

DR-130

Service Manual

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SPECIFICATIONS

1) General

Frequency Coverage:

RX: 136.000 ~ 174.000MHz (T version)
TX: 144.000 ~ 148.000MHz (T version)
RX: 144.000 ~ 146.000MHz (E/EZ version)
TX: 144.000 ~ 146.000MHz (E/EZ version)
RX: 130.000 ~ 174.000MHz (EA/TA version)
TX: 130.000 ~ 174.000MHz (EA/TA version)
RX: 136.000 ~ 155.000MHz (TE1 version)
TX: 136.000 ~ 155.000MHz (TE1 version)
RX: 150.000 ~ 174.000MHz (TE2 version)
TX: 150.000 ~ 174.000MHz (TE2 version)

Frequency Resolution: 5, 10, 12.5, 15,20,25kHzsteps

Antenna Impedance: 50 ohm unbalanced

Power Supply Requirements: DC 13.8 +/-10% Volts DC

Current Drain at I3.8V

Receiving: Squelched less than 800mA

Transmitting: High/10.0A (approx.)

Low/3.5A (approx.)

Dimensions: 140mm(W) x 40mm(H) x 154mm(D)

Weight: 0.86kg (approx.)

2) Transmitter

Output Power:

High: 50Watts (DR-130T/E)

High: 35Watts (DR-130TE1/2)

High:10Watts (DR-130EZ)

Low: 5Watts (Approx.)

Emission Mode:

F3E(FM)

Modulation System:

Variable Reactance Frequency Modulation

Max. Frequency Deviation:

+/- 5kHz (Wide Version)

+/- 2.5kHz (Narrow Version)

Spurious Emission:

-60dB or below carrier

Microphone:

Electret Condenser Microphone

Operating Mode:

Simplex/Semi-Duplex

Offset :

Offset from 0 to 15.995MHz

3) Receiver

Receiving System:

Superheterodyne Dual Conversion

Intermediate Frequency:

1stIF: 17.2MHz

2nd IF: 455kHz

12dB SINAD less than -16dBu (144.000MHz ~ 147.995MHz)

Sensitivity:

More than +/-6kHz at -6dB (Wide Version)

Selectivity:

Less than +/-15kHz at -60dB (Wide Version)

Audio Power Output:

More than 2.5W 10% Distortion

Speaker Impedance:

8 ohm

CIRCUIT DESCRIPTION

1) Receiver System

1. Front End

The signal from the antenna is passed through a low-pass filter and input to the voltage step up circuit consisting of L14. The signal from L14 is led to the gate of Q1. D19 is the diode limiter circuit against the excessive input power of more than 20dBm. Q1 is the FET which has two gates. The voltage of the gate 2 is set higher to get the high gain and sensitivity. The signal from Q1 is led to the triple band pass filter (L4, L5, L6), and gets the high image rejection ratio.

2. Mixer Circuit

The signal from the triple band pass filter is converted into the first IF signal of 17.2MHz. The receiving signal is led to the gate 1 of Q2, and the first local oscillator signal is led to the gate 2 of Q2. To get the high conversion gain, the local oscillator signal voltage is set to about 1V. To reduce the high adjacent channel interference, the band width of the FL2 is set to 20kHz. The signal from FL2 is amplified by Q8, and input to FM IF system IC3 of TK10487.

3. IF Circuit

The TK10487 has the second local oscillator circuit, mixer circuit, detector circuit, squelch circuit, and so on. Pin1 and 2 are the terminals of the crystal oscillator circuit. Pin2 (emitter) is connected to the ground via the resistor R3 to prevent the oscillator from decreasing the power at the low temperature. Pin4 of IC3 is connected to FL1 directly because the matching resistor for ceramic filter is built-in. The quadrature circuit (pin10 of IC3) is connected to the ceramic resonator X2 for the temperature stability and good quality. The signal from pin11 of IC3 is connected to the LPF. The detected AF signal, which has flat frequency characteristics, is led to the control unit and used as both squelch signal and tone squelch signal. De-emphasis circuit consists of R31, R32, C26 and C27. The LPF amplifier consisting of Q5 and Q6 is located far away from the VR in the control unit, so it outputs the high voltage signal to prevent S/N from the deterioration. The squelch switch circuit consists of Q4 and Q16, and switches on/off at the point where there is no voltage to prevent from the switching noise. The S meter signal from pin12 of IC3 is led to the CPU in the control unit after adjusting the level at D20 and VR5. The S meter signal is thermal compensated by TH1 and stabilized. The noise amplifier consists of pin13 and 14, the built-in OP amplifier in IC3. The output signal of noise amplifier is amplified by Q14, rectified by D5, and then led to the pin15 (hysteresis comparator input) of IC3.

4. AF Circuit

IC4 is about 5W audio power amplifier IC. When the capacity of pin1 in C16 is increased more, the output incidental noise becomes smaller. The high-pitched tone becomes smaller at the same time, This radio's capacity of C16 is determined considering the high-pitched tone.

2) Transmitter System

1. Modulation Circuit

3) PLL Circuit

The microphone amplifier IC1 (IDC, LPF) consists of two operational amplifiers. The signal from the microphone is led to pre-emphasis circuit consisting of C36 and R47 and then to the limiter circuit. The limiter circuit uses the saturation of the OP amplifier. The amplified signal is input to the low-pass filter IC1A. The output signal from the microphone amplifier is passed through variable resistors VR2 for modulation adjustment and input to the VCO unit. Sub tone deviation is determined by R24, R25 and VR2. The radio does not have the adjustment variable resistor for sub tone deviation.

2. TX Amp. Circuit

The signal from VCO is amplified by TX, RX wide band LO amplifier Q19. The signal from Q19 is passed through the transmission/reception selector, and amplified by Q20 and Q15. The PA unit is driven at 200mW driving power.

3. PA Circuit

IC5 is 50W powered amplifier module. The output power is controlled by the voltage of V1. The RF signal amplified 50W in PA is passed through D3 and three-stage transmission/reception low-pass filter, and input to the antenna connector.

4. ALC Circuit

The power detection circuit consisting of D17 and D18 rectifies the output signal voltage. The detected DC voltage is led to the VR1 (power adjust trimmer), and amplified by Q3, Q9 and Q13. Output power is controlled by voltage of V1 in IC5 and collector voltage of Q15. When the temperature goes up unusually, the power down circuit consisting of R101 and TH2 works to prevent the device from the destruction.

The VCO unit is designed for the PLL circuit, putting the VCO on one side, and PLL circuit on the other side.

Q301 in the VCO is grounded using the gate oscillator, and its frequency covers 134MHz to 174MHz without transmission/reception shift circuit.

IC301 is pulse swallow system based PLL IC with the built-in prescaler, which synthesizes 150MHz band signal.

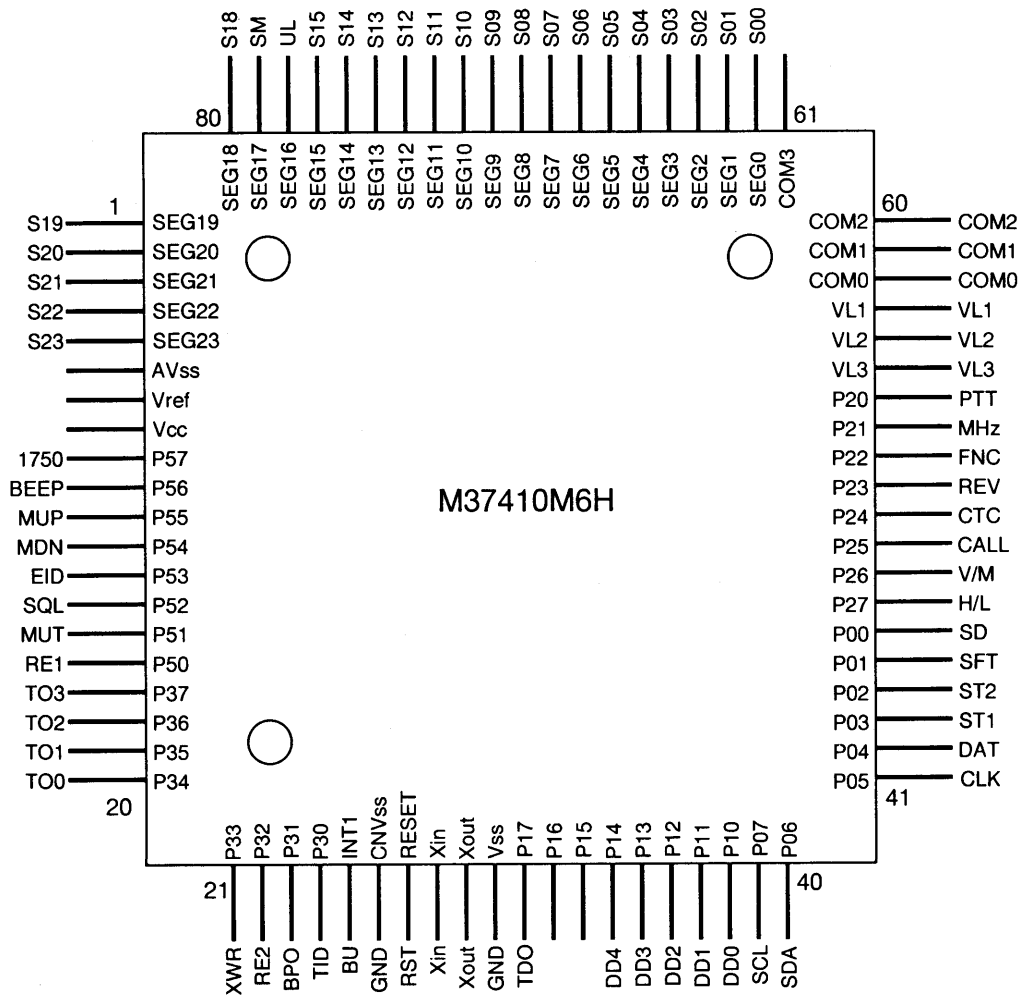
The loop filter consisting of Q302 and Q303 is the active type.

4) Terminal Function of Microprocessor

Port No.	I/O	Logic	PinName	Description
1	O		SEG19	LCDSegment19 Output
2	O		SEG20	LCDSegment20 Output
3	O		SEG21	LCDSegment21 Output
4	O		SEG22	LCDSegment22 Output
5	O		SEG23	LCDSegment23 Output
6	I		GND	AnalogGround 0V
7	I		Vref	Reference Voltage Input 5V
8	I		Vcc	CPU Power Supply Input 5V
9	O		1750_	ToneBurstOutput
10	O	Clock	BEEP	BeepToneOutput
11	I	Active Low	MUP	Channel Up Input (Microphone Control)
12	I	Active Low	MDN	Channel Down Input (Microphone Control)
13	I	NoUse	EID	
14	O	Active Low	SQL	Squelch Control (L: Audio is off.)
15	O	ActiveHigh	MUT	Microphone Mute (H: Mic Amp is off.)
16	I	Active Low	REI	RotaryEncoder Input
17	O	Clock	TO3	ToneOutput
18	O	Clock	TO2	ToneOutput
19	O	Clock	TO1	ToneOutput
20	O	Clock	TO0	ToneOutput
21	I	ActiveHigh	XWR	EEPROM Write Status External Input
22	I	Active Low	RE2	RotaryEncoder Input
23	O	Active Low	BPO	Band Plan Detection Input (Common)
24	I	Active Low	TID	Tone Unit Detection Input
25	I	Active Low	BU	Back Up Signal Detection input
26	I		GND	Ground
27	I	Active Low	RST	ResetInput
28	I		Xin	Crystal Oscillator Terminal (3.58MHz)
29	O		Xout	Crystal Oscillator Terminal (3.58MHz)
30	I		GND	Ground
31	I	Active Low	TDO	CTCSS Tone Detection Output
32	O	Active High	DTD	For Trunking
33	O	NoUse		
34	I	Active Low	DD4	Band Plan 4 (V/U Selection)
35	I	Active Low	DD3	Band Plan 3 (445/435 Selection)
36	I	Active Low	DD2	Band Plan 2 (5k/12.5k Selection)
37	I	Active Low	DD1	Band Plan 1
38	I	Active Low	DD0	Band Plan 0
39	O	Clock	SCL	Clock Output for EEPROM

Port No.	I/O	Logic	PinName	Description
40	I/O	Clock	SDA	Data Output for EEPROM
41	O	Clock	CLK	Clock Output
42	O	Clock	DAT	DataOutput
43	O	Clock	ST1	Strobe Output for PLL IC
44	O	Clock	ST2	Strobe Output for CTCSS IC
45	I	Active Low	SFT	Shift Key Input
46	I	Active High	SD	Signal Detection Input
47	O	Active High	H/L	Transmission Power (H: Low Power)
48	I	Active Low	V/M	VFO/Memory Key Input
49	I	Active Low	CAL	Call Key Input
50	I	Active Low	CTC	CTCSS Mode Set Input
51	I	Active Low	REV	Reverse Key Input
52	I	Active Low	FNC	Function Key Input
53	I	Active Low	MHz	MHzKeyInput
54	I	Active Low	PTT	PTTKeyInput
55	I		LV3	Power Supply Input for LCD
56	I		LV2	Power Supply Input for LCD
57	I		LV1	Power Supply Input for LCD
58	I		COM0	LCD Common 0 Output
59	I		COM1	LCD Common 1 Output
60	I		COM2	LCD Common 2 Output
61	I	No Use		
62	O		SEG00	LCD Segment 00 Output
63	O		SEG01	LCD Segment 01 Output
64	O		SEG02	LCD Segment 02 Output
65	O		SEG03	LCD Segment 03 Output
66	O		SEG04	LCD Segment 04 Output
67	O		SEG05	LCD Segment 05 Output
68	O		SEG06	LCD Segment 06 Output
69	O		SEG07	LCD Segment 07 Output
70	O		SEG08	LCD Segment 08 Output
71	O		SEG09	LCD Segment 09 Output
72	O		SEG10	LCD Segment 10 Output
73	O		SEG11	LCD Segment 11 Output
74	O		SEG12	LCD Segment 12 Output
75	O		SEG13	LCD Segment 13 Output
76	O		SEG14	LCD Segment 14 Output
77	O		SEG15	LCD Segment 15 Output
78	I	ActiveHigh	UL	UnlockInput
79	I	Analog	SM	SignalMeterInput
80	O		SEG18	LCD Segment 18 Output

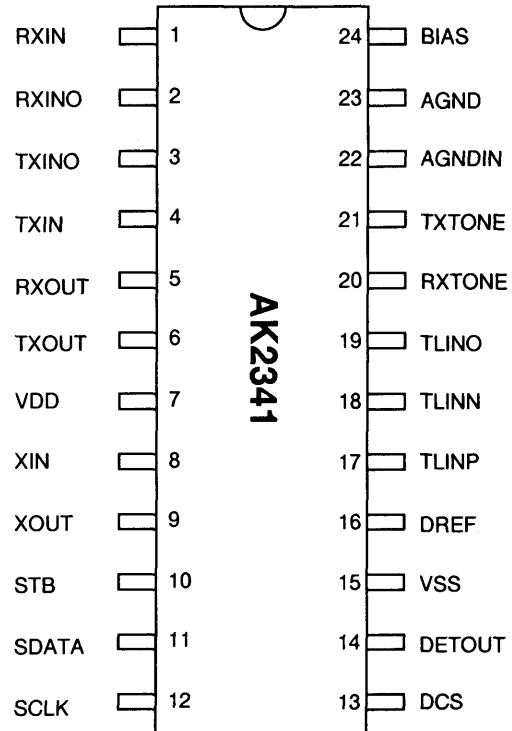
5) Terminal Connection of Microprocessor



