

At the Repair Bench – Icom ID-800H – April 2023

Sometimes, finding the cause of a problem can be more than the repair technician is up to. At those times, the technician has to be careful not to do any harm to the equipment and cause further failures while trying to ferret out the root cause of the initial failure. Sometimes, like the infamous *Zorro*, the technician leaves his/her mark in the night, gives up, and moves on. That is when the failure becomes another technician's problem to solve.



Figure 1 - Icom ID-800H

A little while ago, I got an email from a ham out in Cleveland, Tennessee who asked if I would be willing and able to take on a “mystery” repair on an Icom ID-800H 2-meter/70-centimeter dual-band mobile radio (Figure 1). The unit had an intermittent fault that two other shops had attempted to repair and both gave up without finding the problem. In addition, one of the two shops caused an additional failure, which we will get into in a little while.



Figure 2 - Peterbilt 579 with van trailer

The original problem was related to the occasional and unpredictable blown fuse on the incoming power line. The ID-800H was vehicle-mounted in a 2022 Peterbilt 579 (Figure 2) Class 8 truck-tractor. The secondary problem was a lack of audio from the radio unless an external speaker was installed and connected. This problem showed up when the radio came back from the second repair shop. The owner is an over-the-road long-distance trucker who has historically had his radio – CB's and ham – all repaired at truck stop radio shops.

When the problem first appeared, the owner took the radio to a radio shop at a truck stop in Carlisle, PA. Of course, as nothing was actually repaired other than replacement of the blown fuse, the problem eventually re-occurred. At this point, the owner replaced the fuse himself, and the radio worked as it was intended to, for a while. At some point, the owner happened to have some time to kill while in Kenly, NC, so he took the radio to a radio shop at a truck stop there. This time when he reinstalled it in the truck, it worked again, except that there was no audio from the internal speaker. This was annoying, and the owner assumed that the repairman simply forgot to reconnect the speaker wire harness to the mainboard on re-assembly. However, due to the ambient noise level in the truck, he customarily used an amplified external speaker anyway, so he didn't fret too much about it. Needless to say, the radio was still blowing fuses at random times.

Fast-forward to the first of the year. As of 1 January 2023, the owner came off the road and began operating as a local, home-every-night driver, and the radio came out of the truck to be used in his shack at home, except that it still had that pesky fuse-blowing problem, which is where I entered the story.

The owner explained the entire history to me, and after some judicious questions, I determined that the fuse most often blew while the truck was in motion, though it would occasionally blow when the vehicle was stationary. He wanted me to find and fix the fuse blowing issue once and for all... and oh yeah – plug in the speaker, too. He shipped the radio to me, but he did not include the power cable, so I had to use a bench cable with a fuse holder (*Figure 3*) to power the radio for testing, to which I added Anderson Powerpoles® for my own convenience.



Figure 3 - ID-800H power cable

I put the radio on the bench and connected up the incoming power, a dummy load, and an external speaker... and the radio worked normally. I then decided to connect it to an antenna – my trusty Ed Fong J-Pole – and to use it on the Tuesday net. The radio worked flawlessly, albeit through the external speaker. I decided that I would try to emulate the rough ride of the truck where the radio used to live... I picked it up and I shook it while it was operating. I shook it, I banged on it, I bounced it on a stack of towels... and nothing. It never missed a beat. Next, I tried some “*unusual attitudes*” as we used to call it in flight school. I started twisting and turning the radio while bouncing it on the stack of towels. Finally, when I stood the unit up on end with the front face upwards, and bounced it hard on the towel stack, it finally blew the fuse. I replaced the fuse and tried the same thing again, and once more the fuse blew with the same maneuvers.

So, what did I prove? Well... I showed two things to be true – a) that the fuse *did* blow after some violent jarring of the radio, and b) the behavior was repeatable. Now it was time to open up the radio and the service manual, and to start investigating the internals. It just so happens that I have one of these radios myself, which may come into play for some comparisons, if necessary.

I disconnected the radio and opened it up, and the very first thing that I noted was that the speaker wire harness *was indeed connected to the mainboard*. This meant that I would need to dig a bit into the audio issue as well, to get to the cause of that problem. More on that later.

As usual, I began by looking for any visible indications of something burnt, arced, or otherwise indicating a short circuit, but nothing jumped out at me. I removed the RF shield from the mainboard to look underneath it as well. Finding nothing the easy way, I decided to emulate my vigorous treatment of the radio. With a new fuse in the power wire fuse holder and the unit power on, I began to gently poke and prod various points in the radio using a plastic alignment tool as the prod. Nothing happened until I prodded the wire harness for the cooling fan. As soon as I touched this wire pair, it arced against the chassis rear heat sink and the fuse blew. Success!



