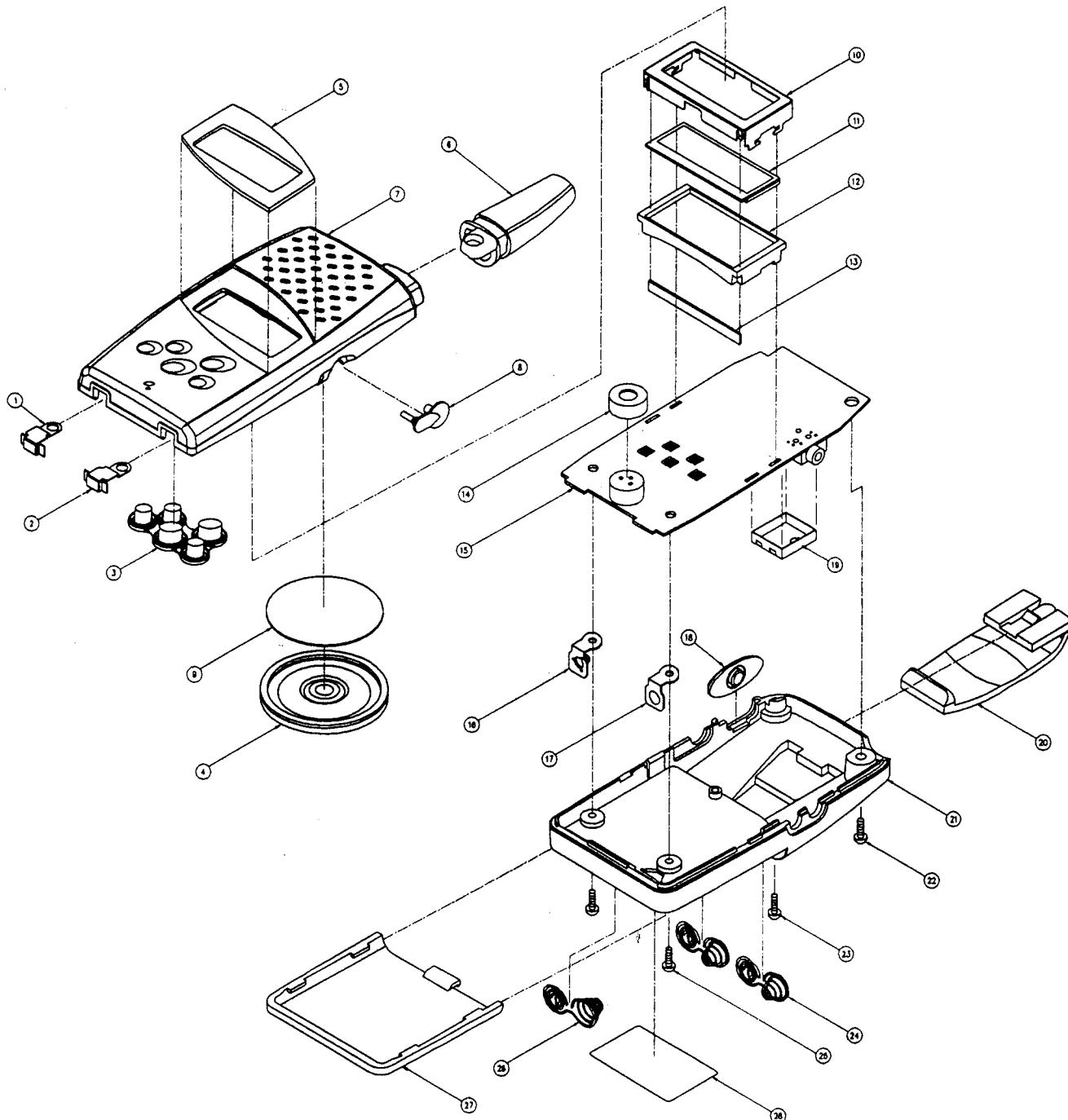


ATTACHMENT L – PARTS LIST/TUNE UP PROCEDURE



NO.	Part Name	Description	Q'TY	REMARKS
28	LABEL SPEC	POLYESTER FILM	1	
27	BATTERY COVER	POLYCARBONETE	1	
26	CONTACT SPRING-B	PWR(Die 0.5)+NI PLATING	1	
25	SCREW MACHINE	BH, M2.0*6, NI-PLATING	2	
24	CONTACT SPRING-A	PWR(Die 0.5)+NI PLATING	2	
23	SCREW TAPPING	BH, D2.0*10, NI-PLATING	1	
22	SCREW MACHINE	PH, M2.6*10(S/W+P/W), NI-PLATING	1	
21	BACK COVER	POLYCARBONETE	1	
20	BELT CLIP	POLYCARBONETE	1	
19	SHIELD TOP	SPTE 10.3	1	
18	KNOB PTT	SILICONE, (H=50')	1	
17	CONTACT BATTERY	HSW, D0.6, NI-PLATING	1	
16	CONTACT BATT. "S"	PBS, 10.3+HSW D0.5, NI-PLATING	1	
15	PCB MAIN	FR-4 11.0	1	
14	BUSHING MIC	SILICONE, (H=50')	1	
13	INTER CONNECTOR	SILICONE, H5.1*130*11.0	1	
12	REFLECTOR LCD	PMMA	1	
11	LCD		1	
10	BRKT LCD	STS-430, 10.3	1	
9	FELT SPEAKER	HIMELON, D36*10.2	1	
8	CAP EARPHONE	PVC(H=80')BLACK	1	
7	FRONT COVER	POLYCARBONETE	1	
6	CAP ANTENA	POLYURETHANE	1	
5	WINDOW LCD	PC-PLATE, 10.8	1	
4	SPEAKER		1	
3	KEY FUNCTION	SILICONE, (H=55')	1	
2	CONTACT 'R'	PBS, 10.3, NI-PLATING	1	
1	CONTACT 'L'	PBS, 10.3, NI-PLATING	1	
Material				
Decimals Tolerance	Date 2000.03.10	Q'TY	44	
0~20mm : ±0.05				Item No. JSF-414H
21~50mm : ±0.1				Part No.
51~100mm : ±0.15				Drawing No.
101~200mm : ±0.25				Rev. No.
201~500mm : ±0.5				
Decimals Tolerance				
0.5	SD, LEE			

