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FRS500 CIRCUIT ANALYSIS

Receiver Circuit

The receiver circuit operates over the frequency range of 462.5625MHz to 467.7125MHz and is a dual conversion superheterodyne receiver with a 21.4MHz high IF and a 450KHz low IF. A programmable phase-locked-loop frequency synthesizer provides high side, first local oscillator injection frequency to the receiver circuit within the 483.9625MHz to 489.1125MHz.

The receiver circuit consists of RF amplifier Q2, first mixer bipolar transistor Q3, 21.4MHz crystal filter FL2, second mixer /If amplifier/detector/audio preamp/squelch module U3.

The RF input signal from the antenna enters the receiver circuit through low pass circuit which consists of L4,C57,MS4 and C53. Where it is restricted low frequency entrance. It is fed to first RF amplifier Q2 and supplied to first mixer Q3. After mixing by Q3, the signal is converted into the 21.4MHz first IF frequency. After having been restricted to a ± 7.5 KHz bandwidth by FL2 and amplified by first IF amplifier Q5, the signal is supplied to IF U3. The second local frequency is 20.950MHz. The frequency is converted here into the 450KHz second IF frequency. It is detected inside the IC and it appears at pin9 as a demodulated audio signal. It is then through the high pass circuit U5 to increase high frequency response. The signal are then amplified by the speaker amplifier U3(main board) and the receive talk speaker is activated. Speaker muting Q11 and Q18 (main board) is released by the low-level output from CPU.

Transmission Signal Circuit (main board)

The signals from the send talk microphone are amplified by Q7. It is then through the low- pass circuit U4 (fc 3KHz) to form the send talk modulation signals. An ALC (automatic level control) circuit is built into the send talk signal circuitry so as to prevent distortion from arising in the amplifier circuitry due to excessively high outputs from the send talk microphone. Q8 acts as a voltage detector for the collector output level when the Q6 input level increases, and DC level smoothed by C29 is produced. When the DC level rises and Q9 is set ON, the level of the signal supplied Q7 drop and, similarly, the level of the signal supplied to Q6 drops. As a result, the signals are kept down to a constant level where distortion caused by excessively high inputs in the send talk signal circuit composed of Q6 is prevented.

VCO Circuit

This circuit is configured by Q1 , Q4, varactor diode D1 and Inductors L8,. The control voltage from the PLL IC is supplied to the D1 cathode to control the oscillation frequency. The modulation signal is supplied to D2 cathode. U1 is a single PLL. The 400MHz band frequency signal from the VCO is supplied to pins 8, and it is divided down to 6.25KHz in accordance with the frequency division ratios assigned by the CPU. Furthermore, the 20.950MHz frequency of crystal is divided down to 6.25MHz to serve as the reference frequency. SVC1 is a trimmer capacitor used to adjust the oscillation frequency. C67 and C68 are temperature compensating capacitors increasing frequency stability due to the temperature variation.

Power Amplifier

The power amplifier consists of U2. It is a high power, high efficiency amplifier IC and has been designed for use as the final RF amplifier.. The transmit signal from the VCO pass through low-pass circuitry where consists of C56, R26, C13, R39, and C55 so as to suppress EMI signal and it is then

amplified by U2.

Tune- up Procedure:

The transmission power from VCO output at C8 is 0dBm+-2dBm, and power control can be adjusted by using R32 and R33 to vary the power source. The power is set to 26 ± 1 dbm at the C57(TP1). The C51, MS1, C11, C12, C37, L6, L9 components provide spurious and EMI filtering so as to suppress radiation from the antenna.



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- 4) Types of emission: F3E
- 5) Frequency Range: 462.5625MHz ~467.7125MHz
- 6) Range of Operating Power: power supplied by battery
- 8) DC Voltages and DC current applied into the several elements of the final radio frequency amplifying: amplified by IC U2 with DC 5V / 250mA
- 9) Operating Voltages: DC 4.5~6.0V