

# DR-140T/E/TE1/TE2

## Service Manual

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# 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 Squelch	Low Low	High 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		○
22	INT0	BU	I	Backup signal input	Normal	Backup		○
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		○
32	P26	UP	I	UP key	OFF	ON		○
33	P25	DOWN	I	Down key	OFF	ON		○
34	P24	KEY 1	I	Key 1 H/L	OFF	ON		○
35	P23	KEY 2	I	Key 2 SET	OFF	ON		○

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			

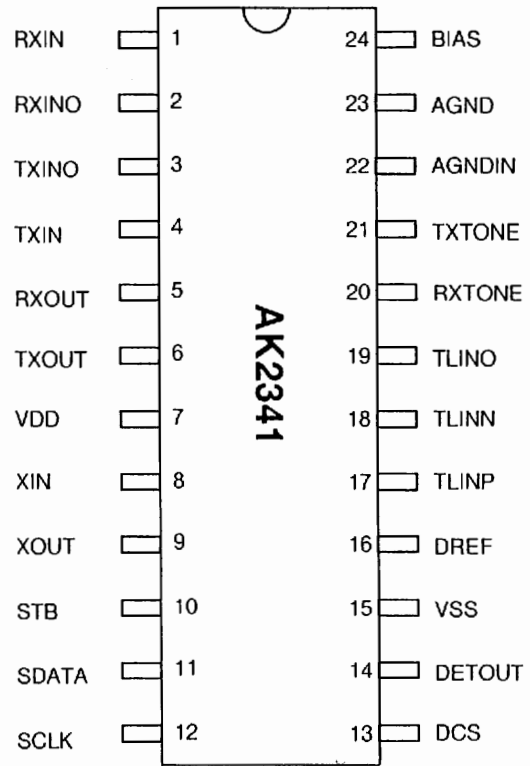


No.	Name	Pin Name	I/O	Description	H	L	HI Z	Pull UP
71	VCC	VDD	I	Power supply				
72	VREF	VREF	I	Reference voltage input				
73	AVSS	GND	I	GND				
74	COM3	COM3	O	LCD common 3 output	Pulse			
75	COM2	COM2	O	LCD common 2 output	Pulse			
76	COM1	COM1	O	LCD common 1 output	Pulse			
77	COM0	COM0	O	LCD common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

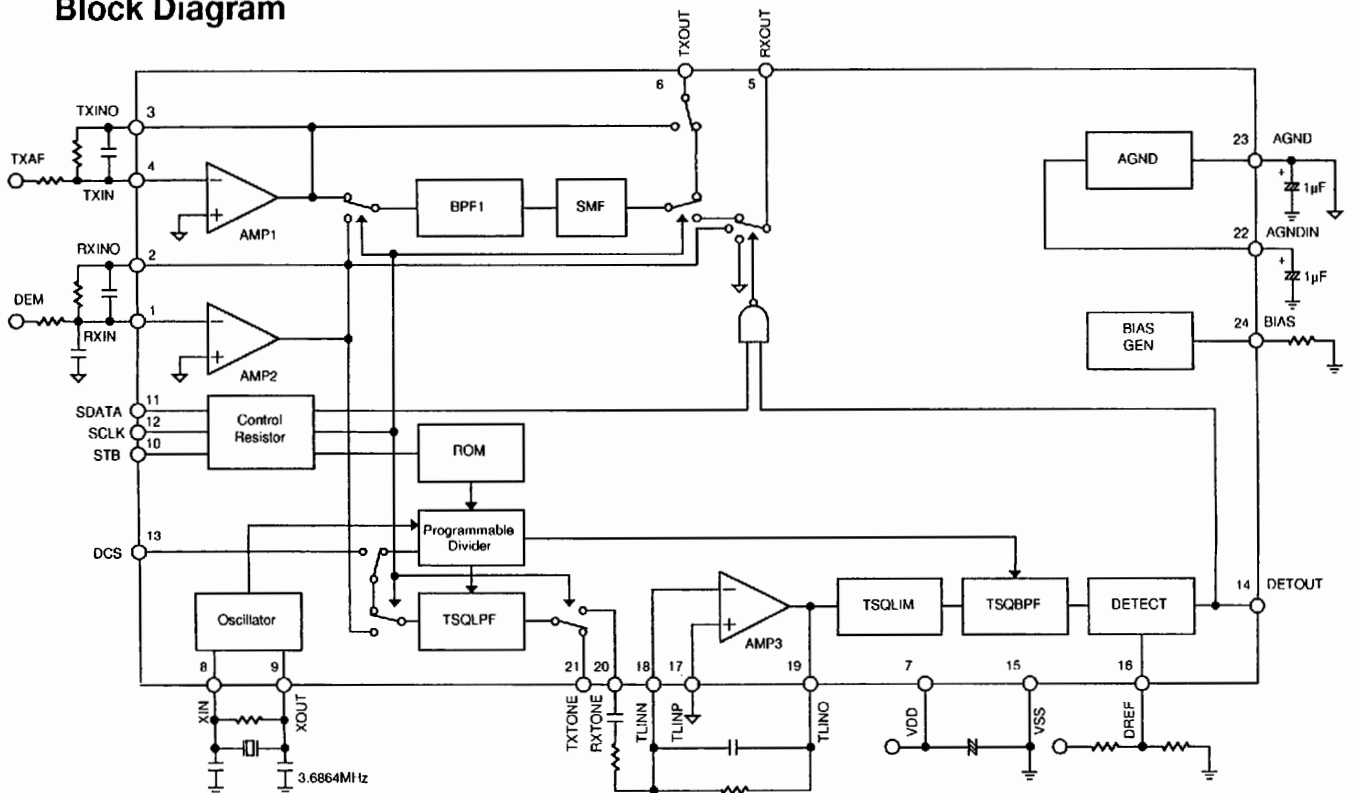
# SEMICONDUCTOR DATA

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

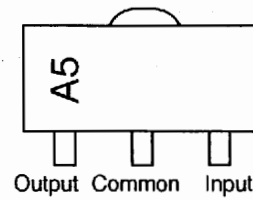
Pin No.	Pin Name	I/O	Function
1	RXIN	I	RX Signal Input
2	RXINO	O	AMP2 Output
3	TXINO	O	AMP1 Output
4	TXIN	I	TX Audio Input
5	RXOUT	O	RX Audio Output
6	TXOUT	O	TX Audio Output
7	VDD	-	Power Supply (1.8 ~ 5.5V)
8	XIN	I	Crystal Terminal (3.6864MHz)
9	XOUT	O	Crystal Terminal (3.6864MHz)
10	STB	I	Strobe for 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



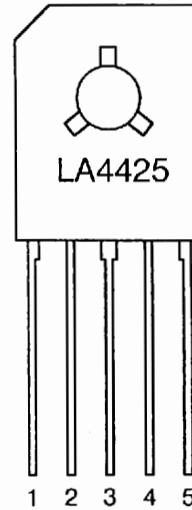
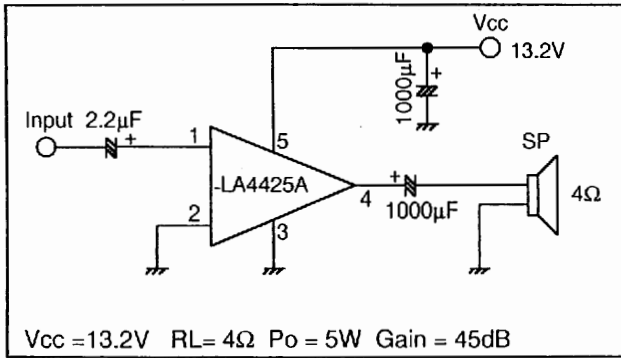
**2) AN78L05M (XA0238)**  
5V Voltage Regulator



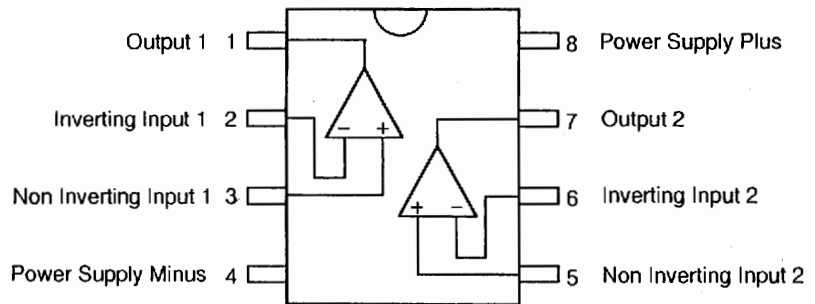
AN78L05M

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

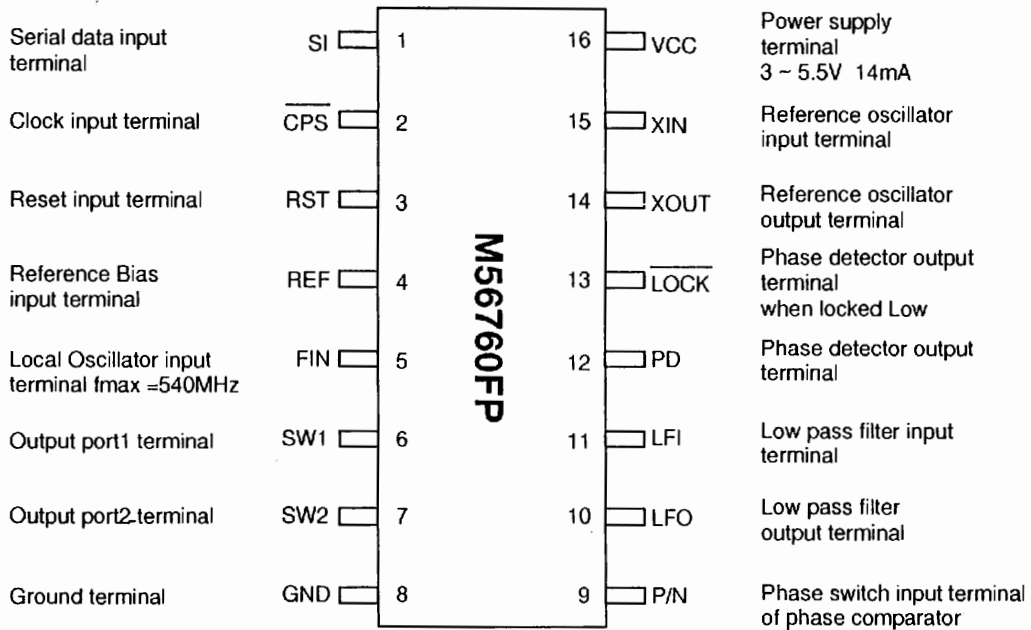
**Test Circuit**



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

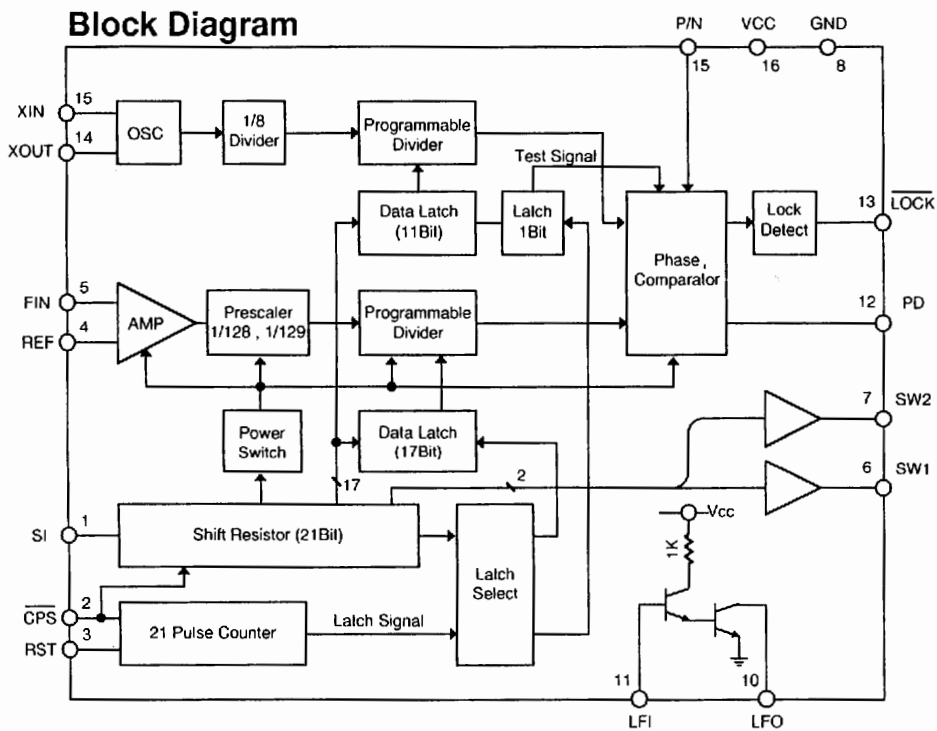


# 5) M56760FP (XA0235) 540MHz Frequency Synthesizer

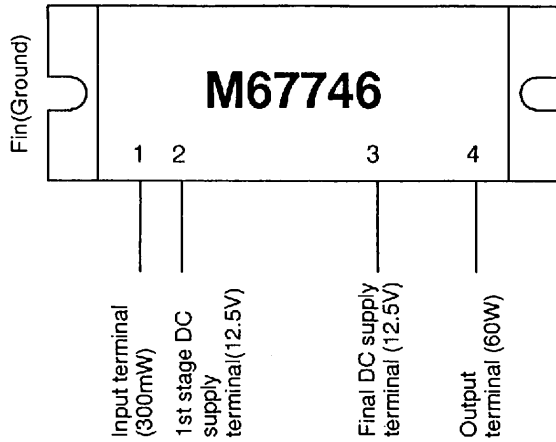


## Function Table

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



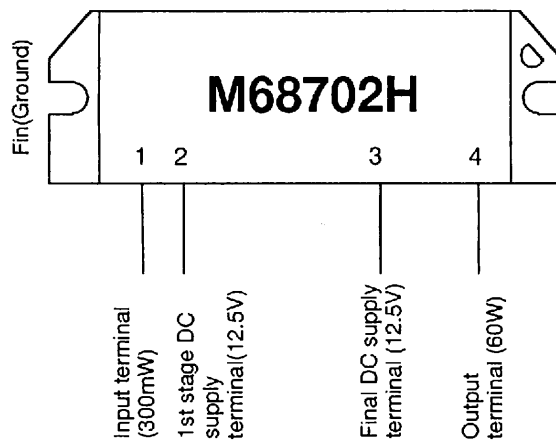
**6) M67746 (XA0412)**  
 144 ~ 148MHz 60W  
 RF Power Module



