



# EQUIPMENT REVIEW

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## THE ICOM IC-R70 RECEIVER

It is perhaps strange that as the ICOM Company were one of the first to produce a general coverage transceiver, it is only over the last few months that their first receiver has been released. They have no doubt had the technology required to do this for several years. One wonders what their market research on the production of a receiver only turned up. Whatever, several other Japanese firms have undoubtedly been doing very nicely selling their receivers now for some years. One thing however is certain, that when ICOM do something, they do not follow fashion but follow a method of design and presentation that sets their equipment apart from the others.



As might be expected, the R-70 has that ICOM look. In fact at a quick glance it could easily be mistaken for the IC-740 transceiver. It also incorporates many of the features that we have become used to in the ICOM amateur transceivers. As we shall later see, the R-70 has a performance that is in every way comparable with the IC-720A transceiver and performance has not been compromised by the introduction of gimmicks.

Let's have a look at the features of the IC R-70 receiver. Front panel size is the same as the IC-740 but depth is about 100 mm less. The height matches the IC-720 and ICOM intend to produce an adaptor to allow the 720A and the R-70 to operate as a fully integrated system with VFO control from either set. At the time of our review this adaptor was not available so I am unable to comment on its effectiveness.

The R-70 is an all mode receiver with provision for AM, CW, SSB, RTTY and FM reception. It has three speed tuning system

and two separate VFO's. Coverage is from 100 kHz to 30 MHz in 1 MHz steps but it is possible to change the stepping rate from 1 MHz to amateur band selection only. The noise blanker is designed for either normal electrical interference such as power line noise and car ignition noise or for the Woodpecker. Pass band tuning and a notch filter are provided to pull through the hard ones and an RIT control allows an offset from the selected VFO frequency. A monitor control allows you to listen to a companion transmitter and would no doubt be useful when the R-70 is teamed with the 720A.

The only facility that the R-70 does not have is a memory. Strange that ICOM did not use the 730/740 system or even enlarge on this. There is also no scanning offered. There is of course no analogue dial readout. Frequency indication is via a very bright six digit readout that also shows the mode and VFO selection. To finish off the line up of facilities, there is a tone and squelch

control.

The R-70 is a triple conversion receiver with IF frequencies at 70.4515 MHz, 9.0115 MHz, 455 kHz and then back to 9.0115 MHz. The last IF is used in conjunction with the second IF frequency to produce the band-pass tuning. The pre-amp in/out facility on the 730/740 has been taken one step further on the R-70. There is now a Pre-amp in plus an attenuator position. The R-70 is normally AC operated but our review model was fitted with the optional 12 volt DC operation kit. The FM reception facility is also an optional extra which was fitted.

Other options are a 500 Hz CW filter and an extra 455 kHz SSB filter. This latter item was fitted to our review receiver but no mention is made in the instruction manual as to its effect or specification. The rear panel has quite comprehensive facilities. Again there is no information in the instruction manual as how many of them could be used. There is a 24 pin accessory



Rear View of the IC-R70.

socket which obviously allows access to the micro processor that controls the operation of the R-70 but apart from naming these functions, no mention is made of either their use or future intended use.

#### THE ICOM R-70 IN USE

On initial switch on the receiver comes up on 15 MHz if the general coverage mode is selected or on 7.1 MHz if the amateur band mode is selected. Side band selection is automatically chosen to give LSB on 7, 3.5, and 1.8 MHz and USB from 10 MHz up. The same change over point occurs in the general coverage mode also. Selecting the other sideband is a two button job. It is first necessary to push the function button and then the SSB button. The digital indicator at the left of the frequency readout will also show that 'U' or 'L' side band is in operation.

As is common with all ICOM gear, it is necessary to retune when the sideband is changed, the frequency difference being 3 kHz. It's a pity that ICOM haven't seen fit to overcome this and it is perhaps the least professional feature of an otherwise very professional receiver.

The R-70 differs from other current general coverage receivers in that the tuning is not continuous. Once a particular MHz range has been selected it is not possible to tune out of this range. To go up a MHz it is necessary to push the 'Band Up' button. Not only that but it is necessary to give the button a push for each and every MHz one wants to go up or down.

However in general the operation of the R-70 proved to be very satisfactory. The three tuning rates have been well chosen and are the same as the 730/740 transceivers. The 10 HZ steps give a tuning rate of 1 kHz per knob rotation, the 100 HZ steps 10 kHz and the 1 kHz steps an ideal band scanning rate of 100 kHz per knob rotation.