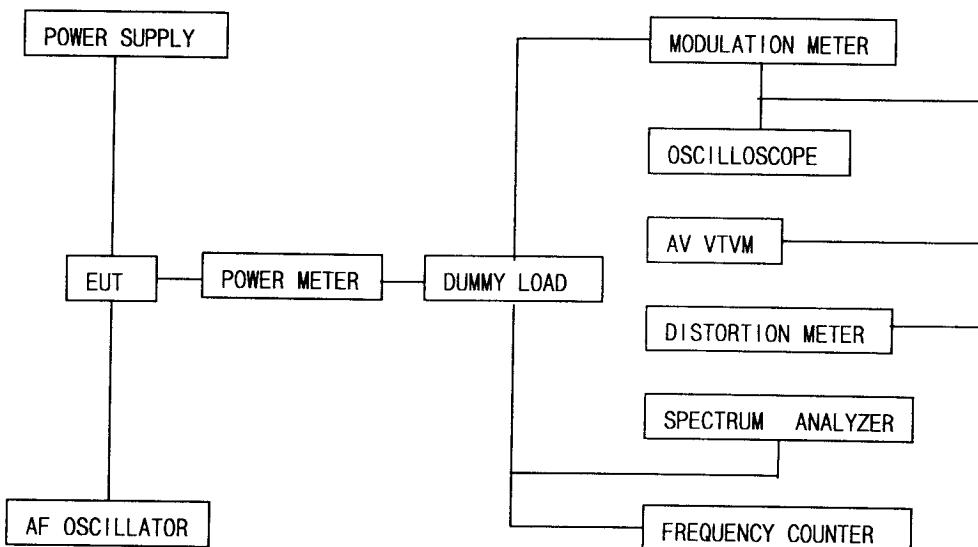
4. ADJUSTMENT

4.1 Frequency synthesizer (PLL)

- a) After connecting the power meter and dummy load(50Ω), join the antenna connector of FR1538-2ch with above equipment.
- b) Check the voltage between TP & GND in digital volt meter.
- c) Then set the low channel of FR1538-2ch the lowest frequency.
- c) After pressed PTT key of FR1538-2ch, trim VCl for adjusting the lowest frequency of Tx channel to DC 1.5V in the voltage of TPl.
- d) After releasing the PTT key, And then check if the highest frequency of Rx channel is within DC 2.0V in the voltage of TP.

4.2 TRANSMITTER

- a) Connect EUT & measure equipment according to block diagram below.



- b) Connect DC 6.0V, voltage preset to EUT.
- c) Connect "power meter" & "dummy load(50Ω)".
- d) Adjust Tx frequency according to trimming trimmer VC2.
- e) Connect AF oscillator to Mic terminal for conform modulation degree.
- f) Adjust the frequency of AF oscillator to 1kHz and adjust AF level should be 100mV.
- g) Checking oscilloscope and modulation meter. max. frequency deviation should be in ± 2.2 KHz.

4.3 TRANSMITTER TEST

a) Output Power Test

Power(6.0V DC) should be Max.500mW and in $\pm 20\%$ range.

b) Audio Response

Connect AF oscillator to Mic terminal and then firm the audio level that doesn't distortion the wave of oscilloscope in the frequency range, 300Hz~3kHz. Check the audio level for 300Hz~3kHz based on frequency standard, 1kHz.

c) Modulation Degree Test

- 1) Connect AF oscillator to the MIC terminal and then adjust the level to 100mV
- 2) Measure the oscilloscope wave and he point needle of modulation meter after pressing PTT key.
- 3) Sweep gradually the frequency of AF oscilloscope from 300Hz to 3kHz.
- 4) At this time, the point needle of modulation meter should be in ± 2.5 KHz.

d) Spectrum Test

- 1) Antenna is 50Ω and attenuator degree should be 20dB more.
- 2) observe the spectrum with pressing PTT key.

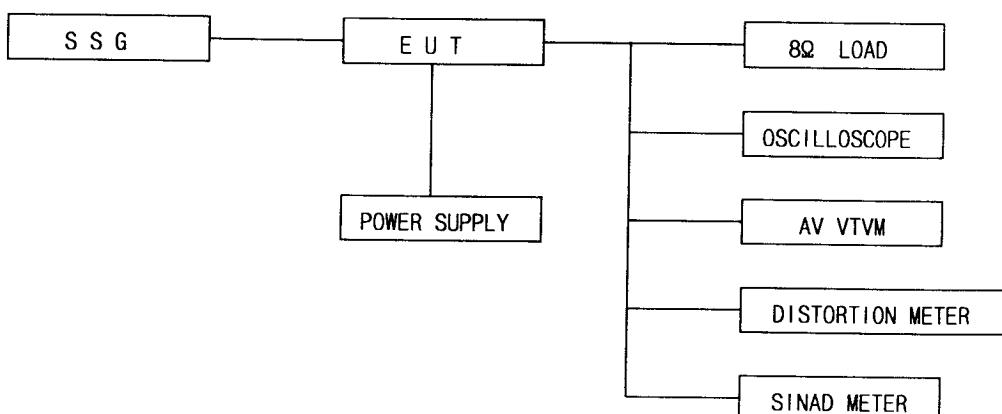
The harmonics should be less -60dB than carrier.

