

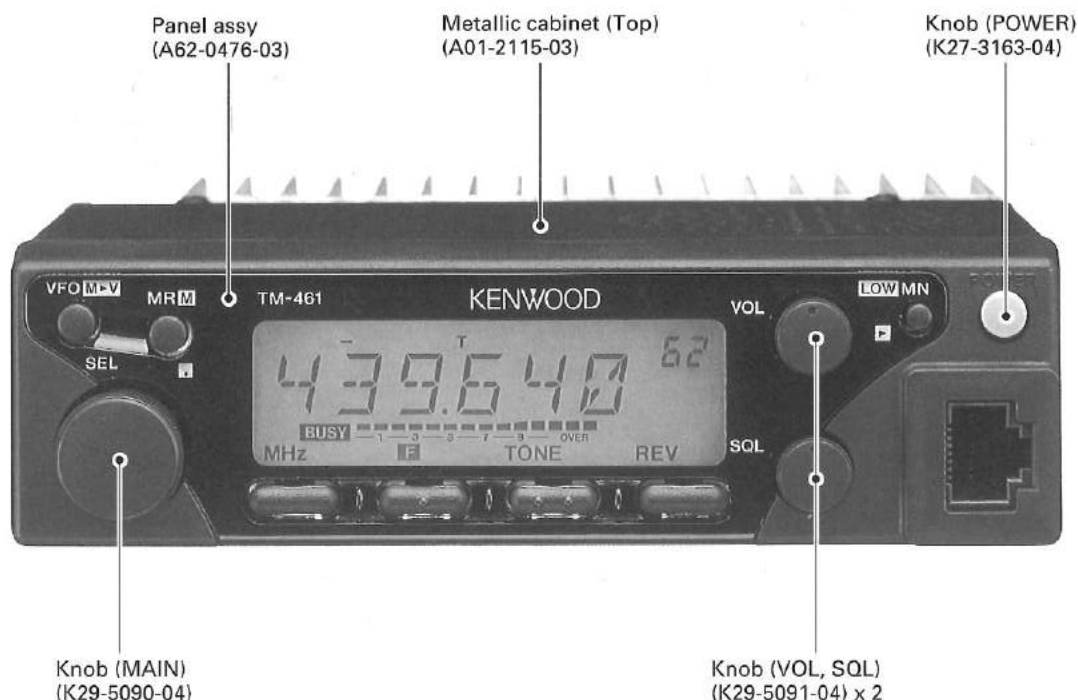
430MHz FM TRANSCEIVER

TM-461A

SERVICE MANUAL

KENWOOD

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B51-8319-00 (N) 318



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CIRCUIT DESCRIPTION

CIRCUIT CONFIGURATION BY FREQUENCY

The TM-461A 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 30.300MHz (C1), 30.825MHz (K,M2), 34.300MHz (C2), using a 1st local oscillator frequency of from 369.700 to 399.695MHz (C1), 369.175 to 439.170MHz (K,M2),

415.700 to 435.695MHz (C2). The 1st IF signal is then mixed with the 2nd local oscillator frequency of 30.755MHz (C1), 30.370MHz (K,M), 33.845MHz (C2) 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.

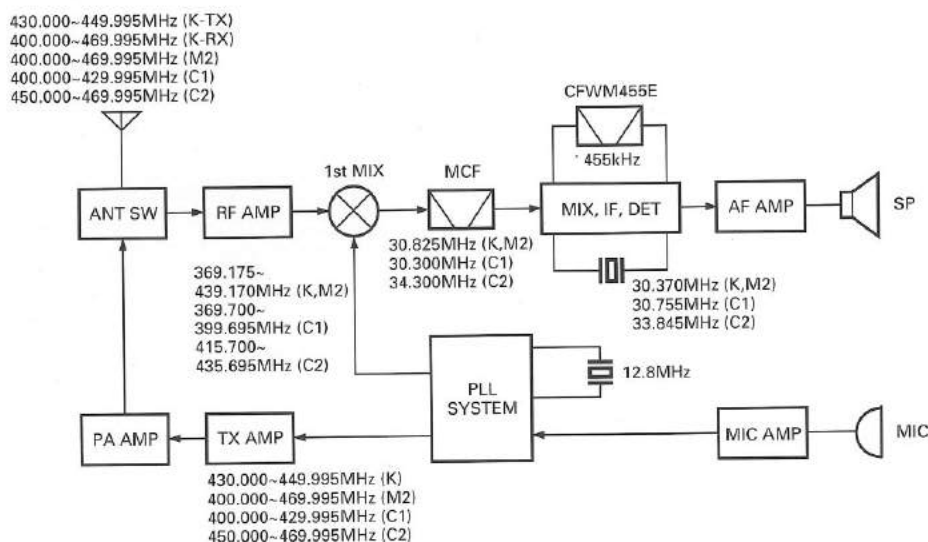


Fig. 1 Frequency configuration

RECEIVING SYSTEM

• Overview

Incoming signals from the antenna pass through a low-pass filter in the transmitters final stage, then through the transmit/receive switching diode, and then to the front end of the receiver.

The incoming signals are amplified by a GaAs FET and enter a two-pole helical resonator. The signals are then passed through an additional two-pole helical resonator in order to remove any remaining undesirable components, and is fed to the 1st mixer. The 1st mixer uses the GaAs FET (Q3) 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 (30.300MHz (C1), 30.825MHz (K,M2), 34.300MHz (C2)). The signal then passes through two-stage MCF (monolithic crystal filters) to remove unnecessary near-by frequency components.

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

The 1st IF signal is amplified and fed into IC1 (KCD10) in the FM IF HIC. The IF signal is then mixed with the 2nd local oscillator frequency of 30.370MHz (K,M2), 30.775MHz (C1), 33.845MHz (C2) to generate the 2nd IF of 455kHz. The 455kHz signal is then passed through a six element ceramic filter (CFWM455E), and fed back into IC1 for additional amplification. The output signal from the IC1 is then fed into a power amplified via the audio volume control for application to the speaker.

• S-meter circuit

S-meter control voltage from IC1 (KCD10) in the FM IF HIC is fed into the control unit. The CPU converts the voltage from an analog to digital signal in order to operate the LCD bar meter.

CIRCUIT DESCRIPTION

Item	Rating
Nominal center frequency (fo)	30.300MHz
Pass bandwidth	±7.5kHz or more 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	1.2kΩ/0.5pF

Table 1 MCF (L71-0294-05) TX-RX unit XF1 (C1)

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 2 MCF (L71-0270-05) TX-RX unit XF1 (K,M2)

Item	Rating
Nominal center frequency (fo)	34.300MHz
Pass bandwidth	±7.5kHz or more 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	0.8kΩ/1.5pF

Table 3 MCF (L71-0296-05) TX-RX unit XF1 (C2)

Item	Rating
Nominal center frequency (fo)	455kHz±1kHz
6dB bandwidth	±7.5kHz or more (from 455kHz)
50dB bandwidth	±15kHz or less (from 455kHz)
Ripple	3dB or less (within ±5kHz of 455kHz)
Insertion loss	6dB or less
(on the maximum point of output) Guaranteed attenuation	35dB or more (within ±100kHz of 455kHz)
Terminating impedance	1.5kΩ

**Table 4 Ceramic filter CFWM455E (L72-0366-05)
TX-RX unit CF1**

TRANSMITTING SYSTEM

• Overview

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

• Modulation circuit

Voice signals from the microphone are fed into the microphone amplifier circuit of the control unit for amplification by the 1st transistor amplifier, and then into two operational amplifiers. These operational amplifier perform pre-emphasis, amplification, limiting, and includes a splatter filter, which is used to reduce undesirable high-frequency components from the signal. This signal is into the VCO of TX-RX unit.

The FM modulation circuit applies this signal directly to the VCO via a vari-cap diode.

• Younger-stage circuit

Signals from the VCO are applied to the drive HIC IC6 (KCB14). 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 younger-stage circuit.

• Power amplifier circuit

The drive signal is amplified to the required level by the power module. The TM-461A uses a large heat sink to prevent failure of the final amplifier due to temperature. It provide efficient radiation of the heat generated by the final amplifier.

• APC circuit (Automatic Power Control)

The automatic power control circuit (APC) uses a diode to detect a portion of the output from the final module. It amplifies this signal and uses it as a control voltage, this control voltage is inversely proportion to the output so that a constant output is produced.

CIRCUIT DESCRIPTION

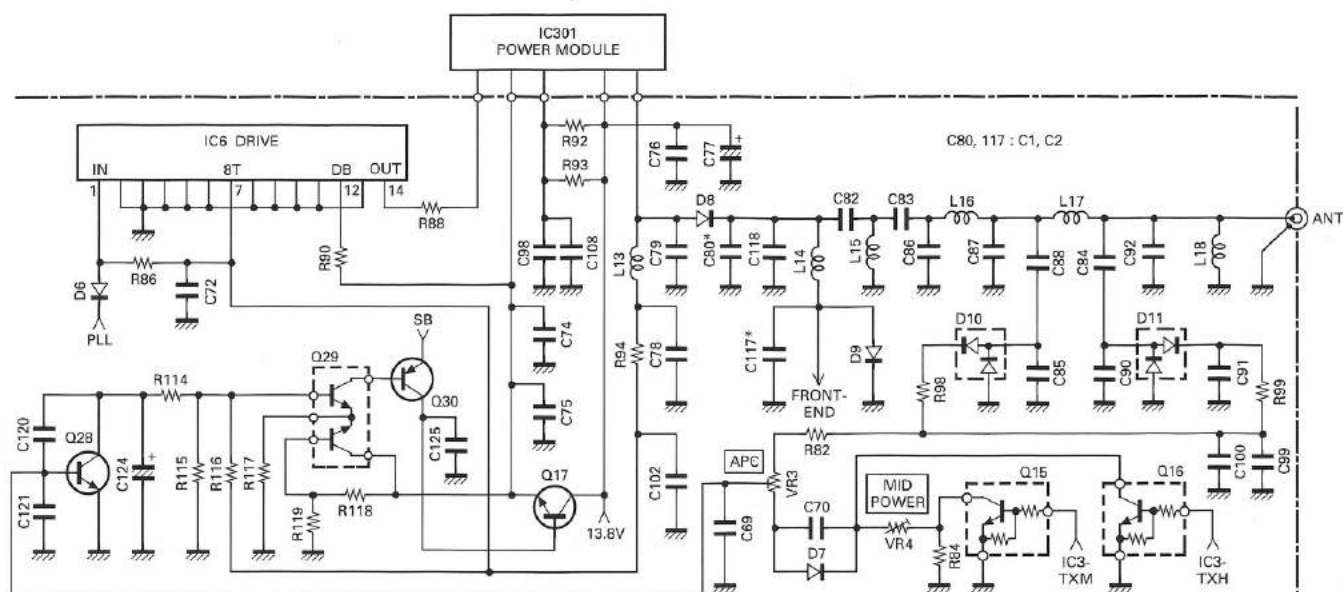


Fig. 2 Younger-stage, Power amplifier, APC circuits

(T _C =25°C)				
Item	Symbol	Condition	Rating	Unit
Operating voltage	V _{CC}		17	V
Current consumption	I _{CC}		12	A
Input power	P _{in}	Z _G =Z _L =50Ω, V _{CC} ≤13.5V	800	mW
Output power	P _o	Z _G =Z _L =50Ω	50	W
Operating case temperature	T _c (op)		-30~+110	°C
Storage temperature	T _{stg}		-40~+110	°C

Table 5 Power module M57788M maximum ratings
(TX-RX unit IC301) : K,M2

(Tc=25°C)					
Item	Symbol	Condition	Rating		Unit
			M57788L	M57788H	
Operating voltage	Vcc1/Vcc2,3		16/17	16/17	V
Current consumption	Icc		12	12	A
Input power	Pin	ZG=ZL=50Ω, Vcc1≤12.5V	500	500	mW
Output power	Po	ZG=ZL=50Ω	50	50	W
Operating case temperature	Tc (op)		-30~+100	-30~+100	°C
Storage temperature	Tstg		-40~+110	-40~+110	°C

Table 6 Power module M57788L (C1), M57788H (C2) maximum ratings
(TX-RX unit IC301)

CIRCUIT DESCRIPTION

PLL SYNTHESIZER UNIT

A block diagram of the PLL and VCO unit is provided in Figure 3. In the TM-461A, 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 5,10,12.5,15,20,25kHz-step operation. The 6.25kHz is obtained by dividing the reference oscillator frequency of 12.8MHz by 1/2048, and the 5kHz is obtained by dividing it by 1/2560. 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 10 of the PLL IC (M54959FP), the LPF is deactivated-activated by Q4 only for the moment when the TM-461A enters transmit mode. This helps produce lock more rapidly than previous methods.

• Calculate example

f_{vco} (RX) is calculated by the following formula;

$$f_{vco} = \{ (n \times 128) + A \} \times f_{osc} \div R$$

where,

f_{vco} : VCO output frequency

n : Binary value of the 10-bit programmable counter

A : Binary value of the 7-bit programmable counter

f_{osc} : 12.8MHz reference frequency

R : Binary value of the 14-bit programmable counter

2560 (When channel step is 5,10,15,20 or 25kHz)

2048 (When channel step is 12.5kHz)

• 8T (8V in transmit mode)/8R (8V in receive mode) switching and unlock circuits

In receive mode, the base of Q9,Q12 has 0.7V. As a result, Q9,Q12 is on, and Q10 and Q8 are off, then the collector of Q7 (8R) provides voltage, and the collector of Q8 (8T) provides no voltage

The CPU output serial data to shift register IC3 when the PTT switch is depressed. As a result, pin 13 of IC3 becomes "L", turning Q12 off, and Q10 and Q8 on. The 8T line is therefore supplied with 8V.

The unlock protect circuit operates only in transmit mode. Q11 is a PLL unlocking switching transistor. Usually, the base of Q11 is supplied with 0V ("L"), and the collector is supplied with 8V ("H").

When the PLL is unlocked, the base of Q11 is supplied with 0.7V, turning Q11 on. As a result, the collector of Q11 becomes "L" (0V). This turns Q10 off and the collector of Q8 becomes 8V, turning it off. Therefore, when the PLL is unlocked, Q8 is off removing bias voltage from the 8T line. Without the 8T voltage no transmit signal is generated.

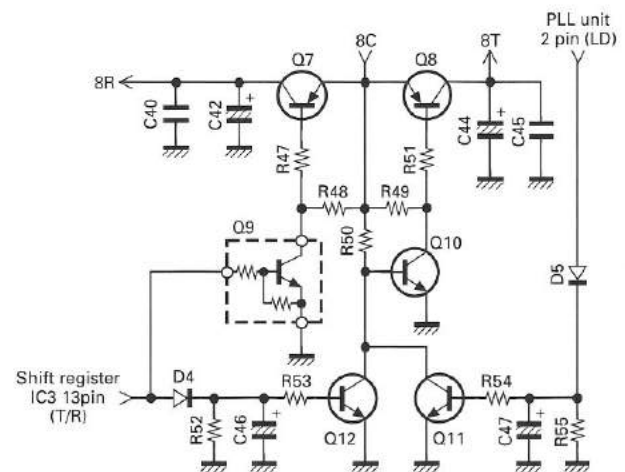


Fig. 4 8T/8R switching and unlock circuits

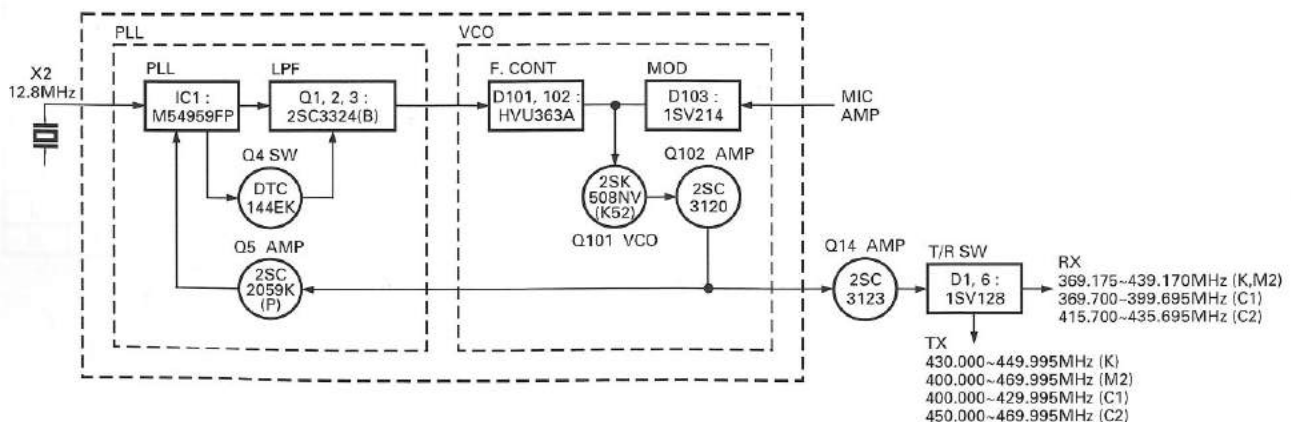


Fig. 3 PLL block diagram

CIRCUIT DESCRIPTION

DIGITAL CONTROL UNIT

• Overview

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

The LCD drive and a tone output is carried by CPU.

• Key and rotary encoder input circuits

The keys (on the panel) input and 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.