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

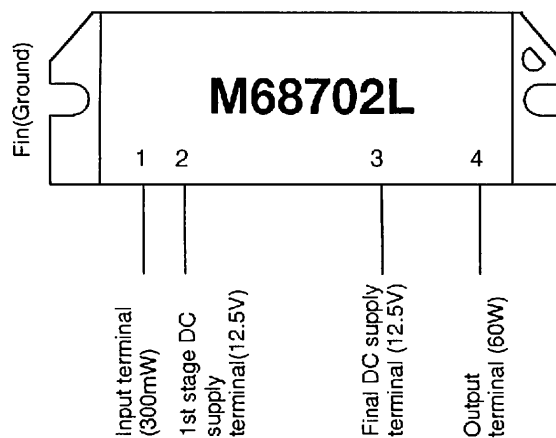
**7) M68702H (XA0444)**  
 150 ~ 175MHz 60W  
 RF Power Module (TE2)



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)

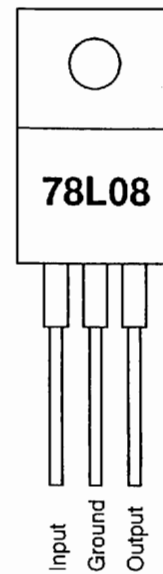
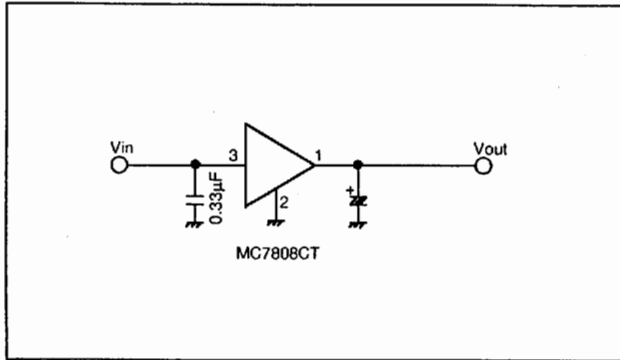


Ratings	Symbol	Ratings	Unit
Supply voltage	Vcc	17	V
Total current	Icc	20	A
Input power	Pin(max)	600	mW
Output power	Po(max)	75	W
Operation case temperature	Tc(op)	-30 to +110	°C
Storage temperature	Tstg	-40 to +110	°C

Zg=Zl=50Ω

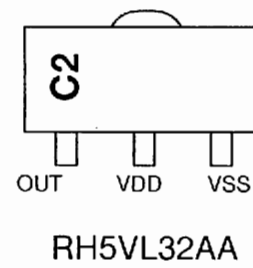
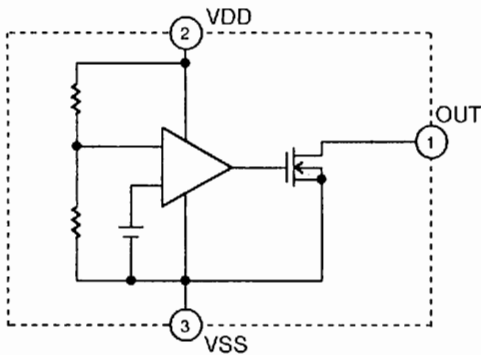
**9) MC7808CT (XA0082)**  
8V Voltage Regulator

**Test Circuit**



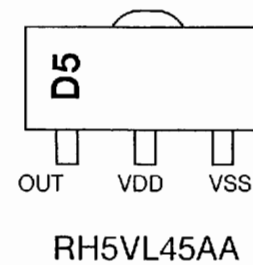
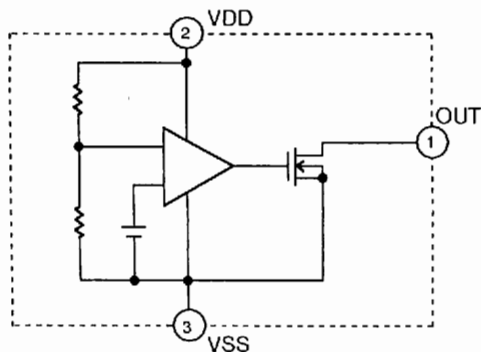
**10) RH5VL32AA-T1 (XA0198)**  
C-MOS Voltage Detector

**Equivalent Circuit**



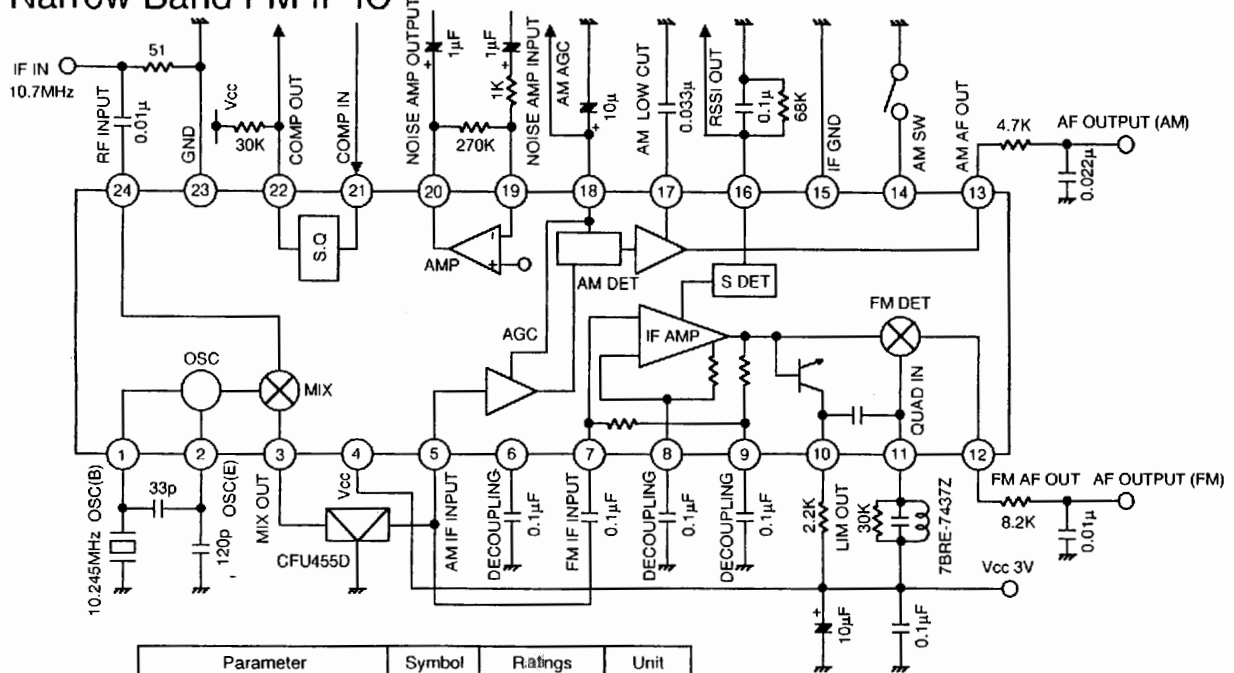
**11) RH5VL45AA-T1 (XA0208)**  
C-MOS Voltage Detector

**Equivalent Circuit**



# 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

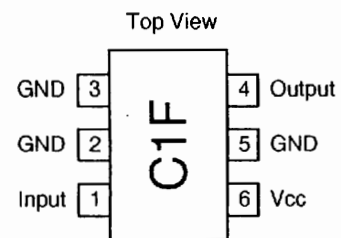
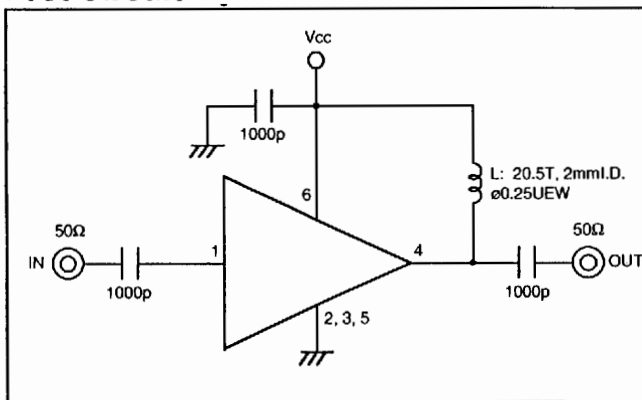
Ta=25°C Vcc=3V

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
<b>FM</b>						
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
<b>AM</b>						
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) $\mu$ PC2710T (XA0449) RF Amplifier

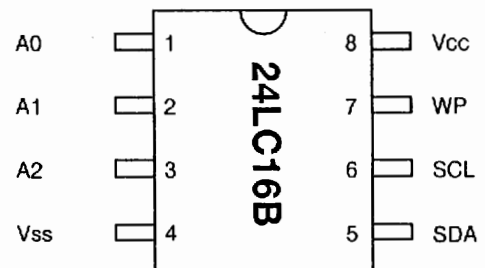
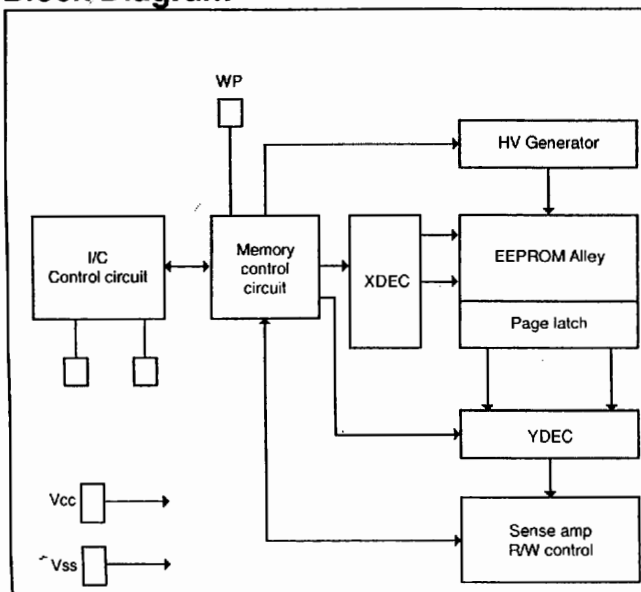
Parameter	Symbol	Condition	Ratings	Unit
Supply voltage	Vcc		5.0	V
Circuit current	Icc	Vcc=5V, no signal	22	mA
Power gain	GP	Vcc=5V, f=500MHz	33	dB
Saturated output power	Po(sat)	Vcc=5V, f=500MHz, Pin=-8dBm	+13.5	dBm
Noise figure	NF	Vcc=5V, f=500MHz	3.5	dB
Upper frequency (-3dB)	fu	Vcc=5V, Reference freq. =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	$\Delta$ Gp	Vcc=5V f=0.1 ~ 0.6GHz	$\pm$ 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



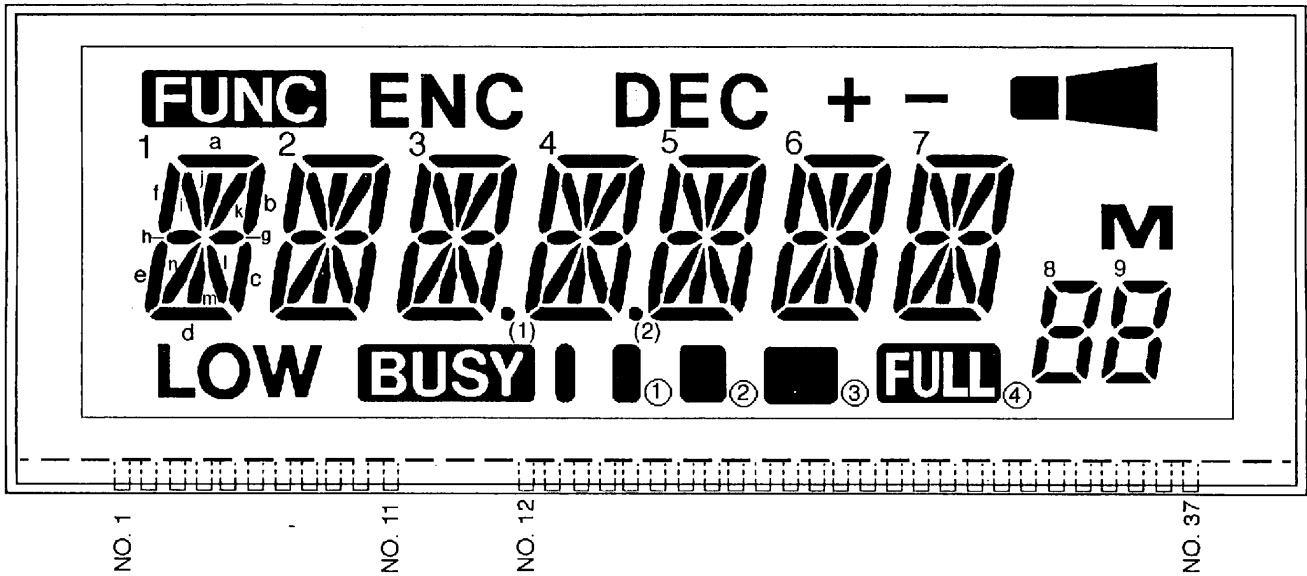
# 15) Transistor, Diode and LED Outline Drawings

Top View

1SS355 XD0254	1SV128 XD0112	1SV215 XD0132	1SV273 XD0298	DA204U XD0130	DAN202U XD0230	DAN235U XD0246	DTZ2.2A XD0145
DTZ5.1B XD0165	G3B XD0107	MA704WA XD0127	MA742 XD0250	MA8110H XD0255	MI308 XD0014	MI407 XD0013	VRPG3312X XL0051
2SK508 XE0010	2SK880GR XE0021	3SK131V12 XE0028					Anode (Red) Cathode (Green)
2SA1576 XT0094	2SB1124 XT0148	2SB1132 XT0061	2SB1292F XT0112	2SC2873Y XT0113	2SC2954 XT0084	2SC4081 XT0095	2SC4081LNT XT0111
2SC4099 XT0096		DTA114YU XU0112	DTC114EU XU0131	UMC2 XU0060	UMC5 XU0152		

