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### **Pursuing the Ultimate Receiver** **By Bob Hawkins**

The search for the best receiver for short wave listening has often included the receiving side of ham transceivers. As many short wave listeners are also amateur radio operators, this comparison is a result of equipment on hand. There are pure receivers on the market that are designed for ultimate performance and priced only after performance is optimized. Since I don't have access to either a Watkins-Johnson or a Tentec 340 receiver, I want to confine the discussion to the next level down in receivers and their matching transceiver cousins. For this article the AOR 7030 Plus receiver is compared to the Yaesu FT1000MP Mark V transceiver. In a later article I want to use the same receiver with the Icom 756 Pro II.

The AOR 7030 Plus has been around since 1997, a long period in the fast changing world of technology. It remains in production because it represents perhaps the ultimate development in a classical receiver. The 7030 receives from below 10KHz to 32 MHz. The design is a double conversion superheterodyne with IF frequencies at 45MHz and 455 KHz. There is limited filtering in the RF stage and a bank of 4-6 filters in the second IF. There are limiting filters before the RF amplifier and after the second IF. The radio is capable of a myriad of modes – USB, LSB CW, Data, AM, synchronous AM and narrow band FM. It offers IF shift, adjustable tone controls, 4 position AGC, 400 memories, and more. The radio being used has a noise blanker and notch filter fitted. Filter bandwidths are 9.5, 6, 3.8 3.4 2.1 and 0.7 KHz. Collins filters are used for the 3.4 and 0.7 KHz positions. Murata filters are used for the other bandwidths. The radio is highly configurable via a complex menu system.

The Yaesu FT1000MP Mark V is an equally capable high frequency transceiver with a potent receiver operating from below 100 KHz to 30 MHz. The design is a blend of old and new with a quad conversion receiver featuring 3 conventional stages and the fourth stage being a micro-processor controlled DSP. There is front end band pass filter-ing for all ham bands and the AM band, two stages of IF crystal/mechan-ical filtering and a DSP stage of filtering. It features the same range of operating modes although synchronous AM is implemented differently and there is an additional data mode. A two stage noise blanker and two notch filters are fitted. IF shift is available via a conventional and a DSP mode and both can operate simultaneously. The operating menu is equally complex and allows extensive configuring of the radio. As fitted there are IF filters for 9, 6, 2.4 (2 consecutive), 2.0 KHz (2 consecutive) and 500 Hz (2 consecutive). DSP filtering the in the fourth IF matches all but the 9 KHz bandwidth and can be switched out. The radio also has a preselector for frequencies below 15 MHz.

The two radios were A-B compared on the same antenna via an antenna switch using the same signals from an inverted V antenna selectable from 1.8 to 30 MHz. AGC settings were matched as were filter selections where possible. Memories and memory scanning were not evaluated.

### **The Results**

A strong signal test was run using WWV at 5 MHz in AM mode. The signal strength on both radios was 10 dB over S9. The signal was equally clear for both tone and voice on a bandwidth of 6 KHz. Background noise was a bit harsher on the Yaesu and softer on the AOR, both using 4 inch speakers. At a bandwidth of 2.4 KHz both were muffled for voice and noise was soft. The AOR had the obvious edge with 2 bandwidths in the 3+ KHz range giving clear AM with low background noise. When tuned off, the AOR still had signal remnants at 5 KHz from the center frequency of 5 MHz. At 2.1 KHz bandwidth the remnants were gone by 3 KHz off center. The Yaesu was similar at 6 KHz bandwidth. At 2.4 KHz, remnants disappeared by 2.5 KHz from the center frequency. The consecutive IF filters of the Yaesu clearly made a selectivity difference that was audible. In synchronous AM mode the AOR took a bit more time to lock but gave a bit clearer

signal. When checking the tone controls on the AOR, about 4 dB of treble boost produced a signal on the AOR similar to the Yaesu in different modes. It seemed clear that the Yaesu was a 'bright signal' as configured. Turning the DSP off completely made the signal brighter. So the Yaesu tone difference was one of design and signals were similar if adjusted equivalently.