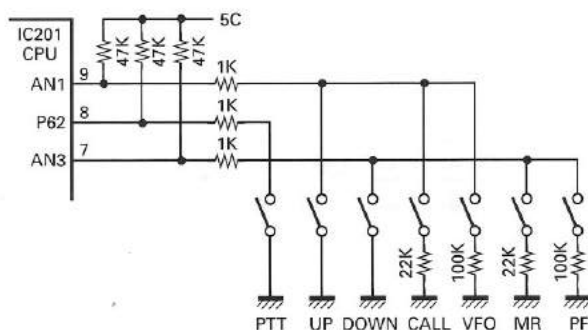


Fig. 5 Microphone key input circuit

• Reset and back-up circuits

when the TM-461A power is turned on, the reset circuit sends a "L" level pulse to the RESET pin of the CPU. This initiates the power-on reset sequence.

When the TM-461A power is turned off, the back-up circuit detects a voltage drop in the SB line and sets the CPU INTO (BCHK) to a "H" level. This causes the CPU to enter a back-up state and then back-up data is transmitting to the EEPROM (IC210 : X25160SI-2.7).

• Microprocessor and EEPROM

The microprocessor (IC201) and the EEPROM (IC210 : X25160SI-2.7) is connected three line system of data input and output. The data forward with Serial-data type. The port P17 and P20 of the microprocessor are directly connected to SI and SO port of the EEPROM.

• Lamp switch circuit

The lamp switch circuit is switched by the constant voltage of 8V from 8C with Q201 and Q202. The lamp switch circuit is turning ON and OFF to LCD back-lamp. R201 is always supply the idle-current to the lamps, it on account of prevent an over-current from flowing through the lamp.

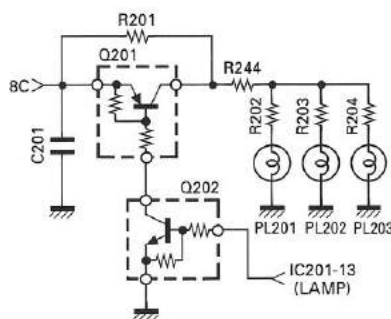


Fig. 7 Lamp switch circuit

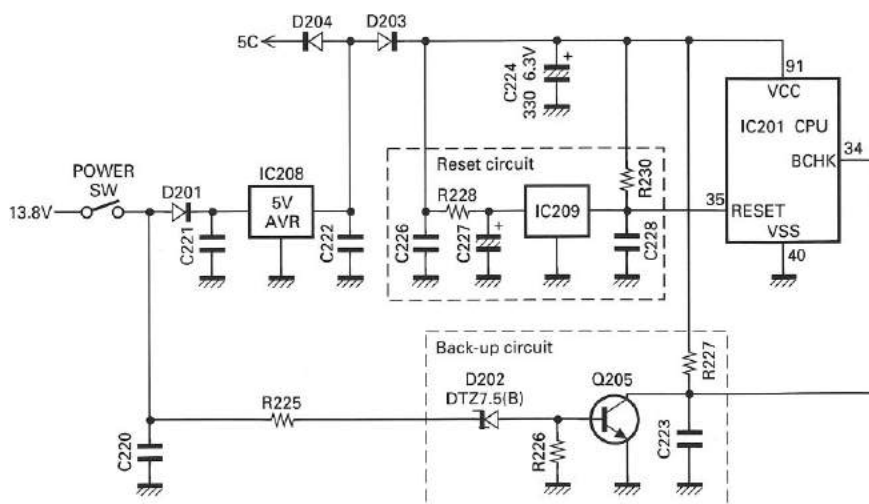


Fig. 6 Reset and back-up circuits

CIRCUIT DESCRIPTION

• PLL data output

PLL data is available from P47 (CK), P46 (DT), and P50 (EP1) of the CPU. Figure 8 is a timing chart for PLL data transfer, and Figure 9 shows the format of PLL data.

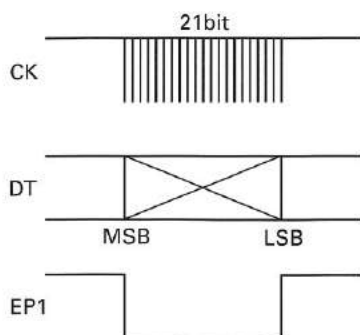
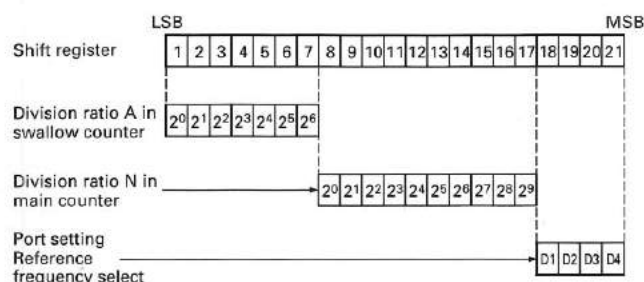


Fig. 8 Timing chart for PLL data transfer



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

1. Division ratio data A and N (17bits)
 F (Display – 30.300MHz (C1) or 30.825MHz (K,M2) or 34.300MHz (C2) in RX mode)
 $= \{(N \times 128) + A\} \times \text{ref}$
 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 (2bits)

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

3. Switch select (2 bit)

Data		Output port	
D3	D4	SW1	SW2
L	H	L	H
H	L	H	L

Fig. 9 PLL data format

• Shift register circuit

The shift register circuit consists of IC3 (BU2090FS). The IC3 receives serial data from the microprocessor to perform the controls listed below.

Pin No.	Pin name	Function
1	Vss	GND
2	DATA	Serial data input.
3	CLOCK	Clock input.
4	–	Not used.
5	–	Not used.
6	–	Not used.
7	–	Not used.
8	–	Not used.
9	–	Not used.
10	TXM	TX power select. "H" in MID mode, "L" in HI or LOW mode.
11	TXH	TX power select. "H" in HI mode, "L" in MID or LOW mode.
12	–	Not used.
13	T/R	Transmit/receive select. "H" in RX mode, "L" in TX mode.
14	MUTE	AF mute. "H" when TX mode, CTCSS or squelch is on.
15	–	Not used.
16	Vdd	5V

Table 7

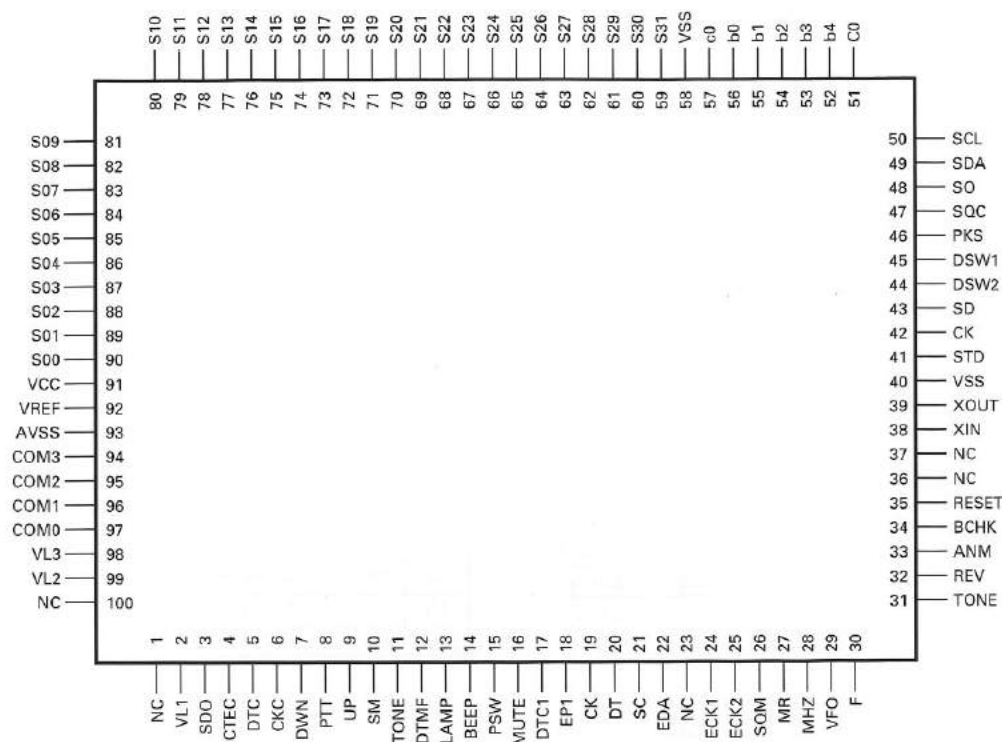
• Input and output of CTCSS unit (option)

The optional CTCSS unit receives data from P64, P65, and P66 of the CPU. When a tone from the CTCSS unit is detected, a "H" level signal is sent to P67 of the CPU, opening the squelch.

SEMICONDUCTOR DATA

CPU : M38267M8L10*FP (TX-RX Unit IC201) 3 : M2,C1,C2 5 : K

• Terminal connection diagram



• Terminal function

○ : Pull up, ● : Pull up

Pin No.	Pin	I/O	P/U	Pin name	Function
1	C1	I			Not used (Vss).
2	VL1	I		VL1	Power supply for LCD.
3	P67	I/O	●	P_SD0	CTCSS signal detect.
4	P66	I/O	○	P_CTEC	CTCSS connected/CTCSS enable output.
5	P65	O		P_DTC	CTCSS data output.
6	P64	O		P_CK	CTCSS clock output.
7	AN3	I	○	P_DWN	DOWN, MR, PF.
8	P62	I	○	P_PTT	Stand-by for PLL.
9	AN1	I	○	P_UP	UP, CALL, VFO.
10	P60	I		P_SM	S-meter input.
11	DA2	O		P_TONE	Sub-tone output.
12	DA1	O		P_DTMF	DTMF tone output.
13	P55	O		P_LAMP	Lamp control.
14	P54	O		P_BEEP	Beep tone output.

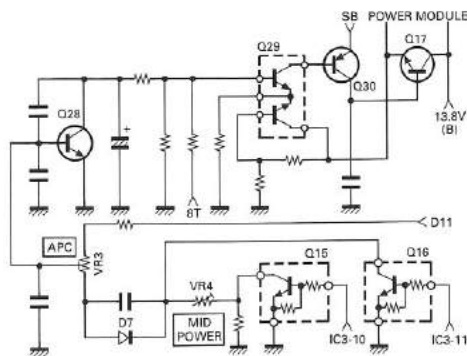
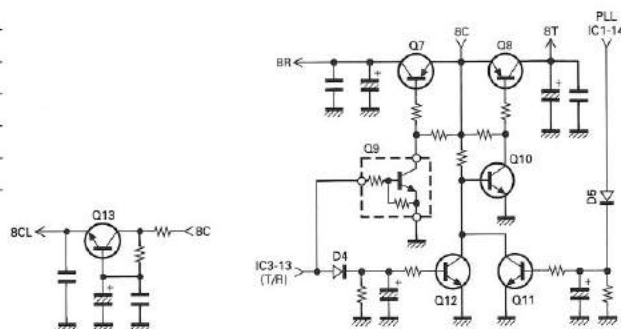
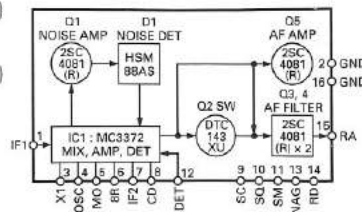
SEMICONDUCTOR DATA

Pin No.	Pin	I/O	P/U	Pin name	Function
15	P53	O		P_PSW	Power switch.
16	P52	O		P_MUTE	MIC mute.
17	P51	O		P_ES1	Shift register data output.
18	P50	O		P_EP1	PLL IC enable output.
19	P47	O		P_CKS	PLL and shift register clock output.
20	P46	O		P_DTS	PLL data output.
21	P45	I	○	P_SC	BUSY signal input.
22	P40	O		P_SQM	Squelch monitor.
23	P43/TOUT	I/O			Not used.
24	INT3	I	○	P_ENCCK1	Encoder clock1.
25	INT2	I	○	P_ENCCK2	Encoder clock2.
26	R44	I	○	P_EDA	Encoder data.
27	P77	I	○	P_KEY6	VFO-key input.
28	P76	I	○	P_KEY5	MR-key input.
29	P75	I	○	P_KEY4	MHz-key input.
30	P74	I	○	P_KEY3	F-key input.
31	P73	I	○	P_KEY2	TONE-key input.
32	P72	I	○	P_KEY1	REV-key input.
33	P71	I/O	○	P_KEY0	ID-key input.
34	INT0	I	○	BCHK	Power supply check.
35	REST	I		SET	System reset input.
36	XCIN	I			Not used (Vss).
37	XCOUT	O			Not used (Open).
38	XIN	I		XIN	4.19MHz crystal oscillator.
39	XOUT	O		XCOUT	4.19MHz crystal oscillator.
40	Vss	I		Vss	GND.
41	P27	I/O	●	P_STD	DTMF signal detect.
42	P26	O		P_CKD	DTMF decoder clock line.
43	P25	O		P_SD	DTMF decoder data line.
44	P24	O		P_DTSW2	DTMF input select switch 2.
45	P23	O		P_DTSW1	DTMF input select switch 1.
46	P22	I	●	P_PKS	Packet standby.
47	P21	O		P_SQC	Squelch control.
48	P20	I		P_EPSO	EEPROM SO.
49	P17	O		P_EPDT	EEPROM SI.
50	P16	O		P_EPCK	EEPROM clock line.
51	P15	I/O	○●	P_C0	Channel display bit.
52~56	P14~P10	I	○●	P_B4~P_B0	Destination bit 4~0.
57	P07	O		P_EPCS	EEPROM chip select.
58	P06	I/O			Not used (Vss).
59~90	SEG31~SEG00	O		P_SEG31~P_SEG0	LCD segment 31~0.
91	Vcc	I		Vcc	Power supply pin.
92	VREF	I		VREF	Standard power supply for A/D converter.
93	AVss	I		AVss	Standard GND for A/D converter.
94~97	COM3~COM0	O		P_COM3~P_COM0	LCD common 3~0.
98	VL3	I		VL3	power supply for LCD
99	VL2	I		VL2	power supply for LCD
100	C2	I			Not used (Vss).

DESCRIPTION OF COMPONENTS

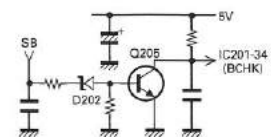
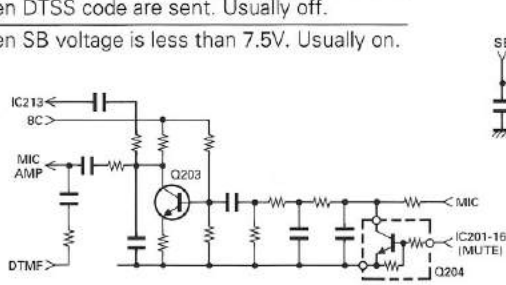
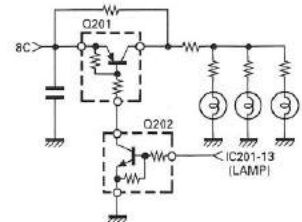
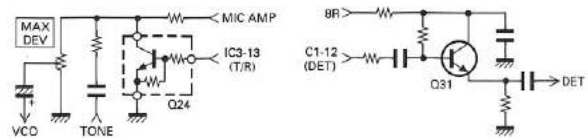
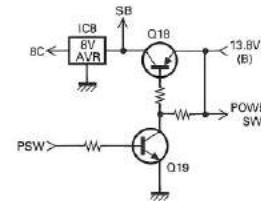
TX-RX UNIT (X57-498X-XX) 0-11 : K 0-22 : M2 3-01 : C1 3-02 : C2

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC1	2nd local oscillator, Mixer IF amplification, Detection, Low-frequency amplification, Noise amplification, Noise detection, Squelch switching	1 : 1st IF signal input (30.300MHz (C1), 30.825MHz (K,M2), 34.300MHz (C2)) 3,4 : 2nd local oscillator (30.755MHz (C1), 30.370MHz (K,M2), 33.845MHz (C2)) 9 : Busy output 10 : Squelch control 11 : S-meter output 14 : RD output 15 : Low-frequency output
IC2	AF amplification	1 : AF input 6 : AF output
IC3	Shift register	See circuit description.
IC4	5V AVR	
IC5	10V AVR	For PLL
IC6	Transmit drive	
IC8	8V AVR	
IC201	Microprocessor	See circuit description.
IC205	Analog switch	
IC207	Low-frequency amplification	Mic amplifies.
IC208	5V AVR	
IC209	Reset	
IC210	EEPROM	
IC211	DTMF decoder	
IC212, 213	Analog switch	
Q1	RF amplification	Operates in receive mode.
Q3	1st mixer	Converts received 430MHz-range signals to 1st IF 30.300MHz (C1), 30.825MHz (K,M2), 34.300MHz (C2).
Q5	IF amplification	Amplifies 1st IF signal.
Q6	AF line mute	Operates when transmit mode, CTCSS or squelch is on.
Q7	8R switching	On in receive mode.
Q8	8T switching	On in transmit mode.
Q9	8R switching control	On in receive mode.
Q10	8T switching control	On in transmit mode.
Q11	8T switching control	Off when PLL locked.
Q12	8T switching control	Off in transmit mode.
Q13	PLL 8V ripple filter	
Q14	PLL output amplification	
Q15	TX power select	On in MID mode.
Q16	TX power select	On in HI mode.
Q17	TX drive stage +B control	



DESCRIPTION OF COMPONENTS

Ref. No.	Use/Function	Operation/Condition/Compatibility
Q18	Power switch	On when power switch is on.
Q19	Power switch control	
Q24	Mic amplification mute	On in receive mode.
Q27	Squelch hysteresis	On when the squelch is on.
Q28-30	APC control	See circuit description.
Q31	RD buffer amplification	
Q201	Lamp switch	
Q202	Lamp switch control	
Q203	Low-frequency amplification	On when DTSS code are sent. Usually off.
Q204	Mic mute	
Q205	buffer amplifier switch	
D1	VCO output switch	On in receive mode.
D4, 5	Reverse current prevention	
D6	VCO output switch	On in transmit mode.
D7	Temperature compensation	For APC.
D8	Transmit/receive switching	
D9	Transmit/receive switching	
D10, 11	Power detection	For APC.
D12	Reverse power protection	
D15	Transmit/receive switching	
D201	Reverse current prevention	
D202	Voltage drop detect	For power supply.
D203-207	Reverse current prevention	



