

CIRCUIT DESCRIPTION

The following schematic diagrams will be similar to those that appear in the final service manual. 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 Commission's rules.

The following are included:

- |                                                         |    |
|---------------------------------------------------------|----|
| 1. Means of Frequency Stabilization                     | 8A |
| 2. Means for Limiting Modulation and Low Pass Filtering | 8B |
| 3. Means of Attenuating Spurious Emissions              | 8C |
| 4. Means for Limiting Power                             | 8D |

EXHIBIT 8

Section 8A - Description for determining and stabilizing frequency

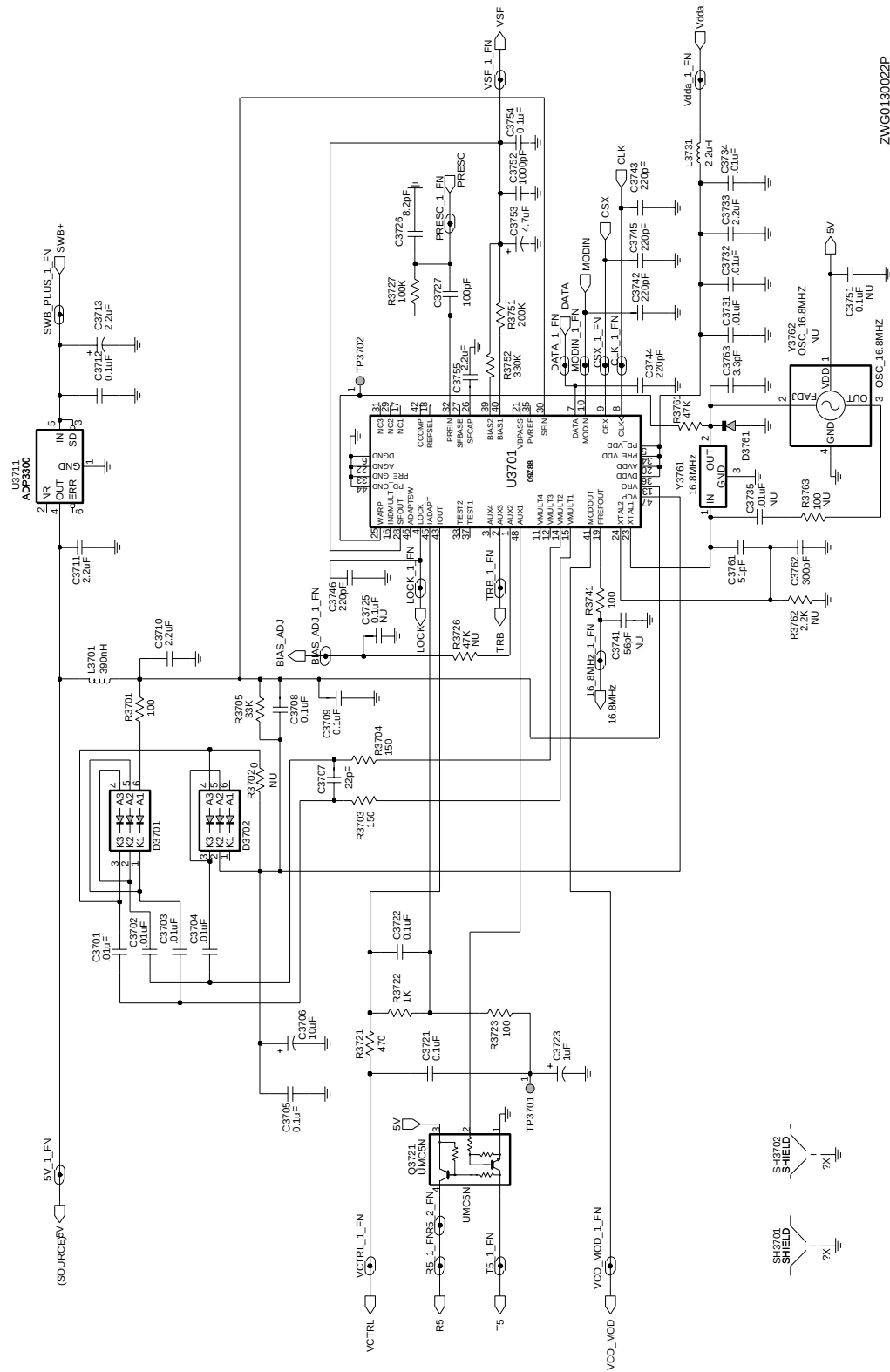
This product uses a frequency synthesizer to generate the transmitter signal which is then applied to the transmitter power amplifier. The frequency stability of the output signal from the synthesizer is determined by the stability of the reference frequency applied to the synthesizer input. The figure above shows the frequency synthesizer with the appropriate circuitry highlighted.