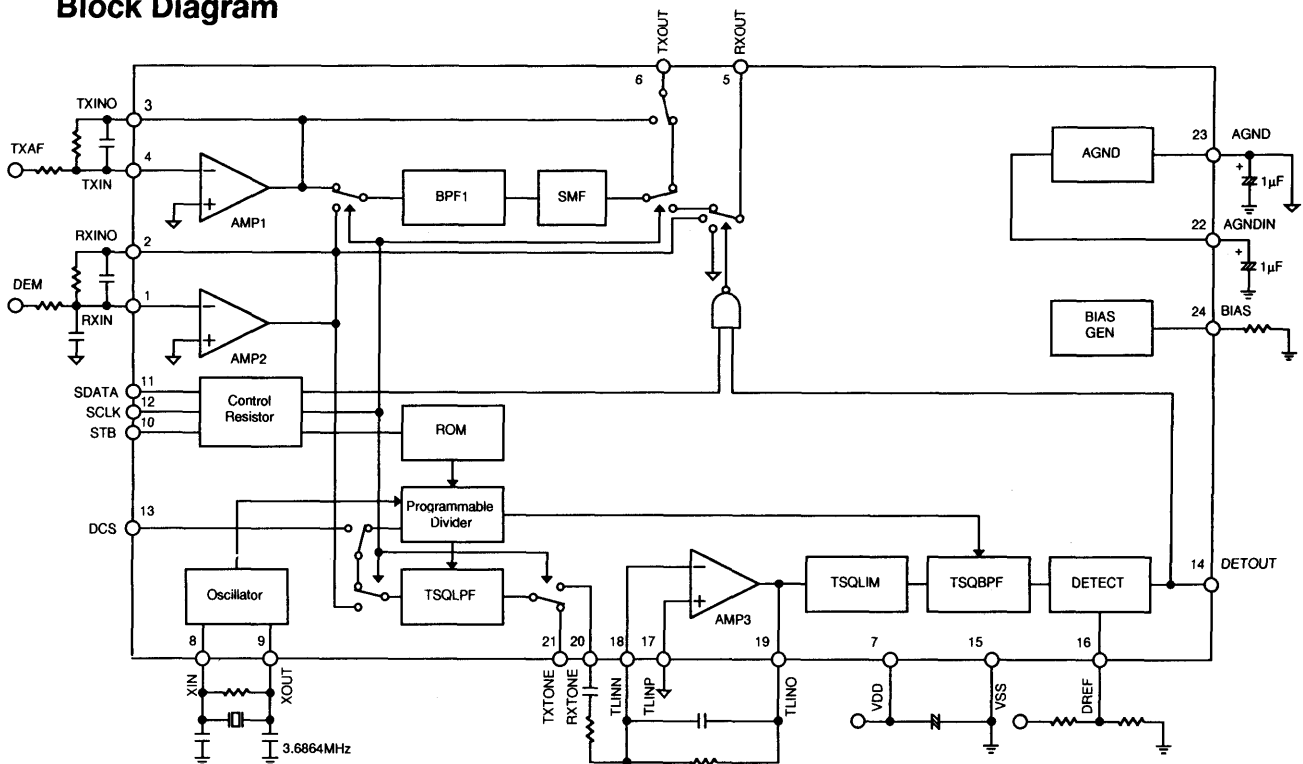
SEMICONDUCTOR DATA

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

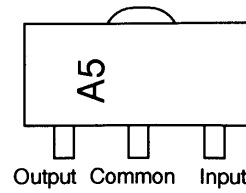
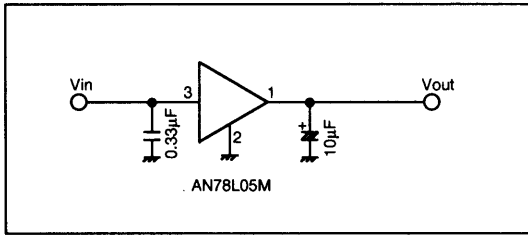


Block Diagram



2) AN78L05M (XA0238)
5V Voltage Regulator

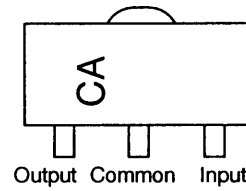
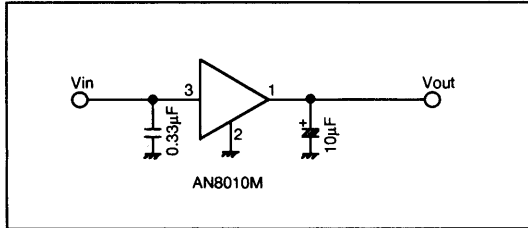
Test Circuit



AN78L05M

3) AN8010M (XA0119)
Voltage Regulator

Test Circuit

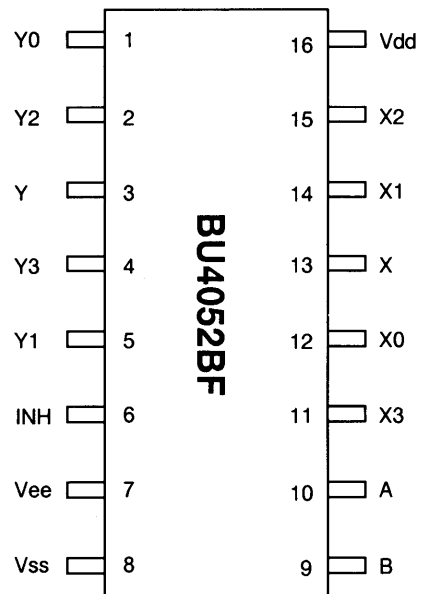


AN8010M

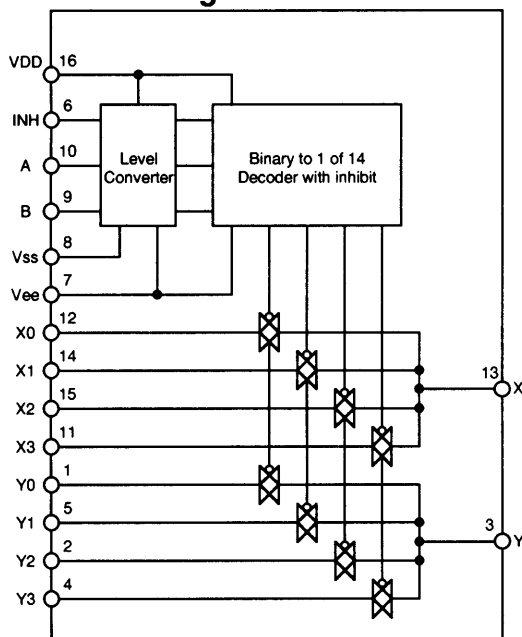
4) BU4052BF (XA0236)
Analog Multiplexers/Demultiplexers

Function Table

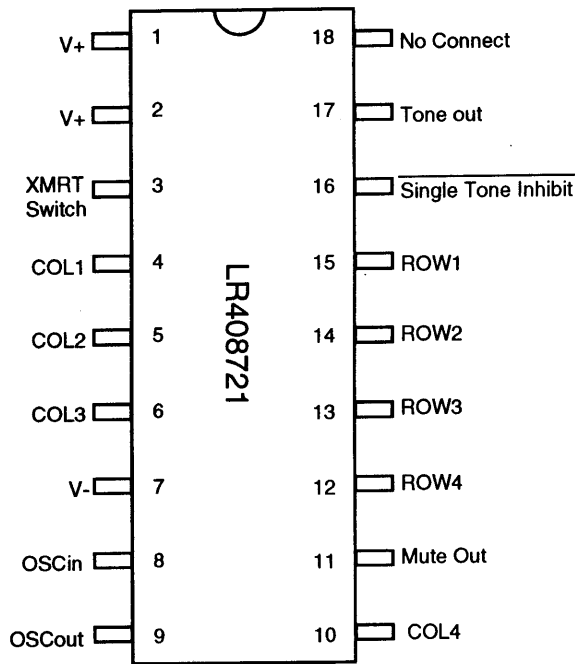
INHIBIT	A	B	ON Switch
Low	Low	Low	X0 Y0
Low	High	Low	X1 Y1
Low	Low	High	X2 Y2
Low	High	High	X3 Y3
High	Don't Care	Don't Care	None



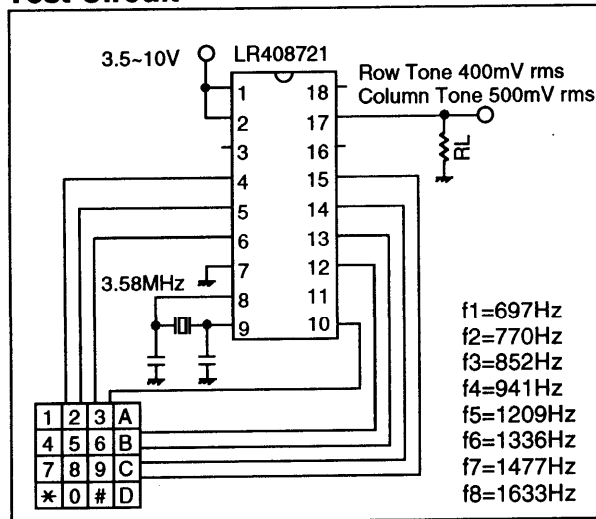
Block Diagram



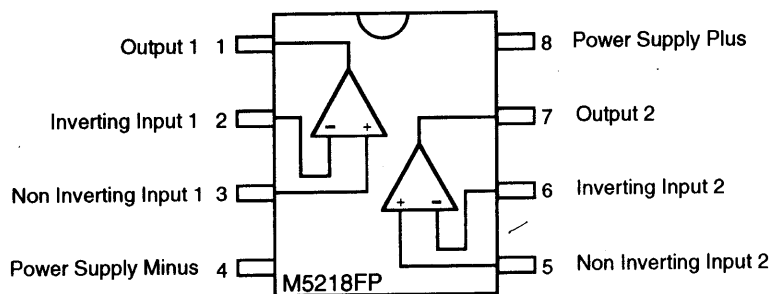
5) LR408721 (XA0042)
Tone Dialer



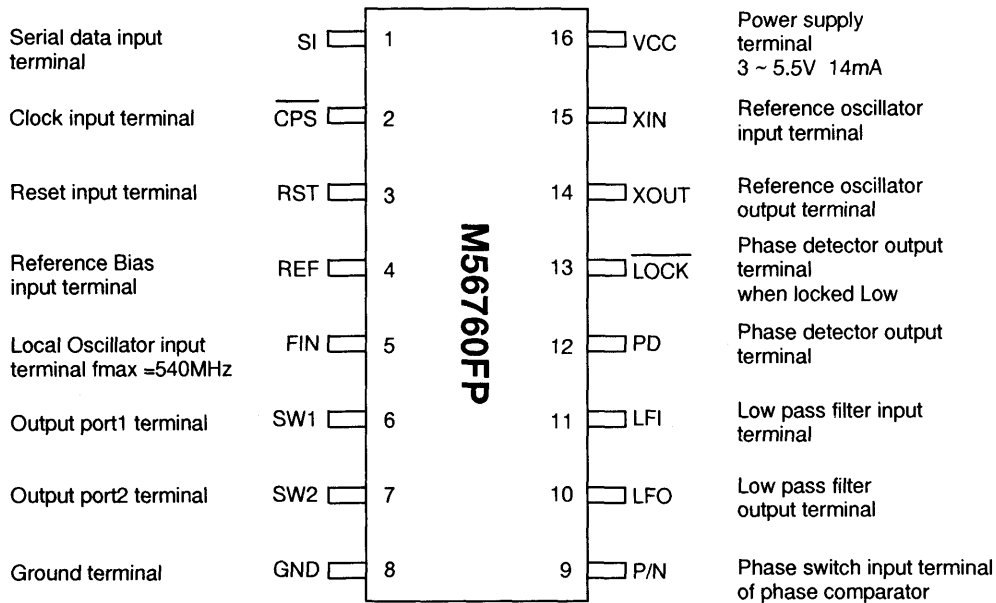
Test Circuit



6) M5218FP (XA0068)
Dual Low Noise
Operational Amplifiers

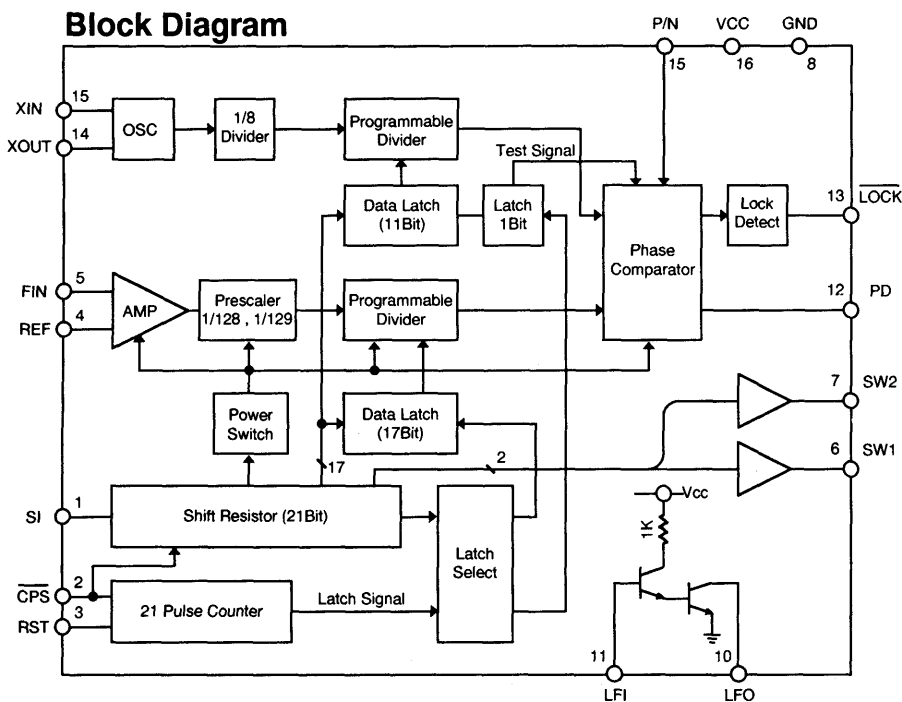


7) M56760FP (XA0235) 540MHz Frequency Synthesizer



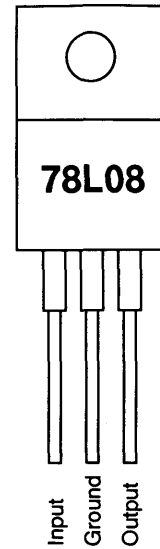
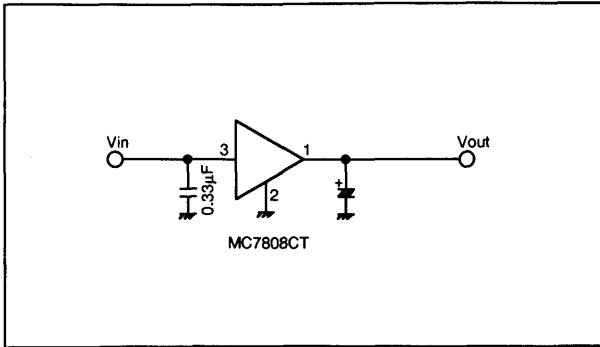
Function Table

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



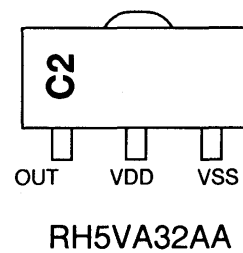
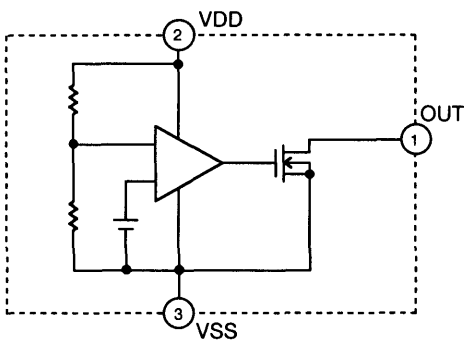
8) MC7808CT (XA0082)
8V Voltage Regulator

