Equipment Review

The Yaesu FT-990HF All-Mode Transceiver

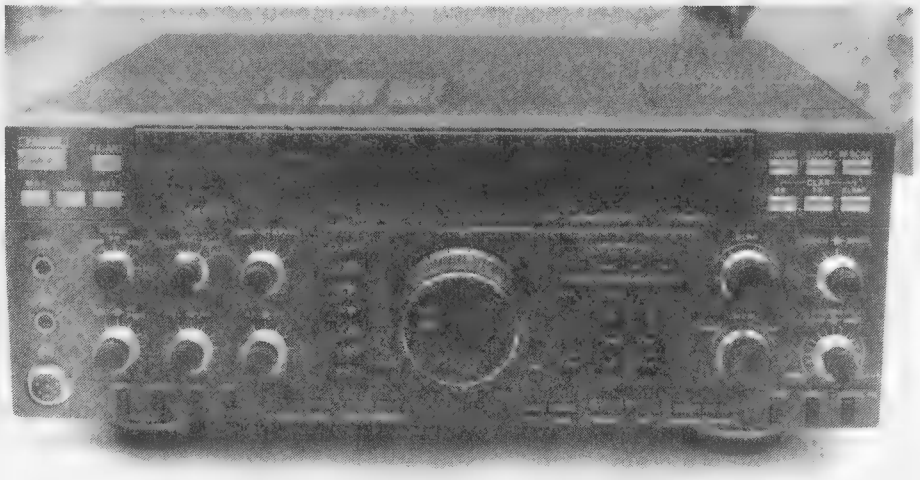
Ron Fisher VK3OM
Gaalanungah
24 Sugarloaf Rd
Beaconsfield Upper 3808

IF, AS THE YAESU ADVERTISING says, the FT-1000 is the "best of the best", then the FT-990 must be a close second best. It has been said that the FT-990 is an FT-1000 less the dual-receive capability. That's not quite true. There are other differences, but in the main areas of handing and general performance, there is not much to choose. However, back to the beginning. The 990 is both smaller and lighter than the 1000. It achieves this in two ways. Firstly, there are less electronics to enclose, but more importantly, the inbuilt AC power supply is a lightweight switched-mode unit. With dimensions of 368 x 129 x 370mm, it is about three-quarters the size of the FT-1000, and at an all-up weight of 13kg, is just about half that of the FT-1000.

Naturally, the receiver tunes the full range from 100kHz to 30MHz with tuning steps of 10Hz. Two 10-bit direct digital synthesisers are provided to give both smooth click-free tuning and also to give fast transmit/receive switching for CW and digital modes. An automatic antenna tuner is included as a standard feature. This is a similar system to that used in the FT-1000, and it has its own microprocessor to control the 39 memories for quick antenna matching.

The transmitter, which covers all the amateur bands from 160 to 10 metres, has an output of 100 watts on SSB and CW and 25 watts output on AM for 100 per cent modulation. An RF speech processor is included for extra punch on DX contacts.

The receiver interference rejection department has some very interesting facilities. There is an IF notch filter, an IF shift and a digital audio filter with separate high and low frequency cut controls. I believe this is the first time this feature has been incorporated in an amateur transceiver. I will discuss the operation of this later. Selectivity is selectable from the front panel with a choice of 2.4kHz for normal SSB, 2kHz (with optional filter) for narrow SSB, 500Hz for normal CW reception, and a 250Hz position for the optional filter which is installed in the third (455kHz) IF. This is then in series with the 500Hz filter in the second IF for superior CW selectivity. Actually, the CW operator is very well catered for with features that include a built-in iambic keyer with dot/dash memory, a presettable BFO offset and a spotting button for exact tuning to zero beat. The key jack is on the front panel. First featured on the FT-1000, I believe these are the only two transceivers to have this facility. There is also a key jack on the back panel, if you prefer it. While on the subject of front panel jacks, I wonder when we might see a front panel 3.5mm audio output jack to connect to a cassette recorder. All current communication receivers have them, so why not have one on a transceiver? The only transceiver that does have one, to my knowledge, is a Yaesu, the FT-77. Pity that more transceivers don't have them. There is, I should mention, an RCA socket on the rear panel which does provide this facility, and it even has an internally adjustable output level. It would, however, be nice to see an output on the front panel.



