

## ■ Equipment Review

# Yaesu FT-3000M

Reviewed by Paul McMahon VK3DIP\*



The Yaesu FT-3000M. Comparison with the microphone shows the compactness of this high power rig.

### What is it?

The FT-3000M is what some call a one-and-a-half-band box. It is basically a 2 metre FM mobile transceiver with a separate wideband receiver. It has up to 70 watts of transmit output power on 2 m, with receiver coverage of 110 – 180 MHz, 300 to 520 MHz, 800 to 869 MHz, and 894 to 999 MHz. The chunk missing in the later range is basically the mobile phone band. The unit is of mid size (140 x 40 x 180 mm, not counting the big, sticking-out knob) and is perhaps a little heavier than normal with a weight of 1.25 kg. The review unit was kindly supplied by Dick Smith Electronics and had the serial number 5N010231. Retail Price is \$799.

### First Impressions

Someone at Yaesu is getting adventurous; this box was obviously designed to at least look different. Instead of having the controls and buttons spread evenly over the front panel, most of the knobs and buttons live

in an area on the right of the panel. This control cluster is obviously designed to be able to be operated with one hand with the minimum of finger travel. Some ergonomist has given these controls a lot of thought, and once you had had a bit of practice you could probably do just about any function by feel, and very quickly. I must admit, though, it does look a bit strange to have this mountain of controls sticking out of the box. Yaesu calls them dual concentric multi-purpose selector knobs and associated control buttons.

This sort of design could well be very good for some hams who have problems with the more normal arrangements of controls. It would be interesting to know if Yaesu had this market in mind when it was designed. Apart from this control cluster, the rest of the front panel contains only two knobs, one for volume and one for squelch, and a large multi-function display panel.

This display shows the frequencies of the main and sub-band simultaneously,

along with a multitude of other things such as the prompts for the menu system, and even the supply volts if required. The latter could be very useful in this case, as the set draws a hefty 15 amps continuous on high power transmit which will make wiring in the car and the condition of the car battery very important.

The box also offers the little brother of the Spectra-Analyser feature I reviewed last month in the Yaesu FT-8500. In this case it is called a Spectra-Scope, with the main difference being that, instead of a true graphical display, activity either side of the centre frequency is indicated via a clever arrangement of standard character segments.

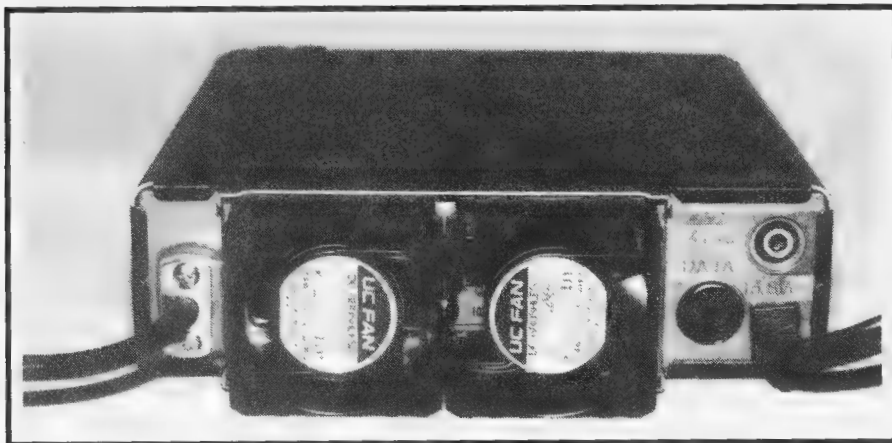
Audio quality seems good in subjective on-air tests, and the receiver sensitivity seems uniform across the ranges covered. The noise from the dual fans was not as loud as expected, though again the increased airflow needs may complicate mobile installation.

