

The ICOM IC-7000

A short review by Fred Lloyd, AA7BQ

Since I have the pleasure of being one of the first 100 or so folks in the US to get the new IC-7000 I wanted take an the opportunity to share my initial impressions with the QRZ community.

By now you've probably heard of the radio which some would describe as the successor to the IC-706MKIIG. The comparisons are easy to make at first glance but in many ways it may be more like the IC-756 PRO series radios, or perhaps a bit of both. There's no denying on any account that it's a dynamite package with big league operating features.

In this review I'll take a practical look at the radio from an experienced user's point of view. Since I don't have a spectrum analyzer or the types of gear needed to do a scientific review, I'll leave that part of it up to the ARRL labs.



First, a bit about myself. I've been involved in electronics and computers for about 30 years. I've been a ham since 1987 and my first radio was a Kenwood TS-820. Over the years I've owned quite a few different HF rigs including Galaxy's, Swans, plus a variety of modern, solid state rigs including the TS-440, TS-940, TS-850, TS-570, TS-480, IC-706, IC-735, IC-761, IC-765, FT-920, plus a few others that I can't recall at the moment. My favorite radio for look and feel was the IC-765, and for performance it has been a toss up between several of them.

Just last week I sold my TS-480SAT (which incidentally was a great radio) as I scraped together the cash (about \$1500) to buy the IC-7000.

Now, back to the IC-7000. Let's face it, from a distance it looks exactly like an IC-706 with a color screen. It's about the same size (a little smaller, actually), and has the main tuning knob on the right just like it's older sibling. It also covers HF/50/144/440 just like the IC-706MKIIG. That said, we can stop comparing the two.

The '7000 has capabilities and features that only a decade's worth of technology can account for, and performance which will probably put a lot of other radios to shame.



First Impressions

Obviously, the color display is big news. ICOM introduced the first color TFT display in an HF rig with the 756PRO and now with the IC-7800.

Yaesu has it in their flagship FT-9000D and Kenwood has, well, nothing. Kenwood is so far behind the technology curve right now that they may well be on the verge of abandoning the amateur radio market.

Unlike most HF radios, the IC-7000's screen is a true video display.

The capabilities of the display are not limited to any specific character set or presentation but instead are controlled by the radio's software. It shouldn't be all that surprising really as this type of small-screen presentation has been available for several years now on your typical cell phone at dirt cheap prices.



When I first looked at the 7000, I was a little shocked at the size of the screen. It measures only 2.5 inches diagonal which is noticeably smaller than the IC-706's antique LCD display.

Some of the characters are very small, smaller than typical newspaper print. Despite this, however, they are extremely sharp and clear. Not a hint of fuzziness or video artifacts but

more like the crisp display of Palm Pilot or cell phone.

Interestingly, the 7000 has a composite video output jack on the rear that can be fed into any standard TV. I saw a Japanese website where someone had mounted one in a car and attached one of those wildly popular 7-inch in-car DVD screens to it. Feeling like I could possibly get an IC-756 PRO III for the cost of a small screen, I hurried down to Fry's Electronics and picked up a 6-inch "headrest monitor" for \$123.

With it's simple 12 volt hookup and single video connector it was a snap to hook up.

I found the results of the external monitor to be a bit of a disappointment. Since the external video output is analog and not digital (as the 7000's internal screen surely is), there were some video artifacts such as some light ghosting/smearing plus some difficulties setting the color and contrast. The biggest shock, however, was the loss of apparent detail. The resolution of the internal screen is very small, perhaps on the order of 320x160 (actual numbers not yet known), and when they're blown up onto a larger screen, the characters look a bit choppy and staircased.

Wondering if this was a product of the cheap 6 inch external display, I then hooked up the 7000's video output to a regular 20" television set. The results were the same except that there was some horizontal overscan. Fortunately, there was a menu setting that corrected the overscan, a nice touch from ICOM.

