

70 km north of Brisbane at an elevation of about 1000 ft with a good take off to ZL.

- ★ VK2ZAB runs 400 watts PEP to four 13 element Yagis from Berowra Heights, a northern suburb of Sydney. The antenna is about 750 ft ASL and the take-off to the east is good.
- ★ Coastal ducts had been observed in both VK2 and VK4 and ZLs were in contact with VK4 via a duct at the time the VK2/VK4 contact was made.
- ★ ZLs could not be heard at the time. This may be a red herring since they could be heard the next night at the time when VK4 was heard on the same strange bearing.

So what is the propagation mode? Ross VK2ZRU suggested an ionospheric "hot spot" out over the Pacific presumably giving rise to "backscatter". This idea seemed plausible at the time but after thinking about it I find that I cannot accept this idea because there was no sporadic E evident at the time, although it had been earlier in the day. The evidence of past observations would require that any hot spot form in the same place each time. An unlikely happening.

In my view all the facts suggest the presence of a large static reflector located in the Pacific Ocean at a bearing of 75 degrees east of north from my location and on a line from southern VK4 to ZL.

Such an object does exist, in the form of Lord Howe Island. Check your own map to verify.

Lord Howe is about 780 km from me and would not normally be illuminated by my signals. This would require a duct which was there at the time in question. It would also be illuminated by signals from VK4 in contact with ZL via a duct since it is on the way. Lord Howe is mountainous with large sheer rock faces. An ideal reflector and much bigger than an aeroplane.

So there's my theory, a Bistatic Radar type of reflector all over again, just like reflections from aircraft only much bigger. Curse me, but I simply cannot resist pointing out that there are no known active volcanos in the area either!

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EQUIPMENT REVIEW

ICOM IC-707 HF All Band Transceiver

Ron Fisher VK3OM

With the introduction of the IC-707, ICOM now has the largest range of HF transceivers on the market. The IC-707 is also the lowest priced HF transceiver in the ICOM range with a retail price of \$1867.

It is interesting to see that ICOM have chosen not to miniaturise their latest model to compete with Kenwood's TS-50S but to keep to the standard ICOM size that started with the IC-735 and continued through the IC-725/728 series. The 707 is, however, slightly lighter with a weight of 4.1 kg as against 4.6 kg for the 728 and 5 kg for the IC-735.

So, just what do you get and what don't you get in the IC-707? First off, you get a 100 watt output transceiver that covers all amateur bands up to 29.7 MHz. You also get a full general coverage receiver that tunes from 30 kHz to 30 MHz. Modes included as

standard are CW, USB & LSB and AM (both reception and transmission). FM can be included in the IC-707 by installing the optional UI-9 FM unit. One interesting feature of the transceiver is a front panel mounted speaker. Not a common thing in HF transceivers. I can think of only four others that have had front mounted speakers over the years. How many can you come up with? The answer is at the end of the review.

Next, you get two VFOs, and 32 memory channels, which include five split operation channels and two band scan limit frequencies. You also get ICOM's great band stacking register which brings you back to the same frequency you have used on each band. As is usual all memories are fully tunable so, in effect, you have 34 separate VFOs. You get a big, bright multi-function LCD display



Operator's view of the compact ICOM IC-707.

which incorporates a bar-graph meter indicating "S" units on receive and relative power output on transmit. Frequency readout is to 100 Hz but there is no indication for RIT offset; not even the main frequency readout shifts. The RIT gives an offset of +/- 1.2 kHz. The receiver front end has a 10 dB pre-amp and a 20 dB attenuator.

Now to the "what you don't get" department. The first thing noted when I put the transceiver on my desk was the lack of a tilt bail to lift up the front of the transceiver. Now I think that's really stingy. You can actually buy a carry handle to screw onto the side of the cabinet but a tilt bail isn't even offered as an option. Compared to the next level of ICOM transceiver, the IC-728, there is no transmitter speech compressor, no receiver pass-band-tuning and no AGC fast/slow selection. There is no RF gain control but then there is none on the 728 or even on the next up again, the 737.

