

DSP Radios Not Perfect

Rob Sherwood
NCØB

Dayton Drake Forum 2007

Should you throw away your vintage radio ?

- Yahoo Icom reflector moderator says “yes.”
- See what you think in a few minutes.



Since you are here, you likely own a classic Drake radio from the 70s and 80s.

In the past years I have given talks on:

Dynamic Range

Receiver Testing

Performance in Contest Environments

- Today I am going to discuss a more subtle problem.
- Your Drake radios don't have the problem.
- Radios designed 10 years ago don't have the problem.
- Many hams are not catching on, and I don't know why.
- The ARRL testing lab is missing it completely.

What is the problem?

All new DSP designs in the past 3 years have AGC problems.

At least one new design “folds up” in QRN.

Lab testing is important **BUT**
You have to **LISTEN** to radios, too.

Why are serious problems getting past R&D?

Fall of 2005

Listening to weak signals on 20 m. with a new DSP radio

Hearing annoying clicks, ticks, and pops

Switched to R-4C – No clicks, ticks or pops at all

20-year-old Icom – No clicks, ticks, or pops

S-Line – No clicks, ticks, or pops

The Problem

- All **new** IF DSP radios from **all** manufacturers have the same AGC problem on Fast Rise-Time Transients.

Wave files

Normal Speech



Speech with AGC Interruptions



Edited description of AGC in new K3 from Elecraft web site

“Will the settings allow the AGC to be set up to tolerate very fast rise-time waveforms while responding [properly] to [normal signals]?”

It goes on to say the blanker can eliminate pops if they are a problem.

You don't even notice the pops on older radios since they don't false trigger the AGC.

I can't wait to listen to the K3 to see if they got it right.

- Older hybrid designs do not exhibit these bad AGC characteristics.
- Icom 756 Pro, Pro II and Pro III are fine.
- Fast rise transients are stretched by the IF filtering to 1 millisecond.
- An R-4C has an R & C in the AGC.
- A 1 msec transient cannot charge up the C.

- New AGC designs in DSP radios strongly react to the transients.
- A “tick” may kick the S meter to S9 on newly designed radios.
- The same “tick” does not even move an R-4C S meter.

Another new DSP problem

- March, 2006, sold two 706MkIIGs
- Bought new IC-7000.
- Human interface is great. Easy to program.
- Has same AGC problem + a different problem.

IC-7000

- Performs poorly in broadband noise, like QRN
- Mobile trip KS to CO
- 40 meter CW, occasional QRN = S9
- Wearing phones, QRN very wide band
- Crashes way outside the 500 Hz CW passband
- How to prove what I was hearing with my ears?

HP 3561A FFT Analyzer



- Swept vs FFT Analyzers

R-4C



781

706

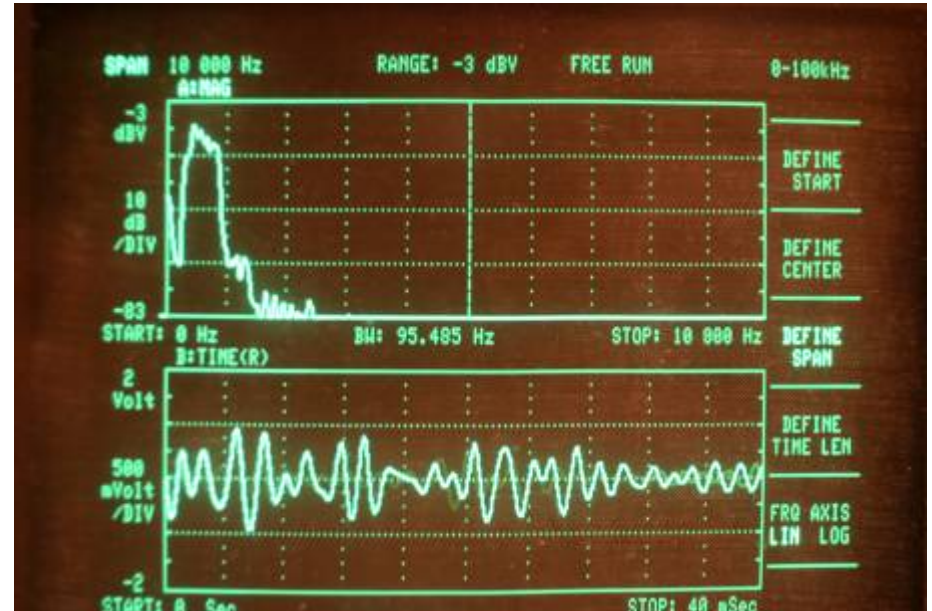
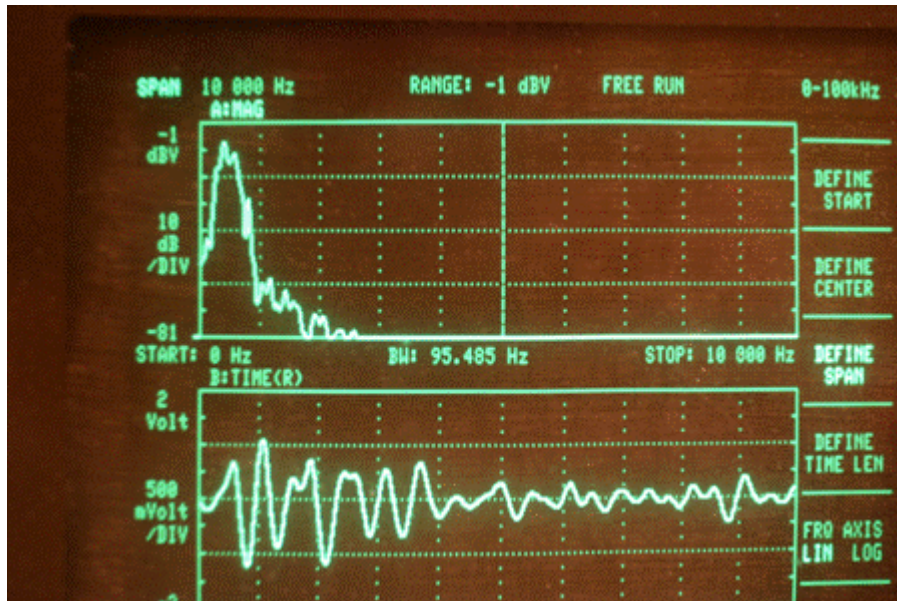


