

■ Equipment Review

Yaesu VX-1R Miniature Hand Held Transceiver

Reviewed by Paul McMahon VK3DIP
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What Is It?

The VX-1R is a miniature hand-held dual band (2 m and 70 cm) FM transceiver. The receiver coverage is a very wide 0.5-1.7 MHz (Yes, the AM broadcast band!) and 76-999 MHz, with AM, FM Wide and FM Narrow modes selectable. As you will see from the photos the unit is very small (47 x 81 x 25 mm) and very light (125 gm). The review unit was kindly supplied by Dick Smith and had the serial number 71022680. Retail price is around \$499.

First Impressions

Yaesu call it an Ultra-Compact/Micro-Miniature Dual-Band Transceiver with Wide-band Rx coverage. If you look at the photo with the VX-1R and a relatively recent Yaesu dual band hand-held it looks positively tiny. There is, however, very little that has been left out of this package. What it loses out on in the output power stakes is well made up for in newer battery technology, and the ability to effectively double as a broadcast band receiver. This small size is even more impressive when you look at the photo with the battery pack removed, as it takes up close to half the space in the case.

Again from the photos you will see that, even with the small size, the equally small number of controls helps to maintain an uncluttered look. There is basically one knob plus 10 buttons, including PTT, to control all the functions of this radio. Despite this it is still reasonably intuitive and with a little practice is easy to use. The display is well lit when needed and readable, showing all necessary information including

battery voltage, volume level, S meter, frequency, memory number, alphanumeric memory label, plus all the other usual items.

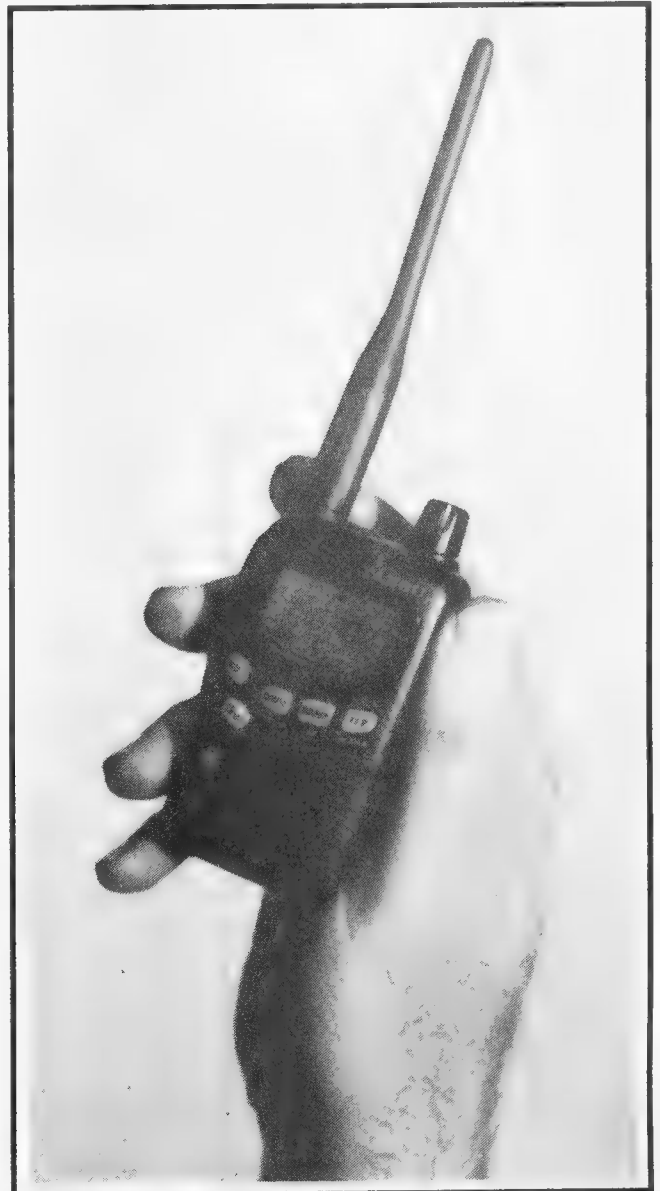
Audio quality and volume is remarkable given the size of the speaker. This is especially true in wide band FM Rx mode in the FM broadcast band. While it is not stereo it still compares very favourably with many of the portable broadcast sets available. One compromise with the 0.5-1.7 MHz range is that the display does not show the frequency; instead the S meter display is used as an analogue bar graph indication of relative position in the band.

