

## 1) Means for Frequency Stabilization

Frequency stability is maintained by a referenced oscillator/programmable temperature compensation circuit located in the frequency synthesizer IC U201. The oscillator is a Colpitts design with an amplifier in the IC. The 68.8 MHz crystal FL201, varactor and feedback capacitors are external circuitry. A control voltage applied to the varactor via the programmable compensation circuit maintains the frequency stability to within +/-2.5ppm over temperature. Frequency tuning, also from the programmable compensation circuit, has 128 steps of resolution.

## 2) Means for Limiting Modulation

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 opamp 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 micro-processor, U409. To keep the deviation constant over the RF frequency range & channel bandwidth, the microcomputer adds the proper correction factor to the attenuator.

## 3) Means for Attenuation of Higher Audio Frequencies

The output of the limiter is applied to a low-pass splatter filter. The 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) Means for Attenuation of Spurious Emissions

The harmonic filter consists of C104, L102, C103, L101 and C102. The design of the harmonic filter for UHF is that of a modified Zolotarev design. It has been optimized for efficiency of the power module. This type of filter has the advantage that it can give a greater attenuation in the stop-band for a given ripple level. The harmonic filter insertion loss is typically less than 1.2dB.

## 5) Means for Limiting Output Power

The transmitter uses the Power Control IC (PCIC), U102 to regulate the power output of the radio. The current to the final stage of the power module is supplied through R101, which provides a voltage proportional to the current drain. This voltage is then feedback to the Automatic Level Control (ALC) within the PCIC to regulate the output power of the transmitter.

The PCIC has internal digital to analog converters (DACs) which provide the reference voltage of the control loop. The reference voltage level is programmable through the SPI line of the PCIC.

There are resistors and integrators within the PCIC, and external capacitors (C133, C134 and C135) in controlling the transmitter rising and falling time. These are necessary in reducing the power splatter into adjacent channels.

CR105 and its associated components are part of the temperature cut back circuitry. It senses the printed circuit board temperature around the transmitter circuits and output a DC voltage to the PCIC. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature

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## 6) Means 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.

Direct FM of PL or DPL is generated by a 6-bit D/A converter contained within 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.