

Troubleshooting 101: Where's the Buzz?

Part of an occasional series on common troubleshooting techniques. In this installment, we're hunting interference from consumer electronics devices.

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Well-meaning amateurs send MP3 audio files and signal analyzer screen images to Mike Gruber, W1MG, on an almost daily basis. Mike is the ARRL interference guru, so this is to be expected. Hams are being driven crazy by spurious signals, and by the time they contact Mike, they are often at their wits' end. However, once a determination is made that the source is something electronic (as opposed to electrical sparking), audio recordings and signal imagery may not be as helpful as many hams may think. Most of the time, interference problems fall into one of two categories.

Mike said:

The first is something very common, such as a regular and repeating pattern of peaks and nulls across a ham band. This is the telltale signature of a switching-mode power supply. Knowing this fact frequency adds little to solving the problem, though. There are so many of these devices in use today that the real challenge is finding that single offending unit among many. I can say, "Yes, that's the sound or the spectral signature of a switching-mode power supply," but that statement often doesn't bring us closer to a solution.

Audio recordings and images are also unhelpful for interference that falls into the second category: interference I've never encountered before. Consider that there are literally thousands of devices on the consumer market that can create radio frequency interference (RFI). It isn't possible for one person to know them all. In many cases, the noise generated by different devices can sound or look quite similar, so much so that one device can easily be mistaken for another.

But let's assume that something jumps out at me. Recognizing an RFI pattern



Common-mode chokes are often very effective at squelching interfering signals. A few turns of wire from the offending device through a Type 31 ferrite core may do the trick.

in an image may not solve the real issue of determining the location of the signal. You still need to track it down.

In other words, the goal is not so much to identify the signal as it is to find its *source*. Once you know where the signal is coming from, and what is generating it at that location, you can work toward eliminating it. "There are easy steps you can take that will usually reveal the source quickly," Mike added. "Once you find it, all will be known. Don't waste a lot of valuable time trying to guess what it might be before starting your investigation."

Bye Bye Buzz

As Mike stated, switching-mode power supplies are the bane of modern Amateur Radio, but other consumer products can also be at the heart of an RFI problem, including certain types of motors and lighting devices, for example.

Before we begin the hunt, however, you may want to eliminate your own radio as a possible source of the problem. Transceivers can generate their own internal signals, and it only takes a

few moments to remove your radio from the list of potential suspects. Simply disconnect the antenna and listen. Did the interference vanish? If the answer is yes, your radio isn't the source.

If the interference is still present, congratulations! You've found the source! You don't have an interference problem; you have a transceiver problem. It's time to get online and research your service and warranty options.

But in all likelihood, your radio won't be the cause of your torment.

Stalking the Buzz

Try to get your hands on a battery-powered receiver. A portable short-wave receiver may work, or even an AM broadcast radio if the interfering signal can be heard on the AM broadcast band.

With receiver in hand and tuned to the interfering signal, go to your home's electrical circuit breaker panel. If you are lucky, someone has already labeled the functions of the individual breakers. If not, I recommend that you take the time to do so. This means you'll have to turn them off, one by one, and see which house circuits are interrupted. But let's assume the breakers are clearly labeled. Start switching them off, with a pause between each one.

Snap goes the first breaker.

Snap.

Snap. Silence. The buzz in your radio abruptly vanishes.

Ah hah! The last breaker you flipped

was labeled “Living Room.” This is like the old *Clue* board game, except this time the felon is Professor Plum, hanging out in the living room with a switching-mode power supply.

Turn the offending breaker back on. Go to the living room and explore carefully. Perhaps you notice a laptop computer that is busily recharging its internal batteries — with a switching-mode power supply. Unplug the laptop charger from the wall outlet and listen to your receiver. If the buzz stops, you just found your culprit. Otherwise, keep exploring. Something on that circuit is generating your buzz; it is just a matter of time before you finally yank the proper plug.

When the Buzz Heads Outdoors

If you’ve shut off electricity to your entire house and the buzz is still present, your investigation just expanded to the great outdoors. This can be challenging, to say the least.

Chances are good that the interference source resides in your neighbor’s home. Unless you and your neighbor are the best of friends, I strongly caution against walking around his or her property carrying a portable receiver. Such behavior usually results in the sudden appearance of police uniforms.

If you are phenomenally fortunate and have a wonderful relationship with the neighbor in question, you may be invited inside to continue your hunt with the aid of his circuit breaker panel. He or she may even find it amusing — at least until they realize that they must reset the digital clocks throughout their house.

On the other hand, if your relationship with your neighbor is indifferent at best, don’t expect a warm reception. You’re about to tell them that something in their house is potentially generating interference to your station. Don’t underestimate the importance of diplomacy at this point.



A typical circuit breaker panel with labeling. With your portable radio at hand, start turning off the individual circuits until the interfering signal disappears. If turning off the “Living Room” breaker, for example, kills the signal, your culprit is hiding somewhere in that room.

Put yourself in their shoes and imagine that some guy you barely know is asking to prowl inside your house while flipping switches in your breaker panel. How would you feel about that?

This situation lacks an easy solution. Unless you radiate the trustworthiness of the Dalai Lama, your neighbor may not be cooperative. Mike emphasizes that dealing with an uncooperative neighbor can become a protracted process. While most FCC actions originate with the ARRL under the terms of the “Cooperative Agreement,” cases can still drag on for a considerable time, even with FCC intervention. Mike has seen cases in which a letter from the ARRL or FCC resulted in an even *less cooperative* neighbor. At the very least, amateurs who reach this unfortunate verdict may have to simply endure the interference for some time to come.

Silencing the Buzz

On a more optimistic note, let’s

assume that you’ve found the source of the signal, and it is in your home. For HF interference, try wrapping the ac power cord through and around a Type 31 (Mix 31) ferrite core, such as those sold by Palomar Engineers (www.palomar-engineers.com/ferrite-products/ferrite-cores). You may need a different mix for VHF signals. Wind several turns of the cable, positioning the core as close to the device as possible. In most cases, this will adequately suppress the signal.

If the device has cables connecting it to still more devices, remove those cables, one by one, and note the effect on the interference. You may find that you only have to apply the ferrite core to one of the cables rather than the ac line.

Of course, part of this troubleshooting process involves deciding just how bothersome the interference really is, and whether the effort required to fix it is worthwhile. For example, I own a new Sears Kenmore washing machine, and I enjoy it very much. However, whenever anyone in my household does a load of laundry, the machine spews an extraordinary amount of interference across the bands. I can even hear the drum spinning back and forth just by listening to the oscillations of the signals.

But this only occurs when there is laundry to be cleaned. Otherwise, the washer is as quiet as a proverbial church mouse. In a world of live and let live, some interference problems are best left alone.

Troubleshooting questions or comments? Contact the ARRL Laboratory RFI Desk at rifi@arrrl.org. Steve Ford, WB8IMY, is the Editor of QST. You can contact him at sford@arrrl.org. You can reach Mike Gruber, WIMG, at mgruber@arrrl.org.

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