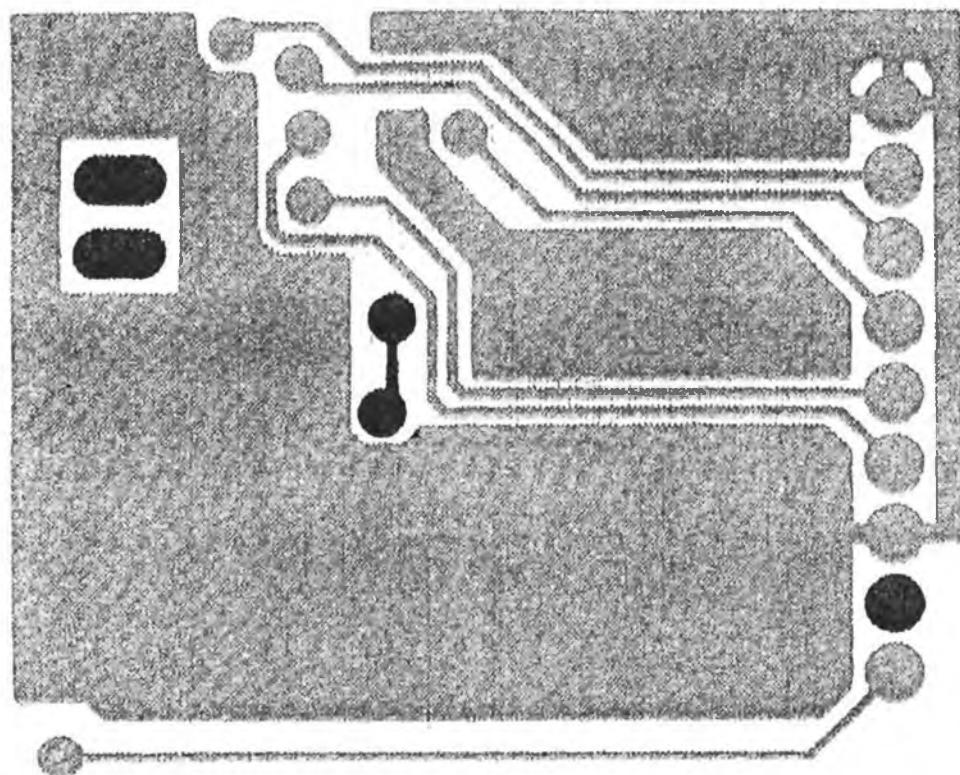
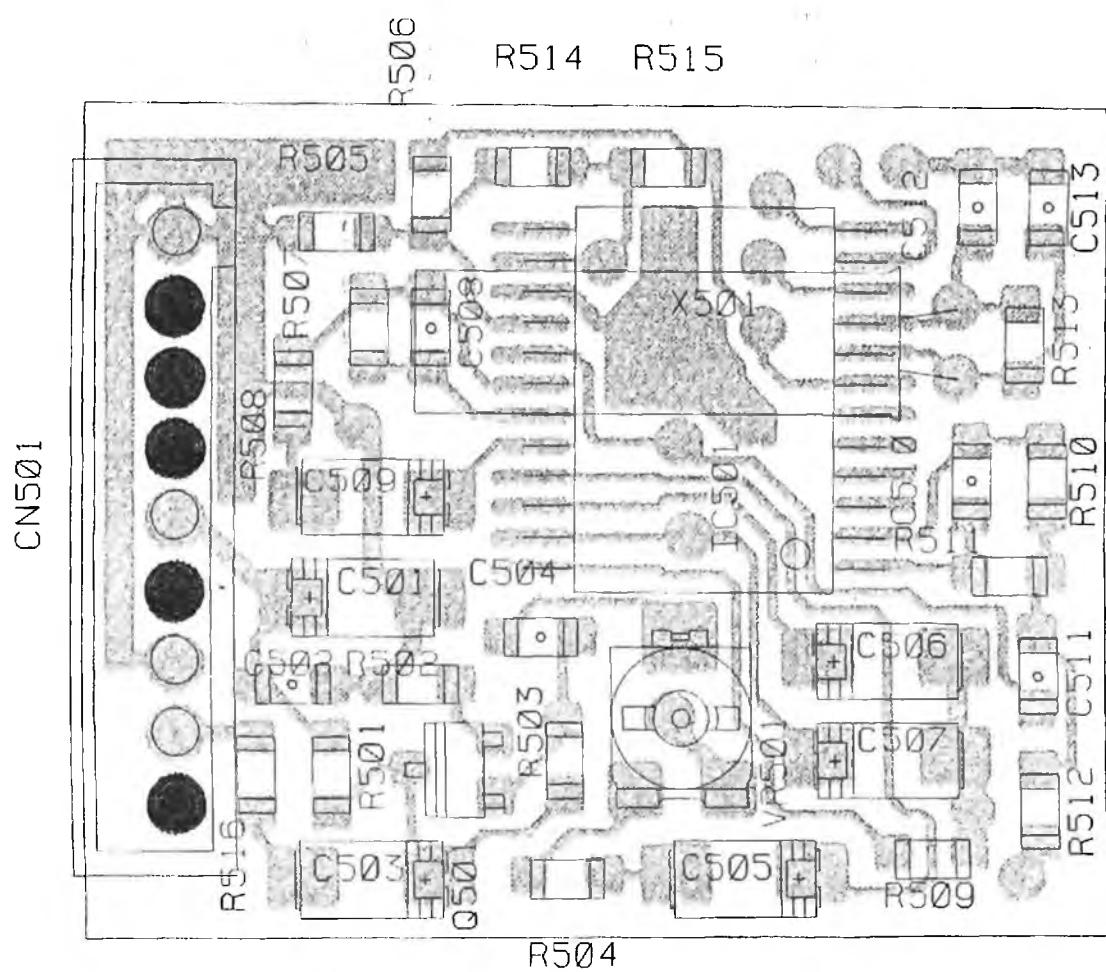
## 5) VCO Unit Side A



