At the Repair Bench – Icom IC-703 – November 2024

Figure 1 - Icom IC-703 QRP radio

Once in a while, a job will come in that is simple and straightforward, but is still a pain in the behind to complete. This is one of those situations. In this case, the job is the replacement of the output transistors in an Icom IC-703 QRP transceiver. This unit came to me with a diagnosis report from an authorized Icom repair facility. The owner had, at the time that the radio was evaluated, not wanted to spend the money that the repair facility quoted to repair the radio. Now, five years later, the radio ends up on my bench because the owner decided to go ahead and have the repairs made.

According to the Bench Report from the Icom facility, transistors Q200 and Q201, the power amplifier transistors, had failed and were in need of replacement. The repair quote that was provided to me with the radio showed an estimated $457 repair cost to the owner, and as I said earlier, that was five years ago. I believed that I could and would do better than that on the price, and I told the owner so.

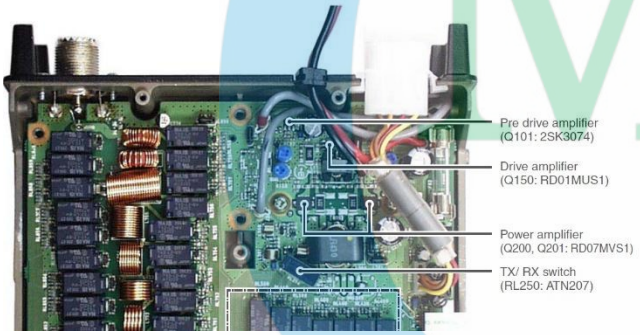

Figure 2 - IC-703 output chain transistors

The Icom repair facility had done the heavy lifting as far as diagnosis was concerned. While it is not my policy to blindly accept such findings, I also consider the source. Then, I attempt to duplicate or verify the diagnosis. In this case, I was able to readily verify that the power amplifier transistors had both failed. This took a minimum of time, but I considered it to be a necessary investment, as I did not want to replace these parts blindly and then find that something else was really wrong with the radio.

The transmit signal was present at healthy levels through the pre-driver Q101, a *2SK3074*, and the driver Q150, an *RD01MUS1* type, both of which are N-channel power MOSFETS. The signal, however, was lost through the power amplifier transistors. This was a simple matter of tracing the signal through the radio using an oscilloscope.

The biggest problem was actually in sourcing the transistors. These transistors, commonly referred to as “final” or “output” transistors, are in fact the last stage of RF amplification before the output RF signal is directed to the antenna for transmission. They are *RD07MVS1* devices, and are N-channel enhancement-mode power MOSFETS made by Mitsubishi. The only sources of these transistors appeared to be in China, and there was therefore, as always, the question of whether or not the received parts would be genuine parts or counterfeits.

I decided to purchase the transistors from a vendor that I have dealt with in the past. Jotrin Inc. is a supplier of surplus electronics parts to the repair industry, and I have always obtained viable parts from them in the past. I put in my request to my representative there and waited for a reply.

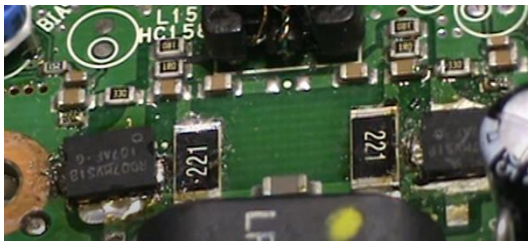

Figure 3 - Power amplifier transistors

Eventually, three weeks later, she sent me an email saying that they had located the parts, but that the price would be considerably higher than originally anticipated. I discussed the situation with the owner of the radio, and we made the decision to go ahead and order the transistors.

Another month went by before the package containing the transistors showed up in my mailbox. Imagine my surprise when the package turned out not to contain two transistors, but to contain twenty of the little buggers. Now I know why the cost was so high. Somehow, we got our wires crossed as to quantity, I thought. I reached out to Elle at Jotrin and found that she was aware of the quantity difference, and that the quantity shipped was the minimum purchase from the source from which she had obtained the parts.