DESCRIPTION OF COMPONENTS

PLL UNIT (X58-442X-XX) 0-00 : K,M2 3-01 : C1 3-02 : C2

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC1	PLL	1 : VCO input. 369.700 to 399.695MHz (C1), 379.175 to 440.820MHz (K,M2), 415.700 to 435.695MHz (C2) in receive mode, 400 to 429.995MHz (C1), 400 to 469.995MHz (M2), 430 to 449.995MHz (K) , 450 to 469.995MHz (C2) in transmit mode. 10 : "L" in transmit mode 14 : "H" when PLL unlocked
Q1~3	LPF	
Q4	Transmit switch	On for an instant when transmission starts.
Q5	VCO output buffer	
Q101	VCO	3369.700 to 399.695MHz (C1), 379.175 to 440.820MHz (K,M2), 415.700 to 435.695MHz (C2) in receive mode, 400 to 429.995MHz (C1), 400 to 469.995MHz (M2), 430 to 449.995MHz (K) , 450 to 469.995MHz (C2) in transmit mode.
Q102	VCO output buffer	
D101,102	VCO voltage control	
D103	Modulation for transmit	

PARTS LIST

* New Parts. Δ indicates safety critical components.
Parts without **Parts No.** are not supplied.
Les articles non mentionnés dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

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

TM-461A TX-RX UNIT (X57-498X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
TM-461A					
1	1B	*	A01-2115-03	METALLIC CABINET TOP	
2	2B	*	A01-2116-03	METALLIC CABINET BOTTOM	
3	2A	*	A62-0476-03	PANEL ASSY	
5	1B,1C	*	B42-2455-04	STICKER (M4X8 MAX)	
9		*	B46-0469-00	WARRANTY CARD	K
12		*	B62-0605-00	INSTRUCTION MANUAL (ENGLISH)	K,M2
12		*	B62-0608-00	INSTRUCTION MANUAL (CHINESE)	C1,C2
13	1C	*	B72-1074-04	MODEL NAME PLATE	K
13	1C	*	B72-1075-04	MODEL NAME PLATE	M2C1C2
15			E30-2111-15	DC CORD ACCESSORY	
16	1C		E30-2137-15	DC CORD	
17	1C		E30-2145-15	ANTENNA CABLE	
18	1B		E31-3197-15	LEAD WIRE WITH CONNECTOR SP	
20	2C	*	F10-2196-04	SHIELDING PLATE	
21	2A	*	F15-0695-04	SHADOW PLATE	
22	2B	*	F15-0696-04	SHADOW PLATE	
24	1C		F51-0016-05	FUSE 10A	
25			F51-0018-05	FUSE 20A ACCESSORY	
29	2B,2C	*	G02-0794-04	FLAT SPRING GND	
30	2C	*	G02-0795-04	FLAT SPRING GND	
31	1B	*	G02-0796-04	FLAT SPRING IC	
32	2A	*	G02-0799-04	FLAT SPRING	
35	1B,2C	*	G10-0779-04	FIBROUS SHEET CHASSIS	
37	1C	*	G10-0786-04	FIBROUS SHEET SP HOLDER	
38	2B	*	G13-1539-04	CUSHION	
-			G09-0405-05	KNOB SPRING	
40		*	H52-0793-02	ITEM CARTON CASE	K
40		*	H52-0794-02	ITEM CARTON CASE	M2C1C2
41		*	H10-6601-02	POLYSTYRENE FOAMED FIXTURE	
42		*	H11-0885-04	POLYSTYRENE FOAMED BOARD	
43		*	H13-0977-04	CARTON BOARD	
44			H25-0103-04	PROTECTION BAG 125X250 DC CORD	
45			H25-0337-04	PROTECTION BAG 180X300 MANUAL	
46			H25-0720-04	PROTECTION BAG 200X350 ITEM	
50	1C	*	J19-1580-04	HOLDER SPEAKER	
51		*	J29-0628-03	BRACKET ACCESSORY	
55	1A	*	K27-3163-04	KNOB POWER	
56	1A	*	K29-5090-04	KNOB MAIN	
57	1A	*	K29-5091-04	KNOB VOLUME	
A	1C,2C		N33-2606-45	OVAL HEAD MACHIN SCREW	
B	2A		N38-2640-46	PAN HEAD MACHIN SCREW	
C	2B		N67-3008-46	PAN HEAD SEMS SCREW	
D	2B,2C		N87-2606-46	BRAZIER HEAD TAPTITE SCREW	
F			N99-0331-05	SCREW SET	
61A			T91-0516-05	MICROPHONE	M2C1C2
61A			T91-0568-05	MICROPHONE	K
61B			E30-3206-08	CURL CABLE	M2C1C2
61B			E30-3240-08	CURL CABLE	K
SP	1C	*	T07-0331-05	LOUDSPEAKER (FULLRANGE)	

Ref. No.	Address	New parts	Parts No.	Description	Destination
63		*	W01-0433-04	SPANNER ACCESSORY	
A1	2B,2C	*	X58-4420-00	SUB UNIT	K,M2
A1	2B,2C	*	X58-4423-01	SUB UNIT	C1
A1	2B,2C	*	X58-4423-02	SUB UNIT	C2
TX-RX UNIT (X57-498X-XX) 0-11 : K 0-22 : M2 3-01 : C1 3-02 : C2					
65	2B	*	B11-1154-02	REFLECTOR	
66	2B	*	B11-1156-04	FILTER	
LCD	2A	*	B38-0761-05	LCD	
PL201-203		*	B30-2158-05	LAMP	
C1			CC73FCH1H030C	CHIP C 3.0PF C	K,M2C2
C1			CC73FCH1H040C	CHIP C 4.0PF C	C1
C2-4			CK73FB1H102K	CHIP C 1000PF K	
C5			CC73FCH1H020C	CHIP C 2.0PF C	C1
C5			CC73FCH1H1R5C	CHIP C 1.5PF C	K,M2C2
C7			CK73FF1C105Z	CHIP C 1.0UF Z	
C10			CC73FCH1H020C	CHIP C 2.0PF C	K,M2
C11			CC73FCH1H180J	CHIP C 18PF J	K,M2
C11			CC73FCH1H471J	CHIP C 470PF J	C1,C2
C12			CK73FB1H102K	CHIP C 1000PF K	
C13			CC73FCH1H030C	CHIP C 3.0PF C	C1
C13			CC73FCH1H050C	CHIP C 5.0PF C	K,M2
C13			CC73FCH1H1R5C	CHIP C 1.5PF C	C2
C14,15			CK73FB1H102K	CHIP C 1000PF K	
C16			CC73FCH1H070D	CHIP C 7.0PF D	C1
C16			CC73FCH1H080D	CHIP C 8.0PF D	K,M2
C16			CC73FCH1H090D	CHIP C 9.0PF D	C2
C17			CK73FF1C105Z	CHIP C 1.0UF Z	
C18			CK73FB1H102K	CHIP C 1000PF K	
C19			CC73FCH1H120J	CHIP C 12PF J	K,M2
C19			CC73FCH1H470J	CHIP C 47PF J	C1,C2
C20			CK73FB1H102K	CHIP C 1000PF K	
C22			CC73FCH1H390J	CHIP C 39PF J	
C23			CK73FB1H102K	CHIP C 1000PF K	
C24			CE04EW1A470M	ELECTRO 47UF 10WV	
C25			CK73FF1C105Z	CHIP C 1.0UF Z	
C26			C92-0001-05	CHIP-C 0.1UF 35WV	C1
C26			C92-0002-05	CHIP-TAN 0.22UF 35WV	K,M2
C26			C92-0502-05	CHIP-TAN 0.33UF 35WV	C2
C29			CK73FB1H102K	CHIP C 1000PF K	
C30			CK73FB1H681K	CHIP C 680PF K	
C31			CK73FB1E104K	CHIP C 0.10UF K	
C32			CK73FB1H103K	CHIP C 0.010UF K	
C33			CE04EW1C470M	ELECTRO 47UF 16WV	
C34			CE04EW1A471M	ELECTRO 47UF 10WV	
C35,36			CE04EW1C470M	ELECTRO 47UF 16WV	
C37			CE04EW1C101M	ELECTRO 100UF 16WV	
C38			CE04EW1C470M	ELECTRO 47UF 16WV	
C39			CK73FB1H473K	CHIP C 0.047UF K	
C40,41			CK73FB1H103K	CHIP C 0.010UF K	
C42			CE04EW1A470M	ELECTRO 47UF 10WV	
C43			CK73FF1C105Z	CHIP C 1.0UF Z	
C44			CE04EW1A470M	ELECTRO 47UF 10WV	
C45			CK73FB1H103K	CHIP C 0.010UF K	

PARTS LSIT

TX-RX UNIT (X57-498X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C46,47			C92-0504-05	CHIP-TAN 0.68UF 20WV		C111			CK73FB1H102K	CHIP C 1000PF K	
C51			CE04EW1C470M	ELECTRO 47UF 16WV		C114			CC73FCH1H1R5C	CHIP C 1.5PF C	C1,C2
C52			CK73FB1E333K	CHIP C 0.033UF K		C115			CC73FCH1H220J	CHIP C 22PF J	
C52			CK73FB1E393K	CHIP C 0.039UF K		C116			CC73FUJ1H150J	CHIP C 15PF J	
C52			CK73FB1E883K	CHIP C 0.068UF K	C2 C1 K,M2	C117			CC73FCH1H050C	CHIP C 5.0PF C	C2
C53			C92-0606-05	CHIP-TAN 4.7UF 10WV		C117			CC73FCH1H080D	CHIP C 8.0PF D	C1
C55			CC73FCH1H101J	CHIP C 100PF J		C118	*		C91-3001-05	CHIP C 1.0PF J	C1,C2
C56			CK73FB1H103K	CHIP C 0.010UF K		C118	*		C91-3006-05	CHIP C 5.0PF J	K,M2
C57			CE04EW1A470M	ELECTRO 47UF 10WV		C119			CC73FCH1H010C	CHIP C 1.0PF C	C2
C58			CK73FB1H103K	CHIP C 0.010UF K		C120			CK73FB1H472K	CHIP C 4700PF K	
C60			CE04EW1C100M	ELECTRO 10UF 16WV		C121			CK73FB1H102K	CHIP C 1000PF K	
C61			CK73FB1H103K	CHIP C 0.010UF K		C124			CE04EW1E4R7M	ELECTRO 4.7UF 25WV	
C62			CK73FB1H102K	CHIP C 1000PF K		C125			CK73FB1H102K	CHIP C 1000PF K	
C64			CK73FB1H103K	CHIP C 0.010UF K		C125,127			CK73FF1C105Z	CHIP C 1.0UF Z	
C65			CC73FCH1H070D	CHIP C 7.0PF D		C128			CK73FB1H103K	CHIP C 0.010UF K	
C66,67			CK73FB1H102K	CHIP C 1000PF K		C137			CK73FB1H102K	CHIP C 1000PF K	K,M2
C68			CC73FCH1H030C	CHIP C 3.0PF C	C2 K,M2C1	C138			CC73FCH1H070D	CHIP C 7.0PF D	K,M2
C68			CC73FCH1H050C	CHIP C 5.0PF C		C139			CK73FB1H102K	CHIP C 1000PF K	
C69-72			CK73FB1H102K	CHIP C 1000PF K		C201			CK73FB1H102K	CHIP C 1000PF K	
C74			CK73FB1H102K	CHIP C 1000PF K		C202			CK73FF1C105Z	CHIP C 1.0UF Z	
C75			CK73FF1C105Z	CHIP C 1.0UF Z		C203			CK73FB1H102K	CHIP C 1000PF K	
C76			CK73FB1H102K	CHIP C 1000PF K		C204			CC73FCH1H101J	CHIP C 100PF J	
C77			CE04EW1C100M	ELECTRO 10UF 16WV		C205			CE04CW1C100M	ELECTRO 10UF 16WV	
C78			CK73FB1H471K	CHIP C 470PF K		C206			CC73FCH1H820J	CHIP C 82PF J	
C79			CM73F2H050D	CHIP C 5.0PF D	C2	C207			CK73FB1H332K	CHIP C 3300PF K	
C79			CM73F2H060D	CHIP C 6.0PF D	K	C208			CK73FB1H681K	CHIP C 680PF K	
C79			CM73F2H070D	CHIP C 7.0PF D	M2	C209			CK73FB1H333K	CHIP C 0.033UF K	
C79			CM73F2H100D	CHIP C 10PF D	C1	C210			CC73FCH1H270J	CHIP C 27PF J	
C80	*		C91-3003-05	CHIP C 2.0PF J	C1	C211			C92-0004-05	CHIP-TAN 1.0UF 16WV	
C80	*		C91-3004-05	CHIP C 3.0PF J	C2	C212			CK73FB1H333K	CHIP C 0.033UF K	
C81			CK73FB1H102K	CHIP C 1000PF K		C213			CK73FB1H102K	CHIP C 1000PF K	
C82	*		C91-3015-05	CHIP C 15PF J	K,C1C2	C214			CK73FF1E104Z	CHIP C 0.10UF Z	
C82	*		C91-3017-05	CHIP C 18PF J	M2	C215			CK73FB1H223K	CHIP C 0.022UF K	
C83	*		C91-3017-05	CHIP C 18PF J	C2	C216,217			CC73FCH1H101J	CHIP C 100PF J	
C83	*		C91-3019-05	CHIP C 22PF J	K,M2C1	C218			CK73FB1H102K	CHIP C 1000PF K	
C84			CC73FCH1H0R5C	CHIP C 0.5PF C		C219			CK73FB1H103K	CHIP C 0.010UF K	
C85			CC73FCH1H010C	CHIP C 1.0PF C	M2C1C2	C220,221			CK73FB1H102K	CHIP C 1000PF K	
C85			CC73FCH1H1R5C	CHIP C 1.5PF C	K	C222,223			CK73FB1H103K	CHIP C 0.010UF K	
C86	*		C91-3005-05	CHIP C 4.0PF J	K,M2	C224			CE04CW0J331M	ELECTRO 330UF 6.3WV	
C86	*		C91-3006-05	CHIP C 5.0PF J	C2	C225			CE04CW1C100M	ELECTRO 10UF 16WV	
C86	*		C91-3007-05	CHIP C 6.0PF J	C1	C226			CK73FB1H471K	CHIP C 470PF K	
C87	*		C91-3008-05	CHIP C 7.0PF J	K,M2C2	C227			C92-0004-05	CHIP-TAN 1.0UF 16WV	
C87	*		C91-3010-05	CHIP C 9.0PF J	C1	C228-230			CK73FB1H103K	CHIP C 0.010UF K	
C88			CC73FCH1H0R5C	CHIP C 0.5PF C	K,M2C1	C231			CK73FB1H102K	CHIP C 1000PF K	
C88			CC73FCH1H010C	CHIP C 1.0PF C	C2	C232			CC73FCH1H330J	CHIP C 33PF J	
C90			CC73FCH1H010C	CHIP C 1.0PF C	C1,C2	C233,234			CK73FB1H103K	CHIP C 0.010UF K	
C90			CC73FCH1H040C	CHIP C 4.0PF C	K,M2	C236			CK73FB1H332K	CHIP C 3300PF K	
C91			CK73FB1H102K	CHIP C 1000PF K		C237			CK73FF1C105Z	CHIP C 1.0UF Z	
C92	*		C91-3006-05	CHIP C 5.0PF J		C238-241			CC73FCH1H101J	CHIP C 100PF J	
C93			CK73FB1H103K	CHIP C 0.010UF K		C242			CK73FB1H103K	CHIP C 0.010UF K	
C94			CE04EW1C100M	ELECTRO 10UF 16WV		C243			CC73FCH1H101J	CHIP C 100PF J	
C95,96			CK73FB1H103K	CHIP C 0.010UF K		C244			CK73FF1E104Z	CHIP C 0.10UF Z	
C97			C90-2092-05	ELECTRO 1800UF 16WV		C245			CK73FB1H102K	CHIP C 1000PF K	
C98			CK73FF1C105Z	CHIP C 1.0UF Z		C246,247			CC73FCH1H100D	CHIP C 10PF D	
C99,100			CK73FB1H102K	CHIP C 1000PF K		C248			CK73FB1H102K	CHIP C 1000PF K	
C102			CK73FB1H102K	CHIP C 1000PF K		C249			CK73FB1H103K	CHIP C 0.010UF K	
C103			CC73FSL1H101J	CHIP C 100PF J		C250			CK73FF1C105Z	CHIP C 1.0UF Z	
C107,108			CK73FB1H102K	CHIP C 1000PF K		C251,252			CK73FB1H472K	CHIP C 4700PF K	
C109,110			CC73FSL1H101J	CHIP C 100PF J		TC1			C95-0354-05	TRIM CAP 3P	

