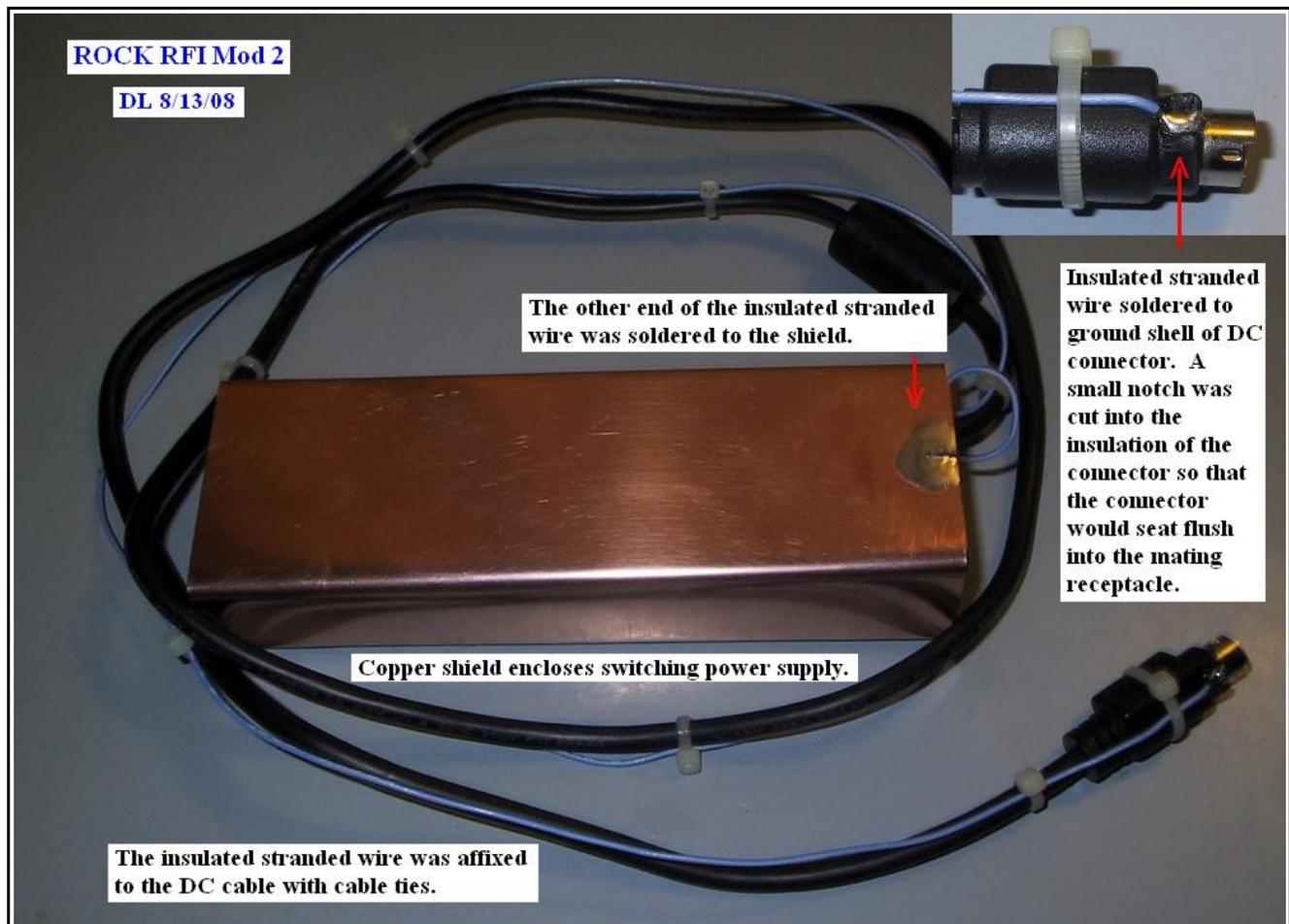


# RFI Shielding For Switching Power Supplies And Other Devices

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Switching power supplies and other modern electronic devices are notorious for causing RFI in the LW, MW, and SW spectrum. Switchers are potentially bad RFI emitters because they generate powerful square waves with (fundamental) frequencies from about 50 kHz to more than a MHz, typically in the vicinity of 50 kHz. Square waves are composed of sine waves which consist of a fundamental and all harmonics of the fundamental. For example, a 50 kHz square wave is composed of a 50 kHz fundamental sine wave and sine wave harmonics of 100 kHz, 150 kHz, 200 kHz, and so on. The amplitudes of the sine waves of a square wave are theoretically inversely proportional to their frequencies. Thus it is not uncommon for a switching power supply to produce RFI in the LW, MW and even into the SW bands. The switching power supply of a ROCK "slim" 500 GB hard drive which I bought recently was one of the worst such RFI emitters I have ever heard. And I had bought it to record in the MW band with a Perseus SDR. At first I considered buying another switching power supply for the HD, but there was no guarantee that I would not get something almost as bad, or worse! I have been trying to tame switching power supplies (used by my laptops, my flat bed scanner, my printer, etc.) for a long time using common mode chokes, but with little success. I have also tried shielding switchers in the past, again with little success. Nevertheless I decided to have another go at shielding. The photo below shows the end result.



The prototype shields were done with (cooking) aluminum foil because it was handy, trivial to bend, easy to remove, and cheap. At first I wrapped the switcher and its DC power cord assuming the the switcher radiated its RFI from the switcher electronics (in the “brick”) and perhaps also from its DC power cord. Then with my R-390A tuned to a loud switcher RFI in the MW band I touched a separate external ground (8' outdoor ground rod) to the aluminum foil. The RFI got stronger! Then I plugged a home made “AC ground adapter” (a three wire AC plug and “green” ground wire [the hot and neutral wires had been removed] with a clip added to the end of the green ground wire) into an AC wall socket. When I connected the AC ground adapter to the aluminum foil shielding, the switcher RFI was significantly reduced. So I added more shielding, enclosing the ROCK hard drive completely, and enclosing the USB cable which connected the HD to the laptop. When I connected the AC ground adapter to the additional shielding (all of the shielding connected together), the RFI disappeared below ambient man made noise. Success! This prototype aluminum foil shielding is not pretty, but it is cheap and easy to do. After more testing with variations I found a much simpler configuration which required less shielding. Only the switcher “brick” needs to shielded, and its shield only needs to be connected to the ground of its DC power cord. I tried this improved version on all of the switching power supplies in my house which cause RFI in the MW band, and in all cases RFI was reduced to below ambient man made noise. Curiously, it turned out than neither of my laptop switchers produced any observable RFI in the MW band (but this may change when man made noise levels drop this coming fall). Also curiously neither of the switchers for my cable modem and wireless router were found to produce any observable RFI in the MW band, although the cable modem and wireless router themselves produce numerous instances of strong RFI throughout the MW band. So I wrapped both the cable modem and wireless router in aluminum foil and grounded both of them to the cable modem coax ground... bye, bye RFI.

Grounding to the ground of the DC connector is not easy unless you cut a notch in the insulation of the connector. An easier way to temporarily ground the shield is to use a USB cable plugged into the laptop and touch the metal shell of the USB connector at the other end of the USB cable to the aluminum shield.

Rather than shield all of my RFI sources, I merely unplug them whenever possible at the AC wall socket when I want to eliminate all of my RFI sources. In my case, only the 500 GB ROCK HD needs a shield. The completed ROCK HD shield is shown in the photo above.