Circuit Description

1. Frequency Configuration

The receiver utilizes double conversion superheterodyne. The first IF is 45.050MHz and the second is 455KHz. The first local oscillator signal is supplied from PLL circuit. Frequency needed in the transmitter is supplied from PLL circuit. Figure 1 shows the frequency configuration.

2-Tone

The output 2-Tone signal from IC1 goes to IC7 (1/4) for voltage amplification, then is processed by shaping circuit that is comprised of IC7 (2/4) and other components before being detected by IC11 Pin11. IC11 determines whether the 2-tone matches the preset value, and controls MUTE, APCO and speaker output according to squelch results.

3. PLL Frequency Synthesizer

PLL circuit generates the first local oscillator signal for reception and the RF signal for transmission.

1) PLL

The step frequency of PLL circuit is 5KHz\6.25KHz\12.5 KHz\25 KHz. A 12.8MHz reference oscillator signal is divided at IC2 by a fixed counter to produce a 5 KHz\6.25KHz\12.5 KHz\25 KHz reference frequency. The output signal from voltage control oscillator (VCO) passes through buffer amplifier Q14 and is divided at IC2 by the programmable dual-module counter. The divided signal is compared in the phase comparator IC2 with the 5 KHz\6.25KHz\12.5 KHz\25 KHz reference signal. The output signal from phase comparator is filtered by a low-pass filter and passed to the VCO to control the oscillator frequency.

2) VCO

The operatiin frequency is generated by Q16 in transmit mode and by Q8 in receive mode. The operation frequency generates a control voltage through the phase comparator to control the varactor diodes, so that the oscillator frequency is made consistent with the preset frequency in CPU (D2 and D3 in transmit mode, D7 and D8 in receive mode). In receive mode, Q6 turns off Q16 and turns Q7 on, which causes the T/R pin to be set high. The T/R pin is set low in transmit mode. The output from Q8 and Q16 is amplified by Q14 and sent to the buffer amplifier.

4. Transmitter

1) Transmit Audio

The modulation signal from microphone is amplified by IC3, pre-emphasized, then filtered

by another low pass filter（separate filter）(Q25 and Q24) to eliminate the frequencies higher than 3KHz. The resulting signal enters the VCO for direct FM modulation. The voice voltage amplitude control circuit （Q46\R131\R601） is used to switch between wideband and narrowband. (See Figure 5)

2) CTCSS/CDCSS Encoder

The signal needed by CTCSS/CDCSS encoder is generated by IC11 and FM-modulated to the PLL reference signal. Since the reference OSC does not modulate the loop characteristic frequency or higher, modulation is performed at the VCO side by splitter.

3) DTMF/2-Tone Encoder

DTMF/2-Tone signalings are generated by IC11 and outputted in parallel by Pin 48-51. The output signal is reshaped by resistor array CP7-CP10, then sent to IC3 (1/4) for amplification, and filtered by active LPF consisting of Q25, Q24 and other components to eliminate the corresponding HF emission before being passed to TX VCO for modulation. The modulated signal is applied to AF AMP through C254 for ease of monitoring.

4) RF Amplifier

The transmit signal obtained from VCO buffer amplifier Q14 is amplified by Q15 and Q17. The amplified signal is passed to power amplifier Q32 and Q31, and is capable of generating a 4.0W RF power. Q50 and R617 are used to toggle between high and low power.

5) Antenna Switch and LPF

The output signal from RF amplifier is passed through a low-pass filter network and a transmit/receive switch circuit before reaching the antenna terminal. The transmit/receive switch circuit is comprised of D11 and D12. D11 and D12 is turned on (conductive) in transmit mode and off (isolated) in receive mode.

5. Power

The 5V reference power supply for the control circuit is derived from a LDO IC. The reference power provides a 5V voltage in transmit mode [T_V], a 5V voltage in receive mode [R_V], and a 5V voltage shared in both modes based on the control signal from the microprocessor.