4.4 RECEIVER

a) Preparation

- 1) Adjust the power supply to DC 6.0V
- 2) Adjust Voltage level to 0.7Vrms(8Ω load) after power on.

b) Connection method



- C) The Conform of Rx sensitivity
 - 1) Adjust SSG to channel frequency.
 - 2) Adjust modulation frequency, 1kHz to modulation degree, 1.5 KHz.
 - 4) After adjusting the frequency of SSG to channel frequency, RF level sets to -47dBm.
- d) The Conform of Squelch sensitivity
 - 1) Set the standard channel.
 - 2) In squelch mode, SQ volume RV1 must be turned counterclockwise.
 - 3) After adjusting SSG to channel frequency, the adjusting SSG to level. -120dBm set is audio on, -130dBm set is audio off.

4.5 RECEIVER TEST

a) Rx sensitivity test

SSG should be adjusted to 12dB of SINAD's point needle seeing wave of oscilloscope as SSG sets in 1kHz with 1.5 KHz frequency deviation. At this time, normal RF level is -121~-123dBm.

b) Audio Distortion Test

- 1) SSG should be adjusted like way of point a) and RF level sets to -47dBm.
- 2) Adjust to 0.7Vrms(8Ω load) seeing Audio wave.
- 3) Read the needle of distortion meter(normal condition would be less than 5% distortion.)

c) Squelch Test

After RF level of SSG should be set to the least level, RF level should be gradually increased until speaker makes audio sound. At this point, check RF level(Check, audio on : -120dBm, audio off : -130dBm)

4.6 Symptoms, Check point & Correction

a) Diagnosis method

- 1) Check each switch to work well.
- 2) Check voltage of battery.
- 3) Problem develops from transmitter or receiver?

b) Troubleshooting

1) Transmitter

- ① Power key is on condition but does not work.
 - a) Battery could completely discharge.
 - b) Battery cell twist..

- ③ Touch problem come between Battery and Radio.
- ② Fail to transmit
 - ② Run out of battery or charge problem.
 - ③ Fault of PTT key.
 - ④ Fault of Q4, Q5.
- ③ Transmitter works but frequency is unmatched
 - ② Out of order in frequency synthesizer.
 - ③ Out of order in X-tal(X2).
- ④ Audio does not sound(Tx power and Tx frequency are normal)
 - ② Problem of microphone or mic connector.
 - ③ IC U7 problem.
- ⑤ Tx is set when switch is on.
 - ② Tx switch problem

2) RECEIVER

- ① Rx does not work
 - ② Speaker line open problem or connector problem.
 - ③ Receiver power circuit problem.
 - ④ Audio amplifier Base band IC U4 problem.
- ② Only noise sound
 - ② U12 problem.
 - ③ VCO problem.
- ③ Rx sensitivity is weak
 - ② Antenna mounting problem.
 - ③ Front-End circuit problem.
 - ④ Local oscillation frequency deviation.
 - ⑤ SFL saw filter fail.
 - ⑥ VCO problem.
- ④ Squelch does not work
 - ② U12 problem.
 - ③ Control logic problem.

5. DESCRIPTION OF RADIO CIRCUIT

5.1 Frequency synthesizer

Frequency synthesizer consists of VCO, PLL IC(built in PRESCALER) and loop filter.

a) VCO

VCO is composed of ONE VCO. Oscillation circuit takes colpitts circuit using variable Diode. And VCO is composed of D1, Q8, Q9, C81, C75, VCl, L1, C74, C76.

VCO control voltage through loop filter adjusts frequency and Microphone signal through Modulation terminal makes modulation.

b) PLL IC

PLL IC is adjustable IC to produce the wished frequency which VCO provides through loop filter.

It has internal counter using 21.25MHz reference frequency to make 6.25kHz as reference Signal.

VCO frequency from prescaled input is divided signal is compared with Reference signal phase in phase comparator.

Built-in charger pump changes voltage (until two signals are in phase) and charged voltage supplies VCO through loop filter to produce the desired frequency.