Test Circuit



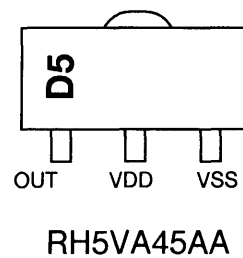
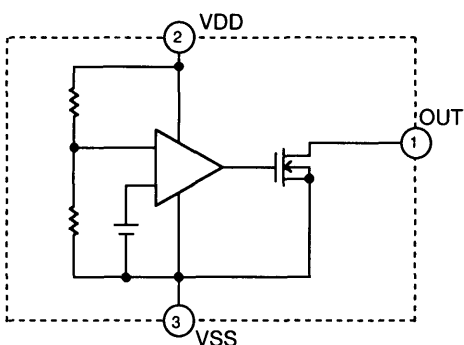
9) RH5VA32AA-T1 (XA0198)
C-MOS Voltage Detector

Equivalent Circuit

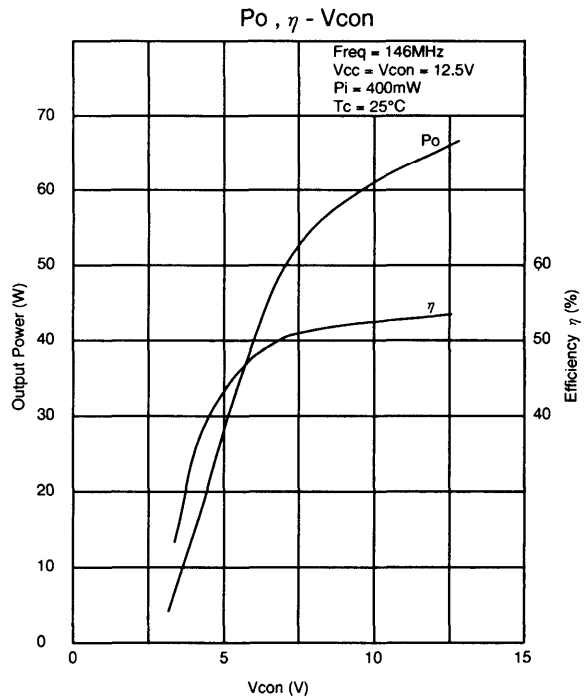
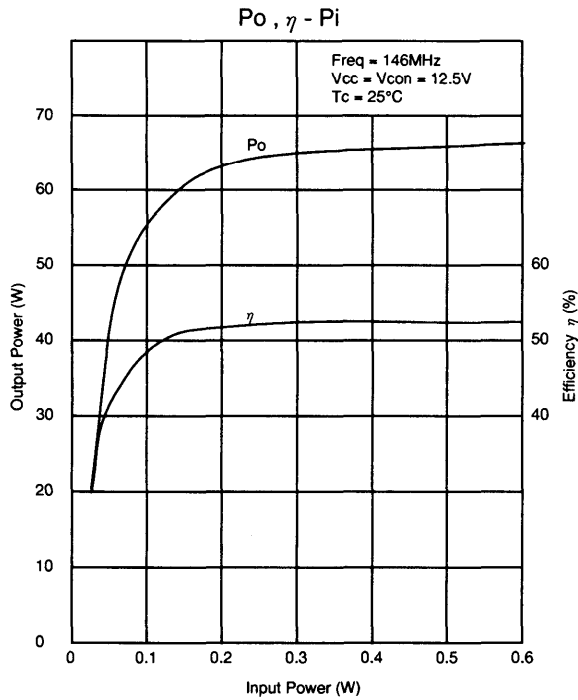
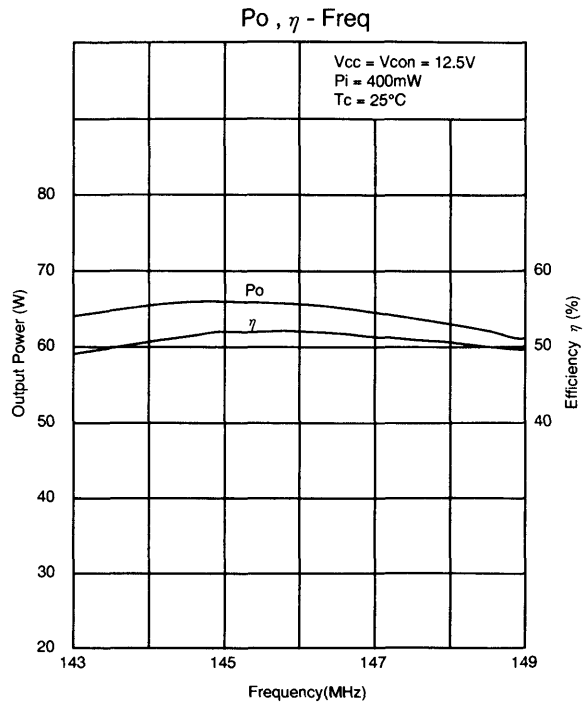
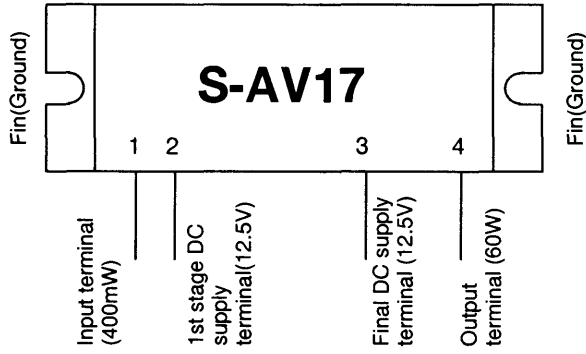


10) RH5VA45AA-T1 (XA0208)
C-MOS Voltage Detector

Equivalent Circuit

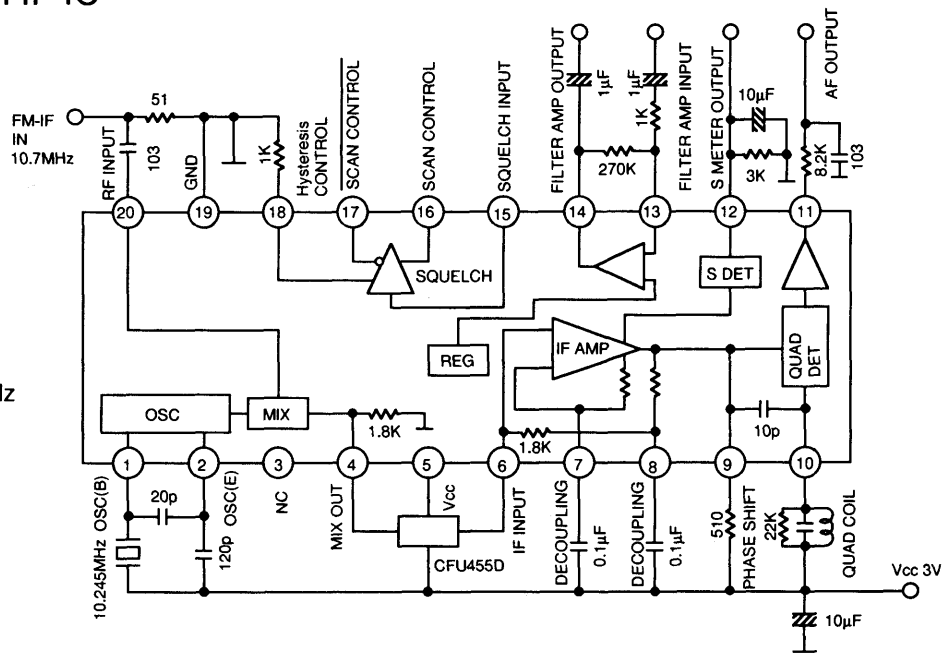


11) S-AV17 (XA0185)
 144 ~ 148MHz 60W
 RF Power Module

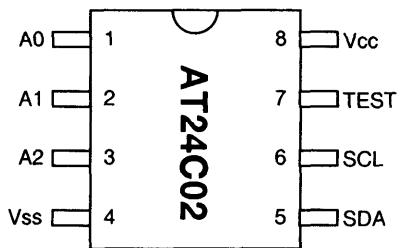


12) TK10487MTR (XA0144) Narrow Band FM IF IC

Vcc=3V
 F=10.7MHz
 Icc 5mA
 Limit 2μV -3dB
 Vo 180mV Dev=3kHz
 THD 1.0%



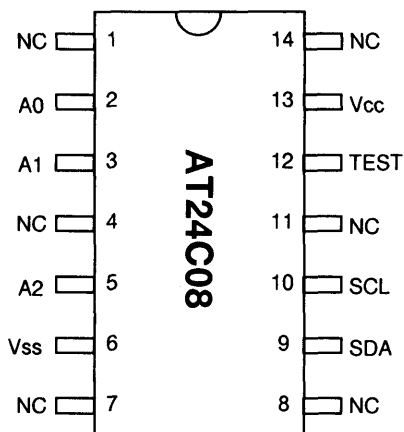
13) AT24C02N-10SI-2.7 (XA0364) EEPROM 256 x 8Bit



Pin Names

A0 ~ A2	Address inputs
SDA	Serial Data
SCL	Serial Clock
TEST	Write Control
Vss	Ground
Vcc	+5V

14) AT24C08-10SI-2.7 (XA0367) EEPROM 1024 x 8Bit

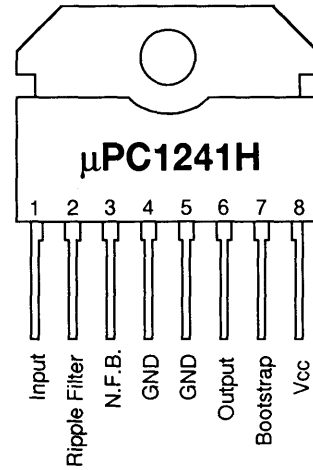
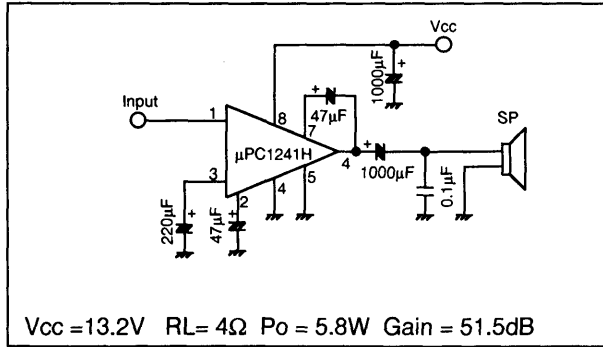


Pin Names

A0 ~ A2	Address inputs
SDA	Serial Data
SCL	Serial Clock
TEST	Hold at Vss
Vss	Ground
Vcc	+5V

15) μ PC1241H (XA0079)
Audio Power Amplifiers

Test Circuit

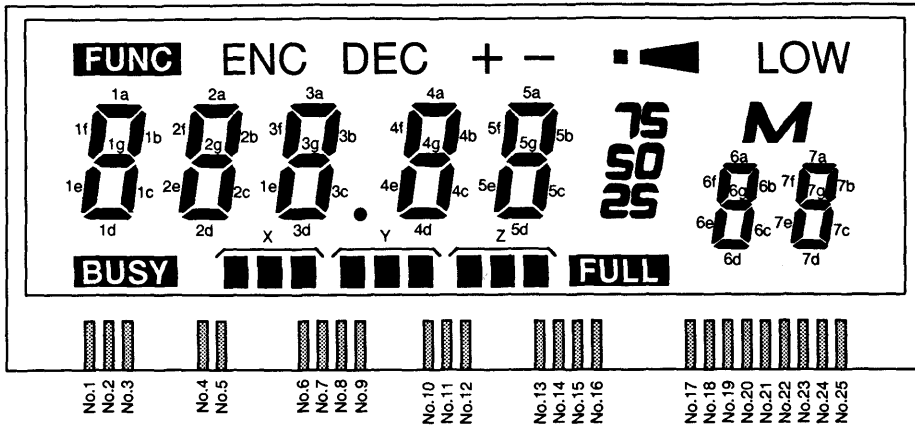


16) Transistor, Diode and LED Outline Drawings

Top View

1SS355 XD0254	1SV215 XD0132	DA204U XD0130	DAN202U XD0230	DAN235U XD0246	DTZ2.2A XD0145	DTZ5.1A XD0136	G3B XD0107
MA704WA XD0127	MA742 XD0250	MA8110H XD0255	MI308 XD0014	MI407 XD0013	2SK508 XE0010	2SK880 XE0021	3SK131 XE0012
TLSG264 XL0029	2SA1576 XT0094	2SA1736 XT0099	2SB1132 XT0061	2SB1292 XT0112	2SC2412K XT0037	2SC2873 XT0099	2SC2954 XT0084
2SC3356 XT0030	2SC4081LN XT0111	2SC4081 XT0095	2SC4099 XT0096	2SC4403 XT0114	UMC2 XU0060	UMC5 XU0152	
DTA114YU XU0112	DTC114EU XU0131	DTC114YU XU0029	DTC124EU XU0140	DTC143TU XU0145			
DTC144EU XU0148							

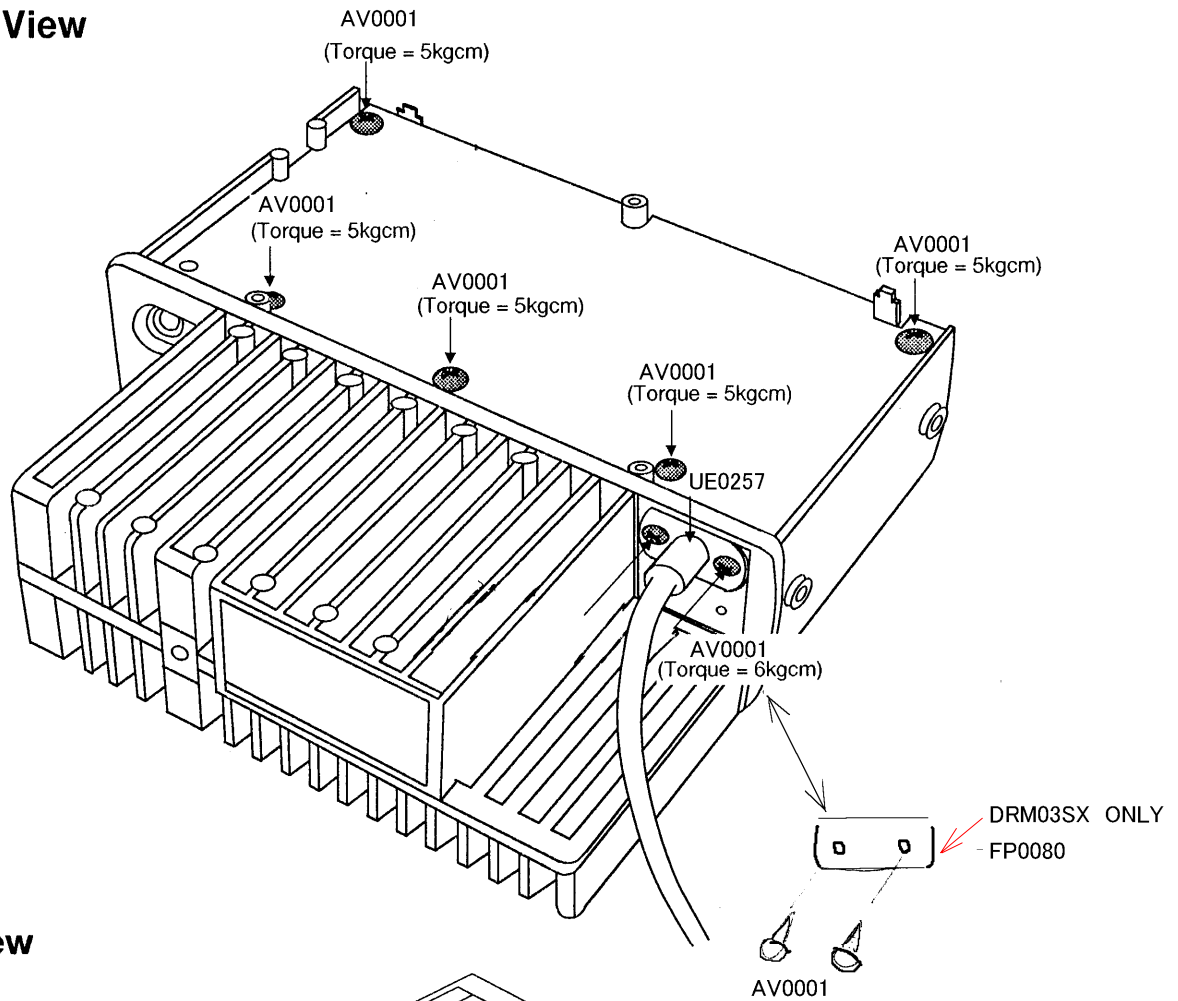
17) LCD Connection (EL0024)



