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MODIFYING THE ICOM IC-765 FOR BETTER-SOUNDING AUDIO AND SMOOTHER AGC PERFORMANCE

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I use a pair of ICOM IC-765 HF transceivers for contesting. A stock IC-765 has a number of wonderfully endearing features, but smooth-sounding receive audio is not one of them, especially when SSB signals are strong!

I admit it; I had been spoiled. For many years I used other radios with far superior audio, including Collins S-Lines and Kenwood TS-830S transceivers. The receive audio in both my IC-765s sounded harsh and even tinny when signals were stronger than about S6 on the meter. Over the course of a 48-hour SSB contest, this harsh sound was very tiring. Even on CW, strong signals sounded just a little “mushy.” And when two signals were both in the CW passband, I could hear false beat notes¾they were weak, but I could hear them.

Furthermore, to a contest operator such as I, the AGC decay time constants are far from optimum. In the FAST position, the decay time constant is way too fast. While okay for casual SSB operation, the decay time in the SLOW position is much too slow for rapid-fire contesting. However, the audio sounded much better in the SLOW AGC position or when the AGC was defeated and the RF gain was used to hold the gain constant. What I wanted was a “medium” AGC decay time, and better- sounding audio. Since I had two radios, I developed my modifications on one of them, leaving the other as a “reference” until I was sure of what I had.

The changes needed are remarkably simple. On the Main Board, I bridged the fast AGC decay capacitor C280 (0.1 µF) with an additional 0.68-µF, 35-V capacitor. (You could also replace C280 with a 0.82-µF capacitor; I just tack-soldered the new capacitor on the bottom of the PCB.) Not only did the larger capacitor give a “medium” decay time constant, it also did a much better job filtering out audio components generated by the AGC rectifiers and amplified by Q77. These audio components had been getting directly onto the AGC bus and had been “reverse modulating” the IF amplifier chain to create IMD.

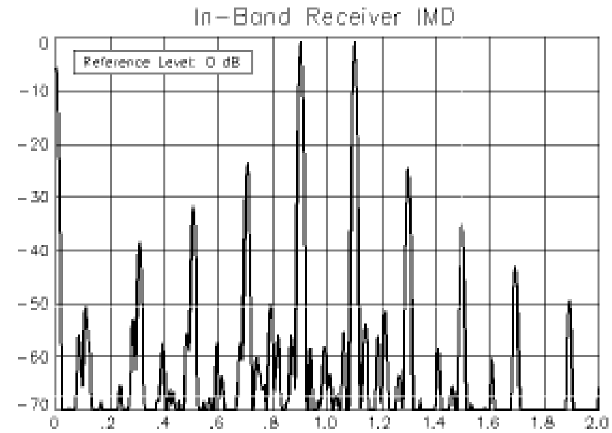
I critically compared my modified radio to the unmodified one, using a local AM broadcast station that puts an S9+30 dB signal into my 160-meter antenna. This one change made a remarkable difference in the IMD I could detect by ear! However, about that time, the JRC JST-245 transceiver found its way to my house for a Product Review. I was struck by how wonderful that receiver sounded! In terms of full-sounding bass response, the JST-245 put my modified IC-765 to shame. It made the unmodified radio sound even worse by comparison!

I examined the output circuitry from the IC-765’s product detector and was surprised to see that the output coupling capacitor C300 was only 0.22 µF. I bridged C300 with a 1.5-µF, 35-V tantalum I had in the junk box and the bass response improved markedly. I now suspect that ICOM engineers purposely made C300 small to reduce transient “pops” when the unmodified AGC system first attacked a strong signal. After this second modification, the JST-245 and the modified IC-765 sounded very much alike when I adjusted the ’245’s audio bandwidth to be approximately the same as the IC-765’s. At that point, I went ahead and modified my second, reference radio.

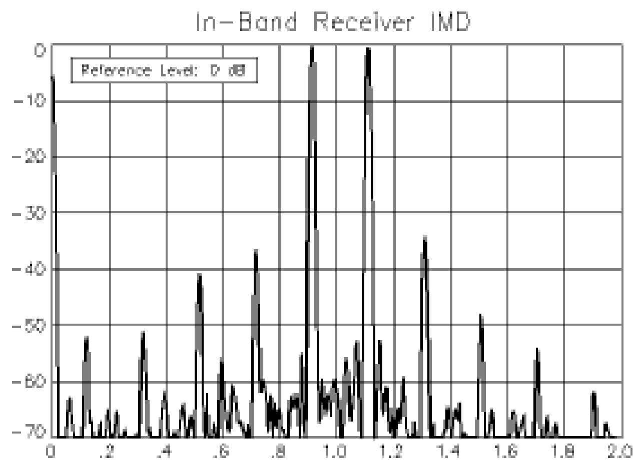
The ARRL Laboratory carried out careful spectrum-analyzer measurements¾first, on my modified radio, then on an unmodified IC-765 we had at HQ.

For each test, equal S9 RF tones from two stable signal generators were used, so that the receiver’s audio output was 900 and 1100 Hz into our spectrum analyzer. Now we could quantify what our ears were telling us. The unmodified IC-765 had third-order IMD about 26 dB down from each tone in the FAST AGC position (see Figure 1). In the SLOW position, the IMD is about 35 dB down, a big difference. (See Figure 2.)

My modified IC-765 has third-order IMD averaging about 38 dB down from each tone in the FAST position (Figure 3) and about 42 dB down in the SLOW AGC position.

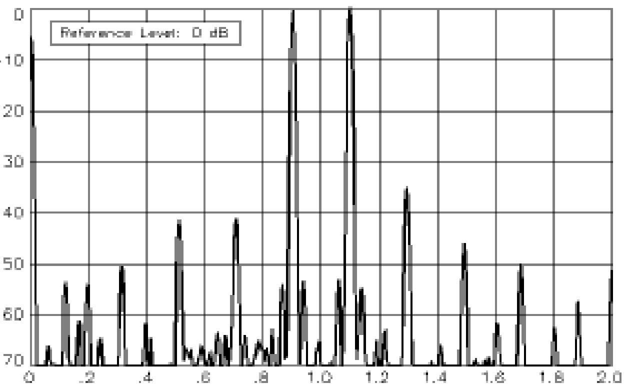


Audio Frequency: 0 to 2 kHz
Stock IC-765 - AGC Fast
Test Tones: 14.02 MHz - S9 + 40 dB



Audio Frequency: 0 to 2 kHz
Stock IC-765 - AGC Slow
Test Tones: 14.02 MHz - S9

In-Band Receiver IMD



Audio Frequency: 0 to 2 kHz
Modified IC-765 – AGC Fast
Test Tones: 14.02 MHz – S9