For the past two days I've been using just the built in 2.5 inch screen and have left the external display disconnected. I'm happy to report that my initial fears were unfounded. Due to the uncompromising clarity of the little screen, I'm having no real trouble reading it even with my 52 year old eyes and bifocal lenses. I can say that I'm happy with it as-is. Forget the external display except when your vision is very bad, or, you're looking to show off the radio to a crowd.

Ever since the radio debuted in Dayton 2005, we've all been told of it's ability to receive and display standard broadcast TV. We've seen pictures of it doing this in Japan. Lo and behold, however, the FCC nixed the idea and when the final approval was granted, it was minus the TV receive capability. Rumor has it that this will be restorable via a diode mod but so far nobody has spilled the beans on it. The mods website www.mods.dk has been listing an extended receive mod for

the IC-7000 for about a month now but there is no description at all as to what exactly the mod accomplishes. I elected not to do the mod from www.mods.dk lacking more info and waiting to hear from others who may be braver than me.

Perhaps the "extended receive" mod makes the radio work in the 200-400 mhz range, which is completely blocked out for some unexplained reason. TV audio can be heard in the low band (54-88 mhz) and part of the high band (175-199 mhz) using the wideband FM mode. You can hear the video as well so its clear that at least the lower 13 channels should be receivable.

To be fair, broadcast TV reception is a gee-whiz feature that doesn't have a lot to do with ham radio, except perhaps for a few isolated cases. The same can't be said for ATV, however, and there doesn't seem to be a good reason why it was disabled too.

The FCC's rationale for inhibiting TV was based on the perceived danger of people watching it while driving their cars. Sure, it could happen, I suppose, but that idea sure hasn't stopped the raft of in-dash CD/DVD players with the flip-up screens that the consumer world so enjoys.

Sure, there are state laws which prohibit its use, but it doesn't prohibit the manufacturers from selling car stereo equipment that has this capability. Why do they think hams are any less responsible? I suppose they do it because they can, and because unlike mass consumers, we're subservient to their wishes.

The Out of Box Experience (a.k.a. the OOBEx)

Unpacking and hooking up the radio was a no-brainer with no surprises.

Two things I noted about the rear were that first, there are two antenna connectors, one labeled Ant-1 and the other, not surprisingly, Ant-2. To me, this meant that the system had an A/B antenna switching capability, much like my TS-480 had.

Not so. Although it's not marked on the unit, Ant-1 is for HF (160 thru 6 meters) and Ant-2 is for VHF (54 mhz) and above.

The other oddity was that there are four 3.5 mm accessory jacks on the back, none of which are labeled! After holding the radio up to the light for several moments I finally noticed that there is a label on the bottom of the unit that identifies the mystery holes as well as the serial number and FCC ID of the unit.

That said, I think that I was able to get "basic" functionality out of the unit before I cracked open the 150+ page manual but had I insisted on sticking with that strategy I would have missed a great deal of what the rig had to offer.

Speaking of the manual, my first recommendation is to go to the ICOM website and download the PDF version. With the newest free Adobe reader, you can search the entire manual for key words which is much faster than endless thumbing back and forth looking for subjects of interest.

The second thing about the manual that I find odd is that unlike most rigs, this one comes without a schematic. There is not one shred of info about the internal workings of the radio, something that at least Kenwood gives with every rig. I can't remember if the other ICOM rigs include a schematic but one would have been nice to have with this one. I suppose I'll have to wait for the service manual to come out in order to get a peek.

Immediately upon unpacking the unit I took notice of its weight. There's a lot of stuff packed in this little box and it has the kind of heft that folks used to use to judge cameras. Good, expensive ones were always heavier than the cheap, plastic

imitations. This box feels like a solid brick which gave me the warm satisfying feeling that it might well be worth the \$1500 that I paid for it.

So just how packed is it? Well, for starters, there aren't any options, none. Filters? None. TCXO? Built-in. Speech synthesizer? Built-in. Voice recorder? Built-in. Memory keyer? Built-in. This is a fully loaded rig containing all the desirable options right from the factory. I like it. On my TS-480 I suffered the indignity of adding the voice recorder/speech synthesizer option which cost too much money. It was especially frustrating to note that the option was about the size of a postage stamp and it contained one big integrated circuit and a connector.