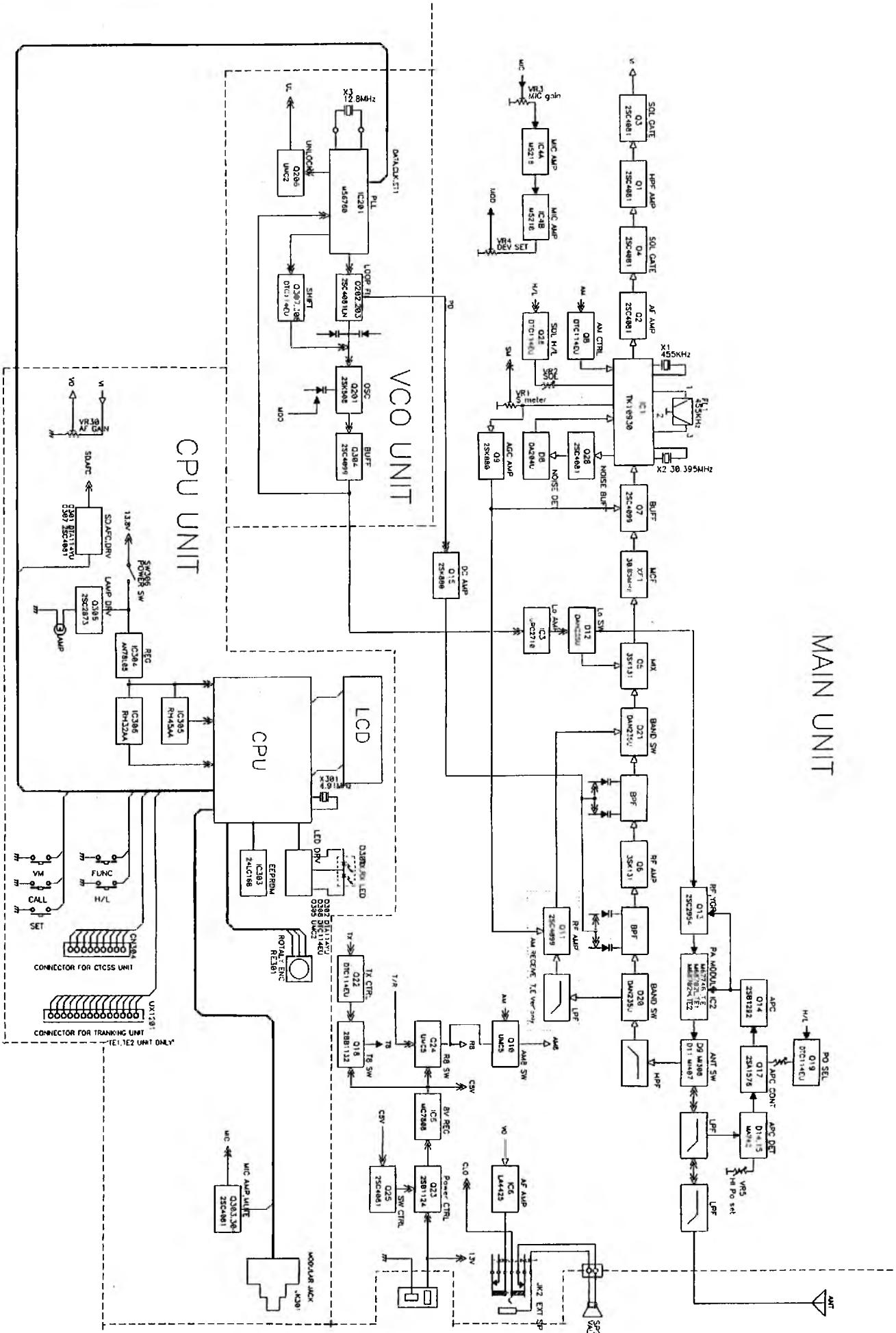
## 6) VCO Unit Side B



