144MHz FM TRANSCEIVER

TM-241A/E

SERVICE MANUAL

REVISED

KENWOOD

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This service manual is the same as the service manual (B51-8059-00) for TM-241A/E (TM-241A : K,P,M,M2 TM-241E : E,E2) destinations except that this manual contains new items for (TM-241A : M3,X,K2,P2 TM-241E : E9,EM) destinations.
Use it together with the previous service manual (B51-8059-00).

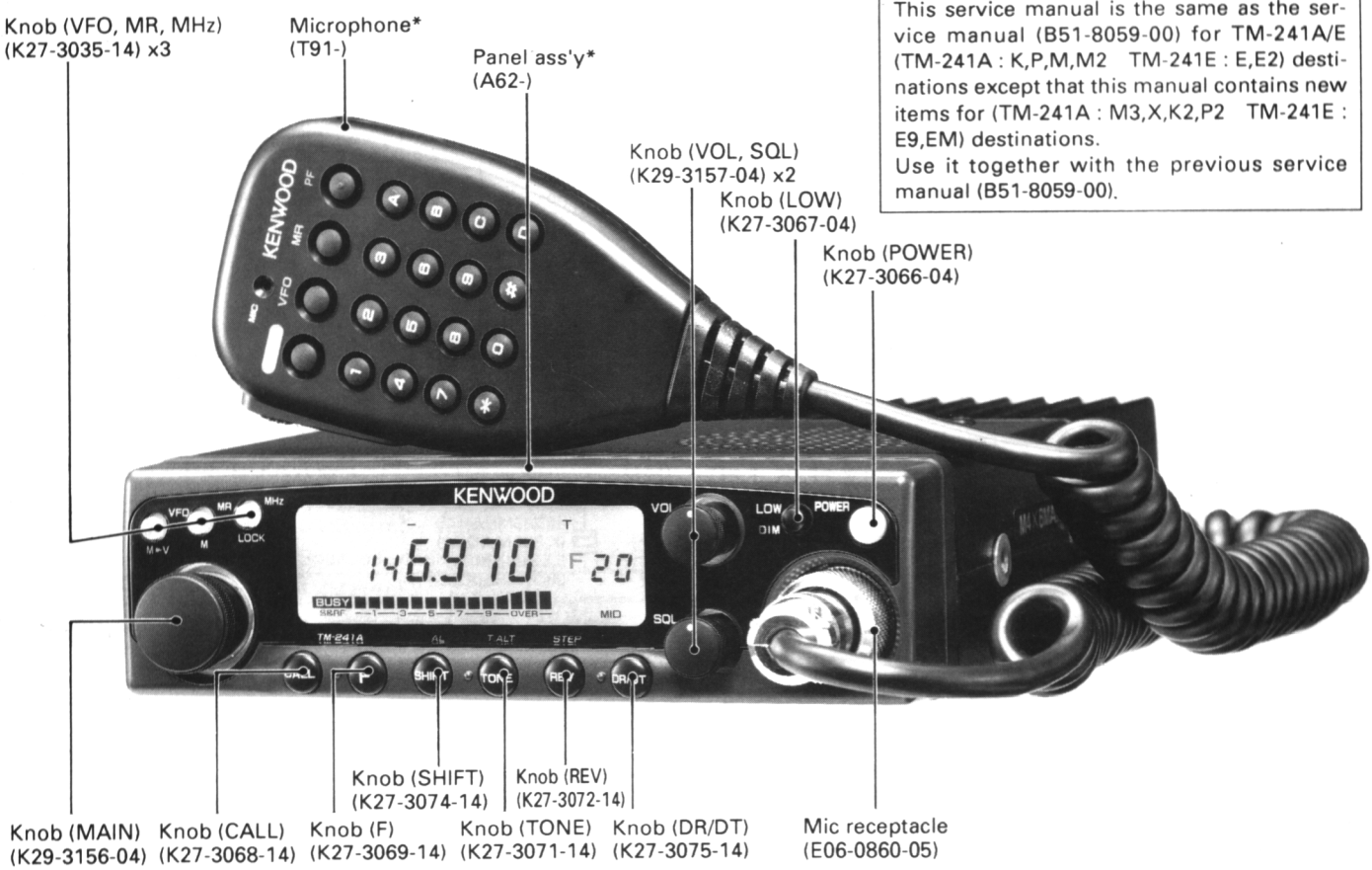


Photo is TM-241A.

*** Refer to parts list on page 15.**

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CIRCUIT DESCRIPTION

Circuit Configuration By Frequency

The TM-241A/E incorporates a PLL synthesizer which uses a digital VFO to allow any channel step of 5, 10, 12.5, 15, 20, or 25kHz to be selected (See Figure 1).

The receiving system utilizes double-conversion techniques. That is, an incoming signal is mixed down to the 1st intermediate frequency (IF) of 10.7MHz (K,P,X,M,M2,M3,E,E2,E9,EM), 30.825MHz (K2,P2), using a 1st local oscillator frequency of from 133.300 to 135.295MHz (E,E9,EM), 133.300 to 137.295MHz (M), 125.300 to 163.295MHz (K,P,X,M2,M3,E2), 105.175 to 166.820MHz (K2,P2). The 1st IF signal is then mixed with the 2nd local oscillator frequency of 10.245MHz (K,P,X,M,M2,M3,E,E2,E9,EM), 30.37MHz (K2,P2) to generate the 2nd IF of 455kHz.

The transmitting system consists of a PLL circuit which allows direct modulation and direct frequency division. Signals from the PLL circuit are amplified by a linear amplifier for transmission.

	TM-241A				TM-241E	
	K,P,X	K2,P2	M	M2,M3	E,E9,EM	E2
TX-RX UNIT (X57-369X-XX)	0-11	0-12	0-21	0-22	2-71	2-72

Table 1

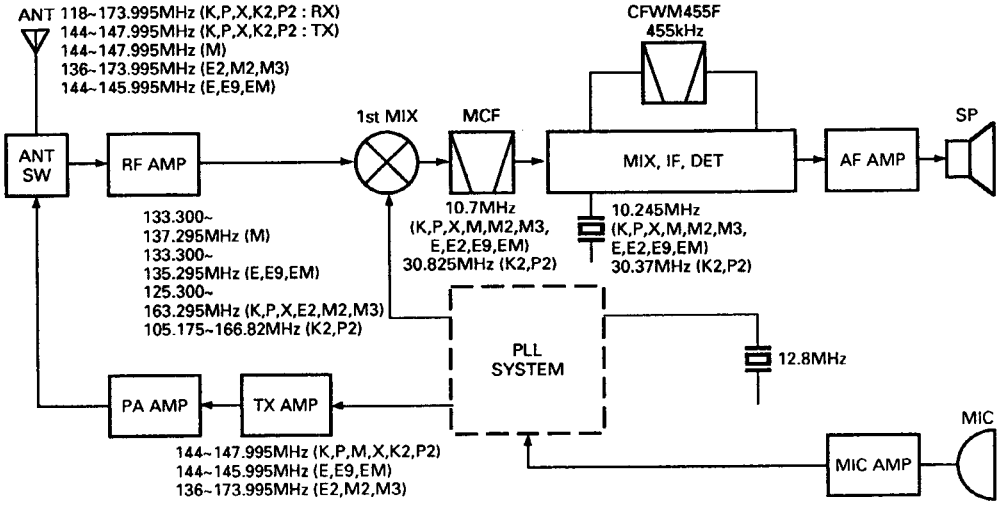


Fig. 1 Frequency configuration

Receiving System

- **Overview**

Incoming signals from the antenna pass through a low-pass filter in the final block of the transmitter system, and are switched to the front-end of the receiver system via a receive/transmit switching diode.

The signals are then passed through an antenna matching coil, where the high-frequency components are amplified by a GaAs FET. The signals are then fed into a three-stage band-pass filter that uses vari-cap tuning to reject unwanted signal components, and is fed to the 1st mixer. The 1st mixer uses the N-channel MOS FET that are used in the RF stage to obtain better two-signal characteristics. The 1st mixer mixes the signal with the 1st local oscillator frequency and converts it to the 1st IF (10.7MHz : K,P,X,M,M2,M3, E,E2,E9,EM, 30.825MHz : K2,P2). The signal then passes through two monolithic crystal filters (MCFs) to remove unnecessary near-by frequency components.

The signal from the MCFs is used as the 1st IF signal.

The 1st IF signal is amplified and fed into IC1 (KCD04) in the FM IF HIC. The IF signal is then mixed with the 2nd local oscillator frequency of 10.245MHz (K,P,X,M,M2,M3,E,E2,E9,EM), 30.37MHz (K2,P2) to generate the 2nd IF of 455kHz. The 455kHz signal is then passed through a six element ceramic filter (CFWM455F), and fed back into IC1 for additional amplification. The output signal from the IC1 is then fed into a power amplifier via the audio volume control for application to the speaker.

- **S-meter circuit**

S-meter control voltage from IC1 (KCD04) in the FM IF HIC is fed into the control unit. The CPU converters the voltage from an analog to digital signal in order to operate the LCD bar meter.

CIRCUIT DESCRIPTION

Item	Rating
Nominal center frequency (fo)	10.7MHz
Pass bandwidth	±7.5kHz or less at 3dB
Attenuation bandwidth	±25kHz or less at 40dB ±45kHz or less at 60dB
Ripple	1.0dB or less
Insertion loss	1.5dB or less
Guaranteed attenuation	70dB or more within ±1MHz Spurious 40dB or more at fo ~ fo+500kHz 80dB or more at fo – (900~920kHz)
Terminating impedance	3kΩ / 0pF

Table 2 MCF (L71-0228-15) TX-RX unit XF1 : K,P,M,M2,M3,X,E,E2,E9,EM

Item	Rating
Nominal center frequency (fo)	30.825MHz
Pass bandwidth	±7.5kHz or less at 3dB
Attenuation bandwidth	±28kHz or less at 40dB
Ripple	1.5dB or less
Insertion loss	3.0dB or less
Guaranteed attenuation	60dB or more within ±1MHz Spurious : 40dB or more
Terminating impedance	1.4kΩ / 1pF

Table 3 MCF (L71-0270-05) TX-RX unit XF1 : K2,P2

Item	Rating
Nominal center frequency	455kHz ± 1kHz
6dB bandwidth	±6kHz or more (from 455kHz)
50dB bandwidth	±12.5kHz or less (from 455kHz)
Ripple	3dB or less (within ±4kHz of 455kHz)
Insertion loss	6dB or less
Guaranteed attenuation	35dB or more (within ±100kHz of 455kHz)
I/O matching impedance	2.0kΩ

Table 4 Ceramic filter CFWM455F (L72-0372-05) TX-RX unit CF1

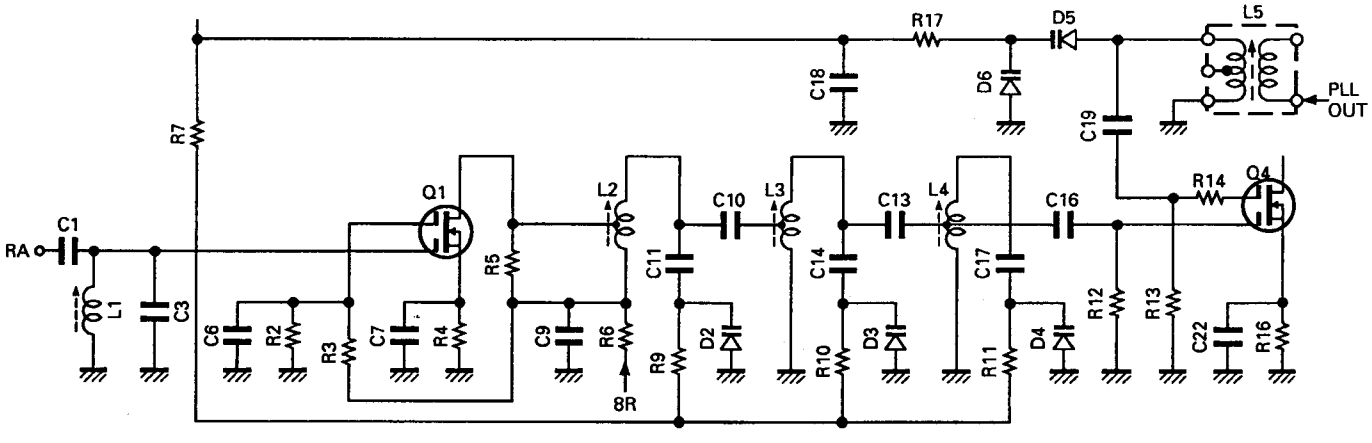


Fig. 2 Front-end section (vari-cap tuning)

CIRCUIT DESCRIPTION

Transmitting System

- **Overview**

The transmitter produces the target frequency thru the use of direct FM-modulation via a varactor diode.

- **Modulation circuit**

Audio signals from the microphone are fed into the mic amplifier unit for amplification by the 1st transistor amplifier, and then into two operational amplifiers. The operational amplifiers form a splatter filter for pre-emphasis, amplification, limiting, and removal of unnecessary high-frequency components.

The FM modulation circuit directly FM-modulates the VCO signals, using a varactor diode.

- **Pre-amplifier stage circuit**

Signals from the VCO are applied to the drive HIC IC8 (KCB05). The amplifier always operates in a linear mode so that signals can be amplified without degradation. Additionally, the amplifier is designed to cover a wide range of frequencies and can produce stable output without adjustment. The APC (Automatic Power Control) controls collector voltage from the last stage of the pre-amplifier.

- **Power amplifier circuit**

The drive signal is amplified to the required level by the power module. The TM-241A/E uses a large heat sink for efficient heat dissipation.

- **APC circuit**

The APC circuit for automatic transmit output control detects part of the power module output, and amplifies it to provide a control voltage for output control. The output control voltage is in inverse proportion to the output from the power module, so it is maintained at the same level.

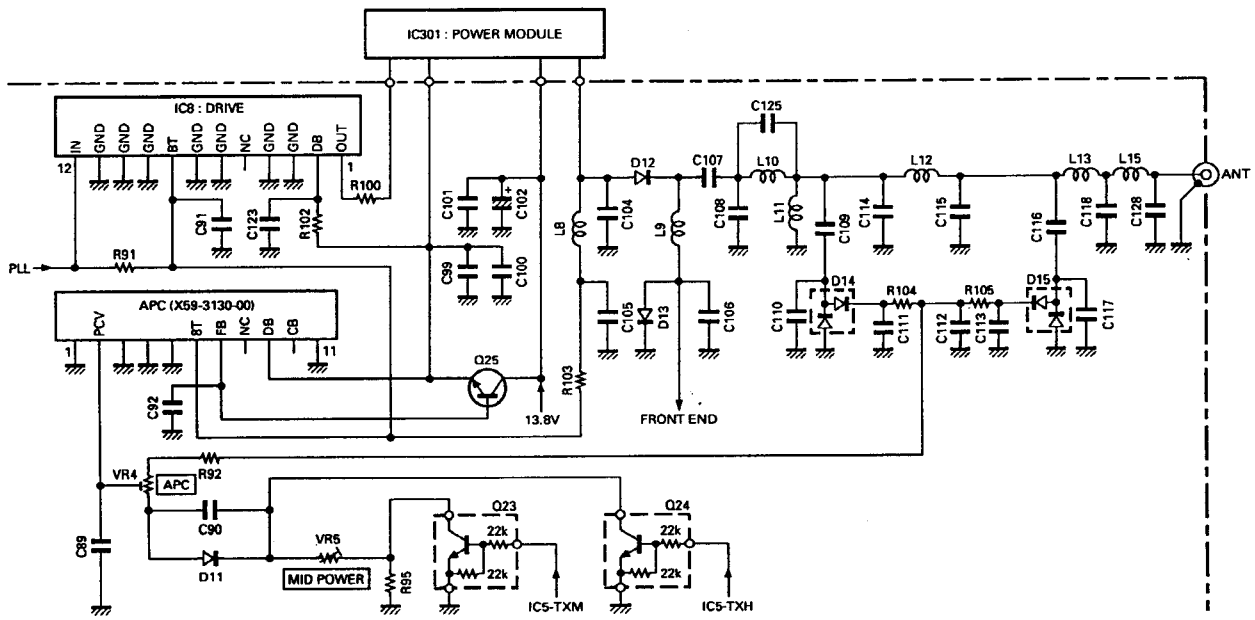


Fig. 3 Pre-amplifier stage, power amplifier, and APC circuits

(Tc = 25°C)

Item	Symbol	Condition	Rating	Unit
Operating voltage	Vcc		16	V
Control voltage	VCON		16	V
Current consumption	IT		14	A
Input power	Pi		600	mW
Output power	Po	12.5V < Vcc ≤ 16V, VCON ≤ 12.5V Pi = 0~500mW, ZG = ZL = 50Ω	65	W
Operating case temperature	Tc(opr)		-30~+100	°C
Storage temperature	Tstg		-40~+110	°C

Table 5 Power module S-AV17 maximum ratings (IC301)

CIRCUIT DESCRIPTION

PLL Synthesizer Unit (K,P,X,M,M2,M3,E,E2,E9,EM)

Figure 4-1 is the PLL and VCO block diagram. In the TM-241A/E, the PLL system is implemented as a sub-unit which is divided into the upper VCO and lower PLL blocks. The sub-unit is shielded to prevent external interference.

There are two reference frequencies, 6.25kHz and 5kHz, available to allow 5, 10, 12.5, 15, or 25kHz-step operation. The 6.25kHz is obtained by dividing the reference oscillator frequency of 12.8MHz by 2048, and the 5kHz is obtained by dividing it by 2560. The VCO directly generates the dial frequency. This dial frequency is amplified once and then fed into a pulse swallow-type PLL IC for frequency division and phase comparison, in order to lock the frequency.

The PLL system is locked without switching between transmit mode and receive mode. By using a signal ("H" in transmit mode) from pin 11 of the PLL IC (M54959FP), the LPF is deactivated-activated by Q52 and Q53 only for the moment when the TM-241A/E enters transmit mode. This helps produce lock more rapidly than previous methods.

In 144MHz mode, fvco (RX) is calculated by the following formula;

fvco = (144 – 10.7) = {(n x 128) + A} x fosc ÷ R

where,

- fvco : VCO output frequency
- n : Binary value of the 10-bit programmable counter
- A : Binary value of the 7-bit programmable counter
- fosc : 12.8MHz reference frequency
- R : Binary value of the 14-bit programmable counter
  2560 (5, 10, 15, 20, or 25kHz step mode)
  2048 (12.5kHz step mode)

In 5, 10, 15, 20, or 25kHz step mode,

n = 208 and A = 36.

Therefore, fvco is calculated as follows;

fvco = {(208 x 128) + 36} x 12800 ÷ 2560
= (26624 + 36) x 5
= 133300 = 133.300MHz

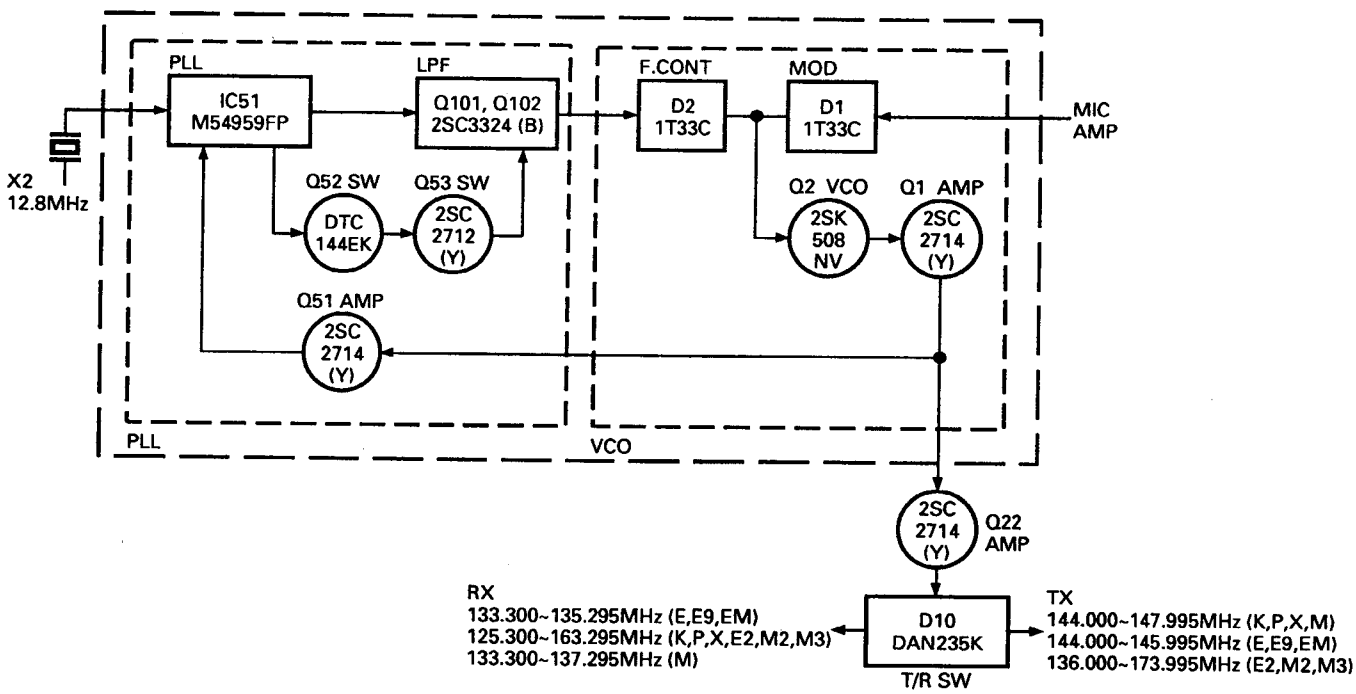


Fig. 4-1 PLL block diagram (K,P,X,M,M2,M3,E,E2,E9,EM)

CIRCUIT DESCRIPTION

PLL Synthesizer Unit (K2,P2)

Figure 4-2 is the PLL and VCO block diagram. In the TM-241A/E, the PLL system is implemented as a sub-unit which is divided into the upper VCO and lower PLL blocks. The sub-unit is shielded to prevent external interference.

There are two reference frequencies, 6.25kHz and 5kHz, available to allow 5, 10, 12.5, 15, or 25kHz-step operation. The 6.25kHz is obtained by dividing the reference oscillator frequency of 12.8MHz by 2048, and the 5kHz is obtained by dividing it by 2560. The VCO directly generates the dial frequency. This dial frequency is amplified once and then fed into a pulse swallow-type PLL IC for frequency division and phase comparison, in order to lock the frequency.

The PLL system has two VCOs, one for transmission and one for reception. Using a signal ("H" in transmit mode) from pin 10 of the PLL IC (M54959FP), the LPF is deactivated by Q105 only for the instant when the TM-241A/E enters transmit mode. This helps produce a more rapid PLL lock-up.

In 144MHz mode, fvco (RX) is calculated by the following formula;

fvco = (144 – 30.825) = {(n x 128) + A} x fosc ÷ R

where,

- fvco : VCO output frequency
- n : Binary value of the 10-bit programmable counter
- A : Binary value of the 7-bit programmable counter
- fosc : 12.8MHz reference frequency
- R : Binary value of the 14-bit programmable counter
  2560 (5, 10, 15, 20, or 25kHz step mode)
  2048 (12.5kHz step mode)

In 5, 10, 15, 20, or 25kHz step mode,

n = 176 and A = 107.

Therefore, fvco is calculated as follows;

fvco = {(176 x 128) + 107} x 12800 ÷ 2560
= (22528 + 107) x 5
= 113175 = 113.175MHz

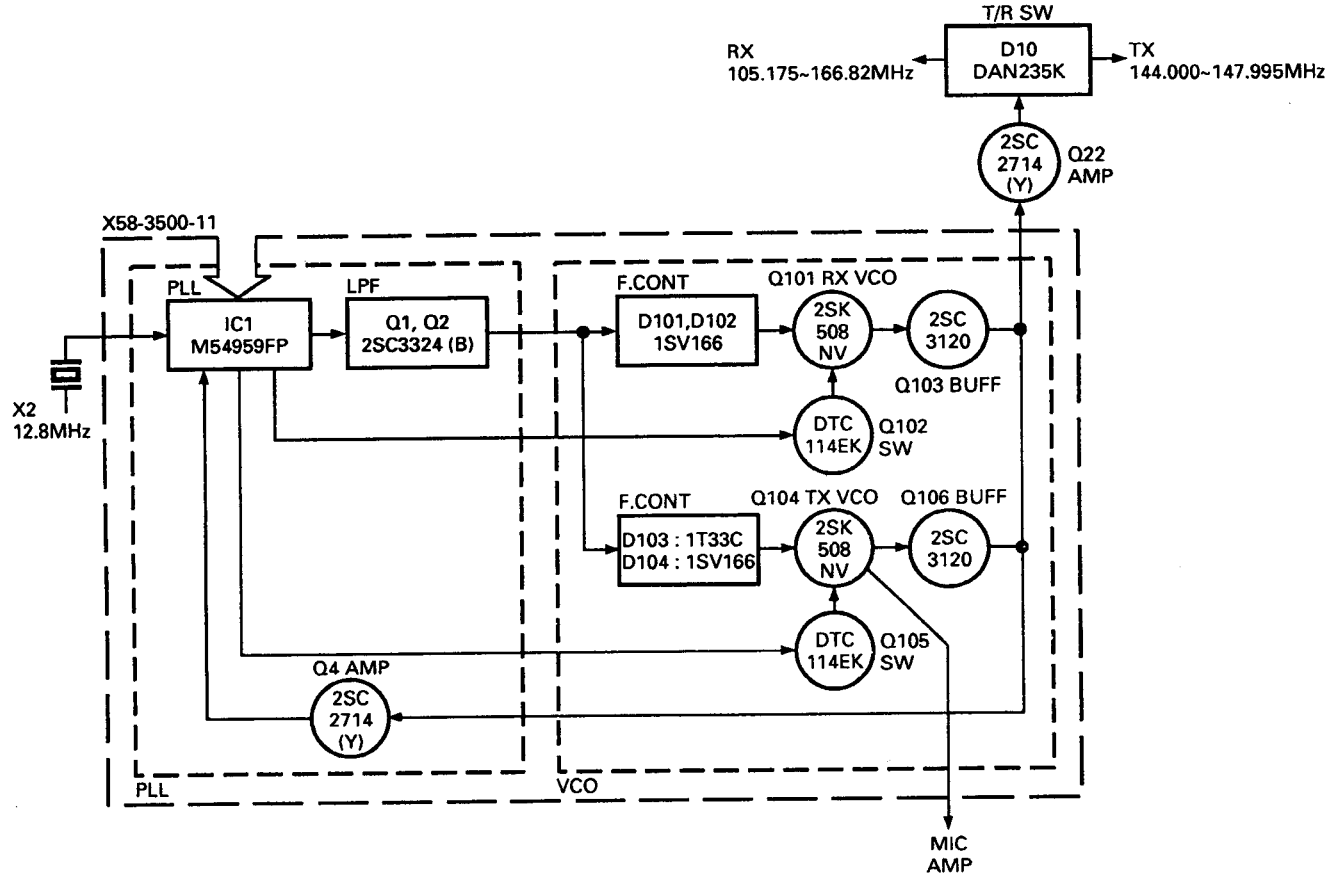


Fig. 4-2 PLL block diagram (K2,P2)

CIRCUIT DESCRIPTION

- **8T (8V in transmit mode) and unlock circuits**

In receive mode, the base of Q17 has 0.7V. As a result, Q17 is on, and Q16 and Q14 are off, and the collector of Q14 (8T) provides no voltage.

The CPU outputs serial data to the shift register IC5 when the PTT switch is depressed. As a result, pin 8 of IC5 becomes "L", turning Q17 off, and Q16 and Q14 on. The 8T line is therefore supplied with 8V.

The unlock circuit operates only in transmit mode. Q18 is a PLL unlocking switching transistor. Usually, the base of Q18 is supplied with 0V ("L"), and the collector is supplied with 8V ("H").

When the PLL is unlocked, the base of Q18 is supplied with 0.7V, turning Q18 on. As a result, the collector of Q18 becomes "L" (0V). This turns Q16 off and the collector of Q14 becomes 8V, turning it off. Therefore, when the PLL is unlocked, Q14 is off removing bias voltage from the 8T line. Without the 8T voltage no transmit signal is generated.

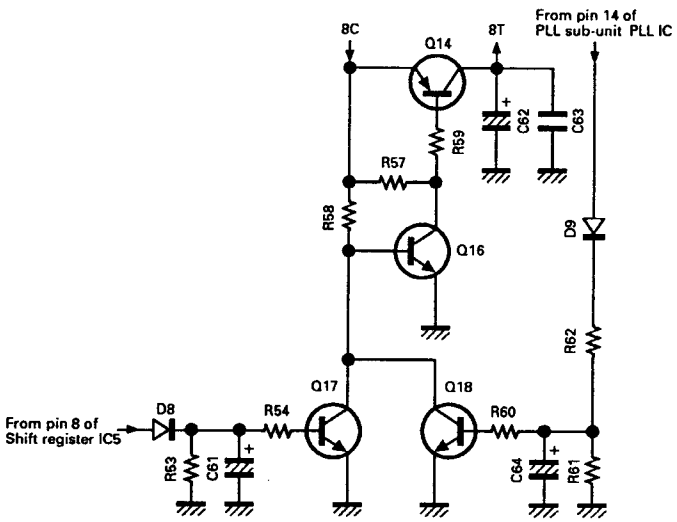


Fig. 5 8T and unlock circuits

Digital Control Unit

- **Overview**

The digital control unit consists of a several keys, a rotary encoder input, a display, a reset circuit, a back-up circuit, and a tone output circuit. These circuits are controlled by a single microcomputer (CPU).

- **Key and rotary encoder input circuits**

The keys on the panel are arranged in matrix. Key input is fed into the CPU, using a key scan technique. Output from the rotary encoder is fed directly into the CPU.

- **Microphone key input circuit**

The UP, DOWN, and other function keys of the microphone are directly connected to their corresponding analog input pins of the CPU. Each of the functions is activated by a voltage generated when the corresponding key is pressed.

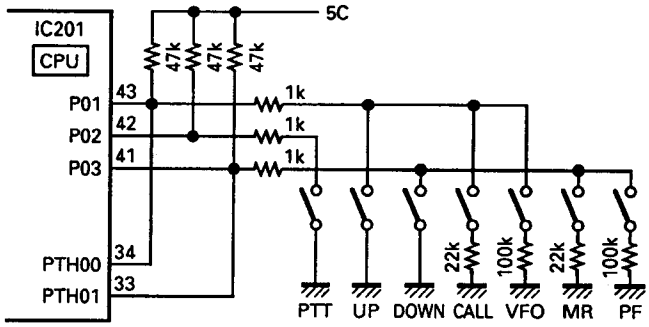


Fig. 6 Microphone key input circuit

- **Reset and back-up circuits**

When the TM-241A/E power is turned on, the reset circuit sends a "L" level pulse to the RESET pin of the CPU for approx. 3ms. This initiates the power-on reset sequence.

When the TM-241A/E power is turned off, the back-up circuit detects a voltage drop in the 5C line and sets CPU INT4 to a "H" level. This causes the CPU to enter a back-up state.

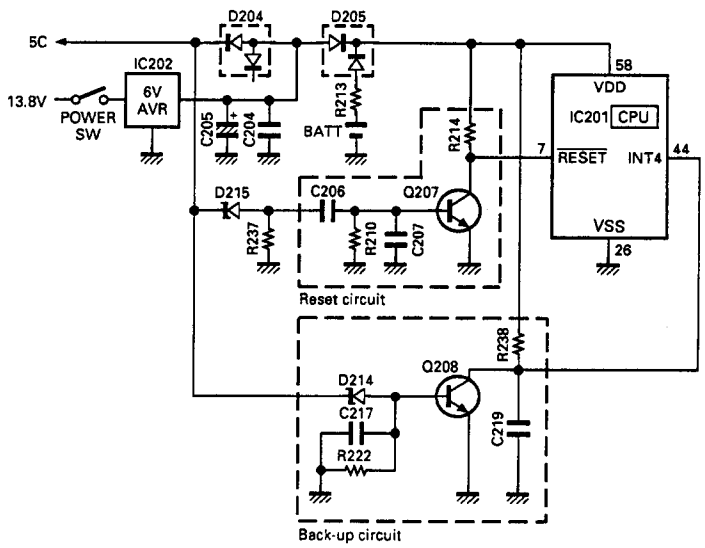


Fig. 7 Reset and back-up circuits

CIRCUIT DESCRIPTION

- **Display circuit**

The display circuit is contained in the LCD assembly. It consists of a LCD driver, its peripheral circuits, and an LCD. The LCD is dynamically operated at a 50% duty cycle. The LCD driver receives LCD data from P33, P140, and P141 of the CPU.

- **Dimmer circuit**

The lamp circuit generates a constant voltage of about 8.8V with SB, Q205, and D202. The lamp circuit resistance is changed by turning Q203 and Q204 on and off to control the dimmer. If the lamp is shorted, Q206 decreases the Q205 V_{BE} to prevent an over-current from flowing through Q205.

Brightness	Bright → Dark			
	1	2	3	4
P50	H	L	H	L
P51	H	H	L	L

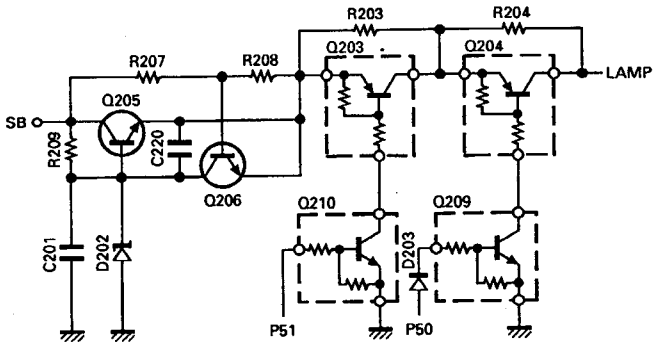


Fig. 8 Dimmer circuit

- **Shift register circuit**

The shift register circuit consists of IC5 (TC9174F). The IC5 receives serial data from the microcomputer to perform the controls listed below.

Pin No.	Pin name	Function
1	GND	
2	B1	Usually "H".
3	B2	Open.
4	CE	Electronic volume select. "H" when electronic volume selected, "L" when panel volume selected or interface connected.
5	VOLD	Electronic volume down. "L" when DOWN key on.
6	VOLU	Electronic volume up. "L" when UP key on.
7	MUTE	AF mute. "H" when TX mode, AL 1ch receive mode, CTCSS, T. ALT, or squelch is on.
8	T/R	Transmit/receive select. "H" in RX mode, "L" in TX mode.
9	TXM	TX power select. "H" in HI or MID mode, "L" in LOW mode.
10	TXH	TX power select. "H" in HI mode, "L" in MID or LOW mode.
11	–	Open.
12	–	Open.
13	DATA	Serial data input.
14	CLOCK	Clock input.
15	EN	Enable input.
16	V_{DD}	

Table 6

- **Tone output circuit**

R246 (ladder resisitor) receives signals from P40 to P43 and P52 to P53 of the CPU and converts them from digital to analog to produce 38 different waveforms from 67.0Hz to 250.3Hz. Figure 9 shows the internal configuration of R246.