# 16) LCD

## LCD Pattern



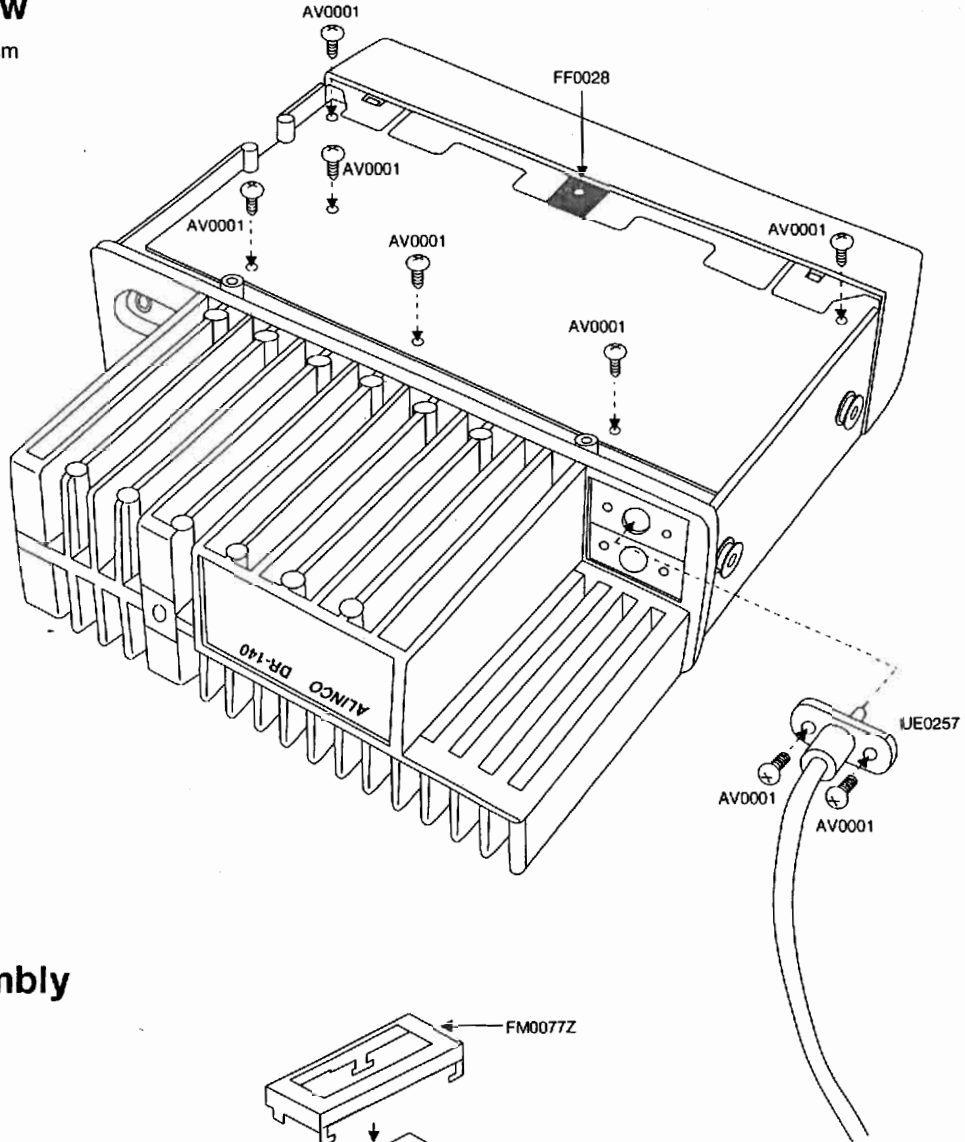
## LCD connection table

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	-	7i	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	■ ■	8f	8e	8d					

