

Equipment review

Exploring the complexities of the Yaesu FT-950 HF and 6 m transceiver

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The Yaesu FT-950 HF and 6 m transceiver is a 13.8 V operated transceiver designed to be used with an external power supply. It has similarities with both the FT-2000 and the FT-450; however, compared with the FT-2000, it has a single receiver only, 100 watt output, and no inbuilt power supply.

The price range puts it in between these other two transceivers and gives Yaesu the widest range of HF transceivers on the market. The FT-950 measures 365 mm wide by 115 mm high by 315 mm deep and weighs only 10 kg, mainly because of no built-in AC power supply.

The transmitter is set up to cover only the standard HF and 6 m amateur bands but the receiver is full general coverage from 30 kHz to 56 MHz. The transceiver covers all modes, SSB, CW, AM, FM, RTTY and packet.

Worthy of mention at this point in the review, before we get into the 'nitty gritty', is that the FT-950 is a very sophisticated and complex piece of equipment. No doubt many will simply take it out of the box, connect it up to power and an antenna, and operate it quite happily. In fact, the reviewers did just this initially and experienced good results.

However, if you want to get the maximum capability from the FT-950, you will need to spend a considerable amount of time having fun exploring the many menu and other settings.

Similarly, if we were to do a complete review of this transceiver, and explain all of its facilities, we would more than fill an issue or two of *Amateur Radio*. Therefore, this review covers only what we see as the more important features that a prospective purchaser would be interested in. If you want a full set of specifications, then we suggest you look on the internet, or contact a Yaesu dealer to obtain a copy of the comprehensive FT-950 brochure.



Photo 1: The FT-950 HF to 6 m transceiver.

What is the FT-950

The transceiver adopts a triple conversion design with a first IF at 69.450 MHz, a second IF at 450 kHz and a third IF of 30 kHz where the digital signal processing occurs. Three roofing filters with bandwidths of 3, 6, and 15 kHz operate at the first IF frequency immediately after the first mixer. A comprehensive menu system provides access to 118 different sets of adjustments.

Display presentation is very good with S meter, PWR out, SWR, ALC and also input voltage metering, presented in a bright, easy to read linear vacuum fluorescent display format.

Immediately to the right of the metering section of the display panel there are four rows for the various receiver signal enhancement functions. The top row is the 'Contour' function display, the second row is the 'Notch' function, the third row displays the 'Width' function, and the bottom row

is the 'Shift' function. In combination, these control graphics indicate the actuality of the various settings for the individual, key selectable control knobs below the display panel.

Above the aforementioned four rows are displayed the settings for the receiver front end and AGC, which include from left to right, antenna selection, attenuator selection, filter selection (with the optional RF μ Tuning units connected – these were not supplied with the transceiver on test), IPO (pre-amp) selection, roofing filter selection, and AGC decay time constant selection.

Frequency, mode selection, VFO, and Rx and Tx clarifier, are all displayed to the right above the main tuning knob, with its surround of attendant selection buttons for VFO/memory menu and various memory/band stacking control buttons.

To the right of the frequency display are the Band Selection keys in four rows

of three keys, with the mode selection keys to the extreme right.

Below this grouping are the attenuator, IPO, roofing filters and noise blanker keys, with larger than normal concentric control knobs for receiver audio and RF gain. Further to the right are the logically grouped Rx and Tx clarifier keys with the clear key to the extreme right. Below these are the clarifier frequency offset control with its attendant grouping of Rx and Tx indicator/switch LEDs.

At the very bottom of the panel are the MHz and memory channel keys. When the MHz key is pushed it enables the CLAR/VFO-B control to tune the receiver up or down in menu selected steps.

The main display is reminiscent of the FT-2000 and is a very bright fluorescent unit, well sorted out and easy to read. Most people will have the display set on full intensity, which is set through the extensive menu system.

