

## Circuit Description

### 1. Receiver System

The signal comes from the antenna and passes through a low-pass filter (L502, L503, L504, C501, C503, C503), then passes a TX/RX switch circuit (D501, D503, D504 are off) and a band pass filter (D505, D506), amplified by Q505. After that the signal is filtered by a band pass filter (D507, D513, L511 and L530) to eliminate unwanted signal before it goes to the first mixer Q506.

### 2. First Mixer

The signal from the RF amplifier is heterodyned with the first local oscillator signal from the PLL frequency synthesizer circuit at the first mixer (Q506) to create a 49.95MHz first IF (intermediate frequency) signal. Then the IF signal is amplified by Q507 and enter IF processor IC U501.

2nd local oscillator signal 50.4MHz is generated by 16.8MHz crystal and amplified by Q605, then enter U501 and mix first IF signal and generate 450KHz 2nd IF signal.

2nd IF signal is then fed through CF501 ceramic filter to eliminate the unwanted signals before it is sent back to U501 and detected by frequency discriminator FD501.

Under analog mode, the AF signal goes from U501 Pin 10 and filtered by IC U102, then passed through the diode Q104 and controlled by volume switch SW401, then amplified by U204, finally goes to the speaker.

Under DMR mode, the IF signal goes from U501 Pin 11 then enter U201 (HR\_C5000) to get the AF signal, and amplified by U203 and controlled by volume switch SW401, then amplified by U204 again and finally goes to the speaker.

### 3. Squelch Control

Under analog mode,

The noise in AF signal from U501 Pin 9 is filtered by outside LC circuit, and goes back to U501 Pin 8 again, and amplified and

rectified by a filter and an amplifier to produce a DC voltage corresponding to the noise level.

The DC signal from U501 goes to the analog port of the microprocessor U301. U301 determines whether to output sounds from the speaker by checking whether the input voltage is higher or lower than the preset value.

Under DMR mode, MCU U301 Pin 44 is in low voltage level and the analog noise is stop and Pin 69 in high voltage level to support DMR circuit working. U301 Pin 95 in high voltage level to stop audio signal to the speaker when there is no carrier.

#### **4. Transmitter System**

The modulation signal from the microphone is amplified by U103 and U201 to generate two modulation signal MOD1 and MOD2. MOD1 signal is amplified by U603 and sent to VCO diode D610. MOD2 signal is amplified by U603 and sent to crystal X601 Pin 1. After that the signal is amplified by Q602, Q604 and Q504, then amplified again by Q503, Q502 and Q501. Q501 and Q502 working voltage is controlled by APC circuit. The power signal is through diode D501 and low pass filter to send out by antenna.

#### PTT and APC control circuit

When PTT is pressed, MCU U301 Pin 42 is in low voltage level, Pin 34 will be in high voltage level and the transmitter circuit is working, at the same time U301 Pin 29 will generate a voltage to U502 and U502 generate a APC voltage to control transmitter power.

#### **5. PLL & VCO**

The operating frequency is generated by Q601 and Q603 in transmit and receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator, to the varactor diodes. (TX: D606, D607, D608, D609) and (RX: D602, D603, D604, D605). The signal are sent back PLL IC U601 Pin 2, 3 and make the phase comparator is passed to the VCO to control the oscillator frequency.