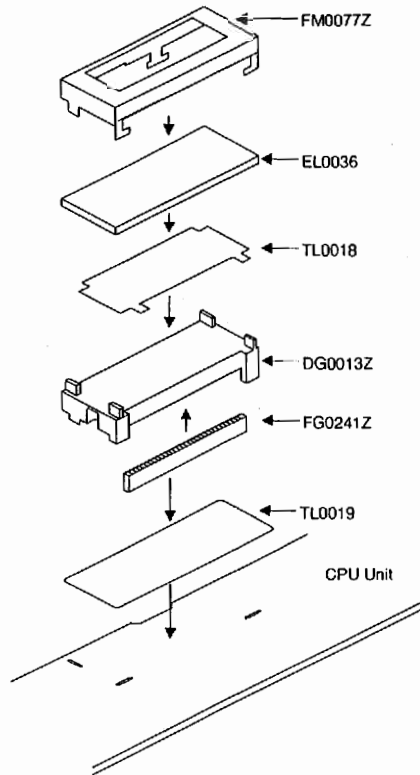
# EXPLODED VIEW

## 1) Bottom View

Screw Torque: 5kgcm

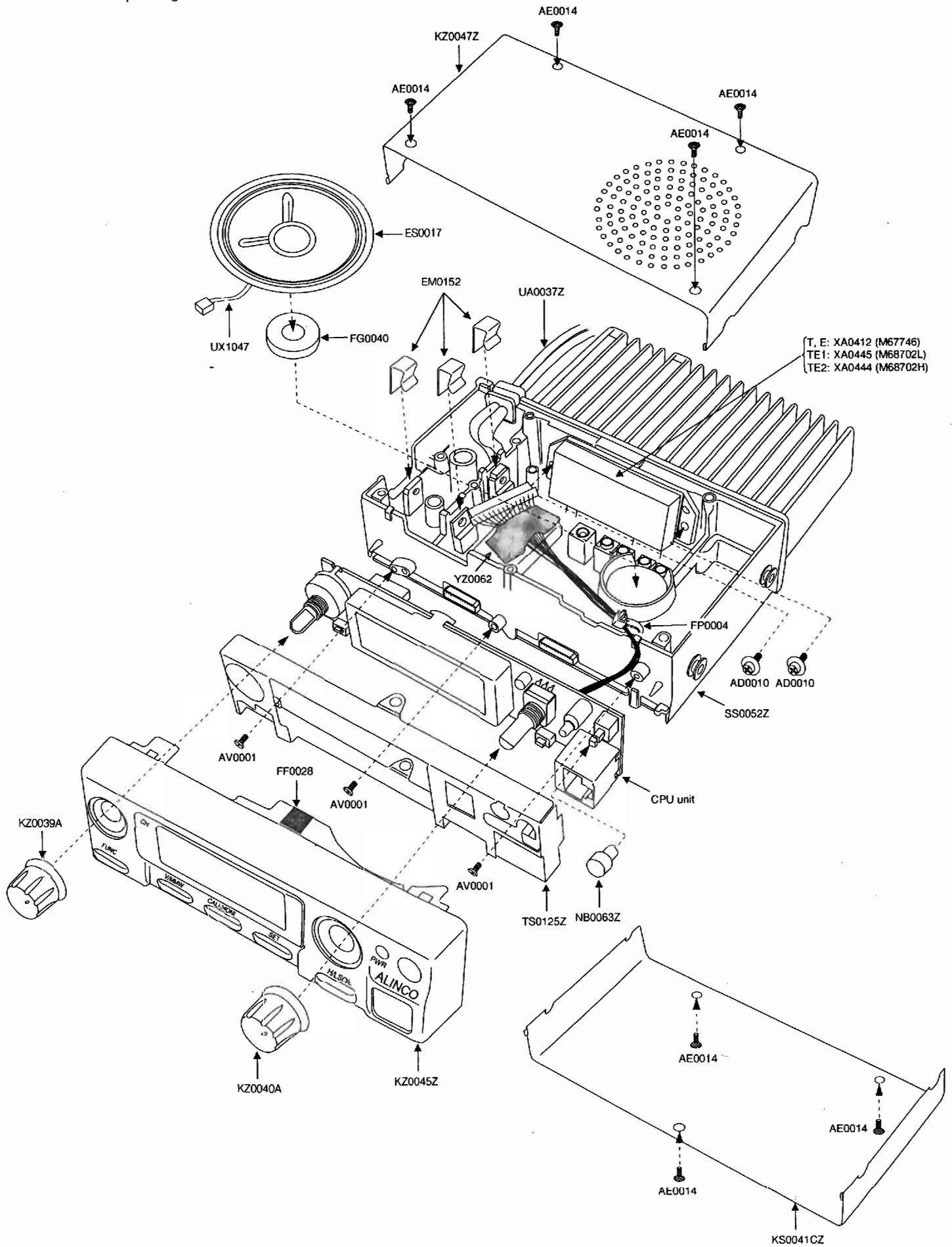


## 2) LCD Assembly



### 3) Top and Front Views

Screw Torque: 5kgcm



# PARTS LIST

Main Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.
		Main Unit		
C1	TZ0058	Silicon diode 49U		
C2	TZ0049	Silicon diode UM1		
C3	TT1002	Tube 1.0 7mm		
C4	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C5	CU3007	Chip C.	16MV 10SW+TS	T/E
C6	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C7	CU3047	Chip C.	16MV 10SW+TS	T/E
C8	CU3059	Chip C.	16MV 10SW+TS	T/E
C9	CU3044	Chip C.	16MV 10SW+TS	T/E
C10	CU3100	Chip C.	16MV 10SW+TS	T/E
C11	CU3007	Chip C.	16MV 10SW+TS	T/E
C12	CU3002	Chip C.	16MV 10SW+TS	T/E
C13	CU3059	Chip C.	16MV 10SW+TS	T/E
C14	CU3059	Chip C.	16MV 10SW+TS	T/E
C15	CU3059	Chip C.	16MV 10SW+TS	T/E
C16	CU3102	Chip C.	16MV 10SW+TS	T/E
C17	CU3047	Chip C.	16MV 10SW+TS	T/E
C18	CU3035	Chip C.	16MV 10SW+TS	T/E
C19	CU3049	Chip C.	16MV 10SW+TS	T/E
C20	CU3018	Chip C.	16MV 10SW+TS	T/E
C21	CU3018	Chip C.	16MV 10SW+TS	T/E
C22	CU3049	Chip C.	16MV 10SW+TS	T/E
C23	CU3005	Chip C.	16MV 10SW+TS	T/E
C24	CU3005	Chip C.	16MV 10SW+TS	T/E
C25	CU3005	Chip C.	16MV 10SW+TS	T/E
C26	CU3047	Chip C.	16MV 10SW+TS	T/E
C27	CU3035	Chip C.	16MV 10SW+TS	T/E
C28	CU3047	Chip C.	16MV 10SW+TS	T/E
C29	CU3059	Chip C.	16MV 10SW+TS	T/E
C30	CU3032	Chip C.	16MV 10SW+TS	T/E
C31	CU3022	Chip C.	16MV 10SW+TS	T/E
C32	CU3012	Chip C.	16MV 10SW+TS	T/E
C33	CU3047	Chip C.	16MV 10SW+TS	T/E
C34	CU3047	Chip C.	16MV 10SW+TS	T/E
C35	CU3035	Chip C.	16MV 10SW+TS	T/E
C36	CU3035	Chip C.	16MV 10SW+TS	T/E
C37	CU3015	Chip C.	16MV 10SW+TS	T/E
C38	CU3015	Chip C.	16MV 10SW+TS	T/E
C39	CU3049	Chip C.	16MV 10SW+TS	T/E
C40	CU3035	Chip C.	16MV 10SW+TS	T/E
C41	CU3013	Chip C.	16MV 10SW+TS	T/E
C42	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C43	CU3059	Chip C.	16MV 10SW+TS	T/E
C44	CU3049	Chip C.	16MV 10SW+TS	T/E
C45	CU3021	Chip C.	16MV 10SW+TS	T/E
C46	CU3059	Chip C.	16MV 10SW+TS	T/E
C47	CU3035	Chip C.	16MV 10SW+TS	T/E
C48	CU3035	Chip C.	16MV 10SW+TS	T/E
C49	CU3035	Chip C.	16MV 10SW+TS	T/E
C50	CU3047	Chip C.	16MV 10SW+TS	T/E
C51	CU3019	Chip C.	16MV 10SW+TS	T/E
C52	CU3023	Chip C.	16MV 10SW+TS	T/E
C53	CU3021	Chip C.	16MV 10SW+TS	T/E
C54	CU3035	Chip C.	16MV 10SW+TS	T/E
C55	CU3019	Chip C.	16MV 10SW+TS	T/E
C56	CU3019	Chip C.	16MV 10SW+TS	T/E
C57	CU3016	Chip C.	16MV 10SW+TS	T/E
C58	CU3013	Chip C.	16MV 10SW+TS	T/E
C59	CU3016	Chip C.	16MV 10SW+TS	T/E
C60	CE0340	Electrolytic C.	16MV 47WH+TS	T/E
C61	CU3035	Chip C.	16MV 47WH+TS	T/E
C62	CU3035	Chip C.	16MV 47WH+TS	T/E
C63	CU3011	Chip C.	16MV 47WH+TS	T/E
C64	CU3024	Chip C.	16MV 47WH+TS	T/E
C65	CU3013	Chip C.	16MV 47WH+TS	T/E
C66	CU3035	Chip C.	16MV 47WH+TS	T/E
C67	CU3035	Chip C.	16MV 47WH+TS	T/E
C68	CU3013	Chip C.	16MV 47WH+TS	T/E
C69	CU3012	Chip C.	16MV 47WH+TS	T/E
C70	CU4033	Chip C.	16MV 47WH+TS	T/E
C71	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C72	CU3035	Chip C.	16MV 10SW+TS	T/E
C73	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C74	CU3035	Chip C.	16MV 10SW+TS	T/E
C75	CU3035	Chip C.	16MV 10SW+TS	T/E
C76	CU3035	Chip C.	16MV 10SW+TS	T/E
C77	CU3035	Chip C.	16MV 10SW+TS	T/E
C78	CU3035	Chip C.	16MV 10SW+TS	T/E
C79	CU3035	Chip C.	16MV 10SW+TS	T/E
C80	CU3035	Chip C.	16MV 10SW+TS	T/E
C81	CU3035	Chip C.	16MV 10SW+TS	T/E
C82	CU3035	Chip C.	16MV 10SW+TS	T/E
C83	CU3015	Chip C.	16MV 10SW+TS	T/E
C84	CU3015	Chip C.	16MV 10SW+TS	T/E
C85	CU3035	Chip C.	16MV 10SW+TS	T/E
C86	CU3002	Chip C.	16MV 10SW+TS	T/E
C87	CU3002	Chip C.	16MV 10SW+TS	T/E
C88	CU3003	Chip C.	16MV 10SW+TS	T/E
C89	CU3039	Chip C.	16MV 10SW+TS	T/E
C90	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C91	CU3035	Chip C.	16MV 10SW+TS	T/E
C92	CU3035	Chip C.	16MV 10SW+TS	T/E
C93	CU3035	Chip C.	16MV 10SW+TS	T/E
C94	CU3021	Chip C.	16MV 10SW+TS	T/E
C95	CU3047	Chip C.	16MV 10SW+TS	T/E
C96	CU3035	Chip C.	16MV 10SW+TS	T/E
C97	CU3035	Chip C.	16MV 10SW+TS	T/E
C98	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C99	CU3035	Chip C.	16MV 10SW+TS	T/E
C100	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
D1	XD0165	Diode	DTZ-1B TT11	T/E
D2	XD0132	Diode	1SV215 TPH4	T/E
D3	XD0132	Diode	1SV215 TPH4	T/E
D4	XD0130	Diode	DA204U T106	T/E
D5	XD0132	Diode	1SV215 TPH4	T/E
D6	XD0132	Diode	1SV215 TPH4	T/E
D8	XD0130	Diode	DA204U T106	T/E
D9	XD0013	Diode	MI407	T/E
D10	XD0013	Diode	MI407	T/E
D11	XD0013	Diode	MI407	T/E
D12	XD0246	Diode	DAN235UT 106	T/E
D13	XD0254	Diode	1SS355 TE17	T/E
D14	XD0250	Diode	MA742 TX	T/E
D15	XD0250	Diode	MA742 TX	T/E
D16	XD0254	Diode	1SS355 TE17	T/E
D17	XD0254	Diode	1SS355 TE17	T/E
D18	XD0130	Diode	DA204U T106	T/E
D19	XD0107	Diode	G3B	T/E
D20	XD0246	Diode	DAN235UT 106	T/E
D21	XD0246	Diode	DAN235UT 106	T/E
D22	XD0254	Diode	1SS355 TE17	T/E
D25	XD0130	Diode	DA204U T106	T/E
FL1	XC0022	Ceramic Filter	KBF-455RL-12A	T/E
IC1	XA0223	IC	TK10930VTL	T/E
IC2	XA0412	IC	M67746	T/E
IC2	XA0444	IC	M68702H	T/E
IC2	XA0445	IC	M68720L	T/E
IC3	XA0449	IC	UPC2710T	T/E
IC4	XA0068	IC	MS218AFP600E	T/E
IC5	XA0068	IC	MS218AFP600E	T/E
IC7	XA0412	IC	LC4425A	T/E
JK2	LU0038	Jack	HSJ2000-01-010	T/E
L1	QA0084	Coil	QA0084	T/E
L2	QA0084	Coil	QA0084	T/E
L3	QA0043	Coil	QA0043	T/E
L4	QA0084	Coil	QA0084	T/E
L5	QA0084	Coil	QA0084	T/E
L6	QC0067	chip L.	NL322522TR10J	T/E
L7	QC0065	chip L.	NL322522T068J	T/E
L8	QC0065	chip L.	NL322522T068J	T/E
L10	QC0065	chip L.	NL322522T068J	T/E
L11	QA085A	Coil	MR1.5 8.5T 0.4	T/E
L12	QA085A	Coil	MR1.5 8.5T 0.4	T/E
L13	QA035D	Air Core Coil	MR3.0 4.5T 0.6	T/E
L14	QA045E	Air Core Coil	MR3.0 4.5T 0.8	T/E
L15	QA045E	Air Core Coil	MR3.0 4.5T 0.8	T/E
L16	QA045E	Air Core Coil	MR3.0 4.5T 0.8	T/E
L17	QA045E	Air Core Coil	MR3.0 4.5T 0.8	T/E
L18	QA045E	Air Core Coil	MR3.0 4.5T 0.8	T/E
L19	QC0039	chip L.	NL322522TR10J	T/E
L20	QC0063	chip L.	NL322522T047J	T/E
C102	CU3031	Chip C.	C1608JB1H471KTA	T/E
C103	CU3028	Chip C.	C1608CH1H271JTA	T/E
C104	CU3035	Chip C.	C1608JB1H102KTA	T/E
C105	CU3035	Chip C.	C1608JB1H102KTA	T/E
C106	CS0049	Chip C.	TMCSA1C105MTR	T/E
C107	CU3035	Chip C.	C1608JB1H102KTA	T/E
C108	CS0049	Chip C.	TMCSA1C105MTR	T/E
C109	CU3035	Chip C.	C1608JB1H102KTA	T/E
C110	CS0049	Chip C.	TMCSA1C105MTR	T/E
C111	CS0049	Chip C.	TMCSA1C105MTR	T/E
C112	CU3035	Chip C.	C1608JB1H102KTA	T/E
C113	CE0339	Electrolytic C.	16MV 10SW+TS	T/E
C114	CU3059	Chip C.	C1608JF1E104ZTA	T/E
C115	CE0338	Electrolytic C.	25MV 4R75SW+TS	T/E
C116	CU3059	Chip C.	C1608JF1E104ZTA	T/E
C117	CE0343	Electrolytic C.	16MV 1000HC+T	T/E
C118	CU3035	Chip C.	C1608JB1H102KTA	T/E
C119	CU3035	Chip C.	C1608JB1H102KTA	T/E
C120	CU3031	Chip C.	C1608JB1H102KTA	T/E
C121	CU3035	Chip C.	C1608JB1H102KTA	T/E
C122	CU3035	Chip C.	C1608JB1H102KTA	T/E
C123	CU3035	Chip C.	C1608JB1H102KTA	T/E
C124	CU3035	Chip C.	C1608JB1H102KTA	T/E
C125	CU3023	Chip C.	C1608CH1H101JTA	T/E
C126	CU3023	Chip C.	C1608CH1H101JTA	T/E
C128	CU3027	Chip C.	C1608CH1H221JTA	T/E
C129	CU3059	Chip C.	C1608JF1E104ZTA	T/E
C130	CU3102	Chip C.	C1608JB1C333KTA	T/E
C131	CE0342	Electrolytic C.	16MV 470HC+TS	T/E
C132	CU3035	Chip C.	C1608JB1H102KTA	T/E
C133	CU3035	Chip C.	C1608JB1H102KTA	T/E
C134	CU3035	Chip C.	C1608JB1H102KTA	T/E
C135	CU3035	Chip C.	C1608JB1H102KTA	T/E
C136	CU3035	Chip C.	C1608JB1H102KTA	T/E
C137	CU3035	Chip C.	C1608JB1H102KTA	T/E
C138	CU3047	Chip C.	C1608JB1H102KTA	T/E
C139	CU3047	Chip C.	C1608JB1H103KTA	T/E
C140	CU3059	Chip C.	C1608JF1E104ZTA	T/E
C141	CU3011	Chip C.	C1608CH1H100CTA	T/E
C143	CU3035	Chip C.	C1608JB1H102KTA	T/E
C144	CU3035	Chip C.	C1608JB1H102KTA	T/E
C145	CU3023	Chip C.	C1608CH1H101JTA	T/E
C146	CS0235	Chip C.	TMCSA1V334MTR	T/E
C147	CU3059	Chip C.	C1608JF1E104ZTA	T/E
C148	CU3052	Chip C.	RCC05SL040C-L46AE	T/E
C150	CU3035	Chip C.	C1608JB1H102KTA	T/E
C151	CU3015	Chip C.	C1608CH1H220JTA	T/E
C152	CU3035	Chip C.	C1608JB1H102KTA	T/E
C153	CU3035	Chip C.	C1608JB1H102KTA	T/E
C154	CU3023	Chip C.	C1608CH1H101JTA	T/E
CN1	UE0191	Connector	11PS JE	T/E
CN2	UE0191	Connector	11PS JE	T/E
CN4	UE0043	Connector	PI22A02M	T/E

Main Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.
L21	OKA95D	Air Core Coil	MR3.0 9.5T 0.6	T/E/2
L21	OKA75G	Air Core Coil	MR5.0 7.5T 0.6	1
L22	OC0063	Chip L	NL32522T047J	E
L23	QL0012	Coil	QL0012	
Q1	XT0095	Transistor	2SC4081 T106R	
Q2	XT0095	Transistor	2SC4081 T106R	
Q3	XT0095	Transistor	2SC4081 T106R	
Q4	XT0095	Transistor	2SC4081 T106R	
Q5	XE0028	FET	3SK131V12-T1	T/E
Q6	XE0028	FET	3SK131V12-T1	T/E
Q7	XT0095	Transistor	2SC4099 T106N	
Q8	XU0131	Transistor	DTC114EU T106	T/E
Q9	XE0021	FET	2SK880GR TE85L	
Q10	XU0152	Transistor	UMC53TR	T/E
Q11	XT0096	Transistor	2SC4099 T106N	
Q12	XU0112	Transistor	DTA114YU T106	
Q13	XT0084	Transistor	2SC2954 T1	T/E
Q14	XT0112	Transistor	2SB1292F	T/E
Q15	XE0021	FET	2SK880GR TE85L	
Q16	XT0095	Transistor	2SC4081 T106R	
Q17	XT0094	Transistor	2SA1576 T106R	
Q18	XT0061	Transistor	2SB1132T 100Q	
Q19	XU0131	Transistor	DTC114EU T106	T/E
Q20	XU0131	Transistor	DTC114EU T106	T/E
Q22	XU0131	Transistor	DTC114EU T106	
Q23	XT0148	Transistor	2SB1124-TD	
Q24	XU0152	Transistor	UMC53TR	T/E
Q25	XT0095	Transistor	2SC4081 T106R	
Q26	XU0131	Transistor	DTC114EU T106	
Q27	XU0152	Transistor	UMC53TR	T/E
Q28	XT0095	Transistor	2SC4081 T106R	
R1	RK3026	Chip R.	ERJ3G5YJ101V	
R2	RK3030	Chip R.	ERJ3G5YJ221V	
R3	RK3026	Chip R.	ERJ3G5YJ101V	
R4	RK3042	Chip R.	ERJ3G5YJ222V	
R5	RK3043	Chip R.	ERJ3G5YJ272V	
R6	RK3043	Chip R.	ERJ3G5YJ272V	
R7	RK3026	Chip R.	ERJ3G5YJ101V	
R8	RK3026	Chip R.	ERJ3G5YJ101V	
R9	RK3071	Chip R.	ERJ3G5YJ564V	
R10	RK3054	Chip R.	ERJ3G5YJ223V	
R11	RK3026	Chip R.	ERJ3G5YJ101V	
R12	RK3058	Chip R.	ERJ3G5YJ473V	
R13	RK3071	Chip R.	ERJ3G5YJ564V	
R14	RK3038	Chip R.	ERJ3G5YJ102V	
R15	RK3058	Chip R.	ERJ3G5YJ473V	
R16	RK3058	Chip R.	ERJ3G5YJ473V	
R17	RK3057	Chip R.	ERJ3G5YJ393V	
R18	RK3054	Chip R.	ERJ3G5YJ471V	
R19	RK3034	Chip R.	ERJ3G5YJ223V	
R20	RK3064	Chip R.	ERJ3G5YJ154V	
R21	RK3042	Chip R.	ERJ3G5YJ222V	

Ref. No.	Parts No.	Description	Parts Name	Ver.
R78	RK3052	Chip R.	ERJ3G5YJ153V	
R79	RK4026	Chip R.	ERJ-12YJ101V	
R80	RK3050	Chip R.	ERJ3G5YJ103V	
R81	RK3050	Chip R.	ERJ3G5YJ103V	
R82	RK3062	Chip R.	ERJ3G5YJ104V	
R83	RK3043	Chip R.	ERJ3G5YJ222V	
R84	RK3042	Chip R.	ERJ3G5YJ222V	
R85	RK3060	Chip R.	ERJ3G5YJ683V	
R86	RK3060	Chip R.	ERJ3G5YJ683V	
R87	RK3042	Chip R.	ERJ3G5YJ222V	
R88	RK3042	Chip R.	ERJ3G5YJ222V	
R89	RK4034	Chip R.	ERJ-12YJ471U	
R90	RK3049	Chip R.	ERJ3G5YJ822V	
R91	RK3057	Chip R.	ERJ3G5YJ393V	
R92	RK3062	Chip R.	ERJ3G5YJ104V	
R93	RK3050	Chip R.	ERJ3G5YJ103V	
R94	RK3026	Chip R.	ERJ3G5YJ101V	
R95	RK3038	Chip R.	ERJ3G5YJ102V	
R96	RK3050	Chip R.	ERJ3G5YJ103V	
R97	RK3054	Chip R.	ERJ3G5YJ223V	
R98	RK3023	Chip R.	ERJ3G5YJ560V	
R99	RK3030	Chip R.	ERJ3G5YJ221V	
R100	RK3062	Chip R.	ERJ3G5YJ104V	
R101	RK3001	Chip R.	ERJ3G5YR000V	
R102	RK3044	Chip R.	ERJ3G5YJ332V	
R103	RK3050	Chip R.	ERJ3G5YJ103V	
R104	RK3001	Chip R.	ERJ3G5YR000V	
R105	RK3053	Chip R.	ERJ3G5YJ183V	
R106	RK3054	Chip R.	ERJ3G5YJ223V	
R107	RK3038	Chip R.	ERJ3G5YJ102V	
R108	RK3041	Chip R.	ERJ3G5YJ182V	
R109	RK3046	Chip R.	ERJ3G5YJ472V	
R110	RK3044	Chip R.	ERJ3G5YJ332V	
R111	RK3050	Chip R.	ERJ3G5YJ103V	
R112	RK4034	Chip R.	ERJ-12YJ471U	
R113	RK3043	Chip R.	ERJ3G5YJ272V	
R115	RK3050	Chip R.	ERJ3G5YJ103V	
R116	RK3050	Chip R.	ERJ3G5YJ103V	
R117	RK3042	Chip R.	ERJ3G5YJ222V	T/E
R118	RK3001	Chip R.	ERJ3G5YR000V	1/2
R119	RK3042	Chip R.	ERJ3G5YJ222V	T/E
R120	RK3042	Chip R.	ERJ3G5YJ222V	T/E
R121	RK3001	Chip R.	ERJ3G5YR000V	1/2
R122	RK3042	Chip R.	ERJ3G5YJ222V	T/E
R123	RK3042	Chip R.	ERJ3G5YJ222V	T/E
R124	RK3001	Chip R.	ERJ3G5YR000V	T/E
R125	RK3050	Chip R.	ERJ3G5YJ103V	T/E
R126	RK3062	Chip R.	ERJ3G5YJ104V	T/E
R127	RK3050	Chip R.	ERJ3G5YJ103V	T/E
R128	RK3038	Chip R.	ERJ3G5YJ102V	T/E
R129	RK3058	Chip R.	ERJ3G5YJ473V	T/E
R130	RK3026	Chip R.	ERJ3G5YJ101V	T/E
R131	RK3038	Chip R.	ERJ3G5YJ102V	T/E
R132	RK3067	Chip R.	ERJ3G5YJ274V	T/E

