

Newcomers and Elmers Net:RFI -- Robert AK3Q 2-9-14

Radio Frequency Interference (RFI) is a continual problem for radio reception, and it can be a real nuisance. Worse, we might be the source of interference for others!

-- while I will mention our responsibilities for not creating interference later, mostly I will cover things that may cause interference for us
-- I will start by talking a bit about why we are fighting this issue when we are supposed to be protected from it as licensed operators

There are real concerns over broad spectrum interference and how such issues are being dealt with (or ignored).

-- Two common assumptions are typically presented in such discussions: either the needs of the many outweigh the needs of the few, or the agencies responsible for tracking/enforcing RFI infractions simply "do not want to upset the apple cart."

-- A more cynical person might say "follow the money" as an explanation of why problem technologies exist, and no doubt there is some of that in any industry/field.

-- There may indeed be valid reasons why complaints are not investigated or companies are not required to pass regular checks of their consumer products.

-- In the medical industry, for example, problems with less than 1 or 2% probability are not included in drug reaction warnings.

-- No problem unless you happen to be in the 1 or 2%! The same is true in most any field.

"The Greater Good"

As to the former reason given for why problems are not acted upon more vigorously, there is the belief by some that the "greater good" should be served, and that concerns by a small minority of people must be weighed in the balance. Broadband over power lines is usually argued this way

-- If tens or hundreds of thousands of people can get Internet services where traditional sources are too cost prohibitive, then BPL interference to a few hundred (or a few thousand) amateur radio operators can be ignored (or so the argument goes).

-- Some might argue the same point when it comes to plasma TVs—the advancement of the technology and the market share they represent are positive factors outweighing the interference they cause.

-- Having watched a number of videos showing the noise level generated by this type of electrical device, it is hard to see how this can be justified.

-- No doubt there is far more interference being caused to all kinds of RF equipment than just HF radio! (For a sample of interesting interference videos follow this link:

http://hamradionation.com/browse_vidfeeders.php?tag=interference+plasma+tv

-- Several possible solutions might involve alerting interested parties to the interference these devices cause, such as AM radio stations or emergency/public service agencies.

-- Shortwave broadcast stations might also be interested as each listener becomes more important in an ever-shrinking marketplace.

Sources

RFI can be a real nuisance, and sometimes the source is quite unexpected.

-- almost any electrical device can cause interference; the question is the same for any device—can it be shielded or can the noise be effectively minimized

-- modern convenience items are the worst offenders; plasma TVs; light switch dimmers; wall warts of almost any type; power supplies

-- cell phones, routers, wireless devices of all kinds

-- computers, monitors, cordless and corded mice and keyboards; inexpensive electrical devices of almost any kind can be troublesome

-- vacuum cleaners, alarm systems, remote control cameras, and almost any small appliance

-- large appliances are common culprits as well, as are the furnace/ac unit; modern water heaters, heat pumps, and the list goes on

-- When the interference is something like a neighbor's plasma TV you may not be able to do much about it.

-- Fortunately interference is something which often can be fixed over time or with some experimentation, even if it means sacrificing a bit of convenience, such as shutting down your computer or TV system while you enjoy the radio hobby.

Identifying Sources

A pocket AM radio with a fresh set of batteries can reveal a lot of noise sources large and small both outside in the neighborhood and around the house as you walk around

-- The actual sources in the house may come as something of a surprise, especially from devices which appear to be turned off!

-- Wall warts are particularly susceptible to producing hash, and of course we have more of these than ever to charge or power our electronic gadgets.

