

# THE YAESU-FT 1000 HF ALL MODE TRANSCEIVER

RON FISHER, VK3OM

Once upon a time (and this isn't the start of a fairy story) if you wanted an HF transceiver, you bought a Yaesu. Why? Because there wasn't much else about. These were the days before Icom and Kenwood had really appeared on the market, they were relatively expensive, and most of the operating aids were optional extras anyway. Along came Yaesu, and all the extras were built in. Cast your mind back. Transceivers like the FT-101 and the FT-200 were the ones that everyone had, and further more, they are mostly still going strong. These were followed up with famous models like the FT-101Z, the FT107 and, of course, the best known of them all the FT-7. Then to my way of thinking, things started to go slightly wrong. Over the last five or six years, Yaesu hasn't been a big name in HF transceivers. It seems that this is likely to change in the near future.

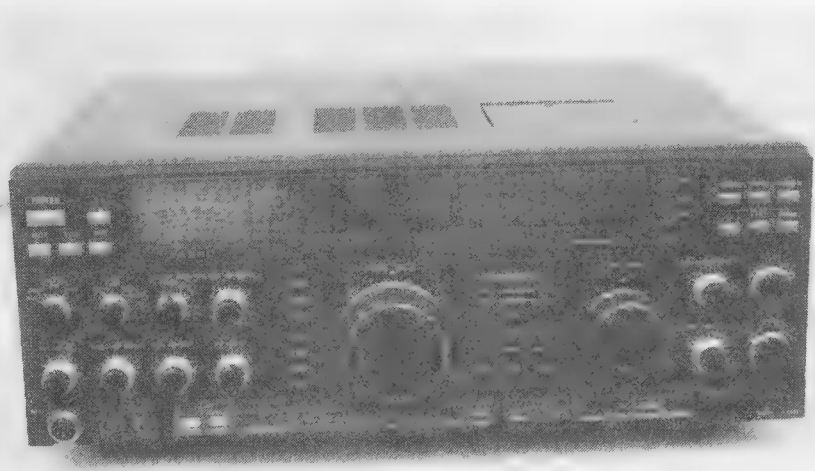
## Enter The FT-1000

So just what is the FT-1000 and how will it change the Yaesu image? Read on...

The FT-1000 is Yaesu's flag ship. It's the front runner against such transceivers as the Kenwood TS-950S and the ICOM IC-765. The FT-1000 is a brand new transceiver, unlike the other two, which are continuations of popular and successful models. Let me say, that I was most impressed with the new model. Yaesu are off on the right track.

## Features Of The FT-1000

Like the other transceivers in this class, the FT-1000 is big and heavy. It has all the features that are expected in a top line transceiver which has been designed to go into the 1990s, so let's go into detail. This rig is AC operated only. Even if you could run it from a battery (you can't), you would need a large bus to get it anywhere near the driver. The overall size is impressive. It measures 420 mm wide, 150 mm high and 375 mm deep. It weighs in at a massive 25.5 kg, which makes it the heaviest transceiver on the market. However, this extra weight is needed, because the FT-1000 also has the highest power output — just above 200 Watts. If you stick to the letter of the law, you won't need a linear. 400 Watts would



*The Yaesu FT-1000 all mode HF transceiver*

give you only about half an S point more signal at the other end. Of course, the FT-1000 has two receivers which can be used simultaneously over a wide frequency split, or over any split if the optional receiver front end filter (BPF-1) is installed.

Both VFOs have excellent tuning controls with fly-wheel weighted knobs. Naturally, the receivers have full general coverage range with 100 kHz to 30 MHz reception capability. The output from each receiver can be either split between each ear, or mixed to both ears with stereo headphones. However there is only one loudspeaker with a single audio channel feeding it. The digital readouts are exceptionally clear and easy to read. Frequency resolution is 10 Hz on the main VFO, the sub VFO and the receive and transmit clarifier. A read-out also indicates which of the 99 memory channels is selected. Metering of receive and transmit functions is via a large and clear analog meter. Metering functions include, S meter, ALC, compression, power output, SWR, final collector current, and final amplifier voltage.

The transmitter power output position gives a very accurate reading on steady RF power, but unfortunately is not designed to give proper reading of PEP output.

