A Mechanical Fuse for your Laptop

By R. G. Sparber

Once in a while I stumble on a design choice that is so bad and so obvious that it drives me to action. In this case, it is the power cord on a typical non-Apple® laptop[2].

Take a close look at the terrible design choice here. On the right we have a very expensive laptop that requires power. Plugged into it, on the left is a low cost power plug.

The power plug has a massive strain relief on it. This strain relief protects the low cost power cable from pulling out of the low cost plug.

[1] You are free to copy and distribute this document but not change it.
[2] Apple laptops tend to use a magnetically attached power cord that easily pulls off before any damage can occur.

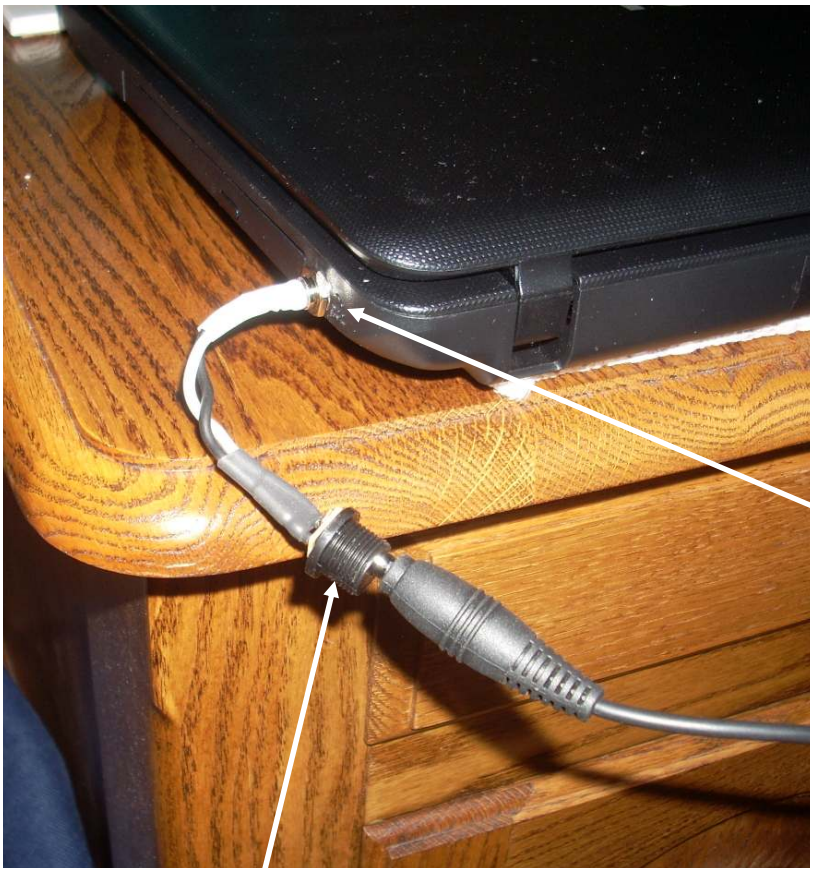
Next, picture what happens when "someone" trips on the power plug. If the power cable was sticking straight out, it would pull the plug straight out of the laptop and all would be well.

But this is rarely what happens. Far more often, the cable hangs down off of the table and across the floor. The snagged cable pulls on the massive strain relief at something close to a right angle.

The result, in our case, was for the low cost cable and strain relief to survive just fine. The barrel of the power plug bent and snapped off. This was not a big deal. However, all of that bending force went into the expensive laptop containing its mating jack. This internal jack broke plus cracked the supporting plastic around the jack.

Had I brought the laptop to a commercial computer repair shop, they would likely have insisted on selling me a new shell. That would have cost around $200. Instead, I replaced the broken jack with one from Radio Shack® for less than $5 and spent less than an hour opening up the laptop and replacing the jack. You can find plenty of information on-line about that repair so I won't duplicate the discussion here.

I also spent less than $5 at Radio Shack on a replacement power plug. So for less than $10, I was back to essentially a functional laptop with the same astoundingly bad design choice. Unfortunately, my wife, who actually tripped over the power cable, had already ordered a new power supply before telling me of the accident. So now we have two power supplies.



For less than another $10, I came up with a fix that should minimize and maybe eliminate future damage.

Recall that I said that there would be no damage if the cable pulled straight out of the laptop when snagged. This observation suggests the dongle shown here.

The male end of the dongle is soldered to a male power connector that sticks out of the laptop as little as possible. This minimizes the lever arm length as the cable is snagged.

The short length of wire permits the female end of the dongle to always align with the power plug. Any pulling on the power cable is more likely to disconnect from the dongle than damage the jack inside the expensive laptop. It is possible that the dongle's wires might break instead. That is still far easier to repair than opening up that laptop.

In other words, the dongle acts as a mechanical fuse that ideally eliminates the possibility of damaging the laptop when the power cord is snagged.

Making the Dongle

First of all, it is essential that the wires connect to the right places on the connectors. One wire connects the central pin in the female connector to the inner barrel of the male connector. The other wire connect the outside contact in the female connector to the outside barrel of the male connector.

Here you see the white wire soldered to the central pin of the female connector. The black wire connects to the outside contact. I trimmed off the excess tab on the central pin connection.

There is a third tab that connects to the outside contact only when the jack does not hold a male connector. I just cut that tab off.

Both wires were sleeved in shrink tubing as added protection against shorting.

As a final step, I slid a piece of black heat shrink tubing over the wires. I don't mind these wires breaking. I just don't want them shorting out.

I slid on a piece of white heat shrink tubing before attaching the wires to the male connector.

Note that I did not use the black shell that came with the male connector. I wanted to have this connector body stick out of the laptop as little as possible.

After both wires were soldered to the male connector, I slid down the white heat shrink tubing and applied heat. Remember, the goal here is to make a mechanical fuse. So you do not want to make this dongle to solidly.

I welcome your comments and questions.

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