- the source of noise may be external, especially when living in highly populated areas.
- Apartment dwellers have had to put up with noisy neighbors since the beginning of time, but radio enthusiasts are very likely to have (or cause!) interference for which there may be little recourse.
- Noise introduced within the building's wiring can be quite difficult to overcome, but so too the neighbor's plasma TV which stays on from 6 pm until 2 am!
- Finding the source of interference into a radio is half of the battle, but once found, may be fairly simple to overcome.
- Using the AM radio method mentioned above, try to locate sources of noise in your immediate surroundings.
- If the noise is coming from wall warts unplug them or look at replacing them with units with better shielding.
- Just make sure you are replacing like-for-like—pay close attention to output ratings as small devices are easy to overload.
- Try turning off circuit breakers in the house either one by one or all at once and then turn them back on one at a time to find the offending circuits.
- Just keep in mind what devices are connected to what circuits, and that you may have to reset some clocks or appliances when power is restored.
- If you have an alternate power source to run your radio see what happens when everything is turned off—the results may surprise you!
- As you turn circuits back on you should be able to isolate the problem sources, and from there determine how best to deal with them.
- Replace dimmer controls with standard light switches, or if you just must have a dimmer control, see if there are better units available or if shielding is possible.
- Small appliances may need to be unplugged if they produce noise, and the same goes for larger electrical appliances.
- Sometimes moving plugs to a different outlet can eliminate a noise problem, such as separating the computer or TV from the same wiring that feeds your radio room.
- Power strips can be offenders as well, especially when switching power supplies or wall warts are plugged in to them.
- Some cable boxes, DVD players, and TVs may have power-down modes which leave some circuitry on even when "power" is off. This is usually to keep timers going or displays working to show the status of the device.
- If you find noise is still present when everything is turned off in the normal manner, try unplugging devices from the wall one by one to find the offender.

-- Just keep in mind DVRs and cable boxes cannot record your favorite shows when unplugged from the wall!

Ferrite Beads and Toroid Cores

Ferrite is a substance which can really help reduce or eliminate RFI along power cords, speaker wires, mouse cables and video inputs.

- By placing one or more ferrite beads around a cable, often the offending interference can be stopped.
- (This is useful if you find your computer speakers are making horrendous noises as you transmit on your HF rig. You may need to put beads on the speaker wires and the power cable, or you may need several)
- Some ferrite beads come in a housing which allows them to be separated and then fitted over a cord and snapped in place.
- Ferrite cores are designed so that wires may be wrapped around them multiple times, with each turn acting like an additional bead.

If beads and toroid cores are not enough, another device which may be worth a look is an AC line RFI filter.

-- There are various styles to handle noise and transients and surges for individual lines as well whole-house filters.

-- There are also units designed to work as power strips for computers, stereo and TV equipment. (While these can work well for line noise in many cases, they will not do anything for interference caused by a plasma TV. The source of the noise is the plasma technology itself, not the electronics.)

-- Keep in mind sometimes the biggest noise offender can be the power supply you are using for your radio!

-- While linear power supplies are usually very quiet, switching power supplies can generate a lot of noise. Their lighter weight and smaller footprint sometimes come with a price.

-- Of course not all switching power supplies produce interference—just do not assume your radio power is clean; check it for noise like any other piece of electrical equipment in the house.

Sometimes noise/interference can be minimized by moving your equipment to another room or even just another outlet.

-- Some interference is generated within the power lines, but some is radiated and picked up by sensitive radio gear or along antenna lines.

-- Move the rig as far away from the source of noise as possible, and do the same with your antenna system if possible.

-- Ferrite beads or cores can also help isolate RF or other electrical noise coming in from the antenna, and do not neglect checking your radio/antenna system for loose connections or frayed wires.

Sometimes the noise comes from out of the house

- Power company equipment can cause problems, particularly arcing pole wires and transformers
- Using your AM radio, locate the problem transformer by walking around the neighborhood (in good weather!)
- report the situation to the power company and keep on them, politely, until you get action

Watch Over Your Station!

Although every amateur operator has a vested interest in identifying, controlling, and eliminating man-made sources of noise, we should all remember that noise is a reciprocal issue.

- using the lowest power we can to get out signals heard is a good start
- having well-made equipment, testing it, and fixing problems right away is the responsible thing to do
- We should also go to great lengths to ensure that our stations and test benches are not noise sources relative to any other devices able to pick up RF energy.
- The less we tolerate noise and interference that might emerge from our own equipment, the more justified we are in insisting that other interests do likewise.

In the end, however, some folks are condemned to live in areas where noise is beyond control; this is where operating skill comes in

- antenna choice, feed system choice, filtration, noise cancellers, noise blankers, and operator skills can go a long way toward reducing currently unlivable noise to a mere constant irritation

ARRL Resource Page for RFI

<http://www.arrl.org/radio-frequency-interference-rfi>

Sounds of RFI

<http://www.arrl.org/sounds-of-rfi>