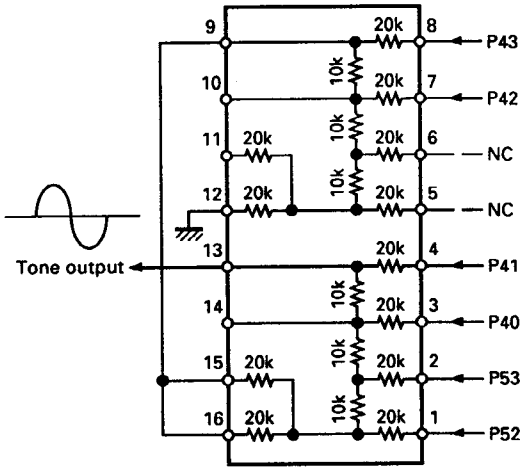


Fig. 9 Internal configuration of ladder resistor (TX-RX unit B/2 R246)

CIRCUIT DESCRIPTION

- **PLL data output**

PLL data is available from P21 (CK), P22 (DT), and P23 (EP1) of the CPU. Figure 10 is a timing chart for PLL data transfer, and Figure 11 shows the format of PLL data.

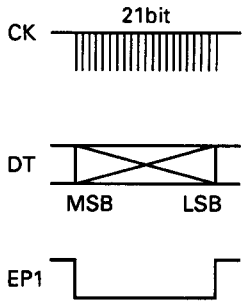
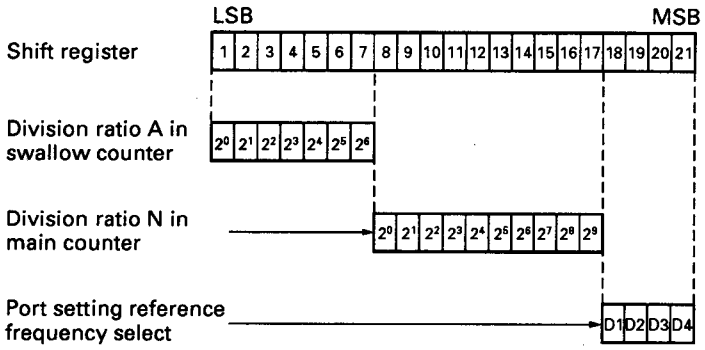


Fig. 10 Timing chart for PLL data transfer



The 21-bit data is made up of the following;

1. Division ratio data A and N (17 bits)

F (display – 10.7MHz or 30.825MHz in RX mode)

={(N x 128) + A} x 12.8MHz ÷ ref

N : Division ratio set in 10-bit main counter (binary)

A : Division ratio set in 7-bit swallow counter (binary)

2. Reference frequency (ref) select (2 bits)

Data		Phase reference frequency	
D1	D2		
L	L	5kHz	5, 10, 15, 20, 25kHz step mode
H	L	6.25kHz	12.5kHz step mode

3. Switch select (2 bits)

Data		Output port		
D3	D4	SW1	SW2	
L	H	L	H	RX mode
H	L	H	L	TX mode

Fig. 11 PLL data format

- **Input and output of CTCSS unit (option)**

The optional CTCSS unit receives data from P21, P22, and P73 of the CPU. Figure 12 is a timing chart for CTCSS data transfer, and Figure 13 shows the format of CTCSS data. When a tone form the CTCSS unit is detected, a "H" level signal is sent to TIO of the CPU, opening the squelch.

- **Input and output of the remote control unit (option)**

When the optional remote control unit is connected, a "H" level signal is applied to INT0 of the CPU, and the following pins have different functions;

P03 → S1 : Serial data input pin
P02 → S2 : Serial data output pin
P01 → SCK : Serial clock I/O pin

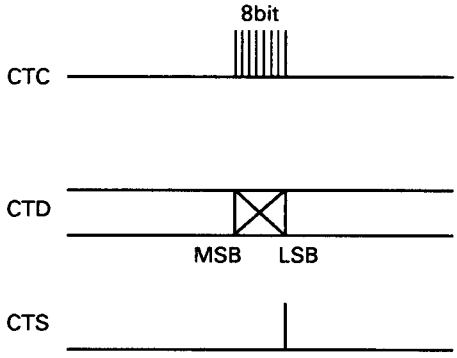


Fig. 12 Timing chart for CTCSS data transfer

Tone frequency select data for CTCSS unit

	D1	D2	D3	D4	D5	D6
Example : 88.5Hz	L	H	L	H	H	H

Fig. 13 CTCSS data format

CIRCUIT DESCRIPTION

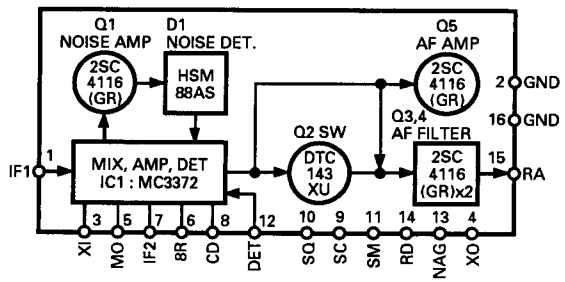
Pin No.	Pin name	I/O	Logic	Function
1, 2	P41, P40	O	–	D/A digital output (tone).
3, 4	P53, P52	O	–	D/A digital output (tone).
5, 6	P51, P50	O	–	Dimmer select.
7	$\overline{\text{RESET}}$	I	L	Reset input.
8, 9	X2, X1	–	–	4.194304MHz crystal oscillator.
10	P63	I	H	Function display.
11	P62	O	H	DRS remote control ST.
12	P61	O	–	DRS unit reset $\overline{\text{ACL}}$.
13	P60	I	H	DTMF signal detect.
14	P73	O	H	CTCSS unit enable output.
15	P72	O	H	Shift register enable output.
16	P71	O	H	DRS unit VOB output.
17	P70	O	H	DRS unit VOA output.
18	P83	O	H	DRS unit OE, DTSS EN output.
19	P82	O	H	DRS unit STBY output.
20	P81	O	L	DTSS DTSEL output, DRS unit $\overline{\text{WR}}$ output.
21	P80	O	L	DRS unit $\overline{\text{RD}}$ output.
22~25	P93~P90	O	H	DRS unit data output. D8/D3, D4/D2, D2/D1, D1/D0
26	Vss	–	–	GND.
27	P13	I	H	DRS unit connect check.
28, 29	INT2, INT1	I	–	Encoder input.
30	P10	I	H	Remote connect detect input.
31	PTH03	I	–	S-meter analog input.
32	PTH02	I	–	Not used (GND).
33	PTH01	I	–	Microphone DOWN/MR/PF input.
34	PTH00	I	–	Microphone UP/CALL/VFO input.
35	TI0	I	H	CTCSS unit DET input.
36	TI1	I	L	Not used (GND).
37	P23	O	L	PLL IC enable output.
38	P22	O	–	Serial data output.
39	P21	O	–	Serial clock output.
40	P20	O	–	Beeper output.
41	P03/SI	I/I	L/–	Serial data input. (KENWOOD BUS)
42	P02/SO	I/O	L/–	Serial data output. (KENWOOD BUS)
43	P01/$\overline{\text{SCK}}$	I/–	L/–	Serial clock I/O. (KENWOOD BUS).
44	INT4	I	H	Back-up detect input. Back-up : "H"
45	P123	I	L	CALL, VFO key and destination input.
46	P122	I	L	F, MR/M key and destination input.
47	P121	I	L	SHIFT, MHz key and destination input.
48	P120	I	L	TONE key and destination input.
49	P133	I	L	REV key and destination input.
50	P132	I	L	LOW, DRS/DTSS key and destination input.
51	P131	I	L	Not used (GND).
52	P130	I	L	Busy input.
53	P143	O	L	Squelch control.
54	P142	O	H	Power switch.
55	P141	O	–	LCD driver clock output.
56	P140	O	–	LCD driver data output.
57	NC	–	–	Not used (V_{DD}).
58	V_{DD}	–	–	Power supply pin.
59	P33	O	–	LCD driver enable output.
60	P32	O	L	Destination output.
61, 62	P31, P30	O	L	Key output.
63, 64	P43, P42	O	–	D/A digital output (tone).

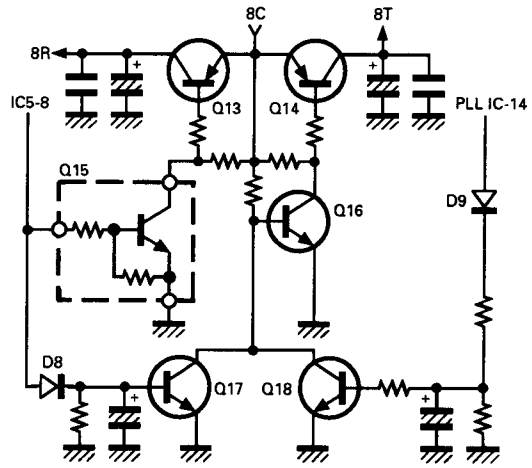
Table 7 CPU : 75116GF-XXX-3BE terminal functions (TX-RX unit IC201)

DESCRIPTION OF COMPONENTS

TX-RX UNIT (X57-369X-XX) 0-11 : K,P,X 0-12 : K2,P2 0-21 : M 0-22 : M2,M3 2-71 : E,E9,EM 2-72 : E2

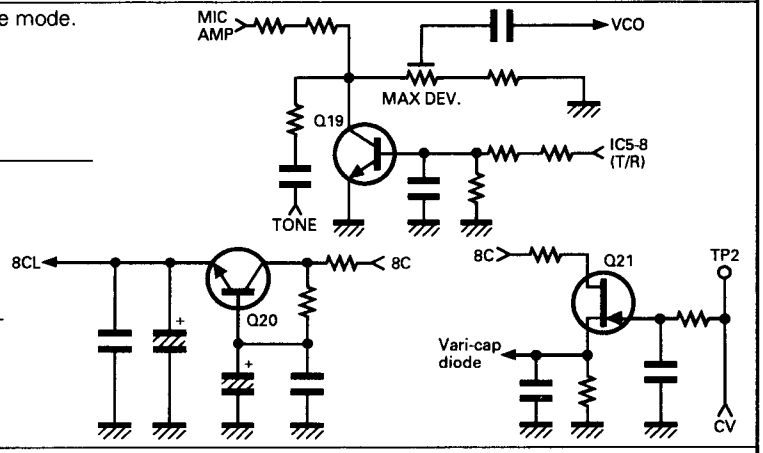
Ref. No	Use/Function	Operation/Condition compatibility
IC1	2nd local oscillator, IF amplification, Detection, Low-frequency amplification, Noise amplification, Noise detection, Squelch switching	1 : 1st If signal input. 3, 4 : 2nd local oscillator. 9 : Busy output. 10 : Squelch control. 11 : S-meter output. 14 : RD output. 15 : Low-frequency output.
IC2	AM detector	
IC3	AF amplification	1 : AF input 6 : AF output
IC4	Electronic volume conntrol, AF switch	2 : AF output. 3 : "L" during step-up. 4 : "L" during step-down. 5 : "H" when electronic volume selected. 7 : Panel volume input. 8 : Panel volume output. 10 : AF input.
IC5	Shift register	See circuit description.
IC6	5V AVR	
IC7	10V AVR	For PLL.
IC8	Transmit drive	
IC9	8V AVR	
IC201	Microprocessor	See circuit description.
IC202	6V AVR	
Q1	High-frequency amplification	Operates in receive mode.
Q2	11R switching	On when the aircraft band is selected.
Q3	BPF switching	On when the aircraft band is selected.
Q4	1st mixer	Converts received 144MHz-range signals to 1st IF.
Q5	High-frequency amplification	Amplifies 1st IF signal.
Q6	Q5 gain control	
Q7	Detector output switch	When the aircraft band is selected, the FM detection switch is turned off.
Q8	AF amplifier	When the aircraft band is selected, the output signal from the AM detector is amplified.
Q9 (1/2)	RD line mute	On when DRS unit replays.
Q9 (2/2)	AF line mute	
Q10	Low-frequency amplification	Operates when DRS unit replays.
Q12	AF line mute	Operates when transmit mode, AL 1ch receive mode, CTCSS, T. ALT or squelch is on.
Q13	8R switching	On in receive mode.
Q14	8T switching	On in transmit mode.
Q15	8R switching control	On in receive mode.
Q16	8T switching control	On in transmit mode.
Q17	8T switching control	Off in transmit mode.
Q18	8T switching control	Off when PLL locked.

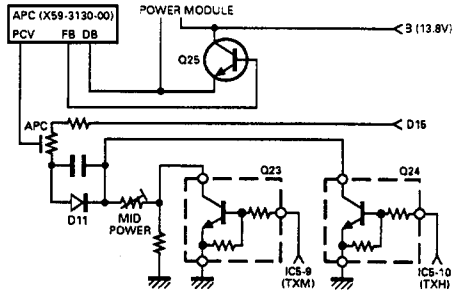


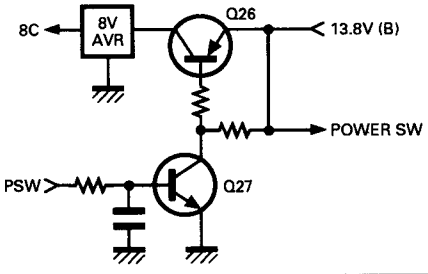


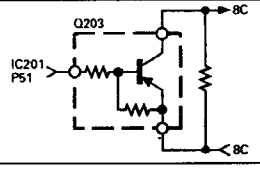
DESCRIPTION OF COMPONENTS

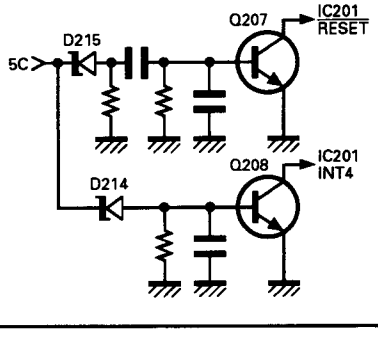
Ref. No	Use/Function	Operation/Condition compatibility
Q19	Mic line mute	On in receive mode.
Q20	PLL 8V ripple filter	
Q21	CV line buffer	
Q22	VCO output amplification	
Q23	TX power select	On in HI or MID mode.
Q24	TX power select	On in HI mode.
Q25	TX drive stage +B control	
Q26	Power switch	
Q27	Power switch control	On when power switch is on.
Q28	Squelch hysteresis	On when the squelch is on.
Q201, 202	Function dimmer switch	Refer to circuit description.
Q203, 204	Lamp dimmer switch	
Q205	Lamp AVR	
Q206	Lamp AVR	
Q207	Reset switch	On for approx. 3ms when system power turned on. Usually off.
Q208	Back-up switch	Off when 13.8V line becomes 7.5V or less. Usually on.











DESCRIPTION OF COMPONENTS

Ref. No	Use/Function	Operation/Condition compatibility
Q209, 210	Dimmer switch on/off	Turn Q201~Q204 on or off.
Q211	Function drive switch	
Q212	Mic mute	On when DTSS and paging codes are sent.
D1	Band select switch (AM/FM)	On when the aircraft band is selected.
D2~6	Vari-cap tuning	
D7~9	Reverse current prevention	
D10	VCO output switch	
D11	Temperature compensation	For APC.
D12, 13	Transmit/receive switching	
D14, 15	Power detection	For APC.
D16	Reverse power protection	
D202	Lamp standard voltage	
D203	Dimmer switch	
D204, 205	Switch	D205 switches in the lithium battery when the power is off.
D206~211	Used for destination setting	
D212	CPU protector	
D213	Reverse current prevention	
D214	Back-up detection voltage	
D215	Reset detection voltage	
D216	Function LED	
D217	Reverse current prevention	

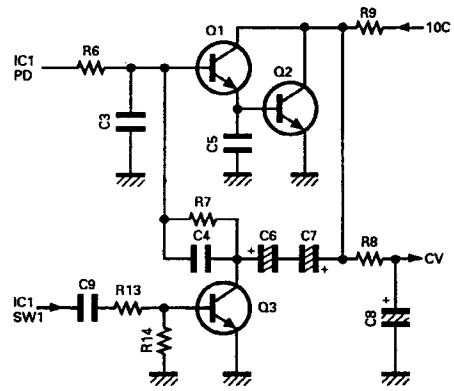
Dimmer	1	2	3	4
Q209	ON	OFF	ON	OFF
Q210	ON	ON	OFF	OFF

PLL (X58-3470-00) : K,P,M,M2,M3,X,E,E2,E9,EM

Ref. No	Use/Function	Operation/Condition compatibility
IC51	PLL	1 : VCO input. 133.300 to 135.295MHz (E,E9,EM), 133.300 to 137.295MHz (M), 125.300 to 163.295MHz (K,P,X,M2,M3,E2) in receive mode, 144.000 to 145.995MHz (E,E9,EM), 144.000 to 147.995MHz (K,P,X,M), 136.000 to 173.995MHz (M2,M3,E2) in transmit mode. 11 : "L" in transmit mode 14 : "H" when PLL unlocked
Q51	VCO output buffer	
Q52	Transmit switch	Off in transmit mode.
Q53	Transmit switch	On for moment when transmission starts.
Q101, 102	LPF	
Q1	VCO output buffer	
Q2	VCO	133.300 to 135.295MHz (E,E9,EM), 133.300 to 137.295MHz (M), 125.300 to 163.295MHz (K,P,X,M2,M3,E2) in receive mode, 144.000 to 145.995MHz (E,E9,EM), 144.000 to 147.995MHz (K,P,X,M), 136.000 to 173.995MHz (M2,M3,E2) in transmit mode.
D1	For modulation in TX mode	
D2	VCO voltage control	

DESCRIPTION OF COMPONENTS

PLL (X58-3500-11) : K2,P2

Ref. No	Use/Function	Operation/Condition compatibility
IC1	PLL	1 : VCO input. 105.175 to 166.820MHz in receive mode, 144.000 to 147.995MHz in transmit mode. 10,11 : "H" in transmit mode 13 : Phase comparison output 14 : "H" when PLL unlocked 23 : Reference oscillation input
Q1, 2	LPF	
Q3	Transmit switch	On for an instant when transmission starts.
Q4	VCO output amplification	105.175 to 166.820MHz in receive mode, 144.000 to 147.995MHz in transmit mode.
Q101	Receive VCO	105.175 to 166.820MHz.
Q102	Receive VCO switch	On in receive mode.
Q103	Receive VCO output buffer	105.175 to 166.820MHz.
Q104	Transmit VCO	144.000 to 147.995MHz.
Q105	Transmit VCO switch	On in transmit mode.
Q106	Transmit VCO output buffer	144.000 to 147.995MHz.
D101, 102	VCO voltage control	Receive.
D103	VCO voltage control/ Varactor diode for modulation in transmit mode	
D104	VCO voltage control	Transmission.

APC (X59-3130-00)

Ref. No	Use/Function	Operation/Condition compatibility
Q1	Differential amplification	
Q2 (2/2)	APC control	
Q3	Drive stage +B AVR	

MIC AMP (X59-3610-00)

Ref. No	Use/Function	Operation/Condition compatibility
IC1 (1/2)	Limited amplification	
IC1 (2/2)	LPF	
Q1	Low-frequency amplification	

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TM-241A/E

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
TM-241A/E						
1	1B		A01-1065-03	METALLIC CABINET(TOP)		
2	2B		A01-1066-03	METALLIC CABINET(BOTTOM)		
3	1C		A10-1292-01	CHASSIS CALKED ASSY		
4	2B		A22-0770-13	SUB PANEL		
5	2A	*	A62-0007-33	PANEL ASSY	KMM2PX	
5	2A	*	A62-0007-33	PANEL ASSY	M3K2P2	
5	2A	*	A62-0008-33	PANEL ASSY	EE2	
5	2A	*	A62-0008-33	PANEL ASSY	EM,E9	
			B42-3343-04	S/NO LABEL(NAME PLATE)		
			B42-3356-04	LABEL(EXT SP)		
9	1B		B42-3394-14	FCC LABEL	KK2	
10	3E		B42-5526-04	LABEL	KK2	
11	1C		B72-0093-04	MODEL NAME PLATE	KPX	
11	1C		B72-0093-04	MODEL NAME PLATE	K2P2	
11	1C		B72-0094-04	MODEL NAME PLATE	MM2M3	
11	1C		B72-0095-14	MODEL NAME PLATE	EE2E9	
11	1C	*	B72-0432-04	MODEL NAME PLATE	EM	
11	1C	*	B72-0651-14	MODEL NAME PLATE	E9	
12	2B		B11-0484-08	FILTER(LCD)		
13	2B		B30-0869-05	LAMP		
14	2B		B38-0330-05	LCD ASSY		
15	1B,1C		B42-2455-04	LABEL(M4X8 MAX)		
16	1D		B46-0310-03	WARRANTY CARD	EE9E2	
16	2E		B46-0410-30	WARRANTY CARD	KK2	
16	1D		B46-0422-00	WARRANTY CARD	PP2	
17	1E		B62-0031-10	INSTRUCTION MANUAL	KXK2	
17	1D		B62-0032-10	INSTRUCTION MANUAL	MM2PM3	
17	1D		B62-0032-10	INSTRUCTION MANUAL	EE2E9	
17	1D		B62-0032-10	INSTRUCTION MANUAL	P2	
17	1E		B62-0440-00	INSTRUCTION MANUAL	EM	
18	1D		B62-0033-00	INSTRUCTION MANUAL	EE2E9	
			E31-3197-15	CONNECTING WIRE(SP)		
			E37-0051-05	WIRE (POWER HIGH LOW)	EM	
20	2D		E30-2111-05	DC CABLE		
21	1C		E30-2137-15	DC CABLE		
22	1C		E30-2145-15	ANT CABLE		
		*	F15-0677-04	SHADE		
25	2D		F51-0017-05	FUSE 15A		
26	1C		F51-0018-05	FUSE 20A		
27	1B		F20-0587-04	INSULATING BOARD(LITHIUM BATT)		
28	1B		F20-1059-04	INSULATING BOARD(LITHIUM BATT)		
			G02-0558-04	FLAT SPRING (TX-RX B PATTERN)		
30	2C		G02-0565-04	FLAT SPRING (COIL)	KPX	
30	2C		G02-0565-04	FLAT SPRING (COIL)	K2P2	
			G13-0926-04	CUSHION (CONT)		
32	1B,1C		G02-0576-14	FLAT SPRING		
33	2A		G09-0405-05	SPRING (KNOB)		
			G10-0651-04	NON-WOVEN FABRIC(SP)		
35	1B,2C		G10-0681-04	NON-WOVEN FABRIC(CHASSIS)		
36	1B,2C		G10-0686-04	NON-WOVEN FABRIC(CASE)		
		*	G10-0747-04	NON-WOVEN FABRIC(LCDASSY)	K2P2	
		*	G13-0959-04	CUSHION (TX-RX)	K2P2	

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TM-241E : (E,E2,E9,EM)

⚠ indicates safety critical components.

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TM-241A/E

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
39	2B		G13-0906-04	CUSHION (3KEY)		
40	2A		G13-0960-04	CUSHION (6KEY)		
41	2B		G13-0961-04	CUSHION (LOW)		
43	3E		H10-2658-02	POLYSTYRENE FOAMED FIXTURE		
44	1E		H11-0822-04	POLYSTYRENE PLATE	KXK2EM	
45	1D		H11-0823-04	POLYSTYRENE PLATE	MM2P	
45	1D		H11-0823-04	POLYSTYRENE PLATE	M3P2	
46	2E		H13-0814-04	PROTECTION PLATE		
47	1D		H13-0825-04	PROTECTION SHEET	MM2PM3	
47	1D		H13-0825-04	PROTECTION SHEET	P2	
47	1D		H13-0825-04	PROTECTION SHEET	EE2E9	
48	2D		H25-0029-04	PROTECTION BAG(MIC HOOK)	KPK2P2	
49	2D		H25-0117-04	PROTECTION BAG(DC CABLE)		
50	2E		H25-0720-04	PROTECTION BAG(RADIO)		
			H25-0750-04	PROTECTION BAG	EE2E9	
51	3D		H52-0054-04	ITEM CARTON BOX	KMM2PX	
51	3D		H52-0054-04	ITEM CARTON BOX	M3K2P2	
51	3D		H52-0055-04	ITEM CARTON BOX	EE2E9	
51	3D	*	H52-0301-04	ITEM CARTON BOX	EM	
53	1C		J19-1434-04	HOLDER(SP)		
54	2D		J20-0319-24	MIC HOOK	KPK2P2	
55	2A		J21-4303-08	MOUNTING HARDWARE(LCD ASSY)		
56	2E		J29-0436-03	BRACKET		
58	2B		K27-3035-14	KNOB(ENCODER)		
59	2B		K27-3066-04	KNOB(POWER SW)		
60	2B		K27-3067-04	KNOB(LOW)		
61	2A		K27-3068-14	KNOB(CALL)		
62	2A		K27-3069-14	KNOB(FUNC)		
63	2A		K27-3071-14	KNOB(TONE)		
64	2A		K27-3072-14	KNOB(REVERSE)		
65	2A		K27-3074-14	KNOB(SHIFT)		
66	2A		K27-3075-14	KNOB(DR/DT)		
67	2A		K29-3156-04	KNOB(MAIN)		
68	2A		K29-3157-04	KNOB(VOL,SQL)		
70	2D		N99-0331-05	SCREW SET		
71	2D		N46-3010-46	PAN HEAD TAPPING SCREW	KPK2P2	
A	2B	*	N67-3010-41	SCREW(POWER MODULE 3X10)		
B	2B		N38-2640-46	SCREW(SUB PANEL)		
C	1C,2C		N33-2606-45	OVAL HEAD MACHINE SCREW(CASE)		
D	1C,2C		N87-2606-46	BRAZIER HEAD TAPTITE SCREW		
E	2B		N87-2610-46	BRAZIER HEAD TAPTITE SCREW		
F	2B		N88-2606-46	FLAT HEAD TAPTITE SCREW		
73	2E		T91-0379-35	MICROPHONE	MM2X	
73	2E		T91-0380-45	MICROPHONE(DTMF)	KPM3	
73	2E		T91-0380-45	MICROPHONE(DTMF)	K2P2	
73	2E	*	T91-0382-35	MICROPHONE(1750Hz TONE)	EE2	
73	2E	*	T91-0382-35	MICROPHONE(1750Hz TONE)	EM,E9	
SP	1C		T07-0246-05	LOUDSPEAKER		
IC1			LC7582	IC(LCD DRIVER)		
IC301	2C		S-AV17	IC(POWER MODULE FOR 144MHZ)		
75	2D		W01-0414-04	WRENCH		
76	2B		W09-0326-05	LITHIUM BATTERY		

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TM-241A/E
TX-RX UNIT (X57-369X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格			Destination 仕向	Remarks 備考
77	2B,2C		X57-3690-11	TX･RX UNIT			KPX	
77	2B,2C	*	X57-3690-12	TX･RX UNIT			K2P2	
77	2B,2C		X57-3690-21	TX･RX UNIT			M	
77	2B,2C		X57-3690-22	TX･RX UNIT			M2M3	
77	2B,2C		X57-3692-71	TX･RX UNIT			EE9,EM	
77	2B,2C		X57-3692-72	TX･RX UNIT			E2	
TX-RX UNIT (X57-369X-XX) 0-11 : (K,P,X) 0-12 : (K2,P2) 0-21 : (M) 0-22 : (M2,M3) 2-71 : (E,E9,EM) 2-72 : (E2)								
C1			CC73FCH1H040C	CHIP C	4PF	C		
C2			CC73FCH1H060D	CHIP C	6PF	D	KPX	
C2			CC73FCH1H050C	CHIP C	5PF	D	K2P2	
C3			CC73FCH1H040C	CHIP C	4PF	C	KPX	
C3			CC73FCH1H040C	CHIP C	4PF	C	K2P2	
C3			CC73FCH1H070D	CHIP C	7PF	D	MM2M3E	
C3			CC73FCH1H070D	CHIP C	7PF	D	E2E9EM	
C4 ,5			CK73FB1H102K	CHIP C	1000PF	K	KPX	
C4 ,5			CK73FB1H102K	CHIP C	1000PF	K	K2P2	
C6 ,7			CK73FB1H102K	CHIP C	1000PF	K		
C8			CK73FB1H103K	CHIP C	0.010UF	K		
C9			CK73FB1H102K	CHIP C	1000PF	K		
C10			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C11			CC73FCH1H470J	CHIP C	47PF	J	KPXMM2	
C11			CC73FCH1H470J	CHIP C	47PF	J	M3EE9	
C11			CC73FCH1H470J	CHIP C	47PF	J	EM,E2	
C11			CC73FCH1H680J	CHIP C	68PF	J	K2P2	
C12			CK73FB1H103K	CHIP C	0.010UF	K		
C13			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C14			CC73FCH1H470J	CHIP C	47PF	J	KPXMM2	
C14			CC73FCH1H470J	CHIP C	47PF	J	M3EE9	
C14			CC73FCH1H470J	CHIP C	47PF	J	EM,E2	
C14			CC73FCH1H680J	CHIP C	68PF	J	K2P2	
C15			CK73FB1H102K	CHIP C	1000PF	K		
C16			CC73FCH1H150J	CHIP C	15PF	J		
C17			CC73FCH1H470J	CHIP C	47PF	J	KPXMM2	
C17			CC73FCH1H470J	CHIP C	47PF	J	M3EE9	
C17			CC73FCH1H470J	CHIP C	47PF	J	EM,E2	
C17			CC73FCH1H680J	CHIP C	68PF	J	K2P2	
C18			CK73FB1H103K	CHIP C	0.010UF	K		
C19			CC73FCH1H030C	CHIP C	3PF	C		
C20			CK73FB1H102K	CHIP C	1000PF	K		
C21			CK73FB1H103K	CHIP C	0.010UF	K		
C22			CK73FB1H102K	CHIP C	1000PF	K		
C23			CC73FCH1H050C	CHIP C	5PF	C	KPXMM2	
C23			CC73FCH1H050C	CHIP C	5PF	C	M3EE9	
C23			CC73FCH1H050C	CHIP C	5PF	C	EM,E2	
C23			CC73FCH1H080D	CHIP C	8PF	D	K2P2	
C24			CK73FB1H102K	CHIP C	1000PF	K		
C25			CK73FB1H103K	CHIP C	0.010UF	K		
C26			CC73FCH1H220J	CHIP C	22PF	J	KPXMM2	
C26			CC73FCH1H220J	CHIP C	22PF	J	M3EE9	
C26			CC73FCH1H220J	CHIP C	22PF	J	EM,E2	
C27			CK73FB1H102K	CHIP C	1000PF	K		
C28			CC73FCH1H330J	CHIP C	33PF	J	KPXMM2	
C28			CC73FCH1H330J	CHIP C	33PF	J	M3EE9	
C28			CC73FCH1H330J	CHIP C	33PF	J	EM,E2	

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TX-RX UNIT (X57-369X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格			Destination 仕向	Remarks 備考
C28			CC73FCH1H100D	CHIP C	10PF	D	K2P2	
C29			CC73FCH1H151J	CHIP C	150PF	J	KPXMM2	
C29			CC73FCH1H151J	CHIP C	150PF	J	M3EE9	
C29			CC73FCH1H151J	CHIP C	150PF	J	EM,E2	
C29			CK73FB1H102K	CHIP C	1000PF	K	K2P2	
C30			CK73FB1H102K	CHIP C	1000PF	K	KPX	
C30			CK73FB1H102K	CHIP C	1000PF	K	K2P2	
C31			CC73FSL1H101J	CHIP C	100PF	J	KPX	
C31			CC73FSL1H101J	CHIP C	100PF	J	K2P2	
C32			CK73EF1C105Z	CHIP C	1.0UF	Z	KPX	
C32			CK73EF1C105Z	CHIP C	1.0UF	Z	K2P2	
C33			CK73FB1H223K	CHIP C	0.022UF	K	KPX	
C33			CK73FB1H223K	CHIP C	0.022UF	K	K2P2	
C34			CK73FB1H333K	CHIP C	0.033UF	K	KPX	
C34			CK73FB1H333K	CHIP C	0.033UF	K	K2P2	
C35			C92-0004-05	ELECTRO	1.0UF	16WV	KPX	
C35			C92-0004-05	ELECTRO	1.0UF	16WV	K2P2	
C36 ,37			CK73FB1H103K	CHIP C	0.010UF	K	KPX	
C36 ,37			CK73FB1H103K	CHIP C	0.010UF	K	K2P2	
C38			C92-0002-05	CHIP TAN	0.22UF	35WV	K2P2	
C38			C92-0504-05	CHIP TAN	0.68UF	20WV	KPXMM2	
C38			C92-0504-05	CHIP TAN	0.68UF	20WV	M3EE9	
C38			C92-0504-05	CHIP TAN	0.68UF	20WV	EM,E2	
C39 -41			CK73EF1C105Z	CHIP C	1.0UF	Z		
C43			CE04EW1A470M	ELECTRO	47UF	10WV		
C44			CK73FB1H103K	CHIP C	0.010UF	K		
C47			CK73EB1H104K	CHIP C	0.10UF	K		
C48			CE04EW1A471M	ELECTRO	470UF	10WV		
C49			CK73FB1H103K	CHIP C	0.010UF	K		
C50			CE04EW1C470M	ELECTRO	47UF	16WV		
C51 -53			CE04EW1A470M	ELECTRO	47UF	10WV		
C54			CK73FB1H273K	CHIP C	0.027UF	K		
C55			CC73FSL1H101J	CHIP C	100PF	J		
C56			CE04EW1E4R7M	ELECTRO	4.7UF	25WV		
C57 ,58			CK73EF1C105Z	CHIP C	1.0UF	Z		
C59			CK73FB1H103K	CHIP C	0.010UF	K		
C60			CE04EW1A470M	ELECTRO	47UF	10WV		
C61			C92-0504-05	CHIP TAN	0.68UF	20WV		
C62			CE04EW1A470M	ELECTRO	47UF	10WV		
C63			CK73FB1H103K	CHIP C	0.010UF	K		
C64			C92-0504-05	CHIP TAN	0.68UF	20WV		
C65 ,66			CK73FB1H102K	CHIP C	1000PF	K		
C67			CC73FCH1H050C	CHIP C	5PF	C		
C68			C92-0501-05	CHIP-TAN	1.5UF	6.3WV		
C69			CK73FB1H103K	CHIP C	0.010UF	K		
C70			CC73FCH1H390J	CHIP C	39PF	J	K2P2	
C71			CK73FB1H102K	CHIP C	1000PF	K		
C72			CK73EB1H473K	CHIP C	0.047UF	K		
C73			CK73FB1H102K	CHIP C	1000PF	K		
C74			CK73EF1C105Z	CHIP C	1.0UF	Z		
C75 ,76			CK73FB1H102K	CHIP C	1000PF	K		
C78			CK73FB1H102K	CHIP C	1000PF	K		
C79			CC73FCH1H330J	CHIP C	33PF	J		
C80			CK73FB1H102K	CHIP C	1000PF	K		
C81			CC73FCH1H220J	CHIP C	22PF	J		