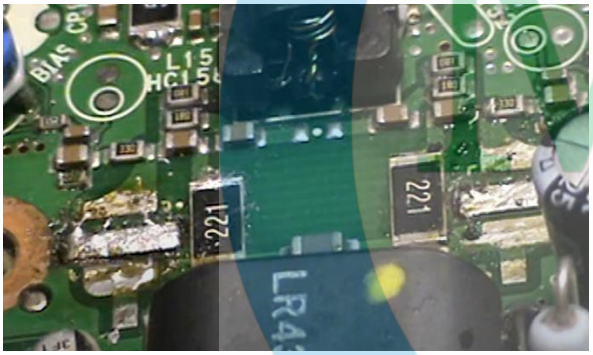

Figure 4 - Transistors removed but board not cleaned

OK — so I now had eighteen spare transistors to fit the Icom IC-703 radios, and I could also extend a lower price to my customer. All that I had to do now was to replace the transistors and test and align the radio.

Replacement of the transistors involved the use of focused hot air to de-solder the original transistors. I then used some solder wick to clean up the excess solder on the traces on the board, and cleaned the area afterwards with some 99.9% IPA. The board was now ready for the installation of the new transistors.

I applied some low-temperature CHIPQUICK® paste solder to the pads, and then applied plenty of liquid flux to the area, working with one of the transistor locations at a time. After positioning the transistor on the pads, I applied heat via the focused hot air again. This caused the solder to flow and to bond the transistor to the board. I repeated the process with the second transistor, and then cleaned up the excess flux with the IPA after the board had cooled.

Testing of the radio with a Bird 43 directional wattmeter into a dummy load showed that the output power was right where it should be, peaking at about 9.8 watts in CW mode, and easily reaching 9.5 watts in USB with a continuous 10kHz moderately loud audio tone into the microphone.

I spent some time going through a full alignment of the radio, but it really was very close to correct alignment to begin with. I made some very minor adjustments, but as I said, it was just about right to start with.

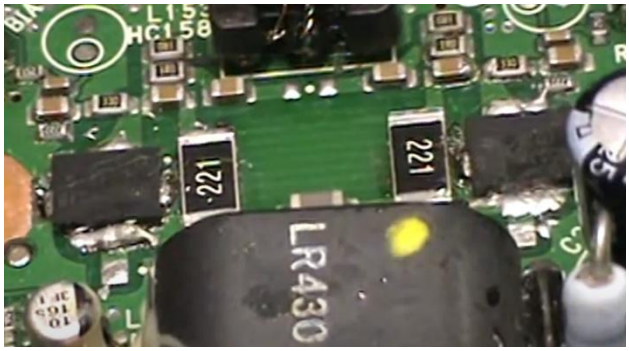

Figure 5 - New transistors installed

I did notice that the cone of the speaker in the radio was cracked in two spots. After some discussion with the radio owner, I made a repair to the speaker cone mostly to prevent further cracking of the cone. Such repairs are easily made with rubber cement brushed lightly onto both sides of the cone material over the cracks. A light coating of the rubber cement will remain pliable enough so as to not hinder movement of the cone as the speaker operates, but will hold the paper edges together nicely and prevent rattling. I extended the coat of cement around the cone in line with the cracks, as that was where the stress on the cone had been. I was not too concerned with the speaker performance either way, as the owner stated that his intent was to use an external speaker or headphones with the radio. He did not want to spend the money for a replacement speaker, though it would not have been very expensive.

This was one of those repairs that did not call for any real diagnosis – that part of the job had already been done by a reputable vendor. My policy in a case like that is to accept, but verify, which I did. In the long run, this was simply a mechanical repair, with no real brain work required, but nonetheless, it made sense to investigate all aspects of the problem.

The radio was returned to its owner, who was happy to have it back on the air after may years of sitting in a box in his basement. I enjoyed the repair, and ended up with eighteen spare transistors for this type of radio. All in all, not a bad job.

