

Radio Frequency Interference (RFI) Tip #1

By Palomar Engineers

RFI Caused by an Amateur Radio Service

Primary Station Antenna

Your neighbor calls to tell you that the Screen goes blank on his new *Digital TV*, and at the same time your voice comes out of his microprocessor-controlled *Expresso Coffee Maker*. What measures do you need to do to your Amateur Radio Service Primary Fixed Station?

As the Control Operator of a Federal Communications Commission (FCC), Amateur Radio Service, Primary Station License Grant, it is your responsibility to help alleviate the problems by taking the following Steps to your Primary Station:

1. Add a Low Pass Filter (LPF) on the Transmitter or External RF Power Amplifier output.
2. Add a AC "Brute Force" AC Line Filter on the Transmitter or External RF Power Amplifier AC Voltage power line.
3. Install a Current Balun on your Antenna.
4. Improve the Station Ground System.

Note:

1. Insure as the Control Operator of the Federal Communications Commission (FCC), Amateur Radio Service, Primary Station License Grant, that you have performed all of the previously listed RFI reduction measures to your Station.

2. In accordance with Federal Communications Commission (FCC) Regulations; The owner of any equipment receiving Radio Frequency Interference (RFI), is responsible to alleviate the problem. The equipment owner may purchase and try any one or all of the following choices as necessary. "As with almost all RFI situations the owner must try and see what works and what doesn't."

All of these are considered Amateur Radio Service "Good Engineering Practices" and, if you are lucky, they may cure the problem. But, more than likely, they won't help at all. Lets examine Why not?

Let's first look at your Transmitter and if used, a External RF Power Amplifier. They are generating the 100 to 1500 watts that is causing the problem. Because of the Amateur Radio Services long history of Television Interference (TVI) problems, the Transmitter and RF Power Amplifier manufacturers have provided a tight metal box to keep both from directly radiating. They also have put filters on the leads coming out of the boxes (power input, key and microphone leads, remote control wiring, etc.). Filters

aren't perfect but the RF leakage from these leads will be in the low *milliwatt* (1,000th of a watt) or even the *microwatt* range (1,000,000th of a watt).

There is one exit for the 100 - 1500 watts and that's the Antenna connector. If your Primary Fixed Station is typical, a length of good quality Coaxial Cable transmits the 100 - 1500 watts to your Antenna where it is radiated for all the world to hear. On the way to the Antenna, the power passes through some well shielded metal boxes (SWR meter, tuner etc.). These are not going to radiate if properly connected to your Ground System. *So for the purpose of examining our RFI problem we can consider the Antenna as the primary source of the radiation instead of our transmitter.*

If the Antenna is the source then putting a filter on the transmitter's power cord is not going to help at all. Improving the ground system won't help either because the Antenna still will radiate the full 100 - 1500 watts.

Now we need to find the path the radiation takes from your Antenna to the neighbors electronic Espresso Coffee Maker and Digital TV. Is it picked up directly by both? Not likely – they are both too small to be much of a receiving Antenna. **But it is connected to a large "Antenna", which is the AC Voltage power wiring running through the home. If this AC Voltage power wiring cable runs through the attic it may not be far from your Antenna. It takes the radiation it receives and conducts it right down to the Espresso Coffee Maker and Digital TV.**

Now that we've found the radiation source and path it took to the Espresso Coffee Maker and Digital TV, we need to find the cure for the problem. We could get rid of the problem by shielding the house AC Voltage power wiring, but this is not practical. **Another and easier solution is to 'decouple' the Espresso Coffee Maker and Digital TV from their power cords. This can be done without affecting the power going through these cords.**

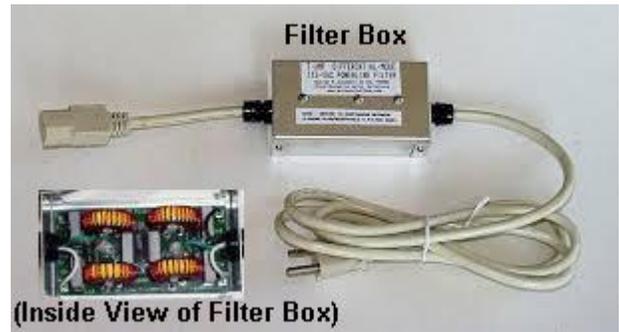
The owners first choice is the use of a Ferrite Split Bead. You just clamp them over the cable and they should stop the RF from getting into the Espresso Coffee Maker and Digital TV. It can take from *one to five* of them depending on the strength of the RF being picked up. *The Ferrite Split Beads work most of the time but not always.* **The owners second choice is the use of a Ferrite Toroid Core. This needs to be large enough to allow the effected equipments power cord plug to pass through the hole and to allow it to be wound about five turns through the hole. *This is strong medicine.* **The owners third choice is the use of a AC "Brute Force" Line Filter. They are fitted with a plug and socket and connect in-line with the equipment AC Voltage power cable. *Sometimes they work better than the Ferrite Toroid Core and sometimes not.*****



Spilt Ferrite Bead



Ferrite Toroid Core



AC "Brute Force" Line Filter

One important point about of all these cures is, that they do not modify the affected equipment's operation in any way. You as the FCC Amateur Radio Service Primary Station Control Operator, can't be held responsible for any later problems with your neighbors equipment. Keep in mind that your neighbor probably hasn't the faintest idea of how their equipment works, they just want to use them in peace without interference. Help them do so by providing them with this information and leave them as a happy neighbor.