

Cleaning up the DSP Tracker's TX Output

By WA4ZKO

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Forgive the organization of this. I'm just tossing together a draft of notes and screenshots. Since this issue is so prevalent out there, guess I should do up a more formal document on it when I have time. Then maybe see if I can get it into Martin's (SCS guru) hands for his review and thoughts?

What is the problem?

Well it involves many DSP Tracker and Radio combinations resulting in transmitted packets accompanied by some extra noise from the modem. Severity varies and it is not harmonics or the like. Just some modem noise getting into the rigs transmit audio. It is a result of two problems coming together:

1. Most modern rigs have very sensitive data jacks. These data jacks are usually high impedance designs that are just asking for lack of adjustment range, noise, hum, and RFI issues when you start interfacing modems to them.
2. The DSP Tracker seems to have some "noise" on its TX output. Most of this noise is down considerably from actual TX modulation. This noise tends to get picked up by rigs with sensitive data jacks and ends up on the transmitted signal. It typically shows up as a TX chirp followed by a "thin" carrier around 1000 Hz alongside your transmitted packet. It is easily viewed by using a 2nd receiver to look at your on air packets on a waterfall display.

NOTE: If memory serves me correct, Tony (K2MO) felt like some of his noise issues came from when his modem was plugged into certain USB ports. Note that I have NOT observed this myself, but could just be my particular setup. At least for my particular setups, I can see no difference with the modem's USB cable plugged in or not.

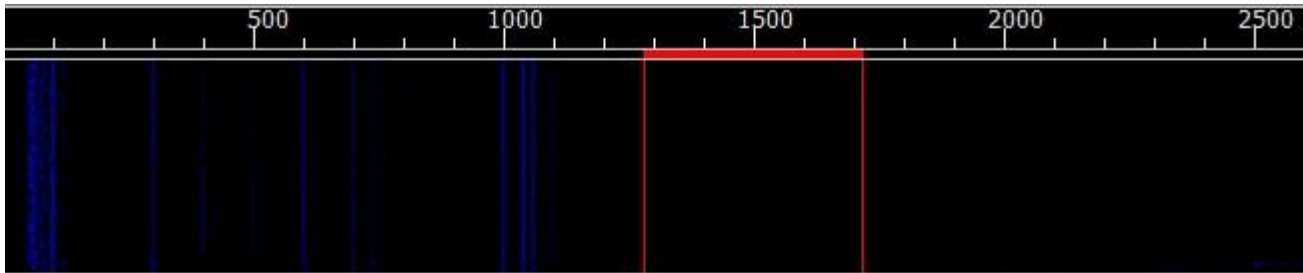
Okay, I guess the best way to detail this problem is to present it visually.....

Here is a waterfall running on my shack PC with nothing plugged into the soundcard.



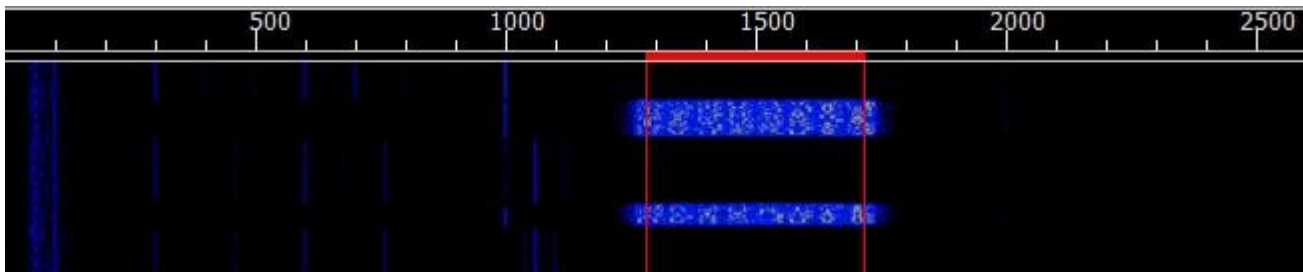
You will note just a bit of low level internal noise present down at the bottom of the waterfall at about 50 to 100 Hz. Make note of it and ignore that noise from here on forward as it is not coming from the Tracker. I have the red markers indicating an area 500 Hz wide centered at 1500 Hz on the waterfall where RP modulation would be present.

