The Receiving Side of the Icom IC-7000

By Jim Clarke, NR2G

The IC-7000 is a mobile amateur radio transceiver covering 30 kHz to 199.999 MHz, and 400 to 470 MHz in AM, FM, WFM, USB, LSB, CW, and RTTY modes.

First Thoughts and Impressions

In the May 2005 issue of *MT*, where I reviewed the Icom IC-746Pro, I made reference to an animated discussion where I tried to hold the position that the number of people purchasing amateur radio transceivers just to be used as communications receivers was very small, or non-existent. While I don't believe we can accurately quantify either of our positions, I think the stage is certainly being set for such a paradigm to take form.

While doing this review, I did a quick check of the communications receivers that are offered – those over $900 – and found that most of them are many years old; the majority of these receivers have little or no DSP (digital signal processing) capabilities.

I don't see the big players such as Icom, Yaesu, Kenwood, etc., coming out with new communications receivers anytime soon. However, their amateur transceivers have excellent receivers with flexible DSP filtering and many "bells and whistles" that actually help signal reception, as opposed to just providing knobs to twiddle. Thankfully, these new features are starting to trickle down from the "big rigs" into the smaller "mobile rigs," and hopefully soon, into "portable rigs."

Case in point: the new Icom IC-7000. After experiencing the performance of my IC-756ProIII for a year, I was anxious to see how the new 7000 would stack up. Because Icom touted the ProIII as containing many of the performance producing components used in the nearly $11 thousand dollar IC-7800, I was curious to see how much of the ProIII would make it into the less-expensive 7000.

What I found was that the 7000 has some things I like over the ProIII, and some things I don't like as much as the ProIII. That may seem logical to many, but, typically, as you go down in the tiers of a radio manufacturer's product line, the majority of features are downgraded, with the rest staying the same, not being upgraded; that's where I see the difference in the 7000.

No, the 7000 doesn't perform as well as the ProIII, but they have made some excellent improvements in feature operation that I found a pleasant surprise. It's encouraging to see continued improvements in operator interfaces as manufacturers deal with an increasing number of features and options that are implemented through the radio's software. It's not enough to just add more and more, while providing switches and knobs to enable, disable, and adjust – it requires an understanding of how these features will be used and designing their controls accordingly.

Ergonomics

The 7000 measures in at about 6.5"W X 2.25"H X 7"D, with a nice 2.5" (diagonal) color LCD front-panel display. The front panel is also occupied by two pairs of concentric knobs, a 1.75" diameter tuning knob with a spinning finger dimple, 14 flush-faced buttons, and three discreet buttons. There is a small speaker in the top cover and a bottom-front fold-down bail-wire providing about 1" of front-panel tilt. The rear panel holds two antenna jacks – one for HF/50 MHz, and the other for 144/430/440 MHz – as well as microphone, power, external speaker, and others.

Icom decided to place four fixed-use function buttons on each side of the display, with a menu-key defined row of four buttons at the bottom. I think they could have gone one step further and allowed the user to define which functions are assigned to those buttons, depending on which menu-key group is selected.

I believe some additional comments on the tuning knob are in order. While many of the amateur radio manufacturers include a mechanism for providing friction – and hence resistance – to its rotation, Icom has embellished on the idea by providing a lever (to the right of the knob) that has four positions: minimum, medium, maximum, and detented. The first three positions provide progressively increased degrees of resistance to smooth rotation, and the fourth switches from smooth to detented rotation. While tuning through the shortwave broadcast bands, I preferred the detented setting, as it allowed me to move quickly, stopping precisely on each 5 kHz channel to listen for an English language station.

The front-panel can be disconnected from the radio, allowing remote operation from up to either 11 or 16 feet away, depending on which optional cable is purchased.

Tuning

While the 7000 doesn't have a numeric keypad on the front-panel for frequency entry, there is one on the microphone – kind of a remote keypad. The front panel does have a button, though, that switches between fast or slow tuning rates. The slow tuning rate is a function of what the user has set for the step size, and the fast is 1 MHz.

There are four scanning options available: programmed scan, memory scan, selected-memory scan, and priority watch. Programmed scan sweeps from one defined frequency to another, or visa versa. Memory scan checks all memories, while selected-memory scan checks only those specified by the user. Priority watch checks for signals on an operator-designated memory channel. Scan initiation can be set for a squelch-open condition, or squelch-closed condition; resuming scan after a signal is detected can be enabled or disabled.

Filtering

This is one of the things that I love most about the 7000 – the DSP filters. No more determining which filters you want to order, or how many the radio can hold – Icom has included 41 passband widths for SSB, 32 for RTTY, 50 for AM, 3 for FM, and 1 for WFM! Combine these bandwidths with twin passband tuning and there shouldn't be many, if any, situations where one of the combinations won't give you the desired signal rejection you're

Mode	Passband width range
SSB	50–500Hz; 50Hz step 600Hz–3.6kHz; 100Hz step
CW	50–500Hz; 50Hz step 600Hz–3.6kHz; 100Hz step
RTTY	50–500Hz; 50Hz step 600Hz–2.7kHz; 100Hz step
AM	200Hz–10kHz; 200Hz step
FM	7/10/15kHz; fixed step
WFM	280kHz; fixed

Sensitivity (Pre-amp: ON)				
	0.5-1.8MHz	1.8-29.9MHz	50-54MHz	144/440MHz
SSB/CW	—	0.15μV	0.12μV	0.11μV
AM	4.0μV	2.0μV	1.0μV	1.0μV
FM	—	0.5μV(28-29.7)	0.25μV	0.18μV
WFM	—	—	10.0μV (76-108MHz)	

SSB/CW, AM : 10dB S/N, FM, WFM : 12dB SINAD

looking for. According to the brochure, it's the incorporation of twin DSP chips that provide the horsepower to accomplish the task. See Figure 1 for more filter details.

