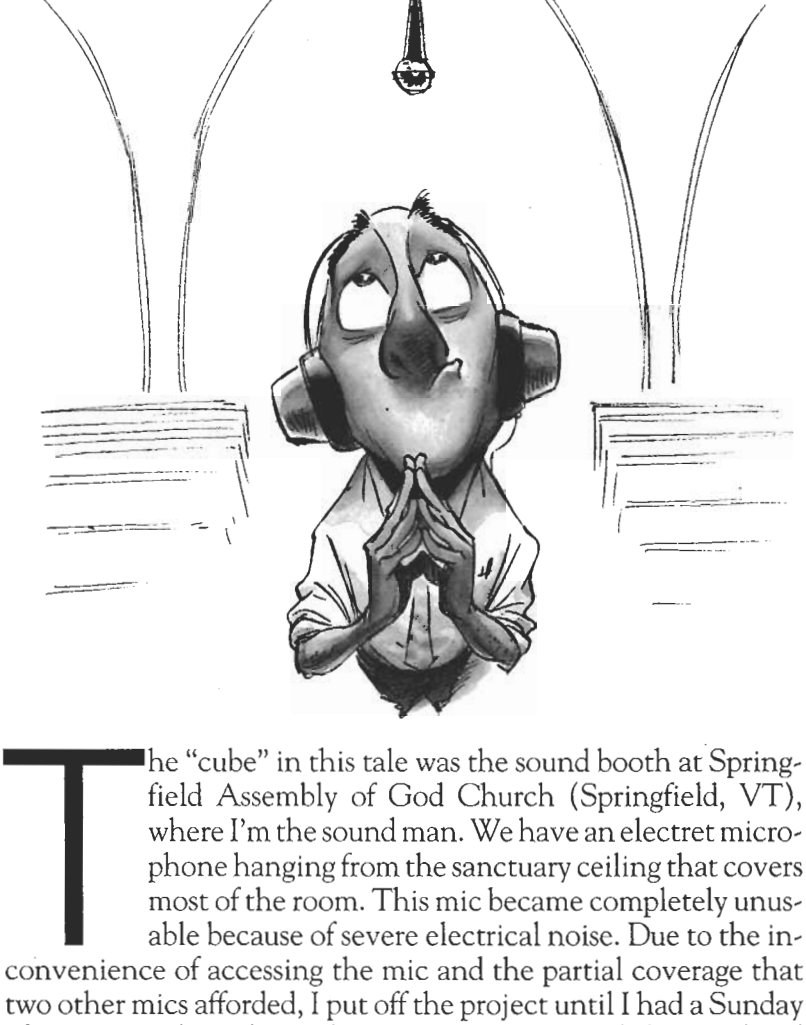
Silence in the sanctuary



The "cube" in this tale was the sound booth at Springfield Assembly of God Church (Springfield, VT), where I'm the sound man. We have an electret microphone hanging from the sanctuary ceiling that covers most of the room. This mic became completely unusable because of severe electrical noise. Due to the inconvenience of accessing the mic and the partial coverage that two other mics afforded, I put off the project until I had a Sunday afternoon with nothing else pressing. We missed the overhead mic, though, for recording, for hearing-impaired people using wireless earphones, and for picking up someone speaking near the back of the room.

We'd had similar noise problems in the past that we resolved with contact cleaning, so I tried cleaning the contacts on the mic and its connector. No change. I brought the mic down to the sound booth and plugged it into the board with a short cord to investigate the problem. There was still a buzz, but it wasn't nearly as bad as with the mic near the ceiling. It sounded like noise from the light dimmer in the booth, and turning off the light confirmed my suspicion. I turned it back on. Touching the end of the microphone had little effect on the buzz, but covering the end with my hand considerably reduced it. Just waving my hand over the end of the microphone had a dramatic effect on the noise, as long as I was grounded by holding the mic in my other hand. The microphone was obviously sensitive to electrostatically coupled noise.

Some change either in the microphone or in its noise environment caused the problem to manifest. I put the mic back in its place under the ceiling and turned off the ceiling lights. Quiet! I turned on the paddle fans. There was a familiar slight buzz, the origin of which had been a mystery until now. I asked our pastor when he'd replaced the incandescent lights with compact fluorescent lamps, and it sounded like that event about coincided with the onset of the severe noise problem. Reverting to incandescent lights was an unpalatable option; the pastor is also an accountant, and he'd done the math.

We had multiple noise emitters and one receiver. A single-point solution would be simplest. The effectiveness of placing my hand between the microphone and the dimmer-controlled light circuit in the sound booth was encouraging. A Faraday cage grounded to the microphone shell should be sufficient. I wanted to avoid altering the directional pattern and thought a spherical shield would have the least impact, but making a small sphere out of flat screening was impractical. I made a cylinder, closed at one end, out of window screening. A mounting ring that I fabricated from polyvinyl-chloride pipe and drilled for three Sheetrock screws would hold the cage, and the screws would electrically connect it to the microphone shell. I spray-painted the whole assembly black to match the microphone, then removed the paint from the electrical contact areas.

Back at the church, I sandpapered the anodizing off the microphone shell where the screws would touch it, then attached the shield and put the microphone back up. Complete silence! The noise was inaudible, and whatever happened to the microphone's directional pattern was an improvement. I can now use the sanctuary microphone without having to pad down the speaker that's right behind it. EDN

Dick Neubert has been an electronics enthusiast since he was 6 years old. Like Dick, you can share your Tales from the Cube and receive $200. Contact Maury Wright at mgwright@edn.com.

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