

Pyramid Model #: SVR-200
Transmitter Type: LRUSVR-200LA

Exhibit A

Subpart 2.983 (d)(10)(11)

Circuit Description

Receiver

The receiver is a double-conversion super heterodyne type designed for narrow band FM reception. The first local oscillator is derived from the frequency synthesizer. The second LO is crystal controlled.

RF Stage: The incoming RF signal from the antenna jack is directed to the RF input stage by the antenna switch U7. The RF signal is presented to the discrete band pass filter and then to the input of RF amplifier Q1. The RF signal is then presented to a second discrete band pass filter.

First LO: The first LO signal is developed by the synthesizer and is output to the mixer Q2.

First Mixer: The RF signal is mixed with the first LO signal by Q2. The difference component (70 MHz) is filtered by crystal filters FL1A/FL1B and applied to Q3 the 1st IF amp.

Second LO/Mixer: The first I.F. signal is presented to U1, which performs the function of second LO, second I.F. amp and mixer, FM discriminator and squelch. X1 (69.545 MHz) is the second LO crystal and is mixed with the 70 MHz first I.F. signal to produce the second I.F. frequency of 455kHz. Ceramic filter FL2 provides selectivity for the 455 kHz signal.

Detector/Squelch: U2 demodulates the 455kHz signal via quadrature coil L21 to produce the audio and noise components. The output of U2 is the recovered audio and the RSSI voltage (receiver signal strength indicator), which is compared by the controller board with a threshold voltage level for squelch setting.

Transmitter

The output of the VCO is input to pre-amps U5 and U6. After initial amplification the output is fed into the driver Q6 before being input to final PA Q7. The final amp is an RF MOSFET power amplifier and drives the discrete low pass filter. U7 is the transmit antenna switch controlled by Q2.

Control Board

Power Supply: DC power comes from the mobile radio via P1 pins 1 and 5. Fuse F1 and MOV VAR1 provide over current and voltage spike protection. Q3 is the remote enable/disable pass switch, controlled by Q1 and Q2 via pin 3. Q3 output is switched 12VDC and is presented to audio amp U6, and voltage regulators U7 and U8. Bias voltage for the op-amp circuits is provided by voltage divider R68, R60 and buffer amp U2A.

Transmit audio path: Receiver audio from the mobile is input to the mic amp portion of U4; PC programming of the SVR-200 provides flat response or +6db/octave pre-emphasis. The output of the mic amp is internally connected to the limiter and low pass filter. When a condition to repeat exists (base to handheld) U4 audio is switched on and audio is presented to amplifier/limiter and low pass filter to remove audio components above 3kHz. U4 provides -48db/octave of attenuation to out of band signals. Transmit audio is output on pin 22 of U4 and passes through the final low pass filter U2C to remove any clock noise generated by U4's switched capacitive filters before being presented to the RF module on P2 pin 6.

Receive audio path: Receiver audio from the transceiver module is input on P2 pin 13 and presented to U5 pin 10 and pin 16. Pin 10 is the input of the receiver high pass filter to remove any sub audible signals before being output on pin 11 and sent to U4 for receiver audio processing. Pin 15 is the input to the sub-audible tone decoder section of U5. Receive audio entering pin 7 on U4 is processed as flat, or -ddb/octave depending on PC programming. The receive audio then passes through the internal low pass filters to remove unwanted noise and output on pin 21, where it is sent to the local receiver audio amp and mobile transmit audio output amp U1B. J1 selects either high sensitivity (open) or low sensitivity (shorted) and J2 selects the output impedance (600/2.2K Ohms).

Sub-Audible tone signaling: U5 processes the sub-audible signal from the receiver by comparing the incoming signal to previous samples in a noise correlator. If the signal is sufficiently coherent, the output of the comparator is counted by the internal circuitry and an interrupt is generated to the main microprocessor. U12 reads the data from U5 in 2 bytes: byte one contains the number of internal clock cycles elapsed for the remainder. U12 performs a comparison of minimum and maximum values allowed in a look up table and determines if the data is within the decode bandwidth for the programmed tone.

IN band tone signaling: Audio from the transceiver is also fed to U3B where it is amplified and limited for input to the commutation switched capacitive filter made up by C23-C26 and PO.4-Po.7 of the microprocessor. The microprocessor outputs four identical signals with 90° phase difference on the incoming respective port pins. The resultant waveform will be a function of the difference between the incoming signal frequency and the decode frequency output by the microprocessor. The signal is buffered by U3C and amplified by U3A before being rectified and filtered by D1 and C2. The resulting DC voltages compared to the reference voltage by U3D. If the incoming signal is within the decode bandwidth, the output of U3D will be a logic of 1 and read by the microprocessor.

Logic and control: U12 provides all of the logic and control functions for the repeater including mobile/repeater PTT output, local mobile PTT sense, mobile transmitter activity sense, audio switching, in-band and CTCSS detect, and repeater status indications via D2 and D3 led arrays.