Frequency data associated with channel goes to PLL IC by CPU through CLOCK, DATA. PLL IC enables by strobe line of CPU.

c) Loop Filter

Loop filter is composed of R48,R49,C84,C85 and changes pulse from pin14 to DC. and eliminates harmonic component in pulse.

It helps VCO oscillate clearly as DC voltage is supplied into Varicap.

5.2 RECEIVER

This is composed of Dual Conversion Super Heterodyne. First IF is 21.7MHz. Local oscillator frequency is lower in 1'st IF than Rx frequency. It is called low side injection. Second IF is 450kHz. 2nd local oscillator frequency comes to 21.25MHz.

a) Rx/Tx Conversion Circuit

Rx signal goes to Rx/Tx conversion circuit through FIXED antenna connector, low pass filter(L5,L6,L7,C42,C43,C46,C47) and receiver resonance circuit composed of L8,C1. When transmitting, voltage through R25,L12,D6 supplies,D7 of receive input is short and Tx is on condition. When PIN diode is off in condition of Rx,L8 and C1 resonate serially and make impedance matching at receiver bandpass filter. (SF1).

b) Front End

Front-End has Q1 to provide a high sensitivity and low noise feature.

It employs Saw filter as band pass filter to eliminate image frequency and to produce enough pass band by Q1 input and output.

c) Mixer

Mixer has one base BFQ 67W(Q2) to feature high low noise quality. It has RF signal through L7, L8, SF1,SF2 and Q1 RF signal from Local oscillator mixed.

It develops 1'st IF ,21.7MHz. 1st IF goes to 1st IF amplifier Q3(KTC4080) base through X-tal filter Xf1.

IF of mixing signals is selected and taken into X-tal filter. Output impedance of mixer is direct matched with input impedance of X-tal filter.

Matching of filter satisfies pass bandwidth of filter, ripple elimination with in pass band, and attenuation characteristic of stop band.

X-tal filter is composed of two pole monolithic X-tal filter, 8kHz of IF bandwidth R11 is used as impedance matching with 1'st IF Amp Q3.

d) IF AMP and Detection

1'st IF AMP Q3 supplies IF(U12) mixer input pin16 through output resistor R13 and C21 to need gain in insertion loss of X-tal filter and last stage circuit. Multi-use IF IC makes up of mixer IF AMP. pin1 2'nd local frequency enter to pin 1.

It supplies mixer of internal IC. Mixer output of IC through pin3 passes 450kHz ceramic filter, supplies 2'nd IF amplifier and limits. After 2'nd IF AMP has a process of enough gain and AM rejection, it comes to quadrature detection. Demodulated audio signal by T1 (Quad Coil) is amplified and comes out to pin9.

Detected audio signal through R22, VR1 and input in audio amp. IC U4 through C22.

e) Squelch Circuit

Noise component of detected outputs has amplification
Squelch threshold is controlled by Resistor R18,C31,R15

f) Audio Amplifier

Demodulated audio signal enters to pin2 of U4. After above signal amplifies in U4 pin5 through C220.

It comes out to pin5 Then, It reaches at speaker.

5.3 Transmitter

When Tx develops with pressing PTT switch, VCO output amplifies through Q4,Q5 transmits by antenna through low pass filter. Tx RF signal produced from Tx VCO is amplified by DRIVER Q5 through C53 and entered Q4 POWER TR input terminal with final amplification. After this stage, the signal is emitted at antenna through 50Ω matching circuit to low pass filter(L7, L6, L5, C42, C43, C44, C46, C47) to eliminate harmonic.

a) Audio Modulation and Audio Amplification

Audio signal produced by external or internal microphone, limits amplification by IC U7.. It enters to VCO through low pass filter and U2.

Max. Frequency modulation deviation is adjusted by VR1 keeps noise and audio from entering to VCO at time of Tx.

Audio modulation and Audio Amplification has characteristic of 6dB/OCT pre-emphasis by U7(NJM324V).