CIRCUIT DESCRIPTION

A general description of the overall circuit is covered in the instruction manual. This section provides the description of circuits required by subpart 2.983.of the Commissions' rules. Circuits not described in the manual are covered in this exhibit (8 to 8-2).

The following are included:

4.1Carrier Frequency Generation and Stabilization

4.2 Modulation Techniques

4.3 Attenuation of Higher Audio Frequencies

4.4 Modulation Limiting and Post Limited Filter

4.5 Means for Output Power Limiting

4.6 Spurious and Harmonic Emissions Suppression

CIRCUIT DESCRIPTION

4.1. Carrier Frequency Generation and Stabilization

A 16.8 MHz reference frequency is generated and its stability is maintained with +/- 1.5 PPM temperature stability from -30 to +60 degrees Celsius by a purchased, self contained temperature compensated crystal oscillator (TCXO) reference oscillator. The reference frequency is multiplied up to the carrier frequency by a custom fractional-N synthesizer IC, and voltage controlled oscillator (VCO) forming a phase-locked loop.

4.2. Modulation Techniques

The transmitter is capable of the following types of modulation:

i) Voice 300Hz to 3kHz

ii) Modulation of PL (Private Line) - Direct FM tone modulation of 67 Hz to 250.3 Hz at 15% of full system deviation.

iii) Modulation of DPL (Digital Private Line) - Direct FM modulation at 134 BPS at 15% of full system deviation.

iv) Modulation of DTMF tones at nominally 60% of full system deviation.

v) Trunking High Speed Data.

Direct FM of PL or DPL is generated by a 6-bit D/A converter contained within the audio processing IC U404. The frequency-determining clock signal is generated by the radio microcomputer. The modulation signal is processed through a five pole switched capacitor filter. The output of the filter is input to the electronic attenuator circuit.

The microcomputer adjusts the attenuator to compensate for modulation sensitivity variations of the synthesizer & channel bandwidth ensuring 15% of full system deviation for PL and DPL.

DTMF tones are generated by the audio processing IC, U404. The tones are routed and processed in the same manner as the voice signals

4.3 Attenuation of Higher Audio Frequencies

The output of the limiter is applied to a low-pass splatter filter. This filter is a fifth-order switched capacitor filter with the roll off corner located at 3000 Hz. The output of the low-pass filter is input to the electronic attenuator before routing to the modulator.

4.4. Modulation Limiting and Post Limited Filter

Modulation limiting is accomplished within the custom IC, U404. The limiting action itself occurs at the rails (i.e., 3.3V and ground). Using an Op-amp with feedback, very hard limiting is obtained. The limited modulation signal is then input through a low-pass splatter filter then to an electronic attenuator within U404 in order to adjust for variations in modulation sensitivities of the frequency synthesizer.

The electronic attenuator is controlled by the radio's microprocessor, U409. To keep the deviation constant over the RF frequency range & channel bandwidth, the microcomputer adds the proper correction factor to the attenuator.

4.5. Means for Output Power Limiting

The radio utilizes a current sense ALC IC U102 to regulate its output power. The current sensing resistor R102 provides a feedback signal to U102. This signal is then compared to the preprogrammed current reference and the error signal is amplified and used to generate a control voltage to control the bias for Driver U101 and final stage RF Power Amplifier, Q110.

4.6. Spurious and Harmonic Emissions Suppression

The final stage of the RF power amplifier circuit feeds a low-pass filter in order to attenuate harmonics of the carrier frequency as well as any spurious signals. The filter is a seven elements Elliptic design using LC lump elements.