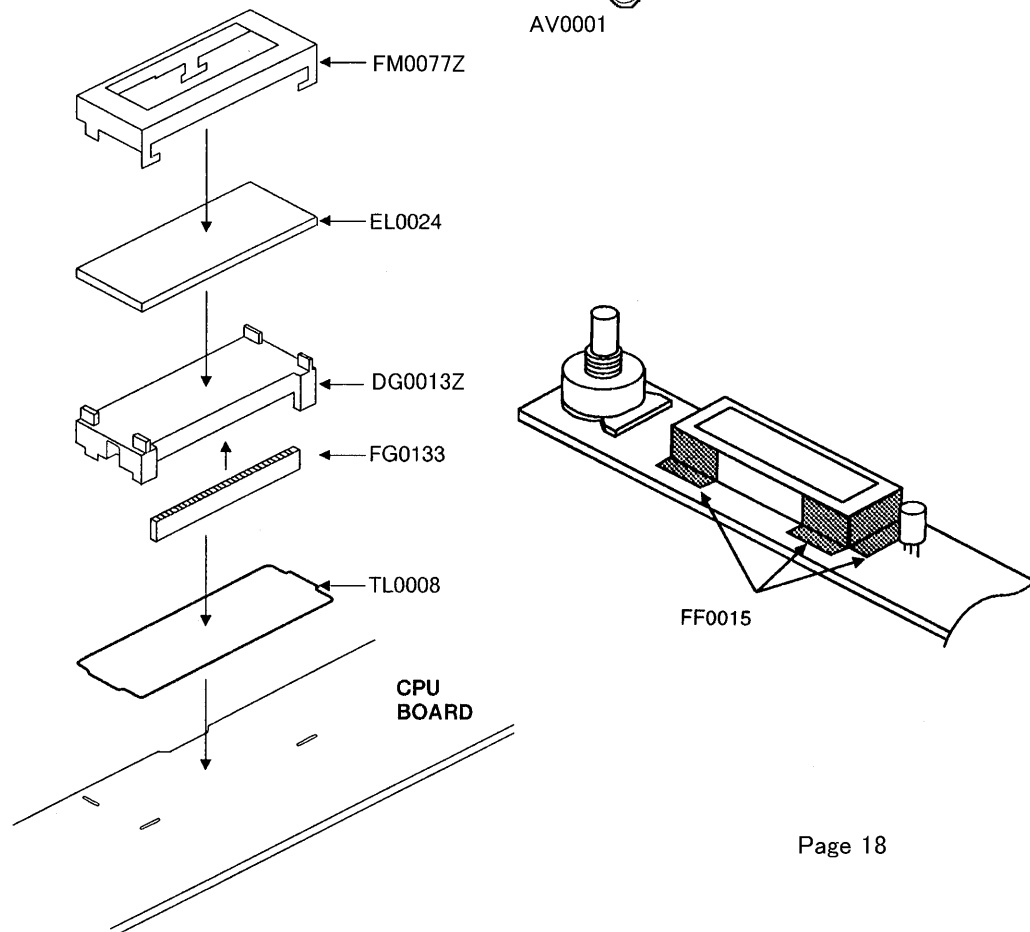
Pin No.	COMMON1	COMMON2	COMMON3
1	FUNC	1e	1f
2	1d	1g	1a
3	BUSY	1c	1b
4	ENC	2e	2f
5	2d	2g	2a
6	X	2c	2b
7	DEC	3e	3f
8	3d	3g	3a
9	●	3c	3b
10	Y	4e	4f
11	4d	4g	4a
12	+	4c	4b
13	Z	5e	5f
14	5d	5g	5a
15	-	5c	5b
16	FULL	25	50
17	75	6e	6f
18	6d	6g	6a
19	■	6c	6b
20	M	7e	7f
21	7d	7g	7a
22	LOW	7c	7b
23		COM.1	
24			COM.2
25	COM.0		

EXPLODED VIEW

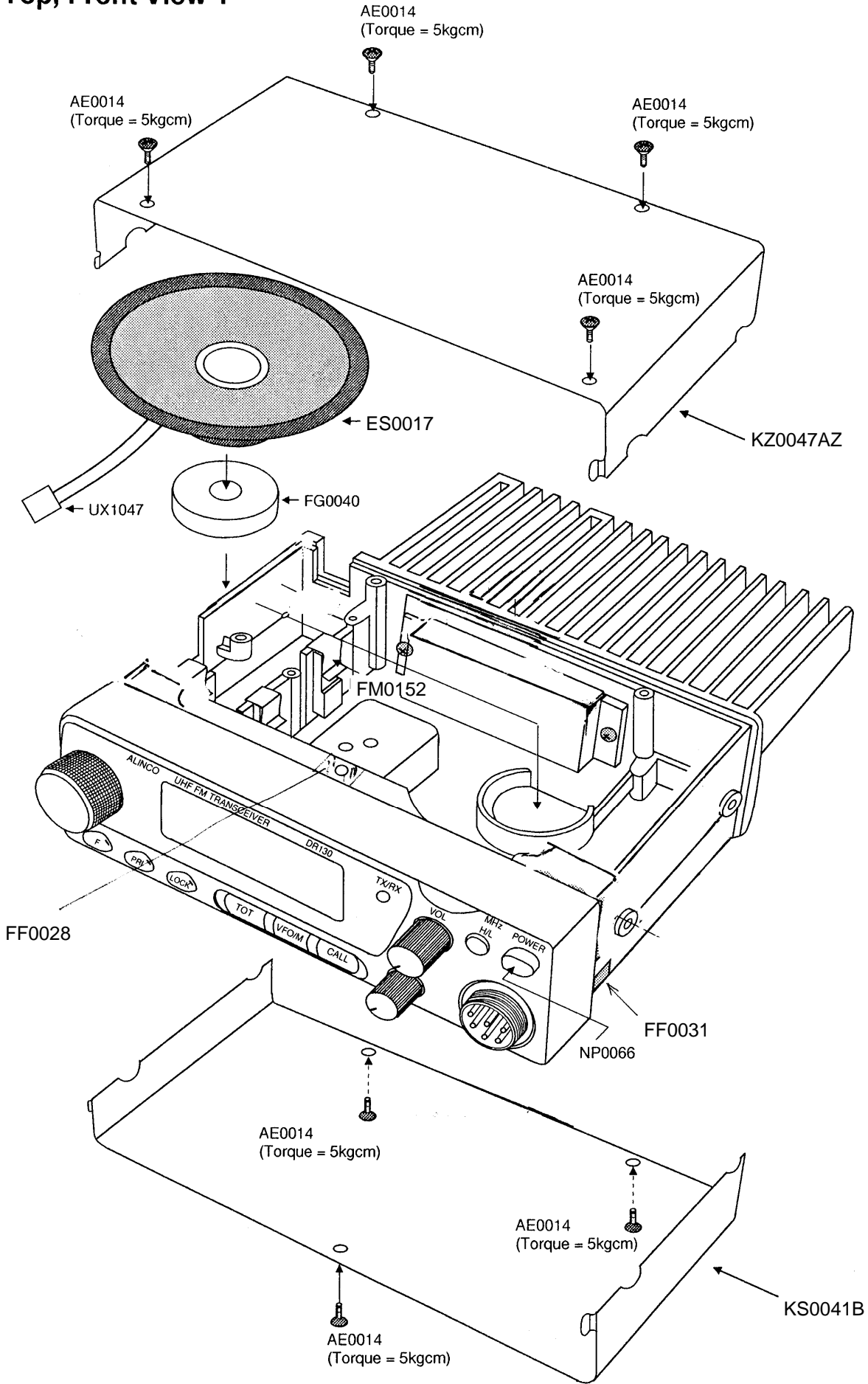
1) Bottom View



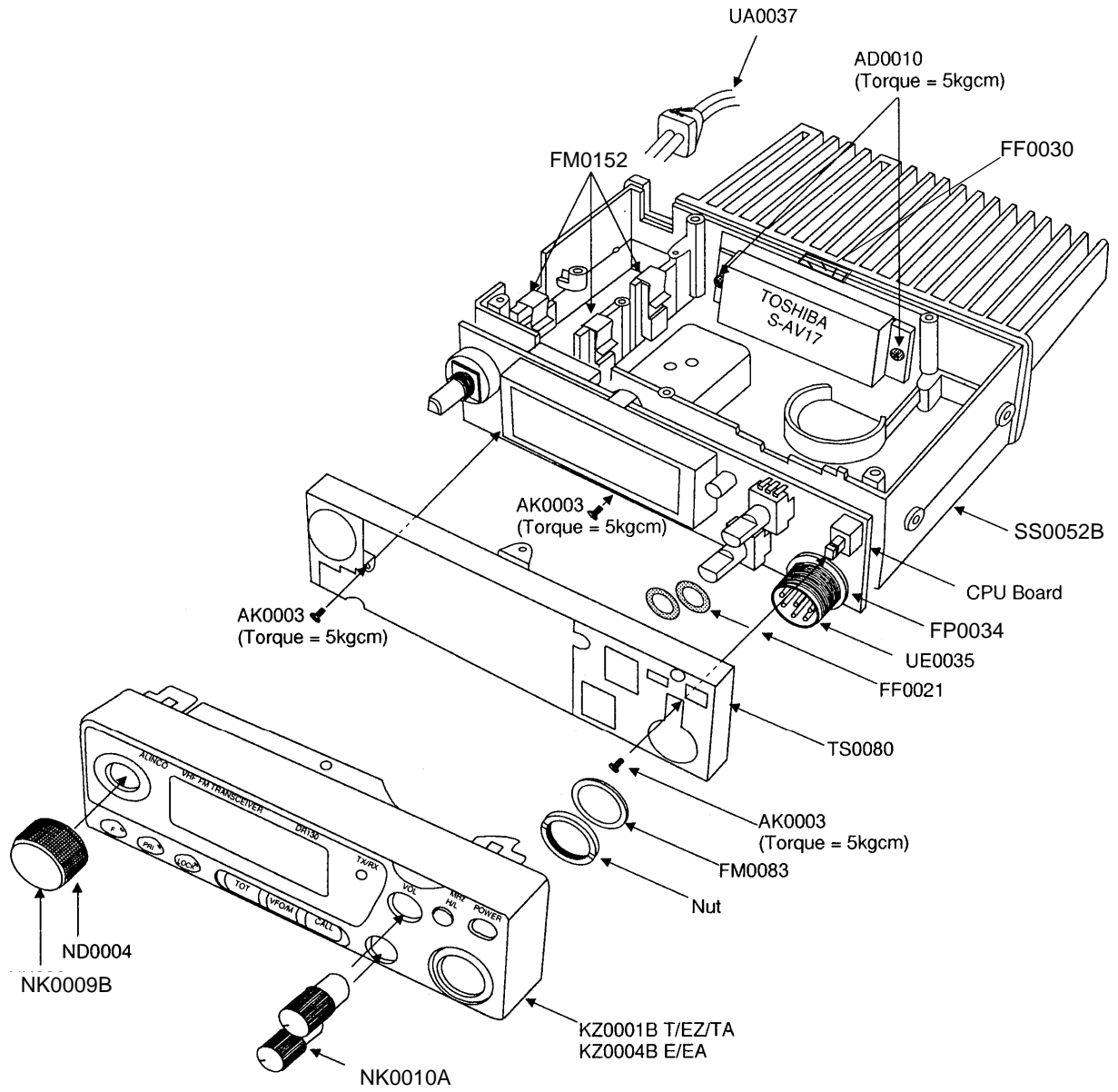
2) LCD View



3) Top, Front View 1



4) Top, Front View 2



VERSION TABLE

1) CPU UNIT

	W1	W2	W3/W4	R284	R294/R295	R286		R296	R297	CN204	IC208
T	JP	-	-	-	0	-		-	-	UE0165	-
E	JP	JP	-	0	0	-		-	-	UE0165	-
EZ	JP	JP	-	-	0	-		IK	1K	-	AT24CO8-10SI
EA	-	-	-	0	0	-		-	-	UE0165	-
TA	-	-	-	-	0	-		-	-	UE0165	-
TE1	-	-	JP	-	-	-		-	-	UE0165	-
TE2	-	-	JP	-	-	-		-	-	UE0165	-

TX Free RX Free Tranking 12.5k/5k Tranking V/U

2) MAIN UNIT

	C7	C43	C62	C63	C68	C71,7 4,75,7	C112	C139	C149
T/E/EZ/EA/TA	1000p	33p	47p	10u/16V	15p	47p	22p	22p	-
TE1	-	33p	100p	100u/16V	22p	56p	22p	12p	0.01uF
TE2	-	47p	33p	100u/16V	10p	1000p	18p	10p	0.01uF

	C150 153 154 155 156	C151	C152	D4	D11 12 13 16	D15	IC5	L4,5,6,14
T/E/EZ/EA/TA	-	-	-	-	1SV215	ISS355	S-AV7	QA0084
TE1	1000p	10u/20V	10u/35V	ISS355	1SV215	ISS355	M67781L	QA0084
TE2	1000p	10u/20V	10u/35V	ISS355	1SV214	-	M67781H	QA0100

	L12	P3	R43	R57	R101	R102	R111	R121	R122	R130	W5
T/E/EZ/EA/TA	QKA35D	-	47k	22	15k	1k	0	-	-	47k	-
TE1	QKA35D	0	47k	100	2.2k	4.7k	-	-	220	-	JP
TE2	QKA45D	0	27k	100	2.2k	4.7k	-	0	220	-	JP

3) VCO UNIT

	C315	C331	C332	D304	R315	R316	R332	R333	R334
T/E/EZ/EA/TA	3p	-	-	-	10k	100	-	-	-
TE1	3p	4700p	0.5p	1SV215	22k	56	8.2k	8.2k	220k
TE2	1p	4700p	0.5p	1SV215	22k	56	10k	8.2k	220k