In addition to this, there are several status indicators for such things as mode selection, VFO selection, transmit, main

receiver busy and sub receiver busy. On the lower panel, status indicators show operation of the processor, noise blanker, notch filter and the audio peak filter used for CW reception. While on the subject of CW, the FT-1000 has a built-in electronic keyer, and is compatible with both packet and RTTY operation. As far as I can see, it lacks only one facility. There does not appear to be any provision for a voice frequency read-out. Our sight-impaired amateurs might have to wait for the FT-1001.

One of the outstanding features of the FT-1000 is the use of Direct Digital Synthesizers. While direct synthesis has been around for quite a few years, it is only just finding it way into the amateur field. If you are used to a normal synthesized transceiver or receiver, then you should try a direct synthesized rig and note the difference. I will cover this later in the "On Air section".

To explain direct digital synthesis a little better, I would like to quote from an article in Ham Radio for October 1988 by Robert Zarvel W7SX:-

"The direct digital synthesizer has arrived in amateur radio. In the past several months DDS state-of-the-art has progressed to the point where good radio performance is obtainable using DDS. The DDS offers some attractive features over the analogue or phase-locked loop (PLL) synthesizer. DDS is digitally con-

trolled. Tuning is regulated by either memories or counters which, in turn, are controlled by rotary optical couplers. Unlike the PLL, DDS doesn't use a vco, loop filter, phase detector, or digital divider and prescaler. Waveform information is generated using digital information only. The last step uses a digital-to-analogue converter (DAC) to generate the rf signal".

In the QRM reduction department, the FT-1000 is right up there with the best of them. Firstly, the Shift/Width controls allow the overall band-width while in all modes, except FM, to be adjusted to suit the prevailing conditions. A notch filter is there to take out those persistent tuner-uppers. IF filters are included for bandwidths of 250,500, 2K and 2.4 kHz, with a 6 kHz filter for normal AM reception. The FM mode is also provided with a suitable band-width filter.

On the transmit side of things, the quality of the output signal has had special care. The final output transistors are powered from a 30 volt rail for low inter-modulation distortion, and coupled with the Direct Synthesis, the transmitter has an exceptionally low noise output. An RF speech processor is available for SSB transmission.

### The FT-1000 On The Air

The FT-1000 is very easy to get on the air. Most of the normal functions really don't even require reference to the instruction book. Each of the amateur bands can be selected via the dedicated "Band" button, or an exact frequency can be entered from the key pad. If you wish to enter a frequency into the sub receiver, this can be achieved by pressing the "Sub" button, then entering the required frequency. In its standard form, the sub receiver only operates in the same band as the main receiver. The actual offset depends on the width of the filter provided in the front end. Once beyond this, the sensitivity drops about 50 db. Unfortunately, the optional BPF-1 receiver bandpass filter module was not supplied. With this installed, a separate receive antenna can be connected to provide up to 29.5MHz frequency separation between the main and sub-receiver.

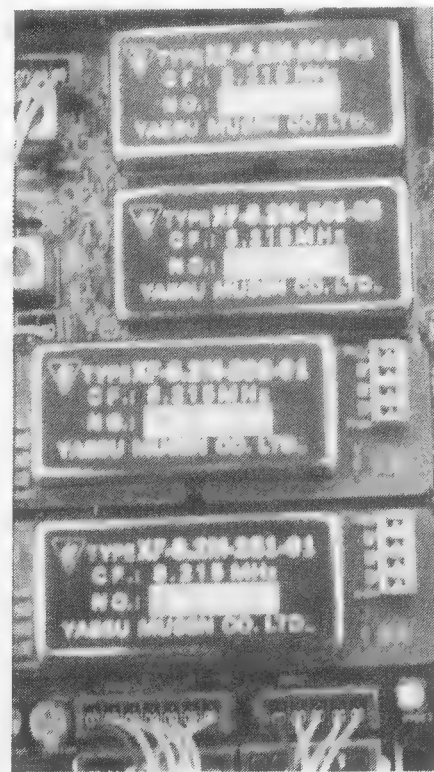
Being something of a short wave listener, I was keen to try out the receiver in the AM mode, and here was the first revelation. There are absolutely no clicks, plops and holes that you hear on the normal synthesized receiver. It tunes just like the old FRG-7, although it's there that the comparison ends. The selectivity on AM is very tight and thus audio quality a little lacking in high frequency response. However the audio appeared to be very clean. While normal synthesized