PARTS LIST

TX-RX UNIT (X57-498X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
TC2			C05-0348-05	TRIM CAP 6P	K,M2C1	R2			RK73FB2A224J	CHIP R 220K J 1/10W	C1
TC3			C05-0349-05	TRIM CAP 10P		R3			RK73FB2A333J	CHIP R 33K J 1/10W	
CN1			E40-3237-05	PIN ASSY		R4,5			RK73FB2A101J	CHIP R 100 J 1/10W	
CN2			E40-0211-05	PIN ASSY		R12			R92-0670-05	CHIP R 0 OHM	
CN3,4		*	E40-5817-05	PIN ASSY		R16,17			R92-0670-05	CHIP R 0 OHM	
CN5			E23-0465-05	TERMINAL							
CN201,202			E40-5203-05	PIN ASSY SOCKET							
CN203		*	E40-5830-05	FLAT CABLE CONNECTOR		R18			RK73FB2A223J	CHIP R 22K J 1/10W	
J1			E11-0425-05	PHONE JACK		R19-21			RK73FB2A102J	CHIP R 1.0K J 1/10W	
J201			E08-0877-05	RECTANGULAR RECEPTACLE		R23			RK73FB2A221J	CHIP R 220 J 1/10W	
W1,2			E33-1871-25	PROCESSED WIRE KIT	K	R24			RK73FB2A470J	CHIP R 47 J 1/10W	
						R26			RK73FB2A102J	CHIP R 1.0K J 1/10W	C2
			J30-0545-05	SPACER	C1,C2	R26			RK73FB2A152J	CHIP R 1.5K J 1/10W	C1
			J30-0564-05	SPACER	K,M2	R26			RK73FB2A471J	CHIP R 470 J 1/10W	K,M2
						R27			RK73FB2A153J	CHIP R 15K J 1/10W	C1,C2
						R28			RK73FB2A334J	CHIP R 330K J 1/10W	
						R29			RK73FB2A102J	CHIP R 1.0K J 1/10W	
CD1			L79-1013-05	TUNING COIL 455kHz		R35			RK73FB2A102J	CHIP R 1.0K J 1/10W	
CF1			L72-0366-05	CERAMIC FILTER 455kHz		R36			RK73FB2A331J	CHIP R 330 J 1/10W	
L1			L40-1871-48	SMALL FIXED INDUCTOR 18nH	C2	R37			RK73FB2A487J	CHIP R 4.7 J 1/10W	
L1			L40-2272-80	SMALL FIXED INDUCTOR 22nH	K,M2C1	R38,39			RK73FB2A101J	CHIP R 100 J 1/10W	
L2			L40-1272-48	SMALL FIXED INDUCTOR 12nH	K,M2	R40			RK73FB2A473J	CHIP R 47K J 1/10W	
L2			L40-1571-48	SMALL FIXED INDUCTOR 15nH	C1	R41			RK73FB2A333J	CHIP R 33K J 1/10W	
L2			L40-2771-48	SMALL FIXED INDUCTOR 27nH	C2	R44			RK73FB2A102J	CHIP R 1.0K J 1/10W	
L3			L79-0690-05	HELICAL BLOCK 435MHz	K,M2	R45			R92-0670-05	CHIP R 0 OHM	
L3			L79-0877-05	HELICAL BLOCK 455MHz	C2	R47			RK73FB2A182J	CHIP R 1.8K J 1/10W	
L3			L79-0883-05	HELICAL BLOCK 415MHz	C1	R48-50			RK73FB2A103J	CHIP R 10K J 1/10W	
L5			L79-0690-05	HELICAL BLOCK 435MHz	K,M2						
L5			L79-0877-05	HELICAL BLOCK 455MHz	C2	R51			RK73FB2A182J	CHIP R 1.8K J 1/10W	
L5			L79-0883-05	HELICAL BLOCK 415MHz	C1	R52			RK73FB2A334J	CHIP R 330K J 1/10W	
L6			L40-1872-48	SMALL FIXED INDUCTOR 18nH	K,M2	R53,54			RK73FB2A223J	CHIP R 22K J 1/10W	
L8			L40-1872-48	SMALL FIXED INDUCTOR 18nH	K,M2C1	R55			RK73FB2A473J	CHIP R 47K J 1/10W	
						R56			RK73FB2A103J	CHIP R 10K J 1/10W	
L8			L40-2772-48	SMALL FIXED INDUCTOR 27nH	C2	R57			R92-0670-05	CHIP R 0 OHM	C1,C2
L9			L34-2157-05	COIL	K,M2C1	R58			RK73FB2A104J	CHIP R 100K J 1/10W	
L9			L34-4191-05	COIL	C2	R60			RK73FB2A334J	CHIP R 330K J 1/10W	C1,C2
L10			L40-1092-81	SMALL FIXED INDUCTOR 1.0UH		R61			RK73FB2A104J	CHIP R 100K J 1/10W	
L11			L40-1005-48	SMALL FIXED INDUCTOR 10UH		R62			RK73FB2A332J	CHIP R 3.3K J 1/10W	
L12			L40-2272-48	SMALL FIXED INDUCTOR 22nH		R66			RK73FB2A102J	CHIP R 1.0K J 1/10W	
L13			L34-0808-05	COIL 9.5T		R69-72			RK73FB2A472J	CHIP R 4.7K J 1/10W	
L14			L34-1052-05	COIL 1.5T	C1	R73			RK73FB2A220J	CHIP R 22 J 1/10W	
L14			L34-1123-05	COIL 1.5T	K,M2C2	R74			RK73FB2A152J	CHIP R 1.5K J 1/10W	
L15			L34-1032-05	COIL 3.5T		R75			RK73FB2A220J	CHIP R 22 J 1/10W	
L16,17			L34-1052-05	COIL 1.5T	C1,C2	R77			RK73FB2A222J	CHIP R 2.2K J 1/10W	
L16,17			L34-1123-05	COIL 1.5T	K,M2	R78			RK73FB2A472J	CHIP R 4.7K J 1/10W	
L18			L34-0908-05	COIL 9.5T		R79,80			RK73FB2A101J	CHIP R 100 J 1/10W	
L19			L40-2271-34	SMALL FIXED INDUCTOR 22nH	C2	R81			RK73FB2A222J	CHIP R 2.2K J 1/10W	
L19			L40-2771-34	SMALL FIXED INDUCTOR 27nH	C1	R82			RK73FB2A104J	CHIP R 100K J 1/10W	
L201			L40-1091-42	SMALL FIXED INDUCTOR 1.0UH		R84			RK73FB2A182J	CHIP R 1.8K J 1/10W	C2
X1			L77-1312-05	CRYSTAL RESONATOR 30.369MHz	K,M2	R84			RK73FB2A222J	CHIP R 2.2K J 1/10W	C1
X1			L77-1419-05	CRYSTAL RESONATOR 30.755MHz	C1	R84			RK73FB2A332J	CHIP R 3.3K J 1/10W	K,M2
X1			L77-1420-05	CRYSTAL RESONATOR 33.845MHz	C2	R85			RK73FB2A100J	CHIP R 10 J 1/10W	K,M2
X2			L77-1491-05	CRYSTAL RESONATOR 12.800MHz		R85			RK73FB2A330J	CHIP R 33 J 1/10W	C1,C2
X201			L77-1476-05	CRYSTAL RESONATOR 4.194304MHz		R86			RK73FB2A102J	CHIP R 1.0K J 1/10W	
XF1			L71-0270-05	CRYSTAL FILTER 30.825MHz	K,M2	R88			R92-0670-05	CHIP R 0 OHM	
XF1			L71-0294-05	CRYSTAL FILTER 30.300MHz	C1	R90			R92-0685-05	CHIP R 22 J 1/2W	
XF1			L71-0296-05	CRYSTAL FILTER 34.300MHz	C2	R92,93			R92-0679-05	CHIP R 0 OHM	
CP1			R90-0714-05	MULTI-COMP 10K X 4		R94			R92-1214-05	CHIP R 120 J 1/2W	
CP2			R90-0720-05	MULTI-COMP 100K X 4							
CP3,4			R90-0714-05	MULTI-COMP 10K X 4		R95			R92-1215-05	CHIP R 470 J 1/2W	
R1			R92-0670-05	CHIP R 0 OHM		R96-99			RK73FB2A103J	CHIP R 10K J 1/10W	
R2			RK73FB2A184J	CHIP R 180K J 1/10W	K,M2C2	R100			R92-0670-05	CHIP R 0 OHM	
						R101			RK73FB2A220J	CHIP R 22 J 1/10W	K,M2

PARTS LIST

TX-RX UNIT (X57-498X-XX)

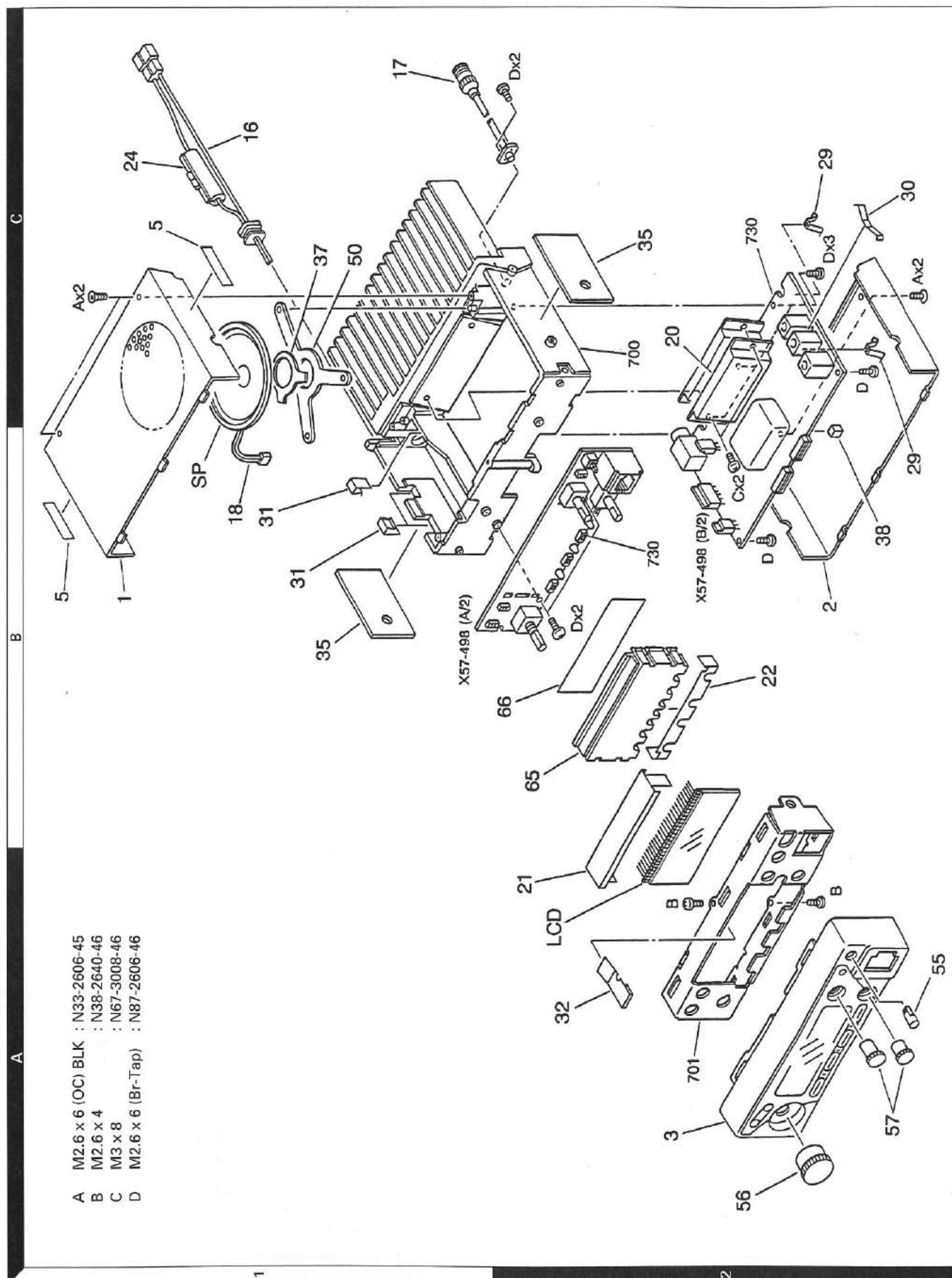
Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R101			R92-0670-05	CHIP R 0 OHM	C1,C2	R255			RK73FB2A102J	CHIP R 1.0K J 1/10W	
R102			RK73FB2A273J	CHIP R 27K J 1/10W		R256			RK73FB2A473J	CHIP R 47K J 1/10W	
R103			RK73FB2A101J	CHIP R 100 J 1/10W		R257			RK73FB2A474J	CHIP R 470K J 1/10W	
R104			RK73FB2A103J	CHIP R 10K J 1/10W		R258,259			R92-0670-05	CHIP R 0 OHM	
R105			R92-0670-05	CHIP R 0 OHM	C1	R260			RK73FB2A103J	CHIP R 10K J 1/10W	
R106			RK73FB2A563J	CHIP R 56K J 1/10W		R261			R92-0670-05	CHIP R 0 OHM	
R107			RK73FB2A104J	CHIP R 100K J 1/10W		R262-264			RK73FB2A473J	CHIP R 47K J 1/10W	
R108			RK73FB2A332J	CHIP R 3.3K J 1/10W		R265			R92-0670-05	CHIP R 0 OHM	
R109			RK73FB2A104J	CHIP R 100K J 1/10W		R266			RK73FB2A473J	CHIP R 47K J 1/10W	
R110			RK73FB2A151J	CHIP R 150 J 1/10W		R267,268			RK73FB2A102J	CHIP R 1.0K J 1/10W	
R111			R92-0670-05	CHIP R 0 OHM	C1,C2	R269			RK73FB2A223J	CHIP R 22K J 1/10W	
R112,113			R92-0670-05	CHIP R 0 OHM		R270-272			RK73FB2A473J	CHIP R 47K J 1/10W	
R114			RK73FB2A152J	CHIP R 1.5K J 1/10W		R273			R92-0670-05	CHIP R 0 OHM	
R115,116			RK73FB2A103J	CHIP R 10K J 1/10W		R280			RD14BB2C473J	RD 47K J 1/6W	
R117			RK73FB2A152J	CHIP R 1.5K J 1/10W		VR2			R12-6744-05	TRIM POT 47K	
R118			RK73FB2A222J	CHIP R 2.2K J 1/10W		VR3,4			R12-6740-05	TRIM POT 10K	
R119			RK73FB2A102J	CHIP R 1.0K J 1/10W		VR5			R12-6746-05	TRIM POT 100K	
R120			RK73FB2A154J	CHIP R 150K J 1/10W		VR201			R05-4420-05	POTENTIO METER 50K	
R121			RK73FB2A102J	CHIP R 1.0K J 1/10W		VR202			R05-3441-05	POTENTIO METER 10K	
R122,123			RK73FB2A101J	CHIP R 100 J 1/10W							
R200			RK73FB2A333J	CHIP R 33K J 1/10W		S201		*	S68-0410-05	PUSH SWITCH	
R201			R92-0686-05	CHIP R 33 J 1/2W		S202-208			S70-0439-05	TACT SWITCH	
R202-204			RK73FB2A100J	CHIP R 10 J 1/10W		S209			W02-1707-05	ROTARY ENCODER	
R205			RK73FB2A332J	CHIP R 3.3K J 1/10W		D1			1SV12B	VARI-CAP DIODE	
R206			RK73FB2A101J	CHIP R 100 J 1/10W		D4,5			DAN202K	DIODE	
R207			RK73FB2A103J	CHIP R 10K J 1/10W		D6			1SV12B	VARI-CAP DIODE	
R208-210			RK73FB2A823J	CHIP R 82K J 1/10W		D7			DAN202K	DIODE	
R211			RK73FB2A473J	CHIP R 47K J 1/10W		D8			UM9401	DIODE	
R212			RK73FB2A224J	CHIP R 220K J 1/10W		D9			MI308	DIODE	
R213			RK73FB2A333J	CHIP R 33K J 1/10W		D10,11			MA716	DIODE	
R214			RK73FB2A184J	CHIP R 180K J 1/10W		D12		*	DSA3A1-FK	DIODE	
R215			RK73FB2A394J	CHIP R 390K J 1/10W		D15			MI308	DIODE	
R216			RK73FB2A224J	CHIP R 220K J 1/10W		D201			MA110	DIODE	
R217			RK73FB2A561J	CHIP R 560 J 1/10W		D202			DTZ7.5(B)	ZENNER DIODE	
R218			RK73FB2A564J	CHIP R 560K J 1/10W		D203,204			MA729	DIODE	
R219			RK73FB2A561J	CHIP R 560 J 1/10W		D205,206			MA110	DIODE	
R220			RK73FB2A470J	CHIP R 47 J 1/10W		D207			MA112	DIODE	
R221			RK73FB2A104J	CHIP R 100K J 1/10W		IC1			KCD10	IC (FM IF)	
R222			RK73FB2A223J	CHIP R 22K J 1/10W		IC2			LA4446	IC (AF POWER AMP)	
R223,224			RK73FB2A102J	CHIP R 1.0K J 1/10W		IC3			BU2090FS	IC (SHIFT/STORE REGISTER)	
R225			RK73FB2A472J	CHIP R 4.7K J 1/10W		IC4			NJM78L05UA	IC (VOLTAGE REGULATOR/ +5V)	
R226,227			RK73FB2A103J	CHIP R 10K J 1/10W		IC5			LA5010M	IC (LOW SATURATION REGULATOR)	
R228			RK73FB2A223J	CHIP R 22K J 1/10W		IC6			KCB14	IC (DRIVER)	
R229			RK73FB2A473J	CHIP R 47K J 1/10W		IC8			TA7808S	IC (VOLTAGE REGULATOR/ +8V)	
R230,231			RK73FB2A103J	CHIP R 10K J 1/10W		IC201		*	M38267M8L103FP	IC (MICROPROCESSOR)	M2C1C2
R233			R92-0670-05	CHIP R 0 OHM		IC201		*	M38267M8L105FP	IC (MICROPROCESSOR)	K
R234,235			R92-0670-05	CHIP R 0 OHM	C1,C2	IC205			BU4S66	IC (ANALOG SWITCH)	
R236			R92-0670-05	CHIP R 0 OHM	K	IC207			NJM4558E	IC (OP AMP X2)	
R237			RK73FB2A152J	CHIP R 1.5K J 1/10W		IC208			TA78L05F	IC (VOLTAGE REGULATOR/ +5V)	
R238			RK73FB2A473J	CHIP R 47K J 1/10W		IC209			PST9130NR	IC (SYSTEM RESET)	
R239			RK73FB2A183J	CHIP R 18K J 1/10W		IC210			X25180SI-2.7	IC (2Kx8bit SERIAL EEPROM)	
R240			RK73FB2A473J	CHIP R 47K J 1/10W		IC211			LC73881M	IC (DTMF DECODER)	
R244			R92-0670-05	CHIP R 0 OHM		IC212,213			BU4S66	IC (ANALOG SWITCH)	
R245			RK73FB2A103J	CHIP R 10K J 1/10W		IC301			M57788H	IC (POWER MODULE)	C2
R246-248			RK73FB2A473J	CHIP R 47K J 1/10W		IC301			M57788L	IC (POWER MODULE)	C1
R249			RK73FB2A822J	CHIP R 8.2K J 1/10W		IC301			M57788M	IC (POWER MODULE/430-450MHz 35W)	K,M2
R250-253			RK73FB2A102J	CHIP R 1.0K J 1/10W		Q1			3SK184(S)	FET	
R254			RK73FB2A330J	CHIP R 33 J 1/10W		Q3			3SK184(S)	FET	
						Q5			2SC2059K(P)	TRANSISTOR	