7000

R-4C

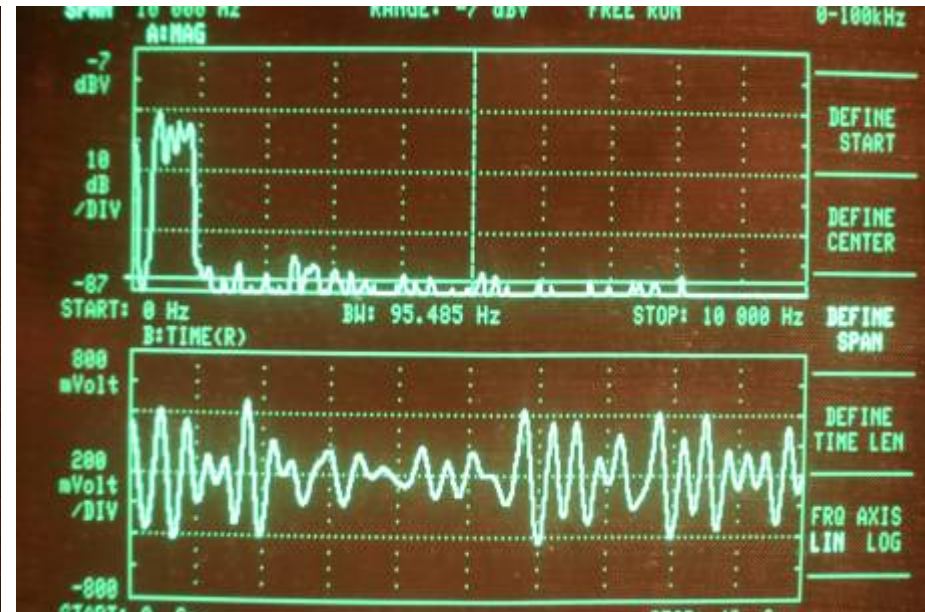
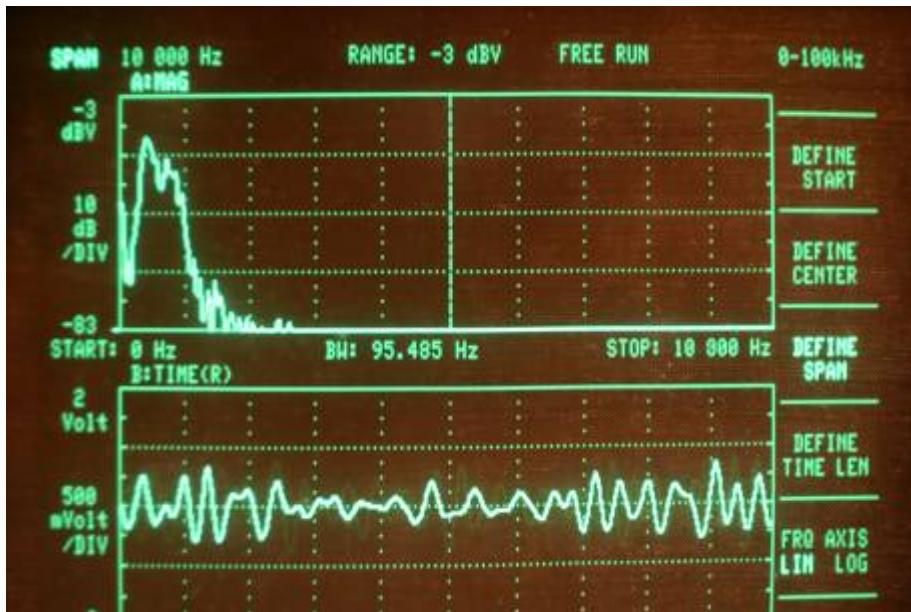
QRN

