

Solving RF Breakthrough and Earth Loops Issues on Transmit

Explanation

In most cases you can put a radio system together with all your wanted 'add-ons' and it works without any problem. However there are a few cases in which problems are experienced especially with the received audio from 'add-on' audio equipment. These problems tend to be caused by RF breakthrough or Earth current issues. In either case it can be found that when the transceiver is in transmit mode (keyed), the operator can hear a buzz in the speaker or their own distorted voice coming out.

There are a number of reasons why this can happen, but the two main ones are: a) A poorly matched antenna which results in RF being reflected back into the radio room. b) A difference in Ground currents between pieces of equipment. This can be caused by the above problem or other items of equipment not sitting at the same ground potential when using the same power supply.

RFI issues are usually caused by reflected waves coming back down the outside of the coax, and as with most amplified audio equipment, you will hear yourself on transmit coming back through the speaker system or headphones. Earth loop problems are usually caused when the same power supply for the radio and "add-on" equipment is being used

Solutions

Check that all your coax connections and grounding points are tight and secure with no loose connections, and make sure that all the power cables and audio connections are routed as far away from the RF cable connections as possible. Ensure that your antenna system is matched up as best it can be at the antenna feed point. Using your transceivers built in tuner should take care of this, or if not a good external antenna tuner will do the job. The place you want a 1:1 SWR is between the output of a transceiver and antenna or between the transceiver and the input of a tuner in order for the transmitter to deliver its maximum power. Also make sure that there is a central ground point for the radio, ATU, PSU etc and that any other items are adequately bonded to ground. If you can match your antenna system up at the antenna feed point you shouldn't hear anything in the speaker or headphones on transmit.

Note: You get SWR dips on most of the ham bands but with 15/20 meters it can sometimes be problematic. Some built-in automatic antenna tuners will match ok, and, of course, a manual tuner will provide a transceiver "match" on nearly any frequency.

The quickest way to sort out earth loop and RFI issues with our DSP noise cancelling products is to use a separate DC power supply. This in most cases has the effect of breaking the earth loop and keeping the stray RFI out. We sell a range of mains plug-in DC power supplies with world-wide power adapters for most countries that will work with your bhi DSP noise cancelling product. Please check the accessories page on our website <https://www.bhi-ltd.com/noise-cancelling/power-supplies-and-power-leads/>.

New bhi GroundBreaker product solution

The new bhi [GroundBreaker](#) is another quick and easy solution to this issue. This new audio product totally isolates the grounds of your ancillary equipment from those of the radio system. The bhi GroundBreaker is easy to install and simply plugs in between your radio and ancillary audio equipment. There are a number of versions to suit most connections and impedances. Check out the bhi website for more information.

Ferrites fitted to the power and audio cables can also help with this issue, fitting them as close to the radio as possible. See bhi FAQ Help sheet 1 on the bhi website:

https://www.bhi-ltd.com/images/docs/datasheets/Helpsheet1_Iss_B.pdf

Putting a small power diode like a 1N4002 in the ground of the bhi fused DC lead may also help by blocking the stray RF/ground loop currents from getting in via the ground (FAQ Help sheet 2 <https://www.bhi-ltd.com/images/docs/datasheets/helpsheet2.pdf>).

You can also try reducing the volume/AF gain on your radio in small steps whilst increasing the volume on the bhi unit to compensate. This has the effect of reducing the overall gain of the RF going into the bhi unit on the input side

If you would like further help and assistance then please call us on +44(0)1444 870333 or use the bhi website contact form <https://www.bhi-ltd.com/pages/pages/contact-us.html> or email info@bhi-ltd.com

NES10-2 product specific:

I think the reason you have problems when keying up the mic is that you have some stray RF in your shack. There are several easy things you can do to eliminate this:

1. Connect the NES10-2 to a separate DC power source. We sell the [1030-UKPA](#) 12V DC mains plug-in power supply for UK customers, or the [PSU12-2A-WW](#) world-wide power supply for most international countries.
2. Turn the input level control down in small steps, whilst turning up the radio to compensate. This lowers the audio gain on the input stage and can have an effect reducing the RF.
3. Fit a small power diode like a 1N4002 in the ground of the bhi fused DC lead (FAQ Help sheet 2 <https://www.bhilt.com/images/docs/datasheets/helpsheet2.pdf>).

Vehicle noise with a bhi DSP installed in a vehicle?

Check these things first

1. Use a multimeter to check for AC voltage if you have a whine in your speaker.
2. Put the meter to AC voltage. Check where you have the radio connected to power. With motor running.
3. DSP will not get alternator whine out its AC voltage you here.
4. You have AC voltage you must remove it with filters or it could destroy your radio.
5. Be sure you have the radio grounded don't depend on the cigarette lighter being grounded.
6. Make good grounds on everything.
7. Check even if you are wired to the battery. You will still need filters most of the time.
8. With newer model autos you will find more noise points than on any older autos. why? All of the electronics (RF spurs) in autos today and no grounds or bad grounds from factory.
10. Electric fuel pumps are a big problem in most autos today.
11. Noise problems in autos - Just remember grounding and filters are necessary for clean audio today.