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Using the ICOM IC-PCR1000 PC controlled receiver for medium wave reception

The ICOM IC-PCR1000 PC controlled receiver has been on the market for over five years, but there doesn't seem to have been a review on its medium wave DXing capabilities. Its specifications don't look bad on paper, with good sensitivity, 1 Hz resolution, IF passband tuning, good stability and a tuning range of 10 kHz to 1300 MHz. Although its list price is in the US$600 range, it has been available for under $400, approaching the $300 price tag of the Ten-Tec RX-320 which was reviewed in these pages in Volume 39 #24.

As with the manufacturers of the RX-320 and the earlier Dymek DR-333, ICOM tried to deliver a better receiver for a lower cost with the IC-PCR1000 by incorporating the control, memory and display functions of the receiver in a program running on a personal computer. A serial port links the computer with the receiver using 38400 baud, a faster rate than is used on most other PC controlled receivers. The receiver itself is a black metal box of approximately 8" x 5" x 1", with a power switch on the front, while on the back are found antenna and power inputs (a wall mount AC adapter is provided), a DB-9 serial port connector, an audio output (suitable for external speaker, headphones or for the line input on a PC soundcard), and a 9600 baud packet radio output. The box itself contains a small internal speaker. (see Figure 1 for details)

Figure 1 -- the ICOM IC-PCR1000, rear view

A program developed by ICOM and suitable for 3.1 and later versions of Windows was supplied with this borrowed radio, but I tested it with more recent software from the ICOM website, suitable for Windows 98 and later. If you buy a PCR1000 today, it also comes with commercial software, RadioCom 4.0, developed by Bonito. (www.bonito.net/infos/en_ham_rc40.htm). The Bonito software is meant to be used with the receiver output fed into the PC soundcard, and performs DSP filtering on the resulting signal. It also allows recording your received audio on the PC and can decode various digital modes. It would have been interesting to test, but the ICOM software told me all I needed to know about the radio's capabilities. According to the ICOM website (www.icomamerica.com for example), there is an audio DSP option available for noise

reduction and auto notch, the UT-106, but the unit I tested was not equipped with it. Nor did it come with the stock active antenna; the antenna's tuning range of 25 to 1300 MHz might give some warning as to where the emphasis was placed by the PCR1000's designers.

After installing the software on my 750 MHz laptop using Windows ME, and attaching the PCR1000 to it via a USB to serial converter, I powered up the radio, and was quickly able to control it using the "component-type screen" (see Figure 2). There are also a "communications receiver" and a "radio" screen available. Tuning the radio is accomplished by setting the tuning step desired, then placing the mouse pointer on the tuning knob and clicking (or holding down) the right button for increasing the received frequency, and using the left button to decrease the frequency. Of course one can also enter the frequency using either the PC keyboard or the virtual pushbutton pad below the frequency read out.

Most of the functions were quite easy to figure out without referring to the manual, but as befits a receiver with this expanded frequency range, there were a number of scanning functions with which I was unfamiliar and didn't investigate at this time (there is a user group at www.groups.yahoo.com for those interested in finding out more about the radio's capabilities). The "band scope" provides a spectrum analyzer function, but only in AM and FM modes can you hear a signal while the band scope operates. In SSB and CW, the receiver audio is muted until you stop the band scope operation.

In the limited time I had available, I found the software easy to use, with a good deal of entertainment value, but how in fact does the receiver work, especially on medium wave? Unfortunately, all was not rosy.

Signal handling capability

There are no specifications given for signal handling capability for the PCR1000, perhaps with good reason. Even using a low output untuned 12 foot square loop antenna, this receiver suffered from overload in my area. I half expected to find a 3rd order product on 1240kHz from my 10 kilowatt locals on 900 and 1070 (though the product wasn't noted on the Drake R8 or the Sony ICF-2010 fed with the same antenna), and the second order product on 170 kHz as well, but, in addition, 920 kHz showed KIXI-880 from 80 miles away, and CFAX-1070 showed up on 1100 kHz due to mixing with CKWX-1130, 60 miles away. Yes, the attenuator helped, but the receiver sensitivity was already being pushed with this antenna, and the added attenuation made even semi-locals into DX. With the PC generating its usual electrical noise, using a nearby tuned loop antenna with the radio was not really an option.