Kudos to ICOM for doing away with this insulting practice and for raising the bar on minimum transceiver standards by including the \$2 chip right on the motherboard!

Getting My Feet Wet

Turning on the new radio, you first see the ICOM logo and then a notice that RF power is set at 100%. The initial operating frequency is 14.100 mhz, USB. A turn of the knob and yep, there's activity on the band. Being a technocrat, however, I wanted to see what the radio would DO, not what was happening on the bands so I started wildly pushing buttons and

flipping through menus. Wow! What an assortment of things to look at. It's hard to begin and impossible to recall exactly which buttons I pressed in what order except to say that I spent a good 30 minutes just marveling over it.

The total number of features is hard to describe. Needless to say, most front panel buttons have multiple, context sensitive functions and some use abbreviations that aren't immediately apparent. It was beginning to look like some manual reading would be in my future.



A really big discovery was the microphone. It's not your typical mic as it has 25 buttons not including the PTT switch. It is most

useful

in that it gives you one-button access to a lot of features that take multiple presses on the radio's front panel. I really like the one button band selectors, the quick access to the Filter menu, and the two programmable buttons that can be set to do whatever. I can imagine that some enterprising soul will invent an external control panel that duplicates these features. This would be especially true for base station use where a different microphone (having no buttons) might be connected.

The basic menu idea follows what has become a standard of sorts in a lot of rigs lately. If a button has a label, pressing it activates that function. Press and hold the same button and you're taken to a menu where you can adjust the feature. While this strategy isn't necessarily followed on all functions, it is the basic idea and one that helps you understand what to expect when pushing buttons. Don't worry, if you're wrong or if the button has no meaning in the current mode context, the radio will issue a beep sound and nothing happens.

An example of this is the mode button. Each time you press it the operating mode changes to the next mode, for example CW -> RTTY -> FM -> LSB. If LSB is currently selected, pressing and holding it changes to USB. If FM is selected, pressing and

holding changes to AM, or to WFM (wideband FM). It's not that different from a lot of other radios and easy enough to get used to. One button is oddly labeled in my opinion. The legend says P.AMP which without thinking reminded me of Power Amp.

Actually, it's the receiver preamp button. I would have labeled it PRE instead. Press once to engage the preamp, hold it down for 1 second and it engages the Attenuator.

The DSP functions are some of the best I've ever seen. The radio has two DSP chips but the documentation doesn't indicate how their tasks are divided. One can only guess that perhaps one is for transmit and one for receive, but until someone sees a block diagram, no one will know. There are four noise reduction features: a Noise Blanker (NB), a Noise Reducer (NR), a Manual Notch Filter (MNF), and an Automatic Notch Filter (ANF).

NB is the typical ignition-type noise blanker. It was hard to find a test signal but I could tell it was engaged when I listened to the 80 meter band. Like all of the DSP features, this one is adjustable by holding down the NB button for more than one second. A pop-up window will show the current level and you use the main tuning knob to adjust. The NR is great, and it is also adjustable. It really improves 80 meter operations. The

MNF is a really useful feature. It is actually a dual notch filter and when it is engaged you have two independently adjustable notches. Adjusting them is easy with a little graphic that slides left and right across a small scale. The ANF is the automatic notch and it works well to suppress heterodynes. It is not enabled in CW mode, where the MNF is typically used.

The DSP is also responsible for an elaborate dual passband filter with adjustable width and center frequency. Adjusting it is similar to the IC-756PRO and it gives a nice graphic to see the two pass bands. The two bands are represented by graphics that have different colors and a third color shows the intersection of the two. For SSB the pass band filters have three default settings of 3.6 khz, 2.4 khz, and 1.8 khz, all of which sound good. By pressing a button, you can customize any of these three filters to be as wide as 3.6 khz all the way down to 50 hz. Cool. The available filter widths vary by operating mode to values that are sensible for that mode. There is also a SOFT/SHARP selection for each filter that selects the filter shape. My gut feeling is that we won't be missing crystal filters with all of this adjustability.



