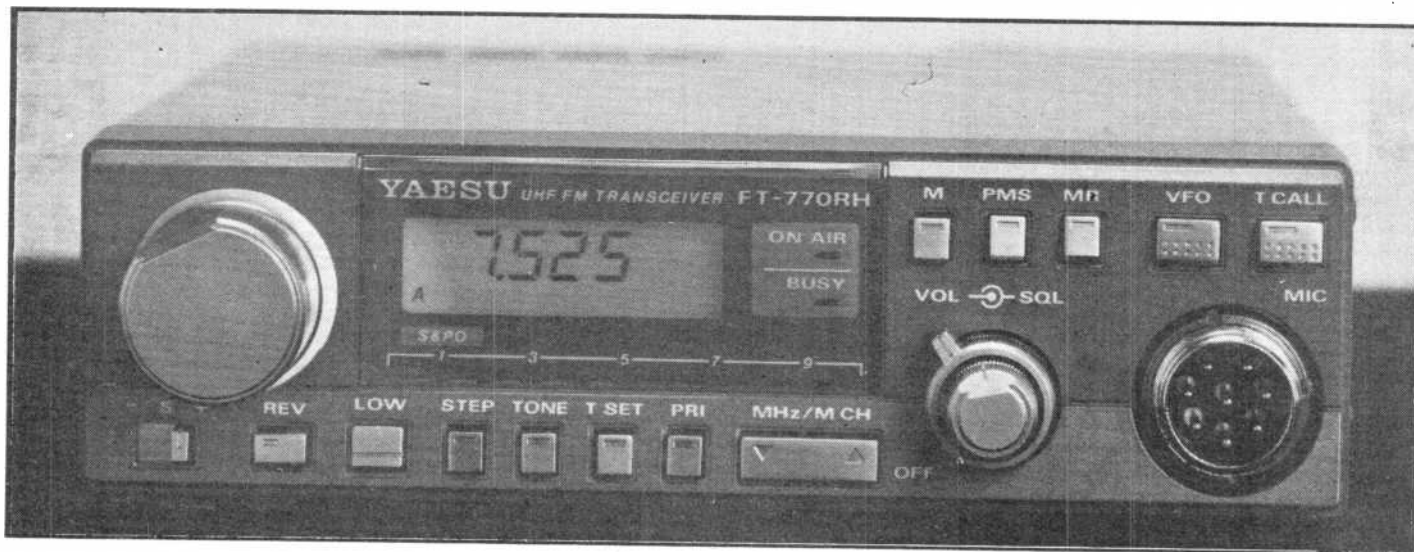


ANGUS MCKENZIE

TESTS



YAESU FT770RH 70cm FM mobile transceiver

In the June 1985 issue of *Amateur Radio* I reviewed the 2m version of this transceiver, so you can see that we have had to wait a year for Yaesu to introduce their 70cm version. The rig covers 430 to 439.9875MHz in 12.5kHz steps, a front panel button allowing selection of 25kHz channelling. Maximum output power is claimed as 25W, but another front panel button can select the low power mode: 2.5W as measured.

Frequency can be varied either on a tuning knob with click steps, on the front panel, or by using up and down buttons on the microphone. Holding the mic stepping button down causes the rig to scan, provided the squelch is in use. Either of two scanning modes can be selected by a switch underneath the chassis: the A position resuming scan after six seconds, while the B position resumes scan two seconds after the squelch closes, the scan having stopped on a station.

Memories

The FT770RH has ten memories, and these can accept simplex or separate Rx and Tx frequencies up to memory 8, memories 9 and 0 being used for setting a programmable scan range; eg 433.0 to 434.0MHz. The rig includes a simplex/repeater negative or positive switch allowing one to select repeater use from the VFOs A and B, or from a simplex frequency memory. Thus, you can either store a repeater channel as a simplex one and use the repeater shift switch, or you can select memory with built-in repeater shift. A reverse repeater button, when pushed in, transfers the Rx and Tx frequencies from VFO with repeater, or from simplex memory with repeater shift switched in, but reverse will not

work when separate Rx and Tx frequencies are stored. The rig includes a priority function for use when you are in the VFO mode: it monitors the selected memory channel every few seconds.

