

## 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 D5, L17, C65, C70, C66, C70 D6, Q14, Q15.

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 C61, R37, C62, R38, C63, R39 and changes pulse from pin7 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<sup>st</sup> IF than Rx frequency.

It is called low side injection. Second IF is 450kHz. 2<sup>nd</sup> 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 (L1, L2, L3, C6, C1, C2, C3, C4, C5) and receiver resonance circuit composed of L4, C24. When transmitting,

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Voltage through R1,L5,D1 supplies,D2 of receive input is short and Tx is on condition. When PIN diode is off in condition of Rx, C25,C86 L21,C87 resonate serially and make impedance matching at receiver bandpass filter.(FL1,FL2)

#### **b) Front End**

Front-end has Q6 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 Q6 input and output.

#### **c) Mixer**

Mixer has two gate 3SK228(Q7) to feature high ,low noise quality. It has RF signal through Q6 and FL1,L13,L14 and RF signal from Local Oscillator mixed.

It develops 1'st IF 21.7MHz. 1'st IF goes to 1'st IF amplifier Q8 base through X-tal filter FL2.

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. R23 is used as impedance matching with 1'st IF Amp Q8.

#### **d) IF AMP and Detection**

1'st IF AMP Q8 supplies IF IC (U8) mixer input pin16 through output resistor R24 and C34 to need gain in insertion loss of X-tal filter and last stage circuit. Multi-use IF IC makes up of mixer IF AMP.

2'nd local frequency enter to IF IC pin1.

It supplies mixer of internal IF IC. Mixer output of IF 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 X3 is amplified and comes out to pin9. Detected audio signal through R34, C41,C42 and input in audio amp. Audio IC U105 through R145.

#### **e) Squelch Circuit**

Noise component of detected outputs has amplification squelch threshold Is controlled by Resistor C40,RT1,VR2.

#### **f) Audio Amplifier**

Demodulated audio signal enters to pin3 of AF IC (U5).

After above signal amplifies in U5 pin1 and pin8 through C144,R147.

It comes out to pin5 then, it reaches at speaker.

### **5-3. Transmitt**

When Tx develops with pressing PTT switch, VCO output amplifies through Q4,Q3,Q2,Q1 transmits by antenna through low pass filter.

Tx RF signal produced from Tx VCO is amplified by Buffer Q4, Pre-driver Q3, Driver Q2 through C14 and entered Q1 Power Transistor input terminal with final amplification. After this stage, the signal is emitted at antenna through 50 $\Omega$  matching circuit to low pass filter (L3,L2,L1,C6,C5 C4,C3,C2,C1) to eliminate harmonic.

#### **a) Audio Modulation and Audio Amplification**

Audio signal produced by external or internal microphone, limits amplification, low pass filter by IC U2.

Max. Frequency modulation deviation is adjusted by R131,VR1 keeps noise and audio from entering to VCO at time of Tx. Audio modulation and Audio Amplification has characteristic of 6 /OCT pre-emphasis by U2.