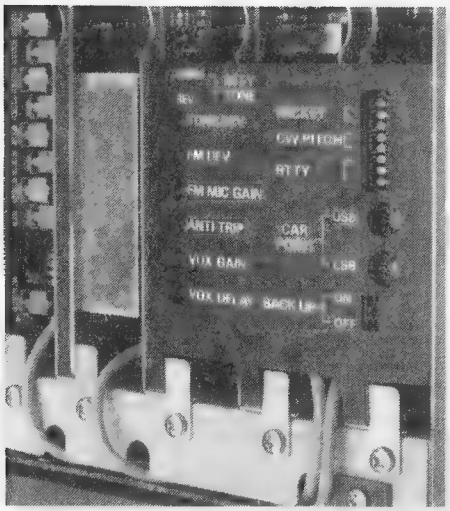
This front panel view of the FT-990 shows up the family resemblance to the FT-1000.

On the subject of recorders, the FT-990 does have provision for the installation of the Yaesu DVS-2 digital recorder. Unfortunately, this was not supplied with our review transceiver, so I must leave comment on it until some time later.

Tuning and band selection on the FT-990 have been very well thought out. To access any amateur band, press the appropriate "Band" button and there you are. Not only will this select the required band, it will also bring up the frequency that was last selected when that band was in use. If you require a particular frequency, then push "Enter" and enter the frequency via the key pad. The third method uses the up/down buttons. These change the frequency in 100kHz steps and, by keeping the button depressed, these go by at a very fast rate. If you need to shift frequency in large chunks, just press the "Fast" button and the up/down rate goes into high gear with one MHz steps.

While on the subject of tuning, the main tuning knob is the same size, and has the same silky smoothness as the one on the FT-1000. The tuning rate is normally 10kHz per knob revolution for SSB and CW, and 100kHz per revolution for AM, FM and packet FM. Again, with the "Fast" button activated, the tuning rate is increased 10 times. As if this is not enough, the tuning rate for any mode can be halved from normal by soldering an internal jumper connection. This is clearly described in the owner's manual.

The receiver and transmit clarifier controls deserve special mention. They are of the type found only on the top class transceivers. That is, there is a total range of plus or minus 9.9kHz. The re-



Here are the "top hatch" controls described in the text.

quired offset can be pre-selected just by turning the clarifier knob, and then brought into use with a push of the "RX" or "TX" button. Push "Clear" and it all resets to zero. All very nice and smooth to operate. Both the main tuning and clarifier readouts indicate to 10Hz, but if for some reason you prefer 100Hz readout, this can be selected with one of the "Switch On" functions. Naturally there are two VFOs, and they can be selected in any combination to provide split operation or two-band operation by selecting either.

The FT-990 on the Air

Plug it in, connect the antenna, and we are ready to go. Push the "Power" button to the "On" position, and ..... nothing; well, not for about two seconds anyhow. I am not sure why; I guess the switch mode power supply has a built-in delay. Once you are used to it, there is no problem. The meter and display illumination is bright and clear. No doubt about it, a good analogue meter really takes a lot of beating. If you prefer a bit less brightness, just hold down the "Fast" button and turn the "Clear" knob, setting the brightness to suit.

While in the initial stages of operation, it's a good time to look at the various "Power Up" options. First off, just for fun or to impress your family and non-technical friends, try the "Las Vegas" diagnostic test of the display and its microprocessor. Press and hold down the 1.5 and 7MHz band buttons while switching the power on. This produces the most amazing effect of all display functions cycling through their functions with, finally, the word "YAESU", followed by the ROM version number displayed. After a couple of seconds, the display returns to normal.

Pressing the 29MHz band button while switching the power on returns the display to 100Hz resolution.

Pressing the 10, 14 and 18MHz band buttons together (three fingers needed) while switching the power on toggles the manner in which the displayed frequency is effected when changing modes. In the default state, switching to and from CW, packet and PKT/RTTY causes the display to change by the amount of offset selected by the CW pitch and PKT/RTTY DIP switches in the top access hatch. After the change, the display will continue showing the same frequency when switching to and from these modes.

While on the subject of the top hatch, there are some very interesting controls hidden up there. Two interesting controls not seen before on amateur equipment are the USB and LSB carrier switches that allow the carrier insertion point to be moved up or down in 20Hz steps. They in fact allow the operator to select the audio response balance to suit his particular requirements.

FM deviation and microphone gain controls as well as tone deviation for the 88.5Hz sub-audible tone for operation into some 10m FM repeaters are located there.