This is not that big a problem as there are ten memories dedicated to this band which can store six character alphanumeric labels, making it very easy to select the required station.

One of the other first things to notice is the antenna conn-

ector. To fit in with the small size, Yaesu have used an SMA socket rather than the more common BNC socket. This will mean something to hams into microwaves, etc, but your average ham is unlikely to have sets of adapters for these connectors and they are not the sort of thing you will find as a standard component in the local stores. Luckily, Yaesu also have an optional SMA to BNC adapter which I would see as a must for most people who want to use external antennas.

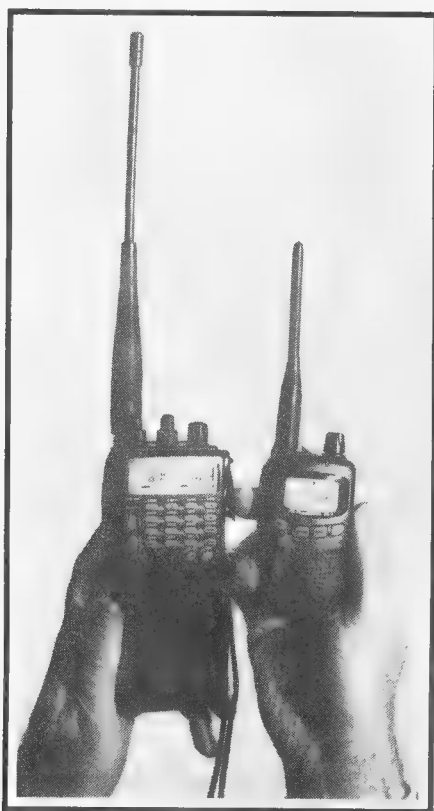
On the subject of accessories there is really very little else to buy as the set has the tone decoder abilities built in that are



The VX-1R miniature hand-held dual band (2 m and 70 cm) FM transceiver.
(Photo by Vicki VK3LT)

normally options with other rigs enabling CTCSS, DCS, etc with 'no more to pay'. One option that I would advise considering, however, is the Yaesu computer programming interface and application. This allows very flexible control and programming of the rig from your PC via a cable plugged into the earphone socket.

The packaging is pretty basic cardboard, but the manual and circuit diagrams are detailed and well written. It is also worth commenting on the supplied charger-cum-power-supply, as the one that came with it is obviously not the Yaesu one illustrated in the manual. In fact, the charger is a fully regulated multipurpose plug-pack (complete with voltage selector switch and multiple connector) set on the six volt position. The supplied power units will have the switch glued in the six volt position to avoid accidentally setting it on 12 volts and frying the set. While the set does tell you the battery voltage at switch-on, you would still have to have noticed that, and if you just plugged it in to charge without turning the set on it may be the battery



Compared to a relatively recent Yaesu dual band hand-held, the VX-1R looks positively tiny. (Photo by Vicki VK3LT)

that will suffer. Despite this, the plug-pack looks well made. Having this as a general purpose unit could be useful, particularly as it has the mains pins orientated so that the normal problems of trying to connect a plug-pack to a low power point will not be a problem.

Much has been said, in various discussion groups on this set on the Web (it's been out in the US for a year or so), about the clip on the back being flimsy and not gripping well. I can see what people are talking about, but this would only be a problem if you want to wear the VX-1R as a semi-permanent belt ornament.

I had no trouble carrying this set wherever I wanted by just putting it in my pocket. If you do want to let it all hang out there on your belt then it might be advisable to investigate the US companies that sell improved versions of the clip as they seem to get nothing but glowing reviews from users.