PARTS LIST

MAIN Unit				MAIN Unit				MAIN Unit				MAIN Unit									
Ref No	Parts No.	Description	Parts Name	Ver	Ref No	Parts No.	Description	Parts Name	Ver	Ref No	Parts No.	Description	Parts Name	Ver	Ref No	Parts No.	Description	Parts Name	Ver		
C1	CU3035	Chip C.	C1608JB1H102KTA		C54	CS0237	Chip Tantal	TMCSA1A475MTR		C95	CU3035	Chip C.	C1608JB1H102KTA		C152	CS0375	Chip Tantal				
C2	CU3044	Chip C.	C1608JB1H562KTA		C55	CU3035	Chip C.	C1608JB1H102KTA		C96	CU3035	Chip C.	C1608JB1H102KTA		C153	-	Chip Tantal	TMCME1V106MTR	0		
C3	CU3100	Chip C.	C1608JB1C393ZTA		C56	CU3011	Chip C.	C1608CH1H100CTA		C97	CU3019	Chip C.	C1608CH1H470JTA		C154	CU3035	Chip C.	C1608JB1H102KTA	1,2		
C4	CU3044	Chip C.	C1608JB1H562KTA		C57	CU3031	Chip C.	C1608JH1H471KTA		C98	CU0027	Chip C.	C2012CH1H470K		C155	-	Chip C.	C1608JB1H102KTA	0		
C5	CU3002	Chip C.	C1608CH1H010CTA		C58	CU3035	Chip C.	C1608JB1H102KTA		C99	CU3019	Chip C.	C1608CH1H470JTA		C156	CU3035	Chip C.	C1608JB1H102KTA	1,2		
C6	CU3002	Chip C.	C1608CH1H010CTA		C59	CU3018	Chip C.	C1608CH1H390JTA		C100	CU3035	Chip C.	C1608JB1H102KTA		C157	-	Chip C.	C1608JB1H102KTA	0		
C7	CU3035	Chip C.	C1608JB1H102KTA	0	C60	CE0339	Electrolytic.C	16MV 10HW+TS		C101	CU3047	Chip C.	C1608JB1H103KTA		C158	CU3035	Chip C.	C1608JB1H102KTA	1,2		
C8	CS0049	Chip Tantal	TMCSA1C105MTR	1,2	C61	CU3022	Chip C.	C1608CH1H820JTA		C103	CU3012	Chip C.	C1608CH1H120DJA		C159	CU3035	Chip C.	C1608JB1H102KTA	0		
C9	CU3059	Chip C.	C1608JF1E104ZTA		C62	CU3019	Chip C.	C1608CH1H470JTA	0	C104	CU3035	Chip C.	C1608CH1H102KTA		C160	CU3035	Chip C.	C1608JB1H102KTA	0		
C10	CU3059	Chip C.	C1608JF1E104ZTA		C63	CU3017	Chip C.	C1608CH1H330JTA	2	C105	CE0340	Electrolytic.C	16MV 47HC+TS		C161	UE0191	Connector	C1608JB1H102KTA	1,2		
C11	CU3047	Chip C.	C1608JB1H103KTA		C64	CE0339	Electrolytic.C	16MV 10HW+TS	0	C106	CU3012	Chip C.	C1608CH1H120DJA		C162	UE0191	Connector	C1608JB1H102KTA	0		
C12	CU3047	Chip C.	C1608JB1H103KTA		C65	CE0341	Electrolytic.C	16MV 100HC+TS	1,2	C107	CU3035	Chip C.	C1608JB1H102KTA		C163	UE0043	Connector	P122A02M			
C13	CU3047	Chip C.	C1608JB1H103KTA		C66	CC5068	Ceramic C.	RCC06SL390J-L46AU		C108	CU3035	Chip C.	C1608JB1H102KTA		C164	XD0013	Diode	MI308			
C14	CU3047	Chip C.	C1608JB1H103KTA		C67	CC5068	Ceramic C.	RCC06SL390J-L46AU		C109	CU3003	Chip C.	C1608CH1H020CTA		C165	XD0014	Diode	DTZ5.1AT11			
C15	CU3047	Chip C.	C1608JB1H103KTA		C68	CU3013	Chip C.	C1608CH1H150JTA	0	C110	CU3003	Chip C.	C1608CH1H020CTA		C166	XD0013	Diode	MI407			
C16	CU3102	Chip C.	C1608JB1C333KTA		C69	CU3011	Chip C.	C1608CH1H100CTA	2	C111	CU3035	Chip C.	C1608JB1H102KTA		C167	XD0254	Diode	1SS355			
C17	CU3059	Chip C.	C1608JF1E104ZTA		C70	CU3035	Chip C.	C1608JB1H102KTA	2	C112	CC5020	Ceramic C.	DD05-979SL-1 80J 500	2	C168	XD0130	Diode	DA204U T106	1,2		
C18	CU3042	Chip C.	C2012JB1C104KTA		C71	CU3019	Chip C.	C1608CH1H220JTA	1	C113	CU3035	Chip C.	C1608JB1H102KTA		C169	XD0130	Diode	DA204U T106			
C19	CU3035	Chip C.	C1608JB1H102KTA		C72	CU3049	Chip C.	C1608JB1H103KTA		C114	CU3035	Chip C.	C1608JB1H102KTA		C170	XD0130	Diode	DA204U T106			
C20	CU3028	Chip C.	C1608CH1H271KTA		C73	CU3035	Chip C.	C1608JB1H102KTA		C115	CU3023	Chip C.	C1608CH1H101JTA		C171	XD0254	Diode	1SS385			
C21	CU3035	Chip C.	C1608JB1H102KTA		C74	CU3019	Chip C.	C1608CH1H470JTA	0	C116	CU3035	Chip C.	C1608JB1H102KTA		C172	XD0107	Diode	G3B			
C22	CU3035	Chip C.	C1608JB1H102KTA		C75	CU3020	Chip C.	C1608CH1H560JTA	1	C117	CU3035	Chip C.	C1608JB1H102KTA		C173	XD0254	Diode	1SS355			
C23	CU3047	Chip C.	C1608JB1H103KTA		C76	CU3035	Chip C.	C1608CH1H560JTA	1	C118	CE0339	Electrolytic.C	16MV10HW+TS		C174	XD0132	Diode	1SV215TPH4	0,1		
C24	CU3059	Chip C.	C1608JF1E104ZTA		C77	CU3035	Chip C.	C1608JB1H102KTA	2	C119	CE0338	Electrolytic.C	25MV 4R7SW+TS		C175	XD0131	Diode	1SV214TPH4	2		
C25	CU3102	Chip C.	C1608JB1C333KTA		C78	CS0049	Chip Tantal	TMCSA1C105MTR		C120	CU3035	Chip C.	C1608JB1H102KTA		C176	XD0132	Diode	1SV215TPH4	0,1		
C26	CU3042	Chip C.	C2012JB1C104KTA		C79	CU3035	Chip C.	C1608JB1H102KTA		C121	CU3035	Chip C.	C1608JB1H102KTA		C177	XD0131	Diode	1SV214TPH4	2		
C27	CU3049	Chip C.	C1608JB1E153KTA		C80	CU3019	Chip C.	C1608CH1H470JTA	0	C122	CE0341	Electrolytic.C	16MV 100HC+TS		C178	XD0132	Diode	1SV215TPH4	0,1		
C28	CE0339	Electrolytic.C	16MV 10HW+TS		C81	CU3020	Chip C.	C1608CH1H560JTA	1	C123	CU7003	Chip C.	C3K31NAR102K		C179	XD0131	Diode	1SV214TPH4	2		
C29	CE0342	Electrolytic.C	16MV 470HC+TS		C82	CU3035	Chip C.	C1608JB1H102KTA	2	C124	CU3035	Chip C.	C1608JB1H102KTA		C180	XD0246	Diode	DAN235U T106			
C30	CE0342	Electrolytic.C	16MV 470HC+TS		C83	CU3019	Chip C.	C1608CH1H470JTA	0	C125	CU3035	Chip C.	C1608JB1H102KTA		C181	XD0254	Diode	1SS385			
C31	CS0049	Chip Tantal	TMCSA1C105MTR		C84	CU3020	Chip C.	C1608CH1H560JTA	1	C126	CU3064	Chip C.	C1608CH1H1R5C1TA		C182	XD0130	Diode	DA204U T106			
C32	CE0340	Electrolytic.C	16MV 47HC+TS		C85	CU3035	Chip C.	C1608JB1H102KTA	2	C127	CU3035	Chip C.	C1608JB1H102KTA		C183	XD0145	Diode	DTZ2.2A TT11			
C33	CE0337	Electrolytic.C	50MV 2R2SW+TS		C86	CU3019	Chip C.	C1608CH1H470JTA	0	C128	CU3035	Chip C.	C1608JB1H102KT		C184	XD0250	Diode	MA742-TX			
C34	CE0340	Electrolytic.C	16MV 47HC+TS		C87	CU3020	Chip C.	C1608CH1H560JTA	1	C129	CU3035	Chip C.	C1608JB1H102KTA		C185	XD0250	Diode	MA742-TX			
C35	CU3035	Chip C.	C1608JB1H102KTA		C88	CU3035	Chip C.	C1608JB1H102KTA	2	C130	CU3039	Chip C.	C1608JB1H222KTA		C186	XD0130	Diode	DA204U T106			
C36	CU3047	Chip C.	C1608JB1H103KTA		C89	CU3015	Chip C.	C1608CH1H220JTA		C131	CU3036	Chip C.	C1608JB1H102KTA		C187	XD0130	Diode	DA204U T106			
C37	CE0339	Electrolytic.C	16MV 10HW+TS		C90	CU3035	Chip C.	C1608JB1H102KTA	1	C132	CE0339	Electrolytic.C	16MV70HW+TS		C188	XD0145	Diode	DTZ2.2A TT11			
C38	CE0339	Electrolytic.C	16MV 10HW+TS		C91	CU3035	Chip C.	C1608JB1H102KTA	2	C133	CU3035	Chip C.	C1608CH1H102KTA		C189	XC0001	Filter	CFW455F			
C39	CU3031	Chip C.	C1608JH1H471KTA		C92	CU3005	Chip C.	C1608CH1H040CTA		C134	CU3023	Chip C.	C1608CH1H101JTA		C190	XF0015	Filter	UM1-172M			
C40	CS0049	Chip Tantal	TMCSA1C105MTR		C93	CU3035	Chip C.	C1608JB1H102KTA		C135	CU3023	Chip C.	C1608CH1H101JTA		C191	XA0068	IC	M5218FP-T01-1			
C41	CU3047	Chip C.	C1608JB1H103KTA		C94	CS0049	Chip Tantal	TMCSA1C105MTR		C139	CC5064	Ceramic C.	RCC06SL220J-L46A E	0	C192	XA0082	IC	MC7808CT			
C42	CU3035	Chip C.	C1608JB1H102KTA		C95	CU3035	Chip C.	C1608JB1H102KTA		C140	CC5059	Ceramic C.	DD05-979SL120J500	1	C193	XA0079	IC	TK10487M			
C43	CU3017	Chip C.	C1608CH1H330JTA	0,1	C96	CU3035	Chip C.	C1608JB1H102KTA		C141	CC5059	Ceramic C.	DD05-979SL100J500	2	C194	XA0079	IC	uPC124H			
C44	CE0339	Electrolytic.C	16MV 10HW+TS		C97	CU3035	Chip C.	C1608JB1H102KTA		C147	CS0232	Chip Tantal	TMCMA1V474MTR		C195	XA0185	IC	S-AV17			
C45	CU3035	Chip C.	C1608JB1H102KTA		C98	CU3035	Chip C.	C1608JB1H102KTA		C148	CS0236	Chip Tantal	TMCMA0.1668MTR		C196	XA0274	IC	M67781H			
C46	CU3059	Chip C.	C1608JF1E104ZTA		C99	CU3035	Chip C.	C1608JB1H102KTA		C149	-	Chip Tantal			C197	XA0274	IC	M67781H			
C47	CS0049	Chip Tantal	TMCSA1C105MTR		C100	CU3035	Chip C.	C1608JB1H102KTA		C150	CU3047	Chip C.	C1608JB1H103KTA	1,2	C198	XA0119	IC	AN8010M-E1			
C48	CU3035	Chip C.	C1608JB1H102KTA		C101	CU3035	Chip C.	C1608JB1H102KTA		C151	CU3035	Chip C.	C1608JB1H102KTA	0	C199	UA0037	Connector	R-B2.00.2 Plug 15A			
C49	CU3024	Chip C.	C1608CH1H1271KTA		C102	CU3035	Chip C.	C1608JB1H102KTA													
C50	CU3019	Chip C.	C1608CH1H470JTA		C103	CU3035	Chip C.	C1608JB1H102KTA													
C51	CE0339	Electrolytic.C	16MV 10HW+TS		C104	CU3035	Chip C.	C1608JB1H102KTA													
C52	CE0339	Electrolytic.C	16MV 10HW+TS		C105	CU3035	Chip C.	C1608JB1H102KTA													
C53	CS0049	Chip Tantal	TMCSA1C105MTR		C106	CU3035	Chip C.	C1608JB1H102KTA													

0 : T/E/EZ/EATA
1 : TE1
2 : TE2

None: all models

CPU Unit

Ref No	Parts No.	Description	Parts Name	Ver
C201	CU3035	Chip C.	C1608JB1H102KTA	
C202	CU3035	Chip C.	C1608JB1H102KTA	
C203	CU3035	Chip C.	C1608JB1H102KTA	
C204	CU3101	Chip C.	C1608JB1H102KTA	
C205	CU3101	Chip C.	C1608JB1C473KTA	
C206	CE0312	Electrolytic.C	ECEVICA100R	
C207	CU3035	Chip C.	C1608JB1H102KTA	
C208	CS0232	Chip Tantal	TMCMAI V4740MTR	
C209	CU3035	Chip C.	C1608JB1H102KTA	
C210	CU3035	Chip C.	C1608JB1H102KTA	
C211	CU3035	Chip C.	C1608JB1H102KTA	
C212	CU3035	Chip C.	C1608JB1H102KTA	
C213	CU3035	Chip C.	C1608JB1H102KTA	
C215	CU3035	Chip C.	C1608JB1H102KTA	
C216	CU3059	Chip C.	C1608JF1E104ZTA	
C217	CU3051	Chip C.	C1608JB1E223KTA	
C218	CU3059	Chip C.	C1608JF1E104ZTA	
C219	CU3059	Chip C.	C1608JF1E104ZTA	
C220	CU3059	Chip C.	C1608JF1E104ZTA	
C221	CU3023	Chip C.	C1608CH1H101JTA	
C222	CU3023	Chip C.	C1608CH1H101JTA	
C223	CU3051	Chip C.	C1608JB1E223KTA	
C225	CU3023	Chip C.	C1608CH1H101JTA	
C226	CU3023	Chip C.	C1608CH1H101JTA	
C227	CU3035	Chip C.	C1608JB1H102KTA	
C229	CS0209	Chip Tantal	TMCMB01 106MTR	
C230	CU3035	Chip C.	C1608JB1H102KTA	
C231	CE0312	Electrolytic.C	ECEVICA100R	
C234	CU3035	Chip C.	C1608JB1H102KTA	
C235	CU3047	Chip C.	C1608JB1H103KTA	
C236	CU3031	Chip C.	C1608JH1H471KTA	
C237	CU3035	Chip C.	C1608JB1H102KTA	
C238	CU3035	Chip C.	C1608JB1H102KTA	
C239	CU3023	Chip C.	C1608CH1H101JTA	
C240	CU3023	Chip C.	C1608CH1H101JTA	
C241	CU3023	Chip C.	C1608CH1H101JTA	
C242	CU3035	Chip C.	C1608JB1H102KTA	
C243	CS0237	Chip Tantal	TMCMAI A475MTR	
C244	CU3051	Chip C.	C1608JB1E223KTA	
C245	CS0237	ChipTantal	TMCMAI A475MTR	
C246	CU3035	Chip C.	C1608JB1H102KTA	
C247	CU3085	Chip C.	C1608CH1H300JTA	
C248	CU3085	Chip C.	C1608CH1H300JTA	
C249	CS0218	ChipTantal	TMCMDI A476MTR	
C250	CU3043	Chip C.	C1608JB1H472KTA	
C251	CU3043	Chip C.	C1608JB1H472KTA	
C252	CU3059	Chip C.	C1608JF1E104ZTA	
CN201	UE0170	Connector	B9B-ZR	
CN2	UE0192	Connector	11R-JE	
CN2	UE0192	Connector	11R-JE	
CN2	UE0165	Connector	B4B-ZR	EZ

