■ Equipment Review

YAESU FT-8100R

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The Yaesu FT-8100R. Note the uncluttered front panel, and how compact the transceiver is in comparison to the standard-sized hand-held microphone. ***(Photo by Vicki VK3LT)***

What Is It?

The FT-8100R is a dual band (2 m and 70 cm) FM mobile transceiver, with up to 50 watts of transmit output power on VHF and up to 35 watts of transmit output power on UHF. The receiver coverage is from 110 MHz to 550 MHz, and from 750 MHz to 1300 MHz (blocked 869 to 894 MHz). The unit is of mid-size (140x40x165 mm) and weight (1.0 kg). The review unit was kindly supplied by Dick Smith Electronics and had the serial number7E022196. Retail price is $899.

First Impressions

This radio is all about Yaesu getting back to basics. The obvious comparison is with the FT-8500 I reviewed about 12 months ago. Gone are the fancy single knob on the box, the complex microphone control, the menus, and the spectrum scanning display and associated gee whiz functions. Instead, with the FT-8100R we have almost the opposite; there is a knob or button for very nearly all functions on the front panel of the set, with effectively no menus. Also, the features have been concentrated, in the main part, in basic RF areas such as the extended receive coverage now rated at up to 1.3 GHz!

As can be seen from the photos the front panel layout, even with all the buttons, is quite uncluttered. The large display is viewable in all lighting conditions and incorporates a nice trick of providing the labels for the row of eight buttons along the bottom. These labels change when the function or shift button is active, so there is little chance of mistaking which button to press for which function.

As is pretty much standard with dual band sets, one half of the display is for each band with separate indications of frequency and signal strength, etc.

The set (via the display) also does something that I have not seen before but which is a really good idea. On power-up, the display briefly shows the DC line voltage. Speaking as someone who has twice blown up finals when a power supply has decided to deliver 18 volts instead of 13.8 (drat those LM723s), this is a great idea.

The only extra I would ask for is an optional interlock that would then disable the transmitter if the supply was outside voltage limits. Once again Yaesu has shown that they are thinking and innovating, introducing features that should become standards.

The microphone connector is, as usual these days, one of those pseudo phone connector plastic click-in things. The microphone looks large but fits the hand well with receive and transmit audio quality that seemed good in subjective on-air tests.

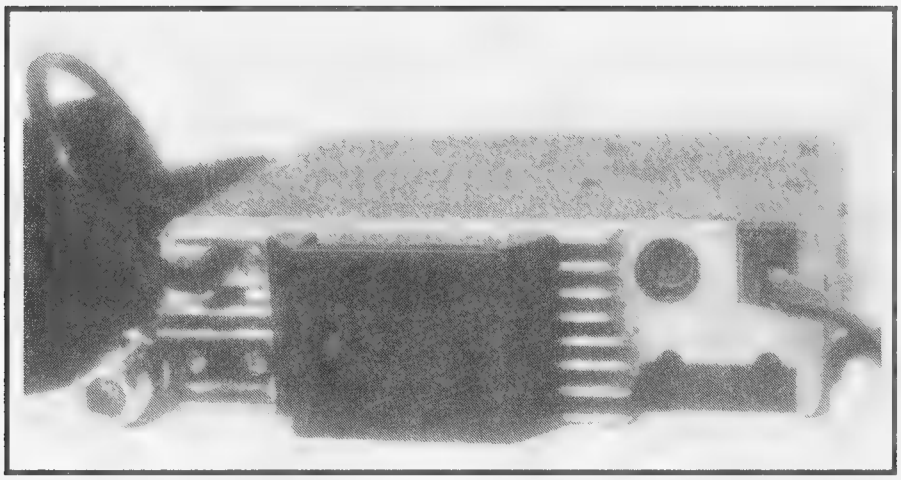
Despite the recommendation in the front of the manual that you should read it through prior to use, I had no problem at all with just powering the set up and using it on-air. The main knobs and buttons did what I expected them to do, and I only had to resort to the manual when testing out some of the fancy memory functions.

The manual is a well written 64 pages of information covering operation of the set in detail, including discussions of such things as coax cable losses and what causes birdies in general coverage receivers. Also included is a full set of circuit diagrams and a quick-guide card. Included in the standard Styrofoam and cardboard box is a mobile mounting bracket, power cable, spare fuse, and miscellaneous nuts and bolts for the bracket.

Technical Bits

The receive frequency coverage of the set is basically a very wide 110 MHz – 1300 MHz with two holes at 550-750 MHz and 869-894 MHz, the latter being the main analogue cellular mobile phone band. The nominal VHF receiver handles 110 to 280 MHz while the UHF one does 280 MHz and up. The segment 110-137 MHz will default to AM reception, however FM can be selected by pressing the appropriate button.

The transmit coverage is 144-148 MHz and 430-450 MHz. This 20 MHz of UHF does not come without some problems as, at least in the set I tested, the auto repeater offset function didn't 100% match the Australian band plans. This isn't a major problem as the auto function can be deactivated and is mainly wrong in the 440-450 region where there is little or no voice repeater activity that I am aware of in Australia. The circuit/block diagram is as good as I am coming to expect from Yaesu.