The noise blanker is non-adjustable. The metering is very basic with only relative power showing on transmit. There is no ALC or SWR metering. Well, I guess if you purchase a basic priced transceiver you have to give something up.

The IC-707 On The Air

After propping up the front of the rig to get a better view, I started to tune around. Might I suggest that a couple of rubber buffers glued under

the front feet would make an enormous improvement, but on with the tests. The first thing noticeable at switch-on is the bright display. The numerals of the main frequency are rather different from what we have become used to. They are quite artistic. Have a close look at the front panel photo. The front mounted speaker sounds quite good but, as usual, a high quality external speaker sounds better.

The internal speaker handled the full audio power output of the transceiver very well with no discernible rattles. The tuning control is typical ICOM, superb! Tuning rate in SSB and CW is ten Hz per step or two kHz per knob revolution. This gives very smooth and effortless resolution of signals. With the AM or FM mode selected the tuning step increases to one kHz or 200 kHz per knob revolution. I believe this is too fast and that AM and FM should tune in 100 Hz steps thereby giving 20 kHz per knob revolution. It is possible to select 10 Hz steps for AM tuning via the TS button but then this is too slow.

The memory system is simple to use and most effective. In the usual ICOM style all memories are fully tunable and the mode can also be changed. This, along with the Band Stacking Register, makes for a very versatile tuning system.

Received audio quality was very acceptable on SSB and reasonable on AM. I thought the AGC decay time on SSB was too fast and, without an

RF gain control to set a threshold level, there is not a lot you can do to improve things. Also, with no band-pass-tuning there is not a lot you can do about interference. Perhaps a thought. Where the cost of fitting band-pass-tuning exceeds the budget on a low priced transceiver, why not include an old fashioned tone control? It would need to provide a very sharp cut from 3 kHz down but with the availability of active filters these days, I doubt that the cost would be excessive.

The bar-graph "S" meter worked well, within its capabilities. If the number of "bars" was doubled it would, however, be better. As we will later see, the "S" meter is quite generous but, at the same time, very vague.

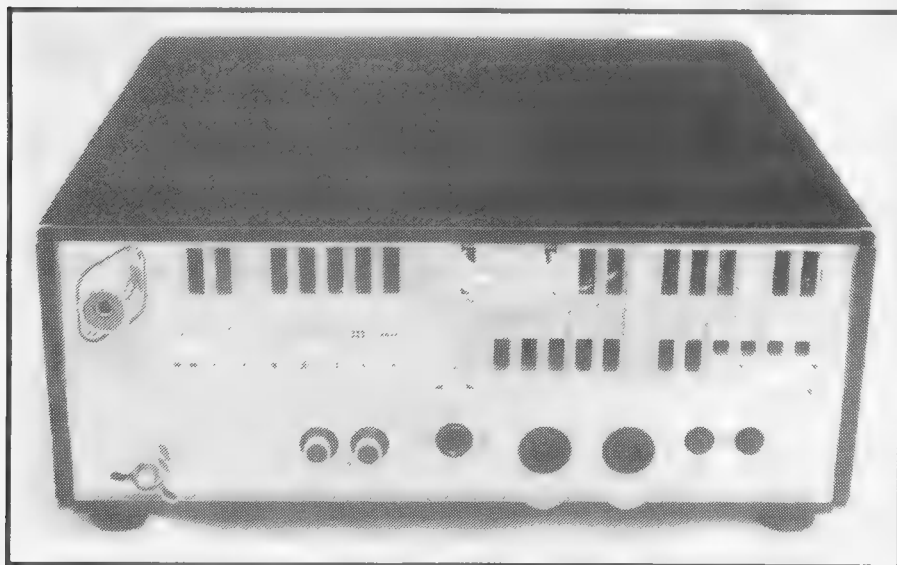
CW reception with the standard SSB filter was good. Unfortunately, none of the optional CW filters was included with our review transceiver.

Mode selection has returned to the old IC-745 system. There is one button and pushing it brings up each mode sequentially. While this saves a few buttons on the front panel, I found that the mode I needed always required several button pushes to get to. You do get used to it, though.

