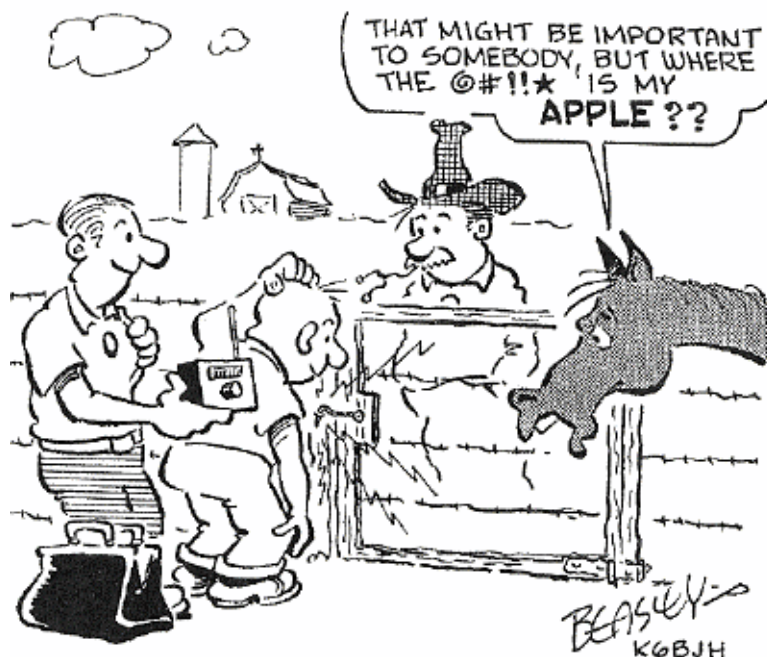


Electric Fence Interference—A Case History

By Ed Hare, KA1CV



I was sitting at my desk in the ARRL Lab when the telephone did what it does every so often—it rang. It was that special ring that tells us that there is a Member with a technical question on the other end. (To most people it sounds like any other ring, but the Lab guys have ESP about this sort of thing.)

It was my turn to pick up the call, especially considering the fact that I had let the rest of the Lab staff answer the past ten inquiries. (Actually, it was an intense phone day and they were all busy with other calls, so I had no choice.) I instantly recognized the caller as my friend, Paul Cianciolo, KB1RP.

"I'm glad it's you, Ed. I'm having an interference problem." This is an unusual admission for Paul. His last job was working at the headend of a local cable company. He literally helped us put the ARRL interference book together, giving me sage advice on the cable industry. I still owe him big time (or so he claims), so I felt obligated to help above and beyond the call of duty. Little did I know how true that premonition would turn out to be!

"I think that I've tracked down the problem," he continued. "A fellow about a mile away has a noisy electric fence." This seemed pretty unlikely to me. I know that electric fences can pose problems, but a mile is a long way for that sort of noise to travel. I expressed my doubts to Paul, but he immediately set me straight. (I firmly believe that he loves to put me in my place, though he denies it.) It turns out that he had taken a portable VHF aircraft receiver on a long drive, and had found that the noise was worse at a particular house. (The aircraft band uses AM—much more sensitive to noise reception than FM.)

Paul scouted the suspect territory from the road. He noticed the insulators and correctly concluded that the culprit was an electric fence. Paul knew that electric fences were notorious noise generators, so he assumed his search had led him to the right place. He boldly knocked on the door and was met by the homeowner, Frank Garofalo. Paul explained why he was stopping by, and asked Frank if he used an electric fence on his property. With a quizzical frown Frank confirmed that, yes, he did have an electric fence. But he failed to understand how his innocent-looking enclosure could possibly cause radio interference.

Paul, of course, assumed the worst (as did I, upon hearing this part of the tale), fearing that this would end up being a "neighbor from Hell" nightmare. He was afraid that his non-technical neighbor would *refuse* to believe that the fence was a problem.

But setting fear aside, Paul gamely explained how hams used spark transmitters decades ago to communicate over long distances. After laying this rhetorical foundation, he delivered the *coup de gras* by suggesting that an electric fence could behave

like a spark transmitter, creating noise that could be heard a mile away.