A rear view of the FT-8100R showing the solid die-cast heat-sink with the integral thermostatically-controlled fan. ***(Photo by Vicki VK3LT)***

The specifications describe the set as a double conversion superhet with a 45.05 MHz and 58.525 MHz first IF on VHF and UHF respectively, with both bands using a 455 kHz second IF. Sensitivity for 12 dB SINAD is claimed as less than 0.18 µV for a main receiver but only less than 0.25 µV when a sub receiver. These figures (as are the selectivity, spurious, and image rejection) are on a par with other like boxes. These figures are, in fact, exactly the same as that of the FT-8500.

Rated audio output is 2 watts, and subjectively sounded clear and clean. For the transmitter the rated power outputs were 50, 20, and 5 watts on VHF, and 35, 20, and 5 watts on UHF (ie more or less the standard for this class of set these days). Peak current drain at maximum rated power out is given as 10 amps at 13.8 volts, which is actually a bit less than usual. For example, the FT-8500 was rated at over 11 amps for the same power output.

Thanks to some decent test equipment obtained courtesy of Charles Edmonds VK3CLE, I was able, in this case, to investigate a bit further just what these claimed figures meant. Basically, the story that surfaced was that within the ham bands this set performs very well; outside the ham bands performance falls off but is still usable. For example, at 435 MHz the claimed sensitivity for 12 dB SINAD is better than 0.18 µV; in fact I measured it at 0.15 µV which is actually about 1 dB better than that. If you are interested, at 435 MHz with 0.18 µV I got 17 dB SINAD.

Once you move out of the ham band, though, things change quite drastically. At 485 MHz, for example, the figure obtained for 12 dB SINAD was 0.25 µV which is what was claimed for the sub receiver. This was not what I had thought was meant by sub receiver. I had equated this with the option of V/V or U/U, that is using both halves of the set on the same band. When I tested this feature, however, I found that it was worse again, giving, for example, 0.5 µV for 12 dB SINAD when using the nominal VHF receiver at 435 MHz.

Unfortunately, I was unable to test accurately the reception at 1296 MHz. It could certainly receive signals but I have nothing even remotely calibrated at that frequency (hint to Charles and other generous souls!). I suspect it was a bit deafer than the 0.25 µV, but I could be wrong.

We can make sense of these measurements by looking at the circuit for the receivers. Basically the incoming signal is split via high and low pass filters between two independent receivers, one via the low-pass for nominally VHF, and one via the high-pass for UHF and SHF. Each receiver has multiple front ends feeding virtually identical wide-band double balanced mixers and IF chains. In each case there is one front end dedicated just to the appropriate ham band, and one or more front ends for a wider range of frequencies. For VHF the ham band front end is track tuned and all others are fixed tuned.

The more narrow band tuned front ends obviously produce better results than the less tuned more scanner-like front ends, thus the better than 0.18 µV for 12 dB SINAD for the main band receiver (ie ham specific front end), versus the better than 0.25 µv for the sub band receiver (ie same receiver but with the wider band less tuned front end).

The extra 6 dB loss in V/V or U/U mode can also be seen to be a function of the way it is achieved. If, for example, you wished to have both receivers tuned to somewhere in the two metre band (ie V/V operation), the normal VHF receiver will utilise the optimised or narrow band ham front end while the UHF receiver, rather than using one of its front ends, will be connected to the VHF receiver's wide band front end. The extra switching losses account for the 6 dB.

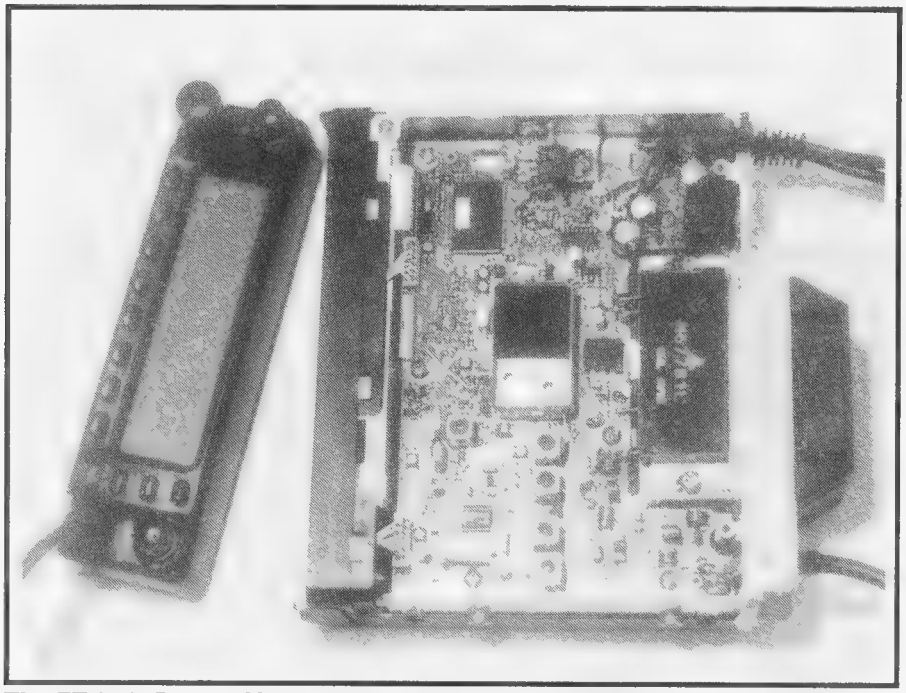
The circuit is very similar to that of the FT-8500, with two exceptions, both in the receiver area. In the FT-8100R there is a third front end in the UHF case for SHF reception, and secondly the Double Balanced Mixers are active using a pair of FETs rather than passive using a four diode ring.