Again similar to the recently reviewed FT-8500, the manual actually seemed to cover all the features of the set, and yes, there is a reasonably detailed circuit diagram. I hope this is now a Yaesu standard which will be adopted by others. Also in the standard styrofoam and cardboard box was a mobile mounting bracket, power cable, spare fuse, and miscellaneous nuts and bolts for the bracket.

### Technical Bits

The receiver frequency coverage of the set is as mentioned above, 110 – 180 MHz, 300 to 520 MHz, 800 to 869 MHz, and 894 to 999 MHz. The segment 110 – 137 MHz can be set up for AM or FM via a menu option. The transmit coverage is 144 – 148 MHz.

The specifications describe the set as a double conversion superhet with a 45.05 MHz first IF and a 455 kHz second IF. Sensitivity for 12 dB SINAD is claimed as less than 0.2  $\mu$ V for the main 2 m band but only less than 0.25  $\mu$ V everywhere else. Selectivity is on a par with other like boxes, as is spurious and image rejection. Rated audio output is 2 watts and, subjectively, sounded clear and clean. For the transmitter the rated power outputs were 75, 50, 25, and 10 watts. Peak current drain at the



Rear view of the FT-3000M showing the efficient twin cooling fans.

various power outputs is given as 15, 10, 7, and 5 amps at 13.8 volts.

The set has 70 normal general purpose memories arranged as seven banks of ten. As well, there are eleven special purpose memories including a home, a priority, and scan edge memories. Each memory can store either separate receive/transmit frequencies or repeater offset, and can also store an up to five alpha/numeric name which can be displayed instead of the frequency. Tuning step sizes of 5, 10, 12.5, 15, 20, 25, or 50 kHz are available in all segments except 800 – 999 MHz where some of the smaller steps are not available.

The set also has a function that I must admit caused me to laugh when I first read of it in the manual. The ARTS, or Auto Range Transpond System, can automatically poll other similarly equipped sets to see if they are in or out of range with appropriate indication on the front panel and melody sound effects. The tones are ascending for in-range and descending for out-of-range indication. It just shows you that memory space in the control processors must be cheap and that people are scratching for ideas, or alternatively there is some real reason why someone would want this function that just totally escapes me.

The set also has the usual complement of scanning options and pager and message systems available with an optional module. It is possible to page the set and leave either one 16 second voice message or two 8 second messages (configurable via the menus).

Also, as is becoming standard, the set has a connector at the rear for packet operation (1200 and 9600 baud).

Other features include DTMF remote control, and transceiver cloning where the setup of one transceiver can be loaded into another. These latter two features should imply that the set could be computer controlled in a similar manner to the FT-8500, but no mention of this possibility is made in the handbook. However, a check with Dick Smith Electronics discovered that Yaesu produce a software/interface package, called the ADMS-1B, which is available for use with both the FT-8500 and the FT-3000M.

The bit I enjoy most about doing these reviews is the chance to, at least when provided, study the circuit and block diagrams to see how the sets tick. Over time we have gone through an evolutionary period where initially the bulk of the innards were taken up with the RF side with all discrete circuits just about out of the same basic text book. We then went through a period where this shrank away into a couple of ICs and the control electronics began to predominate. Now this too has begun to shrink in the number of ICs, if not in power, and we are seeing some real variation and inventiveness in the RF side again. In many cases the designers are doing things that just would not have been practical before the advent of high powered control microprocessors.

In particular, I have noticed what appear to be hybrids of narrow range receivers and circuits that would seem more at home in a scanner. The set

construction technique seems to reflect this hybrid, too, with the ham bits usually being on the mother boards and the scanner bits being separate small daughter board modules. This set is a good example of this. It has four separate receiver front ends, each optimised for different band portions or uses. Two of these provide separate tracking narrow range front ends for the 2 m and 70 cm bands, the more complex of the two being the 70 cm one which can also double as a wide range UHF front end. The other two front ends provide wide band VHF coverage and the 800 – 999 MHz getting-on-for-SHF range. This sort of thing would have been very unwieldy to manage and control before the micro controller.