In my past reviews I have had some harsh things to say about noise blankers. The blanker in the R-70 is, without doubt, the best of the current bunch. Its action on eliminating the Woodpecker is excellent and can certainly make the difference of copy or no copy. The blanker action is equally good on ignition and other elec-

trical type noises.

By using the two VFO's it is possible to up the receiver on two frequencies on two entirely different bands, that is two amateur bands or two short wave bands. Unfortunately the selected mode will not follow. If, for instance, you chose USB on 14.2 MHz with VFO one, your only choice would be LSB on 3.6 MHz with VFO two. If AM is required on 80 then it will be necessary to reselect USB on 20. With the R-70 operating from a constant AC supply then the last frequency tuned to will reappear when the set is turned on again. However if you are listening to a contact and decide to go up a MHz and then come back, your original frequency will have been lost unless you swap VFO's before the change of tuning.

All this sounds rather complicated but does not cause the confusion you might think and actual operating is, in most cases, easy.

The notch filter and the bandpass tuning are both similar to the set up in the IC-740. They are, however, now concentric rotary controls in place of the slider controls. As such they are easier and smoother to operate. Performance of both is similar to the 740.

The new pre-amp/off/attenuator switch gives one a chance to try everything. Using the R-70 on the higher bands, the overall gain sounded low with the pre-amp off. Sensitivity appeared to be OK but 'S'6 signals just would not lift the 'S' meter. I could find no instance where the attenuator was needed, and immunity to front and overload seemed very high. It's also nice to see an all band receiver fitted with an RF gain control which is missing from many contemporary receivers. The action of the RF gain is excellent, being smooth and progressive.

The built-in loud speaker works quite well. Although of small diameter, about 6 cm, it has a large and effective magnet that obviously gives it a much higher efficiency than normal. While many might prefer a large speaker in an external cabinet, the built-in unit has a well balanced response and an excellent transient response.

Now for a few 'funnies' discovered when operating the R-70. It seems that the CPU is

rather slow in its operation. A quick stab at the Band Up or Down button will often have no effect. It often took quite a lengthy push to produce a frequency. At the same time, it took quite a while for the selected mode to catch up when changing bands. Maybe this is peculiar to this receiver, I don't know.

#### THE IC R-70 ON TEST

The following test equipment was used to produce our figures. Daven audio power output meter. AWA F242A noise and distortion meter. A 100 kHz crystal calibrator with multivibrator output. With no access to a calibrated signal generator, all sensitivity tests are subjective and are checked in side by side tests with other receiving equipment. Audio output was taken from the external speaker socket and the power meter terminated in 8 ohms. Noise level with the audio gain set at zero was -50 dBm unweighted and -42 dBm weighted. If you have sensitive hearing you might notice some hiss when listening on headphones.

Maximum audio output was measured at 4 watts at 40% distortion. The 4 watts could only be produced from a very strong signal from the calibrator and with the AGC switched off. At 2 watts output the distortion had dropped to 3.2% and at 1.8 watts it was a very creditable 1%. With the audio output set to 2 watts it was noted that the output rose to 2.2 watts when the AGC was switched from slow to fast.

It is interesting to note that these figures correlate very closely to our figures on the IC-740.

The tone control performed much better than the 740. At full effect it produced a drop of 12 dB at 2.5 kHz, -7 dB at 1.5 kHz, -5 dB at 1 kHz and -2.5 dB at 700 Hz.

AGC action of the R-70 is very good. Listening across the various bands in all modes, there was no sign of pumping or popping with a very constant output level. To check this, the crystal calibrator was fed in to produce signals varying from an indicated 'S'1 to 'S'9+30 dB with the preamp switched in. Audio output only changed by .5 dB over this range, an excellent figure.

The response of the SSB filter was checked by feeding in a weak signal, the output measured with the AGC switched off. The -6 dB points were at 200 Hz and 2.7 kHz. The output was down to -40 dB at 2.9 kHz. The response of the optional CW filter was checked in the same way, the -6 dB points being 400 Hz and 1.1 kHz with a very sharp cut off beyond these points. The notch filter was checked across the audio range. The actual drop in audio output was a constant 20 dB except below 500 Hz where it increased to 25 dB. When listening to a signal at normal level, 20 dB will reduce a heterodyne to almost inaudible point.