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TX-RX UNIT (X57-369X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
C82			CK73FB1H103K	CHIP C 0.010UF K		
C83			CE04EW1A470M	ELECTRO 47UF 10WV		
C84			CK73FB1H103K	CHIP C 0.010UF K		
C85			CE04EW1A221M	ELECTRO 220UF 10WV		
C86			CE04EW1C100M	ELECTRO 10UF 16WV		
C87 ,88			CK73FB1H103K	CHIP C 0.010UF K		
C89 -92			CK73FB1H102K	CHIP C 1000PF K		
C93			CK73FB1H103K	CHIP C 0.010UF K		
C94			CE04EW1A470M	ELECTRO 47UF 10WV		
C95 ,96			CK73FB1H103K	CHIP C 0.010UF K		
C97			CE04EW1C102M	ELECTRO 1000UF 16WV		
C99			CK73FB1H102K	CHIP C 1000PF K		
C100			CK73EF1C105Z	CHIP C 1.0UF Z		
C101			CK73FB1H102K	CHIP C 1000PF K		
C102			CE04EW1C100M	ELECTRO 10UF 16WV		
C104			CC45SL2H220J	CERAMIC 22PF J		
C105			CK73FB1H102K	CHIP C 1000PF K		
C106			CC73FCH1H220J	CHIP C 22PF J		
C107			CK45B2H102K	CERAMIC 1000PF K		
C108			CM73F2H180J	CHIP C 18PF J		
C109			CC73FCH1H0R5C	CHIP C 0.5PF C		
C110			CC73FCH1H040C	CHIP C 4PF C		
C111-113			CK73FB1H102K	CHIP C 1000PF K		
C114			CC45SL2H390J	CERAMIC 39PF J		
C115			CC45SL2H470J	CERAMIC 47PF J		
C116			CC73FCH1H0R5C	CHIP C 0.5PF C		
C117			CC73FCH1H020C	CHIP C 2.0PF C		
C118			CM73F2H470J	CHIP C 47PF J		
C119			CK73FB1H102K	CHIP C 1000PF K		
C120			C92-0511-05	CHIP TAN 0.15UF 35WV		
C121			CK73EF1C105Z	CHIP C 1.0UF Z		
C122			CK73FB1H102K	CHIP C 1000PF K		
C123			CK73EF1C105Z	CHIP C 1.0UF Z		
C125			CM73F2H050D	CHIP C 5.0PF D		
C126			CC73FSL1H101J	CHIP C 100PF J		
C127			CK73FB1H332K	CHIP C 3300PF K		
C128			CM73F2H150J	CHIP C 15PF J		
C129			CC73FCH1H270J	CHIP C 27PF J	K2P2	
C201			CK73FB1H102K	CHIP C 1000PF K		
C202			CK73FB1H103K	CHIP C 0.010UF K		
C203			CK73FB1H102K	CHIP C 1000PF K		
C204			CK73FB1H103K	CHIP C 0.010UF K		
C205			CE04NW0J221M	ELECTRO 220UF 6.3WV		
C206			CK73FB1E223K	CHIP C 0.022UF K		
C207			CK73FB1H102K	CHIP C 1000PF K		
C208,209			CC73FCH1H330J	CHIP C 33PF J		
C210,211			CK73FB1H103K	CHIP C 0.010UF K		
C212-214			CC73FSL1H101J	CHIP C 100PF J		
C215-217			CK73FB1H102K	CHIP C 1000PF K		
C219,220			CK73FB1H103K	CHIP C 0.010UF K		
TC1			C05-0349-05	TRIMMING 10PF		
CN1			E40-3237-05	PIN CONNECTOR(INT.SP)		
CN2			E40-5182-05	PIN CONNECTOR(DRU)		
CN3 ,4			E40-5202-05	PIN CONNECTOR(TR)		

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TX-RX UNIT (X57-369X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
CN5			E40-5183-05	PIN CONNECTOR(DTM)		
CN201,202			E40-5203-05	PIN CONNECTOR(CONT)		
CN203			E40-5185-05	PIN CONNECTOR(DRU)		
CN204			E40-5187-05	PIN CONNECTOR(DRU)		
CN205			E40-5341-05	PIN CONNECTOR		
J1			E11-0425-05	EXT SP JACK		
J201			E06-0860-05	MIC RECEPTACLE		
TP1 ,2			E23-0465-05	TEST TERMINAL		
W1			E33-1902-05	FINISHED WIRE SET(HET)		
W201			E31-6003-15	CONNECTING WIRE(CTCSS)		
W202			E33-1871-15	FINISHED WIRE SET	KPMEX	
W202			E33-1871-15	FINISHED WIRE SET	EM,E9	
W202			E33-1871-15	FINISHED WIRE SET	K2P2	
			J30-0564-05	SPACER		
			J31-0534-05	COLLAR (LED)		
CD1			L79-1013-05	CERAMIC DISCRI(CDBM455C16)		
CF1			L72-0372-05	CERAMIC FILTER(CFWM455F)		
L1 -4			L34-4080-05	COIL		
L5			L34-0956-05	COIL	KPXMM2	
L5			L34-0956-05	COIL	M3EE9	
L5			L34-0956-05	COIL	EM,E2	
L5			L34-4113-05	COIL	K2P2	
L6			L30-0005-05	COIL	KPXMM2	
L6			L30-0005-05	COIL	M3EE9	
L6			L30-0005-05	COIL	EM,E2	
L6			L34-2157-05	COIL	K2P2	
L7			L40-1001-48	SMALL FIXED INDUCTOR(10UH)		
L8			L34-1239-05	COIL		
L9			L34-0895-05	COIL		
L10			L34-0742-05	COIL		
L11			L34-0908-05	COIL		
L12 ,13			L34-0499-05	COIL		
L14			L40-3392-48	SMALL FIXED INDUCTOR(3.3UH)		
L15			L34-0499-05	COIL		
L16			L40-1095-48	SMALL FIXED INDUCTOR(1UH)	K2P2	
L17			L40-1892-19	SMALL FIXED INDUCTOR(1.8UH)	K2P2	
X1			L77-1473-05	CRYSTAL RESONATOR(10.245MHz)	KPXMM2	
X1			L77-1473-05	CRYSTAL RESONATOR(10.245MHz)	M3EE9	
X1			L77-1473-05	CRYSTAL RESONATOR(10.245MHz)	EM,E2	
X1			L77-1312-05	CRYSTAL RESONATOR(30.37MHz)	K2P2	
X2			L77-1405-05	CRYSTAL RESONATOR(12.8MHz)		
X201			L77-1397-05	CRYSTAL RESONATOR(4.194304MHz)		
XF1			L71-0228-15	CRYSTAL FILTER(10.7MHz)	KPXMM2	
XF1			L71-0228-15	CRYSTAL FILTER(10.7MHz)	M3EE9	
XF1			L71-0228-15	CRYSTAL FILTER(10.7MHz)	EM,E2	
XF1			L71-0270-05	CRYSTAL FILTER(30.825MHz)	K2P2	
R1			RK73FB2A682J	CHIP R 6.8K J 1/10W	KPX	
R1			RK73FB2A682J	CHIP R 6.8K J 1/10W	K2P2	
R2			RK73FB2A223J	CHIP R 22K J 1/10W	KPXMM2	
R2			RK73FB2A223J	CHIP R 22K J 1/10W	M3EE9	
R2			RK73FB2A223J	CHIP R 22K J 1/10W	EM,E2	
R2			R92-0670-05	CHIP R 0 OHM	K2P2	
R3			RK73FB2A274J	CHIP R 270K J 1/10W	KPXMM2	

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R3			RK73FB2A274J	CHIP R 270K J 1/10W	M3EE9	
R3			RK73FB2A274J	CHIP R 270K J 1/10W	EM,E2	
R4			RK73FB2A101J	CHIP R 100 J 1/10W		
R5			RK73FB2A103J	CHIP R 10K J 1/10W		
R6			RK73FB2A101J	CHIP R 100 J 1/10W		
R7			RK73FB2A104J	CHIP R 100K J 1/10W		
R8			RK73FB2A333J	CHIP R 33K J 1/10W	KPX	
R8			RK73FB2A333J	CHIP R 33K J 1/10W	K2P2	
R9 -11			RK73FB2A104J	CHIP R 100K J 1/10W		
R12 ,13			RK73FB2A473J	CHIP R 47K J 1/10W		
R14			RK73FB2A470J	CHIP R 47 J 1/10W		
R15			RK73FB2A274J	CHIP R 270K J 1/10W	KPXMM2	
R15			RK73FB2A274J	CHIP R 270K J 1/10W	M3EE9	
R15			RK73FB2A274J	CHIP R 270K J 1/10W	EM,E2	
R16			RK73FB2A470J	CHIP R 47 J 1/10W		
R17			RK73FB2A103J	CHIP R 10K J 1/10W		
R18			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R19			R92-0670-05	CHIP R 0 ΩHM	KPXMM2	
R19			R92-0670-05	CHIP R 0 ΩHM	M3EE9	
R19			R92-0670-05	CHIP R 0 ΩHM	EM,E2	
R20			RK73FB2A101J	CHIP R 100 J 1/10W		
R21			RK73FB2A471J	CHIP R 470 J 1/10W		
R22			RK73FB2A152J	CHIP R 1.5K J 1/10W	KPXMM2	
R22			RK73FB2A152J	CHIP R 1.5K J 1/10W	M3EE9	
R22			RK73FB2A152J	CHIP R 1.5K J 1/10W	EM,E2	
R23			RK73FB2A471J	CHIP R 470 J 1/10W	KPXMM2	
R23			RK73FB2A471J	CHIP R 470 J 1/10W	M3EE9	
R23			RK73FB2A471J	CHIP R 470 J 1/10W	EM,E2	
R23			RK73FB2A102J	CHIP R 1.0K J 1/10W	K2P2	
R24			RK73FB2A101J	CHIP R 100 J 1/10W		
R25			RK73FB2A103J	CHIP R 10K J 1/10W		
R26			RK73FB2A473J	CHIP R 47K J 1/10W		
R27			RK73FB2A272J	CHIP R 2.7K J 1/10W	KPX	
R27			RK73FB2A272J	CHIP R 2.7K J 1/10W	K2P2	
R28			RK73FB2A103J	CHIP R 10K J 1/10W		
R29			RK73FB2A681J	CHIP R 680 J 1/10W	KPX	
R29			RK73FB2A681J	CHIP R 680 J 1/10W	K2P2	
R30			RK73FB2A103J	CHIP R 10K J 1/10W	K2P2	
R30			RK73FB2A153J	CHIP R 15K J 1/10W	KPXMM2	
R30			RK73FB2A153J	CHIP R 15K J 1/10W	M3EE9	
R30			RK73FB2A153J	CHIP R 15K J 1/10W	EM,E2	
R31			RK73FB2A274J	CHIP R 270K J 1/10W	KPX	
R31			RK73FB2A274J	CHIP R 270K J 1/10W	K2P2	
R32			RK73FB2A332J	CHIP R 3.3K J 1/10W	KPX	
R32			RK73FB2A332J	CHIP R 3.3K J 1/10W	K2P2	
R33			RK73FB2A102J	CHIP R 1.0K J 1/10W	KPX	
R33			RK73FB2A102J	CHIP R 1.0K J 1/10W	K2P2	
R35 ,36			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R37			RK73FB2A334J	CHIP R 330K J 1/10W		
R38			RK73FB2A331J	CHIP R 330 J 1/10W		
R39			R92-0670-05	CHIP R 0 ΩHM	KPXMM2	
R39			R92-0670-05	CHIP R 0 ΩHM	M3EE9	
R39			R92-0670-05	CHIP R 0 ΩHM	EM,E2	
R40			RK73FB2A331J	CHIP R 330 J 1/10W		
R43			R92-1220-05	CHIP R 1 J 1/10W		

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R44			RK73FB2A101J	CHIP R 100 J 1/10W		
R45			R92-0670-05	CHIP R 0 ΩHM		
R46			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R47			RK73FB2A473J	CHIP R 47K J 1/10W		
R48			RK73FB2A333J	CHIP R 33K J 1/10W		
R49			RK73FB2A473J	CHIP R 47K J 1/10W		
R50			RK73FB2A223J	CHIP R 22K J 1/10W		
R51			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R52			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R53			RK73FB2A334J	CHIP R 330K J 1/10W		
R54			RK73FB2A223J	CHIP R 22K J 1/10W		
R55			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R56 -58			RK73FB2A103J	CHIP R 10K J 1/10W		
R59			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R60			RK73FB2A223J	CHIP R 22K J 1/10W		
R61			RK73FB2A473J	CHIP R 47K J 1/10W		
R62			R92-0670-05	CHIP R 0 ΩHM		
R63			RK73FB2A102J	CHIP R 1.0K J 1/10W	EE2	
R63			RK73FB2A102J	CHIP R 1.0K J 1/10W	EM,E9	
R63			RK73FB2A332J	CHIP R 3.3K J 1/10W	KPXMM2	
R63			RK73FB2A332J	CHIP R 3.3K J 1/10W	M3K2P2	
R64			RK73FB2A332J	CHIP R 3.3K J 1/10W	K2P2	
R64			RK73FB2A392J	CHIP R 3.9K J 1/10W	KPMM2	
R64			RK73FB2A392J	CHIP R 3.9K J 1/10W	M3X	
R64			RK73FB2A563J	CHIP R 56K J 1/10W	EE9	
R64			RK73FB2A563J	CHIP R 56K J 1/10W	EM,E2	
R65 ,66			R92-0670-05	CHIP R 0 ΩHM		
R67			RK73FB2A220J	CHIP R 22 J 1/10W		
R68			R92-0670-05	CHIP R 0 ΩHM		
R69			RK73FB2A184J	CHIP R 180K J 1/10W		
R70 ,71			RK73FB2A103J	CHIP R 10K J 1/10W		
R72			R92-0670-05	CHIP R 0 ΩHM		
R73			RK73FB2A223J	CHIP R 22K J 1/10W		
R74			R92-0670-05	CHIP R 0 ΩHM		
R75 -78			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R79			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R80			RK73FB2A104J	CHIP R 100K J 1/10W		
R81			RK73FB2A471J	CHIP R 470 J 1/10W		
R82			RK73FB2A220J	CHIP R 22 J 1/10W		
R84			RK73FB2A122J	CHIP R 1.2K J 1/10W		
R85			RK73FB2A220J	CHIP R 22 J 1/10W		
R86			RK73FB2A223J	CHIP R 22K J 1/10W		
R87			RK73FB2A103J	CHIP R 10K J 1/10W		
R88 ,89			RK73FB2A101J	CHIP R 100 J 1/10W		
R90			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R91			RK73FB2A470J	CHIP R 47 J 1/10W		
R92			RK73FB2A104J	CHIP R 100K J 1/10W		
R93			RK73FB2A102J	CHIP R 1.0K J 1/10W	K2P2	
R94			RK73FB2A220J	CHIP R 22 J 1/10W		
R95			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R96			RK73FB2A103J	CHIP R 10K J 1/10W		
R97			R92-1215-05	CHIP R 470 J 1/2W		
R98			RK73FB2A103J	CHIP R 10K J 1/10W		
R100			R92-0670-05	CHIP R 0 ΩHM		
R102			R92-0685-05	CHIP R 22 J 1/2W		

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PARTS LIST

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TX-RX UNIT (X57-369X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R103			R92-1213-05	CARBON 100 J 1/2W		
R104,105			RK73FB2A223J	CHIP R 22K J 1/10W		
R106			RK73FB2A274J	CHIP R 270K J 1/10W	KPXMM2	
R106			RK73FB2A274J	CHIP R 270K J 1/10W	M3EE9	
R106			RK73FB2A274J	CHIP R 270K J 1/10W	EM,E2	
R107			R92-0670-05	CHIP R 0 OHM		
R108			RK73FB2A273J	CHIP R 27K J 1/10W		
R109			RK73FB2A103J	CHIP R 10K J 1/10W		
R110,111			RK73FB2A273J	CHIP R 27K J 1/10W		
R112			RK73FB2A104J	CHIP R 100K J 1/10W		
R113			RK73FB2A683J	CHIP R 68K J 1/10W		
R114			RK73FB2A151J	CHIP R 150 J 1/10W		
R201			RK73EB2B220J	CHIP R 22 J 1/8W		
R202			R92-0685-05	CHIP R 22 J 1/2W		
R203			R92-1259-05	FIXED RESISTOR(18 OHM)		
R204			R92-1262-05	METAL GLAZE 4.7 J 1/2W		
R205			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R207			RK73FB2A103J	CHIP R 10K J 1/10W		
R208			RK73FB2A471J	CHIP R 470 J 1/10W		
R209			RK73FB2A561J	CHIP R 560 J 1/10W		
R210			RK73FB2A563J	CHIP R 56K J 1/10W		
R211			RK73FB2A103J	CHIP R 10K J 1/10W		
R213			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R214			RK73FB2A474J	CHIP R 470K J 1/10W		
R215			R92-0670-05	CHIP R 0 OHM		
R216,217			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R218			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R219			R92-0670-05	CHIP R 0 OHM		
R220			R92-0670-05	CHIP R 0 OHM	M2M3	
R222			RK73FB2A151J	CHIP R 150 J 1/10W		
R223-225			RK73FB2A473J	CHIP R 47K J 1/10W		
R226-229			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R230			RK73FB2A473J	CHIP R 47K J 1/10W		
R231,232			RK73FB2A104J	CHIP R 100K J 1/10W		
R233			R92-0670-05	CHIP R 0 OHM		
R234			RK73FB2A104J	CHIP R 100K J 1/10W		
R235			RK73FB2A474J	CHIP R 470K J 1/10W		
R236,237			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R238			RK73FB2A474J	CHIP R 470K J 1/10W		
R239			RK73FB2A473J	CHIP R 47K J 1/10W		
R240			R92-0670-05	CHIP R 0 OHM		
R241			RK73FB2A473J	CHIP R 47K J 1/10W		
R242			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R243			RK73FB2A474J	CHIP R 470K J 1/10W		
R244			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R245			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R246			R90-0711-05	MULTI-COMP		
R247			RK73EB2B180J	CHIP R 18 J 1/8W		
VR1			R12-5058-05	TRIM POT. 100K		
VR3			R12-3132-05	TRIM POT. 47K		
VR4 ,5			R12-3126-05	TRIMMING POT.(10K)		
VR201			R05-3441-05	POTENTIOMETER(10KA)		
VR202			R05-4420-05	POTENTIOMETER(50KB)		
S201			S40-2458-05	PUSH SWITCH(POWER)		

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TX-RX UNIT (X57-369X-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
S202-211			S40-1086-05	TACT SWITCH		
D1			DAN235K	DIODE	KPX	
D1			DAN235K	DIODE	K2P2	
D2 -4			1SV164	DIODE		
D5 ,6			1SV164	DIODE	KPXMM2	
D5 ,6			1SV164	DIODE	M3EE9	
D5 ,6			1SV164	DIODE	EM,E2	
D5 ,6			1SV166	DIODE	K2P2	
D7			LFB01	DIODE		
D8 ,9			1SS184	DIODE		
D10			DAN235K	DIODE		
D11			1SS181	DIODE		
D12			MI407	DIODE		
D13			MI308	DIODE		
D14 ,15			1SS226	DIODE		
D16			DSA3A1	DIODE		
D202			02CZ9.1(Y)	CHIP ZENER DIODE		
D203			1SS184	DIODE		
D204			1SS181	DIODE		
D205			1SS184	DIODE		
D206			1SS184	DIODE	KPMEM2	
D206			1SS184	DIODE	XEM,E9	
D206			1SS184	DIODE	M3K2P2	
D207			1SS184	DIODE	M2M3E	
D207			1SS184	DIODE	EM,E9	
D207			1SS184	DIODE	E2K2P2	
D208			1SS184	DIODE	K2P2	
D209			MA141A	CHIP DIODE	MM2EE2	
D209			MA141A	CHIP DIODE	EM,E9	
D209			MA141A	CHIP DIODE	M3K2P2	
D210			MA141A	CHIP DIODE	EE2	
D210			MA141A	CHIP DIODE	EM,E9	
D211			MA141A	CHIP DIODE		
D212			1SS226	DIODE		
D213			LFB01	DIODE		
D214			02CZ3.9(Z)	CHIP ZENER DIODE		
D215			02CZ3.0(Z)	CHIP ZENER DIODE		
D216			B30-0852-05	LED(LOW)		
D217			1SS184	DIODE		
IC1			KCD04	HIC(FM IF)		
IC2			TA7787AF	IC(FM/AM IF/3V)	KPX	
IC2			TA7787AF	IC(FM/AM IF/3V)	K2P2	
IC3			UPC1241H	IC(AF PA)		
IC4			KCC02	HIC(EL,VOL)		
IC5			TC9174F	IC(CMOS I/O EXTENSION)		
IC6			NJM78L05UA	IC(VOLTAGE REGULATOR/ +5V)		
IC7			LA5010M	IC(LOW SATURATION REGULATOR)		
IC8			KCB05	HIC(DRIVE)		
IC9			MC7808CT	IC(VOLTAGE REGULATORS/ +8V)		
IC201			75116GF-E83-3BE	IC(CPU)	KPXMM2	
IC201			75116GF-E83-3BE	IC(CPU)	M3EE9	
IC201			75116GF-E83-3BE	IC(CPU)	EM,E2	
IC201		*	75116GF-J64-3BE	IC(CPU)	K2P2	
IC202			NJM78L06UA	IC(VOLTAGE REGULATOR/ +6V)		

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TX-RX UNIT (X57-369X-XX)
PLL (X58-3470-00)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
Q1			3SK184(S)	FET		
Q2			DTA114YK	DIGITAL TRANSISTOR	KPX	
Q2			DTA114YK	DIGITAL TRANSISTOR	K2P2	
Q3			DTC123JK	DIGITAL TRANSISTOR	KPX	
Q3			DTC123JK	DIGITAL TRANSISTOR	K2P2	
Q4			3SK131(L)	FET		
Q5			2SC2714(Y)	TRANSISTOR		
Q6			2SK208(Y)	FET	KPX	
Q6			2SK208(Y)	FET	K2P2	
Q7			DTC143EK	DIGITAL TRANSISTOR	KPX	
Q7			DTC143EK	DIGITAL TRANSISTOR	K2P2	
Q8			2SC2712(Y)	TRANSISTOR	KPX	
Q8			2SC2712(Y)	TRANSISTOR	K2P2	
Q9			FMG2	TRANSISTOR		
Q10			2SC2712(Y)	TRANSISTOR		
Q12			2SD1757K	TRANSISTOR		
Q13 ,14			2SB1119(S)	TRANSISTOR		
Q15			DTC144WK	DIGITAL TRANSISTOR		
Q16 -18			2SC2712(Y)	TRANSISTOR		
Q19			2SD1757K	TRANSISTOR		
Q20			2SC2712(Y)	TRANSISTOR		
Q21			2SK208(Y)	FET		
Q22			2SC2714(Y)	TRANSISTOR		
Q23 ,24			DTC124EK	DIGITAL TRANSISTOR		
Q25			2SD1406(Y)	TRANSISTOR		
Q26			2SB1302(S)	TRANSISTOR		
Q27			2SC2712(Y)	TRANSISTOR		
Q28			2SJ106(GR)	FET		
Q201-204			2SA1519	TRANSISTOR		
Q205			2SD1682(R,S)	TRANSISTOR		
Q206-208			2SC2712(Y)	TRANSISTOR		
Q209,210			DTC114EK	DIGITAL TRANSISTOR		
Q211			DTD143EK	DIGITAL TRANSISTOR		
Q212			FMG2	TRANSISTOR		
S212			W02-0388-05	ROTARY ENCODER		
			X58-3470-00	SUB UNIT(PLL)	KPXMM2	
			X58-3470-00	SUB UNIT(PLL)	M3EE9	
			X58-3470-00	SUB UNIT(PLL)	EM,E2	
		*	X58-3500-11	SUB UNIT(PLL)	K2,P2	
			X59-3130-00	MODULE UNIT(APC)		
			X59-3610-00	MODULE UNIT(MIC AMP)		
PLL (X58-3470-00) : (K,P,X,M,M2,M3,E,E2,E9,EM)						
C1			CC73FCH1H220J	CHIP C 22PF J		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CC73FCH1H020C	CHIP C 2.0PF C		
C4 ,5			CK73FB1H472K	CHIP C 4700PF K		
C6			CC73FCH1H020C	CHIP C 2.0PF C		
C7 -9			CK73FB1H102K	CHIP C 1000PF K		
C10			CK73FB1H472K	CHIP C 4700PF K		
C11			CK73FB1H102K	CHIP C 1000PF K		
C51			CC73FCH1H100D	CHIP C 10PF D		
C52			CK73FB1H102K	CHIP C 1000PF K		
C53			CC73FCH1H100D	CHIP C 10PF D		

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PLL (X58-3470-00)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
C54			CK73FB1H102K	CHIP C 1000PF K		
C55			CK73EB1H223K	CHIP C 0.022UF K		
C56			CK73FB1E393K	CHIP C 0.039UF K		
C101			CK73EB1H223K	CHIP C 0.022UF K		
C102,103			C92-0009-05	CHIP TAN 4.7UF 10WV		
C104			CK73FB1H102K	CHIP C 1000PF K		
C105			C92-0003-05	CHIP TAN 0.47UF 25WV		
C106			CK73EB1H223K	CHIP C 0.022UF K		
C107			CC73FCH1H100D	CHIP C 10PF D		
C108			CC73FCH1H220J	CHIP C 22PF J		
C109,110			CK73FB1H102K	CHIP C 1000PF K		
CN1			E40-0311-05	PIN CONNECTOR(3P)		
CN2			E40-0411-05	PIN CONNECTOR(4P)		
CN3			E40-5201-05	PIN CONNECTOR(7P)		
			F11-1122-24	SHIELDING COVER		
L1			L40-1581-80	SMALL FIXED INDUCTOR(150NH)		
L2 -4			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
L5			L34-2336-05	COIL		
L51			L40-3392-81	SMALL FIXED INDUCTOR(3.3UH)		
R1			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R2			RK73FB2A561J	CHIP R 560 J 1/10W		
R3			RK73FB2A101J	CHIP R 100 J 1/10W		
R4			RK73FB2A121J	CHIP R 120 J 1/10W		
R5			RK73FB2A470J	CHIP R 47 J 1/10W		
R6 ,7			R92-0670-05	CHIP R 0 OHM		
R8			RK73FB2A101J	CHIP R 100 J 1/10W		
R9			RK73FB2A470J	CHIP R 47 J 1/10W		
R10			RK73FB2A103J	CHIP R 10K J 1/10W		
R51			RK73FB2A103J	CHIP R 10K J 1/10W		
R52			RK73FB2A223J	CHIP R 22K J 1/10W		
R53			RK73FB2A221J	CHIP R 220 J 1/10W		
R54			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R55			RK73FB2A473J	CHIP R 47K J 1/10W		
R101			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R102			R92-0670-05	CHIP R 0 OHM		
R103			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R104			R92-0670-05	CHIP R 0 OHM		
R105			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R106			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R107-111			RK73FB2A473J	CHIP R 47K J 1/10W		
R112			RK73FB2A223J	CHIP R 22K J 1/10W		
R113			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R114			R92-0670-05	CHIP R 0 OHM		
D1 ,2			1T33C	DIODE		
IC51			M54959FP	IC(FREQ SYNTHESIZER PLL)		
Q1			2SC2714(Y)	TRANSISTOR		
Q2			2SK508NV(K52)	FET		
Q51			2SC2714(Y)	TRANSISTOR		
Q52			DTC144EK	DIGITAL TRANSISTOR		
Q53			2SC2712(Y)	TRANSISTOR		
Q101,102			2SC3324(B)	TRANSISTOR		

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PLL (X58-3500-11)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
PLL (X58-3500-11) : (K2,P2)						
C1			CK73FB1E223K	CHIP C 0.022UF K		
C2 ,3			CK73FB1H102K	CHIP C 1000PF K		
C4			CK73FB1E223K	CHIP C 0.022UF K		
C5			CK73FB1H471K	CHIP C 470PF K		
C6 ,7			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C8			C92-0003-05	CHIP TAN 0.47UF 25WV		
C9			CK73EB1E473K	CHIP C 0.047UF K		
C10			CC73FCH1H050C	CHIP C 5PF C		
C11 ,12			CK73FB1H102K	CHIP C 1000PF K		
C13 ,14			CK73FB1E223K	CHIP C 0.022UF K		
C15			CC73GCH1H100D	CHIP C 10PF D		
C16			CC73GCH1H220J	CHIP C 22PF J		
C101			CK73GB1E103K	CHIP C 0.010UF K		
C103,104			CK73GB1E103K	CHIP C 0.010UF K		
C105			CC73GCH1H010C	CHIP C 1PF C		
C106			CC73GCH1H220J	CHIP C 22PF J		
C107,108			CK73GB1H102K	CHIP C 1000PF K		
C109,110			CK73GB1E103K	CHIP C 0.010UF K		
C111			CC73GCH1H030C	CHIP C 3PF C		
C112,113			CK73GB1E103K	CHIP C 0.010UF K		
C114			CC73GCH1H010C	CHIP C 1PF C		
C115			CC73GCH1H220J	CHIP C 22PF J		
C116			CK73GB1H102K	CHIP C 1000PF K		
CN1			E40-5201-05	PIN CONNECTOR (7P)		
CN101			E40-0411-05	PIN CONNECTOR (4P)		
CN102			E40-0311-05	PIN CONNECTOR (3P)		
			F11-1122-24	SHIELDING COVER		
L1			L40-3391-19	SMALL FIXED INDUCTOR(3.3UH)		
L101,102			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
L103			L34-2331-05	COIL		
L104-106			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
L107			L34-2332-05	COIL		
L108			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
R1 -5			RK73GB1J473J	CHIP R 47K J 1/16W		
R6			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R7			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R8			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R9			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R10 ,11			RK73GB1J103J	CHIP R 10K J 1/16W		
R13			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R14			RK73GB1J473J	CHIP R 47K J 1/16W		
R15			RK73GB1J223J	CHIP R 22K J 1/16W		
R16			RK73GB1J103J	CHIP R 10K J 1/16W		
R17			RK73GB1J221J	CHIP R 220 J 1/16W		
R18			R92-1252-05	CHIP R 0 OHM		
R101			RK73GB1J101J	CHIP R 100 J 1/16W		
R102			RK73GB1J470J	CHIP R 47 J 1/16W		
R103			RK73GB1J101J	CHIP R 100 J 1/16W		
R104			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R105			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R106			RK73GB1J471J	CHIP R 470 J 1/16W		

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PLL (X58-3500-11)
APC (X59-3130-00)
MIC AMP (X59-3610-00)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R107			RK73GB1J101J	CHIP R 100 J 1/16W		
R108			RK73GB1J470J	CHIP R 47 J 1/16W		
R109			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R110			RK73GB1J470J	CHIP R 47 J 1/16W		
R111			RK73GB1J101J	CHIP R 100 J 1/16W		
R112			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R113			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R114			RK73GB1J471J	CHIP R 470 J 1/16W		
D101,102			1SV166	DIODE		
D103			1T33C	DIODE		
D104			1SV166	DIODE		
IC1			M54959FP	IC(FREQ SYNTHESIZER PLL)		
Q1			2SC2713(B)	TRANSISTOR Or2SC3324(B)		
Q2			2SC3324(G)	TRANSISTOR Or2SC3324(B)		
Q3			2SC2712(Y)	TRANSISTOR		
Q4			2SC2714(Y)	TRANSISTOR		
Q101			2SK508NV(K52)	FET		
Q102			DTC114EK	DIGITAL TRANSITOR		
Q103			2SC3120	TRANSISTOR		
Q104			2SK508NV(K52)	FET		
Q105			DTC114EK	DIGITAL TRANSITOR		
Q106			2SC3120	TRANSISTOR		
APC (X59-3130-00)						
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			C92-0501-05	CHIP TAN 1.5UF 10WV		
C3			CK73FB1H472K	CHIP C 4700PF K		
C4			CK73FB1H102K	CHIP C 1000PF K		
C5			CK73FB1H472K	CHIP C 4700PF K		
C6			CK73FB1H102K	CHIP C 1000PF K		
			E23-0471-05	TERMINAL		
R1			RD41FB2B222J	CARBON 2.2K J 1/8W		
R2			RD41FB2B102J	CARBON 1K J 1/8W		
R3			RD41FB2B152J	CARBON 1.5K J 1/8W		
R4 ,5			RD41FB2B103J	CARBON 10K J 1/8W		
R6			RD41FB2B122J	CARBON 1.2K J 1/8W		
Q1 ,2			FMW1	TRANSISTOR		
Q3			2SA1162(Y)	TRANSISTOR		
MIC AMP (X59-3610-00)						
C1			CK73FF1E104Z	CHIP C 0.1UF Z		
C2			CK73GB1H102K	CHIP C 1000PF K		
C3			CK73FB1E333K	CHIP C 0.033UF K		
C4			CC73GCH1H270J	CHIP C 27PF J		
C5			C92-0004-05	ELECTRO 1.0UF 16WV		
C6			CK73FB1E333K	CHIP C 0.033UF K		
C7			CK73GB1H681K	CHIP C 680PF K		
C8			CK73GB1H332K	CHIP C 3300PF K		
C9			CC73GCH1H820J	CHIP C 82PF J		
C10			CC73GCH1H101J	CHIP C 100PF J		
C11			CK73GB1H102K	CHIP C 1000PF K		
			E23-0471-05	TERMINAL		
R1			RK73GB1J223J	CHIP R 22K J 1/16W		

L:Scandinavia **K:**USA **P:**Canada
Y:PX(Far East, Hawaii) **T:**England **E:**Europe
Y:AAFES(Europe) **X:**Australia **M:**Other Areas

TM-241A : (K,P,X,M,M2,M3,K2,P2)
TM-241E : (E,E2,E9,EM)

⚠ indicates safety critical components.

