

Equipment Review

ICOM IC-R7100

VHF-UHF Receiver

Paul McMahon VK3DIP,
47 Park Avenue,
Wattle Glen 3096

The IC-R7100 is a wide band (25-1999.9999 MHz), multi-mode (AM, FM, SSB), receiver with scanning ability. Price Class AUD2000. The review set had serial number 01078.

First Impressions

The receiver comes in typical cardboard/foam packaging which can be retained for re-use as a transportation carrier. Included in the package are both 13.8V and mains power cords, Instruction Manual, Schematic Diagram, and a bag of miscellaneous bits including 4 x 3.5mm earphone plugs, 2 RCA plugs, 6 fuses, and a number of screws. Unfortunately the review set was missing the DC power cord, and schematic, however this is undoubtedly due more to "path losses" as the set made its way to me, rather than any problem at ICOM.

The set, in size and shape resembles a modern "mobile" HF box, but without the heat sink sticking out the back. A single large tuning knob, reasonable size S-meter and typical multi-function frequency/mode etc readout dominate the front panel. Two other knobs for volume, squelch, and innumerable buttons fill out all remaining space.

The S-meter is a standard analogue

type with markings at S0-9, 20, 40, and 60 dB. All controls are well spaced out and easy to use, with only a minimum of buttons having more than one function. The manual (A4 size with no small print) is some forty pages and describes in easy stages what each button is, how to connect power, and antenna, etc. It also contains a large warning about the privacy of radio communications.

The back panel in contrast is virtually empty. It sports a single "N" type socket for antenna connection, AC (IEA) and DC (as for IC22S) power sockets, four 3.5 mm phono sockets for such things as computer control, tape recorder, external speaker etc. There are two RCA sockets for the optional TV-R7100 which allows Video and Stereo FM broadcast reception. The TV-R7100 option was not available for test.

Initial set up was quick and painless, and basic operation was relatively straightforward. Put in a frequency via the keypad, press enter, select a mode and there it was. The main dial also

could be used. I would be interested to know how many people (as did I) when trying to think of frequencies to try, come up with commercial FM broadcast ones.

Audio quality was good with plenty of volume available. It would take a brave person to advance the volume control past half way when listening to a broadcast FM station, the built-in speaker not quite being of "ghetto blaster" calibre. While on the subject of the audio one thing noticed at this stage was the confirmation beep, ie every time a button is pressed etc a beep is heard. Be careful, this obviously comes through the normal audio path including volume control. If you have been listening to a quiet station with the volume turned up, it can give you a bit of a start when this now very loud beep comes up when you press a button. The manual details how you can turn the beep off, or adjust its level (internal adjustment). In the review receiver this level was set a bit too high for my liking.

Technical Bits

An extract from the specifications for this receiver are given at the end of this review. As can be seen these are quite good; the frequency coverage is very wide and all modes (save an explicit CW one) are available with varying bandwidths. While no information is given on inter-modulation etc no particular problems were experienced in this area.

In terms of sensitivity and selectivity the receiver is on a par with, or better than, most equipment in current use. It is possible to find some equipment with marginally better specifications but they are not all that common. The true test of course would be in terms of dynamic range, image rejection, and inter-mod and unfortunately these figures are not provided with the set. Also unfortunately the requisite test equipment to get accurate answers in these areas was not available to me, likewise the time available for this side of the review was, for various reasons, quite short.

On all my subjective tests however, and on those of others who own this set, the receiver performed very well.

As a fox hunter, some items that are of particular interest to me are the accuracy of the S-meter and the intrinsic

sic shielding and effectiveness of the attenuator. In my tests the S-meter was about average, ie the numbers are only to serve as a guide. There was about 20 dB between 40 and 60 dB over, however there was only about 10 dB from S9 to the 20 dB mark. This appeared to be consistent across the frequency range, as was the effect of the built-in 20 dB attenuator, though this was difficult for me to test properly above 1 GHz. The shielding also appears to be on a par or better than many other rigs. Two watts from a hand held one metre away, with the receiver terminated with a 50 ohm load produced only an S9 signal. In this test the attenuator had little effect.