The radio has a nice RTTY decoder function with a built-in waterfall display. I've never seen an easier RTTY decoder to operate. The waterfall shows up in blue and makes for a pleasing presentation. This isn't a feature that is immediately obvious, however, and one that I had to crack the manual to figure out how to use. One comment about it, however, is that it is receive-only. In other words, it has no built-in tone generator (which would have been easy) and no way to send RTTY except by using a traditional external source. RTTY can be sent either FSK or AFSK and the manual documents the hookups well.



A lot of us get really excited about the notion of a band scope. The scope on the IC-756 PROIII is a prime example, and the scope on the IC-7800 is legendary having a dedicated DSP unit just for that function. The IC-7000's band scope is nice but it won't compare to either of its big brothers. The reason has to do with the fact that a) there isn't a lot of space on the screen to display it and b) it doesn't have a dedicated

DSP chip. When you're using it, the audio cuts out with the regularity of a square wave as the chip samples the IF stream. The sampling speed is adjustable, i.e. FAST and SLOW, and in the slow mode you can still understand what folks are saying.

In the FAST mode, you pretty much give up receive while it updates the display. Still, it's pretty usable and the adjustable bandwidths are nice. It's also easy to tune to a peak to see what's really happening around you.

The CW keyer is pretty fabulous too. It stores up to 4 messages and has an auto increment feature for contests. To program a message, you turn the main dial to select characters to send. Oddly, however, there is no CW decoder which should have been a no-brainer with the on board DSP.

The radio has more memory channels than I will ever use, and I suspect few will exhaust it. A super cool feature is the ability to tag every memory location with a name, and a scrollable list to choose from them.

Room for Improvement

Despite my unabashed love for this new radio, I can still find a few areas where the rig could be made even more spectacular:

First, it's time for the manufacturers to jump on the USB

bandwagon. The interface circuitry for USB is very cheap and there should be no reason that it cannot be added to the typical rig. There is so much that could be done with USB 2.0 including full audio I/O, remote control, accessories, and more. CV-I is nothing more than old fashioned serial data converted from RS-232 to 5V TTL. Stick a fork in this protocol because it's done. In addition, how about Bluetooth? Wouldn't it be cool to attach a wireless Bluetooth keyboard or headset to the unit?

The ability to send CW and RTTY via a keyboard would have been an easy add-on if USB had been implemented. The processing power is certainly there.

Finally, there's the clock. I like the little time display but am left wondering why ICOM went through all the trouble to include a 2nd clock with offset from Clock 1 when only one of the two clocks can be displayed at any time. It would have been nice to see both clocks on the display, such as local and UTC. As it is, its one or the other.



ICOM makes two separation cables for this unit, which are new part numbers for this radio. One is 3M and one is 5M in length. Both are outrageously expensive (About \$80) and the 5M wire costs \$20 more than the 3M wire. Why? I can't help but feel that I'm being raked over the coals on this inconsequential part. To top it off, the connector is so unique that there's virtually no possibility that an after-market third party offering will emerge. Hat's off to Kenwood on their TS-480 for using standard RJxx connectors in this area. To be fair to ICOM, an RJ-45 wouldn't have worked because the radio needs 10 contacts instead of the 8 afforded by the wildly popular telephone / Ethernet /

microphone connector.

The main tuning knob has a detent lever much like the IC-706 that is used to adjust the drag feel. There are 4 settings, Channel, hard, medium, and no drag. My complaint here is that the lever is difficult to move and the detent's aren't as positive as they should be.

The Tune button doesn't work for my tuner, the SGC-230.

ICOM wants me to buy their inferior AH-2 or AH-4 which I don't care for. I suppose I'll have to get one of those little plugs that some guys are selling on eBay to trick the radio into thinking an ICOM tuner is attached. All I need is a few watts of CW out while I'm pushing the button. Of course, whistling into the microphone will do it too, but I can't help but feel like a CB'er when I do this. For that reason I usually end up switching to CW or RTTY for my tune ups, even though I could just key up and start talking, as the SGC can handle it.