As you're adjusting the filter widths and positions in the passband, the 7000 shows a small graphic to help you see just what those changes are doing to the IF.

Another bonus of the advanced DSP used in the IF is the elimination of the typical problems encountered with the AGC, no more "pumping" or "blocking." And speaking of AGC, there are the typical Fast, Medium, Slow, and Manual settings, but the operator also has the ability to modify each of the three level's time constants.

❖ Other Anti-Interference Tools

On top of the filter flexibility, the 7000 has an automatic notch filter capable of tracking up to three moving tones. If that's not enough, there are two (yes, *two*) manual notches. The operator can control the frequency of each notch, the width of each notch, and whether or not each of the notches is active. Talk about flexibility!

Noise reduction is commonly found in DSP equipped radios, and the 7000 is no exception. With 15 levels of reduction, I found this feature – coupled with proper use of the attenuator – very useful in reducing background noise caused by summertime lightning storms, as well as the noise commonly heard even on quiet days.

If pulse-type noise is your problem, the noise blanker in the 7000 allows a blanking-level adjustment from 1% to 100% and also provides control over the width of the blanking.

❖ Cool Stuff

Something I'm certainly not used to seeing on a radio is a video-output jack. Yup, you can go down to your local electronics gadget store, pick up an automobile head-rest monitor, and plug it into the back of the 7000 to increase your display size to whatever you can afford. I personally have not tried it, but I would imagine that, due to the resolution, there is a practical limit to the size of the screen you can employ. However, at least to some point, it should provide an improvement over the small – albeit clean and clear – front-panel screen.

If you're into "watching" signal activity, you'll enjoy the band scope in the 7000 which can be set to display either "fixed mode" or "center mode." In "fixed mode," signals within a specified frequency range are displayed; in "center mode," signals surrounding the displayed frequency are shown. The band scope does cause some audio disruption, but by changing settings the disruption can be minimized. Icom provides a decent range of flexibility for a band scope on a radio with a small display.

How many times have you wished you had a recorder hooked up to your radio when you intercepted a signal you'd like to play back later? Well, according to Icom, the 7000 can record up to 25 minutes of incoming audio with the touch of a button.

Ever wonder what Hams are sending back and forth using RTTY? Now you have a built-in decoder so you can eavesdrop and have the decoded text print to the screen. Unfortunately, Icom locks the decoder settings at a mark of 2125 Hz, a shift of 170 Hz, and 45 bits per second.

❖ How Does It Play?

Well, where do I start? This is a great little radio. The majority of my listening was on HF, but I did "take it for a spin" on the other bands.

Let's start in radio's "basement," 30 kHz to 500 kHz. I found sensitivity to be quite usable, with all of the usual beacons being heard. The noise blanker worked very well on some local fluorescent-light type interference. Surprisingly, the preamp is available in this frequency range, though I didn't use it.

I've tended in the past to skip too quickly over AM broadcast reception. While I'm not a broadcast band DXer, it seems to me the 7000 provides very good performance on the AM band. The 4 uV sensitivity filled the band with signals, and the 9 kHz filter provided excellent audio with virtually no increase in adjacent channel interference. In fact, I could tune to 904 kHz and clearly hear the top-end of one channel, then go up to 906 kHz and clearly hear the low-end of the next-higher channel.

I would have to say that this radio is second only to my 756ProIII, at least with respect to the selection of radios that I have had the pleasure of using. Apart from size, I think it may actually be a better value than the 746Pro, which, until now, I had considered to be the best radio for the money on the market today. I love the DSP filter/passband flexibility, and find the noise blanker, noise reduction, and notches very useful tools in the crowded HF bands.

The audio is clear, but I did notice what seemed to be a little too much audio on the high side – on all bands, not just on HF. Maybe it's just me, or the fact that I like using as wide a filter as possible, but there was a high frequency element of the audio that took some getting used to. FM broadcast stations are heard just fine, but this is probably not the radio to be using if you are an audiophile. However, if you are looking for a little background music while you're typing out your article for *MT*, it certainly "fits the bill."

Television audio was clearly heard, as well as fire dispatchers, Ham repeaters and so on. It's too bad Icom didn't make this radio receive continuously from 30 kHz to 470 MHz, or even better to, say, 1300 MHz – now that would be a nice little mobile.

❖ Final Thoughts

At $1500, this is an expensive mobile, but I would prefer to refer to it as a mini-base. I believe the feature/performance mix to be excellent, with the user interface much better than many I've seen in the past.

There is so much more to this radio than I've been able to describe here, there's just not enough space. If you want to learn more, go to the Icom website at **www.icomamerica.com** and download the instruction manual, and give it a read. If you're thinking of getting a new radio – to use as just a communications receiver or for Amateur Radio use – I think you'll find this little radio very worthy of consideration.