PARTS LIST

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

MIC AMP (X59-3610-00)

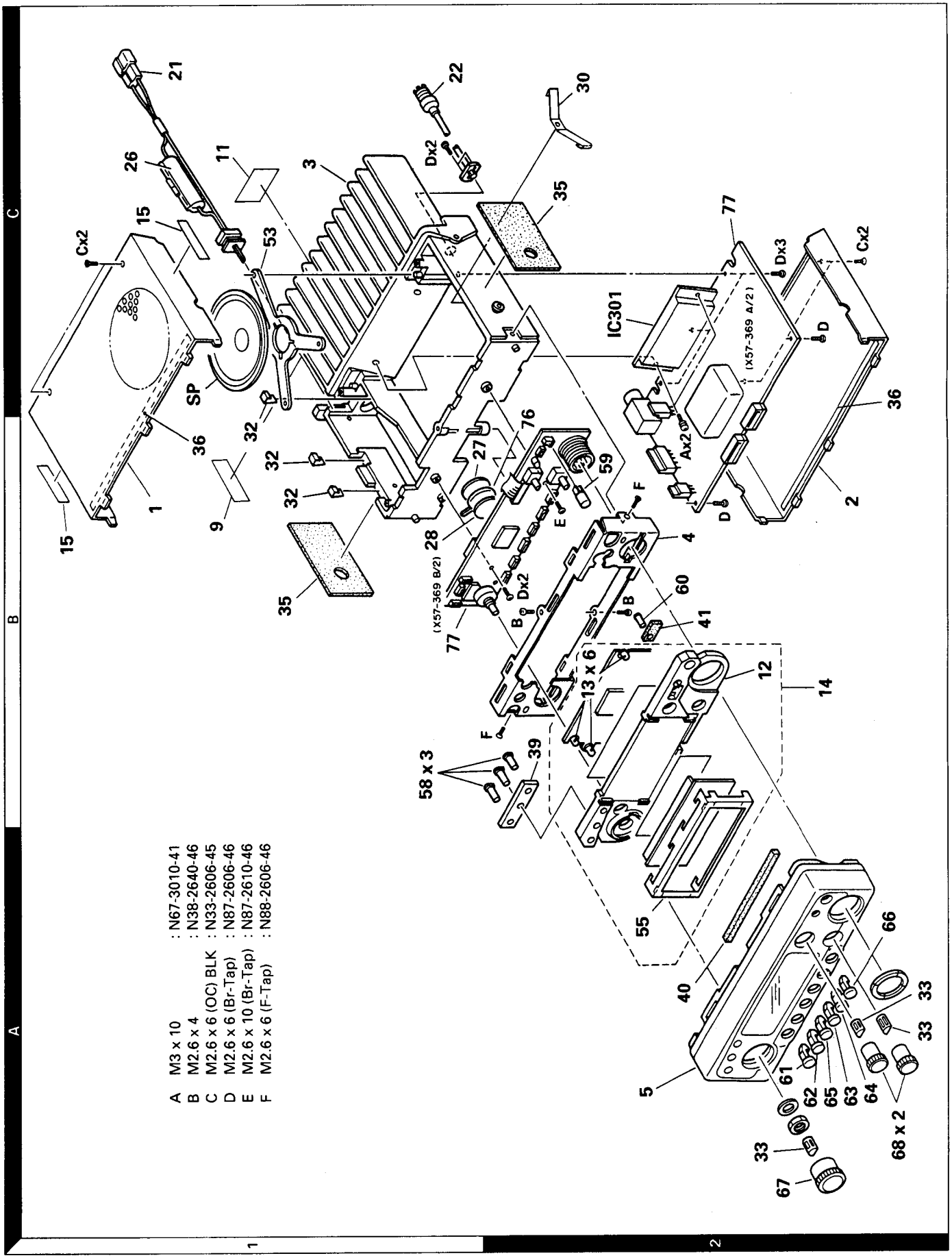
Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R2			RK73GB1J104J	CHIP R 100K J 1/16W		
R3			RK73GB1J561J	CHIP R 560 J 1/16W		
R4			RK73GB1J470J	CHIP R 47 J 1/16W		
R5			RK73GB1J561J	CHIP R 560 J 1/16W		
R6			R92-1252-05	CHIP R 0 ΩHM		
R7			RK73GB1J394J	CHIP R 390K J 1/16W		
R8			RK73GB1J224J	CHIP R 220K J 1/16W		
R9			RK73GB1J184J	CHIP R 180K J 1/16W		
R10			RK73GB1J333J	CHIP R 33K J 1/16W		
R11			RK73FB2A473J	CHIP R 47K J 1/10W		
R12			RK73GB1J224J	CHIP R 220K J 1/16W		
R13 -15			RK73GB1J823J	CHIP R 82K J 1/16W		
R16			R92-1252-05	CHIP R 0 ΩHM		
IC1			NJM4558M	IC(ΩP AMP X2)		
Q1			2SC4116(GR)	TRANSISTΩR		

L:Scandinavia **K:**USA **P:**Canada
Y:PX(Far East, Hawaii) **T:**England **E:**Europe
Y:AAFES(Europe) **X:**Australia **M:**Other Areas

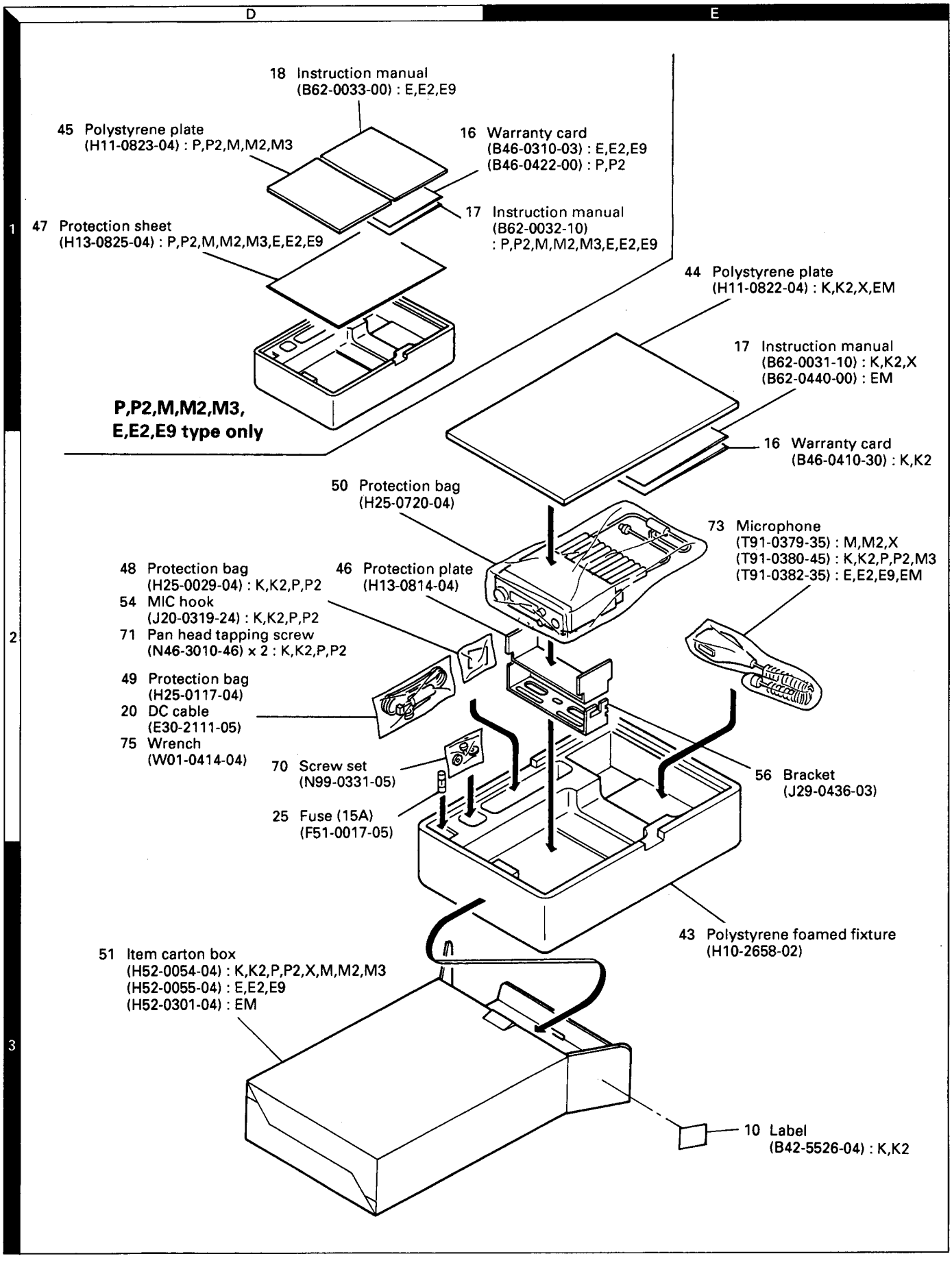
TM-241A : (K,P,X,M,M2,M3,K2,P2)
TM-241E : (E,E2,E9,EM)

⚠ indicates safety critical components.

EXPLODED VIEW



PACKING


D
E
1
2
3
18 Instruction manual
(B62-0033-00) : E,E2,E9
45 Polystyrene plate
(H11-0823-04) : P,P2,M,M2,M3
16 Warranty card
(B46-0310-03) : E,E2,E9
(B46-0422-00) : P,P2
17 Instruction manual
(B62-0032-10)
: P,P2,M,M2,M3,E,E2,E9
47 Protection sheet
(H13-0825-04) : P,P2,M,M2,M3,E,E2,E9
P,P2,M,M2,M3,
E,E2,E9 type only
44 Polystyrene plate
(H11-0822-04) : K,K2,X,EM
17 Instruction manual
(B62-0031-10) : K,K2,X
(B62-0440-00) : EM
16 Warranty card
(B46-0410-30) : K,K2
50 Protection bag
(H25-0720-04)
73 Microphone
(T91-0379-35) : M,M2,X
(T91-0380-45) : K,K2,P,P2,M3
(T91-0382-35) : E,E2,E9,EM
48 Protection bag
(H25-0029-04) : K,K2,P,P2
46 Protection plate
(H13-0814-04)
54 MIC hook
(J20-0319-24) : K,K2,P,P2
71 Pan head tapping screw
(N46-3010-46) x 2 : K,K2,P,P2
49 Protection bag
(H25-0117-04)
20 DC cable
(E30-2111-05)
75 Wrench
(W01-0414-04)
70 Screw set
(N99-0331-05)
25 Fuse (15A)
(F51-0017-05)
56 Bracket
(J29-0436-03)
43 Polystyrene foamed fixture
(H10-2658-02)
51 Item carton box
(H52-0054-04) : K,K2,P,P2,X,M,M2,M3
(H52-0055-04) : E,E2,E9
(H52-0301-04) : EM
10 Label
(B42-5526-04) : K,K2

ADJUSTMENT

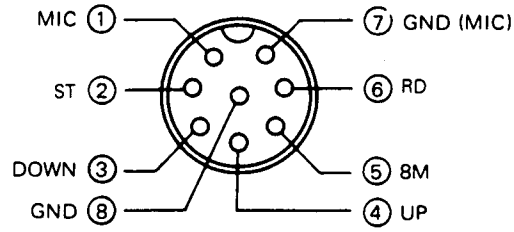
Required Test Equipment

1. DC V.M and Tester
   High input impedance
2. RF VTVM (RF V.M)
   Input impedance : 1MΩ min., 2pF max.
   Voltage range : F.S = 10mV to 300V
   Frequency range : Up to 450MHz
3. Frequency Counter (f. counter)
   Input sensitivity : Approx. 50mV
   Frequency range : Up to 450MHz
4. DC Power Supply
   Voltage : 10V to 17V, variable
   Current : 11A min.
5. Power Meter
   Measurement range : Approx. 60W, 3W, 1W
   Input impedance : 50Ω
   Frequency range : 450MHz
6. AF VTVM (AF V.M)
   Input impedance : 1MΩ min.
   Voltage range : F.S = 1mV to 30V
   Frequency range : 50Hz to 10kHz
7. AF Generator (AG)
   Output frequency : 100Hz to 10kHz
   Output voltage : 0.5mV to 1V
8. Linear Detector
   Frequency range : 450MHz
9. Spectrum Analyzer
   Frequency range : 450MHz
10. Directional Coupler
11. Oscilloscope
    High sensitivity oscilloscope with horizontal input terminal
12. SSG
    Frequency range : 144MHz band
    Modulation : AM and FM MOD.
    Output level : 0.1μV to 100mV
13. Dummy Load
    8Ω, 5W (approx.)
14. Noise Generator
    Must generate ignition-like noise containing harmonics beyond 450MHz
15. Sweep Generator
    Sweep range : 144MHz band
16. Tracking Generator

Preparation

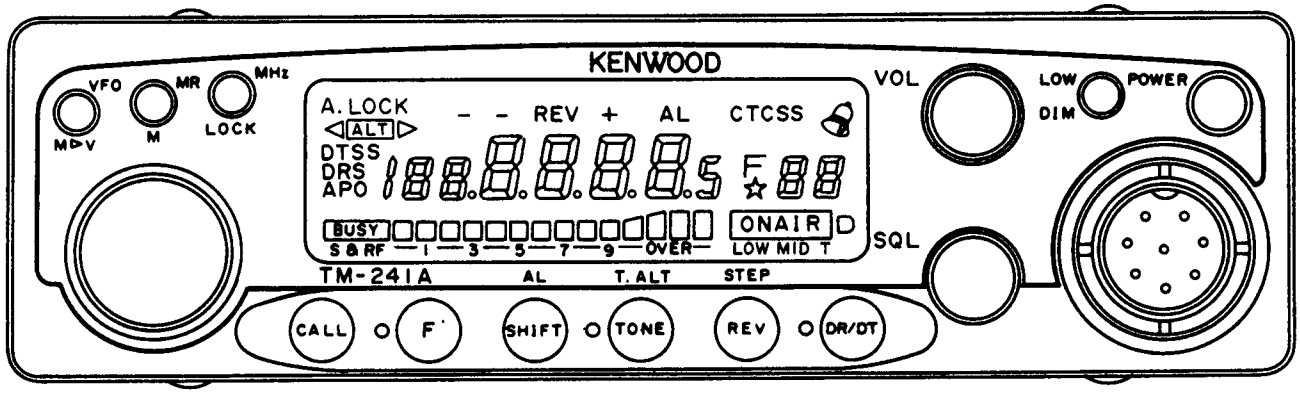
- Unless otherwise specified, knobs and switches should be set as follows.

POWER SW	ON	CALL	OFF
AF VOL VR	MIN	SHIFT/AL	OFF
SQL VOL VR	MIN	TONE/T. ALT	OFF
VFO	VFO	REV/STEP	OFF
MR	OFF	DR/DT	OFF



MIC terminals (view from front panel side)

- Use an insulated adjusting rod to adjust trimmers and coils.
- To prevent damaging SSG, never set the standby switch to SEND while adjusting the receiver section.
- Be sure to turn the power switch OFF, before connecting the power cable to a power source.
- Meter and display section should be set as follows.



ADJUSTMENT

Common Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) Source voltage : DC 13.8V POWER SW : OFF VOL VR : Full counterclock-wise (CCW). SQL VR : CCW TX-RX unit VR3, 4 : CCW VR1 : Center							
2. Reset	1) Turn POWER SW ON while holding down MR/M.						Check	Display : 144.000
3. PLL	1) RX VCO FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** Receive.	DC V.M Dummy	TX-RX (A/2) Rear panel	TP2 ANT			Check	1.7~2.4V **K,P,X,M,M2,M3, E,E2,E9,EM** 2.5V or more. **K2,P2**
	2) FREQ. : 136.000MHz **K,P,X,M,M2,M3** Receive.							1.0V or more. **K,P,X,M,M2,M3**
	3) TX VCO FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** Transmit.							3.2~3.8V **K,P,X,M,M2,M3, E,E2,E9,EM** 4.5~6.5V **K2,P2**
	4) FREQ. : 173.995MHz **M2,M3,E2** Transmit.							10V or less. **M2,M3,E2**
4. Transmit frequency adjustment	1) FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** Transmit.	f. counter Power meter	Rear panel	ANT	TX-RX (A/2)	TC1	144.975MHz **E,E2,E9,EM** 146.000MHz **K,K2, P,P2,X,M,M2,M3**	±100Hz

Receiver Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. BPF	1) FREQ. : 145.050MHz **E,E2,E9,EM** FREQ. : 146.040MHz **K,K2,P,P2,X,M,M2,M3** TX-RX unit VR1 : Center Connect the SSG to ANT. Connect the DC V.M to TP1 SSG output : -113dBm/0.5μV MOD : 1kHz DEV : 3kHz	DC V.M SSG	TX-RX (A/2)	TP1	TX-RX (A/2)	L1~5	Repeat for MAX. **K,P,X,M,M2,M3, E,E2,E9,EM** L4 turn to 180° CCW after adjust the peak. Repeat for MAX. Then L4 turn to 180° CCW. **K2,P2**	
2. Distortion	1) FREQ. : 145.050MHz **E,E2,E9,EM** FREQ. : 146.040MHz **K,K2,P,P2,X,M,M2,M3** SSG output : -113dBm/0.5μV MOD : 1kHz DEV : 3kHz	Distortion meter Oscilloscope	Rear panel	SP	TX-RX (A/2)	L6	Repeat for MIN. **K,P,X,M,M2,M3, E,E2,E9,EM** Repeat for MIN. Then turn to CCW and adjust to 2% distortion. **K2,P2**	Turn L6 core CCW until best SINAD point obtained.

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. Receiving sensitivity	1) FREQ. : 145.050MHz **E,E2,E9,EM** FREQ. : 146.040MHz **K,K2,P,P2,X,M,M2,M3** SSG output : -123dBm/0.16μV **K,P,X,M,M2,M3,E,E2,E9,EM** SSG output : -119dBm/0.25μV **K2,P2** MOD : 1kHz DEV : 3kHz	AF V.M Oscilloscope	Rear panel	SP			Check	SINAD 12dB or more.
	2) FREQ. : 144.040MHz **K,K2,P,P2,X,M,M2,M3** FREQ. : 144.050MHz **E,E2,E9,EM**							
	3) FREQ. : 145.950MHz **E,E2,E9,EM** FREQ. : 147.940MHz **K,K2,P,P2,X,M,M2,M3**							
4. S-meter	1) FREQ. : 145.050MHz **E,E2,E9,EM** FREQ. : 146.040MHz **K,K2,P,P2,X,M,M2,M3** SSG output : -96dBm/3.6μV MOD : 1kHz DEV : 3kHz	LCD (S-meter)			TX-RX (A/2)	VR1	Adjust so that all the S-meter go on, then the last segment goes off.	
	2) SSG output : -95dBm/4μV						Check	All S-meter segments on.
	3) SSG output : OFF							S-meter off.

Transmitter Section

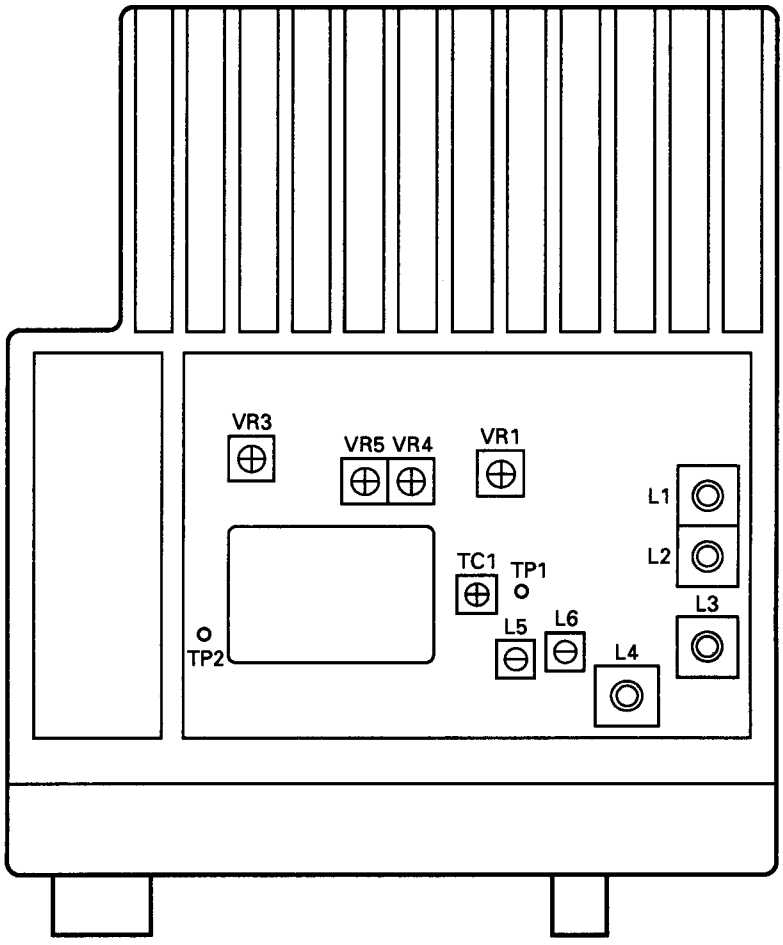
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1-1. Power (APC)	1) FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** Transmit.	Power meter Ammeter	Rear panel	ANT			Check	57W or more. ON AIR LED on.
	2) FREQ. : 145.975MHz **E,E2,E9,EM** FREQ. : 147.995MHz **K,K2,P,P2,X,M,M2,M3** Transmit.				TX-RX (A/2)	VR4	54W	±1W 11A or less.
	3) FREQ. : 144.000MHz Transmit.						Check	49~59W 11A or less.
	4) FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** Transmit.						Read RF meter.	All RF meter LEDs on.

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1-2. MID power	1) FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** LOW SW : Push Transmit.	Power meter Ammeter	Rear panel	ANT	TX-RX (A/2)	VR5	12W Read RF meter.	±1W 10 RF meter LEDs on.
1-3. LOW power	1) FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** LOW SW : Push Transmit.						Check Read RF meter.	3.0~8.0W 6 RF meter LEDs on.
2. DEV.	1) FREQ. : 144.975MHz **E,E2,E9,EM** FREQ. : 146.000MHz **K,K2,P,P2,X,M,M2,M3** AG : 1kHz/28mV **E,E2,E9,EM** AG : 1kHz/50mV **K,K2,P,P2,X,M,M2,M3** Transmit.	Linear detector Oscilloscope Power meter	Rear panel	ANT	TX-RX (A/2)	VR3	±4.4kHz (Read higher absolute value of + or – value.)	±200Hz Check for detected waveform.
	2) AG : 1kHz/2.8mV **E,E2,E9,EM** AG : 1kHz/5.0mV **K,K2,P,P2,X,M,M2,M3** Transmit.						Check	±2.2~3.6kHz
	3) DTSS AG : 1.6kHz/175mV (CN5 input) Transmit.						Check	±2.5kHz or more.
3. Protection	1) FREQ. : 145.975MHz **E,E2,E9,EM** FREQ. : 147.995MHz **K,K2,P,P2,X,M,M2,M3** ANT : Open Transmit.	Ammeter	Rear panel	ANT			Check	11A or less.
4. TONE	1) FREQ. : 145.250MHz TONE : ON Transmit.	Linear detector Oscilloscope Power meter	Rear panel	ANT			Check	DEV. : ±0.5~1.0kHz
	2) FREQ. : 144.975MHz **E,E2,E9,EM** TONE SW of MIC : ON Transmit.							DEV. : ±2.5~5.0kHz

ADJUSTMENT

Adjustment Points (Top View)



TX-RX UNIT (X57-369X-XX)

VR1 : S-meter
VR3 : ±4.4kHz at 1kHz, 28mV (E,E2,E9,EM)
VR3 : ±4.4kHz at 1kHz, 50mV (K,P,X,M,M2,M3,K2,P2)
VR4 : APC
VR5 : MIC POWER
L1~5 : BPF
L6 : Distortion
TC1 : TX frequency

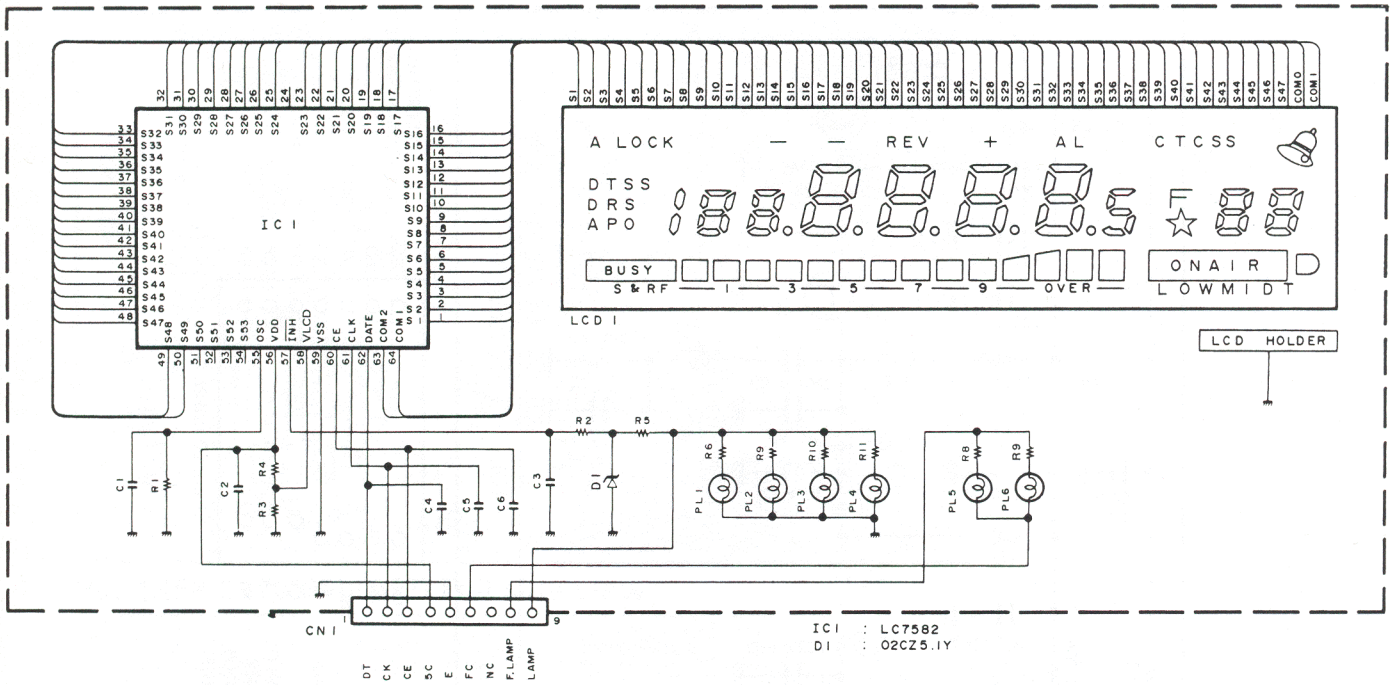
TERMINAL FUNCTION

CN No.	Pin No.	Name	Function
TX-RX UNIT (X57-369X-XX) (A/2)			
CN1	1	E	GND.
	2	SP	Speaker input.
CN2	1	BZ2	
	2	E	GND.
	3	VI	Voice memory input.
	4	VO	Voice memory output.
	5	VOA	Power supply for voice memory.
CN3	1	E	GND.
	2	NC	
	3	ES1	Shift register (IC5) enable.
	4	NC	
	5	EP1	PLL enable.
	6	CK	PLL clock.
	7	DT	PLL data.
	8	DET	CTCSS detector output.
	9	RD	Audio output.
	10	SC	Squelch busy control output.
	11	SQ	Squelch output.
	12	SM	S-meter output.
	13	E	GND.
CN4	1	E	GND.
	2	B	+13.8V.
	3	PSW	Power switch control input.
	4	SB	Switched B.
	5	8C	Common +8V.
	6	BZ	Beep input (To AF IC from CPU).
	7	A2	Audio input (To electronic volume from AF VOL).
	8	A1	Audio output (To AF VOL).
	9	AE	GND.
	10	TO	Tone input.
	11	ME	MIC GND.
	12	MIC	Mic input (To MIC AMP unit).
	13	E	GND.
TX-RX UNIT (X57-369X-XX) (B/2)			
CN201	1	E	GND.
	2	NC	
	3	ES1	Shift register enable (From CPU IC201).
	4	NC	
	5	EP1	PLL enable (From CPU IC201).
	6	CK	PLL clock (From CPU IC201).
	7	DT	PLL data (From CPU IC201).
	8	DET	CTCSS detector output.
	9	RD	Audio input (CPU IC201).
	10	SC	Squelch busy control input (To CPU IC201).
	11	SQ	Squelch input (To CPU IC201).
	12	SM	S-meter input (To CPU IC201).
	13	E	GND.

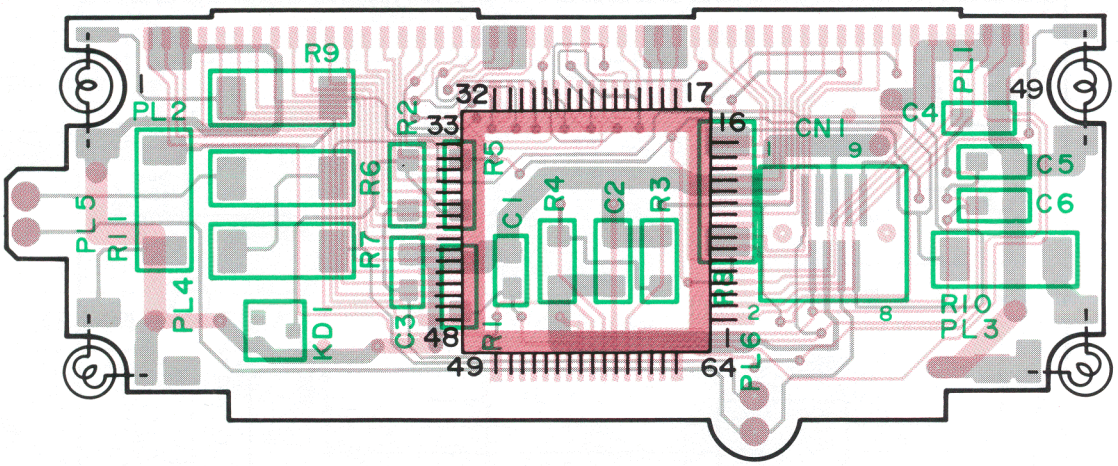
CN No.	Pin No.	Name	Function
CN202	1	E	GND.
	2	B	+13.8V.
	3	PSW	Power switch control output (From CPU).
	4	SB	Switched B.
	5	8C	Common +8V.
	6	BZ	Beep output (From CPU).
	7	A2	Audio output (To electronic volume from AF VOL).
	8	A1	Audio input (To AF VOL).
	9	AE	GND.
	10	TO	Tone output (From IC203).
	11	ME	MIC GND.
	12	MIC	Mic output (From mic jack).
	13	E	GND.
CN203	1	CK	Serial clock output (From CPU P21).
	2	DT	Serial data output (From CPU P22).
	3	VCK	DRS unit connect check.
	4	GND	GND.
	5	D8	DRS unit data.
	6	D1	DRS unit data.
	7	D2	DRS unit data.
	8	D4	DRS unit data.
CN204	1	DST	
	2	C5	Common +5V.
	3	DV	DTMF signal detector.
	4	VOB	DRS unit VOB output.
	5	VOA	DRS unit VOA output.
	6	RD	DRS unit RD output.
	7	WR	DRS unit WR output.
	8	ACL	DRS unit RESET output ($\overline{\text{ACL}}$).
	9	STBY	DRS unit STBY output.
	10	OE	DRS OE, DTSS EN.
CN205	1	DT	LCD driver data output.
	2	CK	LCD driver clock output.
	3	CE	LCD driver enable output.
	4	C5	+5V.
	5	E	GND.
	6	FC	Function control.
	7	NC	
	8	F.LAMP	Function lamp B.
	9	LAMP	Lamp B.
W201	1	GND	GND.
	2	RD	CTCSS unit voice de-modulation input.
	3	C5	Common +5V.
	4	DET	CTCSS unit tone matching input.
	5	CTC	CTCSS unit clock output.
	6	CTD	CTCSS unit data output.
	7	CTS	CTCSS unit enable output.