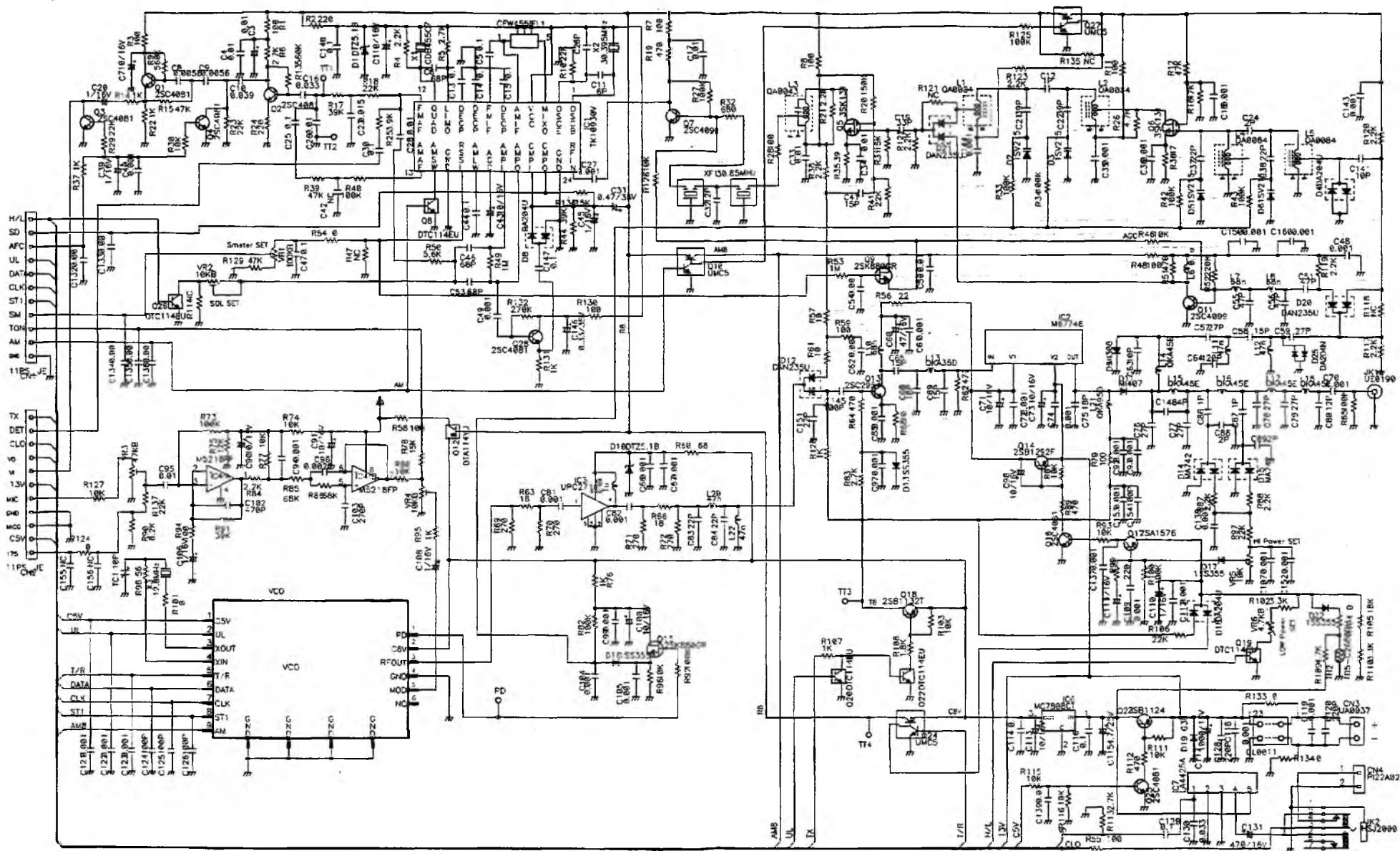
## 7) EJ-20U (CTCSS Unit:Option)



