4. ADJUSTMENT

4.1 Frequency synthesizer (PLL)

a) After connecting the power meter and dumy load(50Ω), join the antenna connector of JF-414EU with above equipment.

b) Check the voltage between TP & GND in digital volt meter.

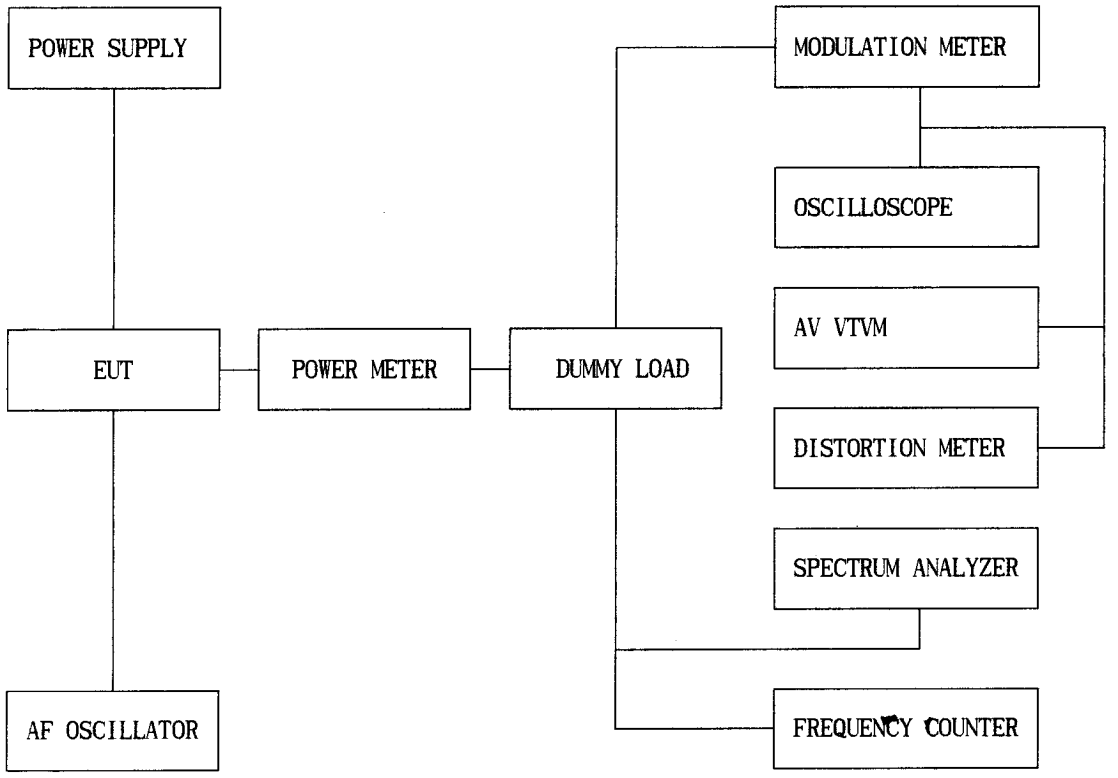
c) Then set the low channel of JF-414EU the lowest fequency.

d) After releasing PTT key of JF-414EU, trim VC1 for adjusting the lowest frequency of Rx channel to DC 2.0V in the voltage of TP. And then check if the highest frequency of Rx channel is DC3.8V in the voltage of TP.

e) After pressing the PTT key, check for the lowest fequency of Tx channel to DC 2.0V in the voltage of TP and then check if the highest fequency of Tx channel is DC 3.8V 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 60mV.

g) Checking oscilloscope and modulation meter. max. frequency deviation should be in ±2.5kHz.

4.3 TRANSMITTER TEST

a) Output power test

power(6.0V DC) should be Max.500mW.

b) Audio Response

Connect AF oscillator to Mic terminal and then firm the audio level that doesn,t distort 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 60mV

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 ± 2.5kHz.

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.

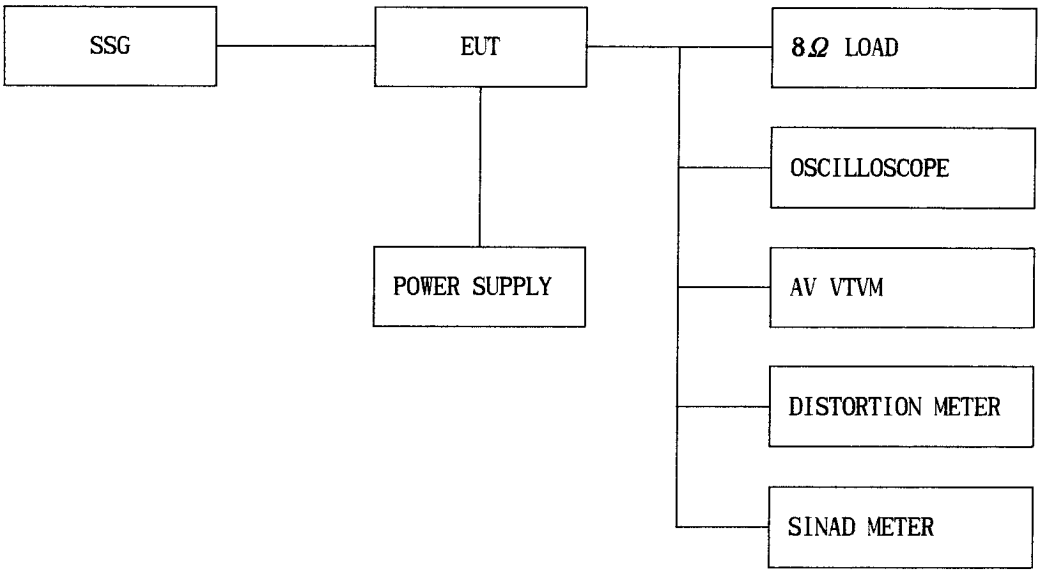
4.4 RECEIVER

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) Adjustment of Rx sensitivity

1) Adjust SSG to channel frequency.

