The ICOM IC-7300 160m - 4m Software Defined Radio (SDR) transceiver.

********** Script of my piece on ICQPodcast **********

Hi and welcome to this review for ICQPodcast of the hot item all have been talking about for the last couple of months. The new software defined HF radio from ICOM, the IC-7300.

This audio review cannot show you the rig and all of its features however there are many videos and technical documents on the Internet that can. Simply search in your favourite search engine for IC-7300.

My review is about how and why I chose to buy this rig and what my initial thoughts about it are.

I bought this rig myself, it was not supplied to me by ICOM or an ICOM dealer to review. As is the case with all equipment described on ICQPodcast we buy the equipment outright and reserve the right to give our honest opinion of the equipment, without having to consider how a dealer might feel about a review.

About five years ago, I returned to the Amateur Radio hobby, having been away from it for over 35 years. I was based in Australia and came back to find my Class B UK licence, RAE exam pass certificate qualified me for a full licence as no Morse test was needed any longer. This meant that I was able to consider operating on the HF bands as well as the VHF bands.

After looking around at rigs, I decided to buy an 18 month old Kenwood TS-2000 “shack in a box” from an Australian dealer. I had also considered the Yaesu FT857D but decided on the larger, easier to read TS-2000 layout. When operating in the UK many years earlier I had bought three ICOM rigs as they were good value at the time compared to other makes. When I looked at ICOM five years ago, I saw what were, in my opinion, rigs that were too expensive compared to Yaesu or Kenwood.

Five years have passed and I am now back in Europe and finding that I operate nearly all the time on the HF bands and that the over 15 year old design of the TS-2000's receiver is nowhere near as sensitive as more modern rigs, especially when trying to receive QRP stations on bands full of QRO stations.

I had used a friends SDR rig while in Australia and the receiver performance had impressed me, however how good an SDR radio was depended upon how good the PC it was attached to was. Specifically how good a sound card the PC had attached to it was. There were many interconnecting cables to multiple boxes to produce even just 10w of output. The idea of a rig that on it's own would not work did not appeal to me. So even the very good but rather expensive Flex

range of rigs would not fit my criteria. I found the Elecraft K3 also to be expensive and it doesn't take advantage of many SDR features.

I then heard about a new SDR rig coming out from ICOM, that operated without needing to be connected to a PC and my first thought was that it would be too expensive to consider as replacement for the Kenwood TS-2000. I heard that the US price was going to be around $1500 and my interest peaked however I waited first to see what the price in Europe was going to be. It's not unusual to find new rigs being sold in Europe at 50% or more above the US price. Then the prices came out and the UK price was the same as the US price with the price in Germany only a little more expensive.

Before placing an order, I went through all the specifications that were now appearing on-line and found that there were three main versions of the IC-7300 – one for Japan, one for the US and one for Europe, with some extra changes to meet some regulations in Spain and Italy. Further investigation showed that the European version would come with coverage of the 70MHz (4 metre) band, which the UK and several other European countries have and Germany has had for two test periods so far. Apart from the ICOM IC-7100, no other current rig from the major manufacturers covers 4 metres and its a band I am interesting in trying out. What I also found out was that the European model does not have the 60 metre (5MHz) band that the US model has (the US model doesn't have 4 metres).

I found this situation strange and wondered what would amateurs do in the UK where both bands are in use. So I contacted Martin Lynch & Sons and asked them this question and got an interesting answer. ICOM UK, who supply the UK dealers were re-enabling the 60 metre band in the European version of the IC-7300 for the UK market, so the UK version of the rig would have one more band than either the continental Europe or the US version. This news combined with the fact that the German dealers could not give me a delivery date for the rig, made up my mind and I placed an order with ML&S. Then started the wait – with an unusually high demand, ICOM were having difficulty in supplying enough IC-7300 rigs to meet the demand. I was told that the target would be the 10th or 11th of May for my rig to arrive with ML&S who would then courier it to me. Compliments to the guys at ML&S, they shipped my rig as predicted on the 11th and it arrived with me on Friday the 13th. of May (not an omen I hoped), just before the Whitsun long weekend.