The basic receiver operation is pretty straightforward. The appropriate front end is selected by the micro, using simple biased diode switches and fed into a wide band double balanced mixer made using a pair of dual gate mosfets along with the appropriate first local oscillator frequency derived from either

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the VHF or UHF VCO. The output of the mixer is fed via a monolithic crystal filter (45.05 MHz) through an IF amp and into a single IC FM/AM receiver IC, a TK10930V for those interested. The SHF front end is quite interesting, consisting of just two transistors, one an RF amp and the other a mixer. For SHF there is not a special VCO off the PLL; instead, the UHF one is reused twice! For example, at, say 900 MHz, the signal is amplified by the RF amp stage then mixed with the UHF VCO at 427.475 MHz to give 472.525 MHz which is fed into the main mixer and again mixed with the 427.475 MHz UHF VCO to finally give the 45.05 MHz IF.

Effectively, the UHF local oscillator is being doubled, which explains why, for SHF, the small step sizes are not available as they too will be doubled by this process. This same trick should be also possible as an add-on mod for existing UHF receivers both scanning and amateur. The frequency display would, of course, be wrong, but for the cost of two extra transistors and some switching you have SHF coverage.

### Operation

I found the smart search feature a useful operating aid. With this you can scan a range between limits set in some special memories, and up to 20 frequencies, where activity was found, will be stored sorted by either frequency or signal strength order (selectable via menu) in a special set of memories. For contesting/scrambling this could prove invaluable, effectively giving you a list of where the other stations are, or have been, which you can quickly step through and exchange a number, etc.

The Spectra-Scope was also not bad, but I felt it was let down by the lack of resolution in the display, at least in comparison with the FT-8500 with its finer detail.

As has been said, the audio quality on transmit and receive was, as is usual these days, well received from on-air reports, etc.

General use of the set was straightforward, though I must admit to finding some things easier to do using the keypad on the microphone rather than the front panel controls. The ability

to user-program the four function keys comes in handy here. As to the dual concentric multi-purpose selector knobs and associated control buttons, I can't say I ever got really used to them, but again I'm sure that for some people they will be just perfect.

One caveat I would make with this rig is that you should watch the current usage on high power. I found it hard to find a power supply that would deliver the 15 amps continuously for any length of time. In most cases in the race to see who got hottest, the rig with its dual fans stayed reasonably cool, but the power supplies got very hot. The standard power supply I use for a normal 200 watt HF box, which is rated at greater than 20 amps peak, was much better at heating up than the rig, and I wouldn't have wanted to use it on high power for,

say, a full day contest. However, Dick Smith Electronics advise that their D-3800 power supply is quite suitable for use with high power transmissions from the FT-3000M.

Likewise, in a mobile/car installation, you will have to watch how long you talk; sucking 15 amps continuously out of your car battery, even with the engine running, will lead to a flat battery, and you can't call for help on 2 m if your new transceiver needs 5 amps, even on the lowest power setting, out of a flat battery.

### Conclusion

If you need a high power 2 m box, and/or the unique control arrangement of this rig suits you, and you have a good high current supply, then this rig seems good value at the price.

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## WIA News

### Cat's Whiskers

Explaining radio communications to non-technical people is now much easier, thanks to the late, world-renowned physicist, Albert Einstein.

According to *The ARRL Letter Electronic Update* for 25 October, when Einstein was asked to describe radio, he is said to have provided this eloquent description: "You see, wire telegraph is a kind of very, very long cat. You pull his tail in New York and his head meows in Los Angeles. Do you understand this?" Einstein then continued: "Radio operates exactly the same way - you send signals here, they receive them there. The only difference is that there is no cat!"

### New WIA Members

The WIA bids a warm welcome to the following new members who were entered into the WIA Membership Register during the month of October 96.

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