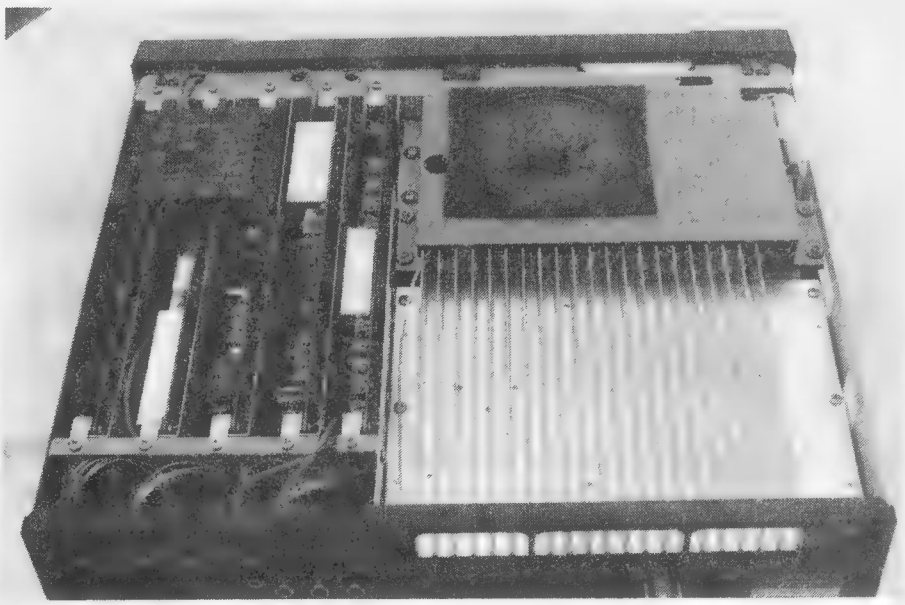
A group of DIP switches allows adjustment of firstly packet FSK tone, the CW tone and, finally, the shift for RTTY transmission. A slide switch allows the mark and space to be reversed for RTTY transmission.

Well, let's have a listen around the bands and see how things sound. The smoothness of the tuning control was quickly appreciated, and the bright amber frequency readout seemed slightly larger than usual, and certainly very legible. First impression of the received quality of SSB signals was that they sounded a bit on the muffled side.

So, up with the top hatch and quick adjustment was made to the USB/LSB carrier points. I switched both to the point of least bass response and tried again. This time it was better, but I still felt it lacked high frequency response. However, the audio was very clean and helped to a large extent by a very good AGC system. The switchable AGC offers four options: off, fast, slow and auto. The auto position gives slow for SSB, and fast for AM reception. I must admit I tended to leave it in the slow position most of the time. Overall, the AGC action is excellent, with no pumping and a very well controlled decay.

The tuning knob would have to rate as one of the smoothest in the business, and it has one thing the others don't have - a finger hole. With the fast button held down, the tuning rate steps up from 10Hz steps to 100Hz steps. This is most useful as it is still a tuning rate as distinct from a stepping rate. You can still tune SSB quite satisfactorily and then go back to the 10Hz rate for fine tuning. Many transceivers go to a 1kHz fast tuning step which is, of course, too broad to resolve SSB and, in most cases, too fast for even AM tuning.

While on the subject of AM, I consider the quality of AM reception is far too bassy. No doubt the AM selectivity is rather tight, but it seems there might be quite a bit of top cut in the audio end of the receiver. It sounds as if the tone control is on full top cut, but unfortunately



Top view of the transceiver with the covers removed. Note the massive heat sink and the plug-in boards on the left.

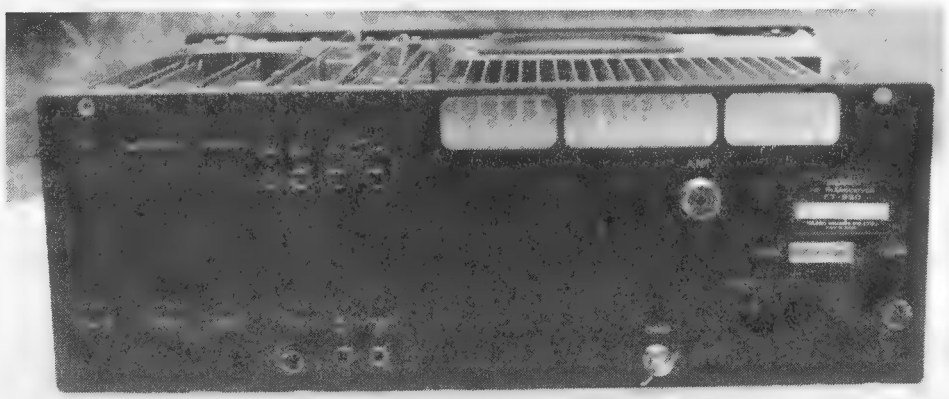
there is no tone control. This might be why even SSB sounds a bit bottom heavy. In the QRM reduction department, there are three weapons to bring out. The IF shifts, the notch filter and the digital filter. Firstly, the IF shift works very well. It's no better and no worse than any other IF shift, but still a very handy thing to have. Unfortunately our review transceiver did not have the optional 2kHz filter fitted for me to check its action with the IF shift. Generally the 'shift works better with a narrower filter. The notch filter is of the IF type, in other words it works at the IF frequency and not at audio frequencies as some do. Most IF type notch filters are effective in removing an interfering hetrodyne, but often, in doing so, remove a lot of the wanted signal as well. In this regard, the 900 filter is better than many, but still suffers from the problem to some extent. Perhaps it's time that manufacturers considered putting in two notch filters, one at the IF frequency and one at the audio end.