Frank looked concerned for a minute, then, much to Paul's surprise, said "Well, I have always wondered where all those black lines on my TV were coming from. Looks like my fence is causing grief to both of us. Do you know how to fix it?"

When Paul related this part of the story, you could have knocked me over with a feather. I regularly hear from hams who relate tales of woe about uncooperative, or downright hostile, neighbors. The typical response to a visit like Paul's is a string of curses and a slamming door. Paul's neighbor was a rare gentleman, indeed!

Having reached this happy state of gracious understanding, however, Paul wasn't prepared to really answer the question. The best Paul could muster was a sheepish "Beats me, but I know the guy who knows all the answers. I'll call him tomorrow." Of course, tomorrow came soon enough, bringing me into the picture.

"So," Paul continued, "what should I do about the fence, Ed? Do you think it is the fence controller that is the problem?"

I gave Paul the best answer I knew at the time, "Beats me, but I guess I am supposed to know all the answers, so let me take a stab at it." I could *hear* Paul's self-satisfied smile over the phone. He loves to watch me squirm!



This innocent-looking country estate had a hidden problem—an electric fence that could be heard over a mile away!

Meddlesome Weeds

"It's unlikely that the problem is an arc inside the fence controller," I continued. "Those things generate a pulsed high voltage. It's *possible* that something is amiss, especially if the controller is an old one, but my guess is that the problem lies in the fence itself. If I'm wrong, we can always deal with the controller later. Let's concentrate on the fence first.

"Does the problem come and go?" I asked. He told me that it did, but there didn't seem to be a pattern. It might drag on for days, then suddenly disappear. "Ah ha!" I exclaimed. "I know what it is! I bet that the problem is caused by weeds."

I'm sure Paul thought that I'd been drinking too much ARRL Lab coffee. (It's rapidly gaining a reputation as a substance to be respected!) "Huh?" was his only response.

"The weeds grow until they reach the height of the fence. When the first tender stalk actually makes contact, you have a short. The unfortunate weed becomes a miniature spark transmitter, coupling a lot of energy onto the fence, which acts like a longwire antenna, radiating the noise quite nicely. After a while, the stalk cooks to a golden brown and separates. The weed is now a few inches shorter and no longer in contact with the fence. The process doesn't repeat until the weed recovers its composure and grows up to the fence again.

"It is also possible that an insulator has gone bad, letting the fence arc to one of the fenceposts. This is more likely if the problem changes with the weather, either getting better or worse when it rains. What you need to do is to talk to Frank. If both of you can walk the perimeter of the fence, I bet you'll find the problem."

I should have seen what was coming, but caffeine had clouded my mind. "Well, I'll be..." he said. "You are so smart, Ed. How did you ever learn all this stuff? I'm not nearly as smart as you. Will you come with me and do all the smart stuff while I watch?"

(Okay, so I am paraphrasing a bit, but that's the gist of what he said. Honest!)

I drew a heavy sigh and said the only words that honor would permit, "After all the ways you've helped me over the years, how can I refuse? Call the fellow and tell him about our conversation. Let him know that we'll be stopping by the next time the noise appears."

I figured that I had just postponed my problem for at least a week or so. It would take that long for Paul to talk to the fence owner, explain how weeds can make electric fence noise and arrange a time for us to inspect the fence. I should have known better than to be so confident where Paul is concerned.

The Visitation

I hadn't been home more than five minutes when the phone rang. It was Paul. "I have good news, Ed. The fence is acting up right now. Can you put your little black bag together and meet me there in 20 minutes?" He gave me the address, a location about 10 minutes away. I lacked the courage to admit that I didn't have a little black bag ready to go. Paul thinks I'm an RFI guru, so I had to fake it. I grabbed my well-worn copy of *Radio Frequency Interference: How to Find It and Fix It* [1] and dashed out the door. After all, one doesn't need a little black bag to pull up a few weeds.