Toneburst selection

You can either select toneburst (1750Hz) automatically at the beginning of each transmission, or more desirably you can get a toneburst to open up a repeater by pushing a toneburst Tx button on the panel. Note that most 70cm repeaters do not require repeated toneburst access once the repeater is on. Sub audible tonebursts are available with programming if you fit an extra optional board, but these are not normally used in the UK.

A rocker switch button on the front panel selects MHz up/down if you are in the VFO mode, or memory channels up/down in the memory mode; buttons selecting memory recall and VFO A/B. Unfortunately, if you wish to shift MHz quickly, but you inadvertently go over a band edge, the selected kHz are wiped out, so you may have to redial the kHz again, which can be most annoying. A memory write button allows you to transfer a VFO frequency into a memory that has already been pre-selected, the button needing to be pushed twice for storage. A separate Tx frequency can be programmed by pressing the write, followed by PTT and then write again. Memory channels can be completely erased by pressing write immediately followed by recall. If you wish to scan memories then you can do this in the normal way, having selected the memory mode. You can also programme into memory a skip command, so that when memory scanning any desired channel

can be skipped over.

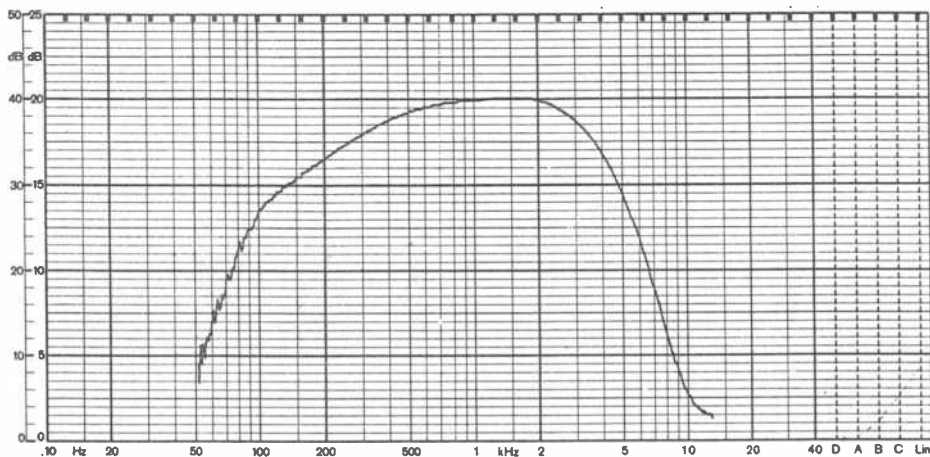
The front panel back lit green LCD gives frequency and all status functions that one would expect. The S-meter is in the form of a series of squares which double as power output indication on Tx and memory channel selected. On the front panel is an eight pin standard Yaesu mic socket, an MH14AB hand mic being supplied with the rig, which includes PTT, up/down buttons and an additional button to command the optional speech frequency/status read-out to operate. On the back of the mic is a slide switch which one can throw across to lock the frequency, thus disabling the up/down buttons on the mic, but not the tuning VFO knob. This facility is quite helpful in general use.

Speech synthesizer

The optional speech synthesizer, FVS1, can be switched to read-out whenever a frequency is changed, or just when the command button is pressed on the mic. I have to say that the quality of speech is poor compared with Icom and Trio speech read-outs. It generally gives too much detail, including the selected VFO as well as the frequency, and has some strange pronunciation anomalies. 'Point' comes out as a warped 'woink', but what is even more amusing is that 'error' reproduces as 'ellar'. As delivered, the read-out was painfully slow, but by fiddling inside you can speed it up, but you may take a while to get used to it!

The FT770RH is remarkably small, measuring only 140mm wide x 40mm high x 160mm deep, and weighing 1.2kg. The miniature built-in speaker is underneath the rig and consequently throws sound downwards, which of course is annoying if you are using the rig as a home base

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Yaesu FT770RH transmitter response chart

station. However, a wire stand for desk top operation is provided, but this has to be fitted by the user. A mobile mount is also supplied and the rig slides in and out of this fairly easily.