Ref No	Parts No.	Description	Parts Name	Ver
R224	RK3055	Chip.R	ERJ3GSYJ273V	
R225	RK3046	Chip.R	ERJ3GSYJ472V	
R226	RK3070	Chip.R	ERJ3GSYJ474V	
R227	RK3038	Chip.R	ERJ3GSYJ102V	
R228	RK3038	Chip.R	ERJ3GSYJ102V	
R229	RK3038	Chip.R	ERJ3GSYJ102V	
R230	RK3038	Chip.R	ERJ3GSYJ102V	
R231	RK3038	Chip.R	ERJ3GSYJ102V	
R232	RK3050	Chip.R	ERJ3GSYJ103V	
R234	RK3038	Chip.R	ERJ3GSYJ102V	
R235	RK3038	Chip.R	ERJ3GSYJ102V	
R236	RK3074	Chip.R	ERJ3GSYJ105V	
R238	RK3038	Chip.R	ERJ3GSYJ102V	
R239	RK3082	Chip.R	ERJ3GSYJ104V	
R241	RK3062	Chip.R	ERJ3GSYJ104V	
R242	RK3062	Chip.R	ERJ3GSYJ104V	
R243	RK3062	Chip.R	ERJ3GSYJ104V	
R244	RK3062	Chip.R	ERJ3GSYJ104V	
R247	RK3050	Chip.R	ERJ3GSYJ103V	
R248	RK3050	Chip.R	ERJ3GSYJ103V	
R249	RK3050	Chip.R	ERJ3GSYJ103V	
R250	RK3046	Chip.R	ERJ3GSYJ472V	
R251	RK3046	Chip.R	ERJ3GSYJ472V	
R252	RK3046	Chip.R	ERJ3GSYJ472V	
R253	RK3038	Chip.R	ERJ3GSYJ102V	
R254	RK0014	Chip.R	ERJ3GSYJ000V	
R255	RK0014	Chip.R	ERJ3GSYJ000V	
R256	RK3042	Chip.R	ERJ3GSYJ222V	
R257	RK3001	Chip.R	ERJ3GSYJ000V	
R258	RK3046	Chip.R	ERJ3GSYJ472V	
R259	RK3054	Chip.R	ERJ3GSYJ223V	
R260	RK3038	Chip.R	ERJ3GSYJ102V	
R261	RK3038	Chip.R	ERJ3GSYJ102V	
R262	RK3038	Chip.R	ERJ3GSYJ102V	
R263	RK3038	Chip.R	ERJ3GSYJ102V	
R264	RK3038	Chip.R	ERJ3GSYJ102V	
R265	RK3050	Chip.R	ERJ3GSYJ103V	
R267	RK3038	Chip.R	ERJ3GSYJ102V	
R268	RK3038	Chip.R	ERJ3GSYJ102V	
R269	RK3054	Chip.R	ERJ36SYJ223V	
R270	RK3001	Chip.R	ERJ3GSYJ000V	
R271	RK3062	Chip.R	ERJ3GSYJ104V	
R272	RK3058	Chip.R	ERJ3GSYJ473V	
R273	RK3058	Chip.R	ERJ3GSYJ473V	
R274	RK3038	Chip.R	ERJ3GSYJ102V	
R275	RK3062	Chip.R	ERJ3GSYJ104V	
R276	RK3038	Chip.R	ERJ3GSYJ102V	
R277	RK3034	Chip.R	ERJ3GSYJ471V	
R279	RK3001	Chip.R	ERJ3GSYJ000V	
R280	RK3038	Chip.R	ERJ3GSYJ102V	
R281	RK3038	Chip.R	ERJ3GSYJ102V	
R284	-	-	-	E/EA
R287	RK3001	Chip.R	ERJ3GSYJ000V	
R287	RK3001	Chip.R	ERJ3GSYJ000V	

Ref No	Parts No.	Description	Parts Name	Ver
R288	RK3052	Chip.R	ERJ3GSYJ153V	
R289	RK3052	Chip.R	ERJ3GSYJ153V	
R290	RK3052	Chip.R	ERJ3GSYJ153V	
R291	RK3052	Chip.R	ERJ3GSYJ153V	
R292	RK3052	Chip.R	ERJ3GSYJ153V	
R293	RK3050	Chip.R	ERJ3GSYJ103V	0
R294	RK3001	Chip.R	ERJ3GSYJ000V	1.2
R295	RK3001	Chip.R	ERJ3GSYJ000V	0
R296	-	-	-	1.2
R297	-	-	-	EZ
R297	RK3038	Chip.R	ERJ3GSYJ102V	EZ
S201	RK3038	Chip.R	ERJ3GSYJ102V	EZ
S202	UU0015	Switch	SKQD-901	
S203	UU0015	Switch	SKQD-901	
S204	UU0015	Switch	SKQD-901	
S205	UU0015	Switch	SKQD-901	
S206	UU0015	Switch	SKQD-901	
S207	UU0015	Switch	SKQD-901	
S209	UU0011	Switch	ESB164801	
S210	UR0002	Switch	EVQ-WGCF1 524B	
VR201	RV0009	Trim. Pot	EVU-F2AF20B14	
VR20	RV0009	Trim. Pot	EVU-F2AF20B14	
W1	MACL04AA		#30 Blue 02JD40-02	
W2	MRCLO4AA		T/E/EZ	EAEZ
X203	XQ00045	Crystal	#30 Red 02JD40-02	
	DG0003	LCMT	LCDMT3.58MHzT8P	
	FG0133	LCMT	LCMT Light	
	FM0077	LCMT	LCD Rubber Connector	
	FM0077	LCMT	LCD Hokkir	
	FP0034	LCMT	Mic ebnector SpacN+r	
	FP0069	LCMT	Crystal Sheet	
	TL0008	Tube	LCDFiner	
	TT1002	Tube	Tube 1mm x 12	
	YZ0042	Adhesion	Bond G17	

0 : T/E/EZ/EA/TA
 1: TE1
 2: TE2
 None: all models

Ref No	Parts No.	Description	Parts Name	Ver
C301	CU3013	VCO Unit		
C302	CU3016	Chip C.	C1608CHIH	
C303	CU3035	Chip C.	C1608CHIH	
C304	CU3035	Chip C.	C1608JB1H102KTA	
C305	CU3035	Chip C.	C1608JB1H102KTA	
C306	CU3047	Chip C.	C1608JB1H103KTA	
C307	CU3035	Chip C.	C1608JB1H102KTA	
C308	CU3035	Chip C.	C1608JB1H102KTA	
C309	CU3043	Chip C.	C1608JB1H472KTA	
C310	CU3043	Chip C.	C1608JB1H472KTA	
C311	CS0220	Chip Tantal	TMCMA1C225MTR	
C312	CS0220	Chip Tantal	TMCMA1C225MTR	
C313	CU3035	Chip C.	C1608JB1H102KTA	
C314	CU3043	Chip C.	C1608JB1H472KTA	
C315	CU3004	Chip C.	C1608CH1H030CTA 0,1	
C316	CU3035	Chip C.	C1608CH1H02KTA 21	
C317	CS0217	Chip Tantal	TMCMC 1A226MTR	
C318	CU3003	Chip C.	C1608CH1H020CTA	
C319	CU3035	Chip C.	C1608JB1H102KTA	
C320	CU3015	Chip C.	C1608CH1H20JTA	
C321	CU3031	Chip C.	C1608JB1H471KTA	
C322	CU3035	Chip C.	C1608JB1H102KTA	
C323	CU3015	Chip C.	C1608CH1H20JTA	
C324	CU3035	Chip C.	C1608JB1H102KTA	
C325	CU3059	Chip C.	C1608JF1E1042TA	
C326	CU3035	Chip C.	C1608JB1H102KTA	
C327	CU3035	Chip C.	C1608JB1H102KTA	
C328	CU3035	Chip C.	C1608JB1H102KTA	
C329	CU3035	Chip C.	C1608JB1H102KTA	
C330	CU3035	Chip C.	C1608JB1H102KTA	
C331	-			0
C332	-			1,2
CN301	UE0188	Connector	C1608CH1HOR5CTA 1,2	
CN302	UE0185	Connector	B6P-BC-2	
D301	XD0132	Diode	1SV215TPH4	
D302	XD0132	Diode	1SV215TPH4	
D303	XD0130	Diode	DA204UT106	
D304	-			0
IC301	XA0235	IC	1SV215TPH4	1,2
L302	QA0067	Coil	M56760FP	
L303	QC0044	Coil	1SV215TPH4	1
L304	QC0044	Coil	1SV215TPH4	1
L305	QC0044	Coil	1SV215TPH4	1
QC0040	Coil			2
QC0045	Coil			2
QC0043	Coil			2R2J-3
Q301	XE0010	FET	2SK508K52-T2B	
Q302	XT0111	Transistor	2SC4081 LN T106S	

Ref No	Parts No.	Description	Parts Name	Ver
Q303	XT0111	Transistor	2SC4081 LN T106S	
C304	XT0096	Transistor	2SCA099T 106N	
C305	XT0096	Transistor	2SC4099T 106N	
Q306	XU0060	Transistor	UMC2TR	
R301	RK3022	Chip R.	ERJ3GGSYJ470V	
R302	RK3034	Chip R.	ERJ3GGSYJ471V	
R303	RK3034	Chip R.	ERJ3GGSYJ471V	
R306	RK3046	Chip R.	ERJ3GGSYJ472V	
R307	RK3058	Chip R.	ERJ3GGSYJ473V	
R308	RK3046	Chip R.	ERJ3GGSYJ472V	
R309	RK3046	Chip R.	ERJ3GGSYJ472V	
R310	RK3040	Chip R.	ERJ3GGSYJ323V	
R311	RK3044	Chip R.	ERJ3GGSYJ332V	
R312	RK3026	Chip R.	ERJ3GGSYJ101V	
R313	RK3044	Chip R.	ERJ3GGSYJ332V	
R314	RK3022	Chip R.	ERJ3GGSYJ470V	
R315	RK3050	Chip R.	ERJ3GGSYJ103V	0
R316	RK3054	Chip R.	ERJ3GGSYJ223V	1,2
R317	RK3026	Chip R.	ERJ3GGSYJ101V	0,1
R318	RK3038	Chip R.	ERJ3GGSYJ560V	2
R319	RK3038	Chip R.	ERJ3GGSYJ102V	
R320	RK3044	Chip R.	ERJ3GGSYJ332V	
R321	RK3001	Chip R.	ERJ3GGSYJ000V	
R322	RK3034	Chip R.	ERJ3GGSYJ471V	
R323	RK3054	Chip R.	ERJ3GGSYJ223V	
R324	RK3034	Chip R.	ERJ3GGSYJ471V	
R325	RK3054	Chip R.	ERJ3GGSYJ223V	
R326	RK3026	Chip R.	ERJ3GGSYJ101V	T/EZ
R327	RK3026	Chip R.	ERJ3GGSYJ101V	/TA
R328	RK3043	Chip R.	ERJ3GGSYJ272V	E/EA
R329	RK3026	Chip R.	ERJ3GGSYJ101V	
R331	RK3038	Chip R.	ERJ3GGSYJ102V	
R332	-			0
R333	RK3049	Chip R.	ERJ3GGSYJ821V	1
R334	RK3050	Chip R.	ERJ3GGSYJ103V	2
R335	-			0
R336	RK3050	Chip R.	ERJ3GGSYJ821V	1,2
R337	RK3066	Chip R.	ERJ3GGSYJ224V	1,2
R338	TS0081	Case	VCO Case	

Ref No	Parts No.	Description	Parts Name	Ver
ES0017	Speaker	VS-57-O814-1.5W		
FG0040	Speaker Cushion			
UX1047	Wire			
CU3035	Chip P.C	EJ19u		
XA0367	IC	C1608JB1H102KTA		
RK3038	Chip P.R	AT24CO8-10SI-2.7		
RK3038	Chip R	ERJ3GGSYJ102V		
FG0057	Cushion			
UX1049	Wire EJ19u			
AD0010	Screw	Mechanical		
AE0014	Screw	D3+8FeNi		
AJ0017	Screw	B2.6+8FeBG		
AK0003	Screw	2.6+6FeNi2		
FF0015	Screw	OB2.6+ FeNi1		
FF0021		Light Shield Cloth		
FF0028		Volume Tape		
FF0030		Cloth		
FF0031		Cloth		
FG0138		Rubber Cushin DR130		
FM0083	Washer	IC Spring		
ND0004		Spring Washer		
NK0009B		Dial Cover		
NK0010		Dial Knob		
NP0066		Volur TN31 Knob		
KS0041B		Power Switch Knob		
KZ0001B		Bottom Case		
KZ0004B		Front Panel DR130T		
KZ0009A		Front Panel DR130E		
SS0052C		Top Case		
TS0080		Chassis		
		Front Shield Case		

Ref No	Parts No.	Description	Parts Name	Ver
EMS-5A		Others	Microphone	(E/EZ/EA)
EMS-11			Microphone	T/TA
DS0260			Specifications Card	T/TA
DS0280			Specifications Card	E/EA
DS0281			Specifications Card	EZ
PH0009			Registration Card	T
PR0157			Seal TA	
PR0161			Seal EA	
AA0013		Packing	M5+20 FeCr	
AE0012		Screw	Fe3PM4x8BC	
AN0002		Nut	Nut M-5FeCr	
AJ0093		Screw	M5+20FeCr	
AZ0009		Washer	Spring SW-5FeCr	
AZ0010			W-5FeCr	
EF0005		Fuse	FGBO15A	
ADFM78			Bracket	
FM0079			Spanner	
HH0042			CushionDR130	
HK0306			Item Carton DR130	T/TA
HK0308			Item Caftm DR130	
HP0006		(Screw set)	Protection Bag	
HP0009		(Code)	Protection Bag	
HP0016		(Button cover)	Protection Bag	
HP0028		(Instr. card)	Protection Bag	
HP0037		(Bracket)	Protection Bag	
HP0035		(Radio)	Protection Bag	
HU0073			Fixture (A) DR130	
HU0075			Fixture (B)	
KZ0003			Button Cover	
PK0047			Schematic Diagram	
PR0215			Seat EZ	
PS0181			Instruction Card	E/EA
PS0182			Instruction Card	
PT0004A			(T/TA/E1/TE2/EZ)	
ADUA38			Lot Nurrdrber Sear	
YZ0118			R-B2.x3M Receptacle 15A	
YZ0121			Tape 50mm	
			Tape 10mm	

0 : T/E/EZ/EA/TA
1: TE1
2: TE2
None: all models

EJ20u/EMS-5A

Ref No	Parts No.	Description	Parts Name	Ver
C501	CS0236	Chip Tantal	TMCMQA0J685MTR	
C502	CJ3059	Chip C.	C1608JF1E104ZTA	
C503	CS0230	Chip Tantal	TMCMAT1E105MTR	
C504	CJ3059	Chip C.	C1608JF1E104ZTA	
C505	CS0230	Chip Tantal	TMCMAT1E105MTR	
C506	CS0230	Chip Tantal	TMCMAT1E105MTR	
C507	CS0230	Chip Tantal	TMCMAT1E105MTR	
C508	CJ3023	Chip C.	C1608CH1H10JTA	
C509	CS0237	Chip Tantal	TMCMAT1A475MTR	
C510	CJ3019	Chip C.	C1608CH1H470JTA	
C511	CJ3035	Chip C.	C1608JB1H102KTA	
C512	CJ3015	Chip C.	C1608CH1H220KTA	
C513	CJ3015	Chip C.	C1608CH1H220KTA	
CN501	UX1050	Wire	EJ20u	
IC501	XA0239	IC	AK2341	
Q501	X10095	Transistor	2SC4081 T106R	
R501	RK3040	Chip R.	ERJ3GSYJ152V	
R502	RK3022	Chip R.	ERJ3GSYJ470V	
R503	RK3067	Chip R.	ERJ3GSYJ274V	
R504	RK3038	Chip R.	ERJ3GSYJ102V	
R505	RK3051	Chip R.	EFJ3GSYJ123V	
R506	RK3089	Chip R.	ERJ3GSYJ912V	
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.	EFU3GSYJ105V	
R514	RK3066	Chip R.	ERJ3GSYJ224V	
R515	RK3048	Chip R.	ERJ3GSYJ682V	
VR501	RH0106	Trim. Pot	EVMI1YSX50BQ4	
X501	XQ0057	Crystal	DS-MAT3.6864MHz	
	HK0305		Carton	
	PG0029		Protection Bag	
	PG0057		Rubber Cushion	
	UP0243a		P.C.B.	
	YZ0042		Bond G17	