*Right hand front: Note the large tuning control for the sub-receiver and the keyboard for frequency selection and direct amateur band selection*

receivers don't show up with as many plops and clicks on SSB as they do on AM, the FT-1000 was notably clean in this mode too. Frequency read-out and stability were checked against the BBC and Radio Australia on the 21 MHz band, an found to be within 5 Hz. An excellent figure. The control system for the two receivers is very simple and user friendly. A single button places the sub-frequency into the main receiver and vice versa. Band change for the amateur bands as mentioned earlier, is easily accomplished via the individual "Band" buttons. When using this method, the actual frequency, previously used on each band will be brought up, and not the same decimal frequency, as most of the older generation of transceivers will do. The frequency "UP/DOWN" buttons move the tuning up or down in 500 kHz steps, with the "down" and "up" button producing this effect each time the button is pressed. Listening to two different signals at the same time must be an acquired taste, but plugging in a pair of stereo headphones produces some startling effects. I thought it rather a pity that Yaesu didn't provide two audio output channels for the receiver, so that two speakers could be used, say on either side of the transceiver, to give some separation between the two receivers. Sometimes, with the audio coming out of one speaker, it's rather hard to tell which signal is which.

Received quality on SSB was found to be very clean, with product detector distortion measured at only 1.1% distortion, but again just a little lacking in high frequency response for my test. A microphone was not supplied with our review



*Close up of the Crystal Filter section transceiver, but I did have a Yaesu MH1B8 on hand, which was used for all of my on-air tests. Reports were all very favourable, especially when using the speech processor. It seemed capable of taking a large amount of compression without producing any audible distortion. With over 200 Watts output available, you have the choice of two ways of running the transceiver. Firstly, run the*

full power output without a linear and get a clear, clean and penetrating signal. Or secondly reduce the output to about 50 Watts and drive your linear to 400 Watts output, but with an exceptionally clean signal. I estimate that at 50 Watts output, the intermodulation distortion would be well in excess of -40 dB.

CW keying was a delight. You can connect either a straight key or a paddle, and full QSK operation is available. The keyer dot/dash weighting is fully adjustable via the DIP switches under the top panel hatch, as is the pitch of the received signal. A useful feature is the PLL spotting LED to let you know when you are on frequency.

With 99 memories to play with, I was anxious to load up a few of my favourite broadcast stations on both the standard and short wave broadcast bands. Getting them into the memory was easy. I even programmed a few on USB or LSB to eliminate an interfering signal. So far so good. With a couple of dozen in, I decided to scan around them to see what I had. The memories can be selected manually with the memory up/down selector knob.

The main tuning control is large and very smooth in operation. It reminded me of the tuning control on my old TS-930, but if anything, is a little better (that's saying something). The tuning rate is 10 kHz per knob revolution, and the tuning rate does not speed up if the knob is rotated quickly. Instead, there is a fast button just to the lower left of the main control. With this depressed, the tuning speeds up to about ten times the normal rate. However, it is necessary to keep this button depressed to produce the effect. By the way, with the AM mode selected, the tuning rate changes from 10 Hz steps to 100 Hz steps and gives 100 kHz per dial revolution. This rate is also automatically selected in the FM mode.

Ten metre FM operators are well catered for with a selectable repeater offset facility. During my test, the ten metre band was in rather poor shape and contacts on FM hard to get. However the transmitted and received quality were judged to be very good.

If you are one of the growing band of digital mode enthusiasts, then the FT-1000 is just the thing for you. Dedicated sockets are provided on the back panel for connection to a packet TNC or RTTY and AMTOR terminal unit. The FT-1000 has a built-in microprocessor to control the audio frequency shift keying tones for RTTY or AMTOR and a choice of shifts is available.