RIT on the IC-707 is very basic. When selected, an "RIT" indicator comes up on the main display but there is no frequency display to show the amount of offset and even the main frequency display stays put. There is no transmitter offset tuning.

The noise blanker is also basic. You can either have it on or off. However, it works very well on car ignition noise which is no doubt what it will be mainly used on. Its effect on power line noise appeared to be minimal. There was no noticeable effect on receiver performance with the blanker switched in.

Overall, the receiver performance would have to be rated as excellent. Tuning is very smooth, band changing simple and straightforward, received audio quality through the internal speaker is good and, through a good quality external speaker, is excellent. There is plenty of gain and, even on a small antenna, the receiver sounds lively although I found that I preferred to have the preamp in most of the time and the attenuator was not



Rear panel view of the IC-707.

used at all. Receiver front end performance was rated as excellent particularly from the strong signal handling point of view.

Connectors

Rear panel interfacing is very complete. There is a socket for the AT-160 or AH-3 automatic antenna tuners. Two DIN sockets, one seven pin and one eight pin, allow connection to, and control of, ICOM linear amplifiers, etc. Control of home-made or other commercial linears is from two phono sockets, one for relay control, the other ALC input. A standard 6.5 mm jack is used for Morse key connection. Two 3.5 mm jacks connect to an external speaker and to a computer interface unit. A standard six pin plastic connector is used for the 13.8 volt DC input.

Now, over to the transmit side. The IC-707 is supplied with an HM-36 microphone. This appears to be the same as the old HM-12 that has been supplied with ICOM equipment for the last ten years or so. The only control that requires setting for SSB operation is the microphone gain control and I must say that the instruction manual is not all that helpful in doing this. I will quote what they say. "Adjust the (MIC) control to the 10 — 12 o'clock position when using the supplied hand microphone. Suitable position differs according to the connected microphone. When rotated too far counterclockwise, output power becomes too low. When rotated too far clockwise, transmit audio may distort." So there you are, good luck.

After carrying out many on air tests, I found that good punchy audio was produced with the gain control as high as the three o'clock position but this would depend on your actual voice level. When adjusted correctly, the audio quality was reported as slightly restricted but quite good. I also tried my SM-6 desk microphone with good results but, as this has a built-in pre-amplifier with adjustable gain, it was a little tricky to get things right.

After extended transmit tests, the transceiver was still cool. The internal cooling fan is very effective. The photo shows this under the final unit sucking air from under the cabinet and blowing it out at the rear.

Frequency stability and dial readout accuracy were right up to the usual ICOM standards. Total drift did not exceed 50 Hz at any time and the dial readout was well within the resolution of 100 Hz.

Finally, the transmitter was checked out in the CW mode. There is, of course, no built-in keyer as with some of the more expensive models. You will have to supply your own. Also, the IC-707 does not have full break-in operation. However, there is an excellent semi break-in system. Unfortunately, the break-in time delay is not externally adjustable. You will need to remove the bottom of the cabinet and adjust a rather small preset potentiometer. The side tone level preset is near the break-in control but, once set, the level is controlled with the normal front panel audio gain control. CW keying was very clean with no clicks audible on a very strong signal. With either of the optional CW filters installed, the casual CW operator should be very happy

The IC-707 On Test

The usual series of tests was carried out starting with transmitter power output. Power output can be set at any level between full power and about five watts minimum with the RF PWR control.

Power Output CW Mode.

Band	Power	Current
160	115 watts	17.0 A
80	120 watts	16.5 A
40	120 watts	16.0 A
30	120 watts	15.5 A
20	120 watts	16.0 A
18	120 watts	18.0 A
15	122 watts	17.5 A
13	122 watts	15.5 A
10	115 watts	17.0 A

PEP output in SSB mode was about the same as above, as indicated on my monitor scope. Minimum power output was spot on five watts. Power output on AM was 25 watts and 100% modulation could be achieved at this level.

The specification does not give a figure for SSB IMD, so our usual tests were carried out. We came up with a figure of -30dB which is actually a shade better than the IC-737 tested last year. I wonder why ICOM have dropped these figures from their

specs as it seems that they really haven't anything to hide. All of the above tests were carried out using a 13.8 volt regulated power supply.