The reference frequency for the synthesizer is 16.8 MHz. This is determined by the crystal component indicated as Y3761 in the figure. Notice also that a varactor, D3761 is connected to one side of the resonator. By varying the voltage applied to the varactor, the frequency of the reference oscillator can be varied. This voltage is supplied from Pin 25 of U3701 and is called the warp voltage. The reference oscillator active device is internal to U3701 and connects to the resonator at pins 23 and 24.

The center frequency of crystal resonators varies in a mathematically predictable way over temperature and following a known polynomial curve. Due to production variations, the coefficients of the curve are slightly different for each crystal. To account for this each crystal is individually characterized and labeled.

The integrated circuit U3701 contains circuitry which senses the ambient temperature and adjusts the warp voltage to track out the variation in resonator center frequency over temperature. This circuitry is designed to be custom programmed for the slight variations in crystals that are indicated on the crystal label. At the time of production, the label is read and the correct adjustments are programmed into the radio.

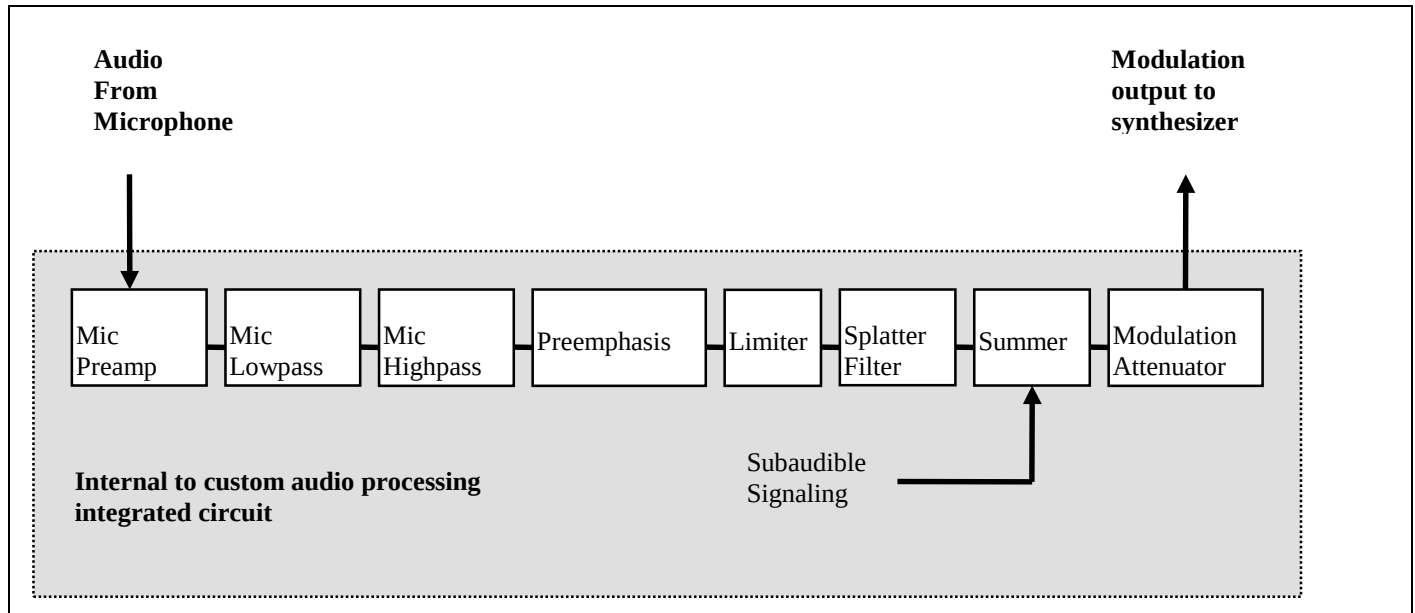
The reference oscillator is powered off a regulated supply voltage. This eliminates variation of the frequency with battery voltage.