Of course, the entire rig can be controlled from your computer, and several pages of the manual are devoted to this. One page notes all of the CAT commands

available, giving their Opcodes and parameter Bytes. As with all upmarket transceivers, the FT-1000 has a built-in automatic antenna tuner. The specification states that this is able to match an impedance of 16.5 to 150 ohms; in other words about a three to one SWR on an unbalanced line. You should note that this ATU is not suitable to feed random length or unbalanced antenna systems. The ATU settings are stored in their own memory system for instant recall when your favourite frequency is selected. The auto ATU can also be controlled via the external computer input if required.

One of the interesting options offered

with the FT-1000 is the DVS-2 digital voice system. This allows recording and replay of either off-air or ex-microphone material. I know that Yaesu have offered this as an option on some of their VHF FM transceivers over the last year or so. As yet, I haven't had a chance to try one. I look forward to the opportunity to do so.

With 200 Watt output capability, the chances of things heating up somewhat are possible. A high volume fan is installed inside the finned heatsinking. I must say that I was somewhat taken aback when it first started up. For the first few seconds it sounds like a cow mooing. However when it settles down it's not too bad but nevertheless produces a little more noise than I consider acceptable.

### The FT-1000 On Test

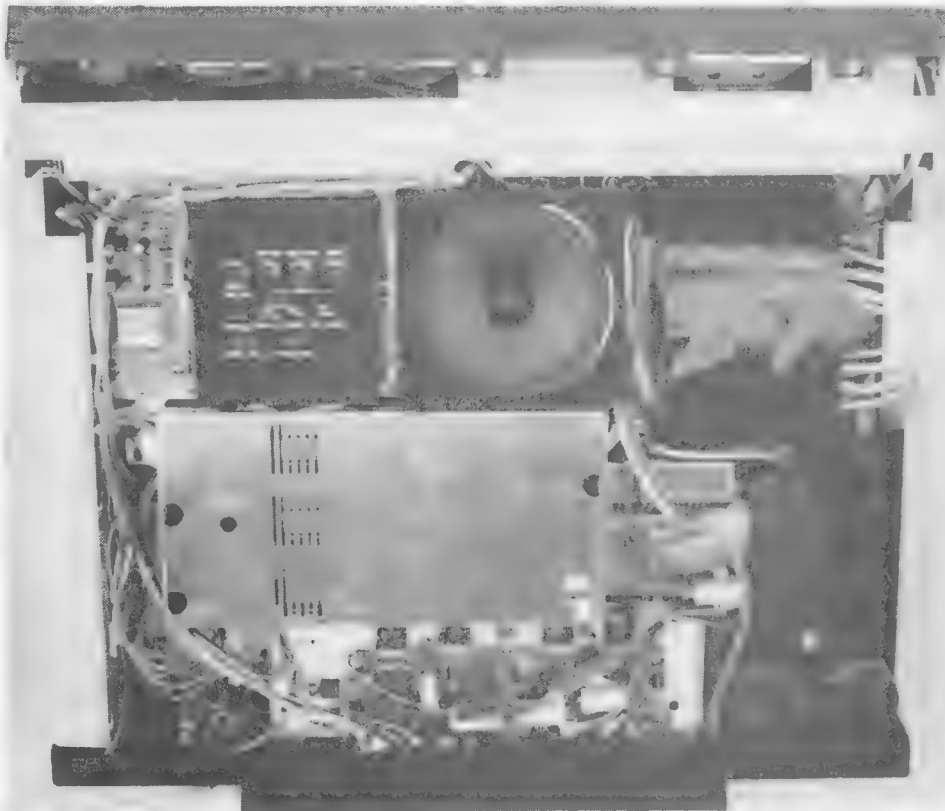
Firstly, the receiver was tested for audio output and distortion. The external speaker output socket was terminated with both a 4 and 8 ohm load.

8 Ohms	1.9 Watts maximum output
4 Ohms	2.4 Watts maximum output

With a 1 kHz beat note, SSB mode on 14.2 MHz the following distortion was noted:



Close up of meter



Top view of transceiver. Note size of power transceiver on right and top controls accessible through top hatch.

4 Ohms .5 Watts output. 1.1%

4 Ohms 1.5 Watts output. 10%

The notch filter was checked, and the maximum attenuation at both 1 kHz and 2 kHz was found to be 27 dB. The input signal was reading about S8 on 14.2 MHz.

The receiver response was measured with the 2.4 kHz filter in circuit.