I found the place quickly. Paul and Frank were waiting for me. Shortly after we were introduced, Frank asked the inevitable question, "Do you know much about this sort of thing?" I held up the tome and said "I literally wrote the book on the subject." That never fails to break the ice, so I began to explain about weeds and electric fences.

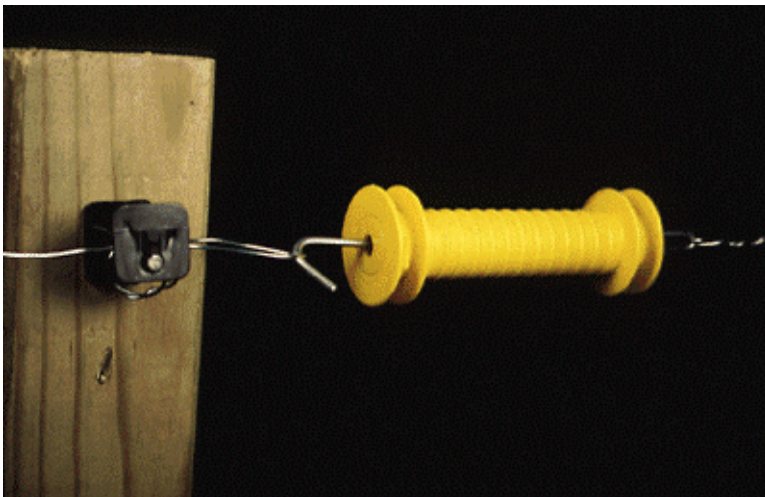
Frank waited patiently for me to finish, then announced that he had already walked the fence and verified that there were no weeds wreaking havoc with the system. Nothing sucks the wind out of your sails like the realization of a faulty diagnosis. I blushed and stammered. Paul's face showed a unique combination of shock and disbelief.

Frank wasn't finished, though. He went on to state that *he* knew the location of the problem. The guy had ears that would make an old CW operator proud. Whenever he strolled past four separate areas, he heard a faint sizzle at about the same tempo as the relay in the fence controller. Paul and I looked at each other in happy disbelief. This fellow was too good to be true!

We walked up to the fence and followed it for a bit. "Right here," Frank said. "Can you hear it?" Sure enough, there was a faint sizzle pulsing at a rate of about 1 Hz. He was pointing to a gate hook. I carefully bent over and inspected the gate hook. (I say "carefully" because I didn't want to discover firsthand why animals respect electric fences!) I could see corrosion on the hook and noted that the aluminum fence wire was pitted about half way through. When I looked closely, I could see a faint spark.

I explained that the spark was putting noise on the wire, which then acted like an excellent antenna. I also mentioned that the spark was apparently eating into the conductor, which would eventually fail. "So that explains it," Frank said. "I wondered why the fence wire kept breaking in the same two places—here, and over there at the next noisy spot."

Paul had the foresight to bring his portable aircraft receiver. He turned it on and extended the whip antenna. The noise could be heard loud and clear. I collapsed the whip down to about an inch or so. We could now hear the noise only when we put the antenna near the arc. From a few feet away it was much weaker. Clearly, Frank had diagnosed the problem. We were impressed!



Gate hooks are a potential problem. They often become corroded where they contact the wire, resulting in an arc or

spark. The result is a “spark” transmitter, hooked up to the longwire “antenna” fence. The arc creates RF noise and ultimately wears through the wire—a problem for the fence owner as well as a nearby ham.



Splices can also create problems, especially if they are between two different types of wire. Splices should be mechanically secure, lessening the likelihood of poor contact, sparking and wire failure.

Dancing with Landmines

Frank invited us to take the shortcut to the next noise spot. As I walked through the gate, he chuckled as he told me to watch my step. I glanced down and saw why—this was obviously a “working” pasture. Scattered throughout were big piles of horse droppings. Thankfully, I’m a country boy and I had taken the precaution of wearing my work boots. I threaded my way across the pasture, avoiding “organic landmines” at nearly every step. (This whole process didn’t seem to faze Frank. And Paul had gotten me into this mess, so I figured he was entirely on his own.)