Now below I'll take the TX output line of the Tracker (idle) and plug it in for viewing on the waterfall:



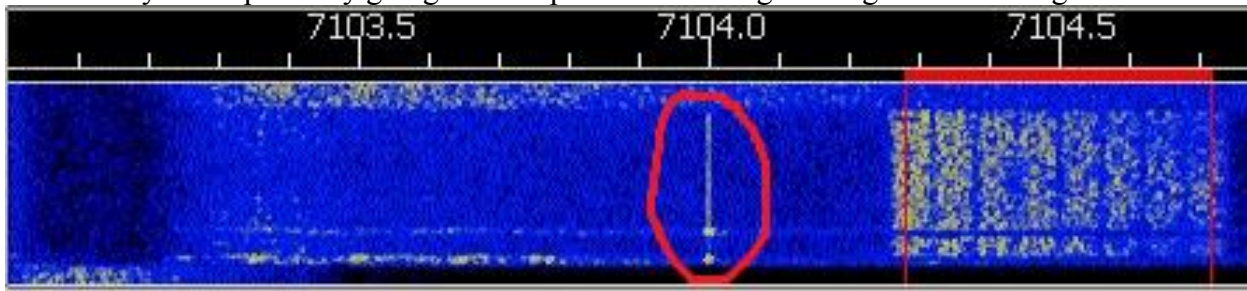
Now you will note some noise on the above waterfall. Some at 300, 400, 600, 700 Hz and a mess around the 1000 Hz area. I have the tracker and the laptop on battery power so there is no chance that this is coming from AC/DC power supply ripple. This remains whether or not the USB cable is plugged in. Note that this is not a problem itself.....unless it's still there when the modem goes into transmit.

Okay, the real test....let's transmit a couple UI packets out of the modem and see what the transmit audio looks like:



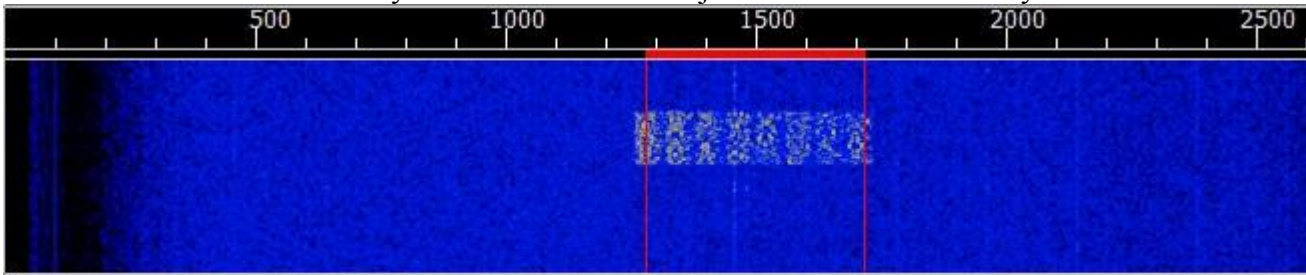
Okay, not good. Most of the noise is muted out during actual TX except we still have that noise there around 1000 Hz. That is going to get transmitted on the air at a pretty high level.

On the air you are probably going to end up with something looking like this being transmitted:



I've circled the problem in red. Ouch, right at the beginning of the two packets you will see pretty big TX "chirps" at 1000 Hz followed by that thin carrier from the noise noticed above.

So what would a clean RP signal look like? Here is one I captured live from my node doing a manual R300 beacon on 30m. The very faint vertical lines are just local noise here at my home station:



Well how do you clean things up if you have this issue?

I doubt this can be fixed by SCS with a firmware fix? I could be wrong, but suspect this would require a board (hardware) level mod/revision?

First off, note that the noise level does NOT seem to change with %XR values. This is good as it allows for some workarounds detailed below.

If your rig allows you to adjust the sensitivity (gain) of your data jack's input port then the fix is usually pretty easy. **Simply turn the gain on that port WAY DOWN and turn the modem's output up to compensate.** This makes the data port less sensitive to that low level noise while still getting plenty of TX audio drive from the modem to reach desired power output levels. Probably take some tinkering while watching a wattmeter, ALC meter, and your signal on another receiver's waterfall as you adjust things.

Example: On my Yaesu FT-817, turning the DIG MIC down to 2 (from its default of 50) and cranking the modem's output up into the %XR 2000 range cleaned it up considerably with a stock cable.

On my Yaesu FT-450 I had to take a different approach. The FT-450 is pretty notorious for having a hypersensitive data jack that has given many folks gray hair till they realize what is going on. Unfortunately Yaesu doesn't provide a menu or pot to adjust that port's sensitivity. Argh!

I dealt with interfacing my Tracker to the FT-450 by building up a modem to rig cable with a small high value resistor in it to pad the modem's TX audio line way down. Then I turned the modem's output up to compensate. A slightly better approach would probably be to add a variable resistor/voltage divider to the rig's data jack inside the case, but that was more rig surgery than I wanted to fool with.

What resistor values to try? Values in the 470k to 620k ohm range will usually do the trick.

Hope this helps some of you facing this DSP Tracker interfacing issue. I'm open to comments, ideas, your noted results, and suggestions on this topic.

73
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