

The Icom IC-746Pro (IC-7400)
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This article is a follow-up of Dallas Lankford's article *Icom IC-746 Pro: Impressions and Mods*, published on www.kongsfjord.no and (partially) in the Swedish *Short Wave Bulletin*. For those who have not read it, and do not plan to read it, here is the micro version: Excellent filters, no uP crud, outstanding AM performance. But crippled MW and LW sensitivity, and disabled Preamp on MW. 3 filter choices (though SSB/CW can be set to your own preferences, AM can't). Dallas modified the receiver (doing non-trivial mods) to full MW and LW sensitivity, and enabling Preamp 1 on MW. This resulted in AM, 6kHz, 30% modulation sensitivity of around 0.6uV on MW.

Since Dallas Lankford mainly dealt with the technical aspect of the receiver, I will try to deal with the MW DX-er's aspect. I can do that since I am now the owner of the first IC-746Pro that Dallas modified.

Please keep in mind that I am dealing with the 746Pro ONLY as a MW and SW RECEIVER. I am not interested in the transmitter part of it – and it should be noted for those unfamiliar with the transceiver that it has a serious reliability problem with its transmitter. Details can be found on the web.



So then. My Icom IC-746Pro Receiver has a sensitivity of 0.6uV in the MW band (preamp 1 fixed on, preamp 2 not available on MW). My filter settings are 9.8/6.8/3.4 kHz on AM (nominally 9, 6 and 3 kHz), and 3.6/2.8/2.2 kHz on SSB. AGC release times on AM are 0.3/3.0/5.0 seconds (factory default being 3/5/7 seconds). I am a MW DX-



Three outstanding receivers, sorted by size...

er (most of the time), I live in an RFI clean environment in the Arctic, and I have experience with other DSP receivers, the Kneisner & Doering KWZ-30 and the JRC NRD-545. Other receivers in my shack include two JRC NRD-525's, one Racal RA6790/GM, one Icom IC-R75 (Kiwa-modified) and one EAC R-390A (manufactured in 1967).

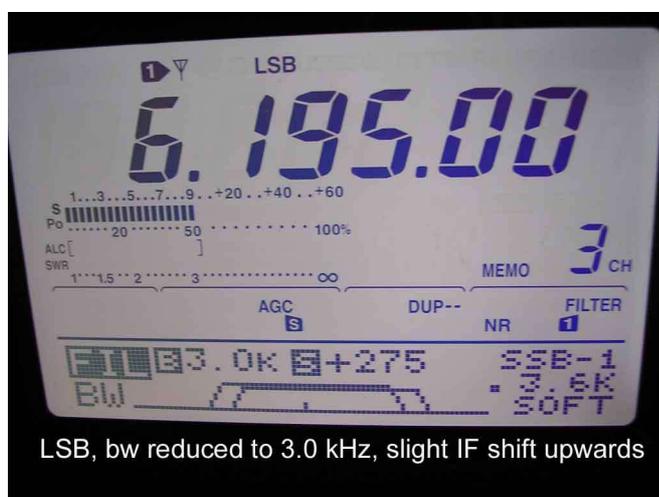
AM performance: Like Dallas mentioned in his article, the 746Pro has an AM synchronous detector which is totally transparent and which never loses lock. AM audio clarity and quality is excellent. Most important for a DX-er is that even if there are more than one signal on the frequency (for instance when monitoring a North American local channel like 1240), the receiver should be able to resolve the audio for not only one station, but as many as possible. Some radios are good at this. Some are not. Based on what I've heard so far, the 746Pro is good at this. The 9 kHz bandwidth is somewhat on the wide side. The ideal setting might have been 3.4/4.5/6,8 kHz.



There is no 4.5 kHz bandwidth but it is not a major concern. The bandwidths are exceptionally good at rejecting signals from outside of the passband – quite contrary to (partially) the KWZ-30 and (especially) the NRD-545. The 3 kHz (nominal) can be used for DX-ing quite tight splits, though of course it can't compete with using SSB (ECSS) when interference is really tough. I have not yet encountered really tough selective fading which could challenge the AM sync detector, but from my experience so far, it clearly out-performs the Kiwa-modded sync detector in

the IC-R75 and my other receivers, in that distortion seems to be almost totally gone.

