The R-390A – More Than A Collector's Item?

Update: August 2005

All my "DX-life" I have been wanting a valve receiver. And, apart from some brief encounters, a domestic Radionette Kurér in 1972, and a Redifon R50M in 1978, I've been a solid-state man all the time.

I have known Dallas Lankford for several years. Dallas' view has been that the R-390A is one of, if not *the* best receiver ever made, especially with regards to sensitivity, selectivity and spurious responses. The thought of having one has matured over the years, but as well as praise, also warnings came from Dallas; buying a poor-performing R-390A would make my dream rather nightmarish. So I was never really able to make up my mind.

Until the spring of 2004, when a friend of mine informed me that a radio amateur not far away had one for sale. And it was not just any old R-390A, it was an EAC, 1967 model R-390A. The latest large production run.

So, one Thursday in May – actually it was Ascension Day – I drove 520 km to the township of Alta, Norway to have a look at it. It was a beauty. Apart from light markings on the knobs, I could hardly see it had been used at all. No modifications seemed to have been made to it. And it was working. There was no way I could turn this one down, so I and my VW Golf drove eastwards some 50 kgs heavier (a cabinet was included).

When I set it up in my DX shack in Kongsfjord, I soon discovered that sensitivity-wise, it was extreme. I also soon discovered that if something appears to be too good to be true, it usually is. Very shortly after arrival it died, and it took some effort to find the rather obvious reason, the ballast valve was dead. Thanks to Dallas, I soon had replacements for the ballast valve and all the other valves as well, plus the necessary tools for working on it. Because it needed work.

Not much really. I discovered that although stable after warm-up, there was a 4.5 kHz difference in readout from one end of the Mhz band to the other. This called for a PTO alignment, which was rather straightforward although time consuming (mostly because of long warm-up periods and lack of training). That done, and a couple of valve replacements later, my R-390A now has a readout accuracy of around 150-200 Hz over one 1 Mhz band. That is, if I remember correctly, according to or better than specs.

I have had no means of measuring the sensitivity. I was told to expect around 0.5 uV for 6 kHz AM, 30% modulation. My NRD-525 is measured to between 0.4 and 0.45uV with same parameters. Testing them both with signals on or just above noise levels during very quiet geomagnetic conditions showed that the R-390A meets the 0.5uV expectation – and maybe more. In "real world" it appears to be slightly more sensitive than the NRD-525, perhaps because the receiver noise floor is lower.

Very promising. Would this mean that the R-390A is a better DX receiver than the NRD-525? Not necessarily. It lacks functions that amateur-grade receivers have, such as passband tuning, easy ECSS modes, a notch filter for starters. Also, its 2/4/8/16 kHz mechanical filters (I am not dealing with the narrow crystal filters in this article since DX-ing AM stations with them is impossible) lack flexibility for split-frequency DX. The 4 kHz filter is superb for DX, but somewhat wide for splits, especially if you can't select one sideband (ECSS). The 2 kHz filter is superb too, but too much on the narrow side. The 8 kHz filter is more like 10 kHz, and thus irrelevant for most DX purposes. And even more so the 16 kHz filter.

Conclusion: In its original state, it can't compete with receivers like the NRD-525 and many other solid-state amateur-grade receivers when it comes to demanding, split-frequency DX. So what does one do? One modifies the IF Deck. Not any"one" in fact, but the process is described in the article *R-390A SSB Filters I & II* in "The Dallas Files" on www.kongsfjord.no. After Dallas had modified my IF Deck, my bandwidths were -3, +3, 4 and 6 kHz on the 2, 4, 8 and 16 bandwidth choices respectively. The filters need not have those bandwidts. Other users may want other bandwidths. For me, I wanted a relatively wide (but not extremely so) filter (6 kHz) for frequencies with little or no interference, an intermediate filter (4 kHz) for moderately interfered frequencies, and relatively narrow (but again, not extremely so) USB and LSB filters (-3, +3 kHz for frequencies where the interference is 1 or 2 kHz away.

Dallas did other mods as well, but the IF Deck bandwidth mode was the single most important mod for making the R-390A into the ultimate DX tool. Having the ability to choose the upper or lower sideband when facing interference makes the need for passband tuning less pressing.

The audio quality has room for improvement. There is a description of an AF Deck mod too on www.kongsfjord.no. Although the parts are there, and the mod is rather trivial, I haven't done it yet. I will. In the meantime I have put a Sherwood SE-3 AMSD on the R-390A 455 kHz IF Output. Audio distortion is reduced from "annoying" to "neglectable", and overall audio quality is very good. The SE-3 does NOT make me hear stations that I could not hear without it though. It will be interesting to see how much difference there is in audio quality after I've done the AF Deck mod.

Heterodynes are still a problem. Most amateur-grade receivers have notch filters that perform from "adequately" (NRD-525) to "superb" (IC-746Pro). There are several standalone notch filters available, such as the Datong FL2/FL3 and the JPS NF-60 – and of course the expensive Timewave products. Common problem is that their audio bandwidth is too narrow, typically 200-3500 Hz or even less. When using a wide bandwith such as 6 kHz, this compromises audio quality too much for my liking. So, if you have a het, you can either try to tune away from it (which works occasionally) or invest in a hi-fidelity equipment such as the Behringer DSP1124P Feedback Eliminator. Maybe it is possible to install a home-brew in the audio path.

Another important factor for audio quality is correct impedance matching for the external speaker and headphones. Both the speaker terminals and the phone jack has 600 ohm outputs. Low-impedance speakers or headphones will not work well unless one uses a 600 to 4 or 8 ohm transformer. I found a Hammond audio transformer at radiodaze.com for USD 18. This works excellently.

Update August 2005:

Sensitivity:

The sensivitivity figures are very good. Some time ago I measured the sensitivity on the full range of the receiver. MW figures were mostly on the -113dBm level, or 0.5uV. SW figures varied from -113dBm to -109dBm for the most part (6 kHz AM, 30% modulation)

Audio quality:
I did the AF deck mods. Audio quality improved noticeably with very little distortion left. But not only that. I also connected an ELPAF audio filter designed by Dallas Lankford. I led the AF out via a 4:600 ohm transformer to the ELPAF, which has two audio filter settings – "high" and "low". On wider bandwidths, especially the 6 kHz but also the 4 kHz setting, audio quality improved significantly and the distortion usually associated with selective fading disappeared. An A-B test with the Sherwood SE-3 proved no improvement when using the SE-3 compared to using the ELPAF.

My EAC R-390A not only pulls out the weakest stations, it presents them to the user with superior audio quality as well.