2) Adjust modulation frequency, 1kHz to modulation degree, 1.75kHz.

3) After adjusting the frequency of SSG to channel frequency, RF level sets to -47dBm.

d) Squelch sensitivity

1) Set the standard channel.

2) After adjusting SSG to channel frequency, the RF level of SSG is set on SINAD 8~6dB.

3) Check carefully until audio is generated from speaker.

4.5 RECEIVER TEST

a) Rx sensitivity test

SSG should be adjusted to 12dB(with CCITT) of SINAD's point needle seeing wave of oscilloscope as SSG sets in 1kHz with 1.75kHz 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 Volume 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 if the SINAD is 8~6dB)

4.6 Symtoms, 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 Switch is on condition but does not work.

ⓐ Battery could completely discharge.

ⓑ Battery cell twist..

ⓒ Touch problem come between Battery and Radio.

② Fail to transmit

ⓐ Run out of battery or charge problem.

ⓑ Fault of PTT key.

ⓒ Fault of Q4,5.

③ Transmitter works but frequency is unmatched

ⓐ Out of order in frequency synthesizer.

ⓑ Out of order in X-tal(X2).

④ Audio does not sound(Tx power and Tx frequency are normal)

ⓐ Problem of microphone or mic connector.

ⓑ IC U4 problem.

⑤ Tx is set when switch is on.

ⓐ Tx switch problem

2) RECEIVER

① Rx does not work

ⓐ Speaker line open problem.

ⓑ Receiver power circuit problem.

ⓒ Audio amplifier IC U2 problem.

② Only noise sound

ⓐ U12 problem.

ⓑ VCO problem.

③ Rx sensitivity is weak

ⓐ Antenna mounting problem.

ⓑ Front-End circuit problem.

ⓒ Local oscillation frequency deviation.

ⓓ SF1 saw filter fail.

ⓔ VCO problem.

④ Squelch does not work

ⓐ U12 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

Oscillation circuit takes colpitts oscillation circuit using variable Diode.

And VCO is composed of D1, Q8,Q9,C81,C75,VC1,L1,C74.

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 enable line of CPU.

c) Loop Filter

Loop filter is composed of R48,R49,C84,C85 and changes pulse from pinl4 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 1st 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(L11,L13,L3,C42,C43,C44,C45,C46) and receiver resonance circuit composed of L2,C2. When transmitting, voltage through L2,D6 supplies, D6 of receive input is short and Tx is on condition. When PIN diode is off in condition of Rx, L2 and C2 resonate serially and make impedance matching at receiver band pass filter.

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 BFQ67W(Q2) to feature high low noise quality. It has RF signal through Q1 and L7,L8,SF1 and RF signal from Local oscillator mixed. It develops 1st IF 21.7MHz.

First IF goes to 1st IF amplifier Q3(2SC4080) 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 2 pole monolithic X-tal filter, 8kHz of IF bandwidth

R11 is used as impedance matching with 1st IF Amp Q3.

e) IF AMP and Detection

1st 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, because 2nd local frequency enter to pin 1.

It supplies mixer of internal IC. Mixer output of IC through pin3 passes 450kHz ceramic filter, supplies 2nd IF amplifies and limits. After 2nd 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 U2 through C133.

f) Squelch Circuit

Noise component of detected outputs has amplification

Squelch threshold is controlled by Resistor R18,19,21.

g) Audio amplifier

Demodulated audio signal enters to Pin 3 of U2.

After above signal amplies in U2 pin3 through R142.

It comes out to pin5. then, It reaches at speaker through C108.

5.3 Transmitter

When Tx develops with pressing PTT switch, VCO output amplifies through Q4,5 transmits by antenna through low pass filter.

Tx RF signal produced from Tx VCO is amplified by driver Q5 through C57 and entered Q4 POWER TR input terminal with final amplification.

After this stage, the signal is emitted at antenna through 50Ω STRIP matching low pass filter(L11,L13,L3,C42,C43, C44,C45,C46) to eliminate harmornic.

d) Audio modulation and Audio amplification.

Audio signal produced by internal microphone, limits amplification by LPF IC U4A/B. It enters to VCO through low pass filter.

Max. Frequency modulation deviation is adjusted by R128,R129

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 U4.

JF - 414EU CHANNEL DATA

CHANNEL	TX FREQUENCY	OPTION		RX FREQUENCY	OPTION
	MHz			MHz	
1	462.5625	NO		440.8625	NO
2	462.5875	NO		440.8875	NO
3	462.6125	NO		440.9125	NO
4	462.6375	NO		440.9375	NO
5	462.6625	NO		440.9625	NO
6	462.6875	NO		440.9875	NO
7	462.7125	NO		441.0125	NO
8	467.5625	NO		445.8625	NO
9	467.5875	NO		445.8875	NO
10	467.6125	NO		445.9125	NO
11	467.6375	NO		445.9375	NO
12	467.6625	NO		445.9625	NO
13	467.6875	NO		445.9875	NO
14	467.7125	NO		446.0125	NO