Ref. No.	Parts No.	Description	Parts Name	Ver.
R133	RD1013	Resistor	RD1013	T/1/2
R134	RD1013	Resistor	RD1013	T/1/2
R136	RK3052	Chip R.	ERJ3G5YJ153V	
R137	RK3054	Chip R.	ERJ3G5YJ223V	
R140	RH0039	Chip R.	ERJ6G6YJ222V	2
TC1	CT0012	Trimmer	CTZ10AW	
TH2	XS0013	Thermistor	TD6-C268DH	
VR1	RH0108	Trim Pot	EVM1YSX50B15	
VR2	RH0103	Trim Pot	EVM1YSX50B14	
VR3	RH0080	Trim Pot	MVR32HXBRN473	
VR4	RH0103	Trim Pot	EVM1YSX50B14	
VR5	RH0103	Trim Pot	EVM1YSX50B14	
VR6	RH0061	Trim Pot	MVR32HXBRN472	
X1	XK0001	Ceramic Disc	CDB455C7	
X2	XQ0058A	Crystal	UM5 30.395MHZ	
X3	XQ0054Z	Crystal	HC49U 12.8MHZ	
XF1	XF0014Z	Crystal Filter	UM1 30.85MHZ	
	S00034		Earth Spring	
	UE0257		Antenna Cable	

Packing

Ref. No.	Parts No.	Description	Parts Name	Ver.
	EHM45Z	Microphone		
	DS0351	Model Name Plate		
	ADFM78	Bracket		
	FF0103Z	Button Cover		
	Y20012	Adhesive Tape		
	HK0408	Item Carton		
	HP0015	Vinyl Bag for Button Cover		
	HP0037	Vinyl Bag for Bracket		
	HU0069	Fixture DR610		
	HU0073	Fixture 45 x 146		
	HU0075	Fixture		T
	PK0009	Registration Card		
	PK0083	Schematic Diagram		
	PR0237	FCC Part 15 Seal		
	PS0242	Instruction Manual		
	PT0004A	Lot Number Seal		
	ADUA38	Power Cable		
	FM0114	MIC Hanger		
	AJ0025	Screw		
	YZ0138	Adhesive Tape		
	FM0079	Wrench		
	EF0005	Fuse 15A		
	AEG012	Bolt		
	AA0013	Screw		
	AJ0003	Screw		
	AZ0009	Spring Washer		
	AZ0010	Washer		
	AN0002	Nut		

CPU Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.
		CPU Unit		
FM0077Z		LCD Holder	DR1130	
DG0013Z		LCD Light	DR130	
FG0241Z		LCD Rubber Connector		
TL0018		LCD Filter		
TL0019		LCD Filter		
FP0110		LED Spacer		
TT1002		Tube 1.0 6mm		
C301	CU3035	Chip C.	C1608JB1H102KTA	
C302	CU3035	Chip C.	C1608JB1H102KTA	
C303	CU3035	Chip C.	C1608JB1H102KTA	
C304	CU3047	Chip C.	C1608JB1H103KTA	
C305	CS0237	Chip Tantal	TMCMA1A475MTR	
C306	CU3101	Chip C.	C1608JB1C473KTA	
C307	CU3101	Chip C.	C1608JB1H472KTA	
C308	CU3035	Chip C.	C1608JB1H102KTA	
C309	CU3035	Chip C.	C1608JB1H102KTA	
C310	CS0237	Chip Tantal	TMCMA1A475MTR	
C311	CU3085	Chip C.	C1608CH1H300JT-A	
C312	CE0308	Electrolytic C.	6.3CV 100B5	
C313	CU3059	Chip C.	C1608JF1E104ZTA	
C314	CU3085	Chip C.	C1608CH1H300JT-A	
C315	CU3047	Chip C.	C1608JB1H103KTA	
C316	CU3049	Chip C.	C1608JB1E153KTA	
C317	CU3043	Chip C.	C1608JB1H472KTA	
C318	CU3043	Chip C.	C1608JB1E153KTA	
C319	CU3043	Chip C.	C1608JB1H472KTA	
C320	CU3047	Chip C.	C1608JB1H103KTA	
C321	CU3111	Chip C.	C1608JB1C104MTR	
C322	CU3059	Chip C.	C1608JF1E104ZTA	
C323	CU3051	Chip C.	C1608JB1E223KTA	
C324	CE0312	Electrolytic C.	ECEV1CA100R	
C325	CE0312	Electrolytic C.	ECEV1CA100R	
C327	CU3051	Chip C.	C1608JB1H102KTA	
C328	CU3059	Chip C.	C1608JF1E104ZTA	
C329	CS0372	Chip Tantal	TMCMB1C108MTR	
C330	CU3019	Chip C.	C1608CH1H470JTA	
C331	CS0220	Chip Tantal	TMCMA1C225MTR	
C332	CS0220	Chip Tantal	TMCMA1C225MTR	
C333	CU3031	Chip C.	C1608JB1H471KTA	
C334	CU3031	Chip C.	C1608JB1H471KTA	
CN301	UX1201	Wire	DR1140TE1	1/2
CN302	UE0192	Connector	11R JE	
CN303	UE0192	Connector	11R JE	
CN304	UE0170	Connector	B95 ZR	
D301	XL0051	LED	VRF33312X	
D302	XD0254	Diode	1SS355 TE17	
D303	XD0127	Diode	MA704WA TX	
D304	XD0255	Diode	MA8110H TX	
D305	XD0254	Diode	1SS355 TE17	
EL301	EL0036	LCD	LCD HLC9843-013400	
IC302	XA0446	IC	M38223MA-408H	
IC303	XA0351	IC	24LC16BT-I/SN	

CPU Unit / SP unit / VCO Unit

Ref. No.	Parts No.	Description	Parts Name	Ver.
		CPU Unit / SP unit / VCO Unit		
R339	RK3082	Chip R.	ERJ3GSYJ104V	
R341	RK3001	Chip R.	ERJ3GSYR000V	
R342	RK3038	Chip R.	ERJ3GSYJ102V	
R343	RK3046	Chip R.	ERJ3GSYJ472V	
R344	RK3050	Chip R.	ERJ3GSYJ103V	
R345	RK3054	Chip R.	ERJ3GSYJ223V	
R346	RK3050	Chip R.	ERJ3GSYJ103V	
R347	RK3082	Chip R.	ERJ3GSYJ104V	
R348	RK3038	Chip R.	ERJ3GSYJ102V	
R349	RK3001	Chip R.	ERJ3GSYR000V	
R350	RK3001	Chip R.	ERJ3GSYR000V	
R353	RK3102	Chip R.	ERJ3GSYJ203V	
R355	RK3102	Chip R.	ERJ3GSYJ203V	
R356	RK3050	Chip R.	ERJ3GSYJ103V	
R357	RK3062	Chip R.	ERJ3GSYJ104V	
R358	RK3062	Chip R.	ERJ3GSYJ104V	
R360	RK3102	Chip R.	ERJ3GSYJ203V	
R361	RK3050	Chip R.	ERJ3GSYJ103V	
R363	RK3058	Chip R.	ERJ3GSYJ473V	
R364	RK3058	Chip R.	ERJ3GSYJ273V	
R366	RK3070	Chip R.	ERJ3GSYJ474V	
R368	RK3058	Chip R.	ERJ3GSYJ473V	
R369	RK3050	Chip R.	ERJ3GSYJ203V	
R370	RK3102	Chip R.	ERJ3GSYJ103V	
R371	RK3038	Chip R.	ERJ3GSYJ102V	
R372	RK0014	Chip R.	ERJ6GEYJ680V	
R373	RK3042	Chip R.	ERJ3GSYJ222V	
R375	RK3070	Chip R.	ERJ3GSYJ474V	
R376	RK3046	Chip R.	ERJ3GSYJ472V	
R377	RK3085	Chip R.	ERJ3GSYJ273V	
R378	RK3070	Chip R.	ERJ3GSYJ474V	
R379	RK3001	Chip R.	ERJ3GSYR000V	
R380	RK3058	Chip R.	ERJ3GSYJ473V	
R381	RK3070	Chip R.	ERJ3GSYJ474V	
R382	RK3034	Chip R.	ERJ3GSYJ471V	
R383	RK3034	Chip R.	ERJ3GSYJ471V	
RE301	UR0002	Encoder	EVG0QGF1524B	
SW301	UU0025	Switch	SKQMAL	
SW302	UU0015	Switch	SKGD 901	
SW303	UU0015	Switch	SKGD 901	
SW304	UU0015	Switch	SKGD 901	
SW305	UU0025	Switch	SKQMAL	
SW306	UU0011	Switch	ESB84801	
VR301	U00035	Trim Pot	EVU2JFK4B14	
X301	XQ0091	Crystal	38C 4.9152MHZ	
	UP0317A		DR140 P.C.B.	
		SP Unit		
ES0017	FG0040	Speaker	VS-57-0814-1.5W	
FG0040	UX1047	Wire	Speaker Cushion Harness DR130	

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.	ERJ3G5YJ102V	
R202	RK3038	Chip R.	ERJ3G5YJ102V	
R203	RK3038	Chip R.	ERJ3G5YJ102V	
R206	RK3046	Chip R.	ERJ3G5YJ472V	
R207	RK3058	Chip R.	ERJ3G5YJ473V	
R208	RK3034	Chip R.	ERJ3G5YJ471V	
R210	RK3040	Chip R.	ERJ3G5YJ152V	
R212	RK3030	Chip R.	ERJ3G5YJ221V	
R213	RK3041	Chip R.	ERJ3G5YJ182V	
R214	RK3022	Chip R.	ERJ3G5YJ470V	
R216	RK3026	Chip R.	ERJ3G5YJ010V	
R217	RK3018	Chip R.	ERJ3G5YJ220V	
R218	RK3050	Chip R.	ERJ3G5YJ03V	
R219	RK3038	Chip R.	ERJ3G5YJ102V	
R221	RK3001	Chip R.	ERJ3G5Y0R00V	
R224	RK3034	Chip R.	ERJ3G5YJ471V	
R225	RK3054	Chip R.	ERJ3G5YJ223V	
R226	RK3028	Chip R.	ERJ3G5YJ010V	
R228	RK3041	Chip R.	ERJ3G5YJ182V	
R229	RK3026	Chip R.	ERJ3G5YJ010V	
R231	RK3058	Chip R.	ERJ3G5YJ473V	
R232	RK3058	Chip R.	ERJ3G5YJ473V	
R233	RK3040	Chip R.	ERJ3G5YJ152V	
R234	RK3046	Chip R.	ERJ3G5YJ472V	
R235	RK3026	Chip R.	ERJ3G5YJ010V	
R236	RK3046	Chip R.	ERJ3G5YJ472V	
R237	RK3066	Chip R.	ERJ3G5YJ224V	
R238	RK3058	Chip R.	ERJ3G5YJ473V	
<b>Mechanical Parts</b>				
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	
NE0063Z			Power Switch Knob	
SS0052Z			Chassis	
TS0125Z			Front Shield Case	
FP0004			Cable Tie	1/2
Ref. No.	Parts No.	Description	Parts Name	Ver.
<b>EJ-20u</b>				
C501	CS0236	Chip Tantall	TMCMAQJ85MTR	
C502	CUJ059	Chip C.	C1608JF1E104ZTA	
C503	CS0230	Chip Tantall	TMCMA1E105MTR	
C504	CUJ059	Chip C.	C1608JF1E104ZTA	
C505	CS0230	Chip Tantall	TMCMA1E105MTR	
C506	CS0230	Chip Tantall	TMCMA1E105MTR	
C507	CS0230	Chip Tantall	TMCMA1E105MTR	
C508	CUJ023	Chip C.	C1608CH1H101JTA	
C509	CS0237	Chip Tantall	TMCMA1A475MTR	
C510	CUJ019	Chip C.	C1608CH1H470JTA	
C511	CUJ0085	Chip C.	C1608J1B1H102KTA	
C512	CUJ0015	Chip C.	C1608CH1H220KTA	
C513	CUJ0015	Chip C.	C1608CH1H220KTA	
CN6001	UX1050	Wire	EJ20u	
IC501	XA0239	IC	AK2341	
Q501	XT0095	Tansistor	2SC4081 T106R	
R501	RK3040	Chip R.	ERJ3G5YJ152V	
R502	RK3022	Chip R.	ERJ3G5YJ470V	
R503	RK3067	Chip R.	ERJ3G5YJ274V	
R504	RK3038	Chip R.	ERJ3G5YJ102V	
R505	RK3051	Chip R.	ERJ3G5YJ123V	
R506	RK3049	Chip R.	ERJ3G5YJ822V	
R507	RK3067	Chip R.	ERJ3G5YJ274V	
R508	RK3047	Chip R.	ERJ3G5YJ562V	
R509	RK3068	Chip R.	ERJ3G5YJ334V	
R510	RK3054	Chip R.	ERJ3G5YJ223V	
R511	RK3054	Chip R.	ERJ3G5YJ223V	
R512	RK3055	Chip R.	ERJ3G5YJ273V	
R513	RK3074	Chip R.	ERJ3G5YJ105V	
R514	RK3085	Chip R.	ERJ3G5YJ184V	
R515	RK3048	Chip R.	ERJ3G5YJ682V	
R516	RK3056	Chip R.	ERJ3G5YJ333V	
VR501	RH0106	Trim. Pot	EVN1Y5X508Q4	
X501	XQ0077	Crystal	38C 3.686400MHZ	
HK0305			Carton	
HP0029			Protection Bag	
FG0057			Rubber Cushion	
UP0243			P.C.B.	
YZ0042			Bond G17	



# ADJUSTMENT

## 1) Required Test Equipment

### 1. Digital Multimeter

### 2. Regulated Power Supply

Supply voltage: 13.8VDC  
Current: 15A or more

### 3. Oscilloscope

Measurable frequency: Audio Frequency

### 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

#### d. Distortion Meter

Measurable frequency: 1kHz  
Input level: Up to 40dB  
Distortion level: 1% ~ 100%