MAIN UNIT

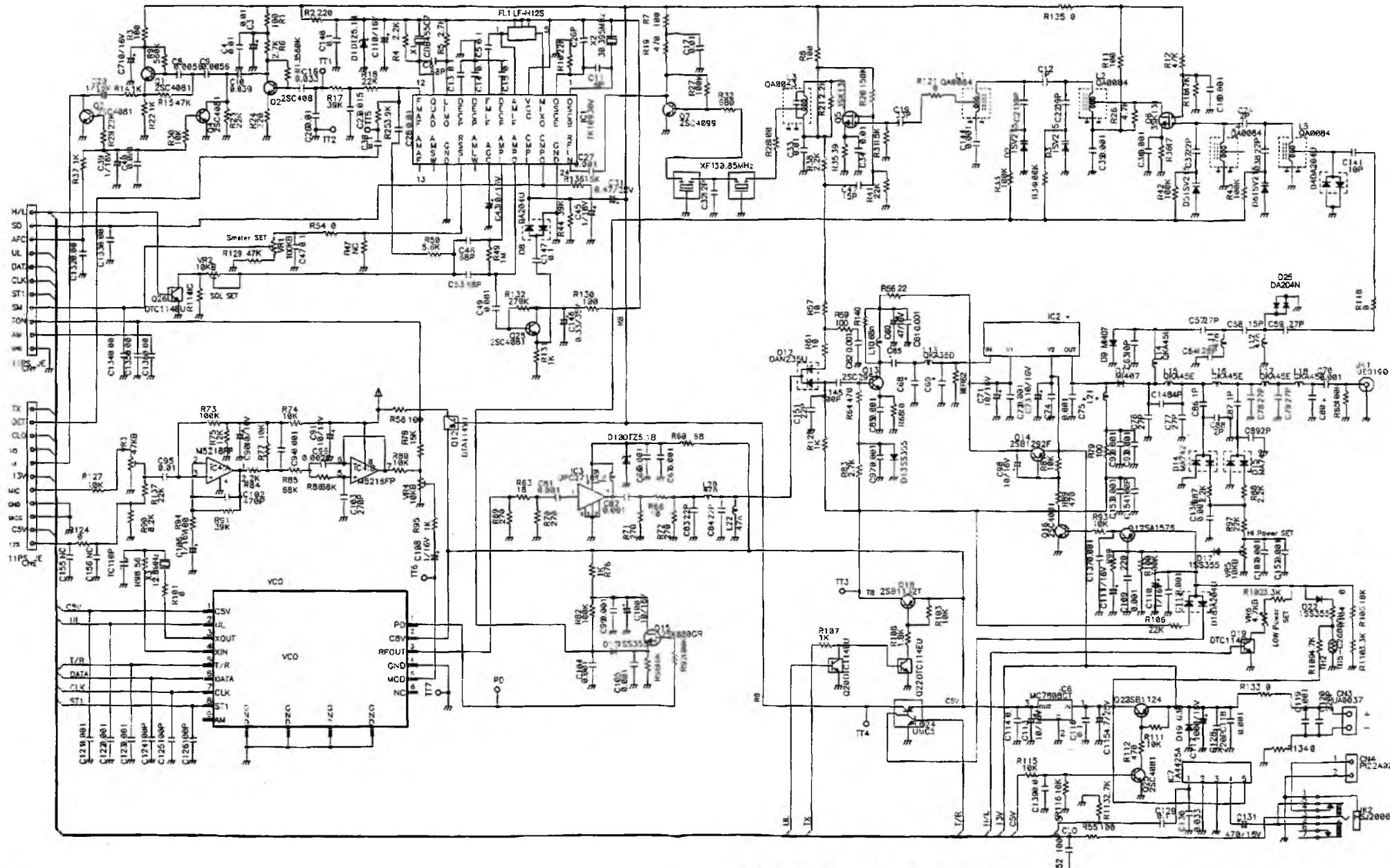


### **1) Main Unit T/E**



