Common Mistake — What Is It?

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When someone has an unusual RFI problem, the first question he or she almost always asks is, “What is it?” That’s an interesting question, and you may need to ask it during the troubleshooting process, but it is not the first question you should ask.

First, even if someone were to say that the noise source is a model “XYZ Panashibi” switching power supply, what would that tell you? You would still have to go into the world and find it. The number of products sold that can produce radio noise numbers in the many tens of thousands, and even if it had the signature of a model “XYZ Panashibi” supply, a model “ABC Shootzu” LED bulb could have a very similar signature, so if someone tells you to look for the “Panashibi,” you could be off on a wild goose chase. “Knowing” what it is could actually make it harder to find. (Determining the general type of noise source is useful in planning how to search for the source as described in the RFI chapter.)

It could be useful, though, to know whether you are searching for a switching power supply, DSL or cable leakage, or a plasma TV. But be general, not specific, because you don’t want to be misled.

First, switching supplies are very common; they are used in nearly everything. Modern LED bulbs and fluorescent ballasts are all probably switching power supplies. Switching supplies do have some characteristics that make them easy to identify. First, they make noise every N kHz, with N typically being somewhere between 10 kHz to 200 kHz. In other words, a switcher will usually make broadband noise spaced some number of kHz apart.

Put your receiver in AM mode and listen to the noise. A switcher will almost always have some 120-Hz ac buzz on the noise, detectable by ear. DSL signals will just sound like broadband noise, or will have a distinct “digital” sound to them. Plasma TVs — if the noise is coming from the plasma screen itself — will have noise that varies with every scene change on the screen, and you may even be able to correlate it with a particular TV channel by switching through all the channels on your own TV and seeing which one has scene changes corresponding to the change in noise.

Most switching supplies make more noise at lower frequencies, tapering off as you switch to higher and higher bands. Most digital devices occupy specific frequencies, so you may not hear it at all on 3.5 MHz, but as you tune through HF, the noise may get strong starting at 6 MHz, and continue pretty steadily all the way to 20 MHz — just as examples — then disappear over the space of a few tens of kHz. So, frequency occupancy over the entire HF range, tapering off as one goes higher indicates a probable switching supply, while specific spectral occupancy indicates a digital device carrying modulation.

Switching supplies are free-running oscillators, but their frequencies do not need to be exactly controlled. So, when the noise first appears, note the frequency of one of the peaks of the noise, then see if it drifts up or down the band. Switchers almost always drift. Stay parked on the frequency for a while and keep listening. Switchers almost always exhibit little changes in frequency as voltage dips and surges occur, although the change could be less than a kHz, which is hard to tell considering the relatively broad nature of the noise. Drifting and the occasional change in frequency are characteristic of switchers.

So, I can’t say this strongly enough: start in your own home. Use a battery operated receiver, and turn off every circuit breaker in your home. If the noise goes away, it’s yours. Do not assume that you know it’s not your own equipment causing the noise, because I can’t tell you the number of times a ham has wasted his or her time and ours trying to track down a neighborhood noise source, only to ultimately discover it was something like a battery charger forgotten plugged into an outlet in the garage.

In any event, what you really want to do is to figure out where the noise source is, something you will need to do no matter what it is.

That battery operated receiver will be a valuable tool. Ideally, it will have an S meter. First, connect it to your antenna and hear the noise. Now, take it outside with a small antenna and if you still hear the noise, your job will be pretty easy. Note the S meter reading and take a walk. You should be able to find the peak pretty easily, isolating it to a few houses on HF. As you tune higher in frequency, you need to be closer to the source, so when you are near it — think 10 meters — check to see whether or not you can hear the noise.

It is possible to get tricked. On your neighborhood walk, you will hear devices from each house, so at least be sure that the noises you hear do in some way resemble the noise you hear at your house.

Now, here comes the tricky part, because in some neighborhoods, you will not have much access to the private properties surrounding you. But you can use that S meter to get a very good idea which house the noise is coming from. To do this, you need to place the antenna of the battery-operated receiver a specific distance away from the electrical wiring in each house and take an S meter reading of the noise. I suggest that you use one or two feet as that distance. Judging by eye is sufficient. The noise radiating from the offending house will be significantly stronger than that radiating from other houses.

You can sometimes use the outside electrical meter on a building, or an outside light on the porch or driveway, making sure is it not 12-volt lighting that can have a different switching supply than the one you are looking for. (Of course, that bulb could be the very source of the noise that you are seeking.)

If you can't go near each building around you but you have overhead electrical wires, you can use the S meter to sniff the ground wire that is connected to each pole, at least isolating the noise to a few houses. If the wiring is underground, you can use the pad mounted transformers that are scattered around the neighborhood, although it is sometimes hard to know which houses are connected to one another.

Once you have found the house, you have a difficult decision to make. Do you approach a stranger or just live with the noise? People don't always react well to accusations that the device they just bought at a big box store is being operated in violation of some federal law that they don't understand — but how to diplomatically approach a neighbor is another subject.

The key, though, is that under FCC rules, it is the responsibility of the operator of noisy devices to not cause harmful interference, so if this is a neighbor's equipment, it is his or her obligation to fix it.