Ref No	Parts No.	Description	Parts Name	Ver
C1	CU8003	Chip C.	C2012JF1E104Z	
C2	CU8035	Chip C.	C2012 B1E393K	
C3	CU8003	Chip C.	C2012JF1E104Z	
C4	CU8012	Chip C.	C2012JB1H471KTA	
C5	CU8012	Chip C.	C2012JB1H471KTA	
C6	CU8016	Chip C.	C2012JB1H102K	
C7	CE0315	Electrolytic.C	ECEV1CA470P	
C8	CK0004	Ceramic C.	CK45-F1H102ZTA	
CI0	CS0066	Chip Tantal	TMCSB 1D225MTR	
FAR1	XA0041	Crystal	FARC4CA0358000K01R	
ICI	XA0042	IC	LR40872	
Q1	XT0031	Tansistor	2SC2712Y TE85L	
R1	RK0062	ChIPR.	ERJ6GEYJ473V	
R2	RK0062	ChIPR.	ERJ6GEYJ473V	
R3	RK0035	ChipR.	ERJ6GEYJ02V	
R4	RK0039	ChipR.	ERJ6GEYJ222V	
R5	RK0039	ChipR.	ERJ6GEYJ222V	
R7	RK0039	ChipR.	ERJ6GEYJ222V	
R8	RK0021	ChIPR.	ERJ6GEYJ181V	
R9	RK0040	ChipR.	ERJ6GEYJ272V	
R10	RK0069	ChipR.	ERJ6GEYJ104V	
R15	RK0025	ChIPR.	Ef66GEYJ331V	
R16	RK3001	ChipR.	ERJ3JSYJ000V	
R17	RK3001	ChipR.	ERJ3JSYJ000V	
SW1	UM0002	Switch	Micro Switch SS-5	
SW2	UU0009	Switch	EVQJQHJ+04G	
SW3	UU0009	Switch	EVCLQHJ04G	
SW4	US0015	Switch	HSW088QJ1D1 -210	
VR1	RH0031	Trim. Pot	CVR42A-103AW1D	
W1	MACK02A	Wire	#28A02-020-02	
W2	MYCK02A	Wire	#28Y02-020-02	

EMS-11

Ref No	Parts No.	Description	Parts Name	Ver
AJ0013	AJ0013	Screw	1M2.3+12FeCr	
AJ0025	AJ0025	Screw	1M3.5+10FeN	
AP0004	AP0004	Screw	PM2+5FeCr	
AP0008	AP0008	Screw	PM3+8FeBC	
DE0007	DE0007	Stopper	Stopper	
EY0006	EY0006	Microphone	WM-60AT	
FG0045	FG0045		MIC Rubber Cushion	
FG0055	FG0055		Rubber Switch	
HP0036	HP0036		Protection Bag	
KB0033	KB0033		Rear Case	
KM0153	KM0153		Front Case	
NP0041	NP0041		PTT Button	
NP0042	NP0042		Up Button	
NP0043	NP0043		Down Button	
NS0003	NS0003		Slide Switch	
SC0004	SC0004		PTT Spring	
TT1002	TT1002	Tube	1.Ox1mm	
UE0125A	UE0125A		Curl Code EMS3	
UP0183B	UP0183B		P.C.B.	

0 : TE/EZ/EATA
1: TE1
2: TE2
None: all models

ADJUSTMENT

1) Required Test Equipment

1. Digital Multimeter

Voltage range: FS= 18V or so
Input resistance: 1M ohm or more

2. Regulated Power Supply

Supply voltage: 13.80V
Current : 15A or more

3. Oscilloscope

Measurable frequency: DC to 30MHz

4. Spectrum Analyzer

Measuring range: Up to 2GHz or more

5. Tracking Generator

Output frequency: Up to 2GHz or more

6. Audio Dummy Load

Impedance: 8 ohm
Dissipation: 5W or more

7. SSG

Output frequency: 1GHz or more
Output level: -20dB/0.1uV to 120dB/1V
Moduration: FM

8. Frequency Counter

Measurable frequency: Up to 500MHz
Measurements stability: 0.2ppm or so

9. Power Meter

Measurable frequency: Up to 500MHz
Impedance: 50 ohm, unbalanced
Measuring range: Full scale of 60W or so

10. Audio Voltmeter

Measurable frequency: 50Hz to 10kHz
Sensitivity: 1mV ~ 10V

11. Distortion Meter

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

12. Audio Generator

Output frequency: 88.5Hz and 1kHz
Output impedance: 600 ohm, unbalanced

13. Linear Detector

Measurable frequency Up to 500MHz
Characteristics: Flat
CN: 60dB or more

2) Adjustment for DR130

SSG Mod:1KHz +/-3.5KHz/DEV

SP terminal is connected to 8ohm dummy load.

RX speaker output level is 50 to 100mW

1. Power supply voltage is 13.8V. Power switch is off.
2. Turn the squelch and volume knobs counterclockwise.
3. Press and hold the "F"key,then turn on the power switch.

The display shows that the frequency is 145.00MHz

PLL Adjustment

Item	Condition	Measurement			Adjustment			Specification/
		Test equipmen	Unit	Terminal	Unit	Parts	Method	Remarks
Frequency	Frequency:145.00MHz power: Low *1 PTT: ON	Freq.Counter Power Meter	Back	ANT	MAIN	TC1	145.00 MHz	+/- 100Hz
PLL VCO	Frequency:145.00MHz PTT: OFF *1	Digital Multimeter	Main	SD	PLL VCO	L302	2.0V Check	1.8-2.2V 0.7-1.0V

RX Adjustment (ALL SSG out =EMF)

Item	Condition	Measurement			Adjustment			Specification/
		Test equipmen	Unit	Terminal	Unit	Parts	Method	Remarks
RX Sensitivity	Frequency:145.03MHz SSG out:0dBu *1	SSG Distortion Meter	Main	TP1	Main	L4-L6 L14	SINAD: MAX	Turn the coil L14, L4,L5,L6,L4,L5 to the MAX in order
	Frequency:145.03MHz SSG out:-10dBu *1					Check	SINAD is above12dB	
	Frequency:134.00MHz SSG out:-2.0dBu *2							
	Frequency:174.00MHz SSG out:-2.0dBu *3							
S Meter	Frequency:145.03MHz SSG out: 15dBu *1 Mod: OFF	LCD S Meter	Front Panel		Main	VR5	Full flashing	
	Frequency:145.03MHz SSG out:0dBu *1 Mod: OFF						Check	S Meter does not light.
SQL	Frequency:145.03MHz SSG out:-10dBu *1 SQL VR:Threshold	LCD Busy	Front Panel		Main		Make sure that SQL is open	Busy ON

*1 or bond-center of your radio version

*2 or bond lower limit of your radio version

*3 or bond upper limit of your radio version

TX Adjustment

Item	Condition	Measurement			Adjustment			Specification/ Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method	
High Power	VR1: max Power:High PTT: ON	Power Meter	Back	ANT	Main	VR1	52w	+/- 1.0W Below 10.5A
	Frequency:145.00MHz Power:High *1 PTT: ON							
	Frequency:130.00MHz Power:High *2 PTT: ON							
	Frequency:174.00MHz or 155MHz Power:Low *3 PTT: ON							
Low Power	Frequency:130.00MHz Power:Low *1 PTT: ON					VR5	5.0w	+/- 0.5W (T.E.EZ)
DEV	Frequency:145.00MHz Power: Low *1 AG:1KHz -30dBm PTT: ON	AG Linear Detector Power Meter	Back	ANT	Main	VR2	4.7kHz /Dev	4.7 +/-0.2kHz/Dev
MIC Gain	Frequency:145.00MHz Power: Low *1 AG:1KHz -47dBm PTT: ON							
CTCSS Ton DEV	Frequency:145.00MHz Power: Low *1 AG: OFF PTT: ON ToneSW(88.5Hz):ON							
Tone Burst DEV	Frequency:145.00MHz Power: Low *1 AG: OFF PTT: ON ToneSW:ON							

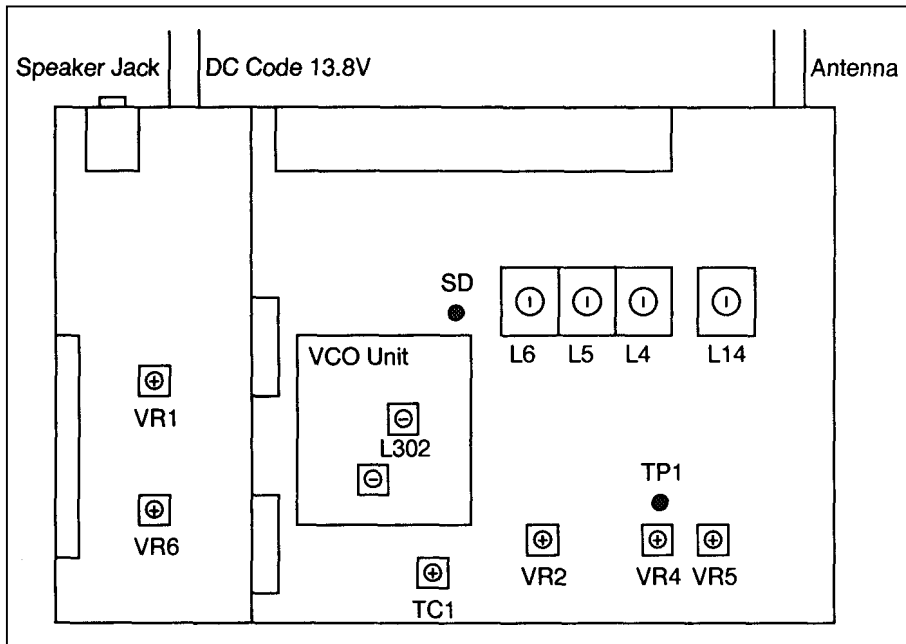
*1 or bond-center of your radio version

*2 or bond lower limit of your radio version

*3 or bond upper limit of your radio version

If the logic board EJ-21D or EJ21D exists ,first pull out the logic board and re-connect W3,W4,W5, so that the radio comes back to conventional

3) Adjustment Points



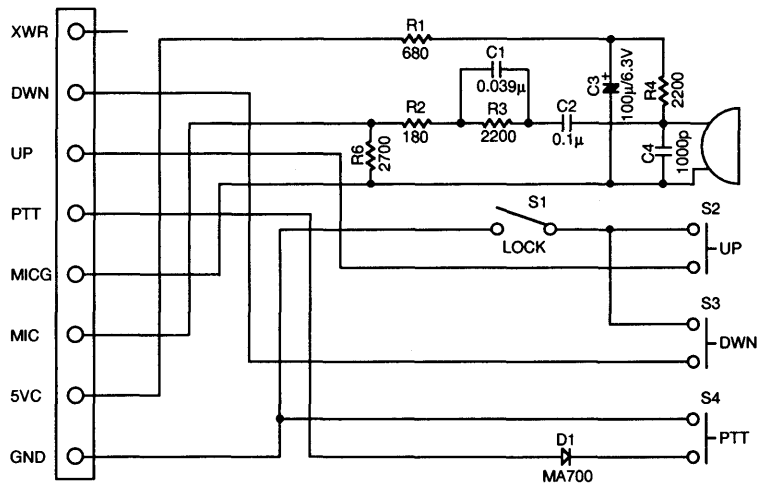
4) Adjustment Quick Reference

SSG Output = EMF

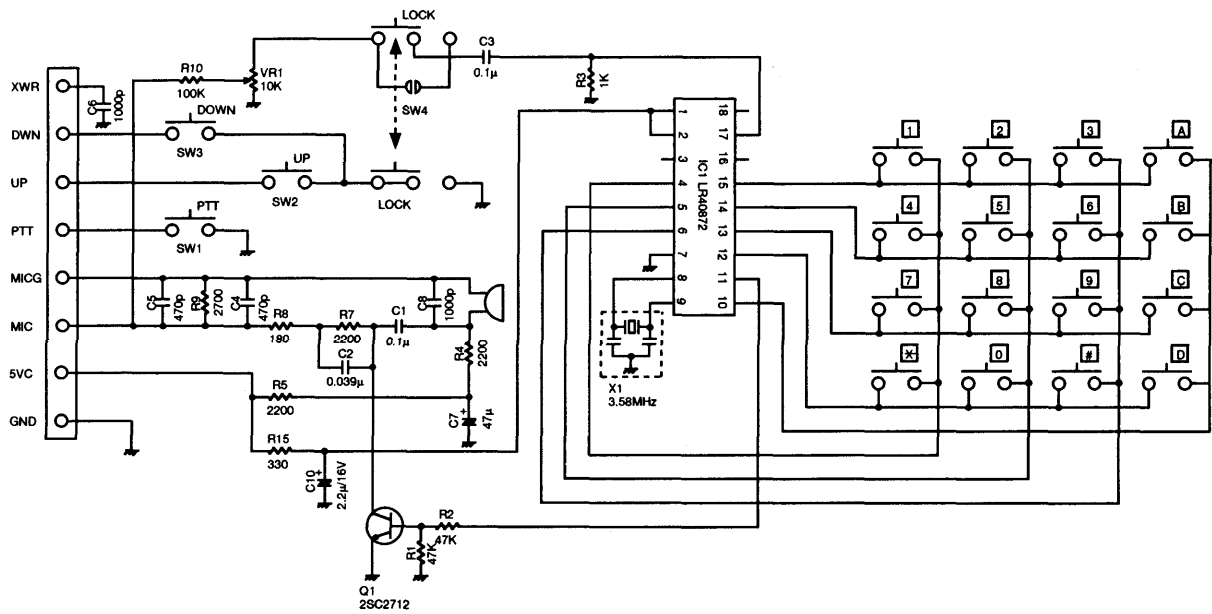
Parts	Item	Specifications	Specifications
L4	RX Sensitivity	-10dBpV (12dB SINAD)	-10dBpV (12dB SINAD)
L5	RX Sensitivity	-10dBpV (12dB SINAD)	-10dBpV (12dB SINAD)
L6	RX Sensitivity	-10dBpV (12dB SINAD)	-10dBpV (12dB SINAD)
L14	RX Sensitivity	-10dBpV (12dB SINAD)	-10dBpV (12dB SINAD)
L302	VCO Frequency	1.8V~2.2V	1.8V~2.2V
TC1	Reference Frequency	145.00MHz +/-100Hz	145.00MHz +/-100Hz
VR1	TX High Power	52W +/- 1.0W	52W +/- 1.0W
		10.5W +/- 0.5W (EZ)	10.5W +/- 0.5W (EZ)
VR2	Deviation	4.7kHz +/-0.2kHz	2.4kHz +/-0.1kHz
VR4	Mic Gain	4.0kHz +/-0.2kHz	2.0kHz +/-0.1kHz
VR5	S Meter	15dBu "Full"	15dBu "Full"
VR6	TX LowPower	5W+/-0.5W	5W+/-0.5W