An area of interest for a receiver with such a wide range is the possible presence of spurious responses or "birdies". It would be all but impossible to have such a good receiver without some problem of the receiver hearing itself. The ultimate test for this is easily set up, but is a problem in itself.

The receiver is terminated with a shielded 50 ohm load and scanning is set for the smallest step (ie 100 Hz) and off we go. The problem is that this is a very wide band receiver. There are some 19,750,000 frequencies to test. Even with the highest scan speed which was capable of a very sprightly 125 steps a second this amounts to 158,000 seconds, or nearly 44 hours from top to bottom. On a slower scan speed this could easily stretch to over a month, not something to be lightly contemplated! It is only figures like this that give you an idea of just how much spectrum this box covers.

After some effort I did manage to find at least one harmonic. Without a circuit it is impossible to be sure, however I am pretty certain that there is a 10.240 MHz oscillator in the box somewhere. This is evidenced by quite small spurs every 10.240 MHz with the first visible at 20.480 MHz, and some 190 odd others all the way up to 2 GHz. All are at a very low level. You probably wouldn't notice them unless you were looking for them, except for the one at 512 MHz which for some reason was S9 on the meter. 512 MHz is also the place where the first IF changes from high side to low side so perhaps this has something to do with it. There may well be others there but I didn't find them. On the whole this

set represents a very impressive bit of receiver design.

Operation

The operation of the rig is straightforward from the instruction manual, however some time should be taken in examining the various scanning options. Scanning is the single largest chapter in the manual, by a large margin. Scanning options include 5 basic scan types with a large number of variations using combinations. The 5 basic types are:

- Programmed scan, ie set from and to.
- Memory scan, ie scan memories.
- Selected Mode Memory scan, ie scan memories that have the same mode.
- Auto Memory Write scan, ie as a frequency is found write it to memory.
- Window Scan, ie hop between the two windows.

The Auto Memory Write is a neat feature. Memories 800-899 are available to be automatically written to as active frequencies are found. These can then be reviewed at leisure. Considering the sorts of times mentioned before this is the only practical way to scan large chunks of spectrum.

The set has 900 memories. Each memory stores frequency, mode, tuning step, and select number or skip channel. The select number is a way of tagging memories with a particular number which can be used in conjunction with the scan, ie groups of memories can be scanned. The skip channel for memories 700-799 can be used to specify frequencies which are to be skipped in a scan.

As well as these scanning functions the set also has a clock and timer ability to enable unattended operation at particular times. Also the set has two so called windows which allow such things as having a scan active in the background window, while doing something else in the foreground. Again the manual explains all, however there is probably no substitute for time spent at the controls.

Operation of the controls is basically straightforward, with the only thing I found a bit tricky being the use of the main tuning knob in conjunction with some of the buttons. For example, changing of memory channels is done by holding down the MCH button while rotating the main tuning dial. The squelch control is particularly simple having a combined, noise and level action. The first 25% of its travel affects a noise squelch level, while the rest affects a signal level squelch.

The FM centre indicators and AFC are novel and useful additions. The FM centre indicator performs a similar function to a centre discriminator meter showing whether tuning is above or below the centre frequency. The AFC action is quite interesting to watch, the frequency can be seen to change by itself as the set tries to lock in on a signal. Sideband tuning with only 100 Hz steps and no RIT takes a bit of getting used to but does produce acceptable results in the end.

One feature, that I didn't have enough time with in order to judge its effectiveness, was the voice squelch system. This system is intended to be used in conjunction with scanning, allowing the radio to move on if no



The versatile ICOM IC-R7100 VHF/UHF All-mode Communications Receiver.

modulation is found on a particular frequency even if a carrier opens the mute. Likewise I didn't have a chance to try out the computer control features, however I will say that if you do intend to use this feature I hope your computer is a lot quieter on the air waves than mine, because I can guarantee you that this rig will find your computer on lots of strange frequencies.