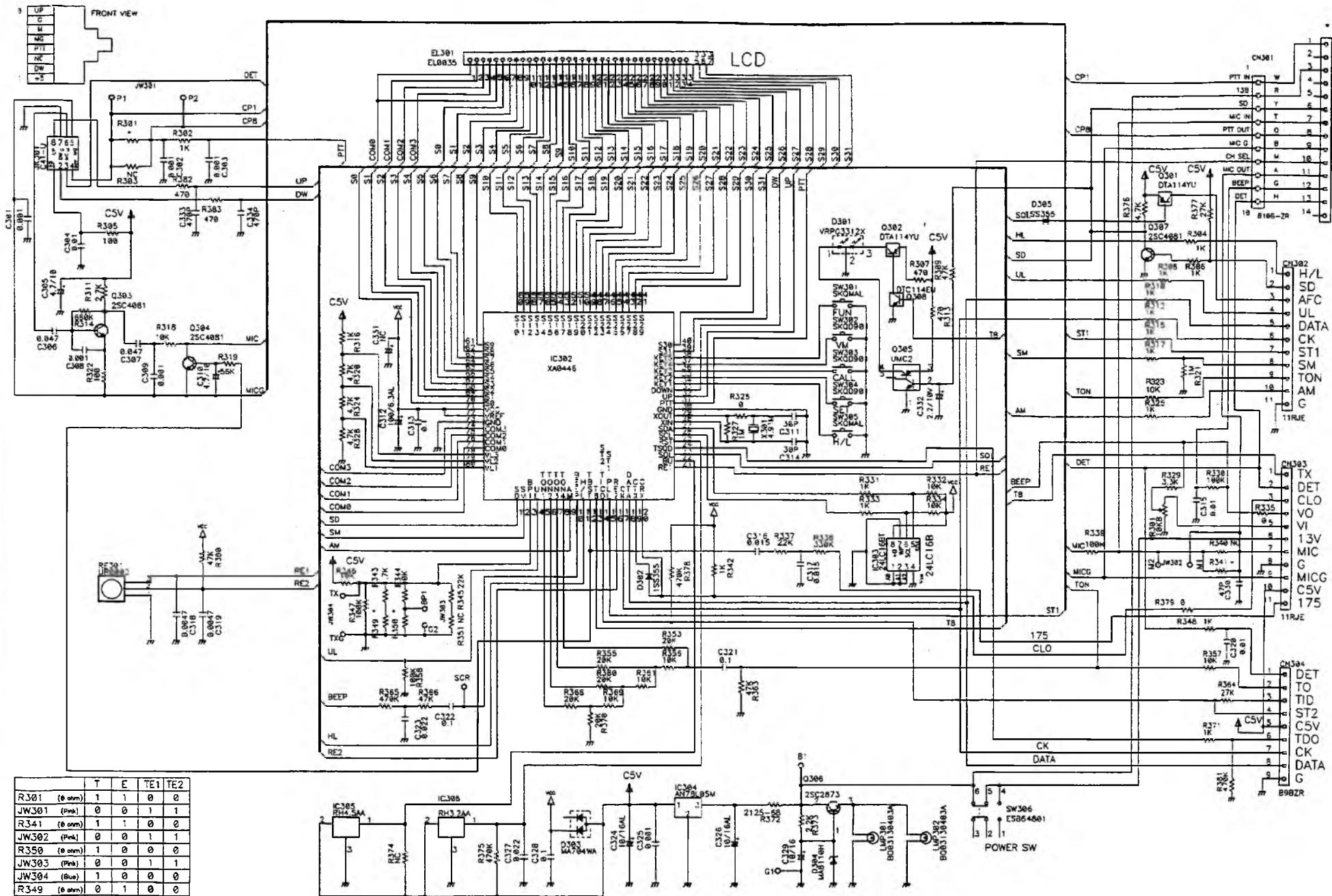
	L23	R133	R134
DR140T	-	0	0
DR140E	0	-	-