Receiver Tests

The "S" meter calibration was checked first. There are eight bars so it was difficult to come up with exact levels as there was quite a bit of overlap.

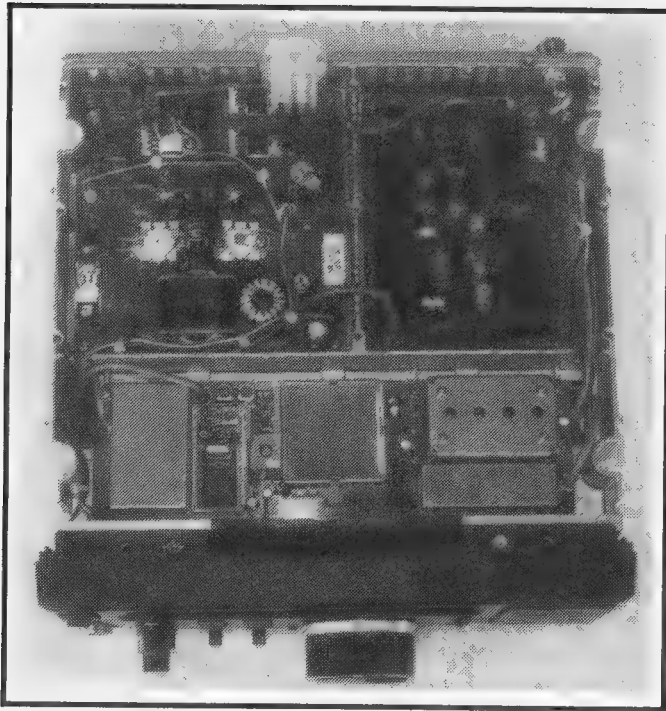
	Preamp Out	Preamp In
S1	2.2/2.8 μ V	1.2/1.5 μ V
5	6.0/15 μ V	2.0/3.0 μ V
9	30/140 μ V	7.0/80 μ V
+20	220 μ V	85 μ V
+40	1300 μ V	600 μ V
+60	10mV	1.5 mV

As can be seen from the above, "S" meter readings need quite a bit of interpretation but then I guess that applies to most "S" meters anyway. The above tests were carried out on 14.2 MHz. Preamp gain was measured at 11 dB and the attenuator at -20dB. AGC threshold was about 1 μ V and the receiver could produce maximum audio output with an input of 0.8 μ V.

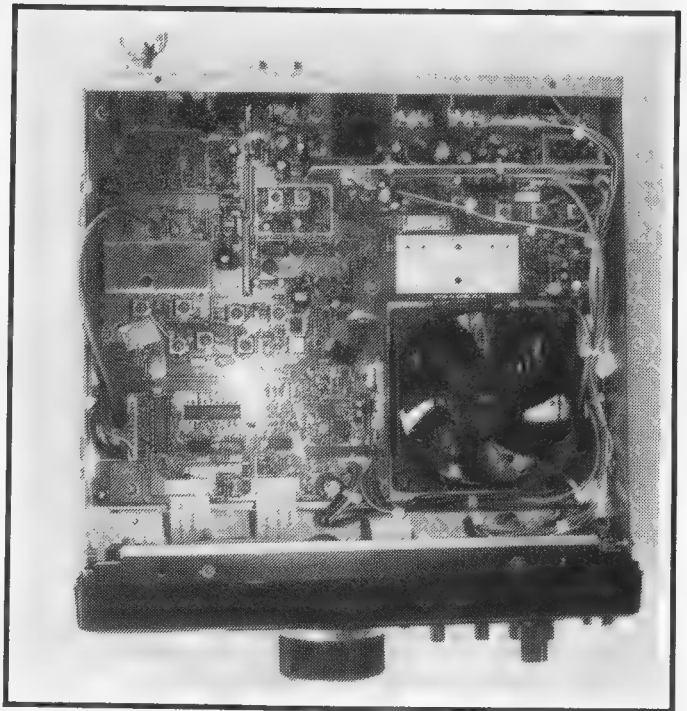
Next the receiver sensitivity was checked. The ICOM specification is a little confused, stating less than 0.16 μ V for 10 dB S/N in the handbook and 0.16 μ V, but no S/N mentioned, in the colour advertising leaflet. Assuming the 10 dB figure, I measured 8 dB signal to noise at 0.16 μ V input. Interestingly this is the same figure that came up with the IC-737 reviewed in the August 1993 issue of AR.

