

## **Circuit Description**

### **(A) Main board - MCU and audio**

#### *Audio Transmit Path*

Audio signal picked up by condenser microphone M1 is amplified with pre-emphasis by U1A. U1B, U1D and D6 form a amplitude limiter. It then passes through a post-limiter low-pass-filter for bandwidth limiting. R50 sets the modulation depth of the FM modulation. The processed audio is then fed to the VCO for FM modulation. Power supply of the transmit path is controlled by Q4.

#### *Audio Receive path*

Demodulated audio signal is fed to the low-pass-filter (U2A). It is then de-emphasized by U2B. U2C forms a high-pass filter to eliminated low-frequency noise. U4 is the audio power amplifier whose gain is controlled by the selection of resistors connected on U7 (MCU) pin 41 to 48. There are totally 16 receive audio levels. Power supplies of the receive path are controlled by Q6 and Q11.

#### *MCU*

U7 is a 8-bit micro-controller providing all necessary control signals for the audio circuits and the RF circuits. Clock frequency is 3.58MHz. MCU will check the supply voltage continuously at pin37 and indicate on the LCD display in four levels discretely.

#### *Power Management*

U6 is low-drop-out voltage regulator providing a 2.7V for the audio and RF circuits. U7 is voltage detector of 3.2V. U3 is a reset circuit for the MCU. Minimum operating voltage is 3.0V.

### **(B) RF board**

#### *RF VCO and Synthesizer*

Q2 is a voltage controllable oscillator. Its frequency is controlled by the reverse-bias on the diode D6. D7 switch the frequency band between the Tx and Rx band. Q3 is a buffer amplifier. U1 is a programmable synthesizer which accepts control data from the MCU. XT1 (20.95MHz) provides the reference frequency for calculating the transmit and receive channel frequencies. The buffered 20.95MHz from U1 is also used for the 2<sup>nd</sup> local oscillator for down-conversion.

#### *Transmitter*

When transmitting (i.e. PTT being pushed), the RF signal pass through D1 and further amplified by Q5. It is then fed to the driver Q7 and power amplifier Q1. C42, L7 and C43 form a low-pass matching circuit to reduce harmonic contents of the amplified RF signal. Then, it passes through D2 and is fed to the antenna.

#### *Receiver*

Receiving RF signal picked up by the antenna is amplified by the low-noise amplifier Q4. It is then fed to the SAW filter F2 for out-of-band signal rejection. Q6 is a bipolar mixer. RF signal from the SAW filter and the LO signal from D1 are both fed to the base of Q6. The down-converted first IF signal at 21.4MHz is then fed to the crystal filter Y1 for un-

wanted signal filtering. Filtered signal is then amplified by the IF amplifier Q8. Then, the amplified IF signal is fed to the IF-demodulator U3. The first IF signal is further down-converted to 450KHz by the 20.95MHz buffered reference from the VCO board. F1 is the 450KHz 2<sup>nd</sup> IF filter to provide out-of-band signal rejection. Pin 9 of U3 provides the demodulated audio signal to the receive audio circuit.