

## 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 D202,Q202,C206,C207,C204,L203. 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, PLL IC enables by strobe line of CPU.

#### c) Loop Filter

Loop filter is composed of R221,R220,C240,C238,C237 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<sup>st</sup> 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(L307,L308,L309,C309,C310,C311) and receiver resonance circuit composed of L310,C101. When transmitting, voltage through R307,L306,D302 supplies D303 of receive input is short and TX is on condition.

When PIN diode is off in condition of RX , L310 and C101 resonate serially and make impedance matching at receiver front-end.

## b) Front End

Front-End has Q101 to provide a high sensitivity and low noise feature.

It employs Saw filter as band pass filter to eliminate image frequency and produce enough pass band by Q101 input and output.

## c) Mixer

Mixer has one base 2SC4901(Q102) to feature high low noise quality.

It has RF signal through L310, front-amp and Q203 RF signal from Local oscillator mixed.

It develops 1<sup>st</sup> IF, 21.7MHz. 1<sup>st</sup> IF goes to 1<sup>st</sup> IF amplifier Q103(KTC3880S) base through X-tal filter CF102.

IF of mixing signals is selected and taken into X-tal filter.

Output impedance of mixer is directly matched with input impedance of X-tal filter.

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

X-tal filter is composed of two pole monolithic X-tal filter, 8kHz of IF bandwidth

R113 is used as impedance matching with 1<sup>st</sup> IF Amp Q103.

## d) IF AMP and Detection

1<sup>st</sup> IF AMP Q103 supplies IF (IC101) mixer input pin16 through output resistor R115 and C120 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<sup>nd</sup> local frequency enters to pin 1.

It supplies mixer of internal IC. Mixer output of IC through pin3 passes 450kHz ceramic filter, supplies 2<sup>nd</sup> IF amplifier and limits.

After 2<sup>nd</sup> IF AMP has a process of enough gain and AM rejection, it comes to quadrature detection. Demodulated audio signal by L108(Quad Coil) is amplified and comes out to pin9.

Detected audio signal through R140, VR101 and input in audio amp.

IC103 through C156.

## e) Squelch Circuit

Noise component of detected outputs has amplification.

Squelch threshold is controlled by Resistor R121, C128, R122, RV101.

## f) Audio Amplifier

Demodulated audio signal enters to pin2 of IC103. After above signal amplifies in IC103 pin5 through C156.

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

## 5.3 Transmitter

When TX develops with pressing PTT switch, VCO output amplifies through Q301~Q304 transmits by antenna through low pass filter.

TX RF signal produced from TX VCO is amplified by RF amplifier Q301 through C303 and entered Q302~4 parallel POWER TR input terminal with final amplification. After this stage, the signal is emitted at antenna through 50  $\Omega$  matching circuit to circuit to low pass filter (L307~9,C309~311) to eliminate harmonic.

### 5.3-1 Audio Modulation and Audio Amplification

Audio signal produced by external or internal microphone, limits amplification by IC503. It enters to VCO through low pass filter.

Max. Frequency modulation deviation is adjusted by RV201 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 IC503(IL324V).