It was noted that when the 100 kHz calibrator was fed into the receiver to produce an 'S'9+30 dB signal many spurious signals appeared throughout the tuning range, with a large amount of white noise on either side of both the wanted and spurious signals . . . In contrast to this, the

R-70 proved to be one of the best performers I have checked on the broadcast and long wave bands. Used with a long wire antenna about 20 metres long, broadcast and aircraft NDB stations were received with a notable lack of cross modulation. Frequency drift was checked by running the receiver in zero beat with VNG on 7.5 MHz. Any slight drift could be checked by comparing the tone beep against the same tone as heard on an AM receiver running alongside. It was noted that even with the tuning of the R-70 set to the 10 Hz rate it was not possible to set the tone to the exact frequency. The initial error was estimated at about 5 Hz. After about one hour's operation the R-70 had drifted around 25 Hz. Quite a superb effort! Due to the method of frequency generation in the R-

70 the total drift should not differ greatly on any other frequency.

### INSTRUCTION MANUAL

The instruction manual is good in some respects and very poor in others. Operating information is well covered but while there are details on how to install some of the options, there is no information on the available options themselves. Strange indeed. You will have to chase up the information on the available options yourself. A circuit diagram is included but no other service information at all. For a receiver bordering on the professional class this is poor. Maybe ICOM have a service manual in the pipeline but as I have previously stated with ICOM reviews I have yet to see one for any model.

### CONCLUSIONS

Perhaps some readers might have taken some of my remarks as being rather critical, but in summing up I would have to give the R-70 almost top marks. If you are looking for multiple memories and flashing lights then you will look elsewhere. The R-70 has a solid professional feel. Sure there is room for improvement but after all it doesn't cost \$3000 either. If you need a general coverage receiver with first class performance that will still be going well in years hence, then this might well be the one you are looking for.

Our review receiver was supplied by ICOM AUSTRALIA of Duke Street, Windsor, Vic. 3181.

## EVALUATION AND ON AIR TEST OF THE ICOM IC R-70 RECEIVER

### CATEGORY

Packaging  
Size  
Weight  
External Finish  
Construction quality

### FRONT PANEL

Location of controls  
Size of Knobs  
Labelling  
'S' Meter  
Status Indicators  
VFO knob action  
Dial readout

Analogue  
Digital

### REAR PANEL

### RECEIVER OPERATION

VFO stability  
Digital dial accuracy  
Memories  
Bandpass tuning  
Notch filter  
Spurious responses  
'S' meter  
Signal handling

Sensitivity  
Pre-amp/attenuator  
RF gain  
Squelch  
Tone control  
Noise Blanker

### QUALITY OF RECEIVED SIGNAL

Internal speaker  
External speaker  
Headphone output  
Power output  
Manual (owner's handbook)

### RATING

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### COMMENTS

*Excellent quality carton with carry handle.*  
*Reasonable size.*  
*Quite reasonable.*  
*Very well finished and clean appearance.*  
*Well up to the usual ICOM quality.*

*An excellent layout, plenty of room for everything.*  
*Some knobs rather small but control action very smooth.*  
*SSB reverse and narrow CW confusing, otherwise satisfactory.*  
*Brightly illuminated. 'S' and Sinpo calibration.*  
*Could use a few more.*  
*The best in the business. Three tuning rates.*

*Bright and accurate. Does not show RIT frequency shift.*  
*Plenty of facilities but no information on how to use them.*

*Hard to fault. See test section.*  
*Spot on calibration.*  
*Only second VFO useable as limited memory.*  
*Reasonable reduction in high end QRM.*  
*Excellent reduction of heterodyne interference.*  
*Very clean.*  
*Realistic response with pre-amp in.*  
*No trace of overload under normal operating conditions. But see test section.*  
*With pre-amp is on a par with contemporary equipment.*  
*As above. Pre-amp needed most of the time.*  
*Smooth progressive action.*  
*Works on all modes. Quite handy.*  
*Well chosen response. See test section.*  
*One of the best yet heard. Even works on the Woodpecker.*

*Well balanced response.*  
*No mention made of any option.*  
*Stereo Headphone compatible. Some hiss audible.*  
*Plenty of audio with low distortion. See test section.*  
*Lots more information needed.*

Rating Code: Poor \*      Satisfactory \*\*      Very Good \*\*\*      Excellent \*\*\*\*