190 300 500 1 kHz 1.5 2.0 2.4 2.7  
-6 04 0 0 -5 03 -6 -14dB

AGC was checked

Slow, 4 seconds decay time from S9

Medium, 3 seconds decay from S9

Fast, 1 second decay from S9

When the signal level was raised from 1 uV, the audio output increased less than .5 dB.

The "S" meter calibration was checked:

S1	2	3	4	5	6
2µV	3µV	4µV	5µV	7µV	10µV
7	8	9	+20	+40	+60
25µV	40µV	100µV	1mV	10mV	60mV

This was measured at 14.2 MHz, but a quick check on other bands showed that the overall S meter sensitivity was within 2 dB. The above figures were taken with

the preamp switched in. I was unable to check the attenuator as the 6 and 18 dB positions were in-operative in our review transceiver.

The overall sensitivity was checked at 14.2 MHz in USB mode and with 2.4 kHz band-width to give a 10 dB S/N ratio. It measured .25µV (without preamp). Again the overall sensitivity remained very constant from band to band.

The transmitter power output was checked in the CW mode and found to be well in excess of 200 Watts on all bands, with the highest on 20 metres (215 Watts), and the lowest on 160 metres (204 Watts). The PEP output on SSB appeared to be a little higher than the above figures.

## The FT-1000 Instruction Manual

The quality of printing and presentation of this book is the best that I have seen, and it was obviously written by an author well versed in the English language.

It covers all aspects of operation and also the installation of the options. However, there is almost no technical information provided, apart from the specification. As Yaesu are using many new techniques in this transceiver, a short description of their operation would have been welcome. No doubt a full workshop manual will be available in the near future, and I look forward to seeing this.

## The FT-1000 Conclusions

In general, the technical operation of the FT-1000 is superb. The direct digital synthesizer works very well and produces receiver performance that sets new standards. The transmitter delivers more

power than almost any transceiver since the old days of the FTDX-400 series, but with an infinitely cleaner signal. Only one thing is needed when Yaesu brings out its improved FT-1000, a voice frequency readout is required for sight-impaired amateurs. With two frequencies to look at, this might be a complicated device. Dick Smith has discussed this with Yaesu which has advised that, due to complexity, such a speech device would entail so much additional circuitry that the cost of the transceiver would be substantially increased. However, the CAT (Computer Aided Transceiver) facility allows access to the main micro-processor data relating to almost all front panel control parameters. As most visually impaired operators would already have a computer available, it would not be a difficult task to investigate the possibility of connecting the computer to the transceiver.

The "in" thing these days is to quote the number of knobs and buttons on the front panel of a new transceiver. I haven't done that (there are plenty of them) because the layout and functions are very user friendly.

At a price of \$4995, with a Yaesu MD-1 desk microphone, and with the Dick Smith two-year warranty, the FT-1000 represents unbeatable value. I look forward in time to see what becomes available from Yaesu to replace the now ageing FT-757 transceiver. If the photos that I have seen in the latest Japanese magazines are an indication, we are in for a few surprises. It really seems that Yaesu are back in the HF transceiver market.

Our thanks to Dick Smith Electronics for the loan of our review transceiver. All enquiries should be directed to their nearest store. ar



## New WIA logbooks available now

at your Divisional Bookshop

These quality logbooks are available in A4 format with plastic spiral binding so the book will open and lie flat on the bench.

VERTICAL OR HORIZONTAL column layout is optional, with the traditional column headings

Price is \$5.00 each plus post and packing where applicable

## Regulations Governing Amateur Stations In Australia

Every radio amateur should by now have obtained a copy of two DOTC booklets to ensure they're aware of the latest regulations.

The free booklets are DOC71 "Licence Conditions and Regulations Applicable to the Amateur Service" and DOC72 "Amateur Service — Operating Procedures". A third booklet in the series DOC70 contains the information needed for prospective amateur operators. All amateur regulations examinations are now based on the contents of the three booklets.

Whether you're already licensed or intend to take out an amateur licence in the future, you should have copies of these booklets. They can be obtained free of charge by applying to the State Manager, Department of Transport and Communications, or to your local District Radio Inspector. Their addresses and phone numbers are in the telephone directory and the 1990 WIA Call Book. ar