CIRCUIT DIAGRAM / PC BOARD VIEW TM-241A/E

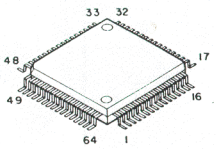
LCD ASS'Y (B38-0330-05)



LCD ASS'Y (B38-0330-05) Component side view

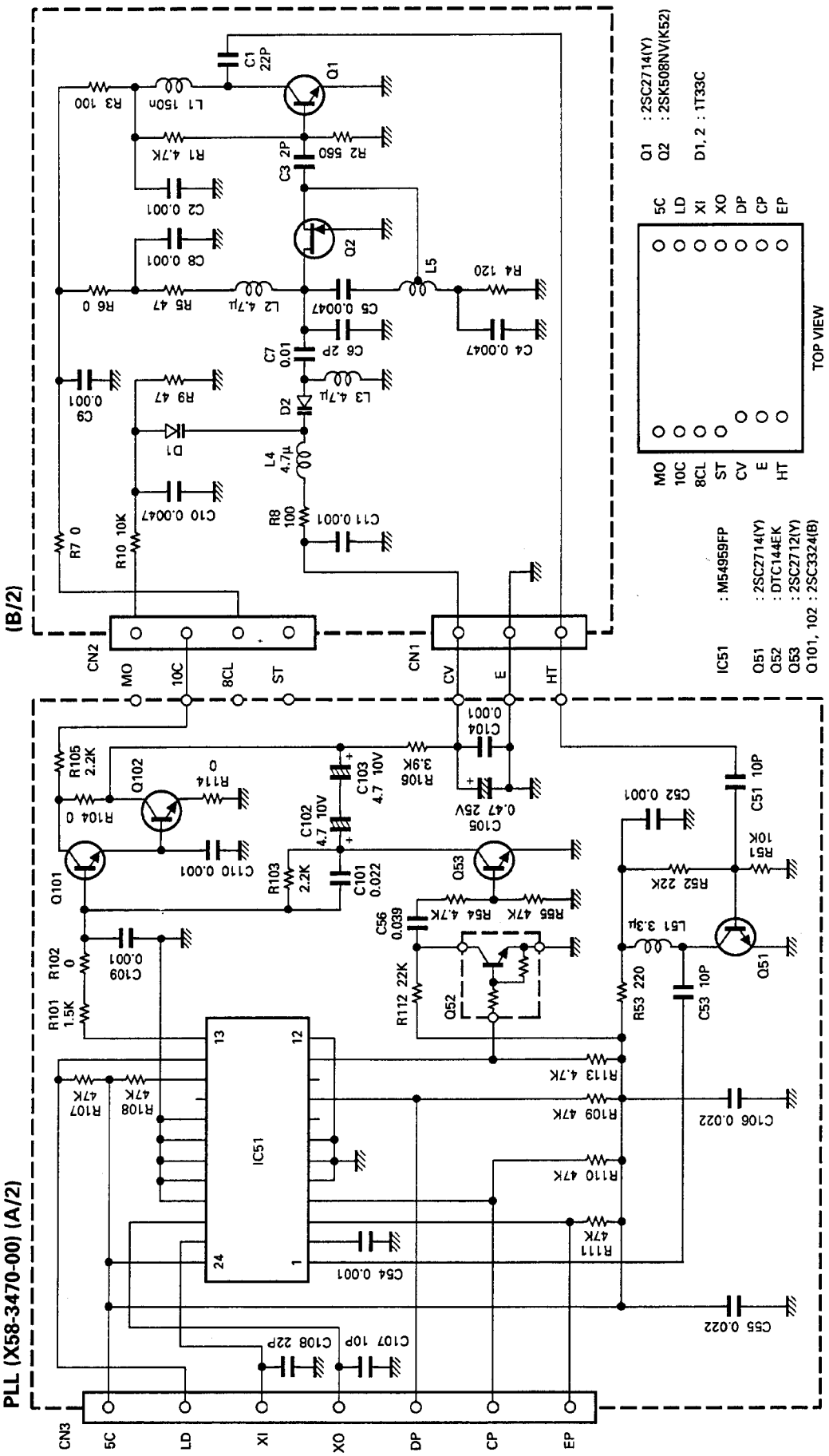


LC7582

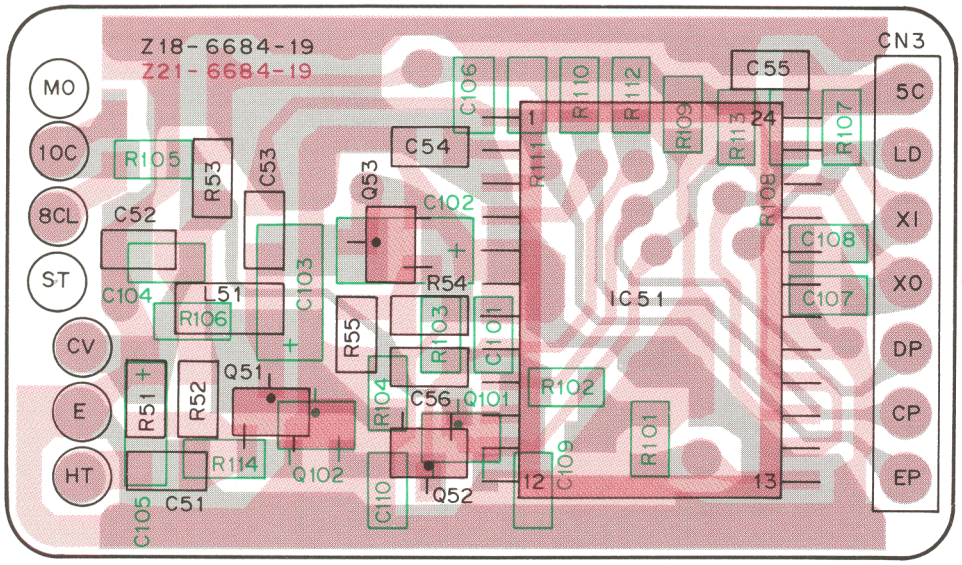


TM-241A/E CIRCUIT DIAGRAM / PC BOARD VIEWS

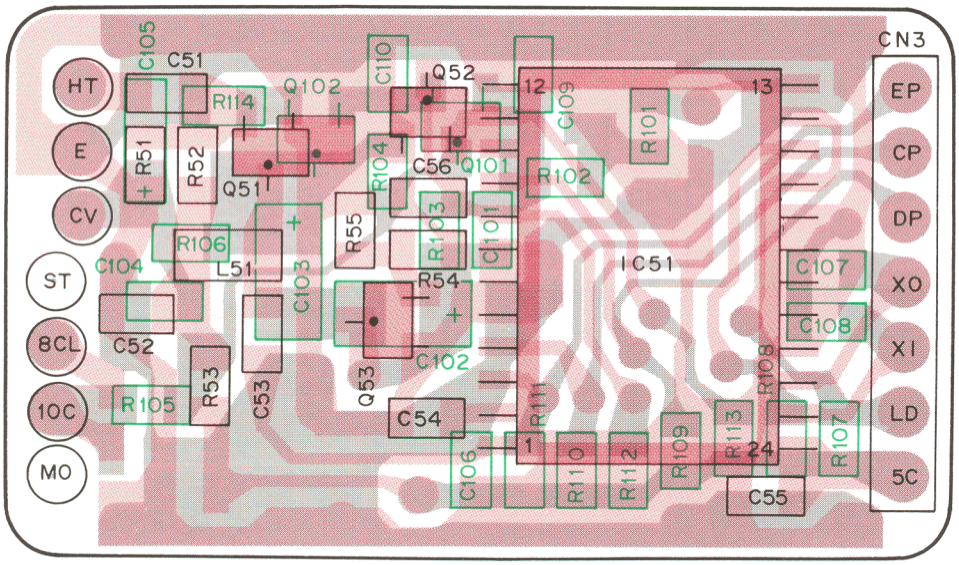
PLL (X58-3470-00) : K,P,X,M,M2,M3,E,E2,E9,EM



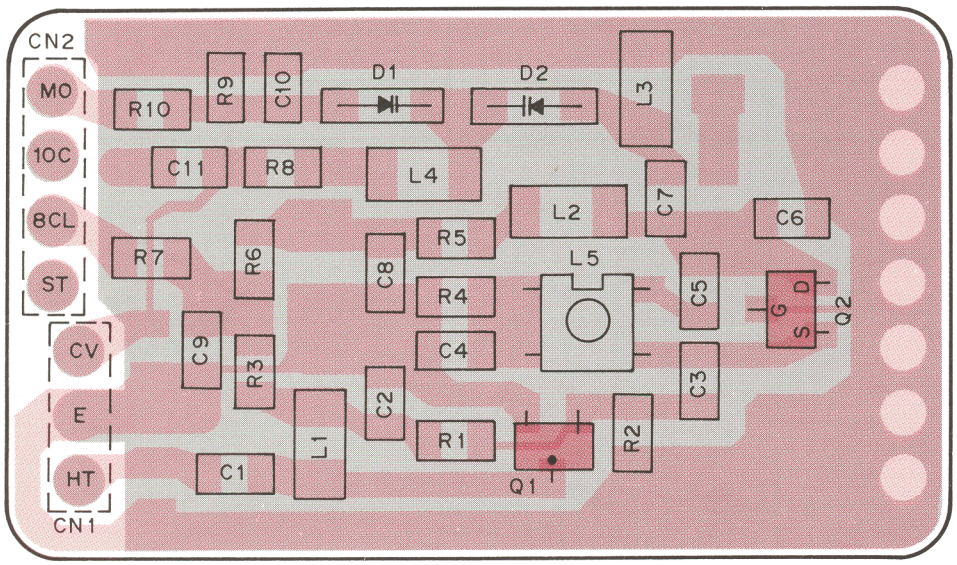
PLL (X58-3470-00) (A/2) Component side view



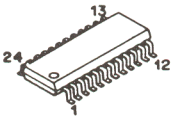
PLL (X58-3470-00) (A/2) Foil side view



PLL (X58-3470-00) (B/2) Component side view



M54959FP



2SK508NV

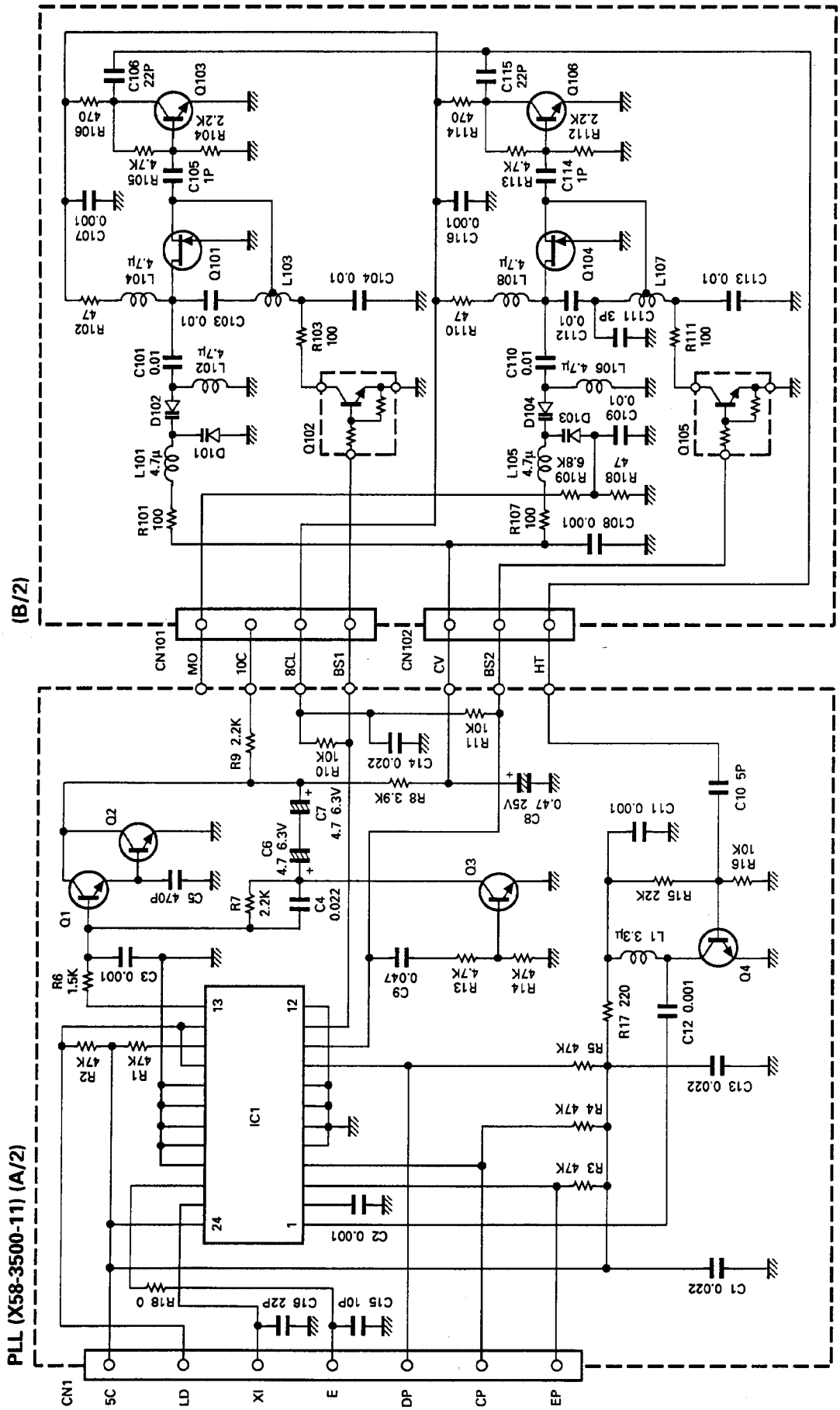


2SC2712
2SC2714
2SC3324
DTC144EK

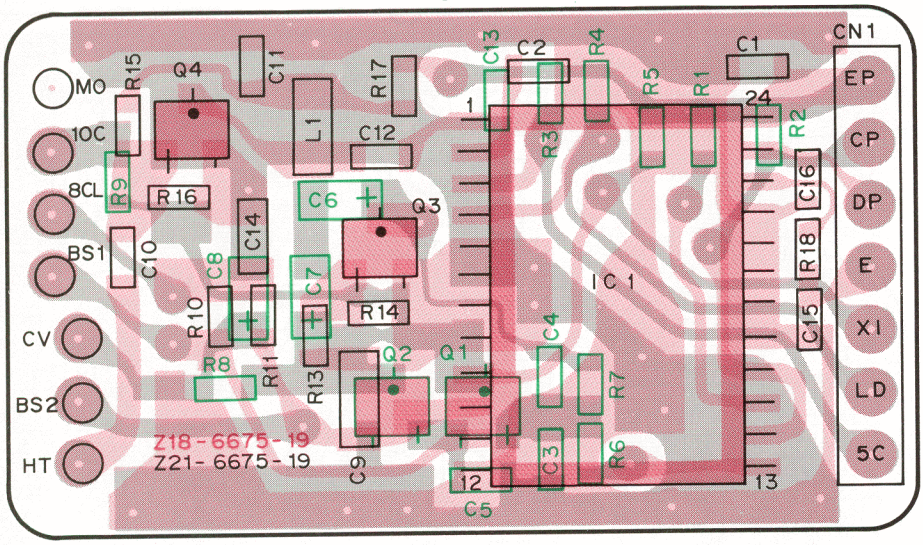


: Component side
: Foil side

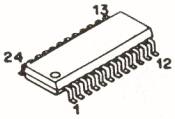
PLL (X58-3500-11) : K2,P2



PLL (X58-3500-11) (A/2) Component side view



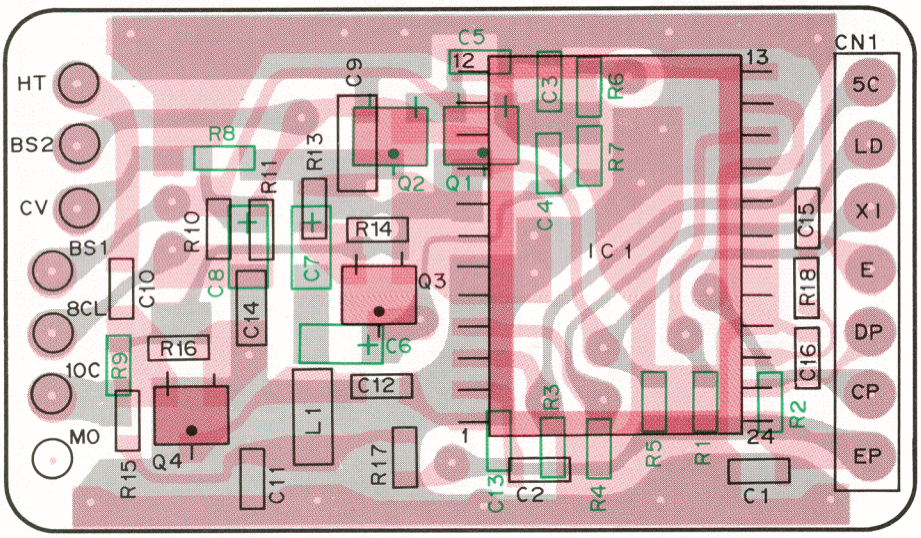
M54959FP



2SK508NV



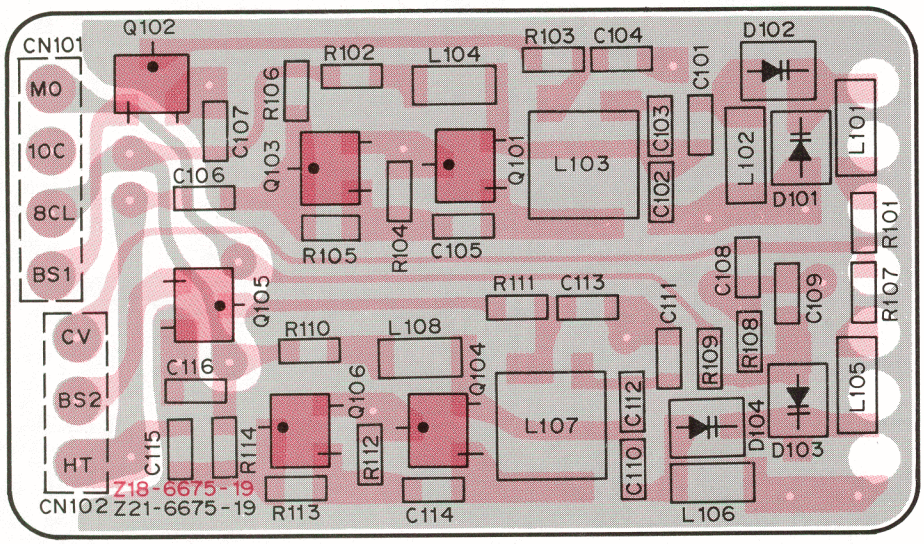
PLL (X58-3500-11) (A/2) Foil side view



2SC2712
2SC2713
2SC2714
2SC3120
2SC3324
DTC114EK



PLL (X58-3500-11) (B/2) Component side view

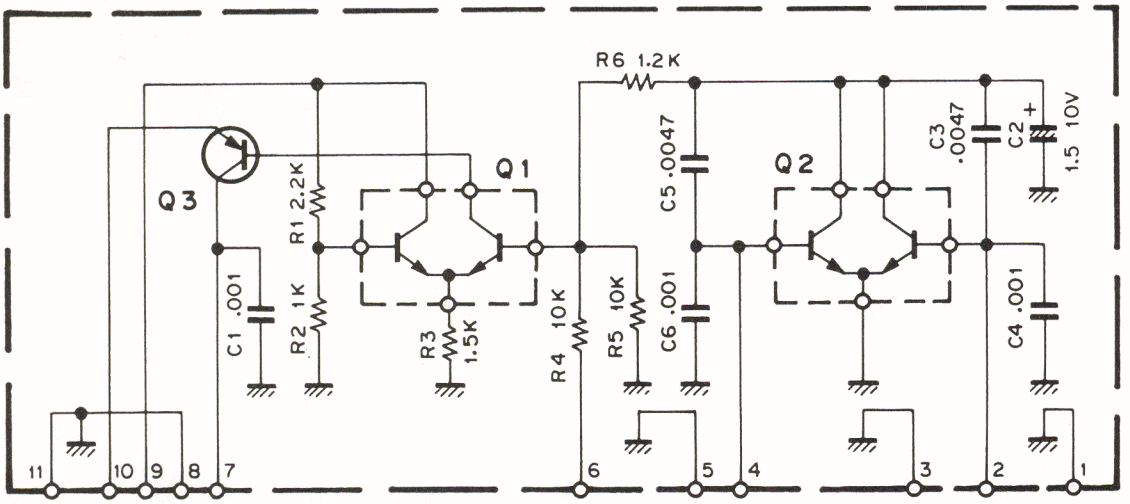


: Component side
: Foil side

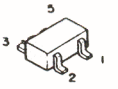
CIRCUIT DIAGRAMS / PC BOARD VIEWS TM-241A/E

APC (X59-3130-00)

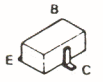
APC (X59-3130-00)



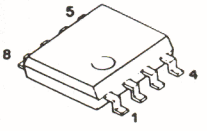
FMW1



2SA1162
2SC4116



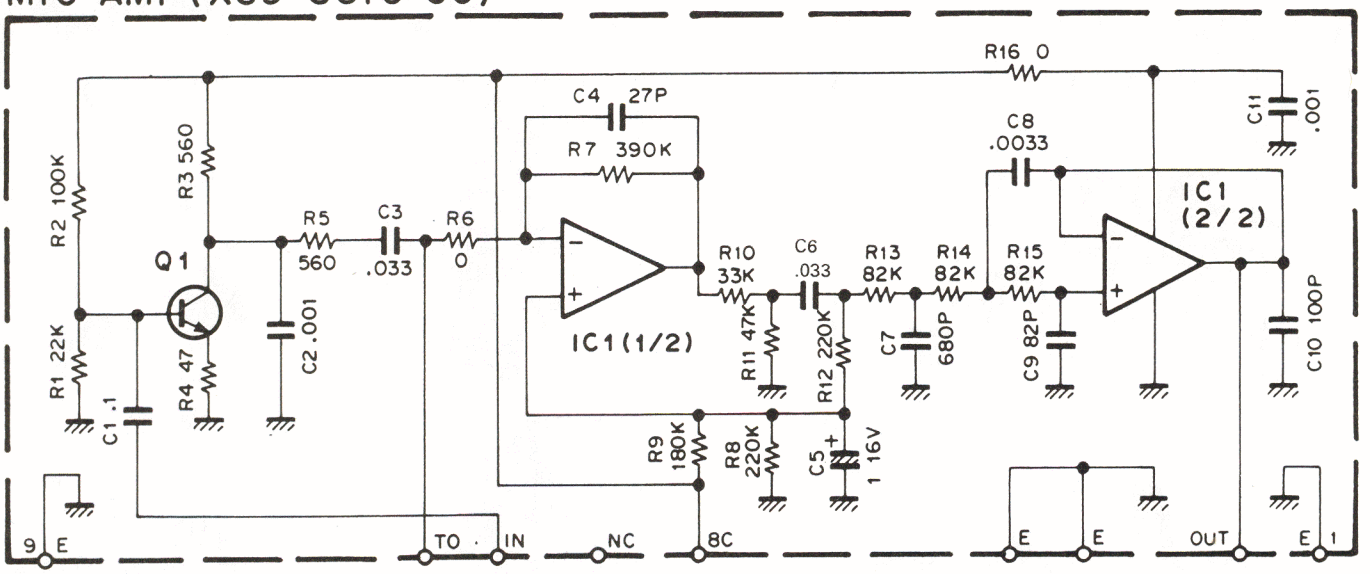
NJM4558M



Q1, 2 : FMW1 Q3 : 2SA1162 (Y)

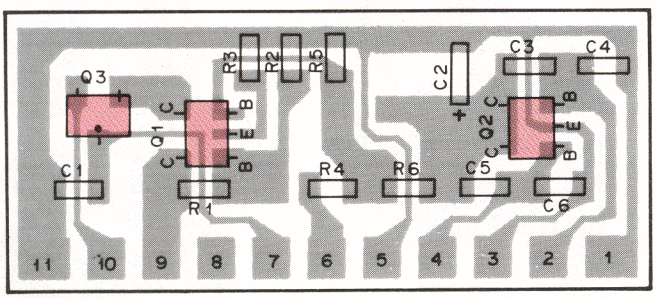
MIC AMP (X59-3610-00)

MIC AMP (X59-3610-00)