Operation

As can be seen in the photo, the set has a solid die-cast heat-sink on the rear with an integral fan. This fan is thermostatically controlled and, while the noise is noticeable in a base station environment, it would not be when mounted in a car.

The set has only a single flying lead N type coax connector for both bands. This is very convenient when using a dual band antenna. However, an optional diplexer is available if you are going to use this set as a base station with separate antennas for each band.

The manual contains a good section on installation and general use of the set, including, as a sign of the times and the current awareness of the possible hazards of RF, a section on safety containing items such as "Do not use directional antennas in any locations where humans or pets may be walking in the main directional lobe, and during vehicular operation when stopped in a parking lot, etc", and "make it a practice to switch to low power if there are people walking nearby". The one about



The FT-8100R out of its case and with the front panel removed. Note that the inside of the box is quite empty looking with extensive use of surface mount and miniature components. ***(Photo by Vicki VK3LT)***

not wearing earmuff headphones while driving I must admit, though, gave me a bit of a chuckle. If you are concentrating that much on hearing the stations down in the noise then you certainly shouldn't be trying to drive at the same time, headphones or not!

The set has a total of 203 memories (103 per band). This is roughly twice the number of the FT-8500 but, while they all still store frequency, repeater shift, and tones, there is no alphanumeric naming of memories. Tuning step sizes of 5, 10, 12.5, 15, 20, 25, or 50 kHz are available. All of the usual VFO and memory scanning features, as well as DTMF paging, etc, are available (with the optional CTCSS module installed).

One nice new feature is the ability to do what is called a smart search. This feature is normally found on scanners and is like a normal VFO scan. However, as it finds frequencies in use, instead of stopping, it just saves the frequency away in a set of special memories (up to 50 per band, 25 below where you started 25 above) for later human evaluation. On review of these memories you can choose to place them in a standard permanent memory or discard them. I found this particularly useful when scanning the wide band receive range looking for signals at the small step size; this can take quite some time so it was nice to be able to set it going and walk away, then come back later and review what had been found. I presume it would also be a help in contests where you are trying to find where everybody is.

While the set can be set up to work in either a one-way or two-way cross band repeater mode, there is the basic limitation that you cannot transmit on both bands at the same time. Receiving on both bands at once is fine, there are even separate external speaker sockets on the rear if you want to have VHF come from one speaker and UHF from the other.

The transmit limitation does, however, lead to one non-obvious (at least it was to me) limitation of the set when used for Packet Radio. While the set, in common with most new ones these days, has a data connector for both 1200 and 9600 baud TNCs, it can only be used with whatever band happens to be the main one at the moment. That means you cannot be chatting away on two metres while down-loading some messages from a bulletin board on 70 cm. Packet needs the transmitter, not just the receiver. I suspect this limitation is present in most, if not all, of the sets on the market today.

The photos show that the front panel can be removed and (with the appropriate optional cable) remotely mounted for both security and ease of finding dashboard space to mount it. Also, you can see from the photo that the inside of the box is quite empty looking with extensive use of surface mount and miniature components. Unfortunately, while this obviously keeps the costs down and the reliability up, it does make it a bit hard for the average ham to fix or modify the rig themselves, even with the circuit diagram provided.

Conclusion

Yaesu have come up with a really good work-horse mobile rig here. At the right price I could see lots of them being sold.

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WIA News

Morse Code Fades on Blighty's Shores

The first of January marked the end of the use of Morse code for ship-to-shore communications in the UK. It first rose to prominence after Marconi saw the potential of wireless as a communications medium for ships at sea.

On the last day of 1997, farewell messages were transmitted in Morse on 500 kHz but, in the midst of these, a genuine emergency SOS on the frequency was very nearly dismissed as a hoax!

Satellite communications are replacing low and medium frequency technologies in maritime distress applications, as satellite technologies have proved more reliable and require far less operator intervention, according to the RSGB's *GB2RS News* for 11 January 1998.

The abandonment of Morse code for maritime distress communications in Australia won't come for 12 months or more, according to the National Search and Rescue Authority in Canberra.

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