## 2) Main Unit TE1/TE2



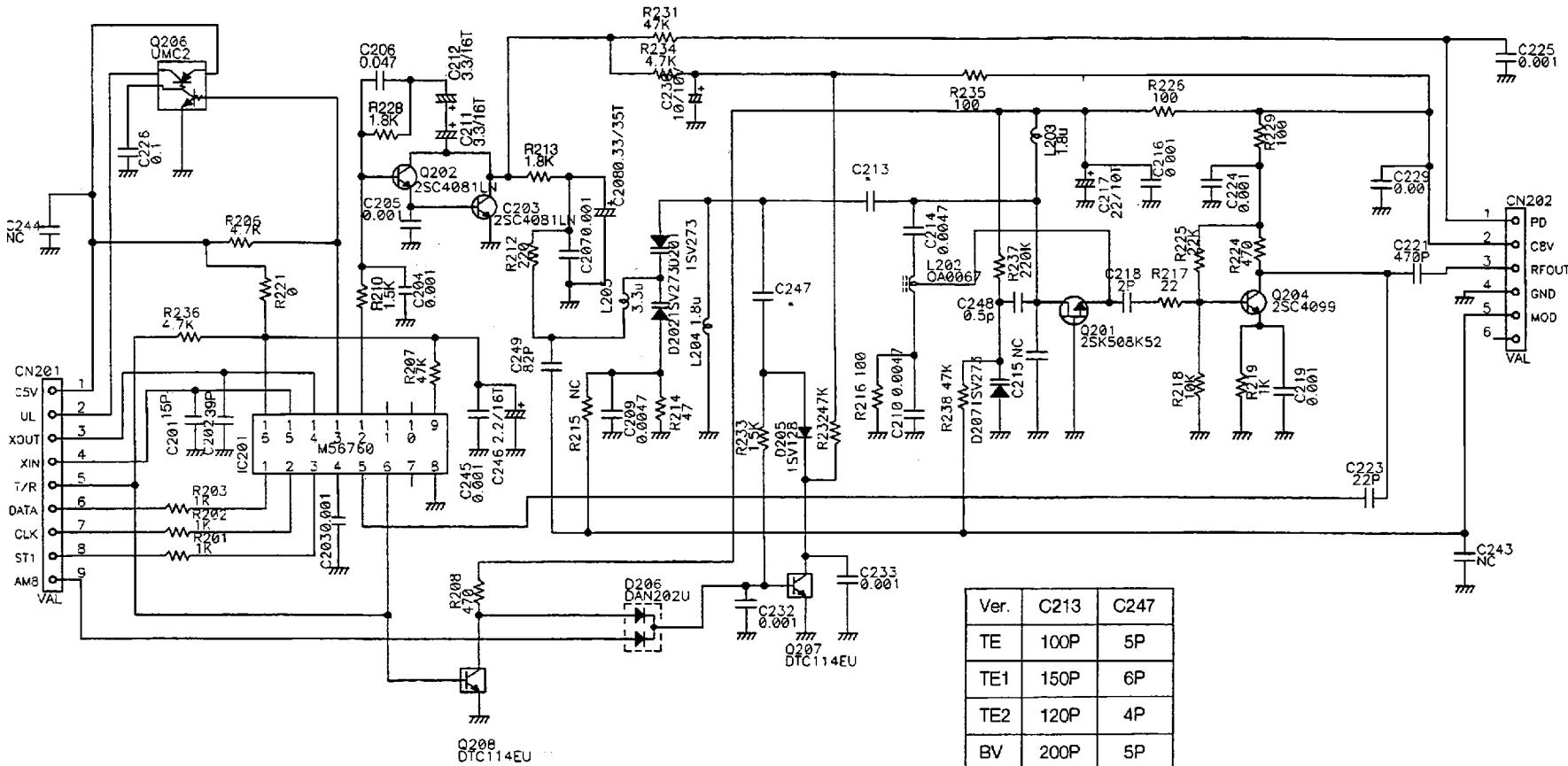
	C65	C68	C69	C75	C80	IC2	L21	R62	R14
TE1	15P	18P	15P	22P	16P	M68702L	QKA75G	470	NC
TE2	15P	15P	12P	10P	15P	M68702H	QKA95D	150	2.2K