Changing to a voice station at 5.070 MHz with a signal strength of 40 dB over S9 gave similar tonal results. Testing selectivity at 2.1 KHz gave signal splatter out to 9 KHz on the AOR, and the same on the Yaesu. The signal seemed to drop more rapidly on the Yaesu but detectable remnants were similar on the two radios. The station probably has a bandwidth that is wider than 5 KHz.

Tuning down from 5 MHz, a barely detectable signal was found at 4.985 KHz. Intelligibility was marginal on both radios but more could be made out on the AOR. The synchronous mode on the Yaesu refused to lock. The signal level was below its threshold. The synchronous AM on the AOR locked very rapidly and held without problems. The tone controls allowed the signal to be improved to where the Spanish was almost intelligible. Interestingly the noise blanker on the Yaesu cleaned up the signal quite a bit to where the difference between the radios was quite small. The AOR noise blanker produced little or no change.

A low tone was found on 4960. The notch filters of both radios removed all trace. A stronger tone at 7.137 MHz on the AOR was absent on the Yaesu. Tuning up the band showed regular intermodulation whistles on the AOR while the Yaesu showed no trace.

Scanning the tropical band below 4960 revealed only one station in each radio, at 4.845 MHz. The Arabic was equally intelligible on both radios although a different tone on the Yaesu. Both radios gave a clear signal from WWV at 2.5 MHz. Similar intermodulation products were found at 3.110 and 3.150 MHz. The AFRTS station at Pearl Harbour (10.320 MHz USB) came up on both radios, but seemed less noisy on the Yaesu. The signal strength was S2 with much static. AIR at 10.330 was right at the noise level on both radios and faded in and out on both.

CFRX (CFRB 6.070) lies in the middle of a cluttered band of strong signals and is not strong at my location. The station was clearer on the AOR although 6 KHz bandwidth was too wide and 2.1 KHz was muffled. It was similar on the Yaesu although not as clear with adjacent station noise on the wide bandwidth. The Yaesu synchronous AM finally locked on the narrow bandwidth. But the AOR was wonderful on all AM bandwidths. Even the 2.1 KHz bandwidth gave clear (but muffled) sound.

Aviation weather on 6.604 USB was clear on both with good quieting. Pirate traffic at 6.600 USB was quite clear on the AOR and crisper on the Yaesu, as was traffic on 6.825 USB. The commercial station (???) at 6.890 was crisp in both radios. Galei Zahal on 6.973 was clear on the AOR on sideband and AM but only on sideband on the Yaesu. Radio Voz Cristiana (15.375) was clear on both with fast AGC to counteract severe flutter. Radio New Zealand (17.675) was noisy but clearer on the AOR than the Yaesu. An unannounced American religious broadcast at 21.760 was easily copied on the AOR but barely audible on the Yaesu.

When switching to the ham bands the Yaesu clearly comes into its own. Copying sideband signals on either upper or lower sideband is clearer on the Yaesu by an audible amount. Copying weak signals is at least as good on the Yaesu without using the DSP. Some signals with heavy noise are similar but most are a little better. Copying Morse code (CW) is easier on the Yaesu and the filtering of the Yaesu 500 Hz filters is much tighter than the Collins 500 Hz filter. The better filtering makes the Yaesu more sensitive to faint signals.

When I tried at very low frequencies there was a tremendous noise level. No beacons were found with either radio. The only difference noted was additional intermodulation signals in the AOR. The Yaesu was free of extraneous music down to its tuning limit of 100 KHz.

## **Conclusions**

The Yaesu is a wonderful radio and its capabilities as a transmitter are outside the bounds of this review. But other than better selectivity, its performance was not quite that of the AOR 7030 Plus except in the ham bands. For general usage as a receiving radio, a dedicated receiver is still the primary choice.