So, what about the rig itself? As I said earlier I can only tell you which features I like – for full reviews or all features, I suggest you search YouTube where there are some very detailed videos on the IC-7300. The rig is FAR smaller than I expected. Even though I had the dimensions, how small the rig actually is amazed me when I unpacked it. I'm not saying it's to small, the knobs are adequately sized and many controls are executed via the touch screen in any case. I am thinking of the IC-7300 as base station, but it could also be used in a mobile installation without any size issues I think. The unit is a mixture of conventional controls and that 4.3 inch LCD screen, that can present a spectrum scope and waterfall as well as an audio scope along with displaying the current frequency and which options are currently turned on. ICOM have included a RTTY decoder that can display to the screen in place of the scope displays unfortunately you cannot simply plug in a keyboard to make the unit a RTTY terminal. You can however store standard replies in the RTTY memories and select those to be transmitted in response to an incoming call. As the screen is quite “busy” with the RTTY decoding and tuning functions on the screen, ICOM supply a circuit diagram for you to make your own external keypad to send one of 4 memories. I have built one of these units and have included some pictures you can see in the show notes for this podcast at icqpodcast.com. That same external keypad can be used for sending pre-recorded voice or CW messages as well.

The combination of a waterfall display and the touch screen, make it possible to look at what is active on a band and where there is a peak, simply touch it and the rig will tune there. You can also tune there using the normal tuning knob. The important difference with the SDR type of radio when compared with a conventional radio is that the SDR listens to all signals across a band of frequencies, all at the same time, where a conventional receiver only receives on one specific frequency that it is tuned to. Being able to view a complete band, allows you to see where activity is in a quiet band and also the contrary, shows where a clear frequency is in a full band.

The inclusion of an SD Card slot in the front of the rig (you supply the SD Card up to 32 GB in size) brings several features, the most obvious one is that you can record the incoming transmission that you are listening to. You can also use the SD card to hold a screen short of what you can see on the spectrum or audio scopes. Those voice keyer messages for SSB, RTTY or CW are also stored on the SD Card, so it' worth getting a fairly large card. I bought a 16GB one, which seems to be more than adequate so far.

An advanced feature of the IC-7300 is the ability to display the SWR across a band as a bar graph. This is similar to what we would normally use an antenna analyser for, to see where our antenna is resonant but now this is built into the rig as another use of the SDRs capability to see a complete band not just one frequency. As with most current rigs the IC-7300 has a built in auto-ATU which can operate with antennas returning an SWR up to 3:1. If your antenna has an SWR greater than 3:1 and external ATU is recommended all though the IC-7300 can be set in an emergency mode where the power output is restricted but it will then operate into an SWR ratio greater than 3:1.

So far I have been very positive about this new rig, however some issues have been reported by other owners who have very strong local signals, either from nearby amateurs or from multi kilowatt broadcast stations overloading and desensitising the receiver front end. I am lucky and do not have any strong local RF signals but I can see how this might be a problem if the IC-7300 is to be used at a field day contest or on a DXPedition. Similarly priced conventional radios from other manufacturers do not have this problem, so hopefully ICOM can look into resolving this issue soon.

Here are some audio recordings of stations on SSB on 20m and 40m at differing strengths and with pile-up QRM and some QSB:

<< Audio clips were included here in the podcast >>

Those audio clips were made with the internal audio recording function of the IC-7300 and transferred to my PC by simply transferring the SD-Card.

My comparisons are made against my Kenwood TS-2000. Is the receiver in the IC-7300 better than the one in the TS-2000? Most definitely yes. From the moment I turned the rig on, signals were clearer and easier to listen to on the IC-7300. 15 years of receiver design improvements over the TS-2000 design are obvious. Is the transmit side of the IC-7300 better than the TS-2000 probably not. Using standard supplied microphones the Kenwood provides both a better quality audio as well as a more effective audio in noisy conditions. As I do not operate the TS-2000 just with the standard microphone but rather with a Leson dynamic microphone and a DF4ZS RF-Clipper RF speech processor, once this is moved over to the IC-7300, I expect to get the punchy audio advantage through the IC-7300 as well.