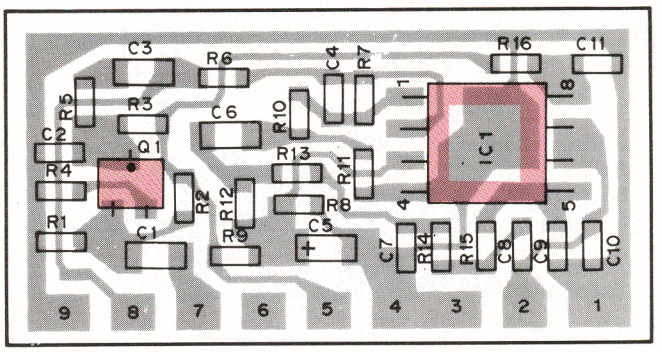


Q1 : 2SC4116 (GR) IC1 : NJM4558M

APC (X59-3130-00) Foil side view



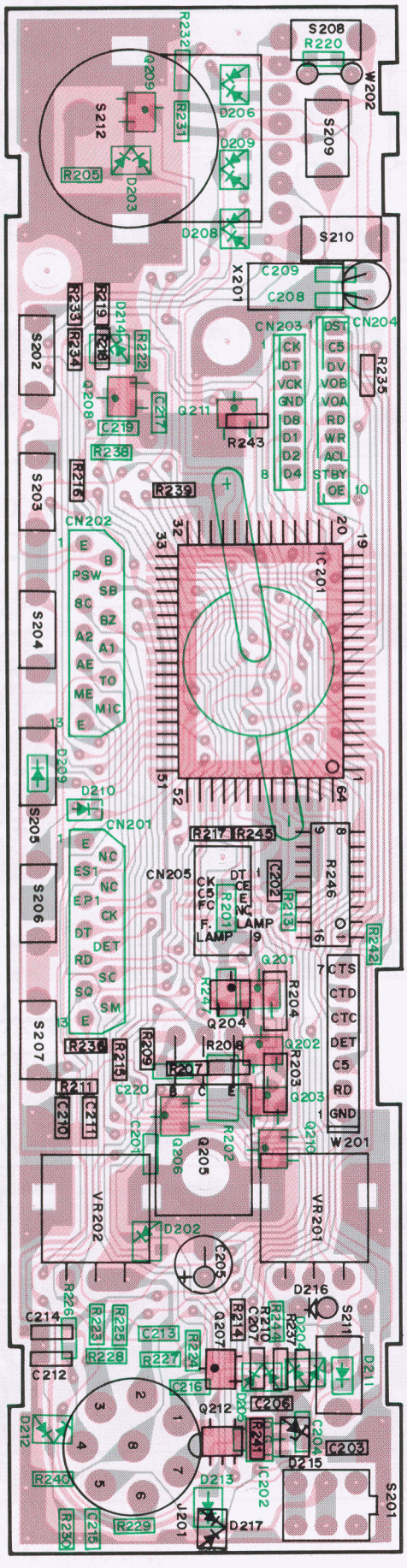
MIC AMP (X59-3610-00) Foil side view

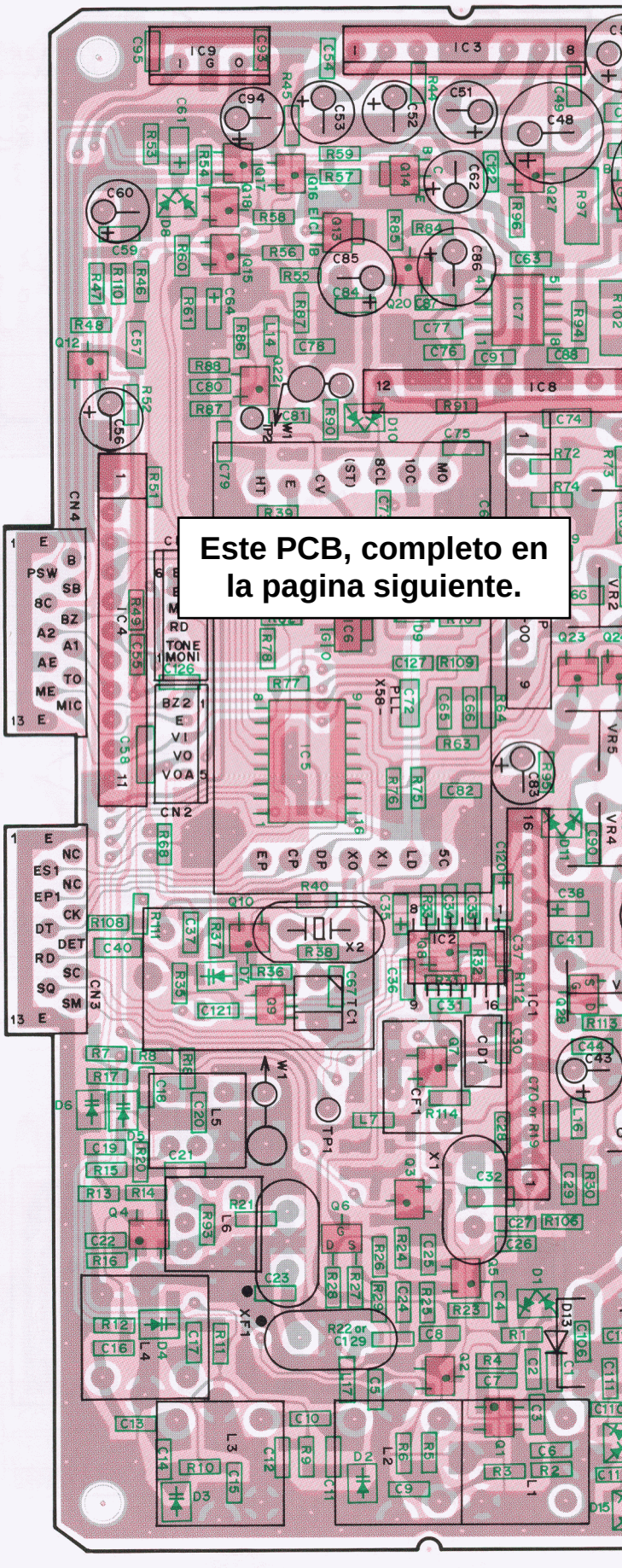


TM-241A/E PC BOARD VIEWS

TX-RX UNIT (X57-369X-XX) Component side view

0-11 : K,P,X 0-12 : K2,P2 0-21 : M 0-22 : M2,M3 2-71 : E,E9,EM 2-72 : E2



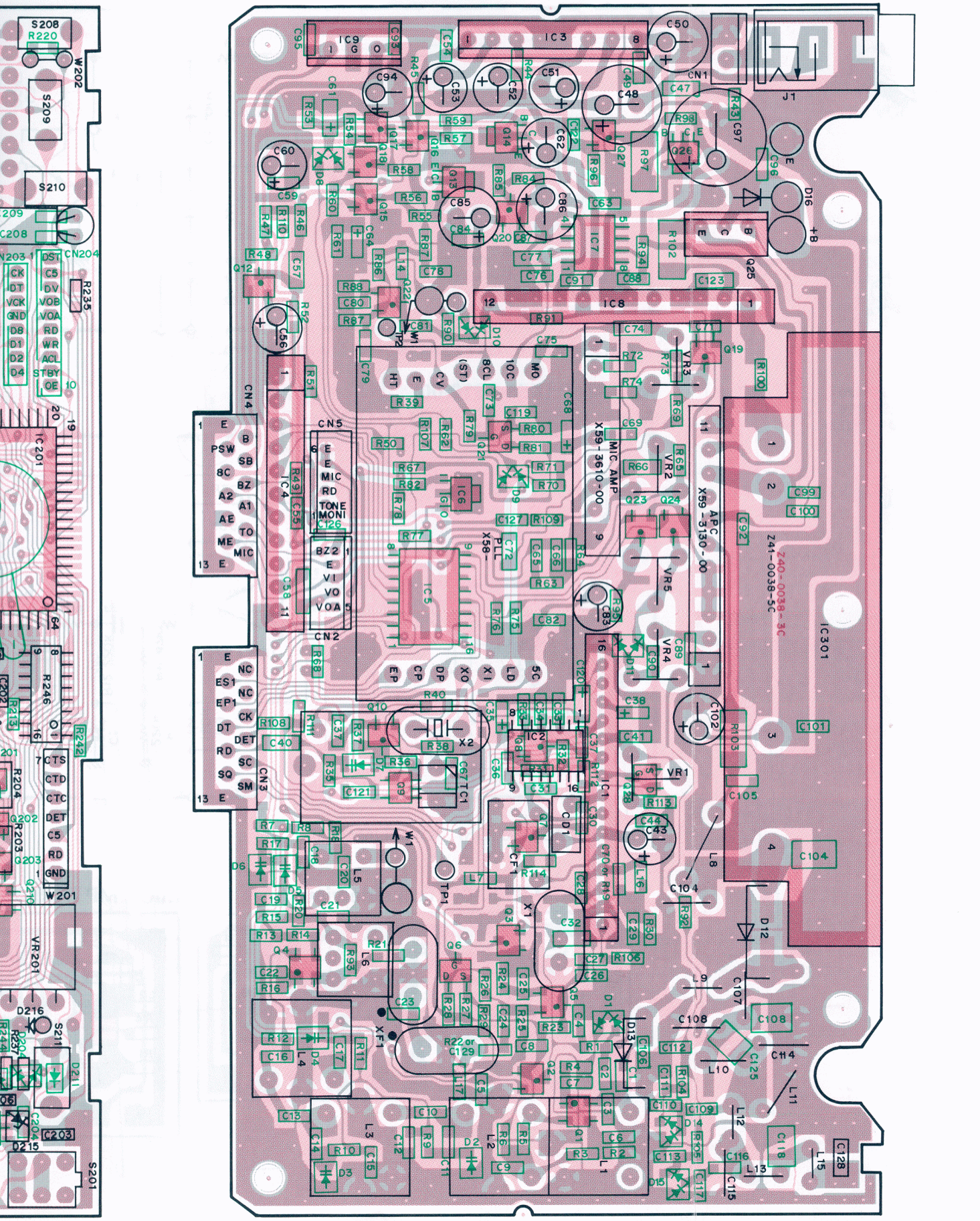


E PC BOARD VIEWS

Cont. de la página 44

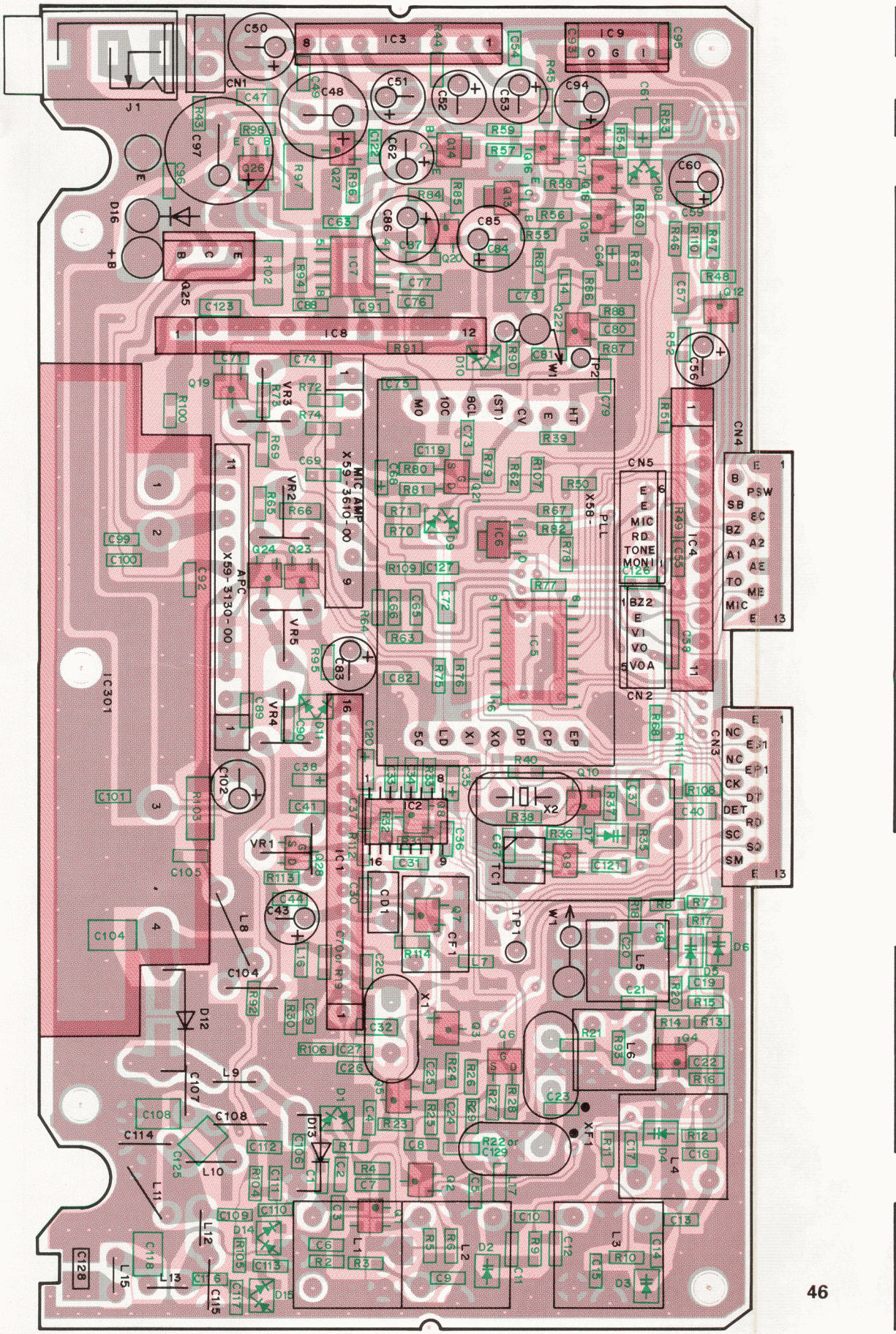
69X-XX) Component side view

K2,P2 0-21 : M 0-22 : M2,M3 2-71 : E,E9,EM 2-72 : E2

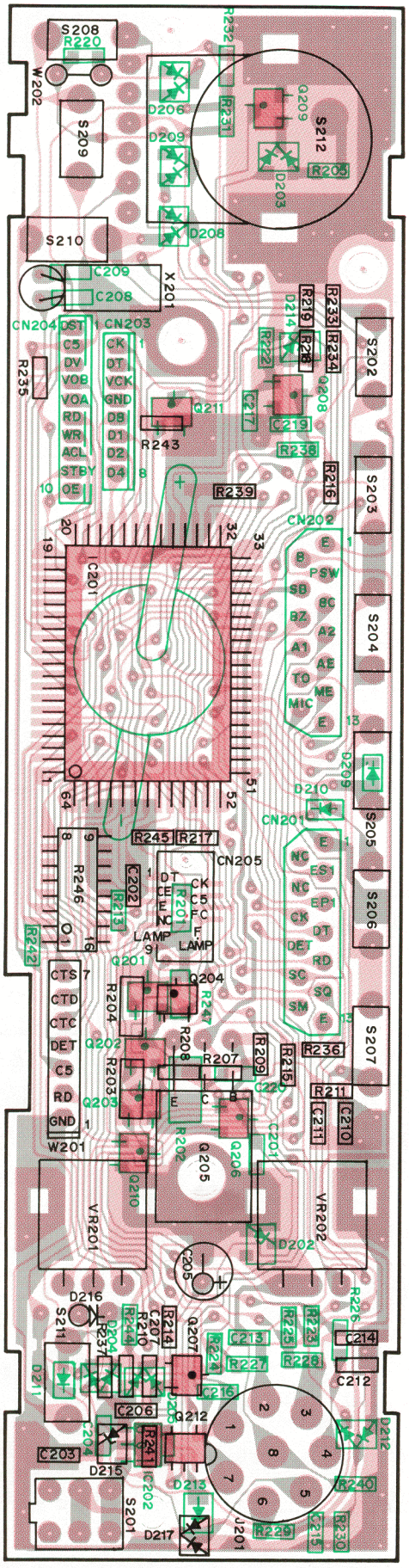


TX-RX UNIT (X57-369X-XX) Foil side view

0-11 : K,P,X 0-12 : K2,P2 0-21 : M 0-22 : M2,M3 2-71 : E,E9,EM 2-72 : E2



2-72 : E2

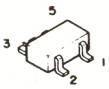


2SA1519
2SC2712
2SC2714
2SD1757K
DTA114YK
DTC114EK

DTC123JK
DTC124EK
DTC143EK
DTC144WK
DTD143EK



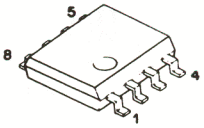
FMG2



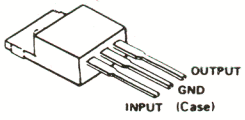
2SK208
2SJ106



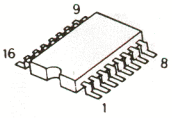
LA5010M



MC7808CT



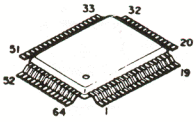
TA7787AF



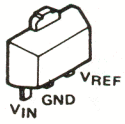
2SB1119
2SB1302



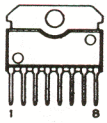
75116GF-E83-3BE
75116GF-J64-3BE



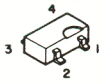
NJM78L05UA
NJM78L06UA



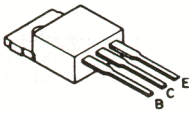
µPC1241H



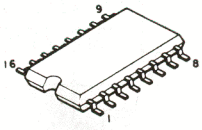
3SK131
3SK184



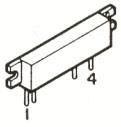
2SD1406
2SD1682



TC9174F

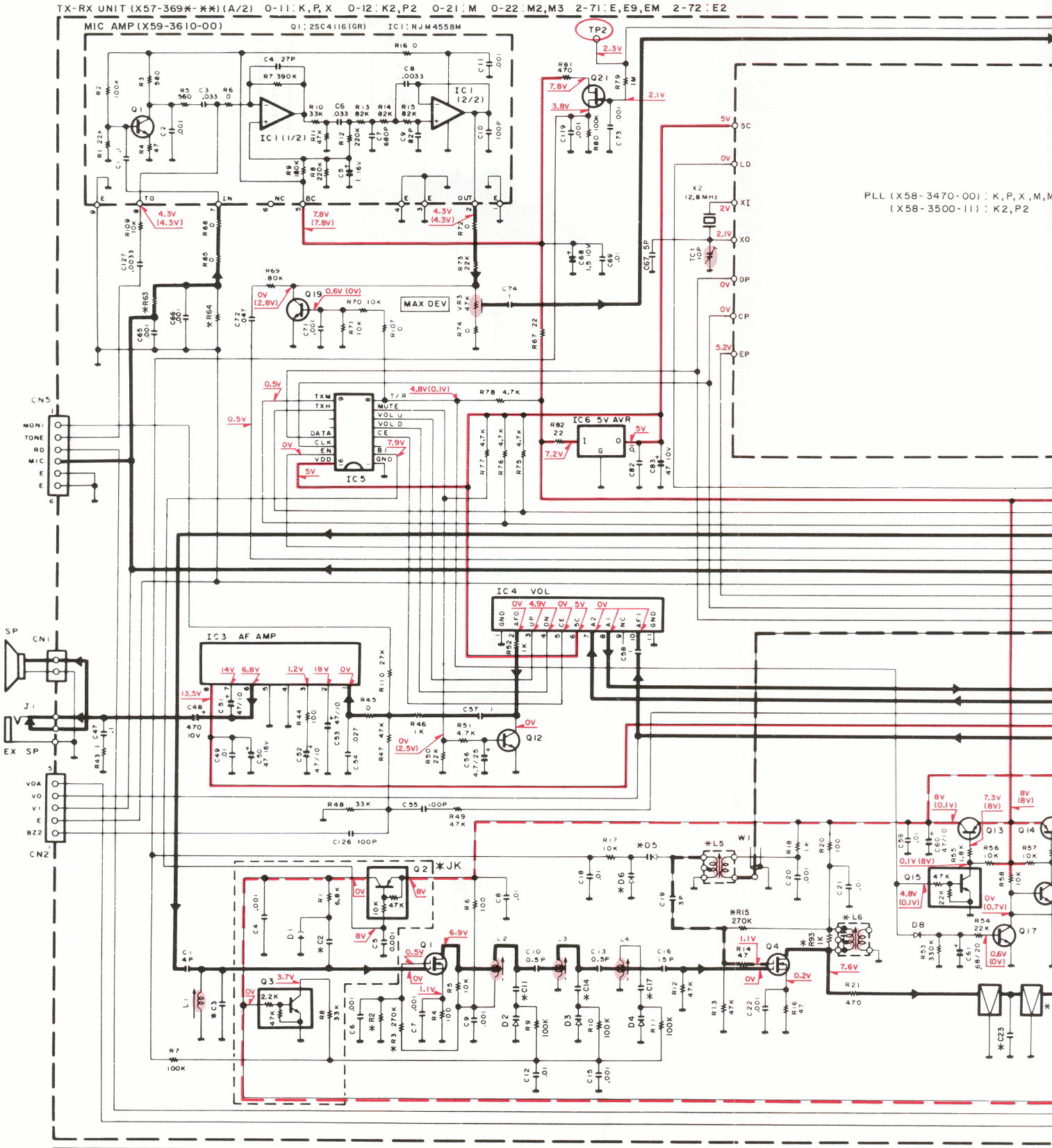


S-AV17



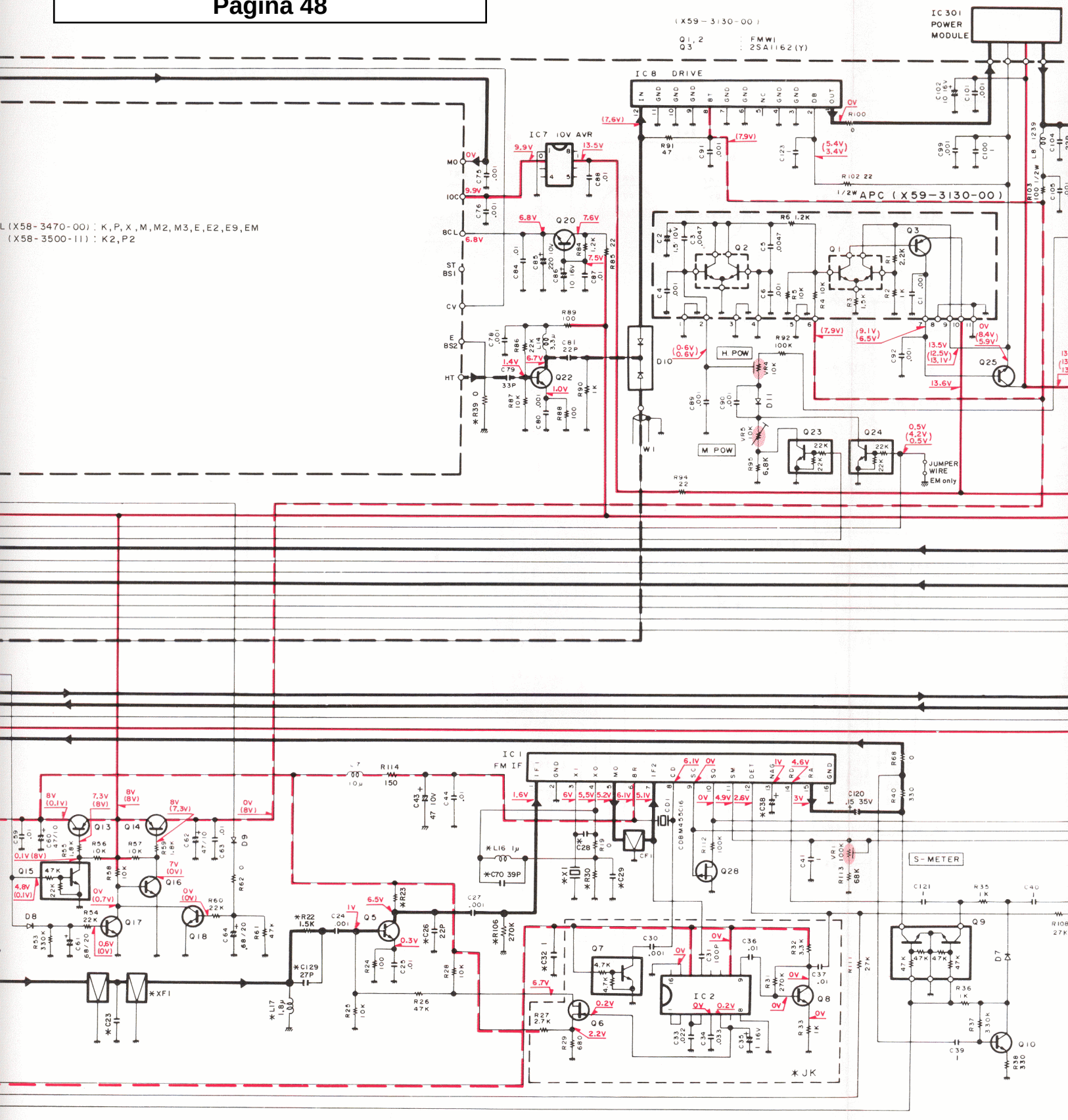
: Component side
: Foil side

Esquema TM241A/E (Part. 1 de 4)
Pagina 47



	X57-369X-XX	IC201 75116GF-XXX-3BE	D5,6	D206	D207	D208	D209	D210	W202	C2	C3	C11,14,17	C23	C26	C28	C29	C32	C38	C70,129	L5 L34-XXXX-05	L6	L16,17	X1 (MHz)	XF1 (MHz)	R2	R3,15,19,22	R23	R3
TM-241A K,P,X	0-11	E83	1SV164	YES	NO	NO	NO	NO	YES	6P	4P	47P	5P	YES	33P	150P	YES	0.68/20V	NO	0956	L30-0005-05	NO	10.245	10.7	22K	YES	470	15
TM-241A K2,P2	0-12	J64	1SV166	YES	YES	YES	YES	NO	YES	5P	4P	68P	8P	NO	10P	0.001	YES	0.22/35V	YES	4113	L34-2157-05	YES	30.37	30.825	0	NO	1K	10
TM-241A M	0-21	E83	1SV164	YES	NO	NO	YES	NO	YES	NO	7P	47P	5P	YES	33P	150P	NO	0.68/20V	NO	0956	L30-0005-05	NO	10.245	10.7	22K	YES	470	15
TM-241A M2,M3	0-22	E83	1SV164	YES	YES	NO	YES	NO	NO	NO	7P	47P	5P	YES	33P	150P	NO	0.68/20V	NO	0956	L30-0005-05	NO	10.245	10.7	22K	YES	470	15
TM-241E E,E9,EM	2-71	E83	1SV164	YES	YES	NO	YES	YES	YES	NO	7P	47P	5P	YES	33P	150P	NO	0.68/20V	NO	0956	L30-0005-05	NO	10.245	10.7	22K	YES	470	15
TM-241E E2	2-72	E83	1SV164	NO	YES	NO	YES	YES	NO	NO	7P	47P	5P	YES	33P	150P	NO	0.68/20V	NO	0956	L30-0005-05	NO	10.245	10.7	22K	YES	470	15

Esquema TM241A/E (Part. 2 de 4)
Pagina 48

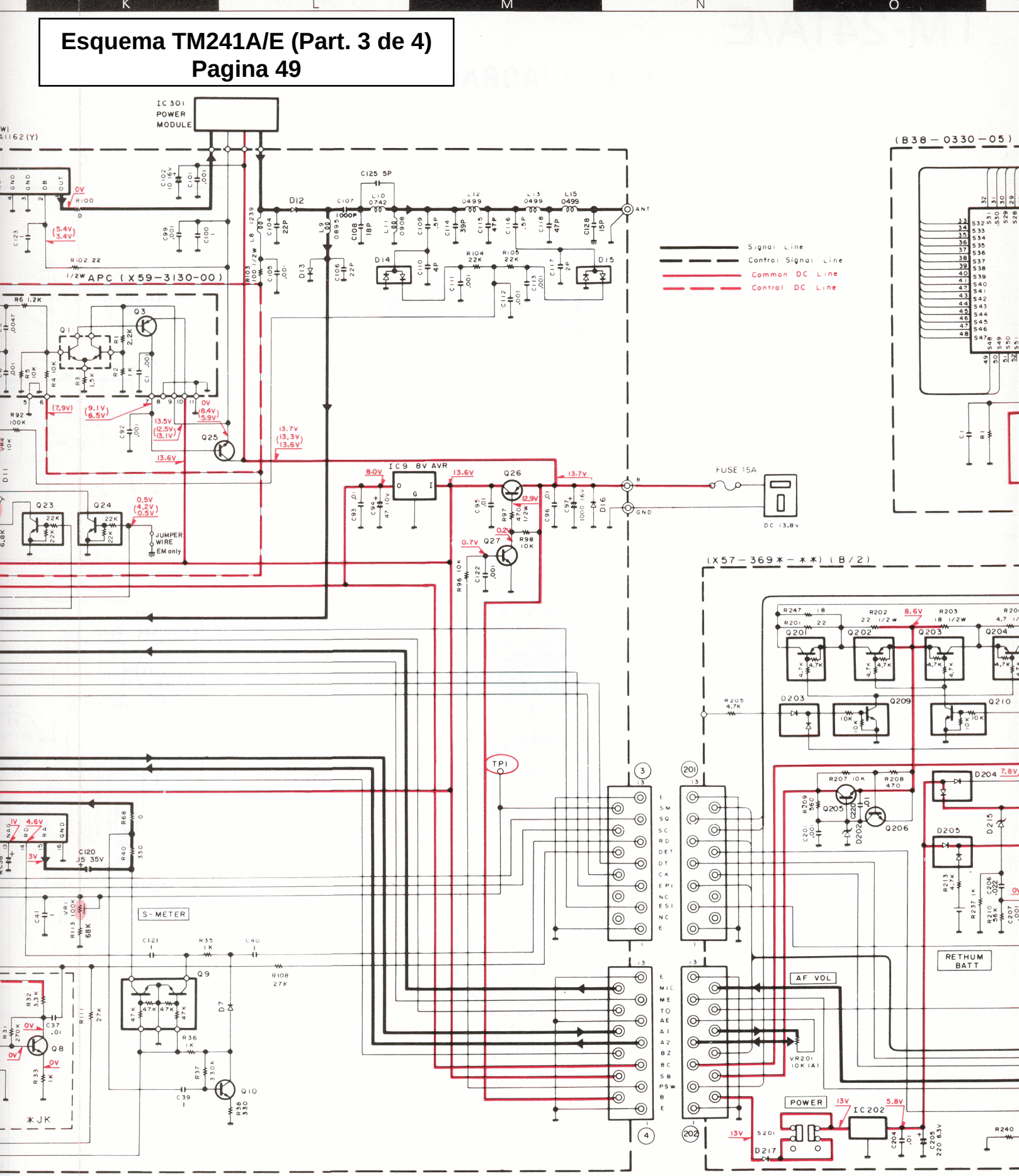


X1 (MHz)	XF1 (MHz)	R2	R3,15,19,22	R23	R30	R39	R63	R64	R93	R106	R220	JK
.245	10.7	22K	YES	470	15K	YES	3.3K	3.9K	NO	YES	NO	YES
.37	30.825	0	NO	1K	10K	NO	3.3K	3.9K	YES	NO	NO	YES
.245	10.7	22K	YES	470	15K	YES	3.3K	3.9K	NO	YES	NO	NO
.245	10.7	22K	YES	470	15K	YES	3.3K	3.9K	NO	YES	YES	NO
.245	10.7	22K	YES	470	15K	YES	1K	56K	NO	YES	NO	NO
.245	10.7	22K	YES	470	15K	YES	1K	56K	NO	YES	NO	NO

IC1 : KCD04
IC2 : TA7787AF
IC3 : UPC1241H
IC4 : KCC02
IC5 : TC9174F
IC6 : NJM78L05UA
IC7 : LA5010M
IC8 : KCB05
IC9 : MC7808CT
IC301 : S-AV17

Q1 : 3SK184 (S)
Q2 : DTA114YK
Q3 : DTC123JK
Q4 : 3SK131 (L)
Q5,22 : 2SC2714 (Y)
Q6,21 : 2SK208 (Y)
Q7 Q8,10 Q9 Q12,1 Q13,1 Q15

Esquema TM241A/E (Part. 3 de 4)
Pagina 49



: KCD04
: TA7787AF
: UPC1241H
: KCC02
: TC9174F
: NJM78L05UA

IC7 : LA5010M
IC8 : KCB05
IC9 : MC7808CT
IC301 : S-AV17

Q1 : 3SK184 (S)
Q2 : DTA114YK
Q3 : DTC123JK
Q4 : 3SK131 (L)
Q5,22 : 2SC2714 (Y)
Q6,21 : 2SK208 (Y)

Q7 : DTC143EK
Q8,10,16~18,20,27 : 2SC2712 (Y)
Q9 : FMG2
Q12,19 : 2SD1757K
Q13,14 : 2SB1119 (S)
Q15 : DTC144WK

Q23,24 : DTC124EK
Q25 : 2SD1406 (Y)
Q26 : 2SB1302 (S)
Q28 : 2SJ106 (GR)

D1,10 : DAN235K
D2~6 : 1SV164
D7 : LFB01
D8,9 : 1SS184
D11 : 1SS181
D13 : MI308

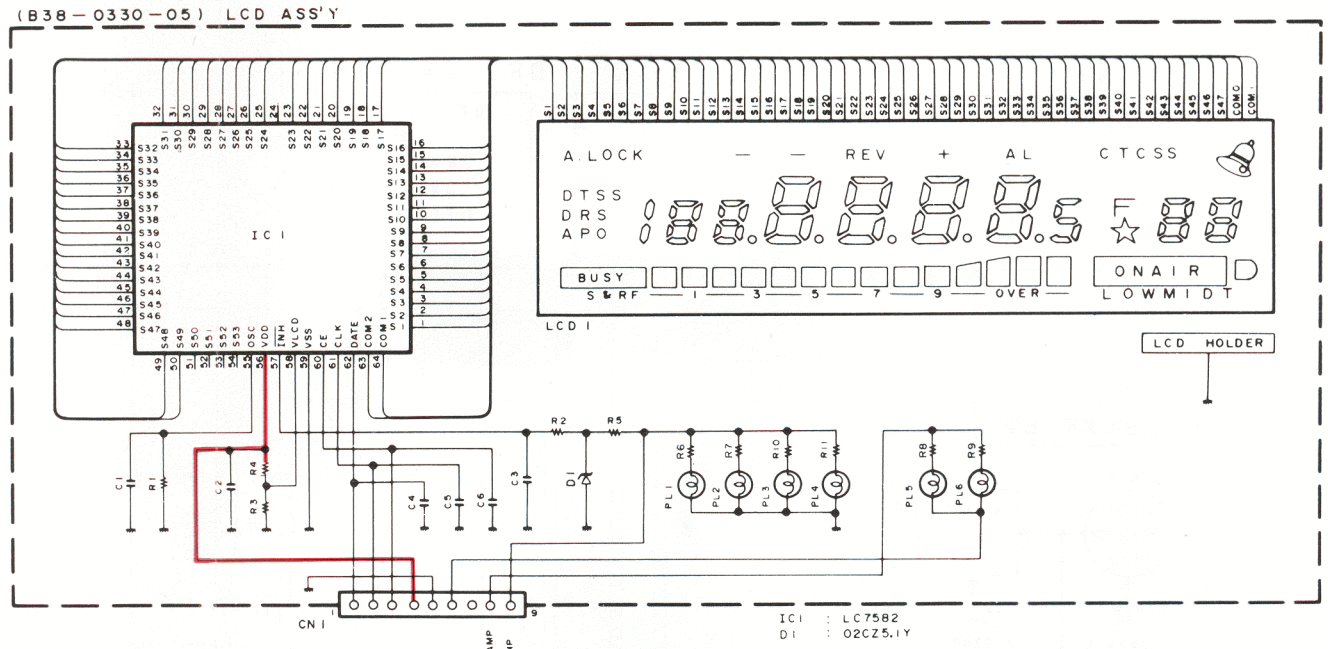
D14,15 : 1SS226
D16 : DSA3A1
D12 : MI407

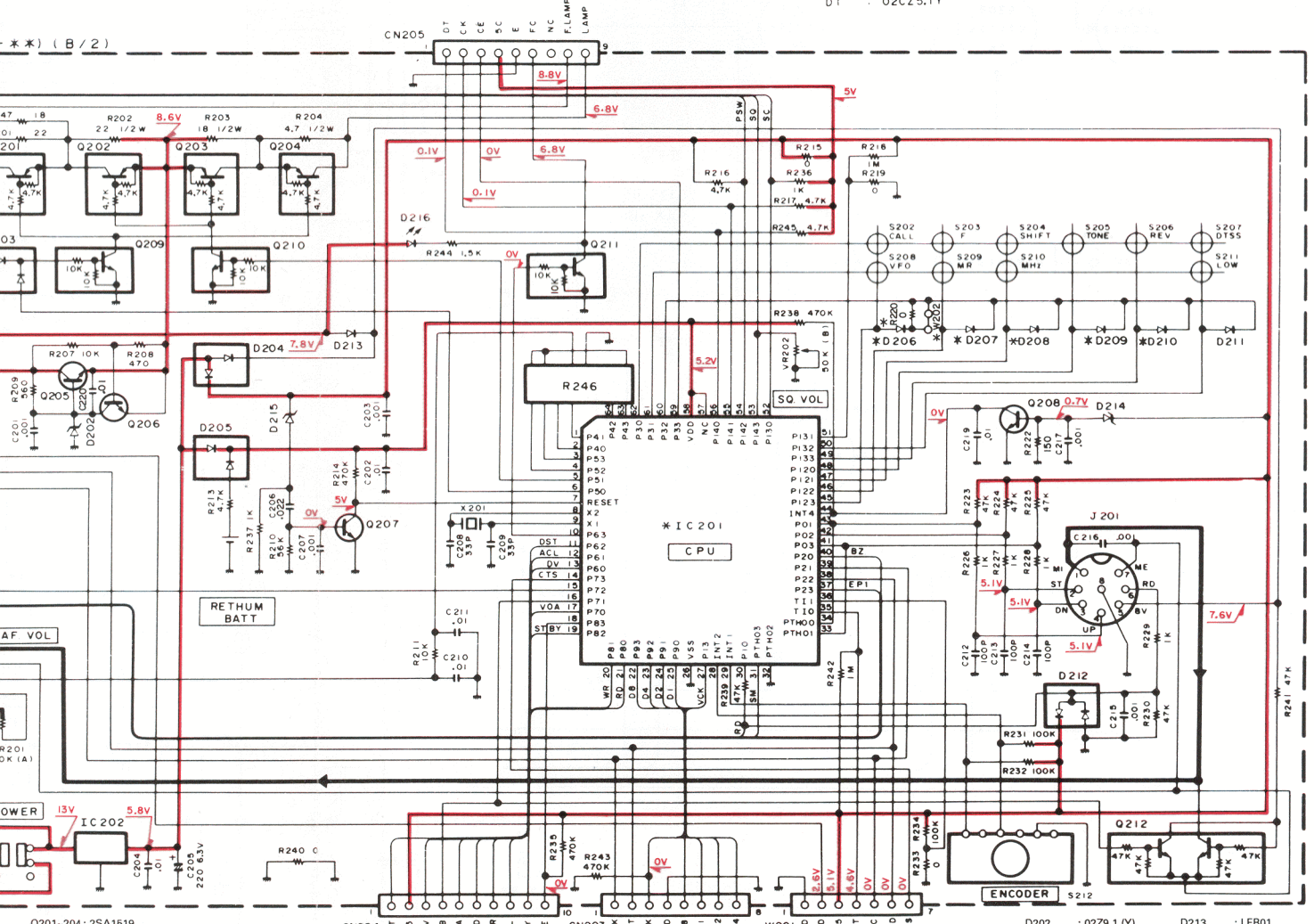
IC201 : *
IC202 : NJM78L06UA

Q201~204 : 2SA1519
Q205 : 2SD1682 (R,S)
Q206~208 : 2SC2712 (Y)
Q209,210 : DTC114EK
Q211 : DTD143EK
Q212 : FMG2

Esquema TM241A/E (Part. 4 de 4)
Pagina 50

SCHEMATIC DIAGRAM TM-2

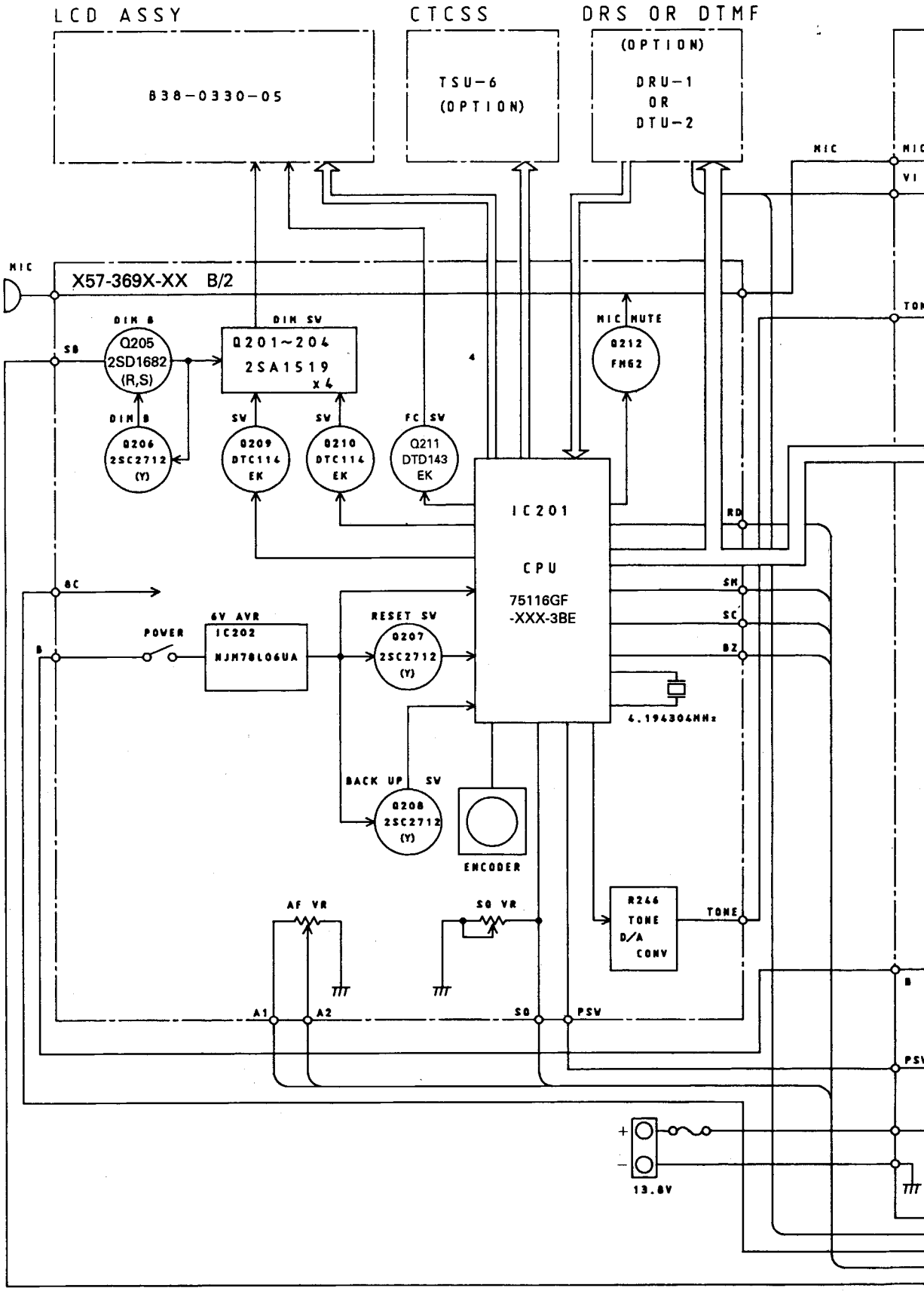




Q201~204 : 2SA1519
Q205 : 2SD1682 (R,S)
Q206~208 : 2SC2712 (Y)
Q209,210 : DTC114EK
Q211 : DTD143EK
Q212 : FMG2

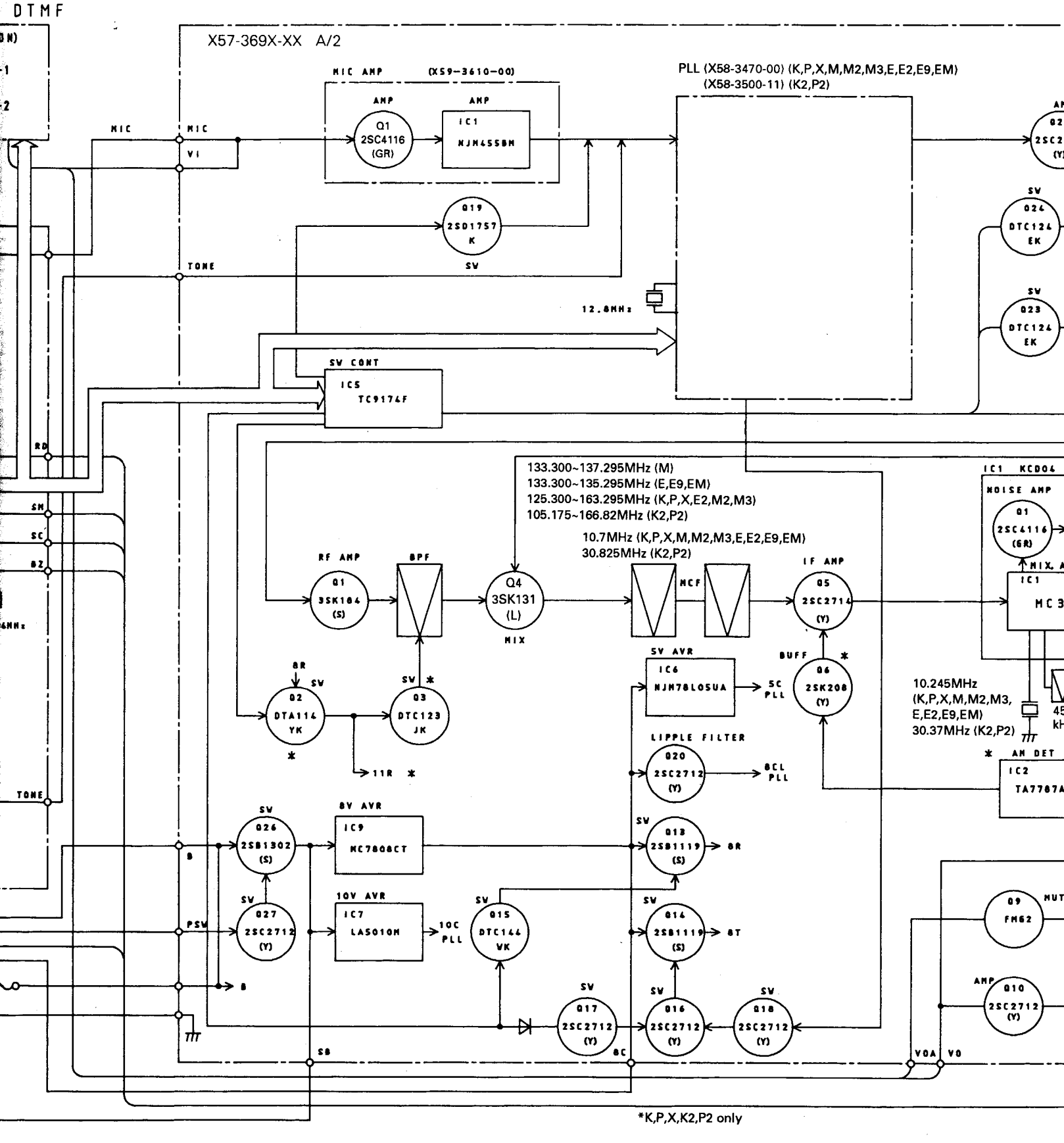
D202 : 02Z9.1 (Y)
D203,205~208,217 : 1SS184
D204 : 1SS181
D209~211 : MA141A
D212 : 1SS226
D213 : LFB01
D214 : 02CZ3.9 (Z)
D215 : 02CZ3.0 (Z)
D216 : B30-0852-05