#### e. Audio Generator

Output frequency: 1kHz ~ 10kHz  
Output impedance: 600Ω

#### f. Linear Detector

## 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

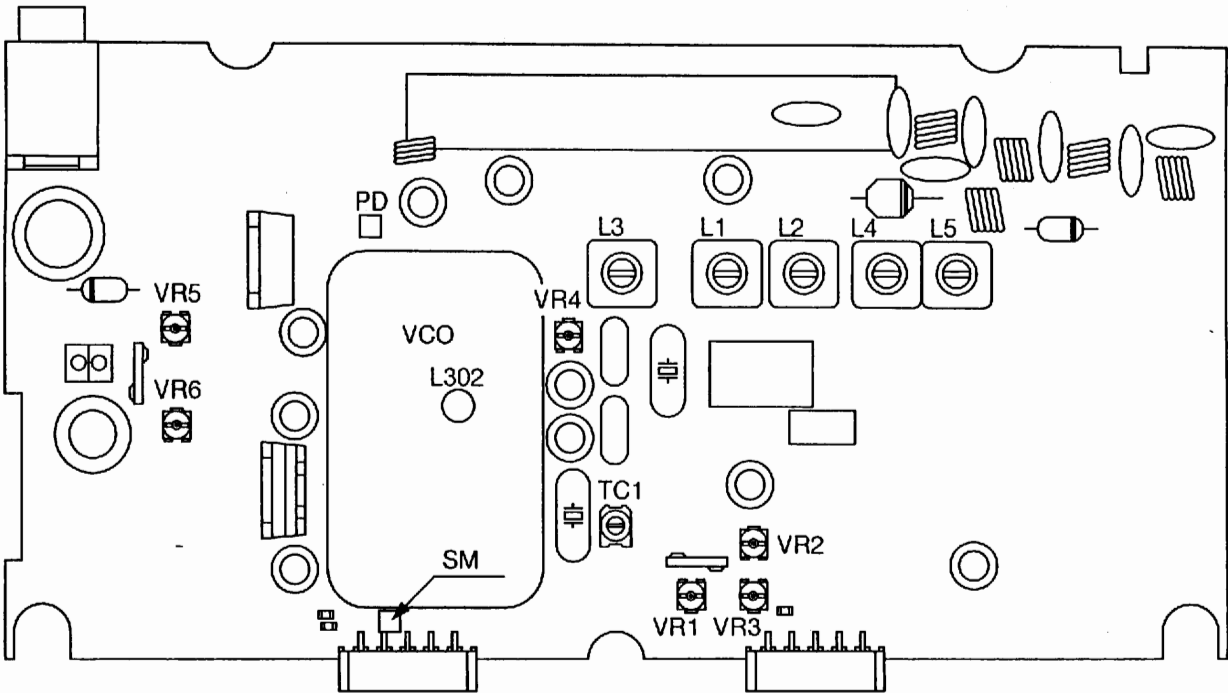
## 3) TX Adjustment

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

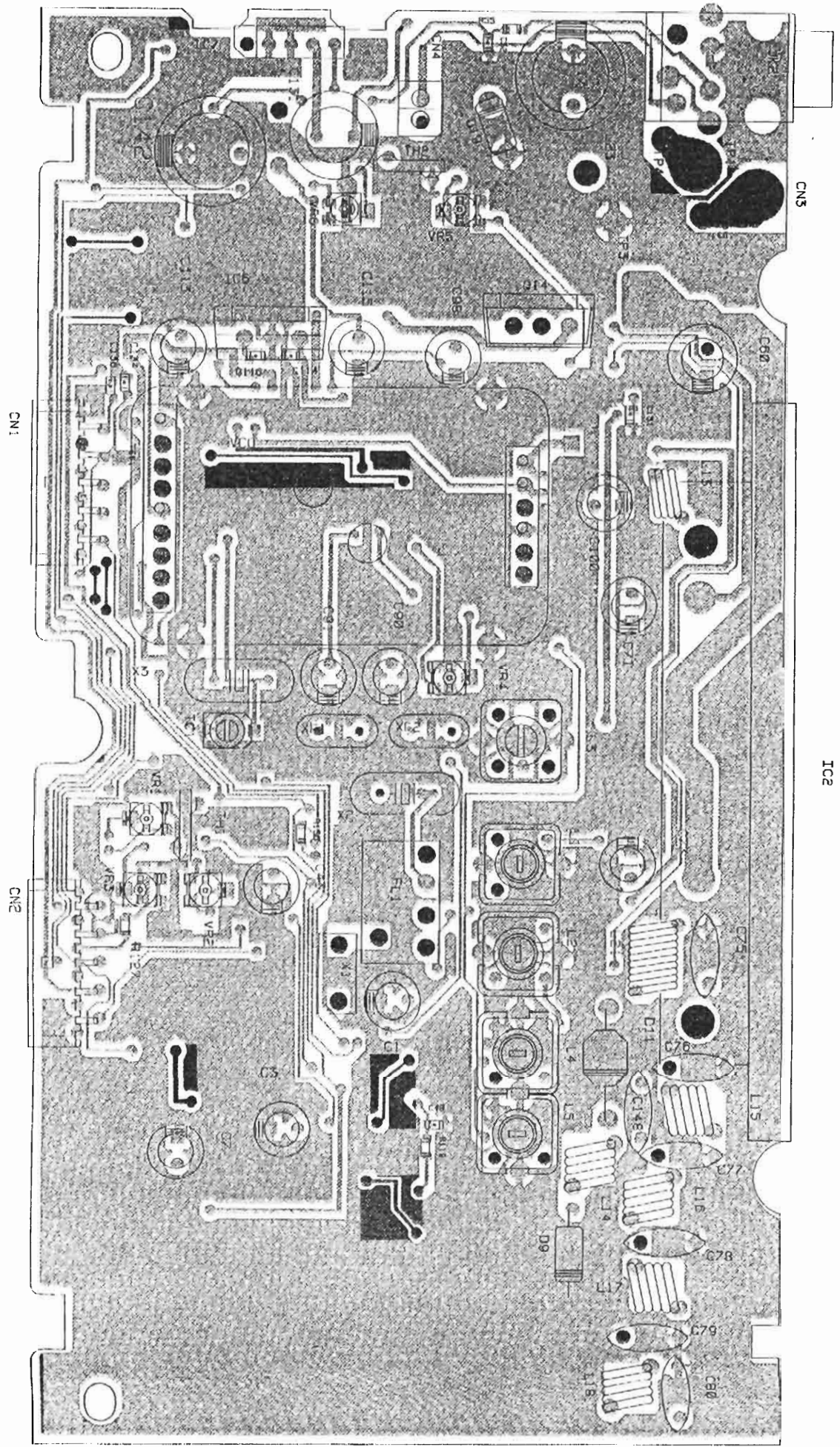
#### 4) RX Adjustment

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.	
	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	
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	