Figure 4 - Chafed area of fan wire

Closer examination revealed a chafed area (*Figure 4*) in the red wire to the fan, exposing the bare wire inside the red insulation. I surmise that this wire would, with enough of a jar to the radio, move just enough to short against the heat sink, causing the fuse to blow. A look at the schematic shows that the fan is fed almost full supply voltage, dropped only by a 6.8Ω resistor in series with the fan

positive lead. The fan supply, on lead *HVI*, traces back from the 6.8Ω fuse R102 directly to the incoming 13.8VDC power inlet. Fan control is all done on the fan's negative lead. Thus, shorting the fan's positive lead to ground is tantamount to placing a direct short on the positive power feed to the radio, causing the fuse to open.



Figure 5 - Wire out for repair

The repair was fairly simple. Using the tip of a hobby knife, I gently lifted the latch of the red wire terminal in the fan harness plug, and pulled the wire and terminal from the plug (*Figure 5*). I then slipped a short piece of narrow heat shrink tube on the wire and hit it with hot air from the heat gun. Once the HST was shrunk in place, I inserted the terminal back into the plug (*Figure 6*). After that, it was a simple matter to re-mount the fan and plug it in onto the mainboard.

Now it was time to look for the audio problem. As a refresher, the radio had audio only via an external speaker. No sound came from the internal speaker, which was plugged in onto the mainboard in the correct location. The owner had thought that perhaps the last repairman had forgotten to connect the speaker harness, but that was not the case,

as I discovered. I had to start somewhere, so I started at the speaker connector on the mainboard. To my surprise, there was a strong audio signal there at the speaker header. Thus, the problem had to be in either the speaker or its connecting harness. I took a "AA" battery that I keep on hand with a clip lead soldered to each end, and I did a momentary "scratch" test of the speaker, which responded with a typical characteristic static scratch. The speaker coil was intact, which narrowed down the problem. It had to be a harness issue.

I took a good close look at the plug end of the harness and found that one of the wires was out of the plug body, and therefore was not able to make contact with the header pin. My guess is that when the last repairman disconnected the speaker on opening the radio, he pulled the wire from the plug (*Figure 7*) and did not notice it. I certainly did not notice it until I had reason to take a good look at the plug. I pushed the wire all the way into the plug body and connected the harness. Magic! The dead audio was once again alive.

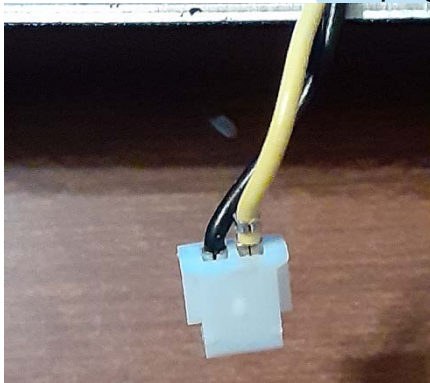


Figure 7 - Speaker wire loose in plug

I reassembled the radio and once more subjected it to a violent thrashing in an attempt to blow another fuse, but failed to do so. I took that as a sign that the repair was effective, so I boxed it up, less the power cord, and shipped it back to Tennessee, together with my invoice and two spare fuses.

What lessons can be learned from this repair? I see a couple of them. Let's take them one at a time, and explore their validity and value.

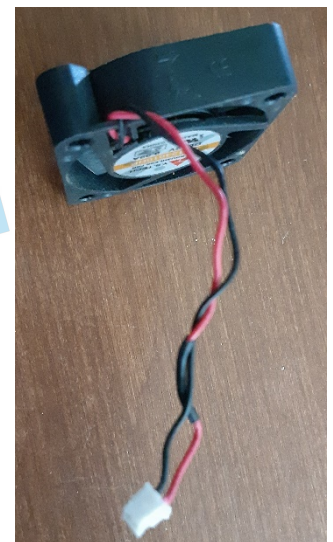


Figure 6 - Repaired fan wire

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What lessons can be learned from this repair? I see a couple of them. Let's take them one at a time, and explore their validity and value.

First off, I think that the fix isn't made until the repair person actually finds the *cause* of the problem. Fixing a symptom, in this case the blown fuses, does *not* repair the equipment, not so long as the root cause has not been located. Without correcting the root cause, the symptom is bound to re-appear at some point in time. The fact that this radio was riding around in an eighteen-wheeler, and taking an aggressive hammering as the truck traveled America's highways and byways, meant that the unit was being put through some unusual operating conditions. It was when I emulated that pounding ride that I was able to reproduce the symptom, reliably and repeatedly. Think outside the box and consider all operating conditions when tracking down a symptom like this one.

Second, it is obvious to me that the second repair shop failed to do any kind of active post-repair testing of the radio, because if such testing had been done, it would have been obvious that a new problem had been introduced in that the speaker audio output was nil. Perhaps the repairman thought that the radio had been like that when it came to him, but the owner says otherwise. It is important that the repaired radio be put through all of its paces post-repair just to make sure that something like this has not happened. It is understandable how it happened; it is inexcusable that it left the shop like that.

I am not saying that my repairs are perfect – I am human, and so I will make mistakes and miss things, as I have in the past. However, any shop should be able to pick the low-hanging fruit and fix the easy ones. The more difficult ones just take a little bit longer, or maybe a lot longer.

See you next month!