BLOCK DIAGRAM
1 de 3

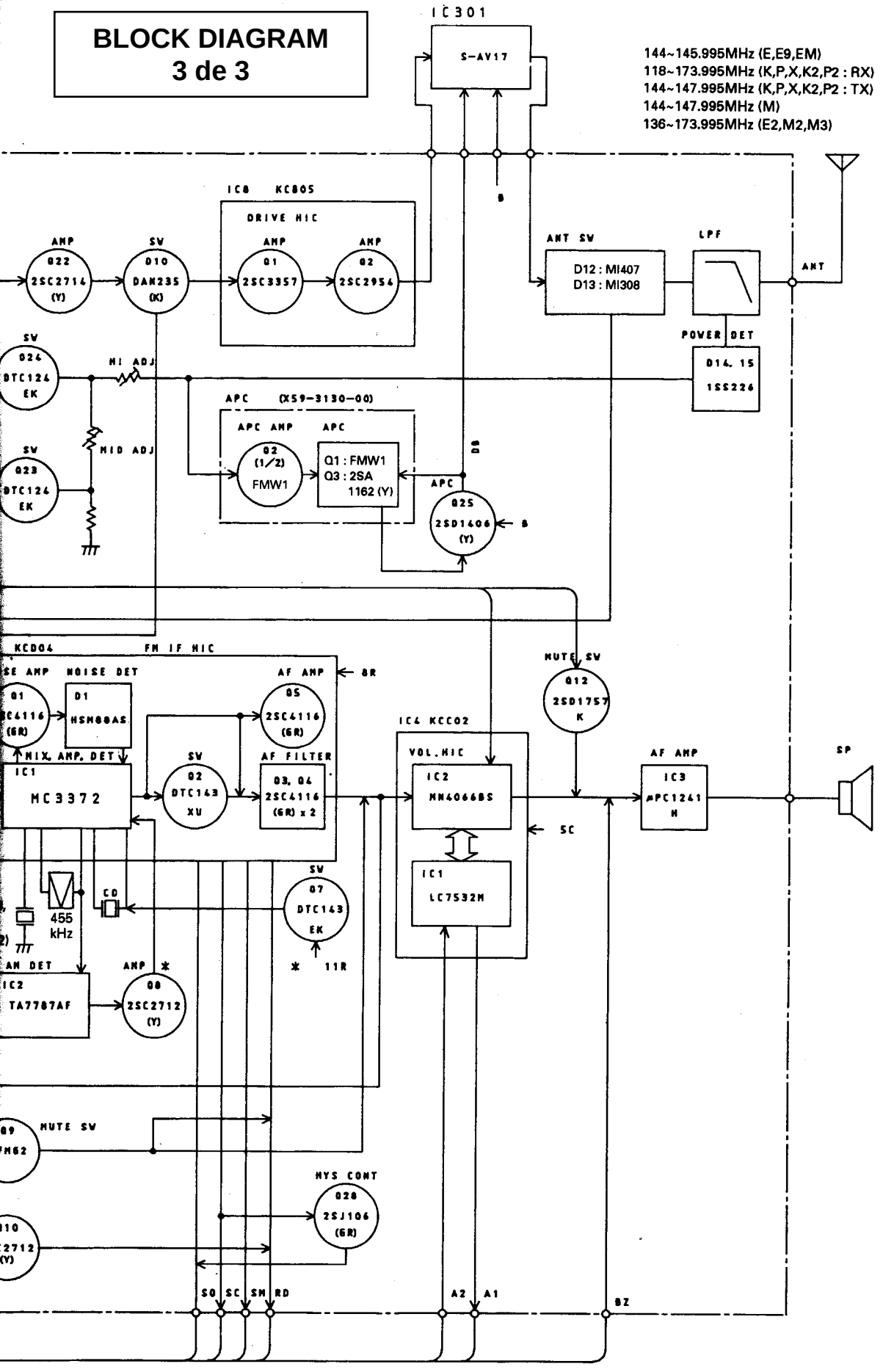


BLOCK DIAGRAM
2 de 3

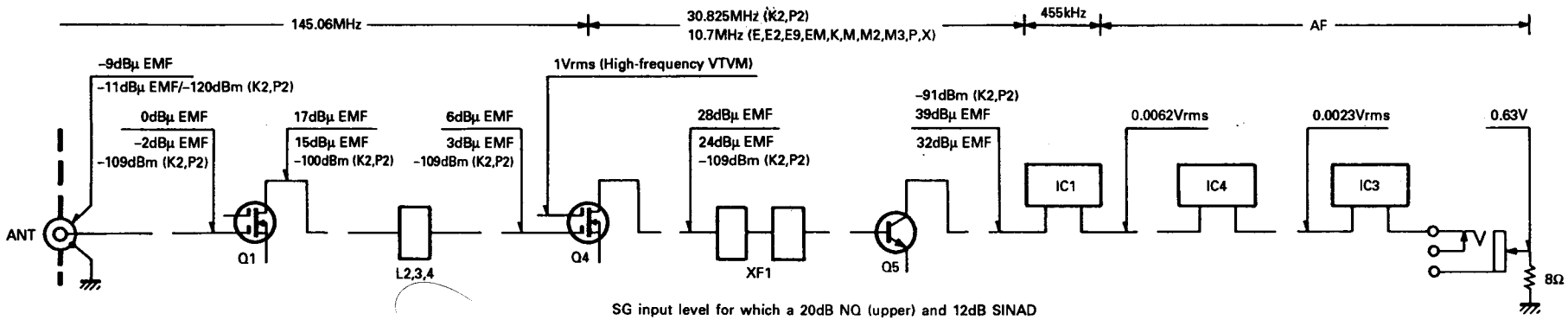
BLOCK DIAGRAM



BLOCK DIAGRAM
3 de 3



Receiver section

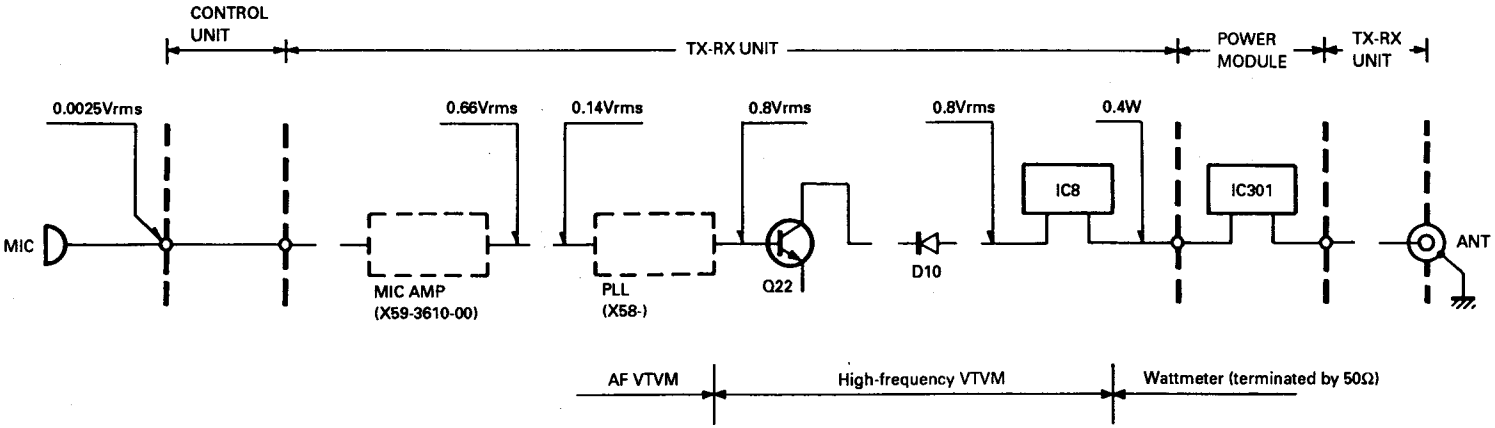


SG input level for which a 20dB NQ (upper) and 12dB SINAD (lower) are obtained. Measured by connecting the SG to each poit via a 0.01μF capacitor.

AF VTVM

AF level obtained when the AF output level is adjusted for 0.63V/8Ω with the front panel AF VOL control. Measured with AF voltmeter connected to the external speaker jack, receiving a 40dB EMF SSG signal modulated at 1kHz, DEV 3kHz.

Transmitter section



1. AG is set so that MIC input becomes 3kHz DEV at 1kHz MOD.
2. Transmitting frequency : 145.06MHz.

DRU-1 (DIGITAL RECORDING UNIT)

DRU-1 CIRCUIT DESCRIPTION

1. Overview

The DRU-1 is a digital recording and playback unit designed to be installed inside the TM-241 A/E series. This unit has the following features:

- Recording received audio (for output to the internal speaker) or transmit audio (microphone input)
- Outputting recorded audio to the internal speaker or outputting recorded audio as modulating signals during transmission
- Built-in lithium battery back-up for maintaining DRU-1 contents
- DTSS and paging code reception.

2. Operations

• Recording received audio (for output to the internal speaker)

A received signal from the VO pin is fed into pin 1 (0Y) of the multiplexer IC1 (TC4052BF). It is then fed into pin 59 (MIC IN) of IC3 (TC8830AF) via pin 3 (Y). The signal is amplified approx. 26dB by a mic amplifier in IC3, and output via pin 60 (C1). The signal from pin 60 is fed into pin 63 (C2) and amplified approx. 20dB. The amplified signal is applied to pin 64 (MIC OUT) and pin 65 (ADI).

• Recording transmit audio (microphone input)

Microphone input from the VI pin is amplified by Q5, and fed into pin 2 (2Y) of the multiplexer IC1 (TC4052BF). It is then supplied to IC3 (TC8830AF) via pin 3 (Y) and recorded in the same way as in recording received sound.

• Outputting recorded audio to the internal speaker

D/A convertor output from pin 66 (DAO) of IC3 (TC8830AF) is passed through a CR filter, and amplified by Q6. The amplified signal is then fed into pin 13 (X) of the multiplexer IC1 (TC4052BF), and output to the VO pin via pin 14 (1X).

• Outputting recorded audio as modulating signals during transmission

When sound recorded in the DRU-1 is played during transmission, the same operations as written above in outputting recorded audio to the internal speaker occur. That is, D/A convertor output from pin 66 (DAO) of IC3 (TC8830AF) is passed through a CR filter, amplified by Q6, and fed into pin 13 (X) of the multiplexer IC1 (TC4052BF). The sound, however, is output via pin 11 (3X).

	VOA (pin 10)	VOB (pin 9)	On channel
Output to speaker	H	L	1X (pin 14)
Output during transmission	H	H	3X (pin 11)
Received audio recording	L	L	0Y (pin 1)
Transmit aidop recording	L	H	2Y (pin 2)

Table 1 IC1 : TC4052BF operations

• DTSS and paging code reception

The DTMF signal input from the VO pin is amplified by Q1 and input to pin 12 of DTMF decoder IC2 (LR4102N). When the DTMF signal is input to IC2, pin 20 (DV pin) is made high. A DTMF code is then output to pins 1 (D1), 24 (D2), 23 (D4), and 22 (D8) of IC2. The CPU can receive the DTMF signal by detecting the DTMF signal input from the DV pin and reading D1, D2, D4, and D8 data.

DRU-1 DESCRIPTION OF COMPONENTS

ACCESSORY UNIT (X42-3010-00)

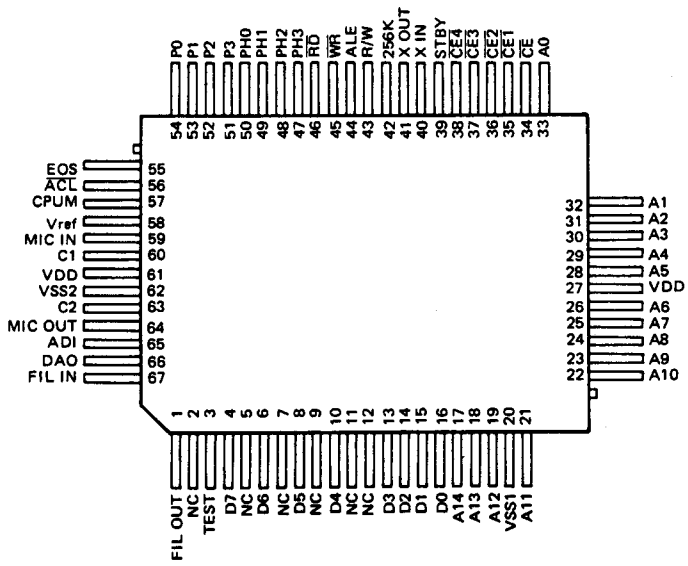
Component	Use/Function	Description
IC1	Multiplexer	See DRU-1 circuit description.
IC2	DTMF decode	
IC3	Audio recording and playback	See DRU-1 semiconductor data.
IC4~7	S-RAM	
Q1	AF amplification	Recieve DTMF input amplification.
Q2	AF amplification	DTMF (from MIC) input amplification.
Q3	AF amplification	BEEP.
Q4	Switch	BEEP AMP.
Q5	AF amplification	Mic input amplification.
Q6	AF amplification	Playback sound amplification.
Q7	Switch	ACL line.
D1	Reverse current prevention	
D2	Reverse current prevention	Back-up.

DRU-1 (DIGITAL RECORDING UNIT)

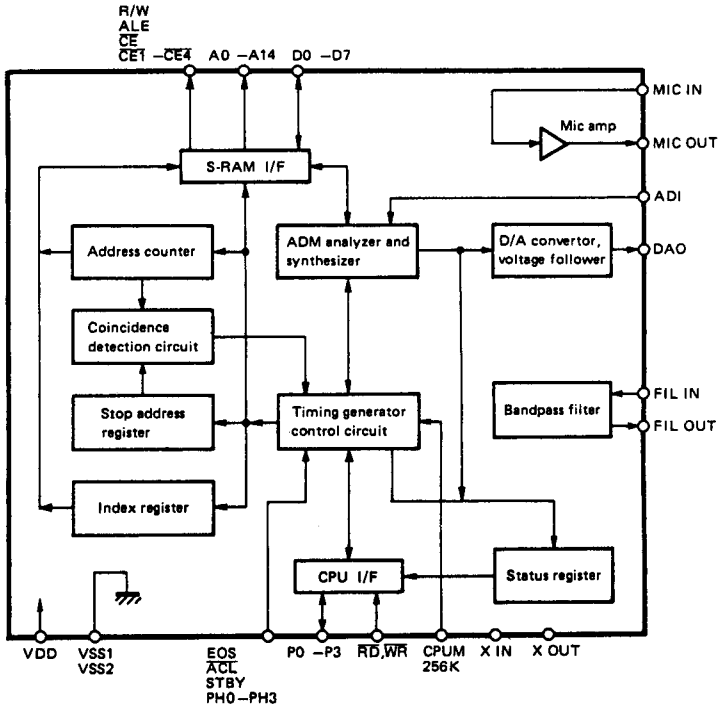
DRU-1 SEMICONDUCTOR DATA

1. Audio recording and playback : TC8830AF (IC3)

• **Terminal connection diagram**



• **Block diagram**



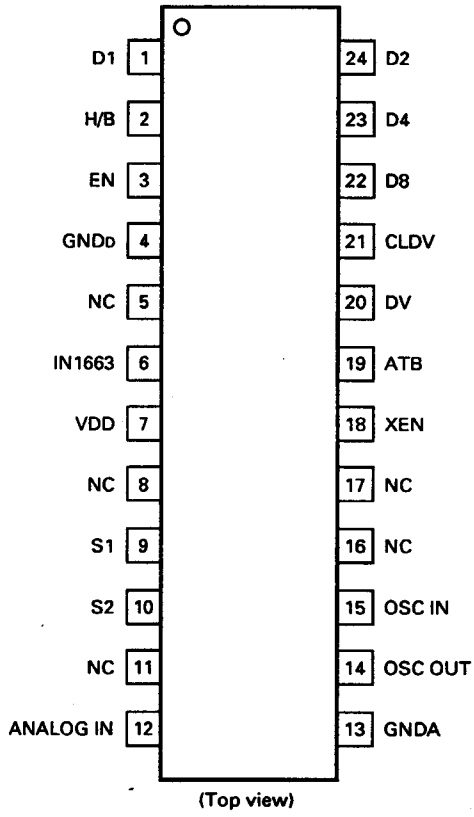
• **Terminal functions**

Pin No.	Pin name	I/O	Function	Pin No.	Pin name	I/O	Function
1	FIL OUT	O	Not used.	41	X OUT	O	512kHz oscillation circuit.
2	NC	–	Not connected.	42	256K	I	64K/256K RAM select,
3	TEST	–	Not used.				"H" when 256K used.
4	D7	I/O	RAM data I/O.	43	R/W	O	RAM read/write output.
5	NC	–	Not connected.	44	ALE	–	Not used.
6	D6	I/O	RAM data I/O.	45	$\overline{WR}$	I	Write pulse input.
7	NC	–	Not connected.	46	$\overline{RD}$	I	Read pulse input.
8	D5	I/O	RAM data I/O.	47~50	PH3~PH0	–	Not used.
9	NC	–	Not connected.	51~54	P3~P0	I/O	Data bus.
10	D4	I/O	RAM data I/O.	55	EOS	–	Not used.
11,12	NC	–	Not connected.	56	$\overline{ACL}$	I	Reset signal input.
13~16	D3~D0	I/O	RAM data I/O.	57	CPUM	I	"H" when CPU control enabled.
17~19	A14~A12	O	RAM address output.	58	Vref	O	Analog circuit reference voltage output.
20	V_{SS1}	–	GND.	59	MIC IN	I	Mic amp. 1 input.
21~26	A11~A6	O	RAM address output.	60	C1	O	Mic amp. 1 output.
27	V_{DD}	–	Power supply.	61	V_{DD}	–	Power supply.
28~33	A5~A0	O	RAM address output.	62	V_{SS2}	–	GND.
34	$\overline{CE}$	–	Not used.	63	C2	I	Mic amp. 2 input.
35~38	$\overline{CE1}$~$\overline{CE4}$	O	RAM chip enable.	64	MIC OUT	O	Mic amp. 2 output.
39	STBY	I	Minimum current standby when standby	65	ADI	I	Audio analysis circuit input.
			input is "H".	66	DAO	O	D/A convertor output.
40	X IN	I	512kHz oscillation circuit.	67	FIL IN	I	Not used.

DRU-1 (DIGITAL RECORDING UNIT)

2. DTMF decoder : LR4102N (IC2)

• Terminal connection diagram



(Top view)

• Terminal functions

Pin No.	Name	I/O	Function
1	D1	O	DTMF data output.
2	H/B	I	16 digit cord setting.
3	EN	I	Output enable.
4	GNDD	–	Digital GND (GND).
5	NC	–	NC
6	IN1633	I	Valid 1633Hz (GND).
7	VDD	–	Power supply.
8	NC	–	NC
9	S1	–	Bypass (Connected to ground by a 0.01µF capacitor).
10	S2	–	Bypass (Connected to ground by a 0.01µF capacitor).
11	NC	–	NC

Pin No.	Name	I/O	Function
12	ANALOG IN	I	DTMF signal input.
13	GNDA	–	Analog GND.
14	OSC OUT	O	X-tal output.
15	OSC IN	I	X-tal input.
16	NC	–	NC
17	NC	–	NC
18	XEN	I	X-tal enable.
19	ATB	O	NC
20	DV	O	Data varied.
21	CLDV	I	Data varied clear.
22	D8	O	DTMF data output.
23	D4	O	DTMF data output.
24	D2	O	DTMF data output.

DRU-1 (DIGITAL RECORDING UNIT)

DRU-1 PARTS LIST

* New Parts
Parts without Parts No. are not supplied.
Les articles non mentionnes dans le Parts No. ne sont pas fournis.
Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
DRU-1						
			B42-3317-04	LABEL		
-			B50-8290-00	INSTRUCTION MANUAL		
			G10-0666-04	NON-WOVEN FABRIC		
			G10-0679-04	NON-WOVEN FABRIC		
			G13-0913-04	FORMED PLATE		
-			H01-8249-03	ITEM CARTON BOX		
-			H03-2772-04	OUTER PACKING CASE		
-			H21-0704-04	PROTECTION SHEET		
-			H25-0029-04	PROTECTION BAG		
-			H25-0710-04	PROTECTION BAG		
			N87-2606-46	BRAZIER HEAD TAPTITE SCREW		
			X42-3010-00	ACCESSORY UNIT		
ACCESSORY UNIT (X42-3010-00)						
C1			CK73FB1H103K	CHIP C 0.010UF K		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CK73FF1E154Z	CHIP C 0.15UF Z		
C4 -6			CK73FB1H103K	CHIP C 0.010UF K		
C7			CK73EF1C105Z	CHIP C 1.0UF Z		
C8 -10			CK73FB1H103K	CHIP C 0.010UF K		
C11			CK73FF1E104Z	CHIP C 0.10UF Z		
C12			CK73FB1H103K	CHIP C 0.010UF K		
C14			CK73FB1H102K	CHIP C 1000PF K		
C15			CK73FF1E104Z	CHIP C 0.10UF Z		
C13			**CK73FB1H222K**	**CHIP C 2200PF K**		
C16			CK73FB1H103K	CHIP C 0.010UF K		
C17			CK73FF1E104Z	CHIP C 0.10UF Z		
C19			CK73FB1H103K	CHIP C 0.010UF K		
C20			CK73FB1H102K	CHIP C 1000PF K		
C21 ,22			CC73FSL1H101J	CHIP C 100PF J		
C23			CK73FB1H103K	CHIP C 0.010UF K		
C24			C92-0010-05	CHIP TAN 6.8UF 6.3WV		
C25			**CK73FF1E104Z**	CHIP C 0.10UF Z		
C26			**CK73FB1H333K**	CHIP C **0.033UF K**		
C27			CC73FSL1H101J	CHIP C 100PF J		
C28			**CK73EB1H104K**	CHIP C 0.10UF K		
C29			**C92-0005-05**	**CHIP TAN 2.2UF 6.3WV**		
CN1			E40-5207-05	PIN CONNECTOR		
CN2			E40-5206-05	PIN CONNECTOR		
CN3			E40-5181-05	PIN CONNECTOR		
W1			E31-6005-05	CONNECTING WIRE		
W2			E31-6006-05	CONNECTING WIRE		
W3			E31-6007-05	CONNECTING WIRE		
			F20-0520-04	INSULATING BOARD		
			F20-0521-04	INSULATING BOARD		
X1			L77-1398-05	CRYSTAL RESONATOR 3.579545MHZ		
X2			L78-0050-05	RESONATOR 512KHZ		
R1			RK73FB2A103J	CHIP R 10K J 1/10W		
R2			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R3			RK73FB2A103J	CHIP R 10K J 1/10W		
R4			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R5			RK73FB2A102J	CHIP R 1.0K J 1/10W		

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE : AAFES(Europe) X: Australia

⚠ indicates safety critical components.

DRU-1 (DIGITAL RECORDING UNIT)

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Telle ohne **Parts No.** werden nicht geliefert.

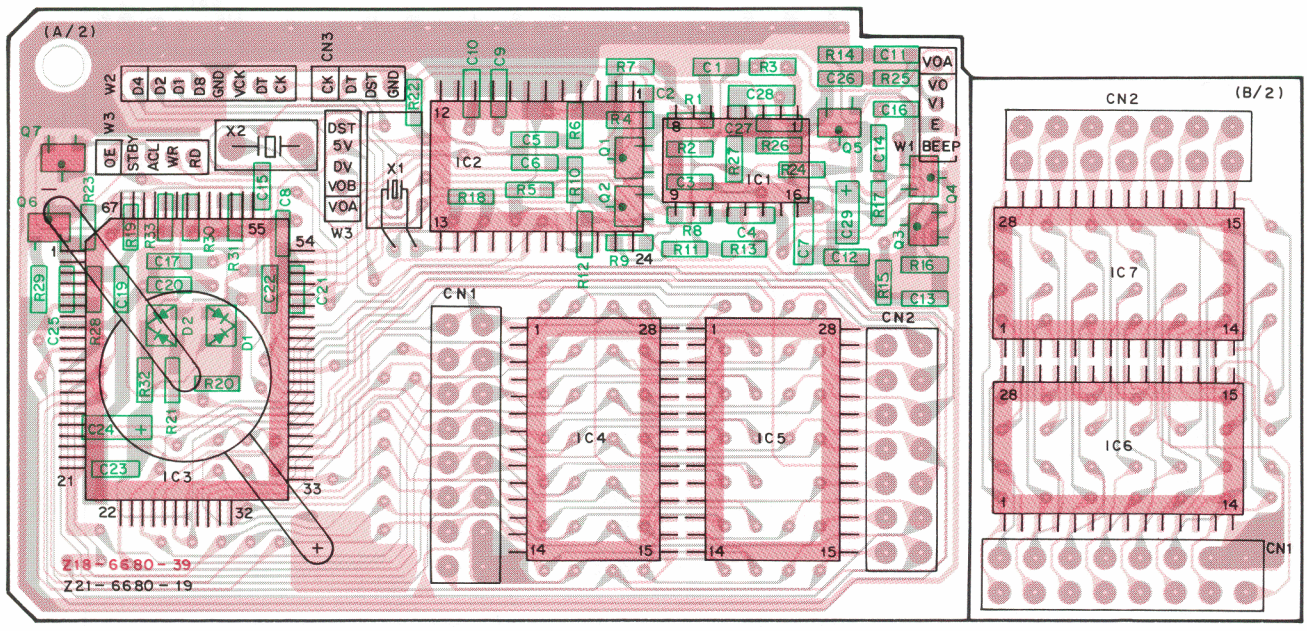
Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名／規格	Destination 仕向	Remarks 備考
R6			R92-0670-05	CHIP R 0 OHM		
R7			RK73FB2A223J	CHIP R 22K J 1/10W		
R8			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R9			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R10			R92-0670-05	CHIP R 0 OHM		
R11			RK73FB2A223J	CHIP R 22K J 1/10W		
R12,13			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R14			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R15			RK73FB2A104J	CHIP R 100K J 1/10W		
R16			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R17			RK73FB2A103J	CHIP R 10K J 1/10W		
R18			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R19			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R20			RK73FB2A104J	CHIP R 100K J 1/10W		
R21			RK73FB2A561J	CHIP R 560 J 1/10W		
R22			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R23			RK73FB2A564J	CHIP R 560K J 1/10W		
R24			RK73FB2A823J	CHIP R 82K J 1/10W		
R25			RK73FB2A223J	CHIP R 22K J 1/10W		
R26			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R27			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R28			RK73FB2A224J	CHIP R 220K J 1/10W		
R29 -31			R92-0670-05	CHIP R 0 OHM		
R32			RK73FB2A220J	CHIP R 22 J 1/10W		
R33			RK73FB2A394J	CHIP R 390K J 1/10W		
D1 ,2			1SS184	DIODE		
IC1			TC4052BF	IC(4CH MPX/DE-MPX)		
IC2			LR4102N	IC		
IC3			TC8830AF	IC		
IC4 -7			HM62256LFPI-12T	IC or HM62256LFP-12T		
Q1 -3			2SC2712(BL)	TRANSISTOR		
Q4			DTC144EK	DIGITAL TRANSISTOR		
Q5 ,6			2SC2712(BL)	TRANSISTOR		
Q7			DTC144WK	DIGITAL TRANSISTOR		
			W09-0326-05	LITHIUM BATTERY		

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE: AAFES(Europe) X: Australia

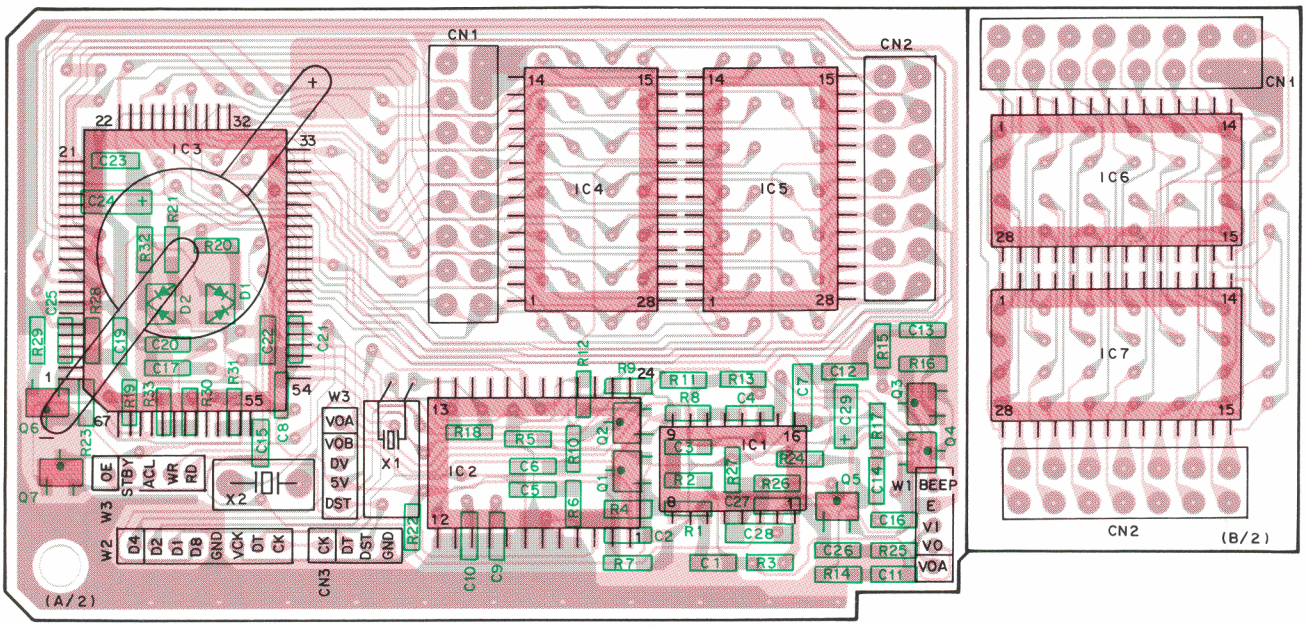
⚠ indicates safety critical components.

DRU-1 PC BOARD VIEWS

ACCESSORY UNIT (X42-3010-00) Component side view



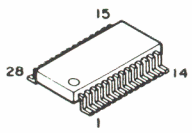
ACCESSORY UNIT (X42-3010-00) Foil side view



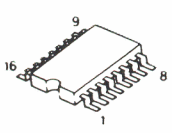
2SC2712
DTC144EK
DTC144WK



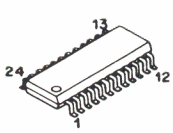
HM62256LFPI-12T



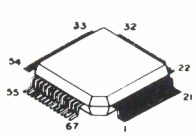
TC4052BF



LR4102N



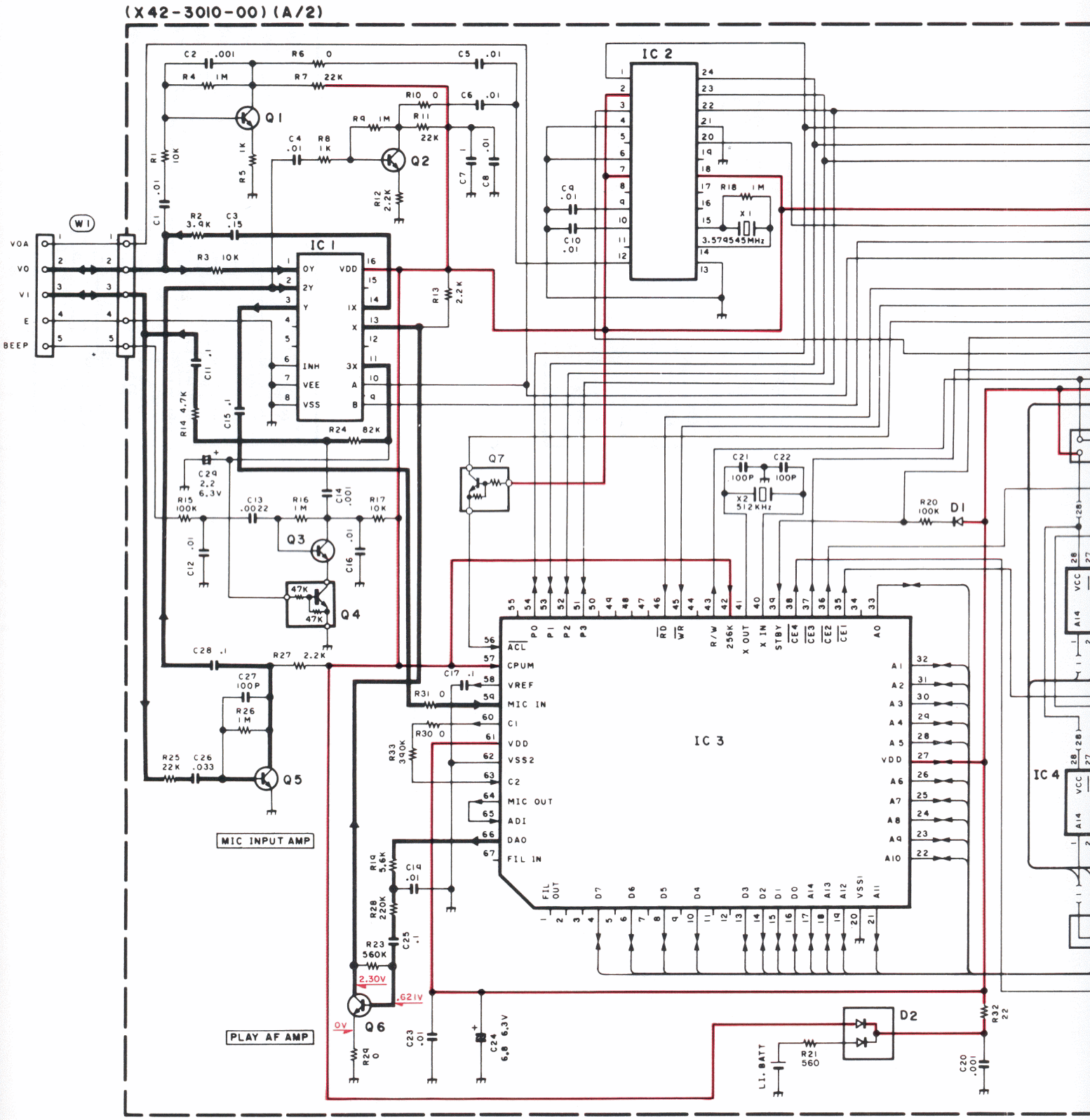
TC8830AF



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Esquema 1 de 2

DRU-1 SCHEMATIC DIAGRAM

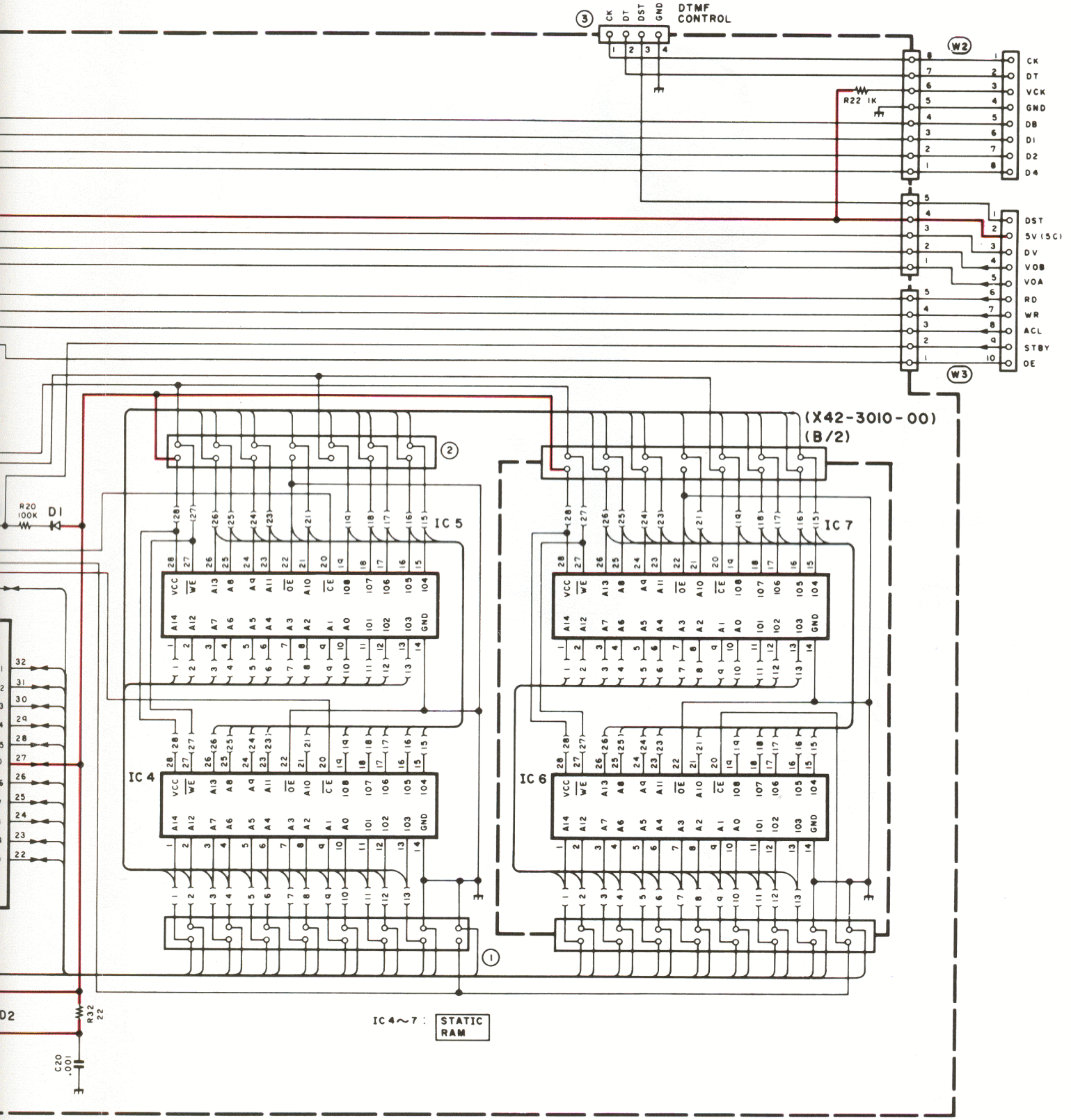
(X42-3010-00) (A/2)