The TS-2000 has several features that the ICOM does not, such as a second independent receiver, a separate HF receive antenna input and four antenna connectors compared to only one. While the TS-2000 has VHF & UHF it can also operate as a cross-band repeater and be remote controlled from a Kenwood handy-talkie. Comparing only the HF side, the TS-2000 still has the separate receiver and three antenna connectors for HF (one receive only), so the ICOM is at a disadvantage here as it does cover HF & VHF (in the form of 6 and 4 metres) and I know of no multi-band antenna that covers that range. The ICOM will need to have some form of external antenna switching and I am looking at building a diplexer which will automatically route HF RF to my HF antenna and VHF RF to my combined 6m & 4m antenna. Others may prefer to put a manual antenna switch on the output of the IC-7300.

To be fair ICOM are selling the 7300 as an entry-level radio, so it is not surprising that it is missing some of these features but purely on a price basis, if you need a second HF receiver and more antenna sockets something like the Kenwood TS-590SG or the Yaesu FTDX1200 might suit your needs better.

I find the “Penny pinching” practised by ICOM in not including the case handle or mounting kit in

with the base rig as they used to, to be insulting, in fact given the quality of the supplied microphone, I'd have preferred they had excluded that and included the handle and mounting kit, rather than expecting the customer to buy these in addition and then not to have any in stock at the dealers!

Despite these small complaints, ICOM have produced a “game changer” in the IC-7300 and I look forward to see how Yaesu and Kenwood re-act. Perhaps they will also release SDR radios but for now I have my IC-7300 and am very happy with it.

Please refer to ICQPodcast.com show notes for my script of this section and additional information about how to select the non-standard bands, how to connect the IC-7300 to your PC to control it, and to operate digital modes through it and to control non-ICOM amplifiers.

I hope to talk to some of you on-air with the IC-7300 in the not too distant future.

73 'til next time - this is Ed DD5LP.

The following is extra information not included in the podcast audio file about how to find the "extra bands" and also how to connect the IC-7300 to your (windows) PC.

To select the extra bands from the standard ones, (i.e. 60 metres and 4 metres) the ICOM uses a "GENE" key in the “Band Stacking register screen”, which is what is displayed when you touch the MHz part of the frequency displayed on the screen. You then "cycle through" additional bands - in my unit this was 5MHz, 15MHz (receive only) and 70MHz. I'm not sure why the 15MHz band is there but I found an interesting Aviation weather forecast on 15.034 Upper Side band. You can also enter the specific frequency (and hence band) you wish to go to in the field at the top of the “Band Stacking register screen”

① *Frequency band codes*

Code	Freq. band	Frequency range (unit: MHz)
01	1.8	1.800000–1.999999
02	3.5	3.400000–4.099999
03	7	6.900000–7.499999
04	10	9.900000–10.499999
05	14	13.900000–14.499999
06	18	17.900000–18.499999
07	21	20.900000–21.499999
08	24	24.400000–25.099999
09	28	28.000000–29.999999
10	50	50.000000–54.000000
11	GENE	Other than above

BAND STACKING REGISTER screen

Remote control software

ICOM produce a product RS-BA1 that has both a server and a client component. In the larger models IC-7700, IC-7851 etc. the server component is built into the rig itself in the latest firmware but on the IC-7300 you need to use a PC next to the rig to run the server software for remote access over the internet.

In the UK the RS-BA1 software is only supplied when you buy the remote control dial knob product, the RC-28, in a combined package. In other countries the software is available separately so that you can simply use the keyboard and mouse/touchpad on the PC to control the IC-7300.

Current price for the RC-28 with the RS-BA1 software in the UK (from ML&S) is £ 269.94.