Sensitivity

This receiver has reasonable sensitivity specifications on medium wave, about 2.5 μV, but its sensitivity is in a constant trade off with its signal handling ability. Having said that, the radio was usually closer to the R8's sensitivity rather than the 2010's during the daytime, but then the 2010's antenna input is not notoriously sensitive. KXL-750, 200 miles away was an example of one of my weak test signals and was clearly audible on the R8, just a carrier on the 2010, and rough audio on the PCR1000 with a subaudible heterodyne perhaps indicating a spurious signal. (Note that KXL is not normally regarded as a weak signal here for a communications receiver, but it was weak using this antenna, and there was further loss in a four way splitter)

I finally threw in the towel on the battle between sensitivity and signal handling ability by adding a tuned circuit with a source follower amplifier between my higher output random wire antenna and the PCR1000. DXing became more like fun, and the band scope lit up with signals. There was, however, still overloading noticed as evidenced by spurious signals turning up within 20 or 30 kHz of my locals, albeit at lesser strength relative to other signals.

Selectivity

Selectivity was an initial concern to me when looking at the specifications, as the narrowest available filter is 2.8 kHz, the final IF is 450 KHz (not a frequency with good quality passband filters available to my knowledge) and there was no skirt selectivity defined for the filters. Having said that, there didn't really seem to be problems with my locals being heard as anything more than splatter on adjacent channels. As seems normal for radio reviews at this location, trans-Pacific 9 kHz channels were inaudible on even the best radio as anything other than carriers, so there was no opportunity to check close-in selectivity. There didn't seem to be much point in measuring deep filter skirts with this radio, as there are larger problems elsewhere, but the narrow filter seemed at least as good as the 2010 stock narrow filter. "IF shift" can narrow this selectivity further, but is only available in SSB and CW modes. The lack of a really narrow CW type filter means that this set would not be much use for automated propagation monitoring programs, even if the front end would allow such monitoring. (Note also that ICOM seems rather coy about revealing this radio's command set, so writing one's own code for the PCR1000 might not be easy anyway)

AGC, S-meter and band scope

There is a choice of fast and slow AGC decay available on the PCR1000, but again there are no specifications given, and with the low output loop antenna, it was hard to tell any difference in AGC response between the fast and slow settings. Unlike some receivers, the AGC didn't leave "holes" in the desired audio after splatter peaks, which is a point in its favor. Until I switched over to the stronger signal output of the antenna preselector, the only observable AGC decay time was when switching from a frequency with a strong signal to one with a weaker one; it seemed to take about a second for the full gain to recover. However, once the