781



706

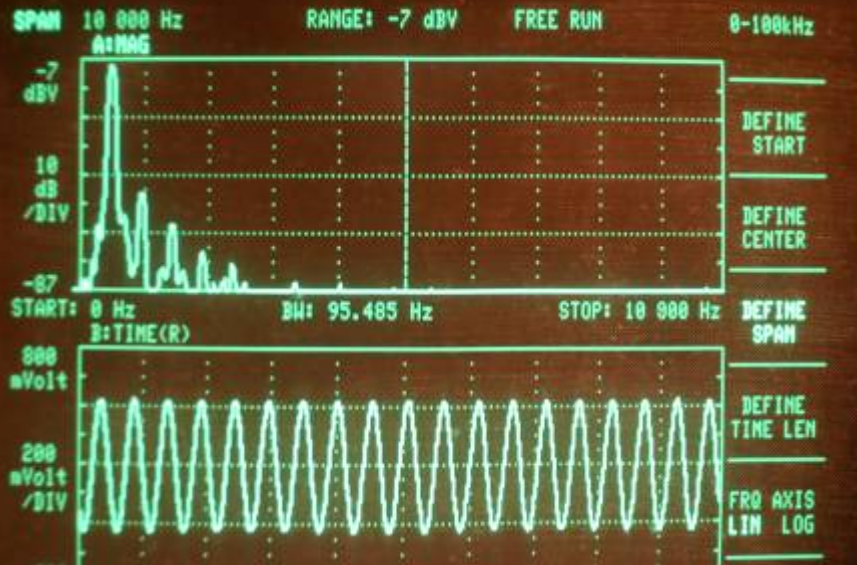
7000



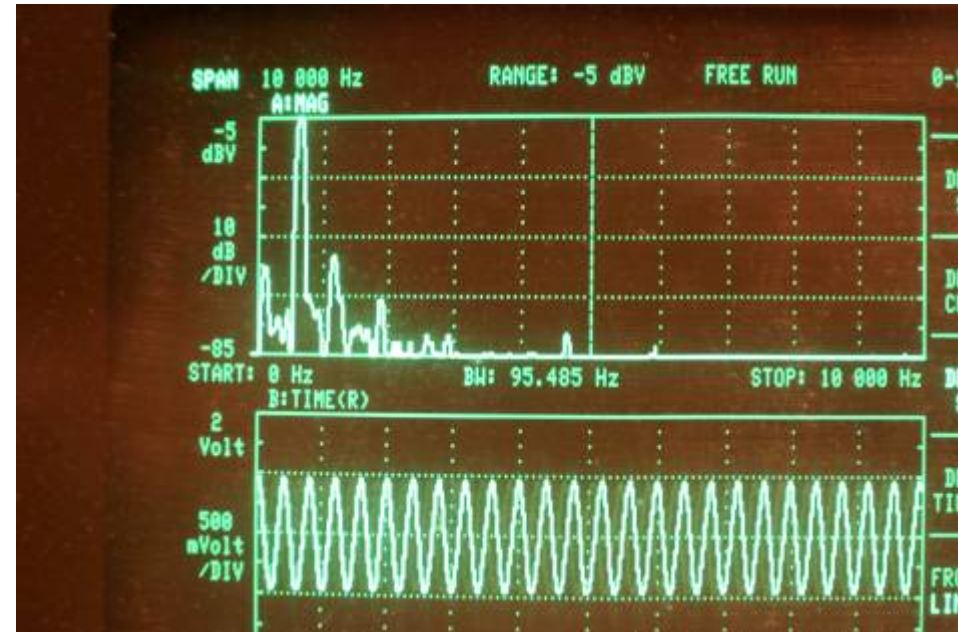
R-4C

Single Tone

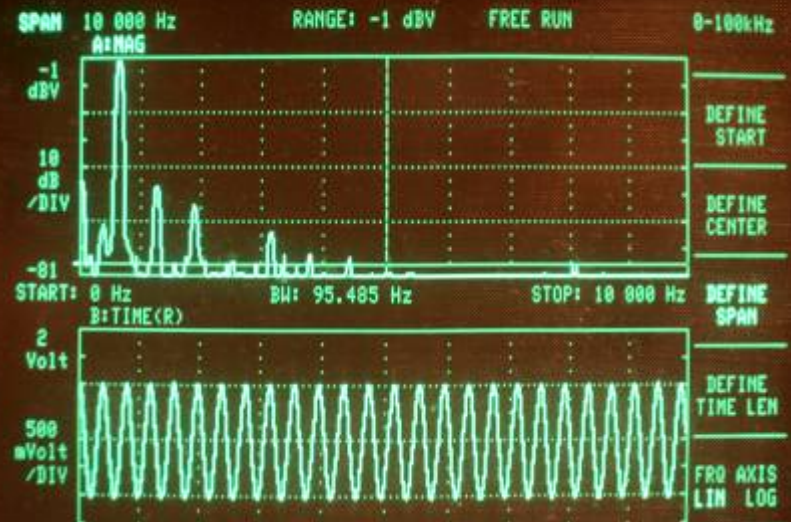