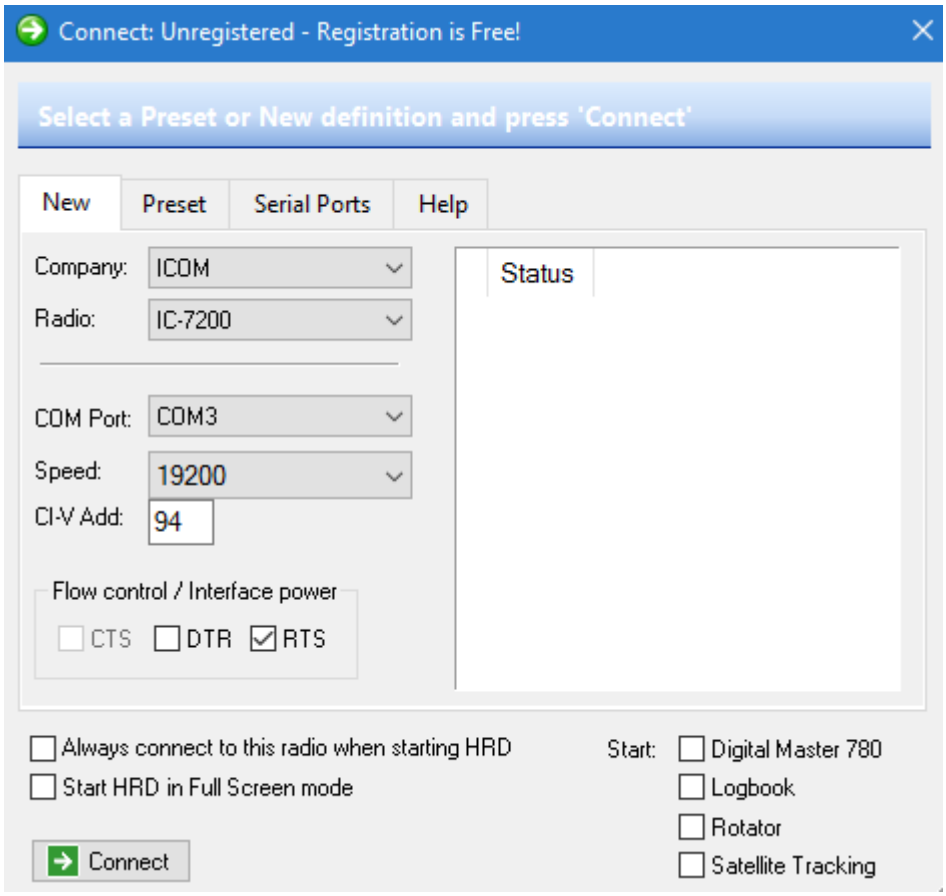
Current price for the RS-BA1 software in Germany (from Mimo) is € 79,90.

If you only want to control your rig from your PC in the shack you need to run a direct USB cable

from the IC-7300 to your PC. Then you can use other software than ICOMs - such as Ham Radio Deluxe (HRD) after installing the USB driver that is available from the ICOM website for free and connecting what is in fact a USB Printer cable (USB A to USB B connector lead) between your PC and the IC-7300.

The free (old) version 5 of HRD does not list the IC-7300 but if you select the IC-7200 and then set the CIV address to 94 it works fine with the radio. You will not get the Waterfall, Spectrum scope or Audio scope on your PC screen, only the ICOM software can do that (so far), but all other controls appear to work fine. The HRD software has an “IP Server” capability, so that remote control (controlling the HRD software) is possible with the appropriate connection configuration and software on a remote PC. I have not tested that capability as yet.

HRD connection configuration screen is shown below:



This control commands connection uses the serial port part of the USB connection. You will need to check in the device manger to see which com port has been assigned to the "Silicon Labs CP210x USB to UART bridge" under the **"Ports (COM & LPT)"** section, and then enter it on this screen (in my case it was COM3).

What should also have been installed when you plugged the cable in between the IC-7300 and the PC is the audio-link. Look under the **"Sound Video & Game Controllers"** section to check there is an entry entitled "USB Audio CODEC". This CODEC is the audio input and output from the IC-7300 that you can use with digital mode programs on your PC such as *Digital Master 780* for RTTY or PSK etc. (*DM780* comes within the HRD package), *MMSSTV* slow scan TV transmission and reception or *FreeDV* for HF digital voice transmissions, to name just a few.

These two devices remain visible even when you turn off the IC-7300 via its power switch (as long as there is still 12v on the rig), the reason being is that you can turn on the 7300 from the PC via the remote control.

What this all means, as is the case in most modern rigs, is that you DONT NEED any special interface boxes and cables between your rig and your PC any more. By having an audio "card" and serial port built into the transceiver all that is needed is a common USB printer cable to connect the transceiver to the PC.