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Section 8B - Audio Low-pass Filtering and Modulation Limiting

Audio processing and modulation limiting are performed inside a custom integrated circuit, U404. This IC takes audio from either the internal or external microphone and performs the necessary processing and outputs modulation information to the synthesizer. The figure below will help explain in the discussion of this operation.



Audio from the microphone is routed to a microphone preamp which adjusts for the differences in sensitivity between internal and external microphones. The signal is then routed to a four pole low-pass filter to bandlimit the signal to 4 kHz and then through a highpass filter which remove energy in the low frequency part of the spectrum which is used for signaling. The signal is the preemphasized and then sent to a limiter. This nonlinear circuit clamps the peak value of the audio signal. By limiting this peak value of the audio waveform, we are able to limit the peak value of modulation output to the synthesizer and thereby peak deviation from the transmitter. After the limiter, the audio is passed through a 5 pole low-pass splatter filter to remove higher frequency energy and then subaudible signalling such as CTCSS is summed in. This signal goes through a programmable attenuator before going to the synthesizer. Alignment procedures for the radio will adjust the modulation attenuator and thereby maximum deviation with the audio level driven into limit. The level of the subaudible signaling tone is a known peak value and alignment procedures offset the transmitter deviation setting to insure peak deviation is kept below maximum limit.

Section 8C - Attenuation of Spurious Emissions

*Note: Schematic references refer to the Figure in Section 6*

This product is equipped with a low-pass filter following the transmitter output to attenuate spurious harmonics of the transmitter. This filter consists of inductors L3532, and L3531, as well as capacitors C3536, C3534, C3535 and C3533. The elements form a general parameter type low-pass filter with 4 poles and 1 zeros.

In addition, the matching of the final device is low-pass in nature. This network is formed by L3522 and L3521 as well as capacitors C3521, C3523, C3524, C3525, C3527 and C3528 inclusive. Both of these networks attenuate the harmonic emissions from the final amplifier.

Section 8D - Limiting of Transmit Output Power

*Note: Schematic references refer to the Figure in Section 6*

This product limits the output power of the transmitter by limiting the dc current into the final device. The current for the RF final amplifier, Q3501, flows through resistor R3519. The voltage on both sides of this resistor are sensed and connected to a custom integrated circuit which is used for power control functions, U3502, at pins 1 and 27. This IC senses the differential voltage across the resistor and compares it to a reference voltage supplied by an internal digital to analog converter. The difference in voltage between these signals controls the magnitude of the output voltage from the IC on Pin 4.

Integrated circuit U3501 is a RF driver amplifier whose output power is controlled by the magnitude of the voltage applied to pin 1. The output voltage from the power control IC is connected to this pin and therefore power output of the RF driver varies with the output voltage from power control IC. This power out of the driver is connected to the final amplifier Q3501. As the power output of the driver goes up, Q3501 draws more current increasing the drop across R3519. Conversely, if the power output of the driver goes down, Q3501 draws less current, decreasing the drop across R3519. In this way, a negative feedback loop is formed which holds the value of final amplifier current constant.

The value of the reference voltage from the digital to analog converter is programmable to allow adjustment of radio output power in the factory or field service center. This adjustment requires special service software and is not adjustable by the operator.

EXHIBITS 8C and 8D