Technical Bits

Before discussing the circuit of the VX-1R it is worth spending a bit of time on the battery technology used in this set. Lithium-Ion (L-ion) technology is pretty new to ham gear. It has been around for a while, particularly in missiles and nuclear warheads, etc where its lightness, energy density and relatively low leakage are definite pluses, but it has only relatively recently started to appear in some up-market mobile phones and laptop computers.

Its big claim to fame here is the very long life times possible between charges, up to 21 hours of continuous listening to broadcast band AM spread over several days or weeks, or 14 hours of six seconds Tx, six seconds Rx, 48 seconds squelched on VHF. If you compare this performance on VHF with the just three hours possible using a standard Alkaline dry cell in the optional carrier, you can get some idea of just how good it is. In this example, over four times the capacity in something that can be recharged in two hours and weighs only 33 grams.

This all doesn't come for nothing, of course. L-ion batteries tend to cost a little bit more than NiMH which are in turn more expensive than NiCads. Add to this the note in the manual that the L-ion battery is only good for 300 charges before it starts to lose capacity, and

perhaps that AA pack isn't quite so bad an idea after all.

Even a quick glance at the circuits shows that this rig's heritage owes as much to the transistor radio as to ham communication equipment. In this case all the front ends and mixers, etc are normal silicon transistors. In fact the only FETs I can see are in the Tx power amps, and in a switching role in the power supply. This is pretty much the reverse of a normal ham rig, but it obviously helps to keep the price down while still delivering pretty good performance.

Unfortunately, I was unable to verify the quoted specs but on air tests lead me to suspect that they are pretty close. In particular I would have been interested in intermod and overload performance as the transistor mixers would tend to imply somewhat poorer performance here. However, the manual does not quote any figures for these and, as said, I was not in a position to measure them. For reference the more important specs given are:

Tx range 144-148 MHz and 430-450 MHz, high power 500 mW, low 50 mW.

Rx Sensitivity rated at better than:

5 μ V for 10 dB S/N 0.5-1.7 MHz

1.6 μ V for 12 dB SINAD 76-108 MHz

0.5 μ V for 10 dB S/N 108-137 MHz

0.16 μ V for 12 dB SINAD 144-148 MHz

15.8 μ V for 12 dB SINAD 170-222 MHz

0.5 μ V for 12 dB SINAD 300-420 MHz

0.18 μ V for 12 dB SINAD 430-450 MHz

15.8 μ V for 12 dB SINAD 470-800 MHz

5 μ V for 12 dB SINAD 800-900 MHz.

As a matter of interest the manual claims that the set is cellular blocked, that is it doesn't work on the frequencies used by analogue mobile phones. However, in the review set, even after a full reset to defaults, I had no difficulties listening to these frequencies. Actually there were no observable breaks in the coverage 76 to 999 MHz.

The circuit basically consists of a set of Rx RF front ends for Broadcast Band, VHF, UHF, and 800 MHz and up. The signals are then mixed with a VHF/UHF dual VCO (which also drives the Tx modules directly) and fed into either a narrow band or a wide band single IC IF chip. This amounts to being a superhet for 0.5-1.7 MHz, with a 455 kHz IF. For the rest it is a dual conversion superhet, with a first IF of 41.45 MHz, and a second

of either 450 kHz for narrow or 10.7 MHz for wide. There are also numerous transistor switches dotted around the circuit to provide the power saving features which basically consist of a variable sleep time of either 200, 300, 500 ms or 1, 2 seconds, which can be set via a menu but which are not operable on the Broadcast, FM or TV bands.

The designer of this circuit has been quite ingenious providing lots of little unusual tricks. One is the ability to slightly shift the micro clock frequency just in case it happens to create a spurious signal on a needed frequency. This is done by having one digital output from the micro able to drop some more capacitance across the 4 MHz clock crystal. Another trick is the use of the same circuit as the volume control voltage to tune the broadcast band VCO with the voltage indication on the S meter. The 800 MHz and up front end also is very simple using basically a filter composed of two Cs and one L to filter the normal UHF VCO output for the appropriate harmonic on the way to feed the mixer.