AM sensitivity measured an excellent 1 μ V for 14 dB S/N with 30% modulation, bettering the specified figure by a wide margin. Again, all these measurements were taken at 14.2 MHz. SSB bandwidth at the -6dB points was 2.2 kHz with these occurring at 300 Hz and 2.5 kHz. The AM bandwidth was only slightly wider although, of course, there are two sidebands involved here. AM audio response -6dB points were at 150 Hz and 2.6 kHz. At 3 kHz this was down to -15 dB. It appears that the response of the audio amplifier is cut sharply above 2.6 kHz.

My next test was audio power output and distortion on both SSB and AM. Maximum power output into 8 ohms was 2.9 watts and into 4 ohms, 4.7 watts. However, this was



Top view of the IC-707 with the top cover removed.



Bottom view of the IC-707 showing the effective cooling fan.

with around 25% distortion. At 2 watts output distortion was down to 10% and with 0.25 watts this was down again to a very creditable 0.5%. ICOM specify audio output at "more than 2.6 watts with an 8 ohm load" but do not mention distortion. On this basis the specification is met, but at 25% distortion.

Distortion on AM varied with frequency and modulation depth with higher distortion occurring at lower frequencies and high modulation depth. With 80% modulation at 200 Hz, distortion was 10% but with 30% modulation at 1 kHz this was down to 1.5%.

Finally, the current drain on receive was measured. With no audio output this was 1.05 amps and with full audio output it was 1.4 amps. Generally, these tests showed that the IC-707 performed very well.

I would like to see better quality AM reception both in terms of distortion and frequency response from Japanese transceivers. In this respect, the IC-707 is no worse than average but all could be a lot better. In terms of weak signal reception, the IC-707 would be very little behind its higher priced relatives. It would only be when interference became a problem that the 707 would be left behind.

The IC-707 Instruction Manual

In my review of the IC-737 I stated that most manuals seem to run to about 60 pages. With the IC-707, ICOM have proven me incorrect. This one is only 45 pages. However, I guess with a basic transceiver, there is less to cover. That said, they do cover the subject quite well. I like the numerous little explanation boxes such as "What is the Preamp", "What is the attenuator", "What is the RIT function", etc. New amateurs should find these most enlightening. Operating instructions are in the main well covered. However, there is some strange English in some sections.

Note my earlier comments on the microphone gain control setting procedure. Again there is no technical description and not even a circuit diagram. The manual does have a full list of the wide range of options available for use with the IC-707. These range from power supplies, and external speakers to automatic antenna tuners and linear amplifiers.

The IC-707 Conclusions

The new ICOM 707 is in direct competition with the Kenwood TS-50S and, to a lesser extent, the lower priced Yaesu FT-747. This is

possibly the most competitive section of the amateur market. If you are looking for a normal sized transceiver with excellent ergonomics and good quality transmitted and received signal, the IC-707 must come into consideration. It would be ideal as a mobile/portable rig, a first HF transceiver or a second rig as a backup in the home shack. In any situation the 707 would perform in an excellent manner. Don't forget you may need a 20 amp DC power supply which would add to the cost. My thanks to ICOM Australia Pty Ltd for the loan of the review transceiver.

Ah, yes. The answer to our little quiz. Which transceivers have front mounted speakers?

1. The Yaesu FT-747 (bet you all got that one).
2. The SBE 33. An American partly solid state transceiver of the early 1960s.
3. The SBE 34. A later model of the above.
4. The Swan 400. An unusual American transceiver that had a front panel speaker but no VFO. You had to add an external unit.

Well, who won the prize? Perhaps there are others with front speakers I haven't heard about.