SSB (ECSS) performance: The three selected bandwidths suit me fine. Some may find 3.6 kHz as the upper SSB limit a downside – I don't. Anyway, if you can make do with 3.6 kHz or less as the



"Wide" SSB (ECSS) filter, you can configure the three bandwidths to your liking – but unlike the NRD-545 there is no continuous bandwidth control (BWC). Or so I thought. But there is! Because the twin PBT actually works as a continuous bandwidth control. Analogue Icom sets (like the IC-R75) use the 9 Mhz and the 455 kHz IF for their passband tuning. Apparently, the 746Pro continues in the Icom tradition, as the Twin PBT controls look exactly like those on the R75. Illusion. The Twin PBT function is pure mathematics, and works like this: Tuning one control right and the other control equally left reduces the bandwidth. It doesn't matter which control you tune to the right, as long as you tune

the other the same number of Hz to the left. To find out if this was real bandwidth reduction, I chose the 3.6 bandwidth and reduced it to 2.8 by turning one control clockwise, the other counterclockwise. I then engaged the 2.8 bandwidth. Audio and interference was identical. There was absolutely no difference. Tuning both one way engages IF shift. And then there are endless variations of reducing the bandwidth AND moving the passband. The manual could be more informative about how the controls work. In fact, one who is used to Icom equipment, could be left with the impression that this function is not much more than a traditional PBT.

Like with AM, the SSB (ECSS) bandwidths do a superb job in reducing splatter from nearby stations – see Dallas' article for details.

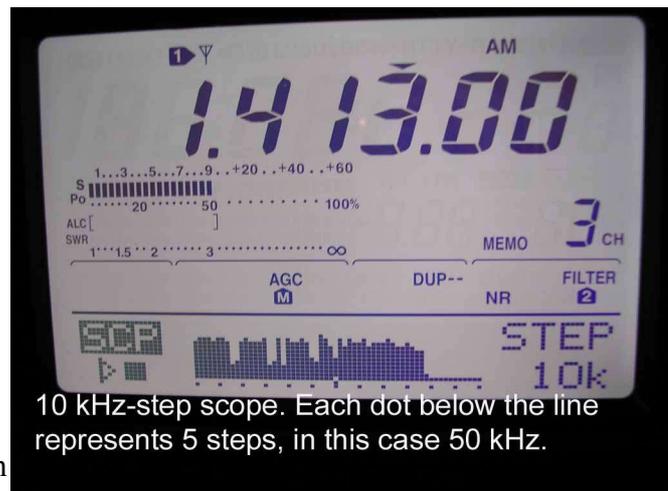
The SSB (ECSS) bandwidths can be set to SHARP or SOFT. In the SHARP setting, speech clarity is enhanced, while SOFT reduces the audible impact of noise (static, splatter etc) somewhat. The correct setting will have to depend on how conditions are. Personally, after using SOFT for a while, I settled for SHARP as the default setting. The NRD-545 has a similar function (SHARP and LOOSE).

I find the audio quality in SSB (ECSS) mode to be very good, bordering on excellent. The receiver is very stable from stock, it is not likely that one will observe differences in LSB and USB audio on MW and low-frequency SW frequencies. Mine is equipped with the high-stability option, and similar results were noted on the 15 Mhz range. Neither the KWZ-30, nor the NRD-545 could match this, in fact my NRD-545 was way off already on 12 Mhz (at least 20 Hz).

Of course, part of why the audio quality in my opinion is outstanding on this receiver, is the possibility of adjusting treble and bass +/- 5dB, so one can adjust audio quality to one's liking. Personally I like a touch of bass if the frequencies aren't too crowded and signal levels are OK. No problem with the 746Pro.