IC1	: TC4052BF	Q1~3,5,6	: 2SC2712(BL)
IC2	: LR4102N	Q4	: DTC144EK
IC3	: TC8830AF	Q7	: DTC144WK
IC4~7	: HM62256LFPI-12T	D1,2	: 1SS184

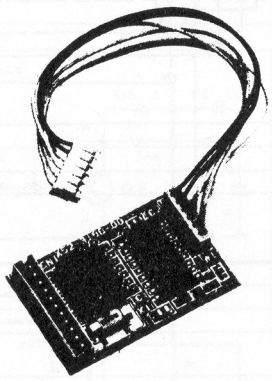
DRU-1 (DIGITAL RECORDING UNIT) TM-241A/E

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Esquema 2 de 2



DTU-2 (DTMF UNIT)

DTU-2 EXTERNAL VIEW



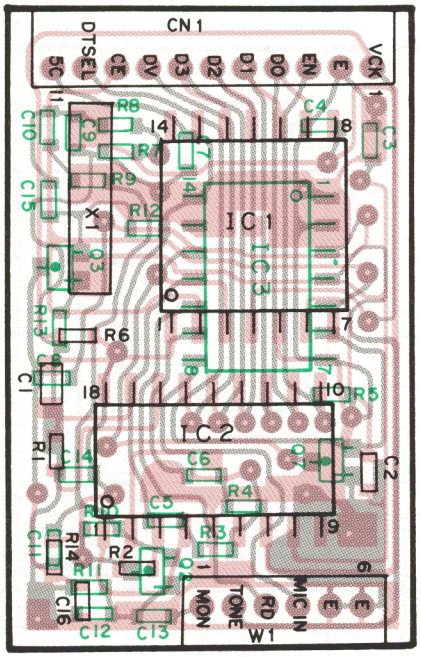
DTU-2 PARTS LIST

Re 5 No.	New Parts	Parts No.	Description
C1		CK73FB1E104K	Chip C 0.1 µF K
C2		CC73GCH1H100D	Chip C 10 pF D
C3,4		CC73GCH1H330J	Chip C 33 pF J
C5~8, 10		CK73GB1E103K	Chip C 0.01 µF K
C13~16		CK73GL1E103K	Chip C 0.01 µF K
C9		CK73GB1E822K	Chip C 0.0082 µF K
C11		CK73GB1E322K	Chip C 0.0033 µF K
C12		CC73GSL1H101J	Chip C 100 pF J
W1		E37-0033-05	Connecting cable (6P)
		E40-5188-05	Pin ass'y socket (11P)
X1		L78-0301-05	CERAMIC RESONATOR (3.58MHz) or L78-0302-05
R1~14		RK73GB1JxxxJ	Chip R
Q1		DTC114EU	Digial transistor
Q2,3		2SC4116 (Y)	Digital transistor
IC1		TP5088WM	IC
IC2		LC7385M	IC
IC3		XRU4066BCF	IC or BU4066BCF

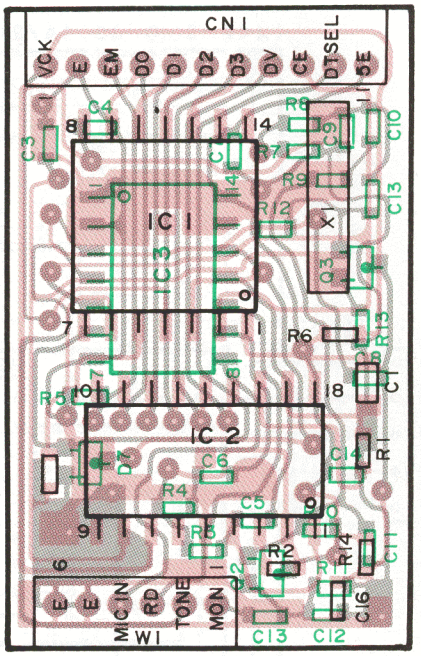
DTU-2 (DTMF UNIT)

DTU-2 PC BOARD

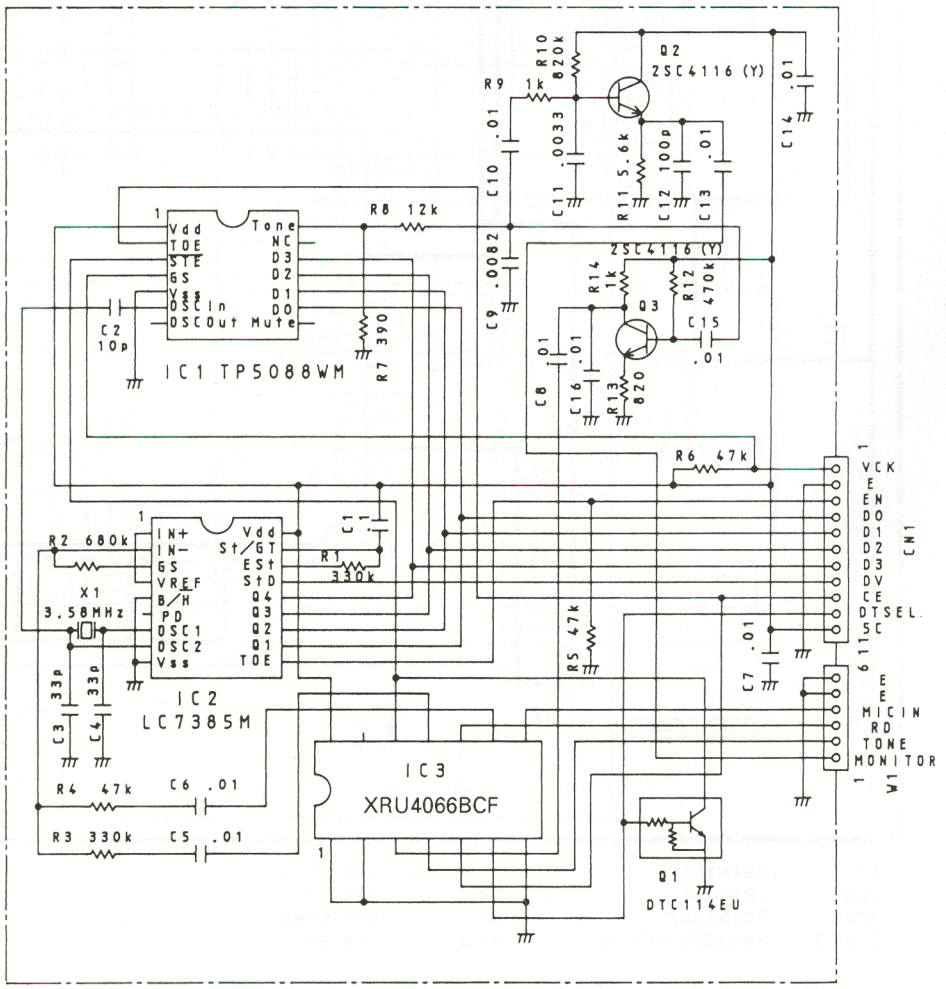
Component side view



Foil side view

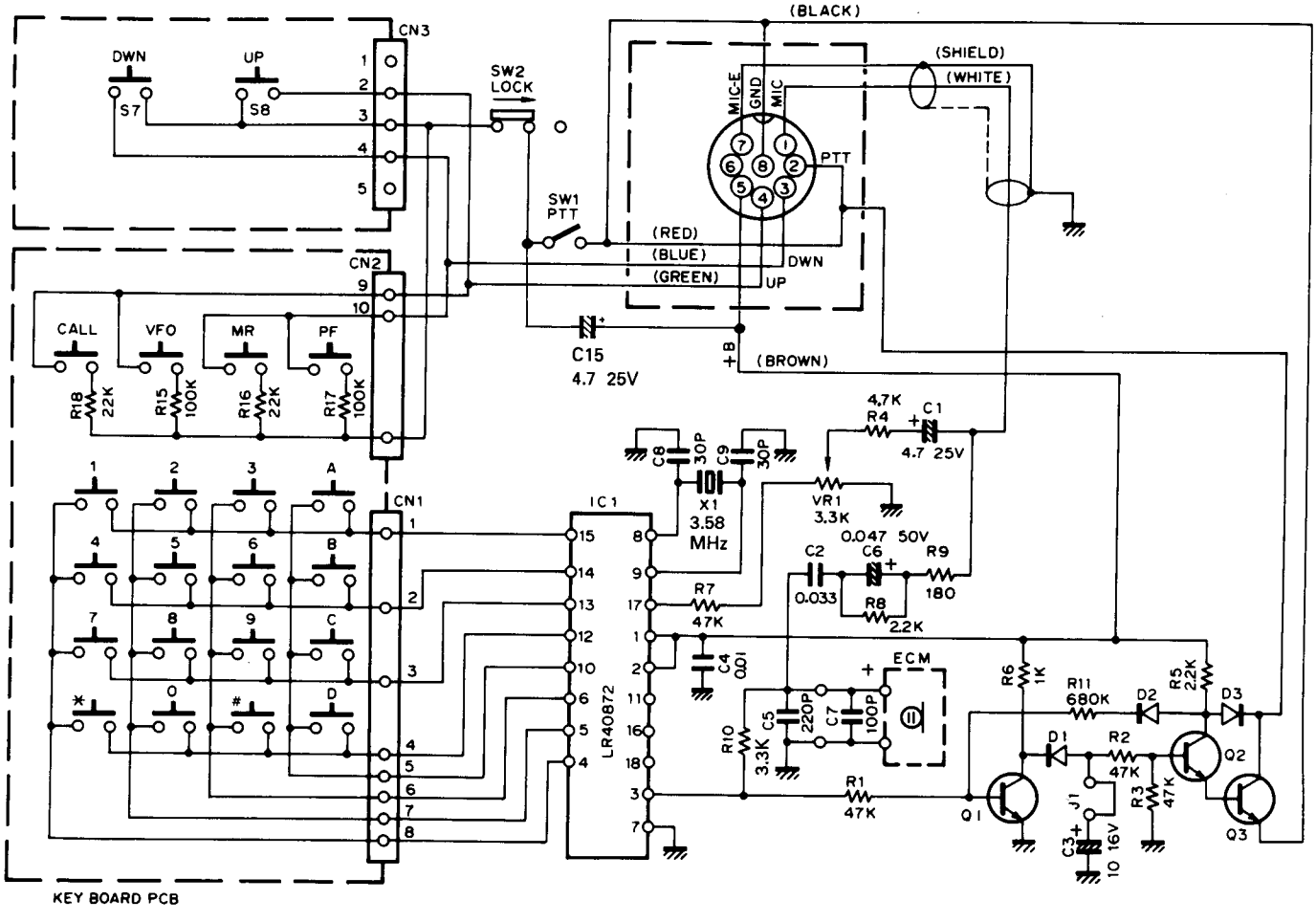


DTU-2 SCHEMATIC DIAGRAM



MC-44DM/44DME (MULTI FUNCTION MICROPHONE WITH AUTOPATCH)

MC-44DM/MC-44DME SCHEMATIC DIAGRAM

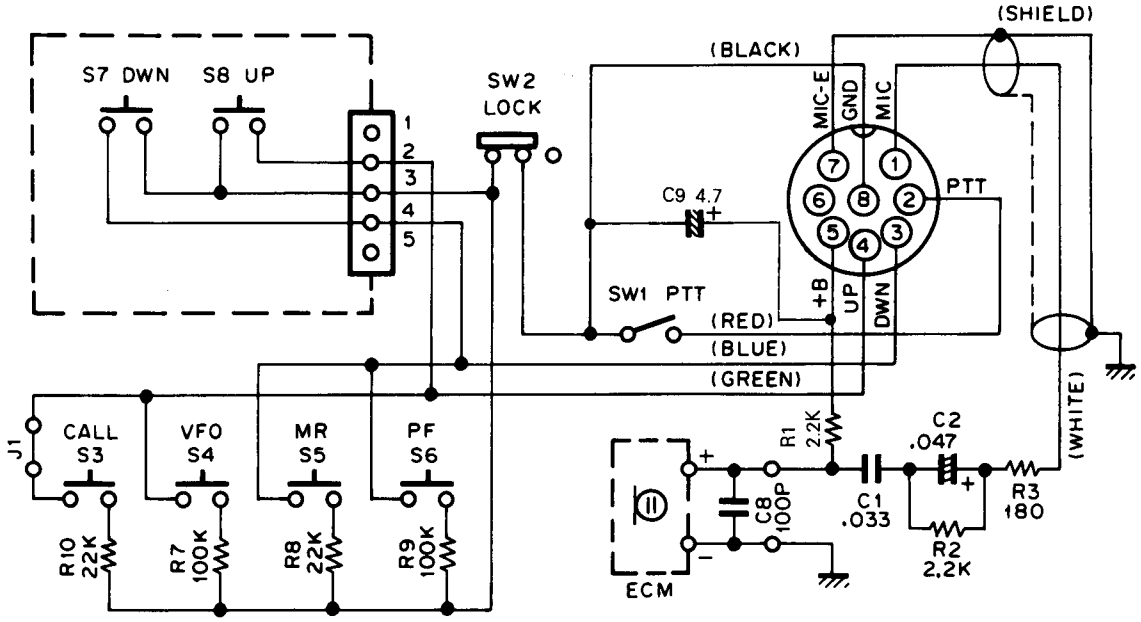


MC-44DM/MC-44DME PARTS LIST

Ref. No.	New parts	Parts No.	Description		
		A02-0898-18	Case (Front)	DTMF	M
		A02-0899-18	Case (Front)	DTMF (With TONE)	W
		A02-0901-08	Case (Rear)	DTMF	
		B50-8293-18	Instruction manual		W
		B50-8289-18	Instruction manual		M
		E30-2149-08	Curl cord		
		G13-0933-08	Cushion		
		K29-3165-08	Knob	PTT	
		K29-3167-18	Key top	DTMF	
		K29-3168-18	Knob	UP	
		K29-3169-18	Knob	DOWN	
SW2		S31-1422-08	Slide switch	LOCK	
SW1		S50-1431-08	Micro switch	PTT	
S7, 8		S59-1409-28	Switch	UP, DOWN	
		T91-0383-08	Microphone element (Condenser microphone)		

MC-44 (MULTI FUNCTION MICROPHONE)

MC-44 SCHEMATIC DIAGRAM

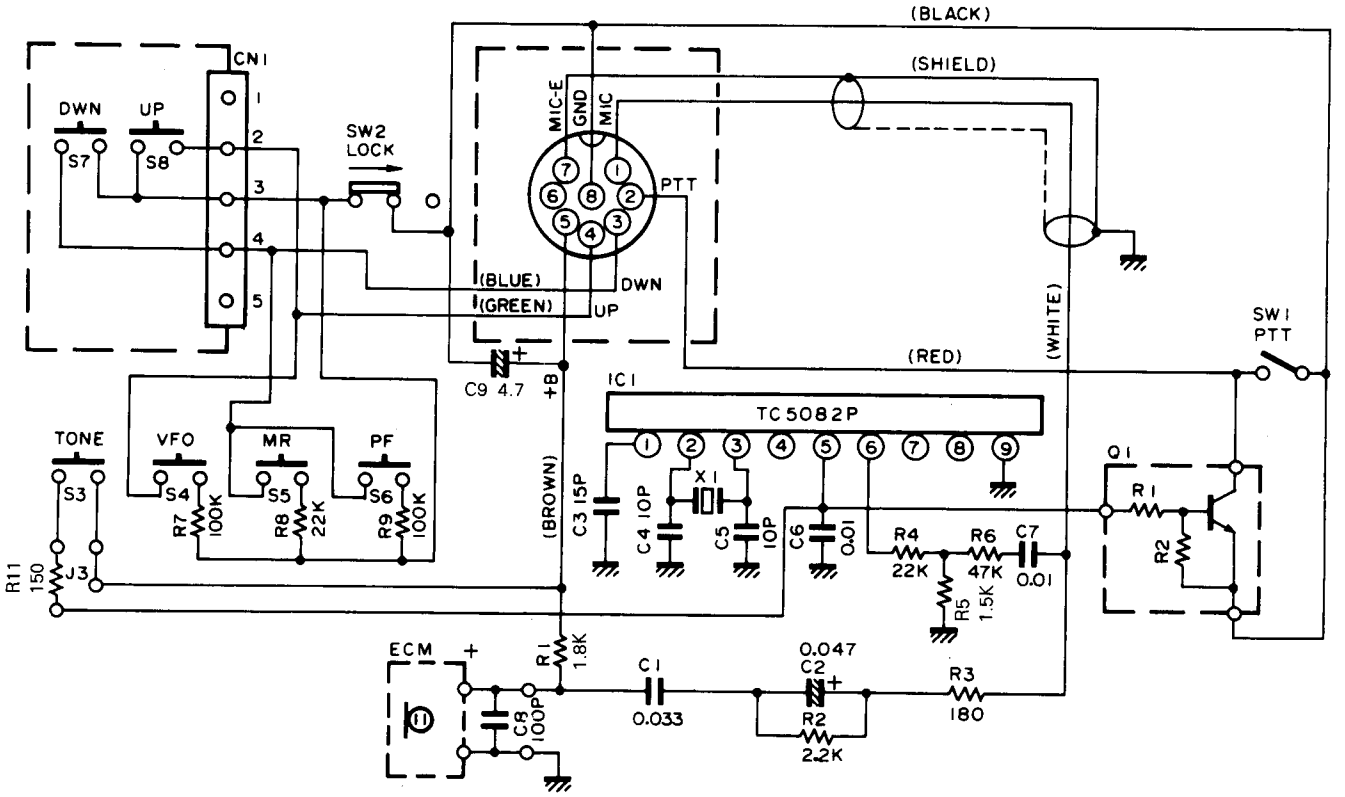


MC-44 PARTS LIST

Ref. No.	New parts	Parts No.	Description	
		A02-0896-18	Case (Front)	
		A02-0900-08	Case (Rear)	
		B50-8293-18	Instruction manual	
		E30-2149-08	Curl cord	
		G13-0933-08	Cushion	
		K29-3165-08	Knob	PTT
		K29-3168-18	Knob	UP
		K29-3169-18	Knob	DOWN
		K29-3170-08	Knob	CALL, VFO, MR, PF
SW2		S31-1422-08	Slide switch	LOCK
SW1		S50-1431-08	Micro switch	PTT
S7, 8		S59-1409-28	Switch	UP, DOWN
		T91-0383-08	Microphone element (Condenser microphone)	

MC-44E (MULTI FUNCTION MICROPHONE)

MC-44E SCHEMATIC DIAGRAM

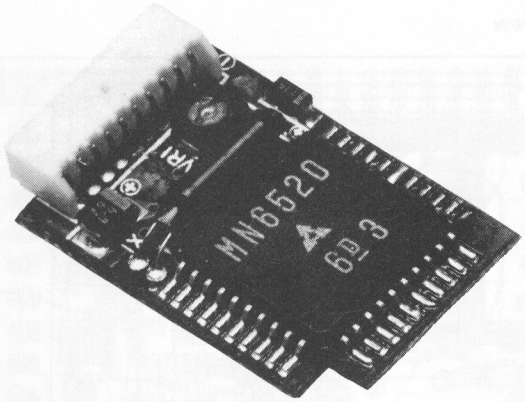


MC-44E PARTS LIST

Ref. No.	New parts	Parts No.	Description
		A02-0897-18	Case (Front) With TONE
		A02-0900-08	Case (Rear)
		B50-8293-18	Instruction manual
		E30-2149-08	Curl cord
		G13-0933-08	Cushion
		K29-3165-08	Knob PTT
		K29-3168-18	Knob UP
		K29-3169-18	Knob DOWN
		K29-3170-08	Knob 1750, VFO, MR, PF
SW2		S31-1422-08	Slide switch LOCK
SW1		S50-1431-08	Micro switch PTT
S7, 8		S59-1409-28	Switch UP, DOWN
		T91-0383-08	Microphone element (Condenser microphone)

TSU-6 (CTCSS UNIT)

TSU-6 EXTERNAL VIEW



TSU-6 PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
		CTCSS UNIT (X52-3100-00)	
C1		CK73FB1H102K	Chip C 1000pF K
C2		C92-0507-05	Tantal 4.7μF 6.3WV
C3		C92-0520-05	Tantal 22μF 4.0WV
C4, 5		CK73EB1E104K	Chip C 0.1μF K
C6		CK73EB1H223K	Chip C 0.022μF K
C7		CK73EB1E104K	Chip C 0.1μF K
C8, 9		CC73FCH1H150J	Chip C 15pF J
C10		CK73FB1H102K	Chip C 1000pF K
C11		CK73FB1E473K	Chip C 0.047μF K
C12		C92-0507-05	Chip tan. 4.7μF 6.3WV
C13		C92-0534-05	Chip tan. 33μF 4.0WV
CN1		E40-5121-05	Pin connector (10P)
X1		L77-1313-05	X'tal resonator 4.194304MHz
R1–10		RK73FB2A○○○J	Chip resistor
R12–14		RK73FB2A○○○J	Chip resistor
VR1		R12-3460-05	Trimming pot. 33kΩ
Q1		DTC144TK	Digital transistor
Q2		DTA114EK	Digital transistor
Q3		2SC2712(GR)	Chip transistor
IC1		MN6520	IC
IC2		MN4094BS	IC

TSU-6 REFERENCE DATA

Tone frequency and MN6520 (IC1) relationship

Tone frequency (Hz)	MN6520 terminal					
	$\overline{S6}$	$\overline{S5}$	$\overline{S4}$	$\overline{S3}$	$\overline{S2}$	$\overline{S1}$
	MN4094BS terminal					
	Q1	Q2	Q3	Q4	Q7	Q8
67.0	L	H	H	H	L	H
71.9	L	H	H	H	L	L
74.4	L	H	H	L	H	H
77.0	L	H	H	L	H	L
79.7	L	H	H	L	L	H
82.5	L	H	H	L	L	L
85.4	L	H	L	H	H	H
88.5	L	H	L	H	H	L
91.5	L	H	L	H	L	H
94.8	H	H	H	L	L	H
100.0	H	H	H	L	L	L
103.5	H	H	L	H	H	H
107.2	H	H	L	H	H	L
110.9	H	H	L	H	L	H
114.8	H	H	L	H	L	L
118.8	H	H	L	L	H	H
123.0	H	H	L	L	H	L
127.3	H	H	L	L	L	H
131.8	H	H	L	L	L	L
136.5	H	L	H	H	H	H
141.3	H	L	H	H	H	L
146.2	H	L	H	H	L	H
151.4	H	L	H	H	L	L
156.7	H	L	H	L	H	H
162.2	H	L	H	L	H	L
167.9	H	L	H	L	L	H
173.8	H	L	H	L	L	L
179.9	H	L	L	H	H	H
186.2	H	L	L	H	H	L
192.8	H	L	L	H	L	H
203.5	H	L	L	H	L	L
210.7	H	L	L	L	H	H
218.1	H	L	L	L	H	L
225.7	H	L	L	L	L	H
233.6	H	L	L	L	L	L
241.8	L	H	H	H	H	H
250.3	L	H	H	H	H	L

Table 1

TSU-6 FINE ADJUSTMENT OF TONE FREQUENCY

The tone frequency can be fine adjusted with an interval of 0.5% step over the range of 0 to +1.5%. Ground the T1 (pin 10) and T2 (pin 9) of IC1 to obtain the desired frequency.

	T1	T2
0%	X	X
+0.5%	○	X
+1.0%	X	○
+1.5%	○	○

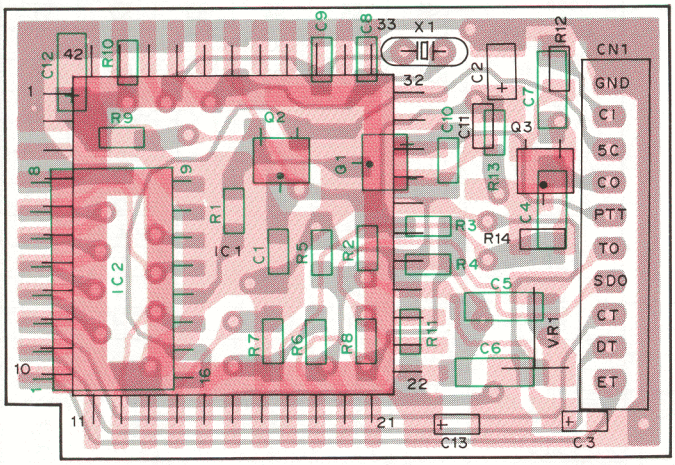
○ : GND, X : OPEN

Table 2

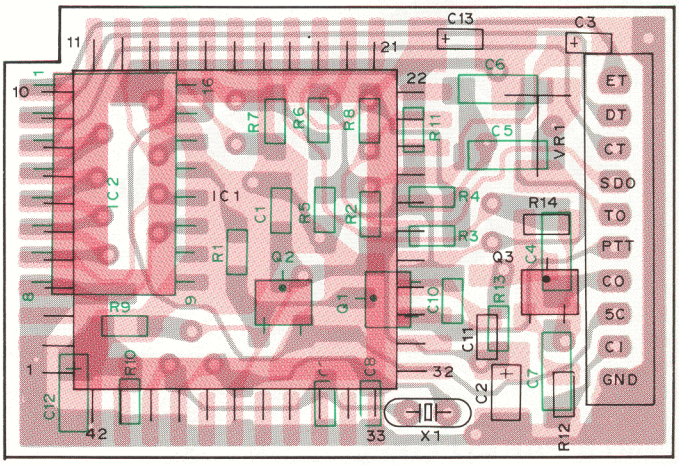
TSU-6 (CTCSS UNIT)

TSU-6 PC BOARD VIEWS

Component side view



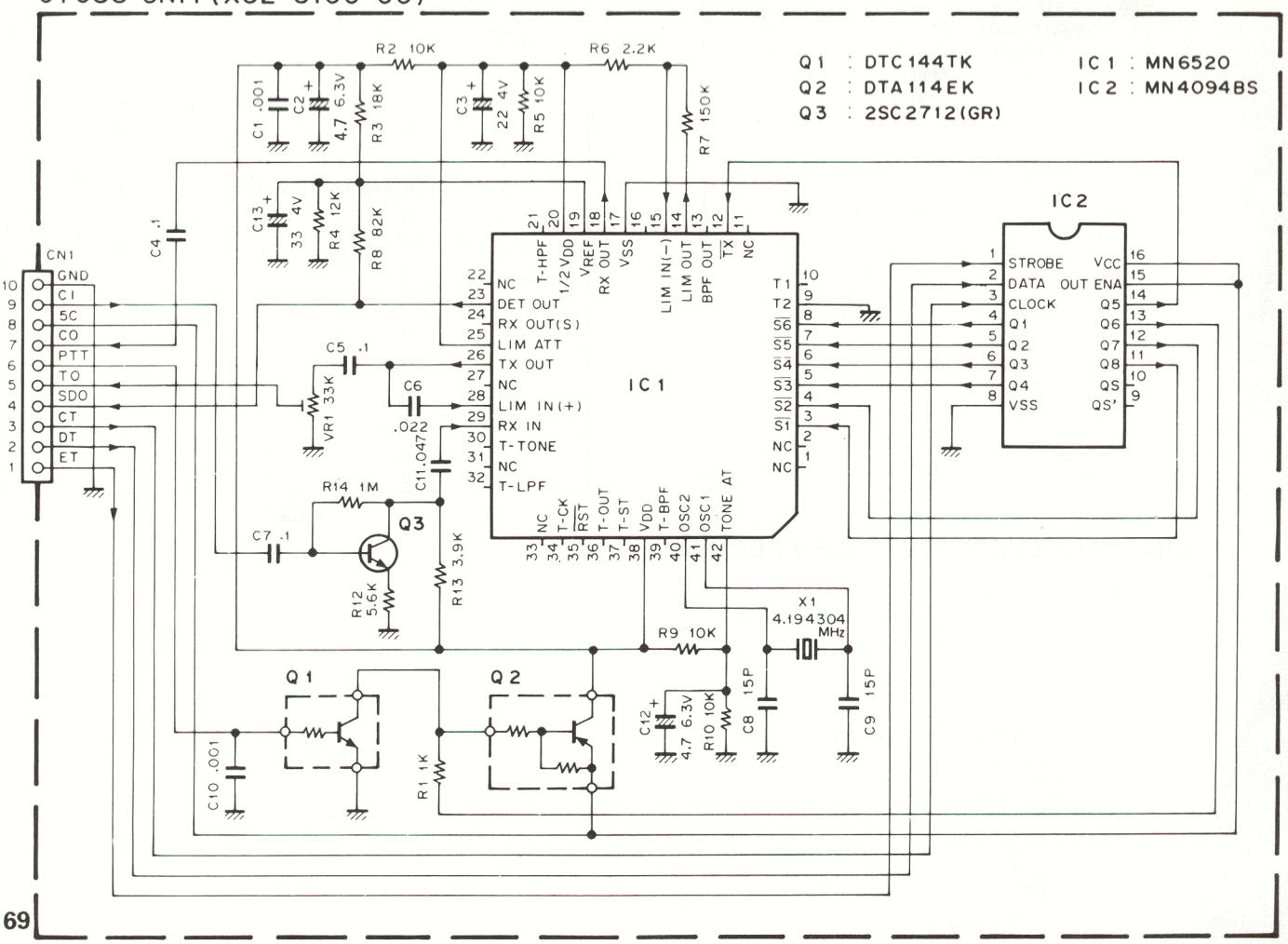
Foil side view



: Component side
: Foil side

TSU-6 CIRCUIT DIAGRAM

CTCSS UNIT (X52-3100-00)



TM-241A/E

SPECIFICATIONS

General

Frequency range	136 to 174MHz : TM-241A (M2,M3), TM-241E (E2) 144 to 148MHz : TM-241A (K,K2,P,P2,X,M) 144 to 146MHz : TM-241E (E,E9,EM)
Mode	F3E (FM)
Antenna impedance	50Ω
Power requirements	13.8V DC ± 15% (11.7 to 15.8V)
Ground	Negative
Frequency stability	Less than ±10ppm
Current drain	Transmit mode : Less than 11A Receive mode with no signal : Less than 0.6A
Operating temperature	–20°C to +60°C (–4°F to +140°F)
Dimensions (W x H x D)	140 x 40 x 160 mm (5-1/2" x 1-37/64" x 6-19/64")
Projection included	140 x 40 x 172 mm (5-1/2" x 1-37/64" x 6-25/32")
Weight	1.2kg (2.65lbs)

Transmitter

Output power*	HI : 50W MID : Approx. 10W LOW : Approx. 5W
Modulation	Reactance modulation
Spurious radiation	Less than –60dB
Maximum frequency deviation	±5kHz
Audio distortion (at 60% modulation)	Less than 3% (300 to 3000Hz)
Microphone impedance	600Ω

Receiver

Circuitry	Double conversion superheterodyne
Intermediate frequency (1st/2nd)	10.7MHz/455kHz : TM-241A (K,P,X,M,M2,M3), TM-241E (E,E2,E9,EM) 30.825MHz/455kHz : TM-241A (K2,P2)
Sensitivity (12dB SINAD)	Less than 0.16μV : TM-241A (K,P,X,M,M2,M3), TM-241E (E,E2,E9,EM) Less than 0.22μV : TM-241A (K2,P2)
Selectivity	–6dB : More than 12kHz –60dB : Less than 24kHz
Squelch sensitivity	Less than 0.1μV
Output (5% distortion)	More than 2W across 8Ω loads
External speaker impedance	8Ω

Notes :
1. Circuit and ratings are subject to change without notice due to advancements in technology.
2. *Recommended duty cycle : 1 minute transmit, 3 minutes reception.

KENWOOD CORPORATION
14-6, Dogenzaka 1-chome, Shibuya-ku, Tokyo 150, Japan

KENWOOD SERVICE CORPORATION
P.O. BOX 22745, 2201 East Dominguez Street, Long Beach, CA 90801-5745, U.S.A.

KENWOOD ELECTRONICS DEUTSCHLAND GMBH
Rembrücker Str. 15, 6056 Heusenstamm, Germany

KENWOOD ELECTRONICS BENELUX N.V.
Mechelsesteenweg 418 B-1930 Zaventem, Belgium

TRIO-KENWOOD FRANCE S.A.
13, Boulevard Ney, 75018 Paris, France

TRIO-KENWOOD U.K. LIMITED
KENWOOD House, Dwight Road, Watford, Herts., WD1 8EB United Kingdom

KENWOOD ELECTRONICS NEDERLAND B.V.
Amsterdamseweg 35, 1422 AC Uithoorn, The Netherlands

KENWOOD ELECTRONICS ITALIA S.p.A.
Via G. Sirtori, 7/9 20129 Milano, Italy

KENWOOD ESPAÑA S.A.
Bolivia, 239-08020 Barcelona, Spain

KENWOOD ELECTRONICS AUSTRALIA PTY. LTD.
(A.C.N. 001 499 074)
P.O. Box 504, 8 Figtree Drive, Australia Centre, Homebush, N.S.W. 2140, Australia

KENWOOD & LEE ELECTRONICS, LTD.
Unit 3712-3724, Level 37, Tower one Metroplaza, 223 Hing Fong Road, Kwai Fong, N.T., Hong Kong

KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8