SCHEMATIC DIAGRAM

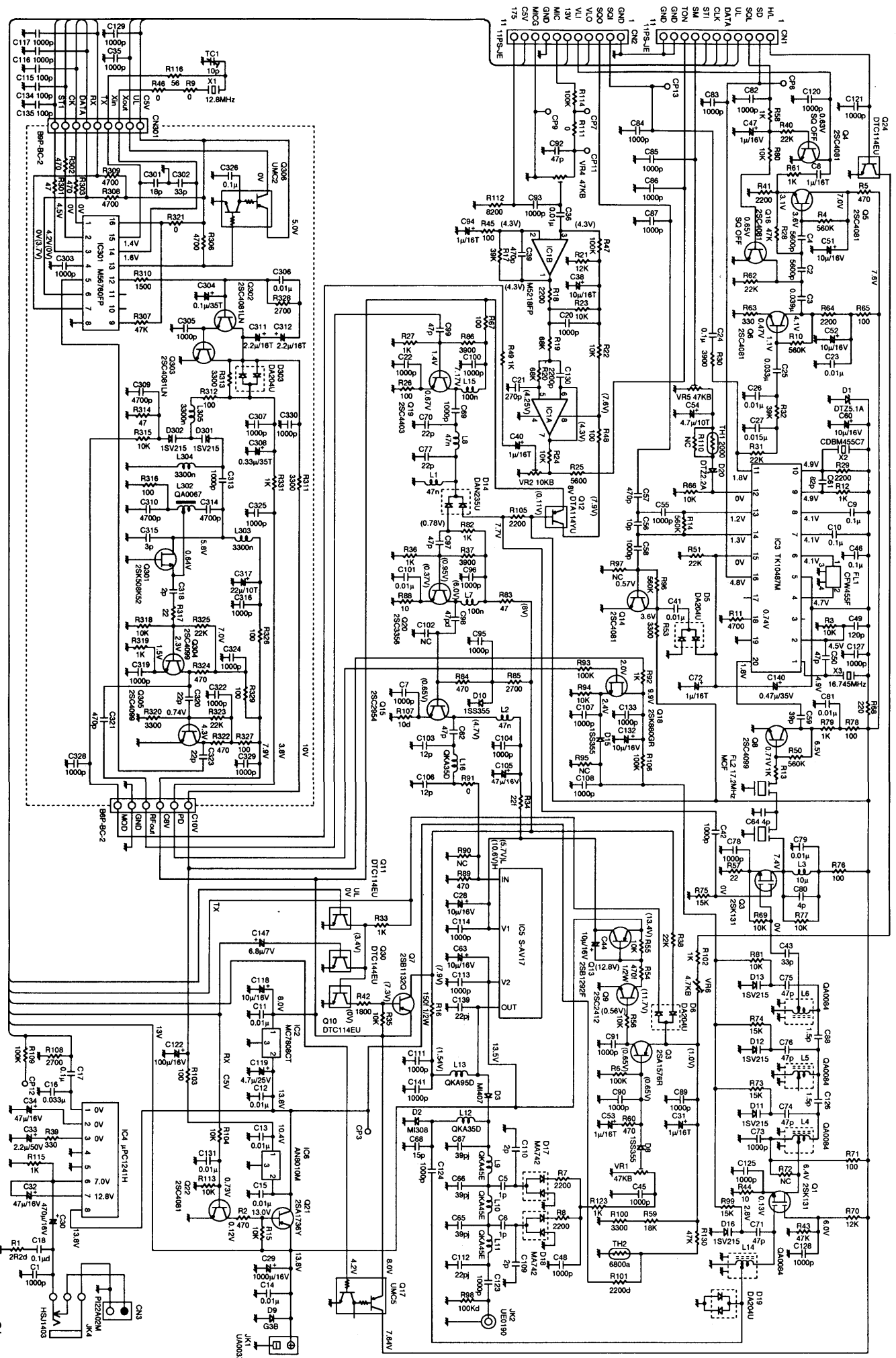
1) CIRCUIT DIAGRAM



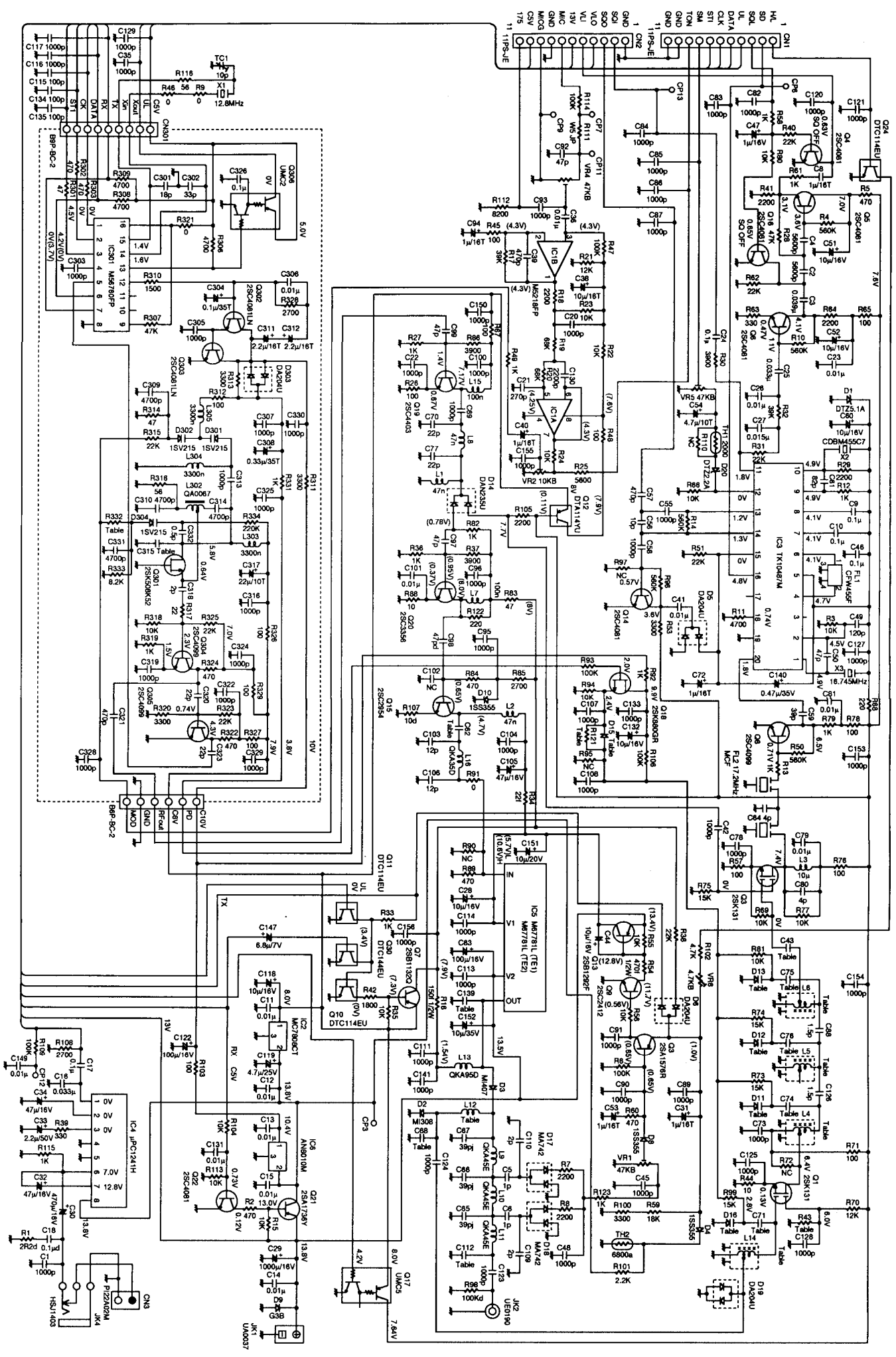
2) CIRCUIT DIAGRAM



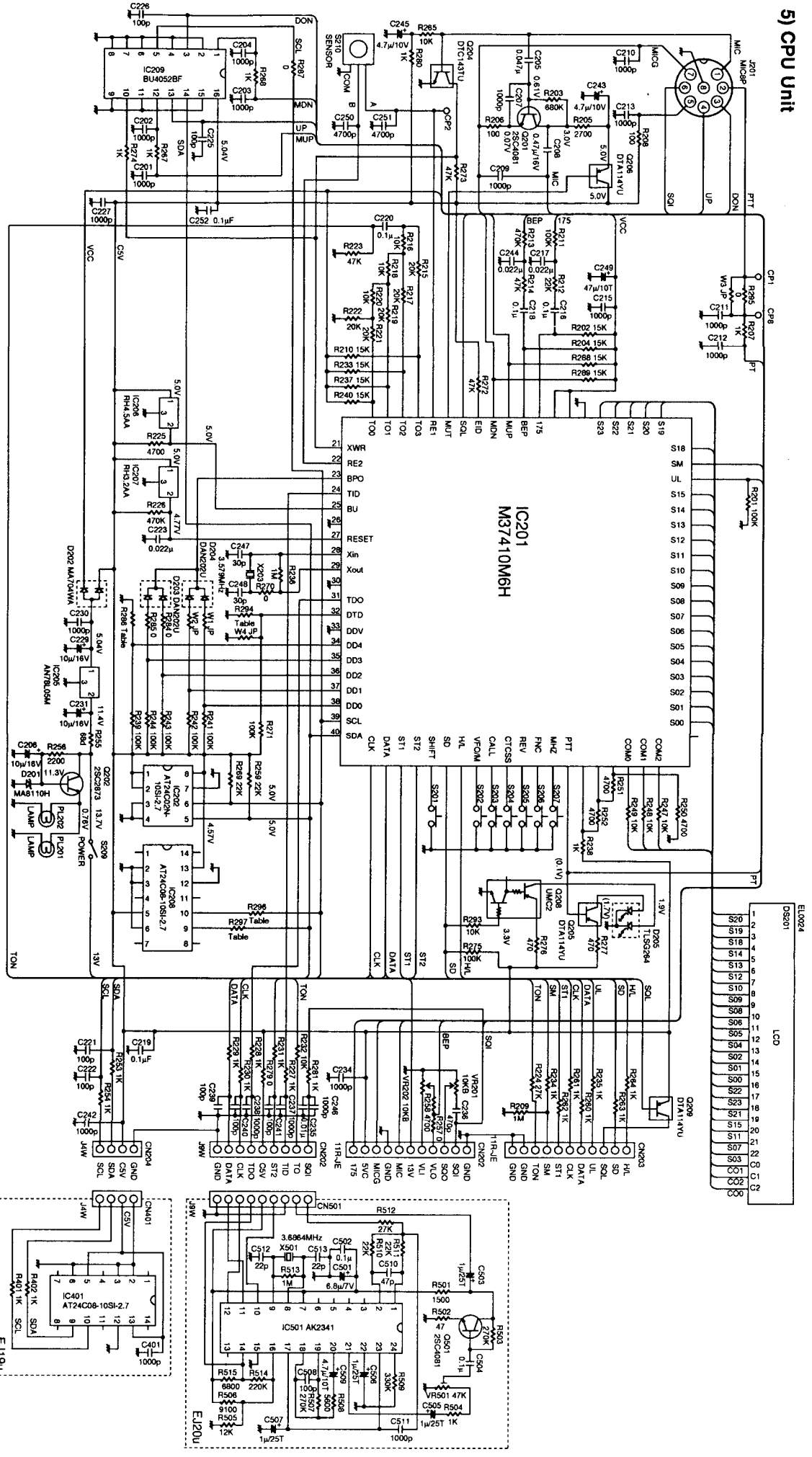
3) Main Unit (T/E/EZ/EATA)



4) Main Unit (TE1/TE2)

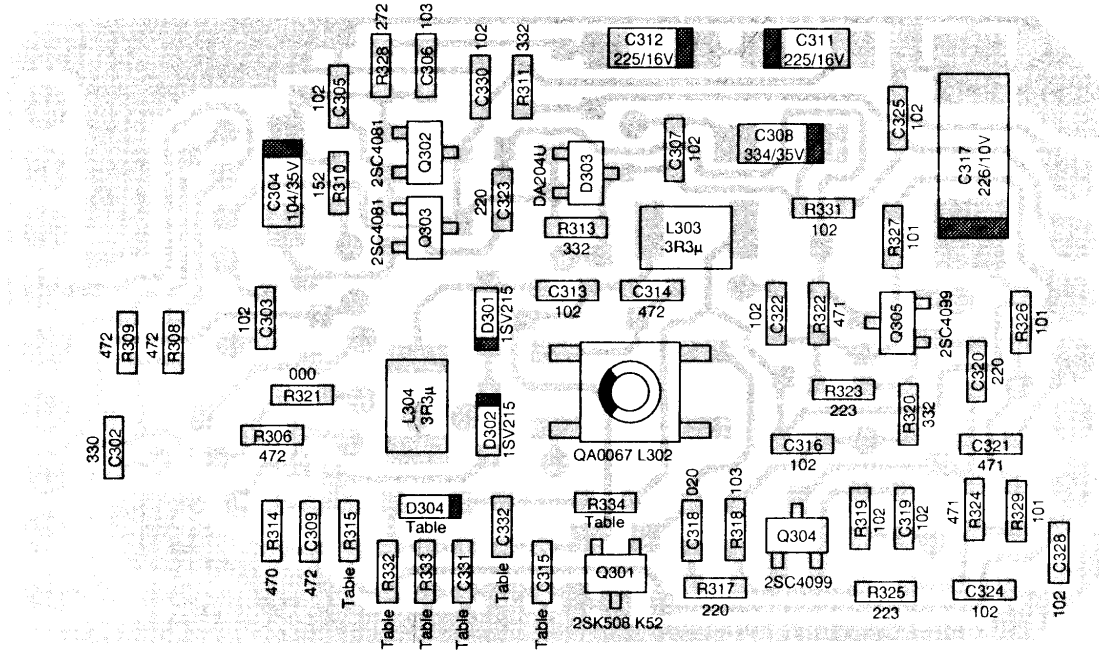


5) CPU Unit

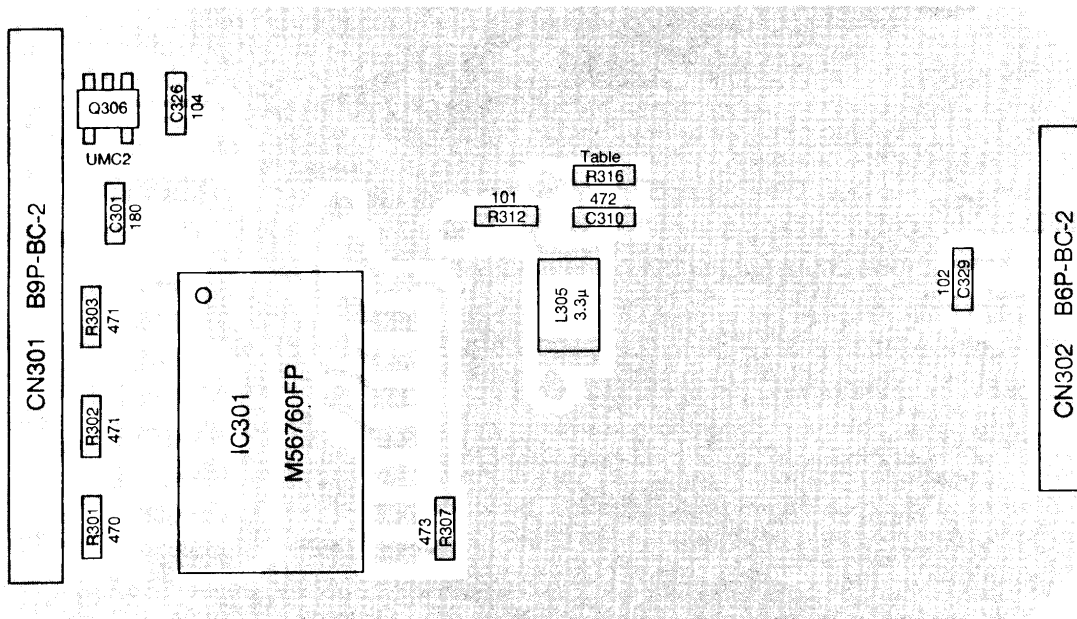


W1	W2	W3	W4	R234	R234	R236	R236	R237	CN204	IC208
JP	JP	JP	JP	0	0	0	0	0	-	-
E	JP	JP	JP	0	0	0	0	0	AT24C08-10SH-2.7	-
EZ	JP	JP	JP	0	0	0	1K	1K	0	-
EA	-	-	-	0	0	0	-	-	-	-
TA	-	-	-	0	0	0	-	-	-	-
TE1	-	JP	JP	-	-	-	-	-	-	-
TE2	-	JP	JP	-	-	-	-	-	-	-

5) VCO Unit Side A



6) VCO Unit Side B



	C315	C331	C332	D304	R315	R316	R332	R333	R334
T/E/EZ/EATA	3p	-	-	-	10k	100	-	-	-
TE1	3p	4700p	0.5p	1SV215	22k	56	8.2k	8.2k	220k
TE2	1p	4700p	0.5p	1SV215	22k	56	10k	8.2k	220k

BLOCK DIAGRAM