Now to the amazing digital filter. When I first saw the FT-990, I guessed (incorrectly) that this device was in fact a shift/width or SSB slope tune control. Well, it is and it isn't. It is actually a sharply tuned top-cut filter (tone control if you like) and a sharply tuned low-cut filter. The steepness of the cut at both ends is really quite amazing. In use, it has an effect similar to the IF slope tune found on, say, my old TS-930 transceiver. It certainly sharpens up the apparent selectivity to a remarkable degree and, in fact, most of the action takes place in the first half of the knob rotation. From there on, there isn't much left to cut. Used in conjunction with the IF shift, it can do a very good job of removing QRM. But, like all audio devices, it cannot remove a strong interfering signal from the actual pass band. So, is it worthwhile? No doubt about it - yes! But, would I swap it for a good slope tune system? No way. Where it does shine is on CW where, with careful adjustment, you can get a single signal effect.

Last, but by no means least on the receive side, is the memory system. There are 90 memories to play with. You can enter frequency, mode, bandwidth and repeater offset into the memory. One of the nice features is the automatic repeater offset for 10m FM repeaters. Overall, the memory system is very easy to use.

The FT-990 on transmit

The 990 has a nominal power output of 100 watts, and not 200 as does the FT-1000. However, this is not to be considered in any way a disadvantage. This puts it in the same class as most other transceivers. Dick Smith kindly supplied an MD-1 desk microphone to use with the 990 and reports on this were first class. The RF speech processor is of a brand new design. It incorporates a frequency shift facility (FSP) which allows the operator to set the audio frequency response to "customise" his signal.



Rear panel of the FT-990. All connections are easy to get at.

The filter band pass is actually shifted relative to the carrier to increase or decrease the low frequency cut-off point.

To set this, just press and hold the "Fast" and "RF FSP" buttons and turn the tuning control until the display shows the required offset. This indicates from -0.3 to +0.5, giving a total variation of 800Hz.

Setting this to suit your voice, plus a few dB of processing, produces an outstanding SSB signal.

I also tried it with a standard Yaesu hand microphone and found that reports were also good, but not up to the MD-1.

Metering on transmit is very comprehensive. You have the choice of the following: RF power output, PA collector current, SWR, RF speech compressor level, ALC and final amplifier collector voltage. The meter illumination and calibration are excellent. CW keying was found to be clean and free from clicks.

The FT-990 Accessories and Options

A good selection of plugs is supplied with the FT-990. A four-pin, a five-pin and an eight-pin DIN plug allow most external connection to be made. Two RCA plugs, a quarter-inch TRS plug for CW key connection and a 3.5mm plug for external speaker connection are also packed with the transceiver.

An AC power connector fitted with an IEC socket and a selection of spare fuses are also provided.

In the options department, you can choose the TCXO-2 high stability Master Reference Oscillator and the MD-1C8 desk microphone which we will be looking at in a separate mini review very shortly. A high quality external speaker, the SP-6 features switchable audio filters.

Two optional filters, one for CW with 250Hz bandwidth, and an eight-pole 2kHz narrow SSB unit, are both available.

If you want to control the FT-990 from your personal computer, then you might consider the FIF-232C interface unit. All in all, enough to satisfy the most critical operator.

The FT-990 Instruction Manual

The instruction manual is well presented. Its overall quality is not quite up to the FT-1000 manual, and there are one or two errors. For instance, the quarter-inch TRS key plug is labelled as a half-inch plug, and the 3.5mm external speaker plug is identified as a quarter-inch plug. However, overall the book is well written and very clearly illustrated, and there is plenty of information on the CAT system computer control, with a full page of CAT commands.

Again, as with the FT-1000, I regret that a full technical description of the rig is not included. Yaesu is using new techniques in the 990 and it should tell us how they work. Again, as with the FT-1000, I hope a workshop manual might be soon available. If and when this occurs, I will be happy to make this the subject of a mini review.

The FT-990 Conclusions

The performance and operation of the 990 are very good. I would prefer to have the "Shift/Width" control of the FT-1000 over the "High/Low" digital filter, but in all other respects the 990 is a delight to use. The built-in lightweight AC power supply also puts it in front of other medium priced transceivers.

Our review transceiver was kindly supplied to us by Dick Smith Electronics, to which all enquiries should be directed.

The FT-990 will retail for $3295, which includes a bonus MD-1C8 desk microphone. **ar**