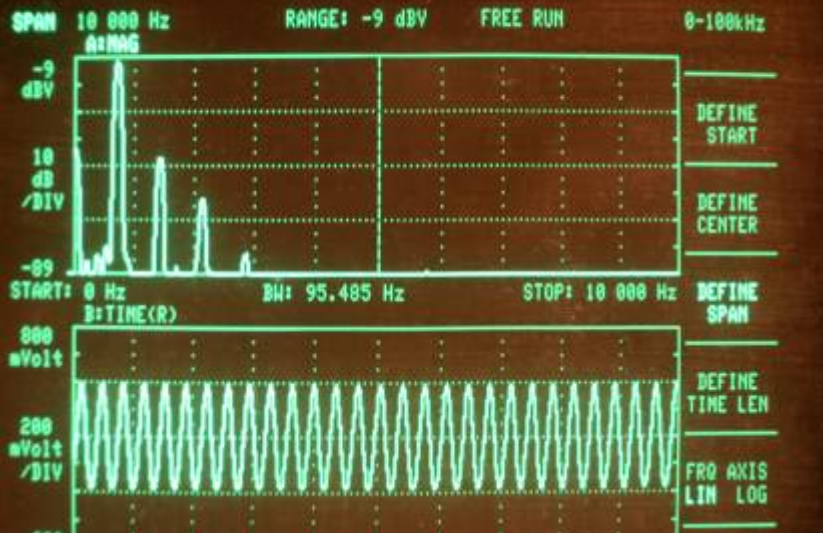
781



706



7000



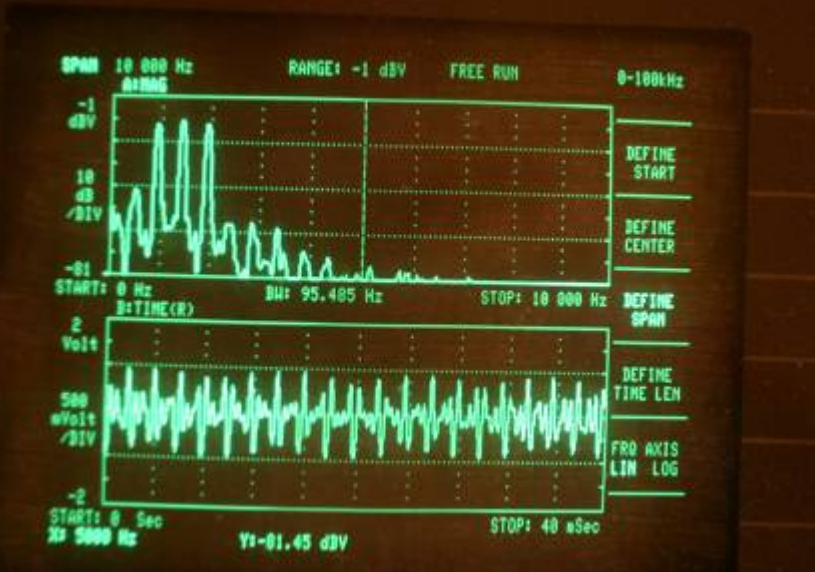
How to Approximate Broadband Noise

- Used 3 tone test to approximate broadband QRN.