Underneath the rig are slide switches selecting VFO dial tuning: speech on/off, scan mode A/B, toneburst on/off and lithium battery back-up on/off. On the back panel there is an attached dc lead approximately 20cm long terminated in

bullet connectors. An extension dc power lead, also fitted with bullet connectors, is 3m long, and fused in both positive and negative lines at 10A. A short coaxial lead (20cm) is provided with an N-type female line connector for the antenna connection. A 3.5mm jack socket provides interconnection for an external speaker.

Also on the back panel is the PA heatsink and a fan which comes on when

the temperature exceeds a preset amount (it comes on after a minute or so of transmission). This fan makes quite a hissy noise, which is not too disturbing in a mobile installation, but is rather irritating in the shack.

Subjective tests

I used this little rig for several evenings at home and was most impressed with its performance, although it was slightly fiddly getting to some of the buttons.

The repeater switch was rather stiff, although positive. Accessing the memories and band scanning was very simple and sensibly designed, and the VFO knob had just about the right feel to it. As with the FT2700 and the FT270, I was not impressed with the speech synthesizer.

RF sensitivity and selectivity seemed very good in practice and the reproduced quality was quite good, although limited by the mini speaker. An external speaker, however, sounded much better. The transmitted quality was considered by many to be at least average although a little coloured, and a better hand mic would undoubtedly have produced superb quality judging by our measurements of the transmitted audio.

Although the digital display is necessarily very small, it was quite bright and easy to read showing a clear advance over many older rigs. I rather like the idea of attached power and antenna leads, which makes it much easier to take the rig in and out of a mobile installation.

Perhaps my only real moan is that the use of the MHz button over a band edge removes the kHz, and it is so easy to make a mistake if you stab at the MHz rocker whilst driving a car. If you go the wrong way by mistake and lose your station after saying '4MHz up', when actually going perhaps to the bottom end of the band, you have to go 8MHz up again and fiddle the tuning for the correct kHz. Obviously something that would cause frustration.

Laboratory tests

The receiver sensitivity is very good at the bottom and centre of the band, but at the top end (eg 439.975MHz) it was 2dB worse, although still acceptable. The front-end RF intercept point was at approximately -12dBm, which is quite good, although I have seen a lot better. The reciprocal mixing performance was audibly adequate, but not outstandingly good. The IF selectivity is excellent for 25 and 50kHz channelling, but inadequate for 12.5kHz channelling, which in any case is not even being considered yet for amateur use (nb: some users sharing the band, however, are using 12.5kHz offsets).

The S-meter gave a range of only 15dB between blobs representing S1 and 9, the final blob requiring only an extra dB to light up!

The S1 indication, in any case, requires a fairly good signal to indicate, and I cannot see that the S-meter, therefore, is of much practical use, other

Yaesu FT770RH Laboratory Test Results

Receiver tests

Rx sensitivity RF level for 12dB sinad	
432 - 436MHz	-124dBm
439.975MHz	-122dBm
RF input intercept point	-12dBm
Selectivity 25kHz channels, wanted and unwanted channels modulated	+66dB average
Selectivity 50kHz channels, wanted and unwanted channels	+72dB average
S-meter	
S1	-110dBm
S5	-99dBm
S9	-95dBm
Capture ratio	3.7dB
3dB limiting point	-131dBm
Quieting at 12dB sinad point	16dB
Discriminator distortion	
1kHz deviation	1.5%
3kHz	2.8%
5kHz	1.7%

Audio output power for 10% THD

8 ohms	1.8W
4 ohms	2.9W

Transmitter tests

RF output power high/low	26 to 28W/2.5W
Max FM deviation into clipping	6kHz
Typical speech deviation	4.7kHz
Toneburst frequency	1750.2Hz
Toneburst deviation	4.5kHz
Tx frequency accuracy after very long warm up	-380Hz
Max dc current drawn on Tx	6.4A
Rx current	280mA
Tx audio distortion below 4.5kHz deviation	less than 1.1%

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than to indicate the presence of a signal which is at least fairly strong, but which is normally audible anyway.

The FM capture ratio measured very well, showing that the rig discriminates a strong signal from a weaker one on the same channel very well indeed. Distortion around the discriminator was about 1.5%, but it was rather odd that the highest distortion of 2.75% was noted at 3kHz deviation of 1kHz audio, while above this deviation the distortion fell again up to the point where it started hitting the edges of the IF bandwidth. The maximum audio output power into 8 ohms was slightly low, but there was a very useful improvement into 4 ohms.