More to Come

I don't yet have a VHF/UHF antenna setup but there's a brand new Diamond dual band stick in my garage. I'm looking forward to trying it out on both FM and sideband, realizing the limitations of not using a Yagi. Still, I expect to have a lot of fun once I get the antenna up on the roof. Speaking of antennas, my HF

setup includes an SGC-230 at the end of about 100' of 9913 coax. This the tuner feeds a 100 foot wire that is about 25 feet above the ground at its highest point. I'm able to tune everything from 160 through 10 meters with this, and the noise level is pretty decent. I don't miss not having an internal automatic antenna tuner and for my money, an external remote tuner is the best in nearly every longwire situation.

Having only owned the radio for 4 days, and not having as much time to spend as I'd wish, I have just barely cracked the surface of what it's capable of doing. I hope to have more to report in the coming weeks.



The Bottom Line

This is one of the most exciting radios I've come across in a while. It delivers performance and features like none other that I've owned. It would be very interesting to see how it competes with the IC-756 PRO III, or the IC-746 PRO. Without the test equipment to prove it, I have a gut feeling that it's going to hold its own in most areas, and surpass in some others.

ICOM should do well with this radio and they have clearly set the new standard for features and usability across a broad product range. Kenwood is left the farthest back in the dust with no top end radio and only a mediocre midrange rig (the TS-

2000). Yaesu is doing quite well with the FT-9000D but they seriously need to produce a competitor to the IC-756 if they're going to expand their market share. The FT1000MPMKV Field is nice, but it doesn't get really nice until you pump a boatload of expensive filters into it. Ditto for the MKV as well. Until Yaesu and Kenwood really jump into the LCD digital display and DSP arena like ICOM has done, they're going to stay in second and third place in the mainstream radio technology race. ICOM clearly wins this round and they are the force to be reckoned with.

Fred Lloyd, AA7BQ

Additional Comments Dec 8, 2005

After some more operating and various emails, I've collected a few more observations that I'd like to share.

The Band Scope

The band scope is much more useful than I first gave it credit for. Last night I set the receiver to the UHF public service band with a scope BW set to 250 khz, channel spacing at 12.5 khz.

Wow! I let it run there for about 30 seconds and I had peaks

popping up everywhere, places that would be easy to miss on a squelch scan. Upon pressing the HOLD key, I could turn the tuning knob directly to any of the peaks and see what was going on at the particular frequency. I'm also using it frequently on HF as well where it does what you'd expect it to do: it finds areas of activity. While it is too bad that it doesn't have a dedicated circuit of its own, it's still a very nice feature and one that I'll be using a lot.

Frequency Changing During Transmit

This rumor is true. None of the front panel buttons, or the mic buttons, seem to be disabled while you're transmitting. I found it easy to accidentally change the operating frequency, or BAND, while talking. I hope this gets fixed with a firmware update. No wonder the DTMF doesn't work from the microphone keypad. When you press any of these buttons with the PTT depressed, it does a band change. The LOCK function helps to keep the main tuning knob from affecting your operating frequency, but it doesn't prevent a band change.

Worse, when the radio switches bands while transmitting, it comes up on the new band also transmitting, at whatever frequency was in the band stacking register. Ouch! While this is bad behavior, it is something that can be avoided with due care by the operator.

I received the following operating tip from a friend at ICOM who has a suggestion about CW operating:

Quote

In CW mode, select a filter setting that you prefer, then select the MNF. Using the MNFs in the narrow setting, bring one Notch Filter just below the signal and one just above the signal. Tweaking these filters to find the "Sweet Spot" will cause the signal to pop out of the noise. Then push the MNF buttons to turn off the filter, and you will be amazed at the noise that is removed.

Watch this space for more updates as I discover them.

TV Receive Capability

A mod to restore the TV receive capability has surfaced and some hams have already got it working.

-fred