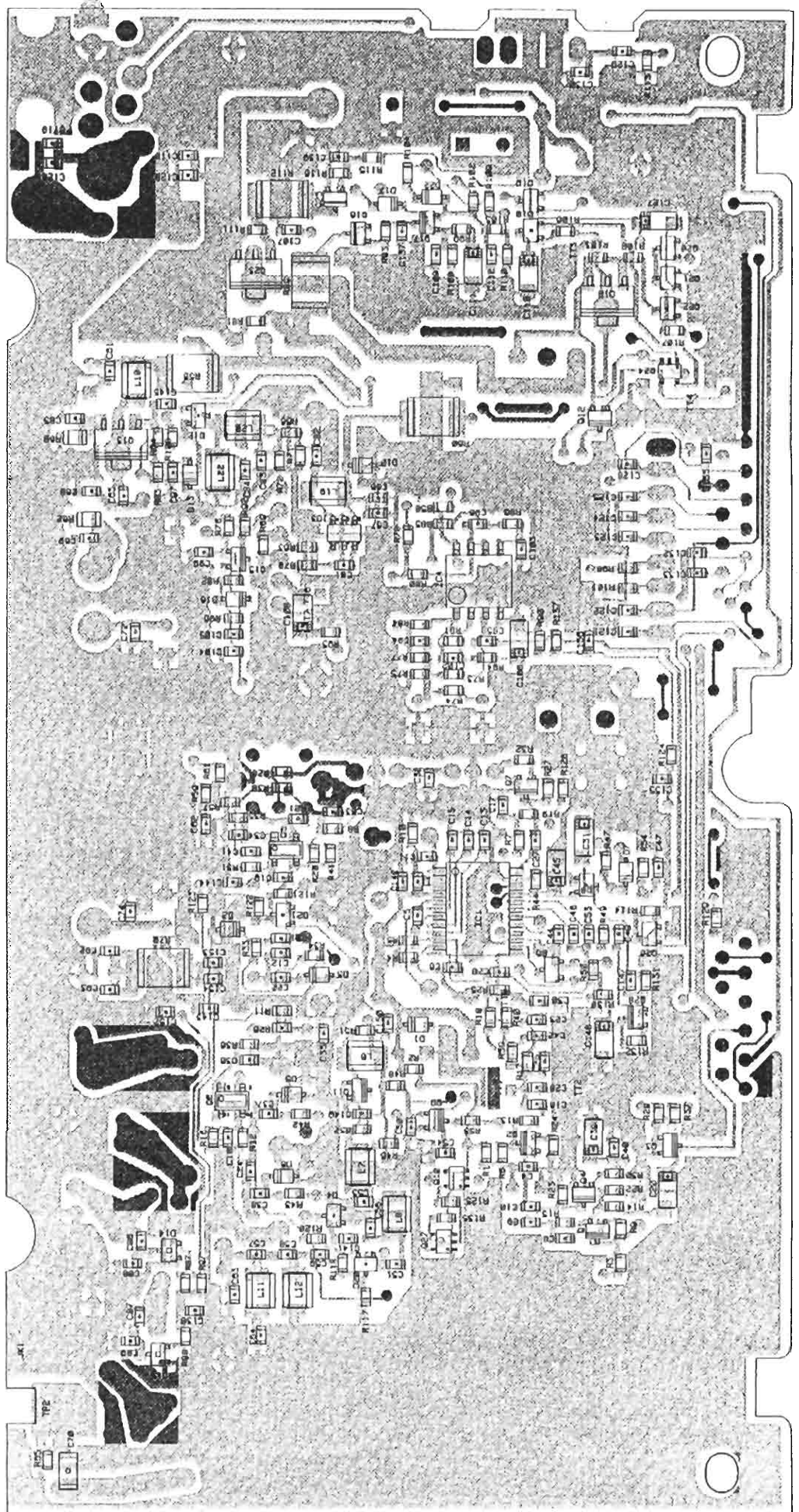
# 5) Adjustment Points



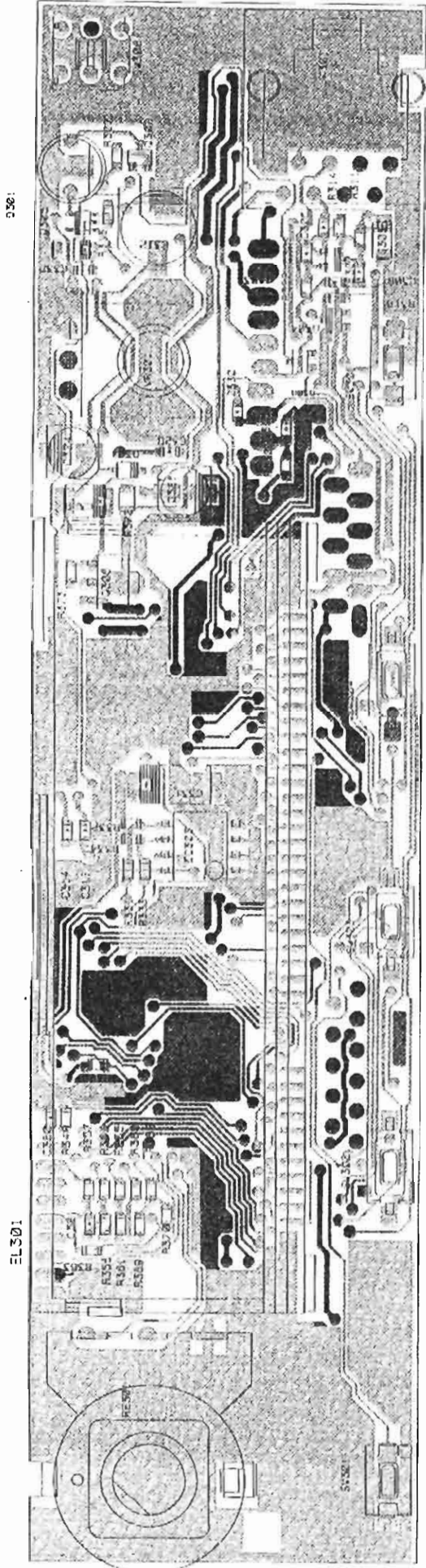
# 1) Main Unit Side A



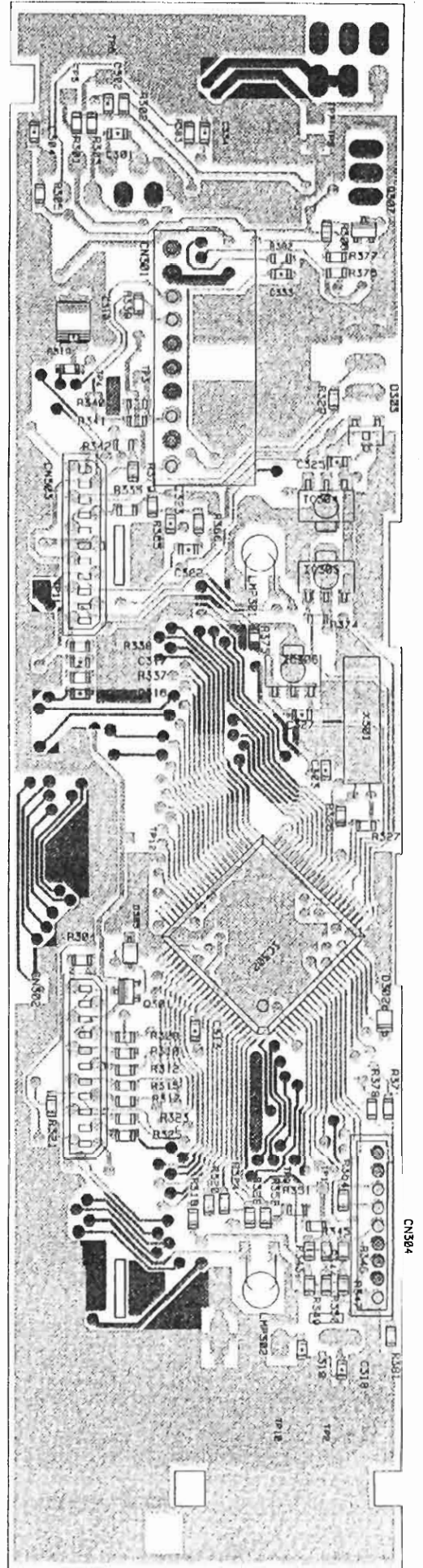
## 2) Main Unit Side B



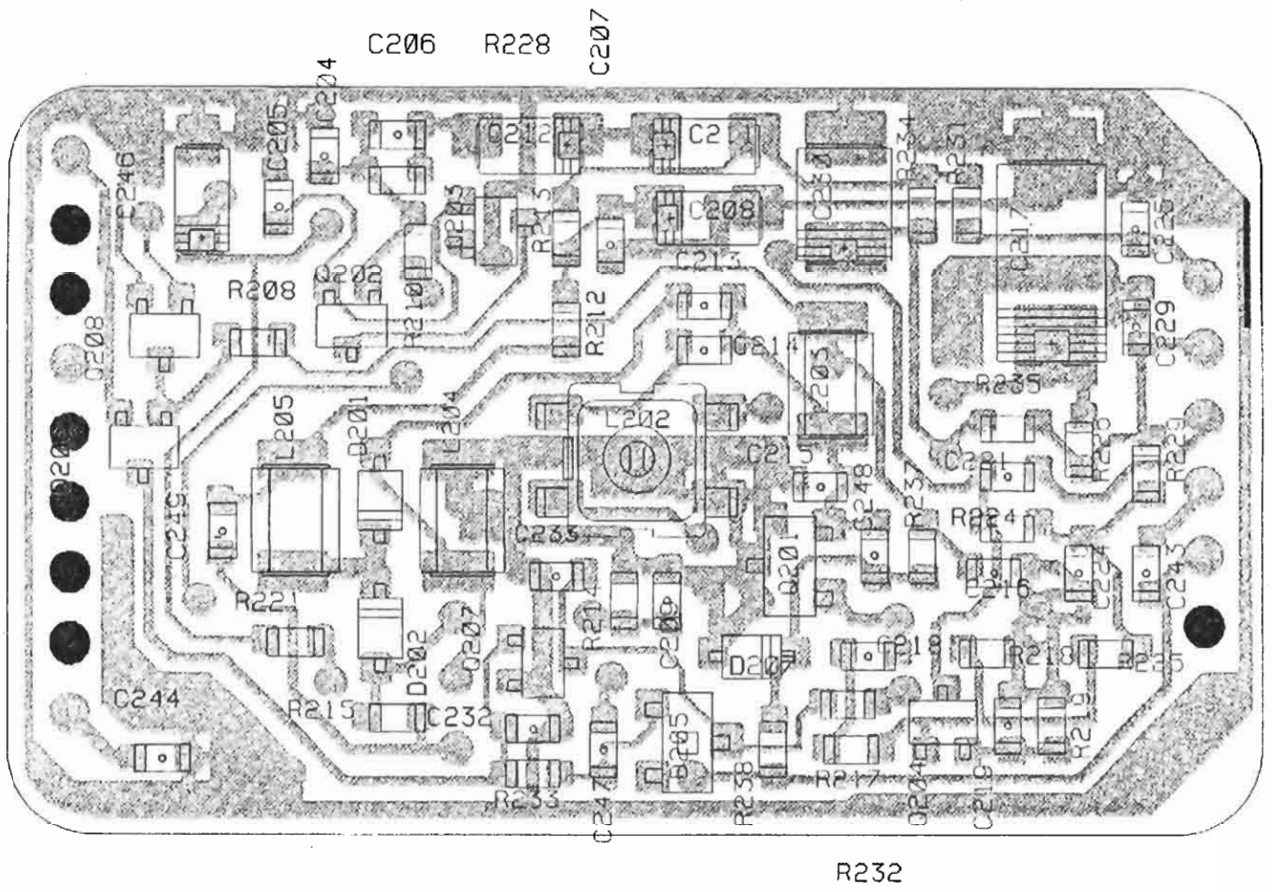
### 3) CPU Unit Side A



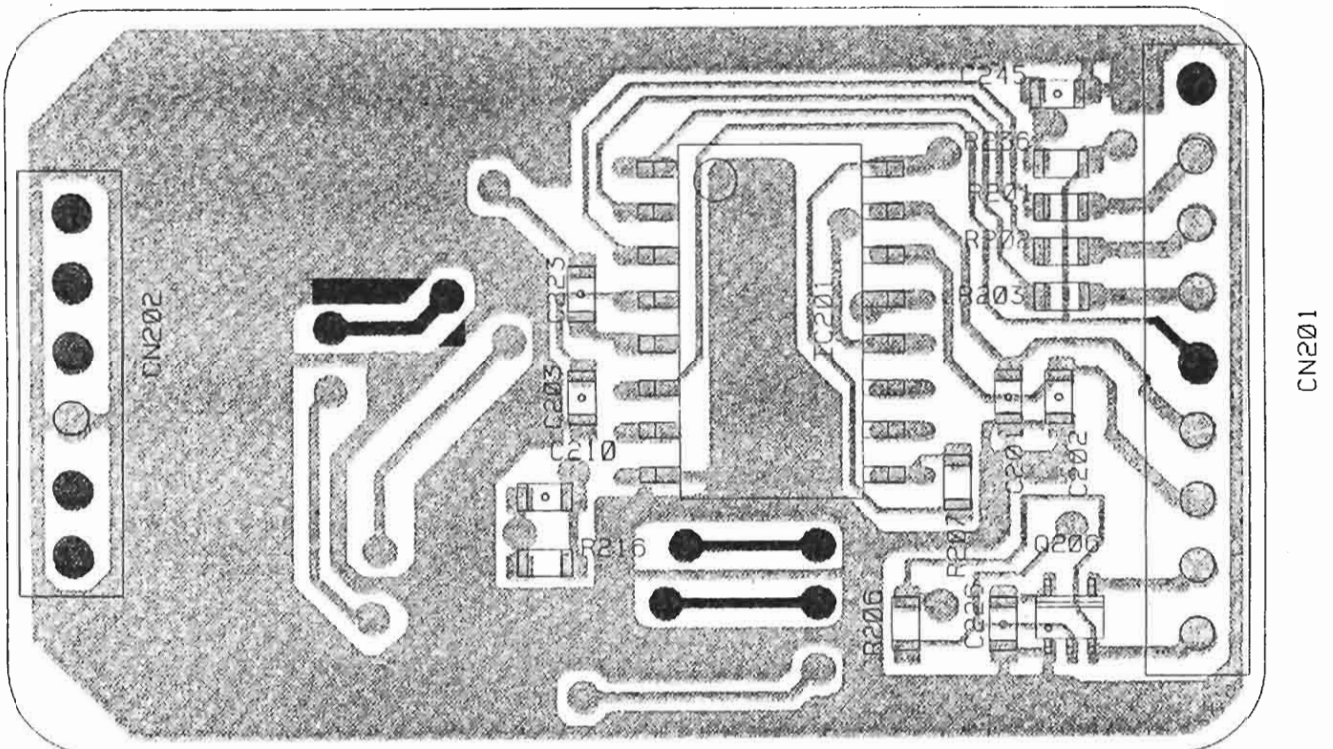
### 4) CPU Unit Side B



5) VCO Unit Side A



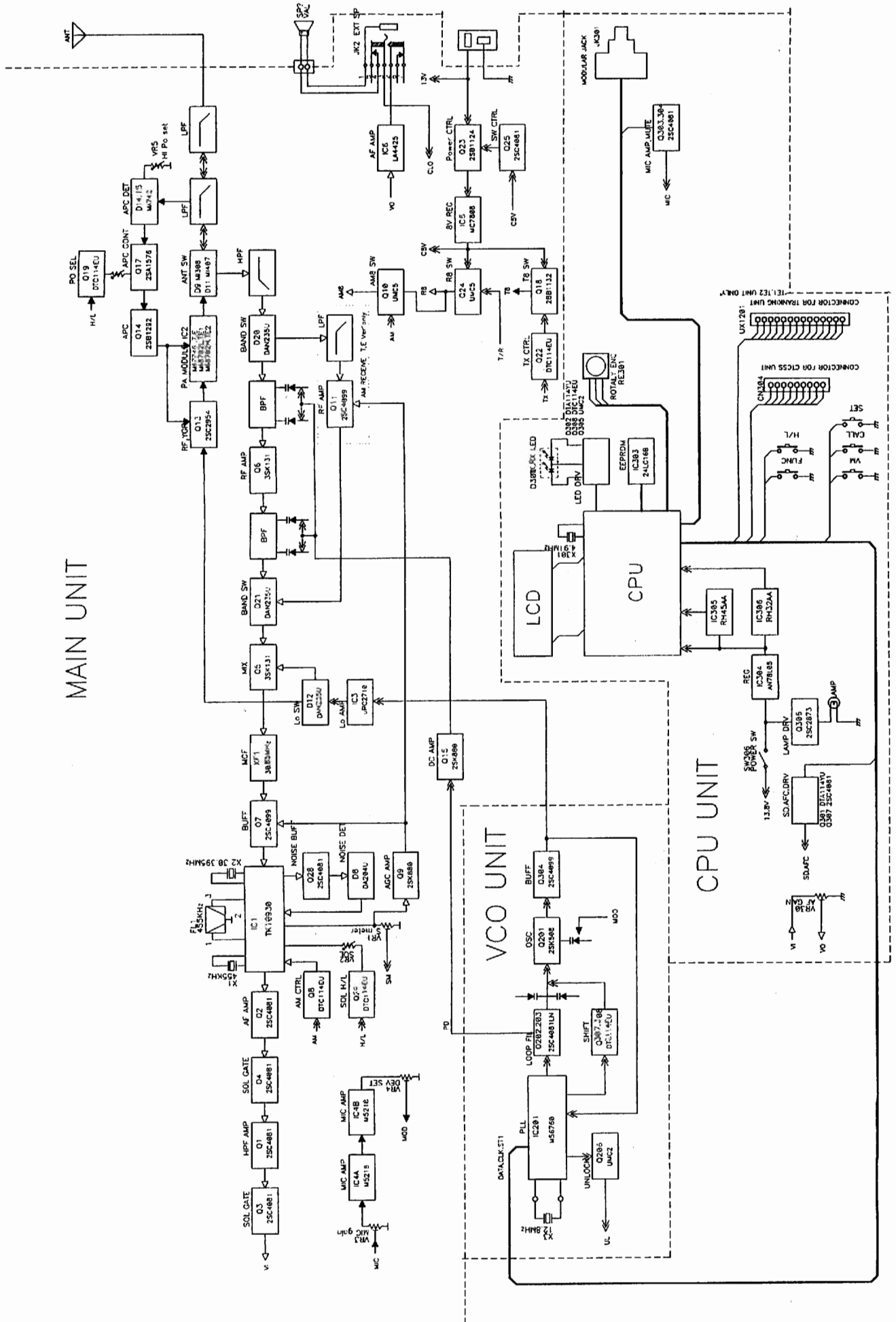
6) VCO Unit Side B



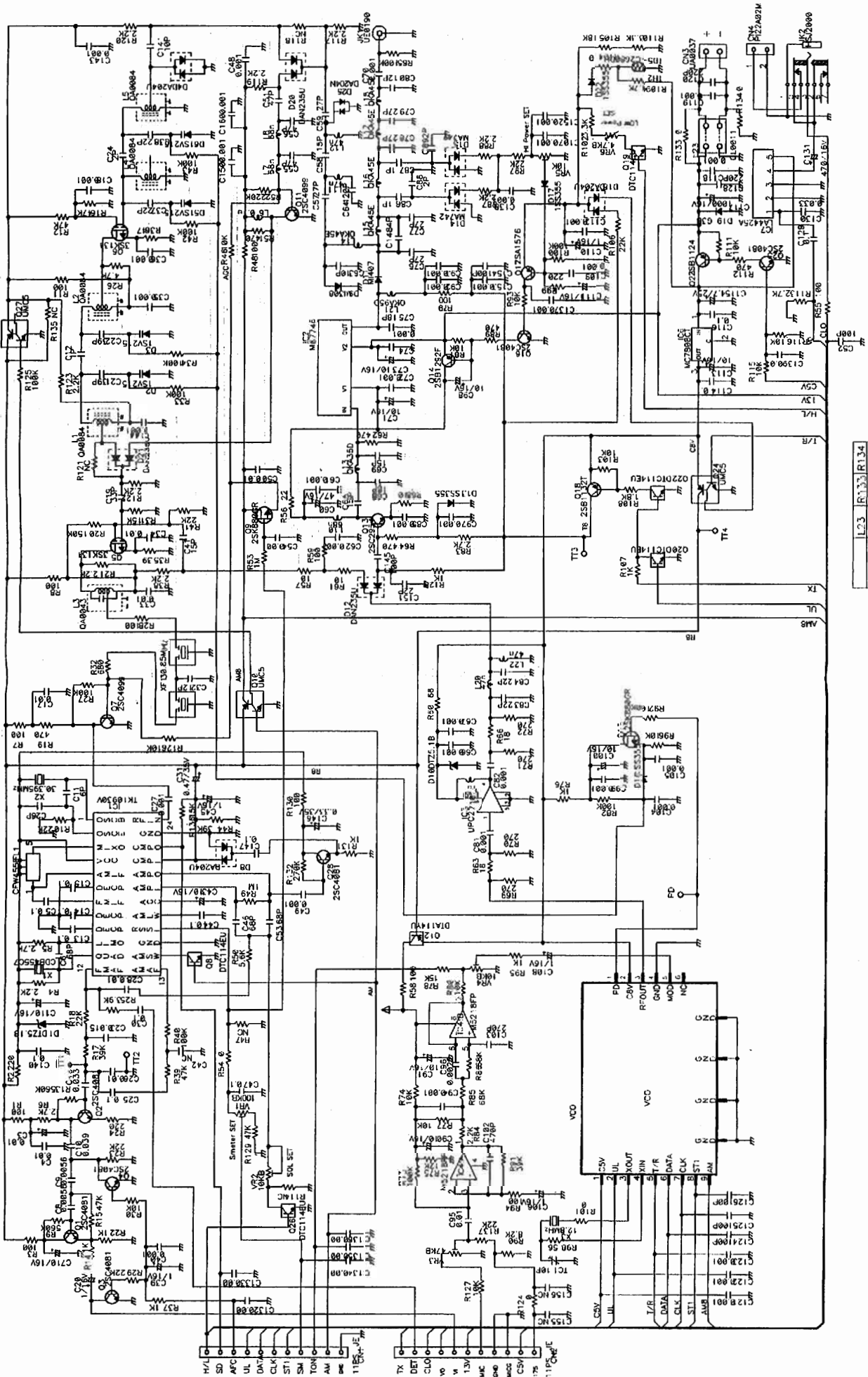




# BLOCK DIAGRAM

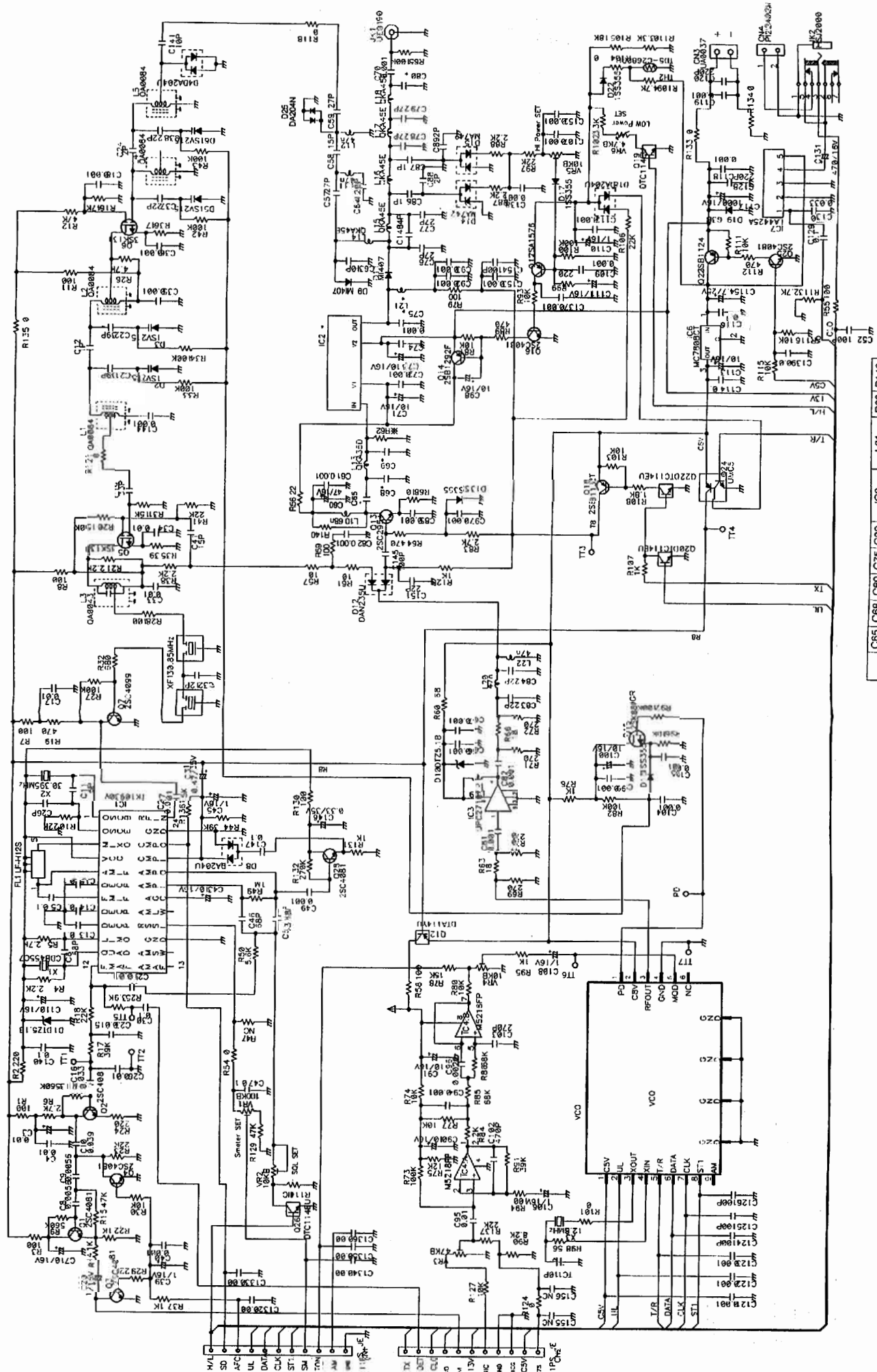


1) Main Unit T/E



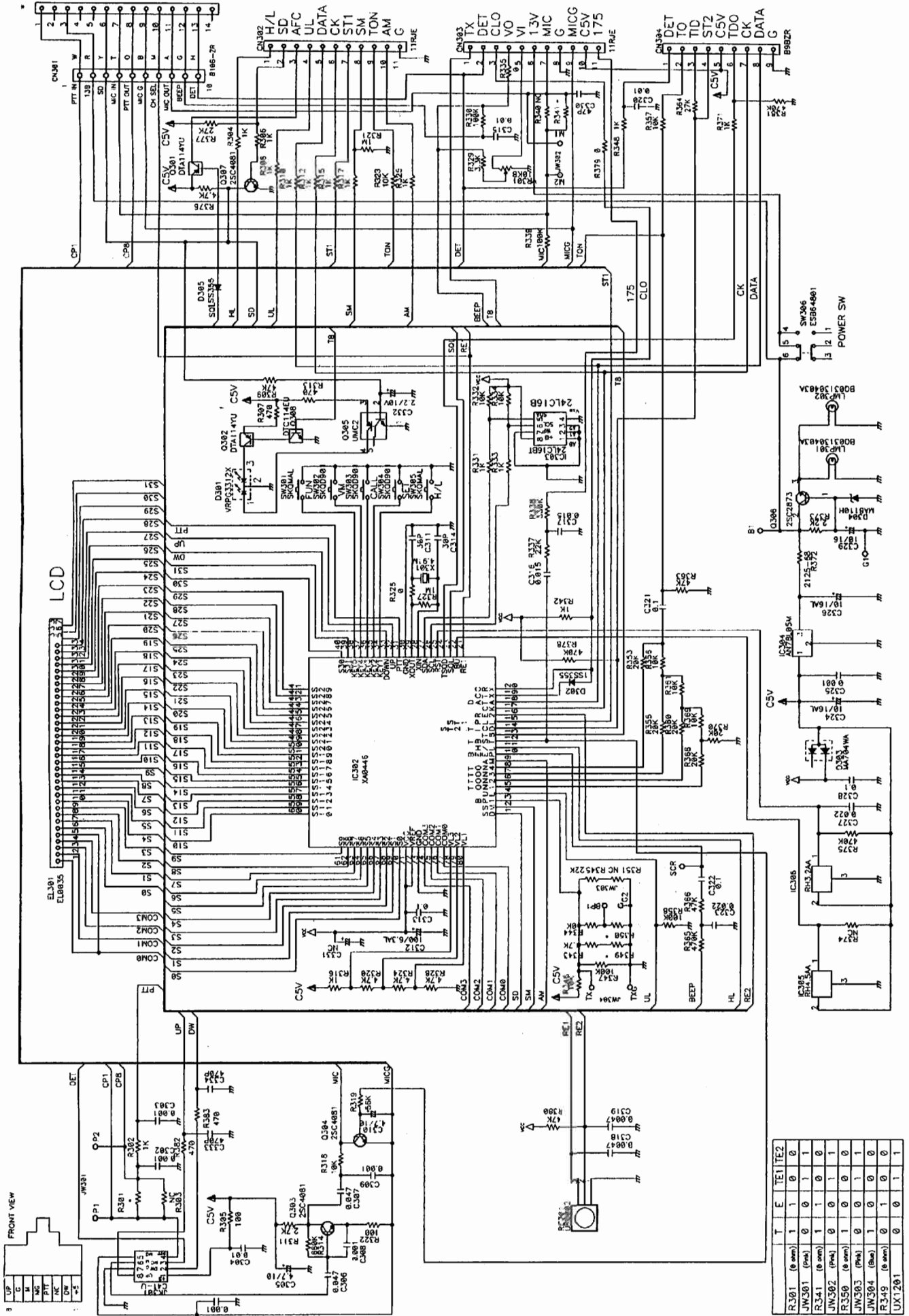
L23	R133	R134
