At the Repair Bench – Icom IC-756 PRO – June 2024

One of my fellow GCARC members called me one day because he was having some difficulties with his Icom IC-756 PRO, particularly in tuning the set via the VFO. While I helped him to determine that his biggest problem was the fact that the VFO was locked, I could not account for all of the behavior of the radio. He asked me to put it on the bench and give it a good once-over.

Figure 1 - Icom IC-756 PRO

I found that *almost* everything was normal with the set, with one glaring exception. The VFO worked very intermittently. It the dial was turned very slowly, it would tune, but it would skip for one half of the revolution of the VFO knob. If the knob was spun rapidly, it would not tune at all.

A quick look at the IC-756 PRO schematic showed that the VFO utilizes a magnetic encoder as its control device. Removal of the front panel, and partial disassembly of that panel, was necessary to access the encoder in its installed location. I quickly determined that the encoder has suffered some sort of a mechanical failure in that a black powdery substance was coming out of the encoder body along the encoder shaft. I attempted a cleaning of the encoder, but to no avail. The encoder still behaved badly, so I determined that a replacement encoder was required.

The encoder has a part number on it (RMS20-250-201P), which turned out to be a Nidec magnetic encoder having 250 pulses per revolution and designed for operation on 5VDC, with "A" and "B" square wave outputs in quadrature. I ordered in a replacement encoder from one of my standard suppliers, knowing that the received encoder would not have the four-pin plug on it, being terminated as wire leads instead. It took only a couple of days to receive that encoder, but when it came in, I discovered that the encoder used by Icom in this case, while carrying that part number, was in fact a custom variation of that part, having a shaft that is approximately 15mm longer than the shaft on the standard part. Obviously, this encoder was not going to fit properly in the radio, in that the shaft would not extend far enough through the front panel for the knob to mount on it properly.

Figure 2 - Icom IC-756 PRO encoder

I ended up locating another encoder, this one having the correct length shaft and the pre-installed four-pin plug. It carried an Icom part number of 6910011090. I was fortunate in being able to obtain this part at a price somewhat reduced from the normal Icom asking price for the part, which was quite expensive.

When the Icom encoder came in, I installed it and tested the operation of the radio. All worked as it was intended to, and the tuning was, of course, back on track. I put the radio through its

paces with the full array of test equipment connected, and all was well. The radio was ready to go back to its owner.

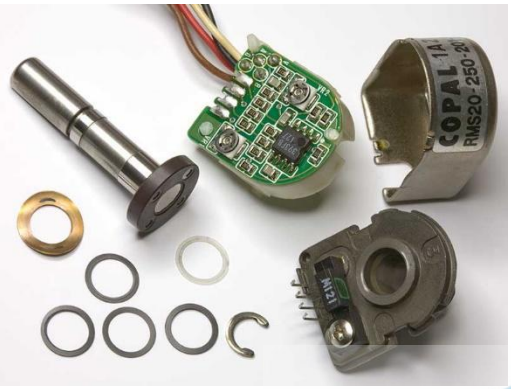

Figure 3 - Icom IC-756 encoder fully disassembled

The lesson learned in this repair is that even when a part carries a part number that matches up with a manufacturer's standard parts offerings, it may still be a customized and therefore a proprietary part. This makes sourcing a replacement part somewhat more difficult, and can severely limit the cost-savings effect of purchasing a standard off-the-shelf part for a repair.

As a final point, I had done some research into Icom IC-756-series encoder issues and I found that this is a quite common failure, in most cases with the encoder going out of alignment or failing due to the failure of one or both halves of the dual comparator IC that is integrated into the encoder assembly. There is information on the web about repairing these encoders from a realignment standpoint and also from a replacement of the IC standpoint. It turns out that an ubiquitous LM393 dual comparator IC in its SMT form factor will do the job nicely.

The reason that I opted for replacement of the encoder is two-fold: (1) while the price of the LM393 comparator is minute, the time that it takes to disassemble the encoder and replace the IC would cost the owner more than the cost of the replacement encoder, and (2) the fact that the black powdery substance was coming out of the encoder tells me that there was physical damage internal to the encoder as well as whatever electronic damage existed.

Had the radio been my own radio, I may have experimented with repairing the encoder. With the radio belonging to a customer, I chose to err on the side of caution, as I would have to stand behind my work. Oh yeah – one other thing. There is also a case documented online about a ham who used one of the standard encoders in an Icom IC-756 and extended the shaft length via the use of a coupling collar and a cut-off shaft from a potentiometer. It turns out that as an idea, that is not half bad. The problem is that there is not much room for any kind of standard 1/4" coupler to fit in there, so instead, I have discussed having custom single-piece extenders turned from aluminum rods. I have provided a fellow GCARC member with a drawing of what I would like the extender to look like, and as of this writing, he has made a small quantity of these shaft extenders for my use. I have also had a few shaft extenders manufactured for me via the 3-D print process. As it turns out, I have now installed both types of shaft extenders. When the metallic type is installed, I have found it advantageous to also install a copper leaf spring contact that maintains a positive connection to the knob and shaft, and which is connected to the radio chassis. This provides an effective ground path for the static electricity that may find its way onto the shaft from the operator's touch.

It also turns out that Icom uses the same encoder with the standard (shorter) shaft in other radio models, including the IC-718, where it seems to see frequent failures, presumably due to static discharge through the encoder knob and circuit to ground. I will hang onto the standard encoder, as it will probably find a use at some point in the future.

See you next month!