Little did I know, but things were about to take a turn for the worse. The sky was clear, so I was surprised to hear a sound like distant thunder. I turned in the general direction of the sound and saw the two largest horses in the Universe headed our way. The last time I was on a horse I managed to send the animal and myself into the Vermont woods at a full gallop. It was my fault, I am sure, but it was an experience that neither I nor the horse ever want to repeat. Let’s just say that horses and I have an understanding. We’ll stay out of each other’s way and let it go at that.

Frank must have sensed my fear. He is a very perceptive fellow who could pick up the slightest nuance of emotion. Paul, on the other hand, is far less sensitive, so he merely said, “You aren’t afraid of horses, are you, Ed?”

The neighbor assured us that they only wanted a piece of apple. I wondered how they would react to the fact that I *had* no apple with which to appease them. I solved the problem quickly by putting Paul between the horses and me.

Fortunately, the horses just nuzzled everyone in turn, then wandered off in search of anyone else who might happen to have an apple. They sort of half heartedly followed us around, occasionally forgetting that none of us had an apple, thus starting the process all over again. Needless to say, I was so busy paying attention to the horses that I paid a bit less attention to my feet, much to Paul’s amusement. Frank just looked on in sympathy, wondering how I ever managed to survive in the country this long.

The second noisy area turned out to be another bad gate hook. The other two “hot spots” were caused by splices in the aluminum wire that had gone bad. In each case we could hear a faint sizzle, see corrosion and, upon close inspection, faint sparks.

Our next stop was the control box. I asked Frank to disconnect the fence so we could check the box itself. If it was also acting as a noise generator, there was little we could do. However, as I had predicted, the control box was fine. (I gave Paul a look that let him know that I was finally right about something!) When the fence was disconnected, the VHF receiver heard only a faint pop as the relay engaged. The band fell silent. The original noise immediately reappeared as soon as the fence was reconnected.





Electric-fence controllers are not often a source of noise. It is more likely that electric-fence interference is caused by a problem on the fence wire itself.

The Cure

I told Frank that we could resplice the fence wires to squelch two noise sources, but that to effect a permanent cure he would also have to replace the faulty gate hooks. I then realized that if we spliced a temporary short across the gate hooks, we could eliminate most of the current flow through the corroded contacts, probably eliminating the remaining noise in the process. I proposed it as a troubleshooting step. Everyone agreed. After all, if we tried it, and still had noise, that meant we'd have to walk the fence again to look for it.

We turned off the fence again and went to work. About 30 minutes later, all of the bad areas had been spliced and we were ready for the acid test. Paul turned on the VHF receiver and we energized the fence. Once again, all we heard was a faint pop as the controller relay engaged. Paul got excited, gave me a high five, then walked to the fence. Even at less than a foot from the wires, his radio was silent. Paul was grinning, Frank looked relieved and I was once again elevated to the status of EMI guru in Paul's eyes. More important, I had learned a *lot* about electric fences.

All's Well that Ends Well

Talk about an atypical scenario! First we had a long-range noise generator that Paul was able to locate quickly. Then the homeowner turned out to be a cooperative chap who appreciated the fact his fence should not be causing interference to a ham station a mile away. (He also turned out to be a sharp troubleshooter!) And for Paul, the process worked. He did what ARRL always advises hams to do: Contact a local RFI expert for help. (In this case, the local help happens to work at ARRL Headquarters, but there are expert Technical Coordinators and Technical Specialists throughout the ARRL Field Organization.) It took all of us working together, but isn't that what it's really all about? As for me, I turned out to be the hero, the horses didn't eat me and I managed not to end up ankle-deep in dung—figuratively and literally. All in all, a pretty good day for a Headquarters staffer!

Photos by Suli Sullivan.

Note

¹*Radio Frequency Interference: How to Find It and Fix It* is available from your favorite dealer, or directly from ARRL Headquarters. See the *Publications Catalog* in this issue.