Overall, as described above, the RF parts of the circuit are very simple. They have more in common with a conventional broadcast band set than a ham one; however, it still performs remarkably well compared to those sorts of boxes. The only lack in comparisons is that there is obviously no room in the case for even a small ferrite rod type antenna so AM broadcast band reception is reliant on either strong signals, and/or an external antenna. In practice it does remarkably well by just holding the small whip near a larger conductor such as house wiring, etc.

Operation

Operation of the VX-1R is straight forward. The frequency coverage is broken up into nine bands, most of which are obvious such as BC BAND is the 0.5-1.7 MHz broadcast band, and FM is mainly the FM broadcast band plus a bit, ie 76-108 MHz. From there on, however, the split up is a bit more arbitrary with AIR covering 108-137 MHz, V-HAM covering 137-170 MHz, VHF TV covering 170-222 MHz, ACT-1 (short for action band 1) covering 222-420 MHz, U-HAM covering 420-470 MHz,

UHF-TV covering 470-800 MHz, and ACT-2 covering 800-999 MHz.

Selecting a frequency then becomes a case of pushing the band button repeatedly to step through the bands until the required one is reached, at which point the set will, if in VFO mode, start at the so-called home frequency for that band (home frequencies can be set), or, if in memory mode, come up with the last memory used. If it is in VFO mode then, if the frequency required is close by, the dial knob is rotated in the appropriate direction with each click being a step. Or, if larger steps are needed, pressing the function key then the up or down key will temporarily make the step size one MHz. In memory mode the up and down keys will step through the memories.

Once on your desired frequency, the volume and squelch can be changed if required (I didn't have any problems leaving the squelch on the auto setting) by pressing the Vol button then using the dial knob to vary the volume. A similar method is used for squelch if needed. If you just want to use this set on memories it would be worthwhile spending a bit of time programming it up, most easily done with the optional computer control software, and then changing the default action of the knob to be volume.

In use on-air, the audio quality, both of the Tx and Rx in the ham bands and Rx in the broadcast bands, was surprisingly good from such a small package. Tx and Rx audio on two metres was especially good, sounding better than that produced from my old IC 2A, and the lower power levels seemed to make very little difference, at least in the situations in which I normally use a handheld.

The VX-1R can be configured for either 52 or 142 memories, with the more powerful 52 configuration being the default. As far as I could see in Australia, and certainly in my case, there is no real benefit in the extra features of the 52 case, so I would recommend changing this to the 142 option via the power-on process described in the manual.

The only down side to this configuration that I could see was that you lose the ability to set the Tx and Rx frequencies independently, and to vary the band home frequencies. In either

configuration, however, memories can store Tx power levels, Rx mode, six character alphanumeric label, repeater offset, etc.

As well as these memories, there are 10 special ones for the 0.5-1.7 MHz band which can have labels, and other special function memories such as the 31 special search memories and 10 pairs of band limit values that don't use labels. These last two memory types are used in conjunction with scanning, as their name suggests. The smart scan with auto saving into the 31 memories for later review can be quite useful.

This smart scanning brings me to a couple of little niggles with the VX-1R.

The manual describes what sounds like a very useful initial start-up mode where you can get the rig to scan the FM broadcast and TV bands and to store the frequencies found into normal memories. The mode works; however, its usefulness was limited by the radio being just a little bit too smart.

Obviously it is set up to expect stations to have audio at XXX.750 MHz, which is fine for the TV bands, but it limits the number of FM stations found. I suspect that the problem is simply one of being configured for a slightly different band plan than that found in Australia.



The VX-1R alongside the removed battery pack.

(Photo by Vicki VK3LT)

Cover Story

There is a similar sort of problem with the automatic repeater offset feature which seems to be set for the US model, again slightly different from ours. Neither of these problems is particularly disastrous and they are easily compensated by a bit of manual intervention. However, they perhaps show some of the disadvantages of being in a relatively small ham market.

