

Circuit Description

一、 Frequency configuration

The receiver utilizes double conversion. The first IF is 38.85MHz and the second IF is 450KHZ. The first local oscillator signal is supplied from the PLL circuit. The PLL circuit in the transmitter generates the necessary frequencies. Fig.1 shows the frequencies.

XT-600 Frequency range: (1): 350 MHz—370MHz
 (2): 370 MHz—390MHz
 (3): 400 MHz—430MHz
 (4): 430 MHz—470MHz

XT-500 Frequency range: (1): 136MHz---150MHz
 (2): 150MHz---174MHz

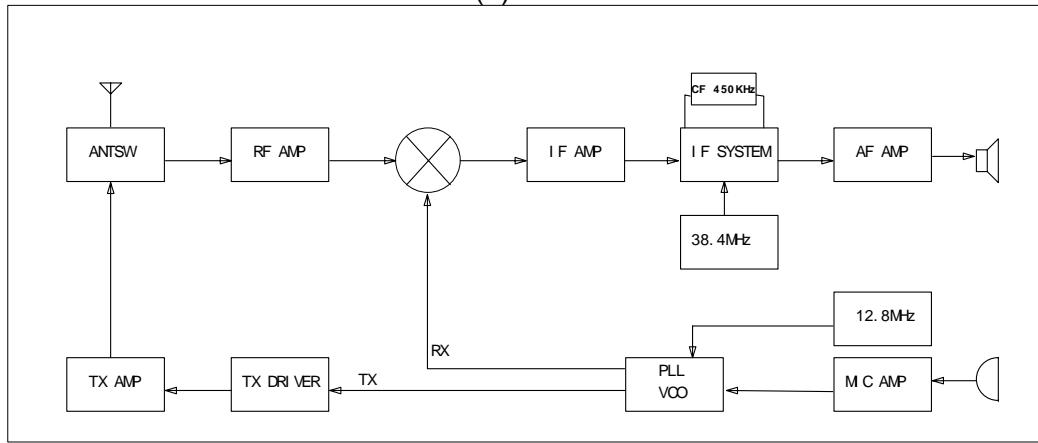


Fig.1 Frequency configuration

二、 Receiver

The receiver utilizes double conversion.

1. Front-end RF amplifier

An incoming signal from the antenna is applied to an RF amplifier after passing through a transmit/receive switch circuit and a band pass filter. After the signal is amplified, the signal is filtered through a band pass filter to eliminate unwanted signals before it is passed to the first mixer.

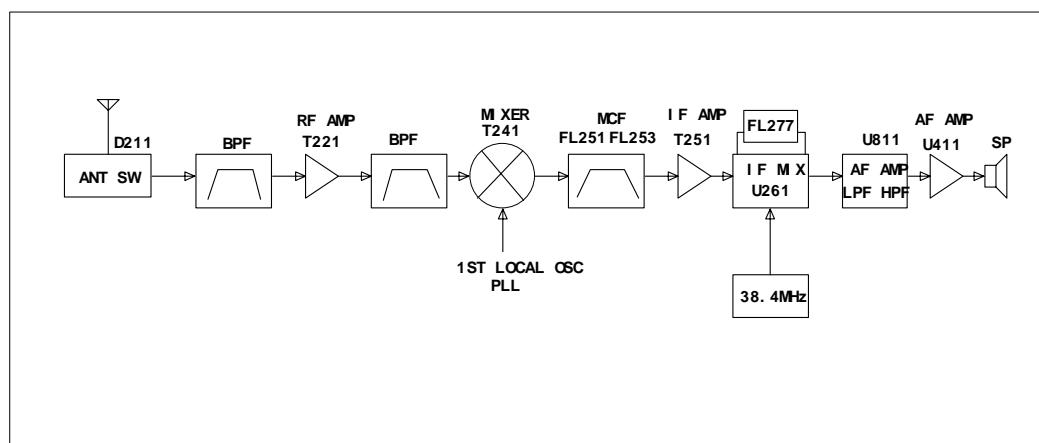


Fig. 2 Receiver section configuration

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 (T241) to create a 38.85 MHz first intermediate frequency (1st IF) signal. The first IF signal is then fed through two monolithic crystal filters (FL251,FL253) to further remove spurious signals.