### 3) CPU Unit

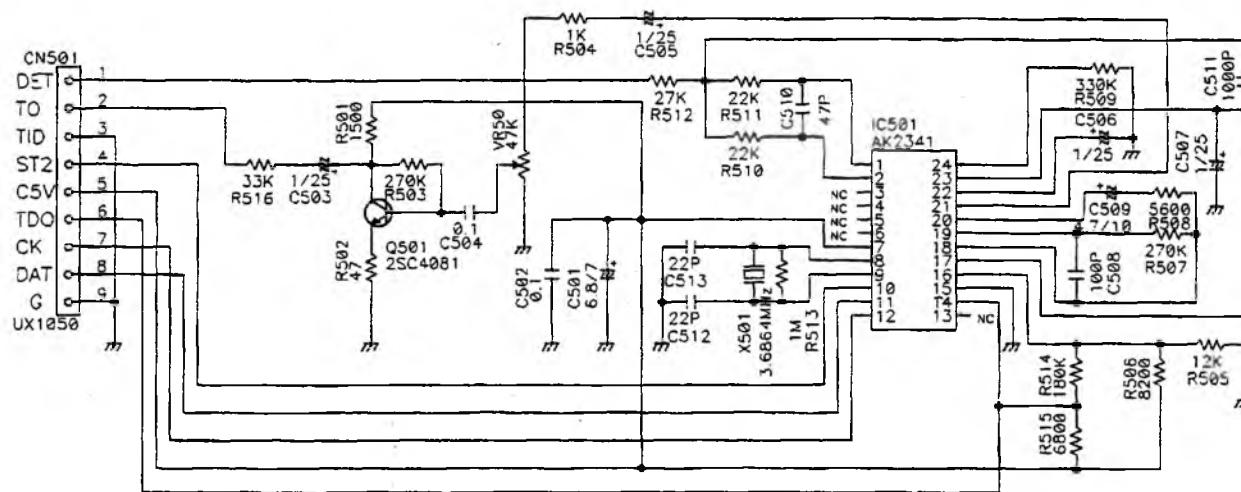


	T	E	TE1	TE2
RJ301 (0 ohm)	1	1	0	0
JW301 (Pink)	0	0	1	1
R341 (0 ohm)	1	1	0	0
JW302 (Pink)	0	0	1	1
R350 (0 ohm)	1	0	0	0
JW303 (Pink)	0	0	1	1
JW304 (Blue)	1	0	0	0
R349 (0 ohm)	0	1	0	0
UX1201	0	0	1	1

#### 4) VCO unit



5) EJ-20U(CTCSS Unit: Option)



# **ALINCO, INC.**

**Head office:** "TWIN 21" MID Tower Building 25F  
1-61, 2-Chome, Shiromi, Chuo-ku, Osaka 540-8580, Japan  
Phone: 06-6946-8150 Fax: 06-6946-8175  
E-mail: [export@alinco.co.jp](mailto:export@alinco.co.jp)

**U.S.A.:** 438 Amapola Avenue, Unit 130, Torrance, CA 90501-6201, U.S.A.  
Phone: 310-618-8616 Fax: 310-618-8758  
<http://www.alinco.com/>

**Germany:** Eschborner Landstrasse 55, 60489 Frankfurt am Main, Germany  
Phone: 069-786018 Fax: 069-789-60766  
<http://www.alinco.de/>

Dealer/Distributor