the RF amplifier stages is fed to a true Double Balanced Mixer which converts the VHF/UHF input signal down to the 21.4MHz IF frequency. This type of mixer is used due to its extremely wide dynamic range characteristics and its extreme simplicity of operation. Note that they are widely used in microwave applications due to their superior performance capabilities. Double Balanced Mixers are well known for their excellent strong signal handling capabilities - which lead to very low spurious responses, 'desense', and overload.

4.1.2 The Local Oscillator (LO) chain consists of a third overtone crystal oscillator stage (Q104) which operates in the 40-60MHz range. (When the optional 450MHz crystal oscillator/oven module is used, Q104 becomes a frequency tripler stage.) Q104's collector output is filtered by the L110/C128 tank circuit, and its output is fed to the base of the Q105 multiplier circuit. The multiplier's output is filtered by a "double tuned" filter which consists of L111 and C131 plus L112 and C135. This signal is fed to the base of Q106, a second multiplier stage whose output is similarly filtered by another double tuned filter consisting of L113 and C137 plus L114 and C141. For 136-151MHz and 406-512MHz receivers, Q105 and Q106 are doubler stages. For 151.001-174MHz receivers, Q105 is a tripler stage and Q106 is an amplifier stage. For 216-250MHz receivers Q105 is a tripler, and Q106 a doubler stage. The multiplier chain's RF output is filtered by a double tuned filter in order to reduce spurious outputs which would lead to spurious responses in the receiver. On the SCR450, the signal is now fed to the base of a third multiplier stage, Q107. The signal at Q107's collector is again filtered by a very sharp triple tuned filter which consists of L115 and C143, plus L116 and C145, plus L117 and C147. The final output is at a level of approximately 5-10mW, (the relatively high level required by the mixer). The L.O. output frequency is always exactly 21.400MHz above the desired receive frequency for 136-151.000MHz and for 216-250MHz receivers. The L.O. output frequency is exactly 21.4000MHz below the desired receive frequency for 151.001—174MHz and for 406-512MHz receivers. This is done to minimize problems with the image response. A L.O. output test point is provided at TP1, and a frequency counter or spectrum analyzer may be connected to this terminal.

4.1.3 The first mixer (M101) is immediately followed by a 4 Pole first IF crystal filter (FL101 and FL102), which begins to filter out off channel signals before they reach the IF amplifier stages. This filter network is followed by Q103, the first IF amplifier stage, which provides about 30dB of gain, Q103's output is tuned by the L120 and C153 tank circuit, and fed to a second 4 Pole crystal filter (FL103 and FL104) which adds further adjacent channel selectivity. A 21.4MHz IF frequency is used in this design since it places the image 42.8MHz away from the desired receive frequency. This image is extremely well attenuated by the very sharp filters in the receiver front end stages. This high frequency IF is far superior in this respect to the commonly used 10.7MHz IF stages.

4.1.4 The 21.4MHz first IF signal is fed to U101 which is a multi-purpose second IF IC. This IC performs the functions of second LO and mixer (down to the 455KHz second IF frequency). This mixer is also doubly-balanced to reduce spurious responses. The second LO operates at a frequency of 21.855MHz. U101 also includes the 455KHz second IF Amplifier and Limiter stages, as well as the FM Quadrature Detector, and high frequency (35KHz) Squelch Noise Amp. The second mixer's output at