3. IF amplifier

The first IF signal is amplified by T251, and then enters U261 (FM processing IC). The signal is heterodyned again with a second local oscillator signal within U261 to create a 450kHz second IF signal. The second IF signal is then fed through a 450kHz ceramic filter (FL277) to further eliminate unwanted signals before it is amplified and FM detected in U261.

4. AF amplifier

The recovered AF signal obtained from U261, and de-emphasized by R264 and C264. The AF signal is then passed through U811 is amplified and low-pass filter and high-pass filter. The processed AF signal passes through an AF volume control and is amplified to a sufficient level to drive a loud speaker by an AF power amplifier (U411).

5. Squelch

Part of the AF signal from the U261 is go into the U261 again, and the noise component is amplified and rectified by a filter and an amplifier to produce a DC voltage corresponding to the noise level.

The DC signal from the U261 goes to the analog port of the microprocessor (U811).

U811 determines whether to output sounds from the speaker, U811 sends a high signal to the MUTE and AFCO lines and turns U411 on through T490. (See Fig.3)

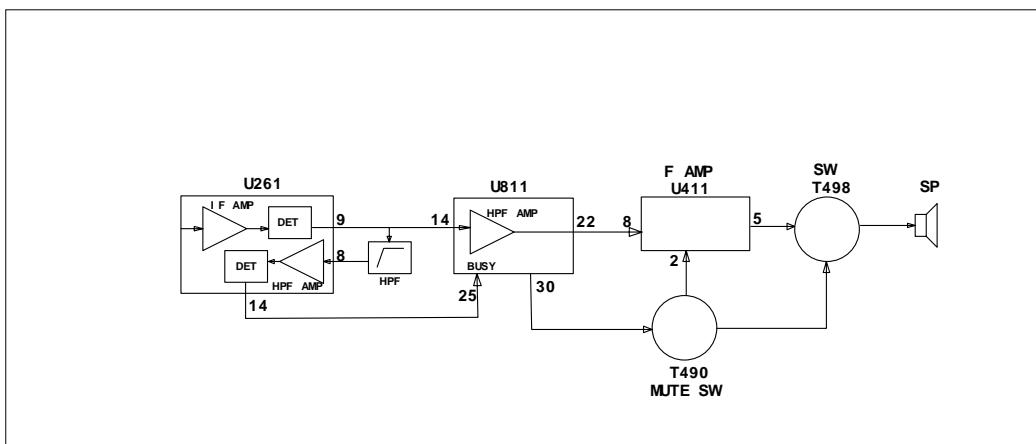


Fig.3. AF Amplifier and squelch

6. Receiving signaling

CTCSS/CDCSS

300 Hz and audio frequencies of the output signal from IF IC are cut by a low-pass filter. The resulting signal enters the microprocessor (U811). U811 determines whether the CTCSS or CDCSS matches the preset value, and controls the MUTE SW and the speaker output sounds according to the squelch results.

三、PLL frequency synthesizer

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

1. PLL

The frequency step of the PLL circuit is 5 or 6.25KHz. A 12.8MHz reference oscillator signal is divided at U311 by a fixed counter to produce the 5 or 6.25KHz reference frequency. The voltage controlled oscillator (VCO) output signal is buffer amplified by T311, then divided in U311 by a dual-module programmable counter. The divided signal is compared in phase with the 5 or 6.25KHz reference signal in the phase comparator in U311. The output signal from the phase comparator is filtered through a low-pass filter and passed to the VCO to control the oscillator frequency. (See Fig. 4)

