

The Motorola® Micor® “Sensitron” High - Band Receiver

A comprehensive description of the Micor single conversion receiver.

The Motorola Micor hi-band receiver is a highly sensitive and selective, single conversion receiver. The bandwidth and selectivity are determined by the rf preselector coils, the i-f crystal filters, and the crystal discriminator. Signals received at the antenna input are routed through the rf preselector cavities to the following mixer stage to be heterodyned with the injection frequency signal. The resultant i-f (intermediate frequency) signal is then amplified by the 1st i-f amplifier then routed through the 1st four pole crystal filter, onto another i-f amplifier then to another crystal i-f filter. The output of the second crystal filter is amplified by a third i-f amplifier / limiter, and this signal is demodulated, (turned into basic audio), by the crystal discriminator. The term “single conversion” means the intended receive signal is only converted one time, to another frequency. Most narrow band frequency modulated (nbfm) receivers are dual, or multi - conversion designs, meaning the desired receive frequency is converted to another, and converted to another, and so on. An example is the Hamtronics R100. The R100 is a dual - conversion design. The intended receive frequency is converted to 10.7 Mcs. and then converted to 455 Kcs. The main advantage of dual - conversion, is the final selectivity is achieved with highly selective (however less costly) 455 Kc. monolithic i-f filters. Since cost was not an issue, for the most part, when Motorola designed the Micor line, this receiver uses only higher frequency (11.7 Mc.) crystal filters, and a 11.7 Mc. crystal discriminator for selectivity. By design, the crystal discriminator has a higher recovered audio signal, than a coil discriminator for given deviation of the input frequency. As mentioned above the desired receive frequency is converted in the mixer, to the i-f frequency, by a process known as heterodyning. Heterodyning is achieved by injecting two frequencies into a non linear amplifier, (mixer) to create another. The mixer amplifier has to be non linear in order to create the i-f frequency, otherwise the two frequencies (desired rf carrier frequency, and injection) would simply be amplified and no other frequency would be created. The injection frequency is created by the local oscillator that is multiplied up to the desired frequency, plus or minus the i-f frequency.

The Micor receiver utilizes an 11.70 Mc. i-f frequency. Since the mixer would accept, and convert, a frequency that is 11.7 Mc. above, or 11.7 Mc. below, the injection frequency, a means of selecting which image, either high side, or low side is to be received. If no selection is afforded, the receiver will copy signals on both frequencies.

Example: I commonly get complaints that my 145.270 Mc. repeater is transmitting in the “commercial” band on 166.67 Mc., it really is not, the receiver that these people are using are scanners, with a somewhat inability to reject the image. 145.27 is 10.7 Mc. (the most common 1st i-f frequency) below the mixers injection frequency. 166.67 is 10.7 Mc. above the mixers injection frequency. In quality fm receivers, like the Micor, a “front

end” preselector is used ahead of the mixer to only allow the desired frequency, and a wee little on each side, to be processed. The design characteristics of the front end determines how well the receiver will deal with out of band signals. In cheap receivers, with little preselection, strong out of band signals, or adjacent in band signals, or both, could overload the mixer, or rf preamplifier, producing multiple undesired signals to be demodulated. This normally sounds like birdies, squeals, and annoying whistles on top of what you are intending to hear. This is called intermodulation distortion, or “intermod”.

As stated earlier, the injection frequency is created by the multiplication of the local oscillator, (LO) crystal, (located in the channel element). The Micor channel element crystal is multiplied nine times to produce the injection frequency for the mixer. If the injection frequency is above the desired receive frequency, you have high side injection, If the injection is below the desired frequency, you have low side injection. The 132 - 150.8 Mc. Micor receiver uses high side injection, the 150.8 - 174 Mc. split uses low side injection. Interestingly this creates a neat situation, the local oscillator crystal frequency range is nearly the same for either of the two tuning ranges. The LO crystal frequency range for the 132 - 150.8 Mc. tuning range is 15.9666666... to 18.0555555... The LO crystal frequency range for the 150.8 - 174 Mc. tuning range is 15.4555555... to 18.0333333..., and the only real difference is the tuning range selection provided by the front end preselector. Let’s say we have a Micor receiving on 162.000 Mc., this receiver would also receive 138.600 Mc. if the front end was retuned to do so. If you have channel elements intended for the commercial band, they just may also work somewhere in the ham band. Just subtract two times the i-f frequency (23.400 Mc.) from the channel frequency on the channel element!

Since most all of the circuits in the receiver are utilizing the same tuning range, the Micor makes a fine ham band receiver with the only modification for proper tuning is the replacement of the coils in the helical preselector. Oh yes, one other thing. If you are intending to use the optional high stability channel elements in the receiver, you will also have to use the automatic frequency compensation (AFC) amplifier plug - in module, and reverse the polarity of the diodes in the crystal discriminator. Why? Since the 132 - 150.8 Mc. receiver uses high side injection, signal phase is reversed in polarity at the output of the discriminator, thus a frequency that is slightly off frequency will be pushed even farther off frequency, instead of being pulled on frequency. If you are not planning to use the AFC option, there is no need to reverse the polarity of the discriminator diodes. This would be as useless as changing the polarity of the speaker leads on a monophonic radio.