DR140T	-	0
LF140E	0	-

2) Main Unit TE1/TE2



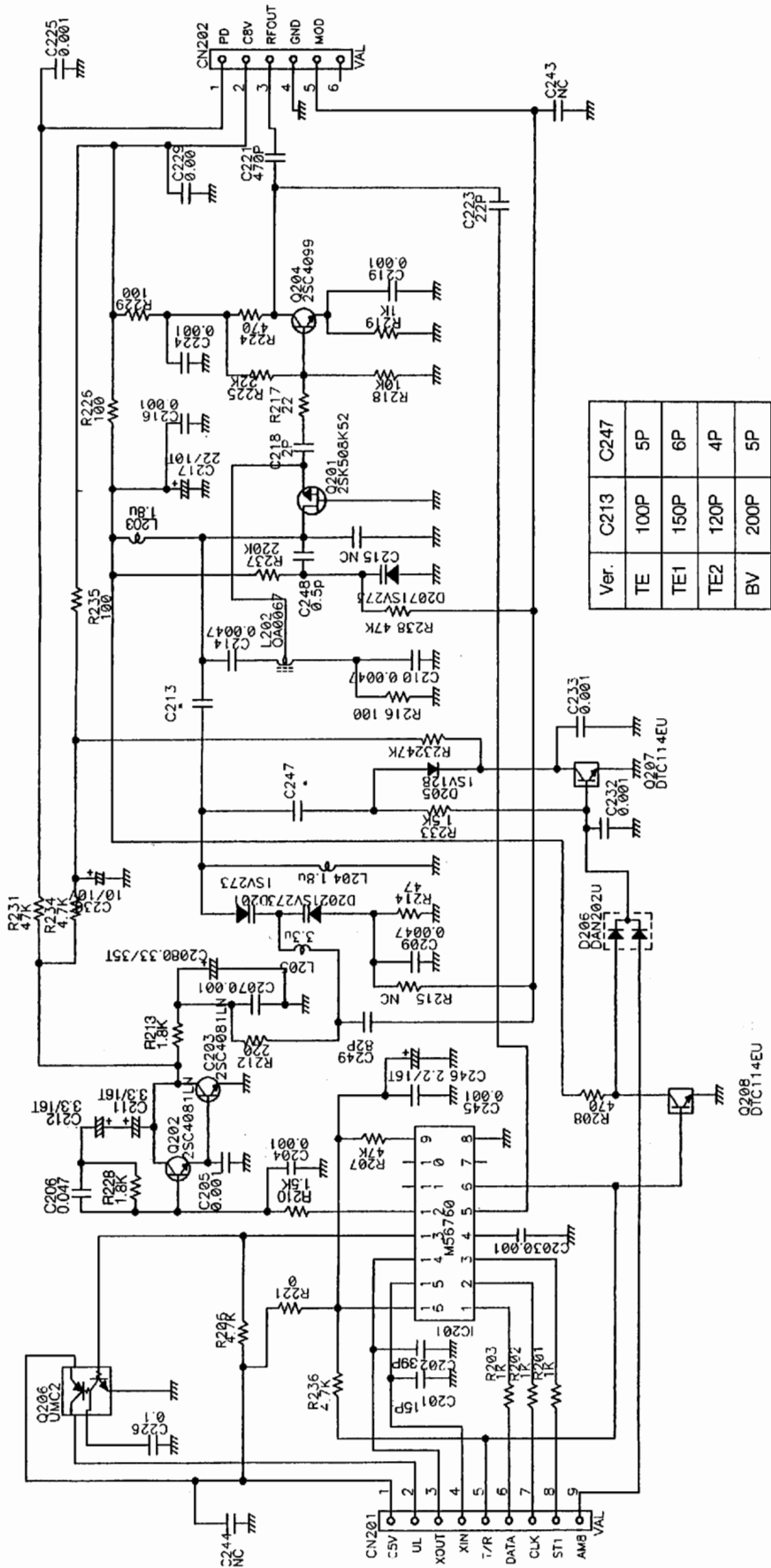
C65	C68	C75	C80	IC2	L21	R62	R146
TE1	15P	18P	15P	22P	15P	M66702L	QK475G
TE2	15P	15P	12P	10P	15P	M66702H	QK495D
						150	2.2K

### 3) CPU Unit

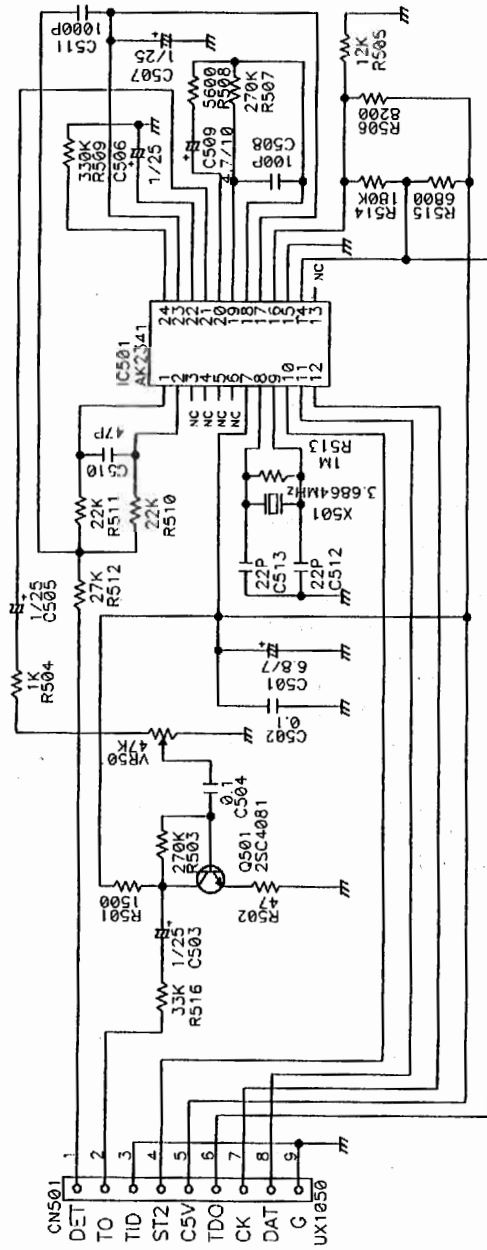


	T	E	TE1	TE2
R301 (8 mm)	1	1	0	0
JW301 (mm)	0	0	1	1
R341 (8 mm)	1	0	0	1
JW302 (mm)	0	0	1	1
R350 (8 mm)	1	0	0	0
JW303 (mm)	0	0	1	1
JW304 (mm)	1	0	0	0
R349 (8 mm)	0	1	0	0
UX1201	0	0	1	1

# 4) VCO Unit



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



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