PARTS LIST

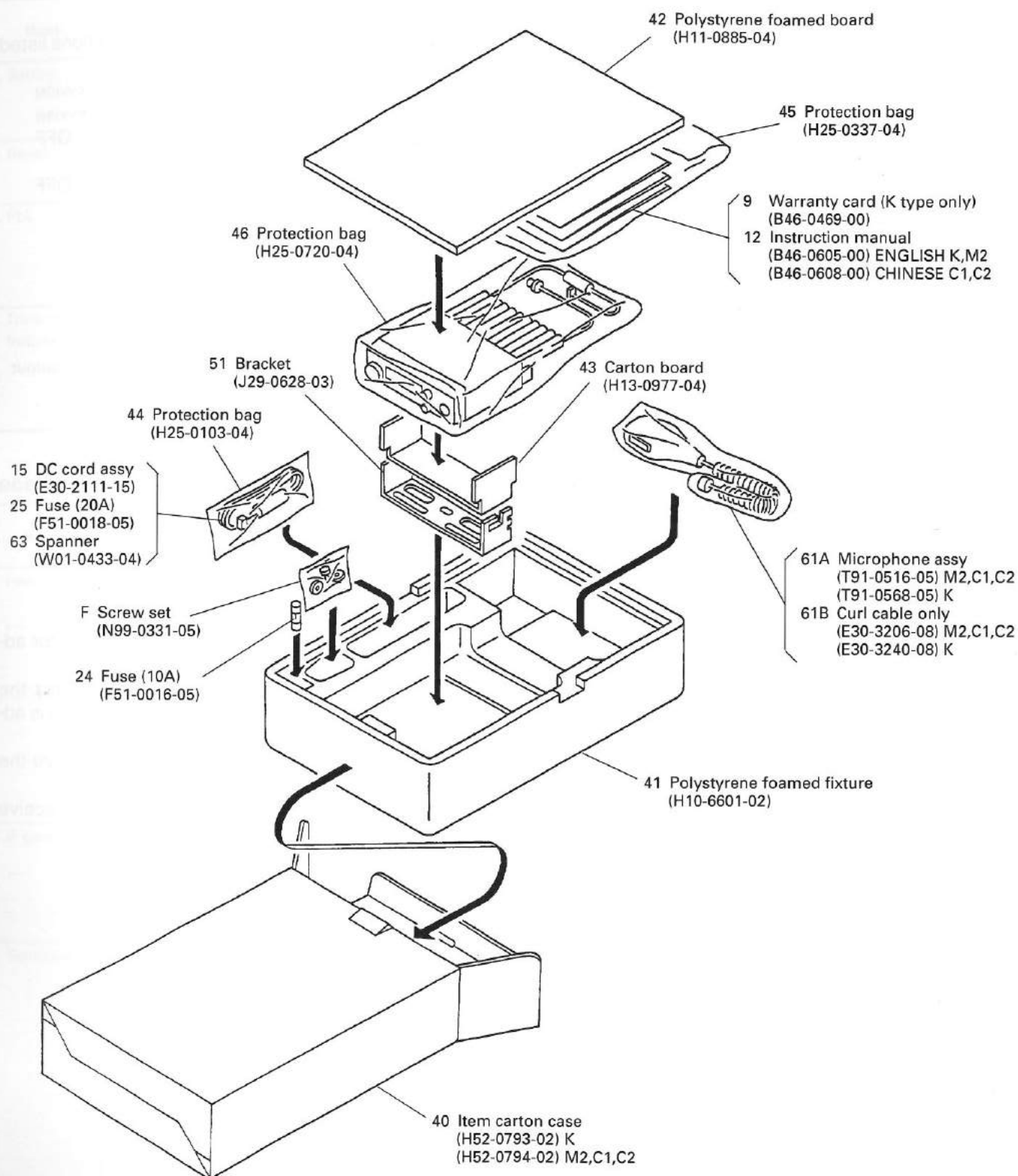
TX-RX UNIT (X57-498X-XX)
PLL (X58-442X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
Q6			DTC363EK	DIGITAL TRANSISTOR		L101,102			L40-8282-19	SMALL FIXED INDUCTOR 820nH	
Q7,8			2SB1132(Q,R)	TRANSISTOR		L103	*		L34-4454-05	COIL 2T	K,M2C2
Q9			DTC144WK	DIGITAL TRANSISTOR		L103	*		L34-4463-05	COIL 2T	C1
Q10-13			2SC2412K(Q)	TRANSISTOR		L104			L40-2281-80	SMALL FIXED INDUCTOR 220nH	
Q14			2SC3123	TRANSISTOR		L105			L40-3382-19	SMALL FIXED INDUCTOR 330nH	
Q15,16			DTC124EK	DIGITAL TRANSISTOR		L106			L40-3972-80	SMALL FIXED INDUCTOR 39nH	
Q17			2SD1406(Y)	TRANSISTOR		R1,2			RK73FB2A473J	CHIP R 47K J 1/10W	
Q18			2SB1302(S)	TRANSISTOR		R3			RK73FB2A392J	CHIP R 3.9K J 1/10W	
Q19			2SC2412K(Q)	TRANSISTOR		R4			RK73FB2A332J	CHIP R 3.3K J 1/10W	
Q24			DTC363EK	DIGITAL TRANSISTOR		R5			RK73FB2A221J	CHIP R 220 J 1/10W	
Q27			2SJ106(GR)	FET		R6			RK73FB2A222J	CHIP R 2.2K J 1/10W	
Q28			2SC2412K(Q)	TRANSISTOR		R7			RK73FB2A474J	CHIP R 470K J 1/10W	
Q29			FMW1	TRANSISTOR		R8			RK73FB2A472J	CHIP R 4.7K J 1/10W	C1
Q30			2SA1037K(Q)	TRANSISTOR		R8			RK73FB2A682J	CHIP R 6.8K J 1/10W	K,M2
Q31			2SC2412K(Q)	TRANSISTOR		R8,9			RK73FB2A682J	CHIP R 6.8K J 1/10W	C2
Q201			2SA1519	TRANSISTOR		R9			RK73FB2A822J	CHIP R 8.2K J 1/10W	K,M2C1
Q202			DTC114EK	DIGITAL TRANSISTOR		R10-12			RK73FB2A473J	CHIP R 47K J 1/10W	
Q203			2SC4116(GR)	TRANSISTOR		R13			RK73FB2A473J	CHIP R 47K J 1/10W	C1,C2
Q204			DTC114EK	DIGITAL TRANSISTOR		R14			RK73FB2A331J	CHIP R 330 J 1/10W	
Q205			2SC4116(Y)	TRANSISTOR		R15			RK73FB2A472J	CHIP R 4.7K J 1/10W	
PLL (X58-442X-XX) 0-00 : K,M2 3-01 : C1 3-02 : C2						R16			RK73FB2A222J	CHIP R 2.2K J 1/10W	
C1			CK73FB1H223K	CHIP C 0.022UF K		R17			RK73FB2A103J	CHIP R 10K J 1/10W	
C4			CK73FB1H102K	CHIP C 1000PF K		R20			R92-0670-05	CHIP R 0 OHM	C1,C2
C5			CK73FB1E683K	CHIP C 0.068UF K		R101			R92-0670-05	CHIP R 0 OHM	
C6,7			CK73FB1H223K	CHIP C 0.022UF K		R102			RK73FB2A102J	CHIP R 1.0K J 1/10W	
C8,9			C92-0007-05	CHIP-TAN 2.2UF 20WV	K,M2	R103			RK73FB2A683J	CHIP R 68K J 1/10W	
C10			C92-0002-05	CHIP-TAN 0.22UF 35WV		R104			RK73FB2A470J	CHIP R 47 J 1/10W	
C11			CK73FB1H223K	CHIP C 0.022UF K		R106			RK73FB2A101J	CHIP R 100 J 1/10W	
C12			CC73FCH1H100D	CHIP C 10PF D		R106			RK73FB2A181J	CHIP R 180 J 1/10W	C2
C13			CK73FB1H223K	CHIP C 0.022UF K		R107			RK73FB2A470J	CHIP R 47 J 1/10W	K,M2C1
C14			CC73FCH1H040C	CHIP C 4.0PF C		R108			RK73FB2A392J	CHIP R 3.9K J 1/10W	
C15			CK73FB1H102K	CHIP C 1000PF K		R109			RK73FB2A103J	CHIP R 10K J 1/10W	
C16,17			CC73FSL1H101J	CHIP C 100PF J		R110			RK73FB2A101J	CHIP R 100 J 1/10W	
C18			C92-0589-05	CHIP-TAN 1.5UF 16V	C1,C2	D101,102	*		HVU363A	DIODE	
C101			CK73FB1H102K	CHIP C 1000PF K		D103			1SV214	VARI-CAP DIODE	
C102			CK73FB1H471K	CHIP C 470PF K		IC1			M54959FP	IC (PLL FREQUENCY SYNTHESIZER)	
C103			CC73FCH1H390J	CHIP C 33PF J	C2	Q1			2SC2713(B)	TRANSISTOR	
C103			CC73FCH1H390J	CHIP C 39PF J	C1	Q1			2SC3324(B)	TRANSISTOR	
C103			CC73FCH1H470J	CHIP C 47PF J	K,M2	Q2,3			2SC3324(B)	TRANSISTOR	
C104			CC73FCH1H040C	CHIP C 4.0PF C	C2	Q2,3			2SC3324(G)	TRANSISTOR	
C104			CC73FCH1H060D	CHIP C 6.0PF D	K,M2	Q4			DTC144EK	DIGITAL TRANSISTOR	
C104,105			CC73FCH1H050C	CHIP C 5.0PF C	C1	Q5			2SC2059K(P)	TRANSISTOR	
C105			CC73FCH1H050C	CHIP C 5.0PF C	K,M2	Q101			2SK508NV(K52)	FET	
C105			CC73FCH1H080D	CHIP C 8.0PF D	C2	Q102			2SC3120	TRANSISTOR	
C106			CC73FCH1H010C	CHIP C 1.0PF C		TH101			157-302-65801	THERMISTOR (3k)	K,M2
C107			CC73FCH1HR75B	CHIP C 0.75PF B							
C108			CC73FCH1H040C	CHIP C 4.0PF C							
C109,110			CC73FCH1H040C	CHIP C 4.0PF C	C1						
C109,110			CC73FCH1H060D	CHIP C 6.0PF D	C2						
C109,110			CC73FCH1H080D	CHIP C 8.0PF D	K,M2						
C111			CC73FCH1H0R5C	CHIP C 0.5PF C							
C112			CC73FCH1H040C	CHIP C 4.0PF C							
C113,114			CK73FB1H102K	CHIP C 1000PF K							
CN1			E40-5201-05	PIN ASSY							
CN101			E40-0411-05	PIN ASSY							
CN102			E40-0311-05	PIN ASSY							
L1			L40-3972-80	SMALL FIXED INDUCTOR 39nH							

EXPLODED VIEW



PACKING



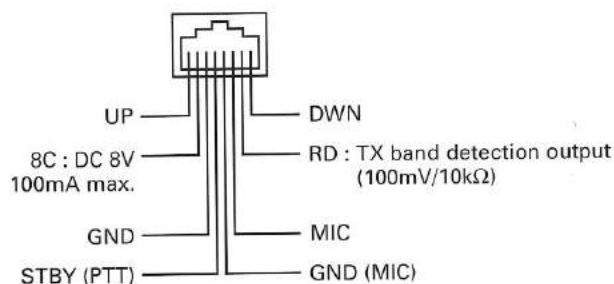
ADJUSTMENT

Measuring Equipment for Adjustment

1. Tester
Input impedance: High
2. RF valve voltmeter (RF V.M)
Input impedance: $1\text{M}\Omega$ or more, 2pF or less
Voltage range: Full scale = 10mV to 300V
Measurable frequency range: Up to 450MHz
3. Frequency counter (f. counter)
Input sensitivity: About 50mV
Measurable frequency: 450MHz or more
4. DC power supply
Voltage: Variable in the range 10 to 17V
Current: 13A or more
5. Power meter
Measurement power: 60W , 3W , 1W
Impedance: 50Ω
Measurable frequency: 450MHz
6. AF valve voltmeter (AF V.M)
Input range: Full scale = 1mV to 30V
Measurable frequency range: 50Hz to 10kHz
7. AF generator (AG)
Output frequency: 100Hz to 10kHz
Output voltage: 0.5mV to 1V
8. Line detector
Measurable frequency: 450MHz
9. Spectrum analyzer
Measurable frequency: 450MHz
10. Directional coupler
11. Oscilloscope
High sensitivity with horizontal input terminal
12. Standard signal generator (SSG)
The standard signal generator must be able to generate the 144 and 430MHz band frequencies and vary the amplitude and frequency.
Output: -20 to $100\text{dB}\mu$
13. Dummy load
 8Ω about 5W
14. Noise generator
The noise generator must be able to generate noise similar to ignition noise containing high-frequency components of 450MHz or more.
15. Sweep generator
The sweep generator must be able to sweep the 144 and 430MHz bands.
16. Tracking generator

Preparation

- Set the controls and switches to the positions listed below unless otherwise specified.
VOL control Fully counterclockwise
SQL control Fully counterclockwise
POWER switch OFF
DC power supply POWER switch
(For fixed stations) OFF



Microphone socket
(as viewed from the front of the set)

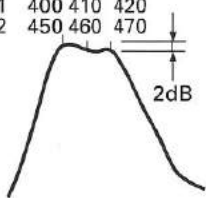
- Use an insulated rod, such as a plastic rod, for adjustment (especially for trimmers, coils, etc.).
- To protect the signal generator, never connect the microphone socket when the receiver section is adjusted.
- Before the power cord is connected, make sure the power switch is off.
- See the instruction manual for transmit and receive operations.

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 : OFF VOL, SQL knob : Minimum							
2. Reset	1) MR key + POWER ON After the check, MR key : Press						Check	All indicator of LCD on.
3. PLL	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Transmit/Receive	DC V.M Dummy load	TX-RX Rear panel	TP3 ANT			Check	RX : 1.0 to 9.0V TX : 1.5 to 9.0V
4. Transmission frequency	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Transmit	f. counter Power meter	Rear panel	ANT	TX-RX	TC3	444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2	(f+0.5kHz)±100Hz

Receiver Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Helical	1) Frequency : 444.05MHz K 435.05MHz M2 410.05MHz C1 460.05MHz C2	Spectrum analyzer Tracking generator	TX-RX Rear panel	CN2 ANT	TX-RX	TC1,2 L3,5	Maximum	M2 430 435 440 K 438 444 450 C1 400 410 420 C2 450 460 470 
100pF CN2 D2 100pF D1 47K D1, 2 : 1SS99 Oscilloscope or spectrum analyzer								
2. IF gain	1) Frequency : 444.05MHz K 435.05MHz M2 410.05MHz C1 460.05MHz C2 SSG output : -122dBm	SSG DC V.M	Rear panel TX-RX	ANT SM	TX-RX	L9	Maximize the SM voltage.	
3. Sensitivity	1) Frequency : K 444.05, 438.05, 449.95MHz M2 435.05, 430.05, 439.95MHz C1 410.05, 400.05, 424.95MHz C2 460.05, 450.05, 469.95MHz SSG output : -122dBm AF : 0.63V/8Ω	SSG Distortion meter AF V.M Oscilloscope	Rear panel	ANT EXT. SP			Check	More than SINAD 12dB
4. Distortion	1) Frequency : 444.05MHz K 435.05MHz M2 410.05MHz C1 460.05MHz C2 SSG output : -53dBm AF : 4.0V/8Ω						Check	Less than 3.0%

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. Hum and Noise ratio	1) Frequency : 444.05MHz K 435.05MHz M2 410.05MHz C1 460.05MHz C2 SSG output : -53dBm MOD : OFF AF : 2.83V/8Ω	SSG	Rear panel	ANT			Check	More than S/N 46dB
		AF V.M Oscilloscope		EXT. SP				
6. S-meter	1) Frequency : 444.05MHz K 435.05MHz M2 410.05MHz C1 460.05MHz C2 SSG output : -95dBm	SSG	Rear panel	ANT	TX-RX	VR5	Align so that all the S-meter go on, then the last segment goes off.	
	2) SSG output : -93dBm	LCD					Check	All S-meter segments on.
	3) SSG output : OFF							S-meter segments off.
7. Squelch	1) Frequency : 444.05MHz K 435.05MHz M2 410.05MHz C1 460.05MHz C2 SSG output : OFF Align so that noise is not audible by SQL knob.	SSG Ammeter	Rear panel	ANT			Check	Maker position of SQL knob 8 : 00~11 : 00 BUSY indication off. Less than 0.6A
	2) SSG output : -127dBm	Oscilloscope		EXT. SP			Check	Squelch opens. BUSY indication on.
	3) SSG output : -113dBm SQL knob : Maximum After the check, SQL knob : Minimum						Check	Squelch opens.

