Theory of Operation of Headset

Headset Transmitter Theory Of Operation

Introduction:

The following theory of operation describes in detail how the headset transmitter RF functions. Please refer to the Head Set Transmitter System Block Diagram when reading this document.

Microphone Input:

The microphone input is a noise canceling type. It is intended that the microphone be positioned with-in 1 inch of the mouth or so.

Automatic Level Control:

This circuit is designed to provide a constant audio output when the input is variable (soft vs loud speech). The component used is a Philips Semi-conductor NE578 compandor I.C. configured to provide ALC. The compression point is set at 50mV rms and the gain is 25 V/V. With these settings, some amplitude variations will be present at normal speech levels.

Crystal Modulation:

The output of the ALC is fed to a varactor diode. The changing audio characteristics change the capacitance of the diode which is connected to the crystal. This changing capacitance pulls the resonant frequency of the crystal.

Crystal Oscillator / X5 Multiplier:

The crystal oscillator for this circuit uses a colpitts topology. Incorporated into the circuit is a high frequency fundamental mode crystal. The collector of the oscillator is tuned to the 5th harmonic of the crystal. There is a capacitor adjustment to trim the oscillator to with in 5 kHz of the actual transmit frequency.

Filter:

The output of the oscillator is connected to the main filter block for the transmitter. The filter type is a 3 pole coupled resonator centered at the transmit frequency. This filter is optimized to provide as much suppression of the 2nd, 3rd, and 4th harmonics of the oscillator as possible and no attenuation of the 5th harmonic which is the transmitter frequency.

Power Amplifier:

This is the final gain stage for the transmitter. The amplifier is operating in the class A mode and the collector is tuned to the transmitter output frequency to reduce the amount of filtering required on the output.

Filter:

The output filter is a 1 pole coupled resonator type with antenna match. This circuit provides further harmonic suppression and isolation of the PA from the antenna.

Antenna:

The antenna is a helical type wound on a 1/4 by 20 nylon thread stock. The helical antenna is operating in the normal mode and therefore has similar performance to a 1/2 lambda end fed dipole.