Conclusion

This is a very good radio, and ideal for the exploring of the vast spaces out there between the ham bands a la Star Trek. If you do happen to want to use this rig or similar in this manner I would however recommend that you also invest in one of the many frequency listings available, or even just a spectrum allocation chart such as the one that used to be available from DOTC.

Even as just a Ham Bands set this receiver would have much to recommend it.

Rumour has it that in the US this radio is hard to come by because a particular US Government agency has purchased several thousand of them. Which is probably about the only way I would ever get to own one, ie as government surplus. Oh well, one can dream! While on the subject of dreaming there are a couple of ideas that I have had for this and similar rigs.

Firstly the predecessor to this radio (the IC-R7000) had an infra-red remote control. The IC-7100 does not. I think this would have been nice to have in this model too. Perhaps this is just microphone envy on a receiver, however something with just up and down buttons or a keypad would be a help.

Secondly, and I should say in common with most radios these days the serial number on the back of the rig doesn't really help as an anti-theft measure. Being on a small plate held on with two small screws it is no deterrent at all. Perhaps it is time that ICOM et al put in features similar to those found on some car cassette radios.

I for one wouldn't mind having to enter say some 8 digit number every time I powered up the rig, if it meant that if someone was to steal it, that the radio would not function until the

secret number I had set was used. Likewise electronically personalising the radio with my call, or driver's licence number locked with this password, would do much more for the resale value than engraving the new \$2000 rig with a vibro-etcher. It is not as if there was a shortage of room in the micro-controllers on the rigs these days. You may have heard of one rig that has, as well as its normal features, a special games mode for a space invaders style game on the multi-function display. I for one would rather have the security features than a game.

Modes	USB	LSB	AM Normal	AM Wide	FM Narrow	FM Normal	FM Wide
Selectivity (kHz at -6dB)	>2.4	>2.4	>6	>15	>6	>15	>150
Sensitivity (μ V for 10dB S/N or 12 dB SINAD*)	<0.2	<0.2	<1.6	<1.6	<0.35	<0.35	<1.0
IF (MHz)	25-512		512-1025		>1025*		
1st(MHz)	778.700		266.700		25-1025		
2nd(MHz)	10.700		10.700		778.7 or 266.7		
3rd Not for WFM(MHz)	455 kHz		455 kHz		10.7		
4th Not for WFM	-		-		455 kHz.		

* A Crystal Converter system is used above 1025 MHz.

Dimensions: 241(W) x 94(H) x 239(D)

Weight: 6.0 Kg

ar

IC-R7100 Specifications (abridged)

Frequency Range: 25 — 1999.9999 MHz (Specs Guaranteed 25 — 1000 MHz and 1240 — 1300 MHz)

Frequency Steps: 1 MHz, 100, 25, 20, 12.5, 10, 5, 1, 0.1 kHz.

Antenna Impedance: 50 ohms Unbalanced.

Power: Built in Mains 100, 117, 240 VAC , or external 13.8 VDC.

Current Drain (13.8 VDC) : Squelched 1.5A , Max Audio 1.9A
Audio Output: > 2.0W

Technical Abstracts

Gil Sones VK3AUI

Interference Reduction

A noise reduction system which allows noise or interference to be cancelled out or nulled has been described in Rad Comm April 1992 and September 1992 issues. The author Trevor Day G3ZYY provided details for use on both 2 and 6 metres as well as for the 4 metre UK band.

The idea is not new but the unit is neat and simple to build and is capable of good performance. The components are all either available locally or

suitable equivalents can be purchased locally.

The idea surfaced many years ago as the "Jones Noise Balancing Circuit" in the Radio Handbook. Since then Drew Diamond VK3XU has published a design in AR Oct 1976 and Lloyd Butler has published a design for HF in AR Sept 1992, with a further article as recently as the January 1993 issue. Seems a good idea goes on and on.

The block diagram is shown in Fig 1. The unit has preamps for both the