Transmitter Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Power	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 TX-RX unit VR3 : Maximum Transmit	Power meter Ammeter	Rear panel	ANT			Check	More than 37.0W ON AIR indication on. All RF-meter segments on.
	2) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Transmit				TX-RX	VR3	36.0W	±1.0W Less than 10.0A
	3) Frequency : K 438.000, 449.975MHz M2 430.000, 439.975MHz C1 400.000, 424.975MHz C2 450.000, 469.975MHz Transmit						Check	28.0~42.0W Less than 10.0A
	4) F key → LOW key (M on.) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Transmit				TX-RX	VR4	12.0W	±1.0W

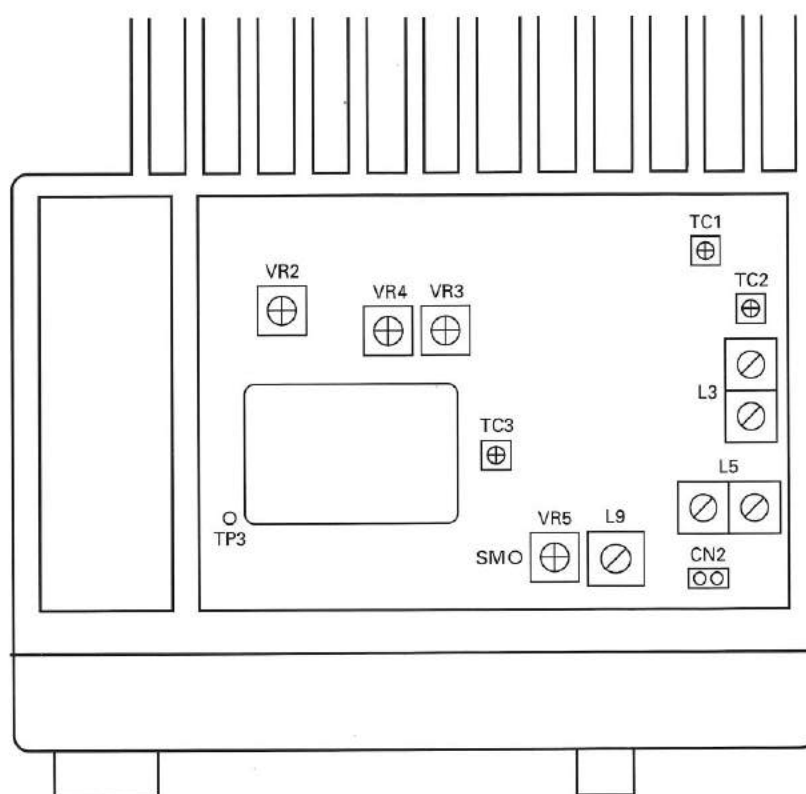
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
	5) F key → LOW key (L on.) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Transmit	Power meter Ammeter	Rear panel	ANT			Check	3.0~8.0W
2. DEV	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 AG : 1kHz/50mV Transmit	Modulation analyzer Oscilloscope	Rear panel	ANT	TX-RX	VR2	±4.4kHz (Align absolute value of + or - value.)	±0.2kHz No abnormal oscilloscope wave.
	2) AG : 1kHz/5mV Transmit	AG AF V.M	Front panel	MIC			Check	±2.2~3.6kHz No abnormal oscilloscope wave.
3. Tone	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 TONE key : Press (T on.) Transmit After the check, TONE key : Press (T off.)	Modulation analyzer Oscilloscope	Rear panel	ANT			Check	±0.5~1.5kHz
4. Single tone	1) POWER : OFF MHz key + REV key + POWER ON Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Transmit						Check	±0.8~1.5kHz
5. DTMF	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 Press the DTMF key of transmission jig.						Check	More than ±2.2kHz
6. Protection	1) Frequency : 444.000MHz K 435.000MHz M2 410.000MHz C1 460.000MHz C2 POWER : HI (F key + LOW key) ANT : Open and short Transmit	Ammeter					Check	Less than 10.0A
7. CTCSS	1) Only TSU-8 is installed set. Frequency : 438.100MHz K,M2 418.100MHz C1 468.100MHz C2 (CTCSS : 88.5Hz) TX-RX-communicate between testing set and monitor set.	Monitor 50Ω dummy load	Rear panel	ANT			Check	Their sets are able to TX-RX-communicate.
	2) Frequency : 438.100MHz K,M2 418.100MHz C1 468.100MHz C2 (CTCSS : 103.5Hz)							Their sets are not able to TX-RX-communicate.

TM-461A

ADJUSTMENT

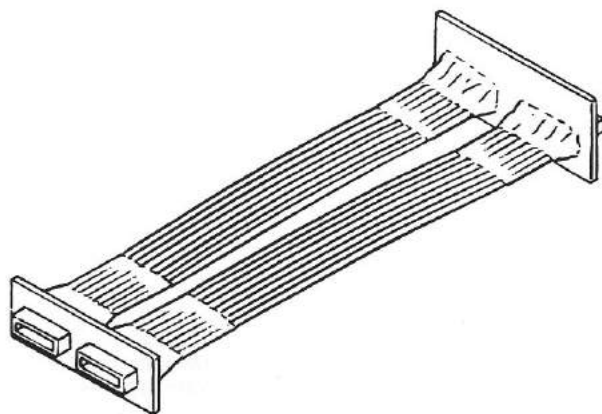
Adjustment Points



TC1, TC2, L3, L5 : Helical
TC3 : Transmission frequency
L9 : IF gain
VR2 : DEV
VR3 : HI power
VR4 : MID power
VR5 : S-meter

Jig (13 Pin Flat cable)

This is the same cable as TM-441's cable.



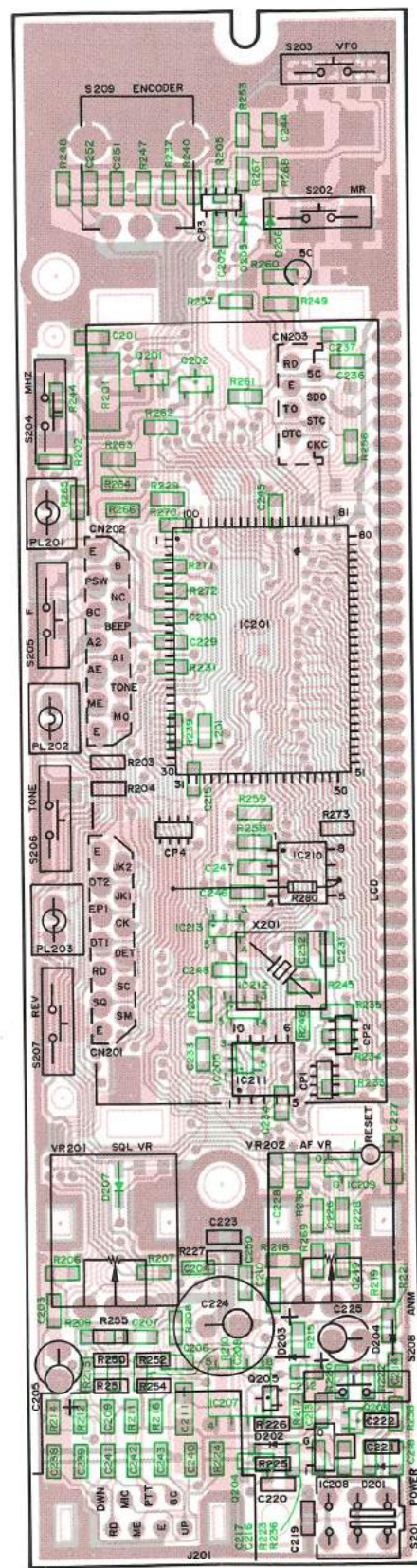
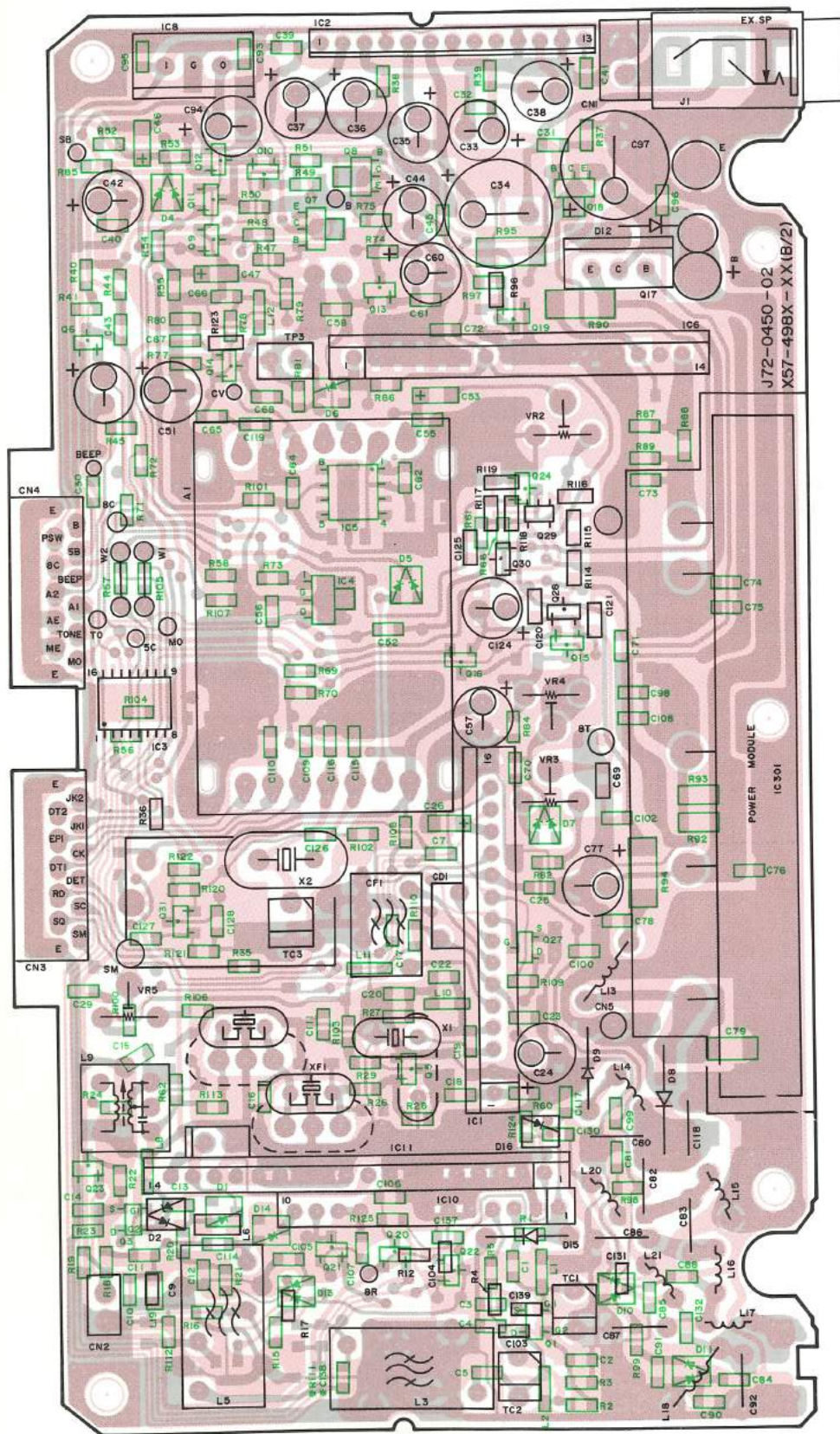
TERMINAL FUNCTION

TX-RX Unit (X57-498X-XX)

CN No.	Pin No.	Name	Function	CN No.	Pin No.	Name	Function
CN1	1	E	GND.		3	DT2	Shift register data output (From CPU IC201).
	2	SP	Speaker input.		4	JK1	Destination data input.
CN3	1	E	GND.		5	EP1	PLL enable (From CPU IC201).
	2	JK2	Destination data output.		6	CK	PLL clock (From CPU IC201).
	3	DT2	Shift register (IC3) enable.		7	DT1	PLL data (From CPU IC201).
	4	JK1	Destination data output.		8	DET	CTCSS detector output.
	5	EP1	PLL enable.		9	RD	Audio input.
	6	CK	PLL clock.		10	SC	Squelch busy control input (To CPU IC201).
	7	DT1	PLL data.		11	SQ	Squelch input (To CPU IC201).
	8	DET	CTCSS detector output.		12	SM	S-meter input (To CPU IC201).
	9	RD	Audio output.		13	E	GND.
	10	SC	Squelch busy control output.	CN202	1	E	GND.
	11	SQ	Squelch output.		2	B	+13.8V.
	12	SM	S-meter output.		3	PSW	Power switch control output (From CPU IC201).
	13	E	GND.		4	SB	+B line input from secondary terminal of power switch.
CN4	1	E	GND.		5	8C	Common +8V.
	2	B	+13.8V.		6	BEEP	Beep output (From CPU IC201).
	3	PSW	Power switch control input.		7	A2	Audio output (From AF volume).
	4	SB	+B line input from secondary terminal of power switch.		8	A1	Audio input (To AF volume).
	5	8C	Common +8V.		9	AE	GND.
	6	BEEP	Beep input (To audio IC from CPU).		10	TONE	TONE output (From CPU IC201).
	7	A2	Audio input (To AF power amplifier from AF volume).		11	ME	MIC GND.
	8	A1	Audio output (To AF volume).		12	MO	Modulation output (From MIC amplifier).
	9	AE	GND.		13	E	GND.
	10	TONE	Tone input.	CN203	1	RD	CTCSS unit voice de-modulation input.
	11	ME	MIC GND.		2	5C	+5V.
	12	MO	Modulation input.		3	E	GND.
	13	E	GND.		4	SDO	CTCSS unit tone matching input.
CN201	1	E	GND.		5	TO	Not used.
	2	JK2	Destination data input.		6	STC	CTCSS unit connect/enable output.
					7	DTC	CTCSS unit data output.
					8	CKC	CTCSS unit clock output.

TM-461A PC BOARD VIEWS

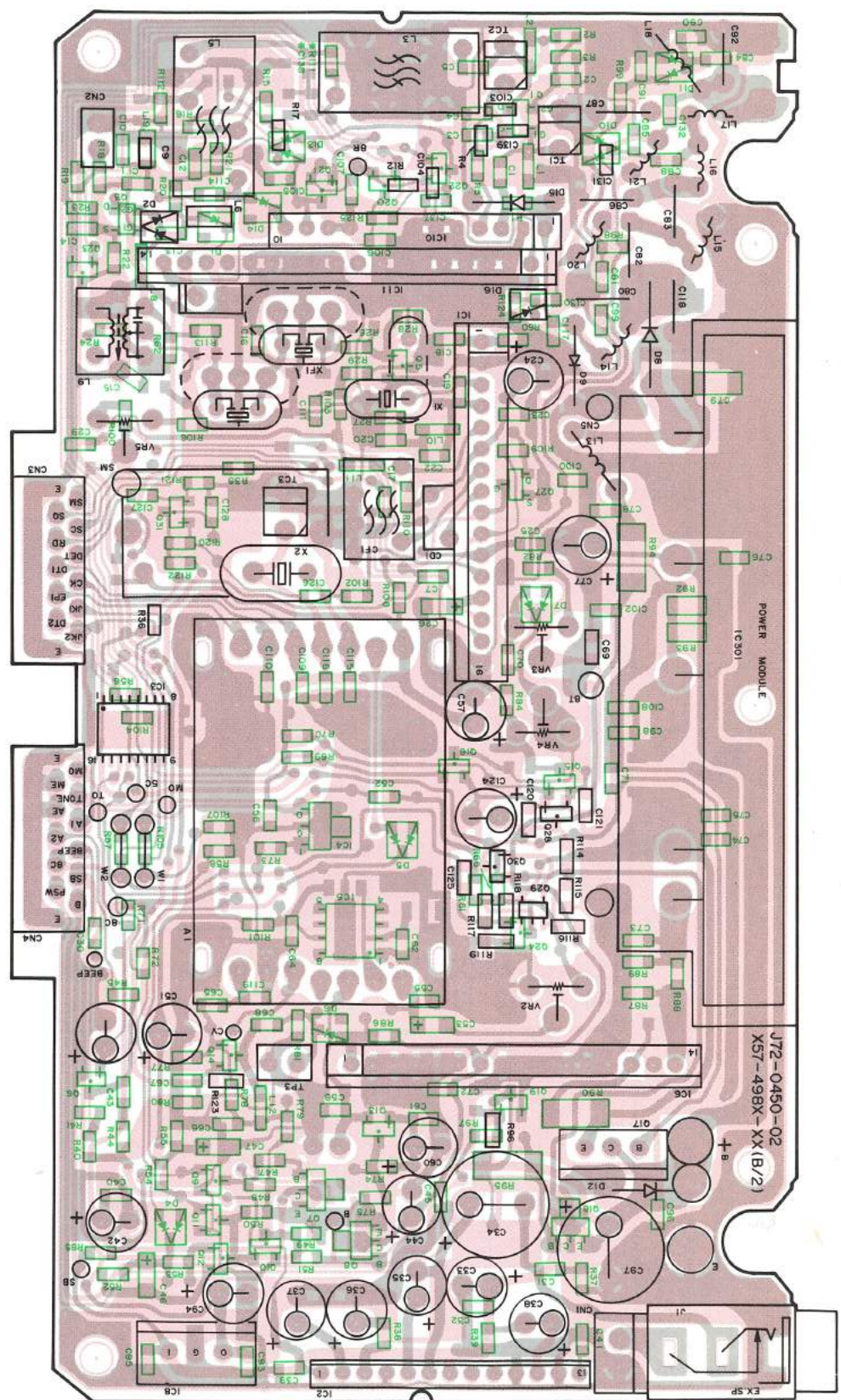
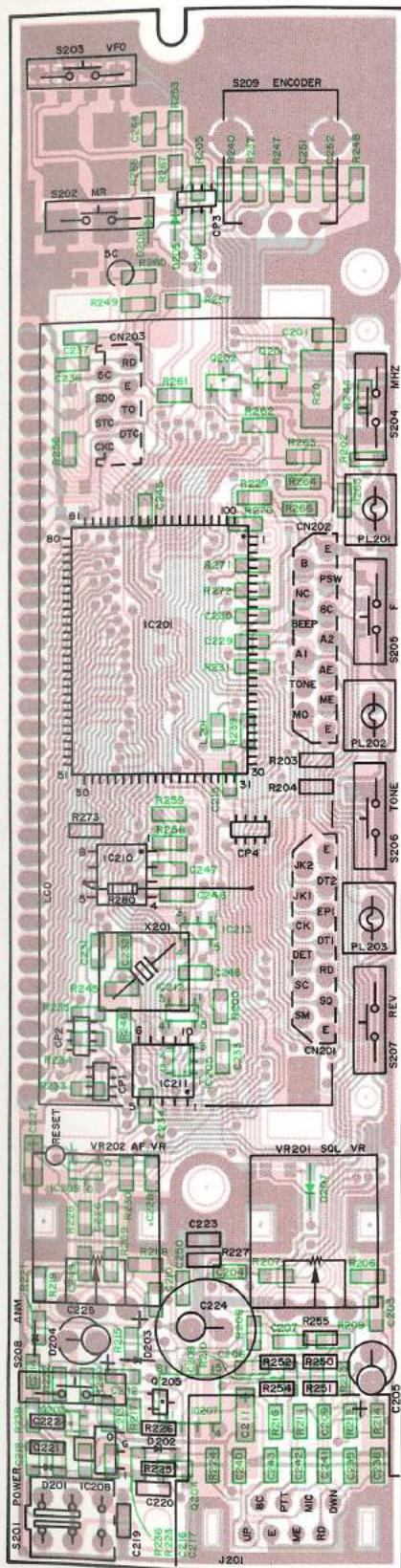
TX-RX UNIT (X57-498X-XX) Component side view
0-11 : K 0-22 : M2 3-01 : C1 3-02 : C2