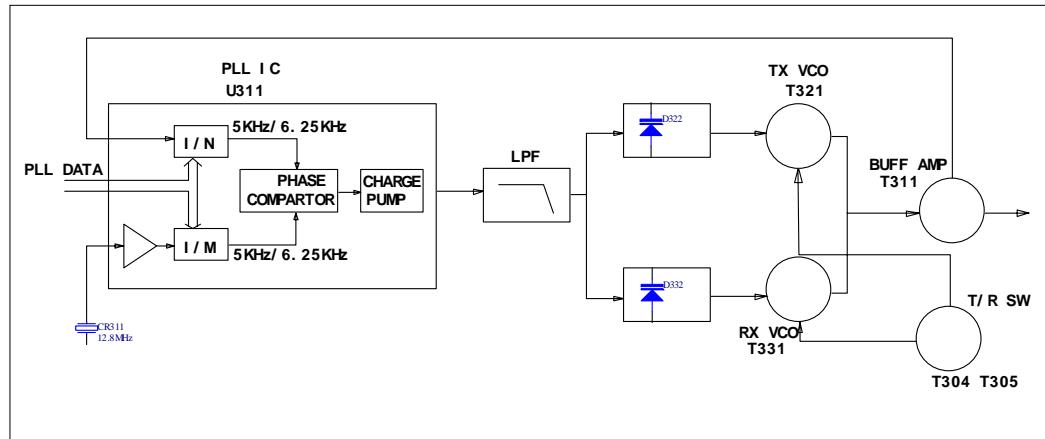


Fig. 4 PLL

2. VCO

The operating frequency is generated by T321 in transmit mode and T331 in receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator, to the varactor diodes (D322 in transmit mode and D332 in receive mode) . The T/R pin is set high in receive mode causing T304 and T305 to turn T321 off, and turn T331 on. The T/R pin is set low in transmit mode. The outputs from T321 and T331 are amplified by T311, then sent to the PLL circuit U311 and receiver or transmitter.

四、Transmitter

3. Transmit audio

The modulation signal from the microphone is amplified by U421, passes through a preemphasis circuit, and the signal then passes through a low-pass filter (splatter filter) (T430 and T433) and cuts up 3kHz and higher frequencies. The resulting signal goes to the VCO for direct FM modulation. (See Fig. 5)

4. CTCSS/CDCSS encoder

A necessary signal for CTCSS/CDCSS encoding is generated by U811 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 adjusting the balance. (See Fig. 5)

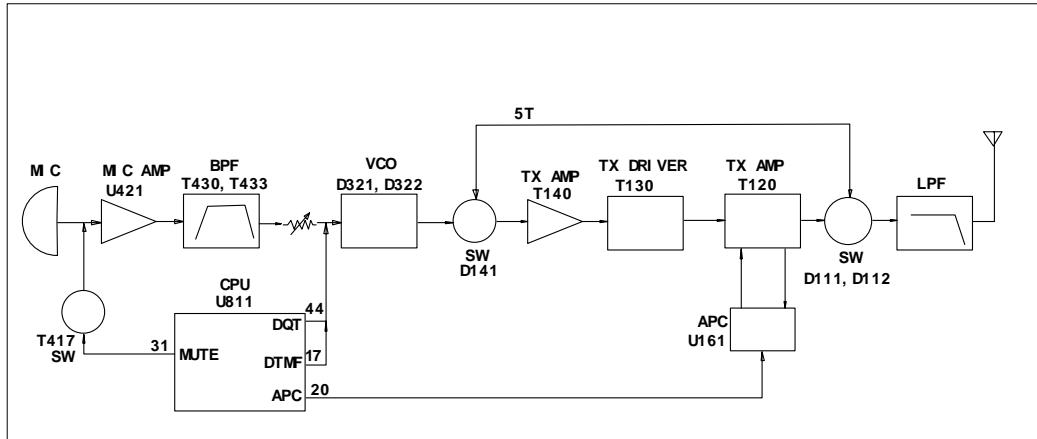


Fig. 5. Transmit audio CTCSS

5. RF amplifier

The transmit signal obtained from the VCO buffer amplifier T311, is amplified by T140. This amplified signal is passed to the power amplifier T130 and T120, which consists of a 2 stage FET amplifier and is capable of producing up to 4W of RF power

6. ANT switch and LPF

The RF amplifier output signal is passed through a low-pass filter network and a transmit/receive switching circuit before it is passed to the antenna terminal. The transmit/receive switching circuit is comprised of D111 and D112. D111 and D112 turned on (conductive) in transmit mode and off (isolated) in receive mode.

五、Power supply

A 5V reference power supply for the control circuit is derived from an internal battery. This power is used to provide a 5V supply in transmit mode [5T], a 5V supply in receive mode [5R], and a 5V, supply common in both modes based on the control signal sent from the microprocessor.

六、Control system

The IC U811CPU operates at 32.768kHz.