The VX-1R has many other features available via buttons or menus. In size and amount of time you can spend just playing with it, this is truly the ham version of a Tamagotchi.

Conclusion

This radio is basically an amazing toy for any radio amateur. The technology where a dual band hand-held can be put in such a small package that you can just about lose it in a suit pocket and think you have dropped it because it is so light, is incredible. Given the price and the functionality of this package I can see it finding its way on to many a ham's present wish-list.

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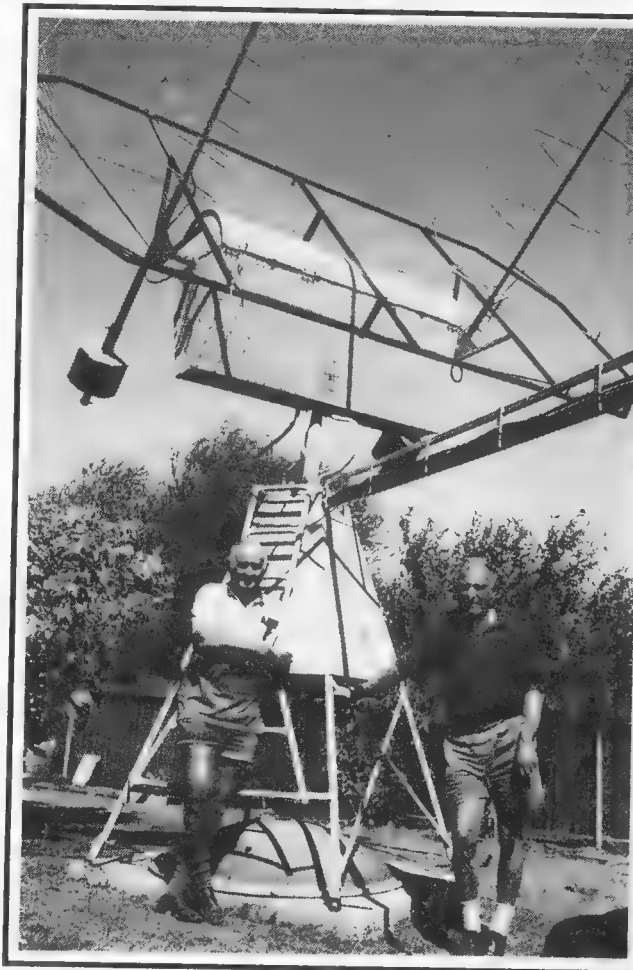
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Doug VK5GA and Tony VK5ZAI with Tony's home-made satellite tracking antenna powered by windscreen-wiper motors. (Photo courtesy of the *Murray Pioneer*)

Our cover photo this month is by courtesy of Doug Tamblyn VK5GA and Tony Hutchinson VK5ZAI who made contact quite frequently with Andy Thomas VK5MIR aboard the Russian Spacecraft MIR. Good publicity for amateur radio was achieved in the newspaper *Murray Pioneer*, published at Renmark, and on which this account is based.

Both of the operators worked Andy from their own stations (Tony at Loxton and Doug at Paringa), but the cover photo was taken by the *Murray Pioneer* photographer in Tony's shack. Tony was a student at the same school as Andy (St

Peters College in Adelaide), although some years earlier.

A few interesting details regarding the space mission are as follows: At the height of 390 km above Earth, places as far apart as Melbourne, Sydney and Ceduna were simultaneously visible. A small fire aboard MIR during March had temporarily raised the carbon monoxide level in the cabin but had been quickly controlled. Andy indicated that some remaining difficulties outside the spacecraft would need extra-vehicular activity (EVA) to put them right. (*The daily press and TV have subsequently reported two EVAs with video coverage by Andy on camera.* Ed)

It was suggested that Andy may have given some preference to working VK5s, but this was probably

“tongue in cheek”. There were many thousands of radio amateurs around the world looking for a QSO with Andy on 145.985 MHz, so he was always busy on the occasions when more urgent activity did not take priority.

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