Component side
Foil side

PC BOARD VIEWS TM-461A

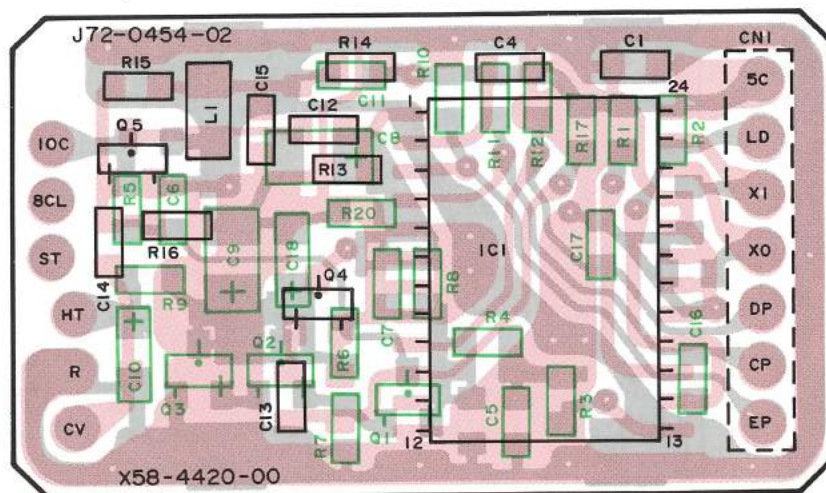
TX-RX UNIT (X57-498X-XX) Foil side view
0-11 : K 0-22 : M2 3-01 : C1 3-02 : C2



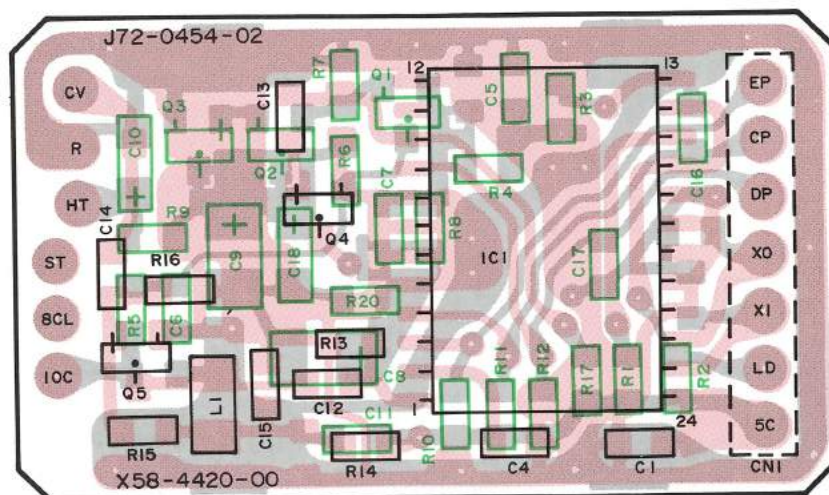
 Component side
 Foil side

TM-461A PC BOARD VIEWS

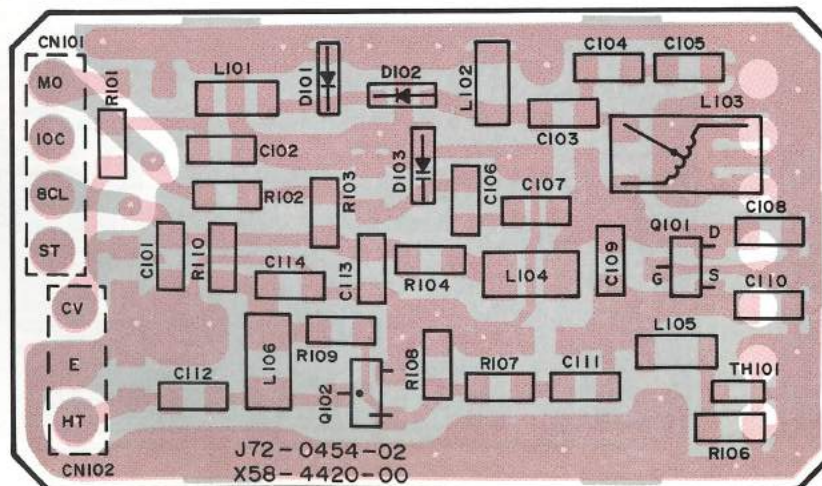
PLL (X58-442X-XX) (A/2) Component side view
0-00 : K,M2 3-01 : C1 3-02 : C2



PLL (X58-442X-XX) (A/2) Foil side view
0-00 : K,M2 3-01 : C1 3-02 : C2



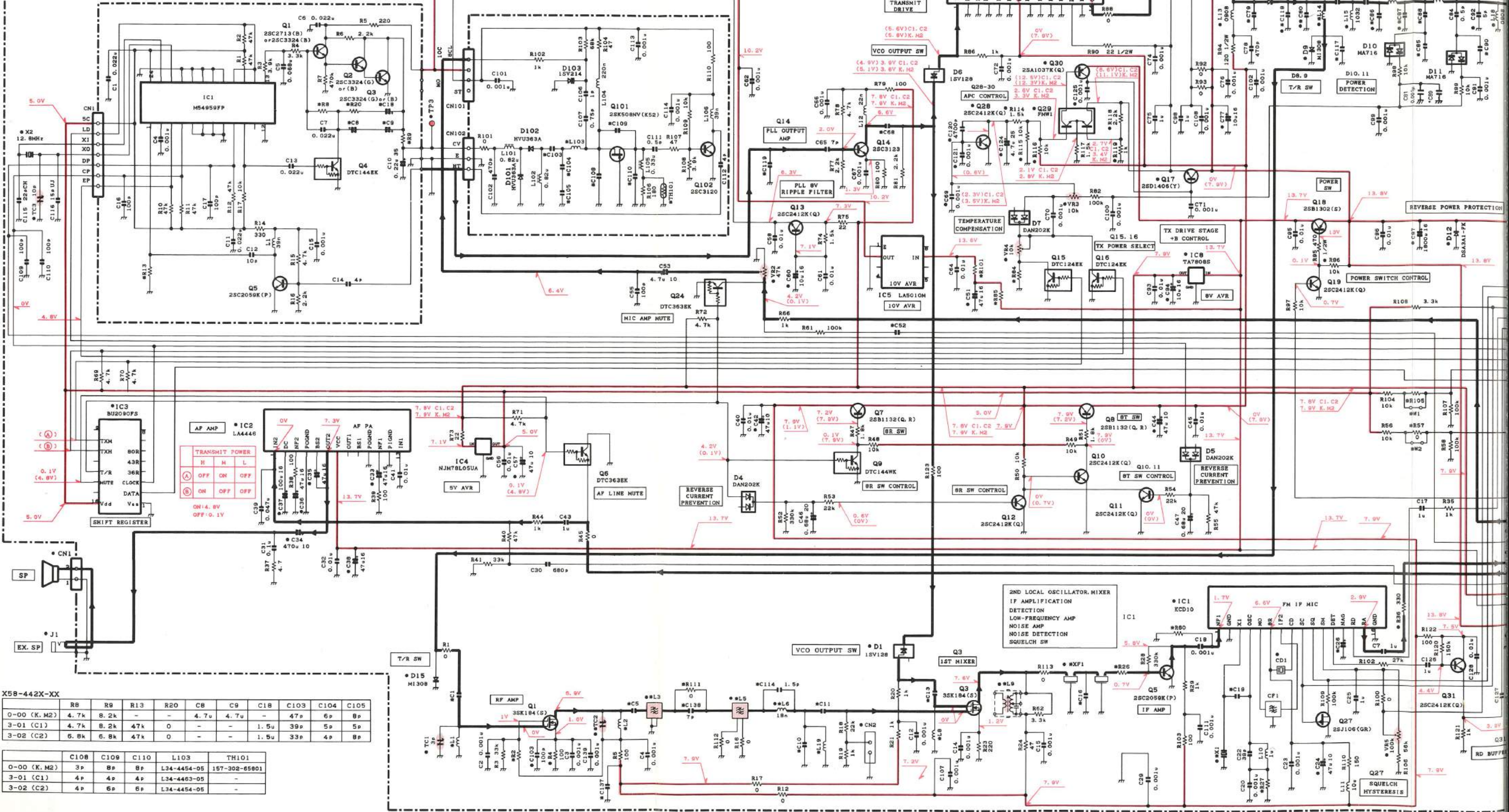
PLL (X58-442X-XX) (B/2) Component side view
0-00 : K,M2 3-01 : C1 3-02 : C2



Component side
Foil side

X57-498X-XX

X58-442X-XX



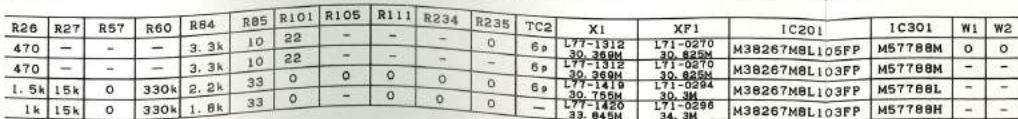
X58-442X-XX

	R8	R9	R13	R20	C8	C9	C18	C103	C104	C105
0-00 (K.M2)	4.7k	8.2k	-	-	4.7u	4.7u	-	47p	5p	8p
3-01 (C1)	4.7k	8.2k	47k	0	-	-	1.5u	39p	5p	8p
3-02 (C2)	5.8k	6.8k	47k	0	-	-	1.5u	33p	4p	8p

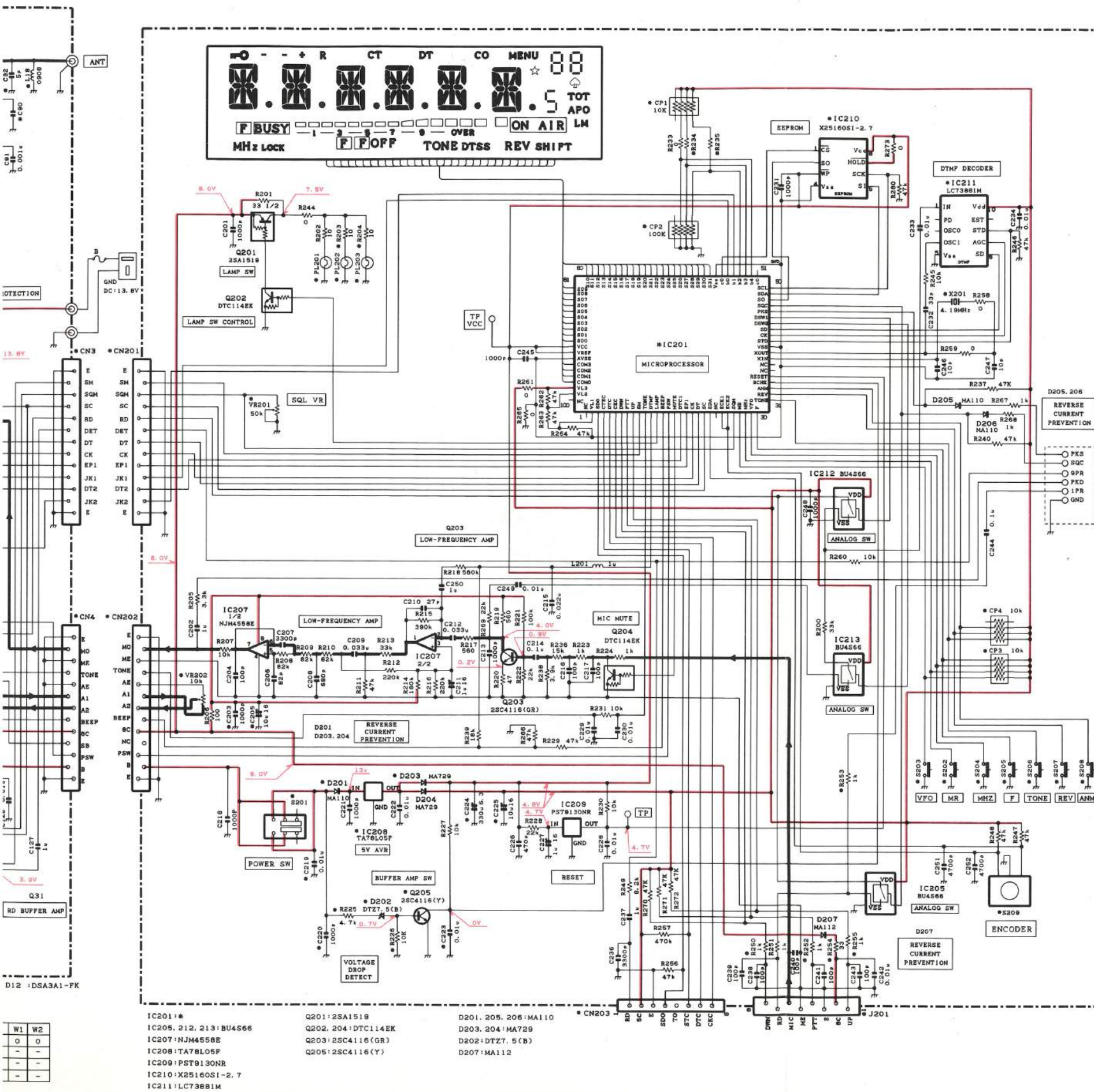
	C108	C109	C110	L103	TH101
0-00 (K.M2)	3p	8p	8p	L34-4454-05	157-302-65801
3-01 (C1)	4p	4p	4p	L34-4463-05	-
3-02 (C2)	4p	6p	6p	L34-4454-05	-

X57-498X-XX

	C1	C5	C10	C11	C13	C16	C19	C26	C52	C68	C79	C80	C82	C85	C86	C87	C88	C89	C90	C114	C117	C118	C119	C137	C138	L1	L2	L3	L5	L6	L8	L9	L14	L16	L17	L19	R2	R26	R27	R57	R60	R64	R65	R101	R105	R111	R234	R235	TC2	X1	XF1	IC201	IC301	W1	W2
0-11 (K)	3p	1.5p	2p	18p	5p	8p	12p	0.22u35	0.068	5p	6p	-	15p	22p	1.5p	4p	7p	0.5p	-	4p	-	-	-	0.001u	7p	22n	12n	L79-0690	18n	18n	L34-2157	L34-1123	L34-1123	-	180k	470	-	-	-	3.3k	10	22	-	-	0	6p	L77-1312 30.360M	L71-0270 30.825M	M38267M8L105FP	M57788M	0	0			
0-22 (M2)	3p	1.5p	2p	18p	5p	8p	12p	0.22u35	0.068	5p	7p	-	18p	22p	1p	4p	7p	0.5p	-	4p	-	-	-	0.001u	7p	22n	12n	L79-0690	18n	18n	L34-2157	L34-1123	L34-1123	-	180k	470	-	-	-	3.3k	10	22	-	-	0	6p	L77-1312 30.360M	L71-0270 30.825M	M38267M8L103FP	M57788M	-	0			
3-01 (C1)	4p	2p	-	470p	3p	7p	47p	0.1u35	0.039	5p	10p	2p	15p	22p	1p	6p	9p	0.5p	-	1p	1.5p	8p	1p	-	-	22n	15n	L79-0883	-	18n	L34-2157	L34-1052	L34-1052	27n	220k	1.5k	15k	0	330k	2.2k	33	0	0	0	0	6p	L77-1418 30.3M	L71-0284 30.3M	M38267M8L103FP	M57788L	-	0			
3-02 (C2)	3p	1.5p	-	470p	1.5p	9p	47p	0.33u35	0.033	3p	5p	3p	15p	18p	1p	5p	7p	1p	1000p	1p	1.5p	5p	1p	1p	-	-	18n	27n	L79-0877	-	27n	L34-4191	L34-1123	L34-1052	22n	180k	1k	15k	0	330k	1.8k	33	0	0	0	0	6p	L77-1420 30.3M	L71-0298 30.3M	M38267M8L103FP	M57788H	-	0		

