

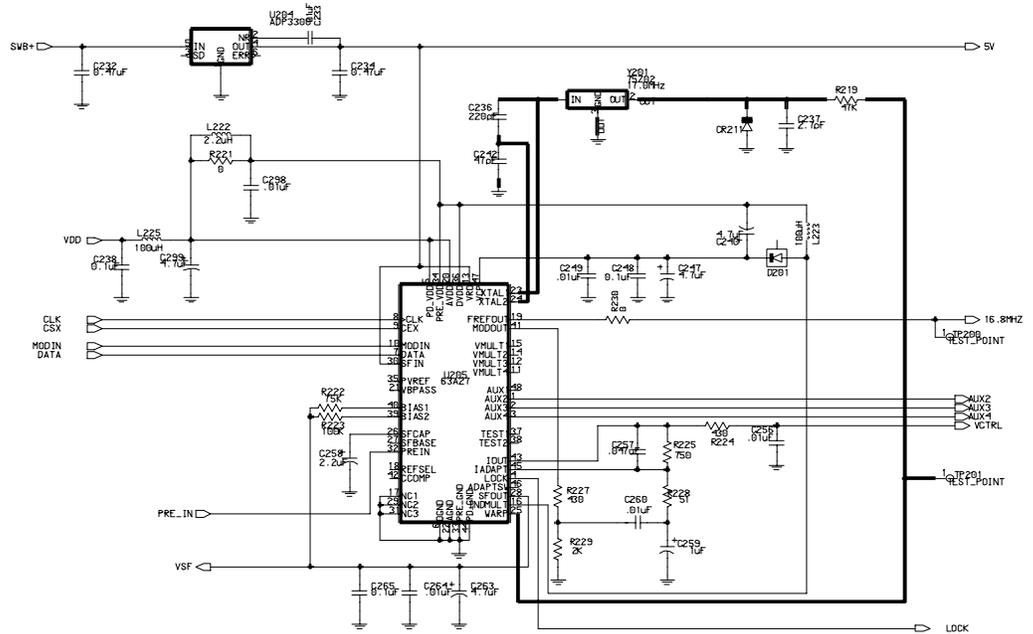
CIRCUIT DESCRIPTION

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 Commission's rules. Circuits not described in the manual are covered in this exhibit.

The following are included:

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| 1. Means for Frequency Stabilization | 8A |
| 2. Means for Limiting Modulation and
Low Pass Filtering | 8B |
| 3. Means for Attenuating Spurious Emissions | 8C |
| 4. Means for Limiting Power | 8D |
| 5. Reference Figure for items 3 and 4 | 8E |

Section 8A - Circuitry 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 17.0 MHz. This is determined by the crystal component indicated as Y201 in the figure. Notice also that a varactor, CR211 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 U205 and is called the warp voltage. The reference oscillator active device is internal to U205 and connects to the resonator at pins 23 and 24.

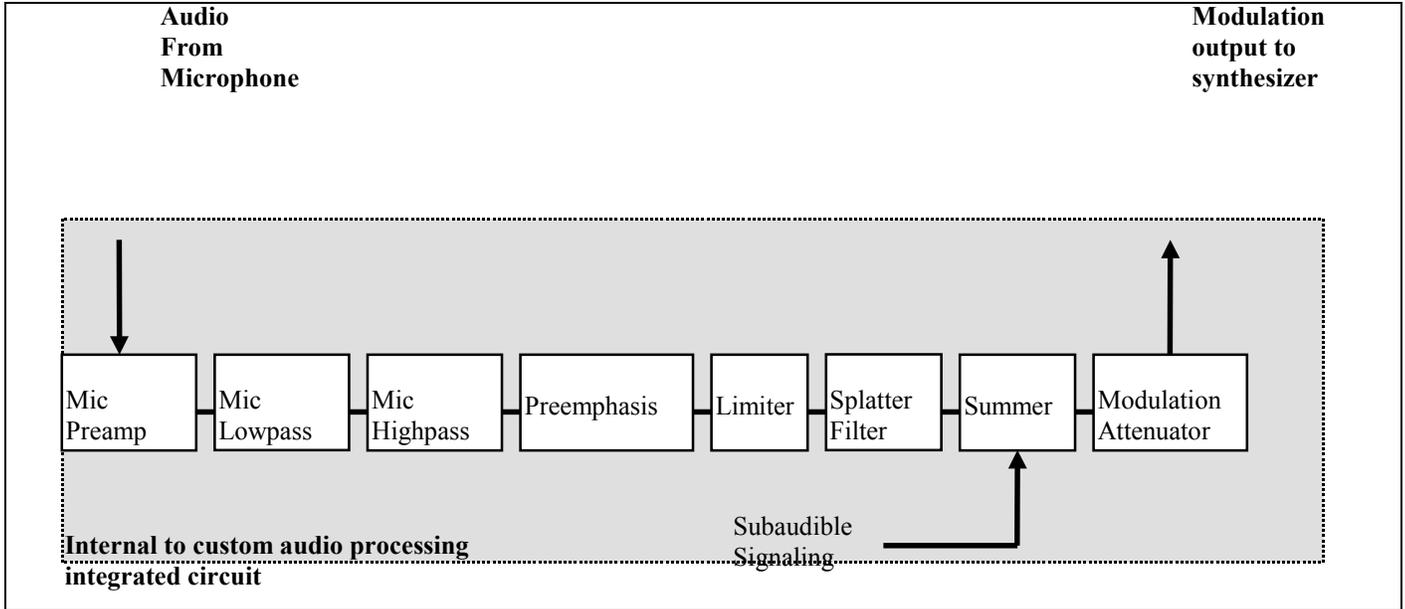
The center frequency of crystal resonators varies in a mathematically predictable way over temperature and following a known polynomial curve. Due to production variations, the coefficients of the curve are slightly different for each crystal. To account for this each crystal is individually characterized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

The integrated circuit U205 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 power off a regulated supply voltage. This eliminates variation of the frequency with battery voltage.

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.



**** If the diagram above does not appear, go under the View menu and select Page Layout.**

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 lowpass 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 lowpass 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 8E

This product is equipped with a lowpass filter following the transmitter output to attenuate spurious harmonics of the transmitter. This filter consists of inductors L100, L101, and L102 as well as capacitors C103, C106, C107, C110, C111, C114 and C116. The elements form a general parameter type lowpass filter with 7 poles and 3 zeros.

In addition, the matching of the final device is lowpass in nature. This network is formed by L105, L106 and L107 as well as capacitors C118 - C123 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 8E

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, Q100, flows through resistor R102. The voltage on both sides of this resistor are sensed and connected to a custom integrated circuit which is used for power control functions, U102, 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 U101 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 Q100. As the power output of the driver goes up, Q100 draws more current increasing the drop across R102. Conversely, if the the power output of the driver goes down, Q100 draws less current, decreasing the drop across R102. 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.

Section 8E - Reference figure for 8C and 8D