Location to download free software mentioned above:

MMSSTV: http://www.qsl.net/kf6ypq/mmsstv.html

FreeDV: http://freedv.org

HRD (including DM780): http://www.iw5edi.com/software/ham-radio-deluxe-5-download-links

Connecting the IC-7300 to an external (non-ICOM) power amplifier.

ICOM provide two RCA/Phono sockets for an external amplifier's PTT and ALC connections but NOTE the PTT connection shorts to earth which is NOT what all amplifiers want. My RM Italy HLA300 wants two connections connecting together, not earthing. Some rigs, like my Kenwood have a remote socket that provides this capability but the ICOM does not, hence you need to have an external relay trigger by being earthed and its isolated contacts then turn on the amplifier. I have used a reed relay for this job as the current involved is low for its contacts and the current draw from the relay coil is minimal. As the reed relay is also very small it simply sits in the cord between the ICOM and the amplifier. The best way to power this relay and trigger it is to wire it to the 13 pin accessory socket on the ICOM as the phono socket provides not voltages on it. The ALC feedback from the linear can also be wired to this ACC socket if needed.

ICOM include a 13 pin plug with leads from each pin, if you are not happy soldering multiple contacts into a tight DIN plug, you can simply extend the required wires and cover the joins with heat-shrink wrapping. The colour coding of each wire to which pin it is connected is given in the IC-7300 basic manual.

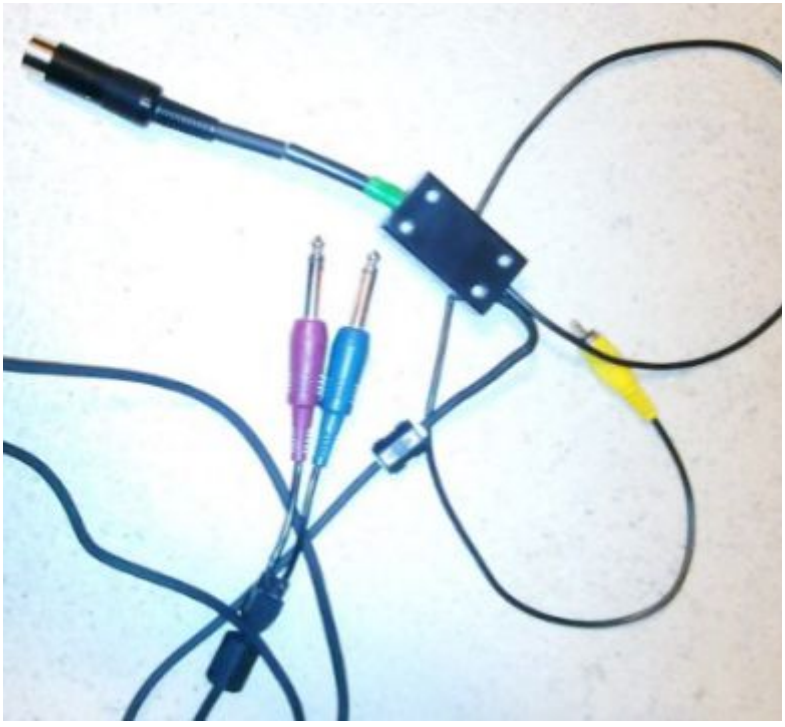


Illustration 1: Accessory socket cable splitting out to linear amplifier PTT line and audio output to a stereo monitor speaker

Here's a couple of photos of the external keypad box that I refer to in the podcast audio file.