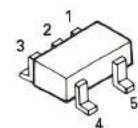


SCHEMATIC DAIGRAM TM-461A

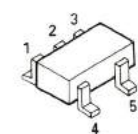


DTC114EK	2SA1037K
DTC124EK	2SA1519
DTC144EK	2SC2059K
DTC144WK	2SC2412K
DTC363EK	2SC2713
	2SC3120
	2SC3123
	2SC3324
	2SC4116

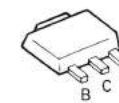
BU4S66



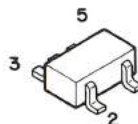
PST9130NR



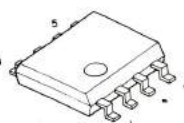
2SB1132
2SB1302



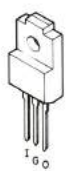
FMW1



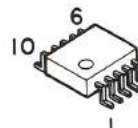
2SD1406

LA5010M
NJM4558E

TA7808S



LC73881M



2SJ106
2SK508NV



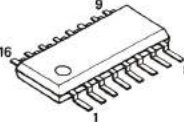
LA4446



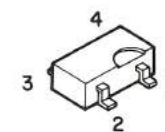
NJM78L05UA
TA78L05F



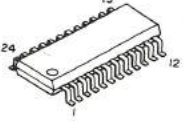
BU2090FS



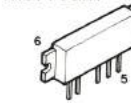
3SK184



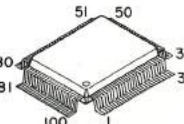
M54959FP

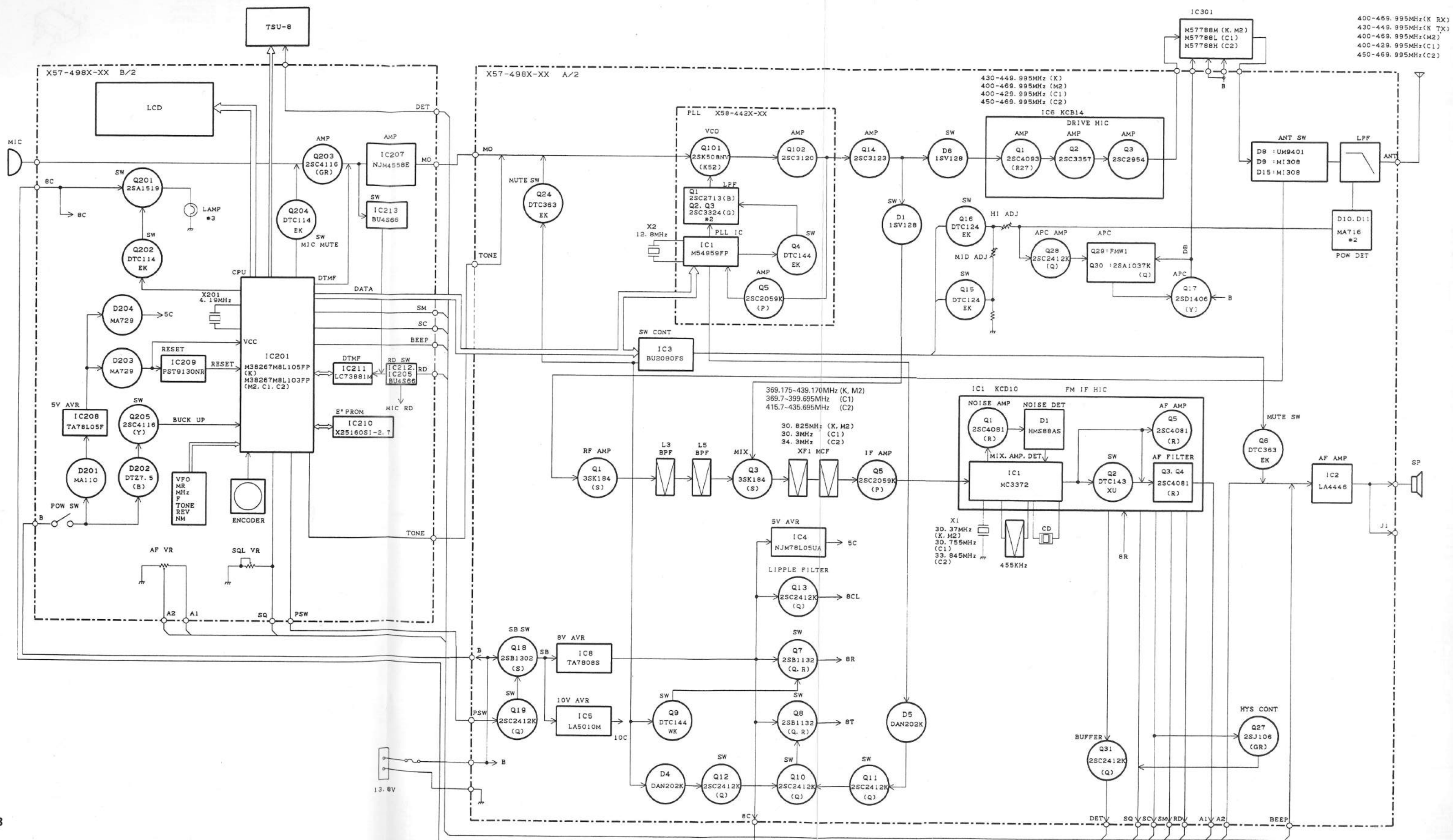


M57788H
M57788L
M57788M



M38267M8L103FP
M38267M8L105FP

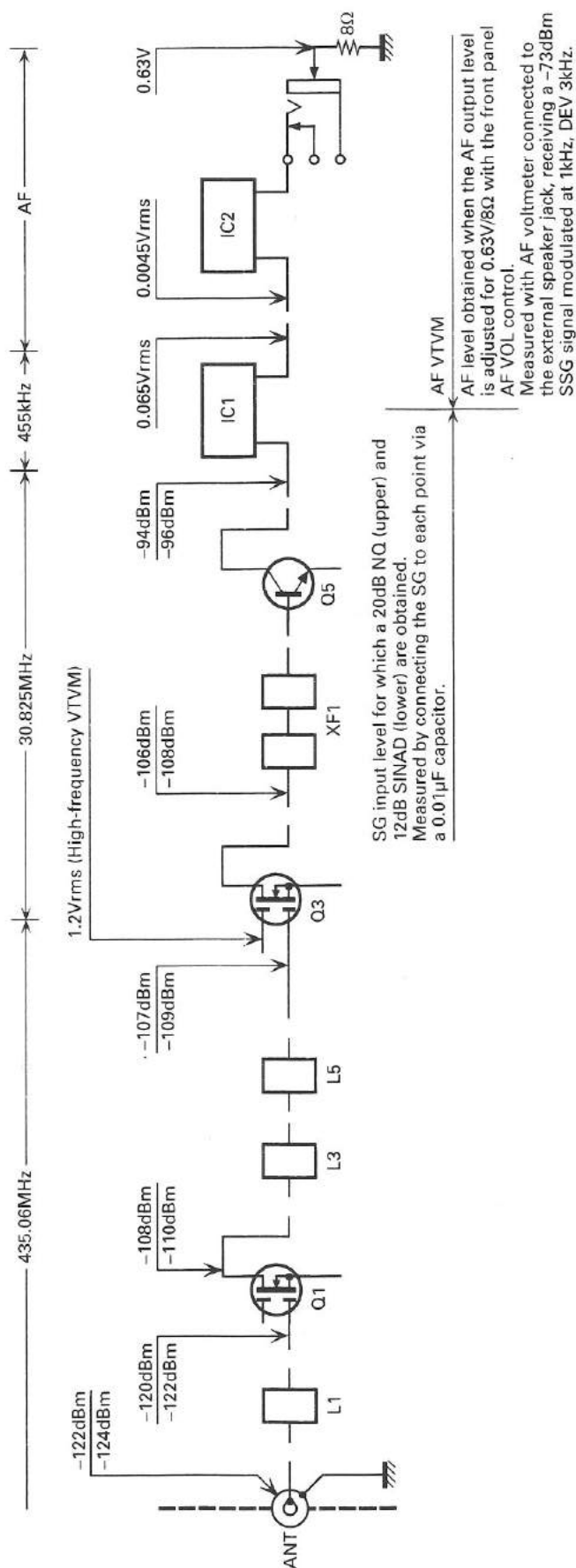




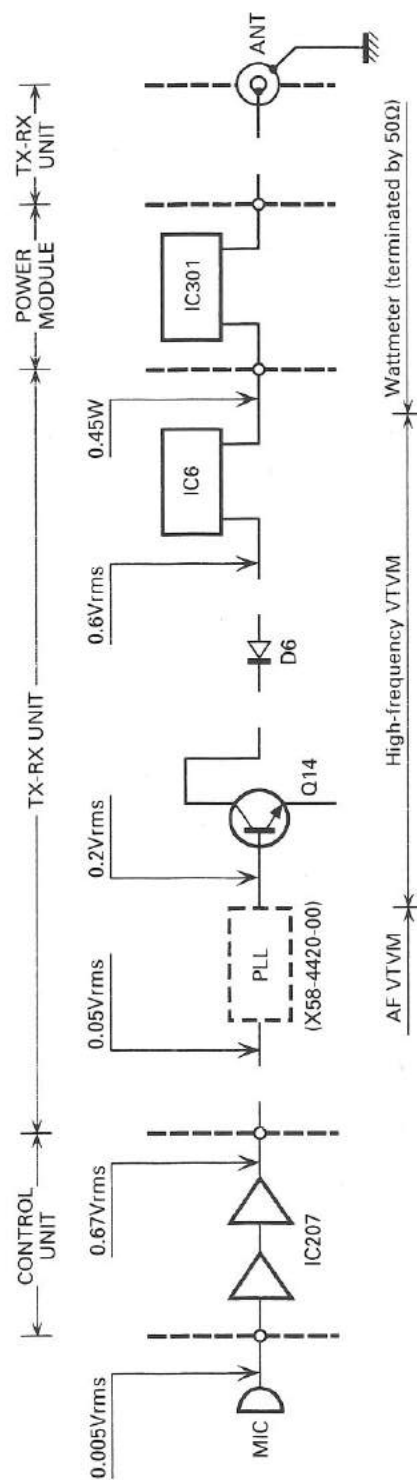
400-469.995MHz (K RX)
430-449.995MHz (K TX)
400-469.995MHz (M2)
400-429.995MHz (C1)
400-429.995MHz (C1)
450-469.995MHz (C2)

LEVEL DIAGRAM (K,M2)

35 RX Section



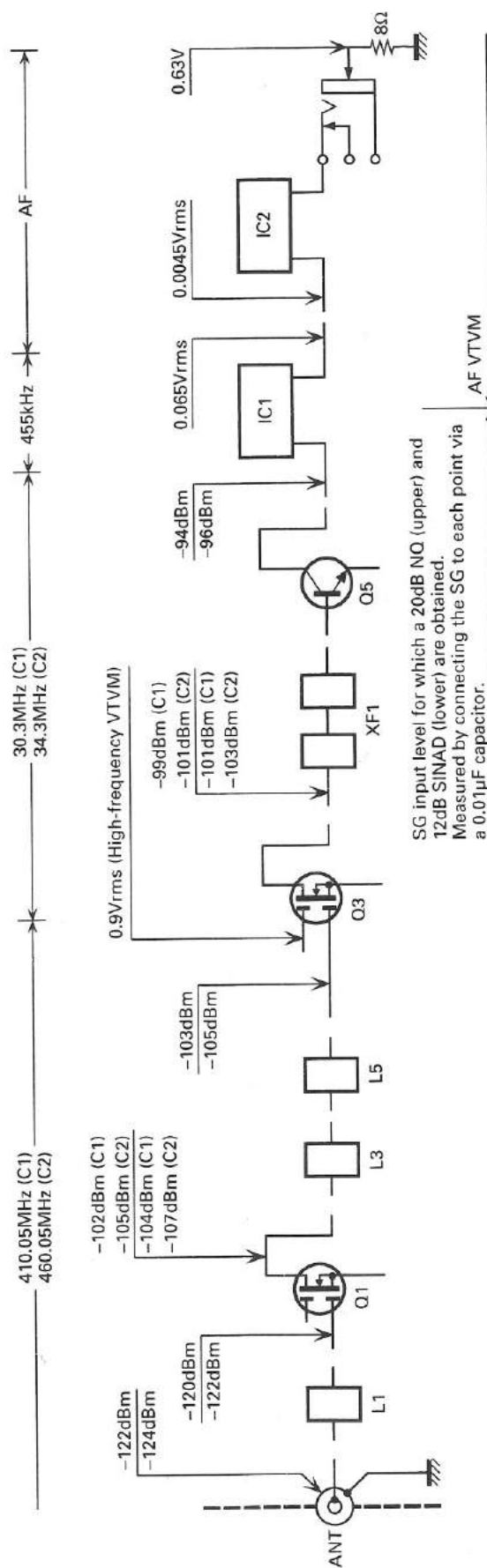
TX Section



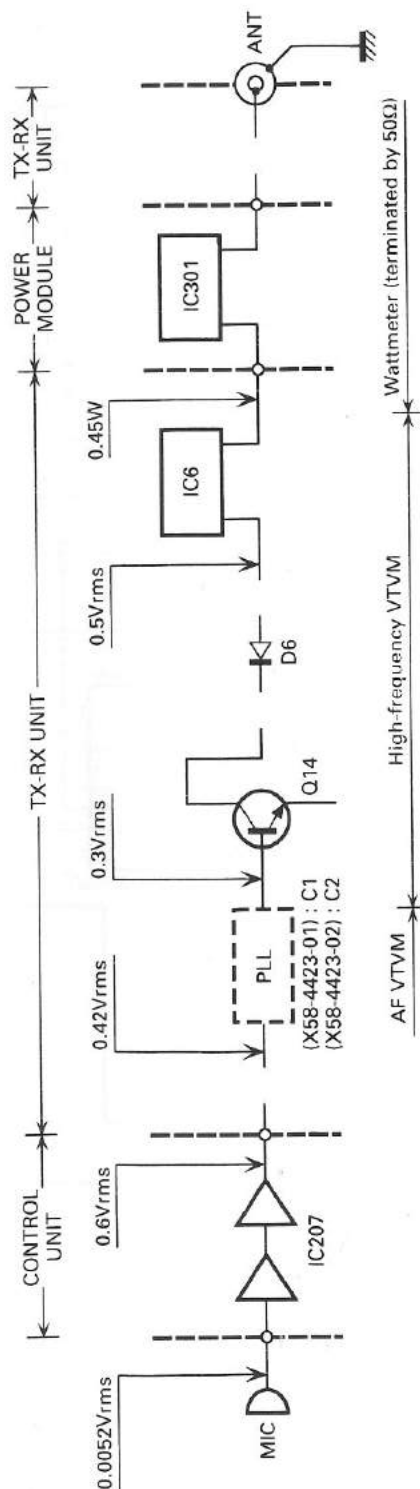
1. Ag is set so that MIC input becomes 3kHz DEV at 1kHz MOD.
2. Transmitting frequency : 435.06MHz

LEVEL DIAGRAM (C1,C2)

36 RX Section



TX Section



1. Ag is set so that MIC input becomes 3kHz DEV at 1kHz MOD.
2. Transmitting frequency : 410.05MHz (C1), 460.05MHz (C2)

SPECIFICATIONS

General

Frequency range	
U.S.A./Canada	438 to 450MHz
China	400 to 420MHz or 450 to 470MHz
General	430 to 440MHz
Mode	F3E (FM)
Antenna impedance	50 Ω
Usable temperature range	-20°C to +60°C (-4°F to +140°F)
Power supply	13.8V DC $\pm$ 15% (11.7 to 16.0V)
Grounding method	Negative ground
Current	
Transmit (max.)	10.0A or less
Receive (no signal)	0.6A or less
Frequency stability	Within $\pm$ 10ppm
Dimensions (W x H x D projections not included)	140 x 40 x 160.5 mm / 5-1/2" x 1-9/16" x 6-5/16"
Weight	1.0kg / 2.2lb

Transmitter

Power output	
High	35W
Medium	10W
Low	Approx. 5W
Modulation	Reactance
Spurious emissions	-60dB or less
Maximum frequency deviation	$\pm$ 5kHz
Audio distortion (at 60% modulation)	3% or less
Microphone impedance	600 Ω

Receiver

Circuitry	Double conversion superheterodyne
Intermediate frequency (1st / 2nd)	
U.S.A./Canada/General	30.825MHz / 455kHz
China	30.3MHz / 455kHz or 34.3MHz / 455kHz
Sensitivity	
12dB SINAD	0.16 μ V or less
-6dB	12kHz or more
-60dB	28kHz or less
Squelch sensitivity	0.1 μ V or less
Audio output (8 Ω , 5% distortion)	2W or higher
Audio output impedance	8 Ω

Specifications are subject to change without notice due to developments in technology.

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