Display: While not in the league of the 756Pro and later, it is large and informative. Light and contrast can be adjusted. The frequency displays in large digits, which seems to be typically Icom. The two Menu lines and five function buttons seem to be well chosen. At first I missed continuous information on bandwidths and PBT offsets (they do display as "pop-ups" when the controls are used, but disappear very quickly, and the filters only display as "Filter 1" etc). But if I press the "Filter" button for a second, all that information is displayed, including the "real" filter bandwidth after adjusting the PBT's.

The display also has a "scope" function which makes a graphic display of a smaller or larger part of the band below and above the selected frequency. I haven't been able to explore this well enough. However, if choosing low resolution (and thus large frequency spans) like 10 or 20 kHz, the graphic display becomes inaccurate, in that low level (but perfectly readable) signals are not displayed. Even when using 1 or 5 kHz resolution, I was able to find audible signals not visible on the scope. So, using the display as a search function only will cause neglectance of the weakest stations (which for the most part are the ones we are looking for, right?).



Interference rejection: Apart from the IF bandwidths, there are three tools, the Noise Blanker (NB), Noise Reduction (NR) and Notch Filter (NF – Auto which kills up to three tones simultaneously, and Manual which kills one down to 70dB at 50 Hz bandwidth).

I have not had any instances yet where I needed the NB. I have a Loran C station nearby which can cause a lot of trouble if I get poor connections on the coax feeds or transformers that match my beverage antennas. So far during my ownership of the 746Pro it hasn't happened. That said, my IC-R75 has had to face the Loran C noise a couple of times, and its NB has handled the noise admirably. I don't expect the 746Pro NB to do any worse.

Nor have I had the need to engage the NR. However, I have noted that adding a small amount of NR does enhance a weak AM signal, pulling it out of the mud so to speak (or possibly more exact; removing the mud).

I wonder if the auto-notch feature may be an audio-notch. In AM mode, it decreased, but did not remove, a rather modest tone. It may not work well in AM compared to SSB for all I know. My experience with the IC-R75 is that the (audio) notch filter does work in AM, but not as well as in SSB. The manual notch is quite a different matter. It is definitely an IF Notch. So you don't only notch out tones, you even notch out stations. Say (from my European perspective) you're on 1520 trying to separate a US station from a strong European on 1521. You would obviously choose to use LSB and a rather narrow filter; still there would be a lot of interference. Engage manual notch, and use it to remove the carrier from the European station. It actually works! Of course it doesn't "remove the station" – what a wonderful tool that would be – but it reduces the interference level by a considerable amount.

Memories: Yes, I would have liked to store all MW frequencies in memory, like I could with the

NRD-545. With only 100 memory positions available, I can't. Still, the tuning step options of the 746Pro do allow me to scan the MW band quite effectively, using a 10 kHz step when DX-ing the Americas, and a 9 kHz step when DX-ing Europe or Asia. The R75 is identical in this respect. So, scanning the MW is rather straightforward. Also, selecting the appropriate tuning steps to higher or lower resolution is easy – and more intuitive than on the NRD-545.

Getting the weak stations: As I mentioned in the beginning of this article, my 746Pro is measured at 0.6uV on MW. My NRD-525's are in the 0.4 – 0.5uV range. My R-390A is not measured, but from usage I'd say it's around 0.5uV (which is where a well-aligned R-390A should be. Mine is well-aligned). The R75 (with Preamp 1 engaged) roughly equals the 746Pro. Those are numbers. What about real life? Comparing the 746Pro with the R-390A and the 525's, I do note that the latter radios are able to resolve an up-coming signal earlier than the 746Pro (and the R75). However, when the signal begins to approach readable levels, there is no difference. So, in real life, there is no signal I can hear with the R-390A and the NRD-525's that I can't hear with the 746Pro (and the R75).

Conclusion: Located in an area where MW transmitters are very far away (and only one stable groundwave signal, on 657 with a signal level of around S9+10, depending on antenna), sensitivity is extremely important. A stock 746Pro with its crippled MW and LW, and non-working preamp on MW, would be useless here even if all other properties of the receiver were outstanding. After Dallas Lankford modified it to correct specifications, it is indeed a superb receiver for MW DX. I haven't tested it much on SW, but I do not expect it to perform any worse on SW DX-ing than it does on MW.