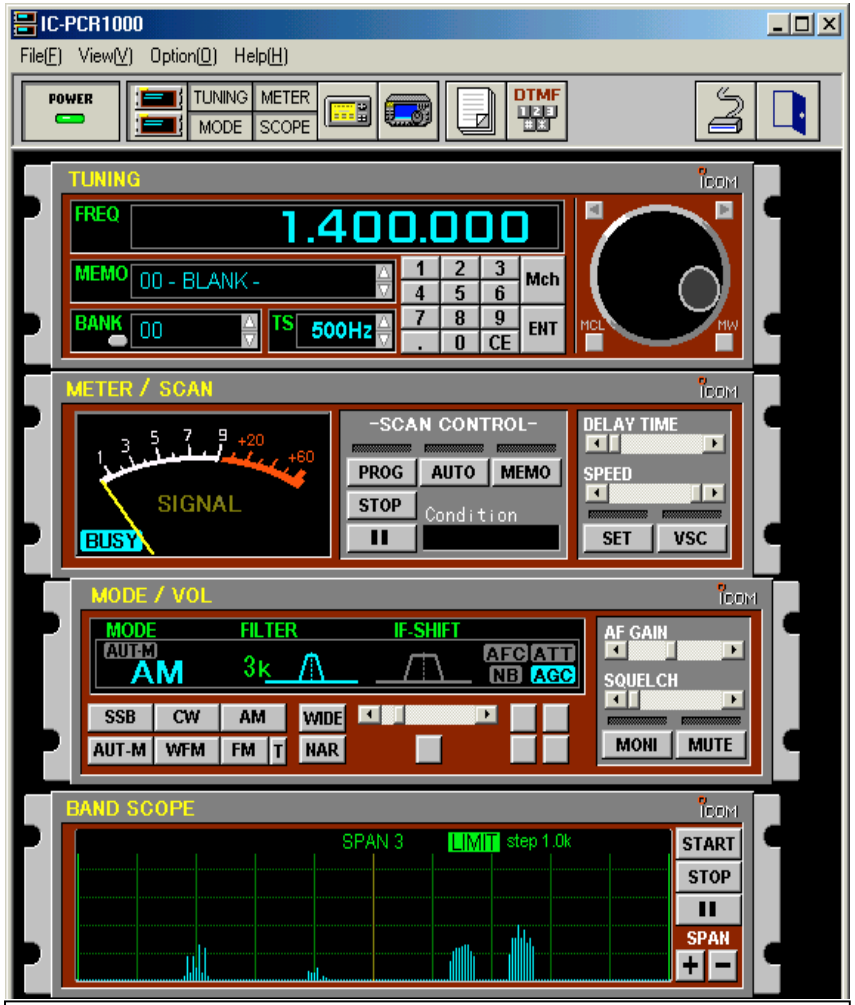

Figure 2 -- the PCR1000 "component-type" screen

radio was fed with stronger signals, the difference between the AGC settings became much more noticeable.

There is no AGC “off” position, and no RF gain control on this receiver. If there was a subaudible heterodyne (SAH) between two signals on a frequency, the AGC was inclined to “pump” in AM mode, which made for less readability than found on the 2010 under the same conditions. However, using ECSS (exalted carrier selectable sideband; zero beating an AM signal in SSB mode) on the PCR1000 made for quite a readable signal even with a SAH present.

The S-meter is reasonably responsive, if a signal is strong enough to make it move, but it did take the stronger semi-locals to make any indication at all on the meter using the low level antenna. The problem is also observed using the band scope. As you can see in Figure 2, there is “no signal” on

1400 kHz either on the S-meter or on the band scope, yet there was audio being heard in the headphones. In addition, the band scope has quite a low dynamic range; if there had been an indication of a signal on 1400 kHz, all the presently visible signals in Figure 2 would have been at maximum level, and spread out (this was checked by hooking up a more efficient random wire antenna, and, yes, some of the resulting signal indications were probably spurious signals). The situation was somewhat better using the antenna preselector, and it was surprising how well this software updated signal strengths at +/-200 kHz once a second, while delivering audio. Remember the RX-320 updates its spectral display quite slowly.

Demodulation

With the tightrope walking needed to avoid overloading this receiver, it was difficult to get a good feel for the demodulation quality. Either DX signals were too weak to deliver good solid audio output, or there were odd distortions from front end overload. However, as is pretty much the norm with communications receivers, ECSS was the way to go to get a readable signal in difficult situations. The IF Shift capability of this receiver combined with its stability and its 1 Hertz tuning steps make ECSS a very useful mode.

Memories

There are 1000 memories available to this receiver via files on your PC. Each memory retains all receiver settings, including IF shift position, volume level and so forth. With my laptop, recalling memories was very quick, which could allow one to monitor parallel frequencies, if one didn't have to also retune an antenna preselector. The fast serial port may the secret of this quick recall; I couldn't find what was the effect of a slower computer as I was never successful in loading the original control program on a Win 3.1 486DX100 machine.

Conclusions

Perhaps the IC-PCR1000 suffers from being designed with such a wide frequency capability along with a relatively low price, because design compromises have been made, particularly in the front end. Its VHF/UHF/scanning capabilities were not reviewed here, and may appeal to aficionados of those

Its weak front end means that it is difficult to use it as a medium wave receiver without the aid of some sort of antenna tuning to knock down stronger off-channel signals, and such tuning needs to be pretty sharp when listening next to a strong station's channel. In an urban area, if one doesn't use a tuner, the signal from a broadband antenna will have to be attenuated so severely as to make the receiver incapable of receiving DX.

The PCR1000 has effective software to which the radio is very responsive due to its fast serial link, but software does not make a radio. If one's DX interests are limited to LW, MW and tropical bands, a Ten-Tec RX-320 would be a better introduction to "black box" PC controlled receivers, as well as being somewhat less expensive.

(There are various links which can give one a better idea of tools and resources available for the PCR1000, including http://qsy.to/pcr and
http://geophysics.ou.edu/ahern/home/pcr1000/

http://www.strongsignals.net/access/reviews/reviews.cgi?type=display&rtype=rev&class=recv01&num=7 contains an extensive review, with a lot of operational details, but even though the author liked it for shortwave, he was using a 20' wire antenna and comparing it slightly unfavorably with a portable Sangean ATS-909 using its own whip.)

Finally, thanks to the Victoria branch of the British Columbia Provincial Emergency Program for the loan of its IC-PCR1000 for this review.