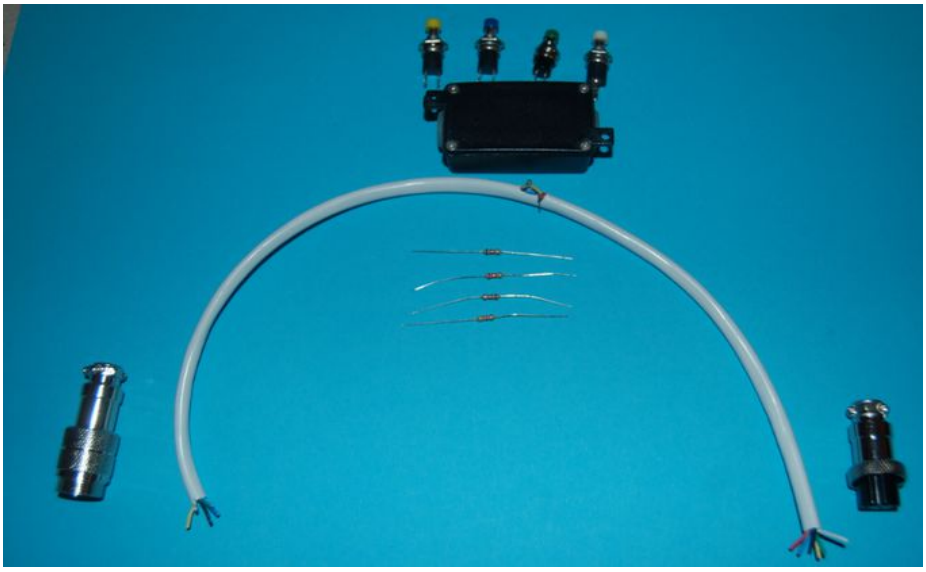


Illustration 2: Components laid out prior to assembly.

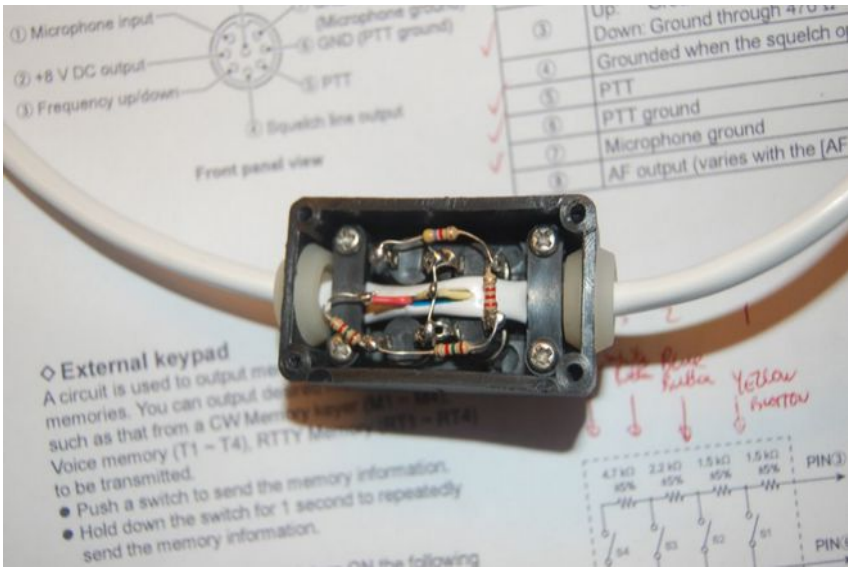


Illustration 3: Internal components soldered in

Illustration 4: Completed unit which, in my design, goes in-line in the microphone lead.

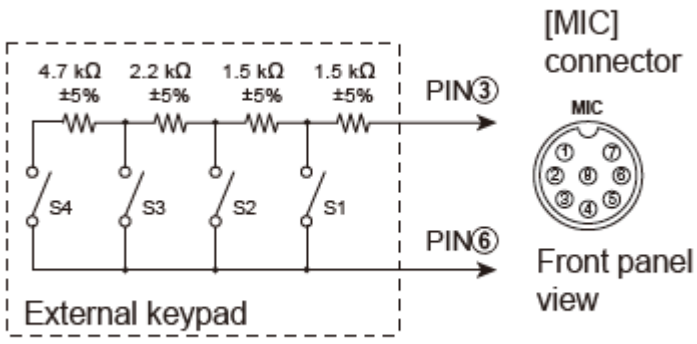


Illustration 5: External Keypad circuit diagram from ICOM manual

Note: When recording the voice key audio clips, (see chapter 7 in the full manual) you need to use the ICOM supplied microphone to make the recordings, other (e.g. better, Dynamic) microphones will not work with the recording software. Eight audio clips can be stored in the IC-7300 (onto the SD Card you supplied) but only the first four can be played using the external keypad.