FM limiting action was excellent, the recovered audio output level being virtually constant way below the input sensitivity level. The receive frequency accuracy was within 500Hz at worst, for sensitivity only improved very marginally indeed when the generator was off-set by this amount.

Audio response

The reproduced audio response, charted with 750 μ sec pre-emphasis in the transmitted modulation, showed 6dB down points at 200Hz and 2.3kHz; the response curtailing quite rapidly above 2.5kHz. I might have preferred a slightly wider response on a 70cm rig, although this response would be about ideal on a 2m rig where 12.5kHz channelling is now in regular use.

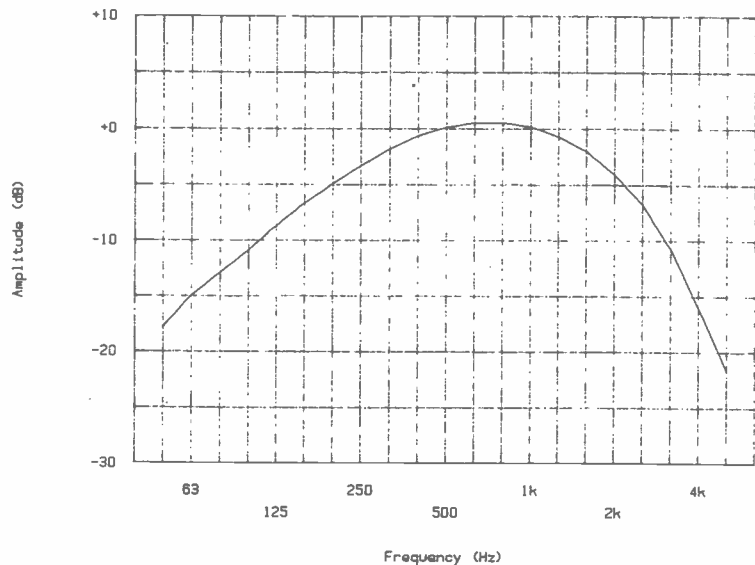
The transmitting section produced 26W output from a 13.8V dc supply from low to mid-band, but an increase to 28W was noted at the top end. The rig typically gave 2.5W in the low power position. Maximum dc current drawn was 6.4A, the receiver drawing around 280mA unless the volume is turned well up.

A brief check for RF harmonics showed that both the second and third were below -70dB ref the fundamental, which shows excellent PA filtering. The onset of audio clipping was at 5kHz deviation and absolute maximum deviation, when provoked, was 6kHz. Normal speech peaked at around 4.7kHz, showing the mic gain as well as deviation to be optimally set. The toneburst was set to 4.5kHz deviation and its frequency was only 0.2Hz in error; one of the most accurate we have yet seen.

Transmitted frequency

The transmitted frequency accuracy was originally only 170Hz out, but as the rig warmed up the error rose to around 280Hz. After an extremely long over, the maximum error was 380Hz; the repeater shift however being extremely accurate. Any frequency errors noted are of no real significance, and it can be seen that the internal crystal is within one part in 10⁶, even when coping with a large temperature change.

We checked the transmitted frequency response from the input of the mic socket to the output carrier, which was subject to 750 μ sec de-emphasis in the Marconi 2305 modulation test set. The



Yaesu FT770RH FM received audio response (750 μ S pre-emphasis)

published plot shows that the transmitted response is within 6dB or so from 200Hz to 4kHz, and is thus appreciably wider than the receive response. I feel this is about right in practice for the UK market, although inappropriate for 12.5kHz channelling. We noted only 1% THD at 4.5kHz deviation and this is excellent, the transmitted signal-to-noise ratio being very good.

Conclusion

It is remarkable how rigs have got smaller and smaller over the years, while Tx output powers have usefully gone up. This little rig worked very well and could

be tucked almost anywhere under a dashboard. In the context of operation on the 70cm band, I feel that it can be recommended highly, although you will need to watch that there is adequate ventilation space behind it. I would like to thank Amcomm ARE Ltd for the loan of the review sample, and Roy Brooker, for helping me with all the tests. Another most useful Yaesu product.

Reference

Amcomm ARE Ltd,
373 Uxbridge Road,
London W3 9RN
Tel: 01-992 5765/6