R-4C

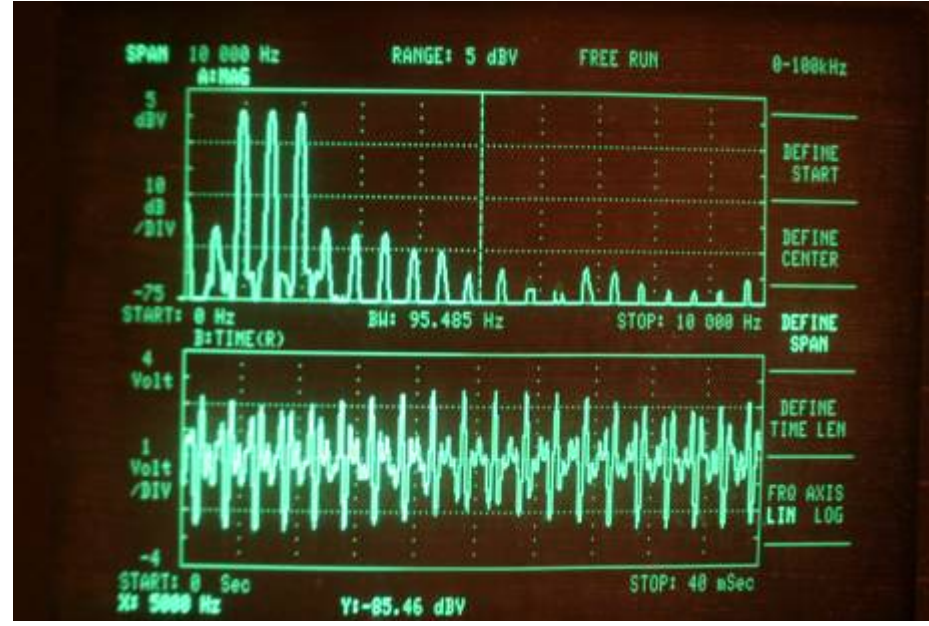
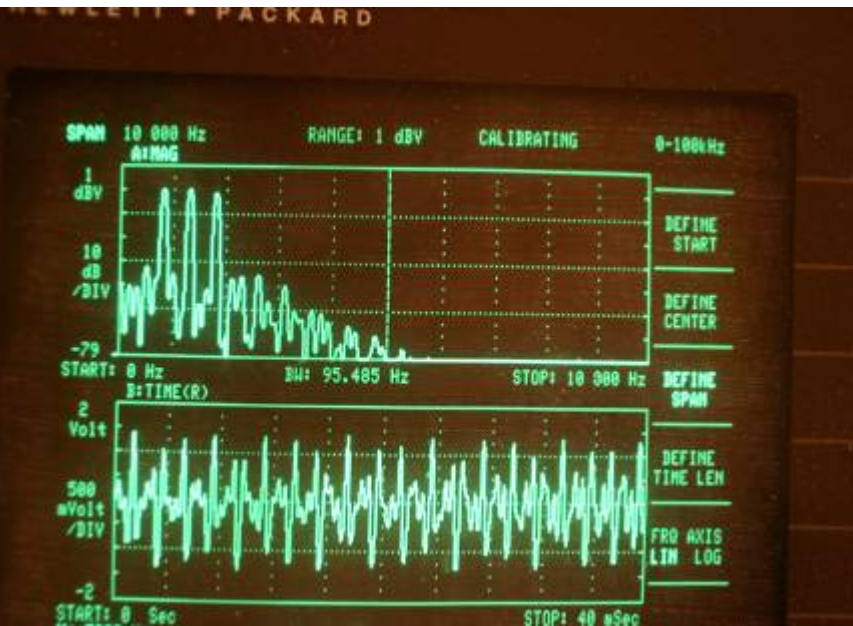
3 Tone

781



706

7000



Where does that leave us?

- New IF DSP designs seriously exaggerate transient noise on weak signals.
- Some DSP radios make QRN much worse.
- Same problem on unblankable line noise.

Are R&D Departments comparing old designs to new designs?

- Some hams are noticing what I am describing, but **many are not**.
- Maybe some hams may have sold all their older radios and cannot compare.
- The bands are **not** always as noisy as the latest digital receivers make them appear.
- An individual radio **can** make noise worse.

Are you ready to sell your Drake?

Maybe NOT!



Sherwood Engineering

www.sherwood-engineering.com

www.NC0B.com