Some of the features of this transceiver include a high speed antenna tuner with 100 memories, a parametric microphone equaliser similar to the FT-2000, a reasonably effective speech processor, and a transmit monitor facility. One of the more useful features is the triple band stacking register, which effectively gives you three memories on each band at the push of the band button.

The CW enthusiast has not been forgotten with features such as the CW

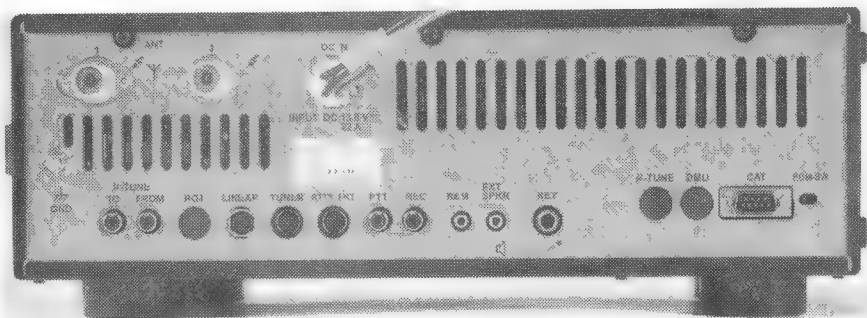


Photo 2: Rear panel of the FT-950 transceiver with the DC input cable plugged in.

zero-in facility, the CW spot switch, key jacks available on both the front and the rear panel, a built-in electronic keyer with 4 to 60 wpm capability, full CW break-in, and five message memories holding 50 characters each.

A very desirable facility is the TCXO (temperature compensated crystal oscillator) which provides 0.5 ppm stability at normal room temperature, ideal for modes such as PSK31 and the like.

The rear panel (see photo) provides comprehensive interfacing with external equipment such as a linear amplifier, a computer, and packet peripherals, plus two antenna inputs which are selectable from the front panel. Unlike some other transceivers, there is no input available for a separate receive antenna, and no low level RF output for VHF/UHF transverters.

The 10 pin mini-DIN socket is used for control of an external linear amplifier; however, the 10 pin plug is very difficult to obtain!

The transceiver is supplied with an MH-31 hand microphone which has up/down frequency buttons on the front and a fast tuning button. On the rear of the microphone is a two position 'tone' switch which, in one position, gives some bass cut in the frequency response.

On the air

As mentioned earlier, the FT-950 requires an external 13.8 V power supply with a peak current rating of at least 22 amps. However, the reviewers found that an earlier Yaesu power supply, an FP-707 rated at 20 amps, was more than adequate to do the job. The power cord supplied with the FT-950 is nearly three metres long with the fuses on both leads

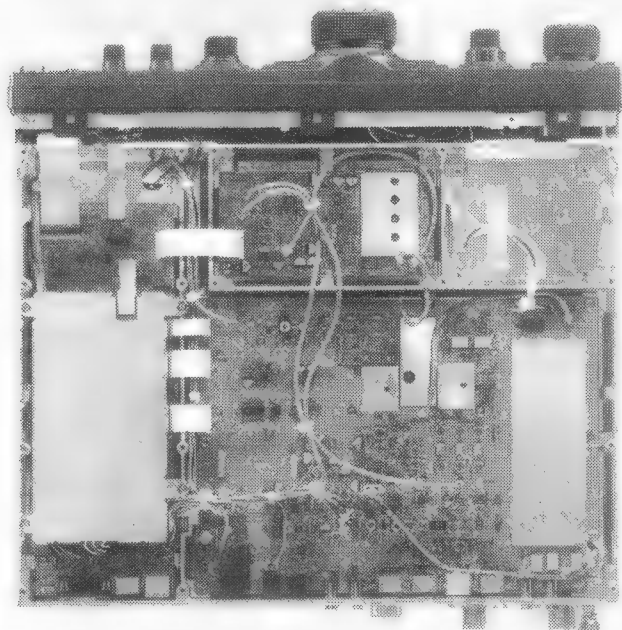


Photo 3: An underneath view of the FT-950 with the case removed.

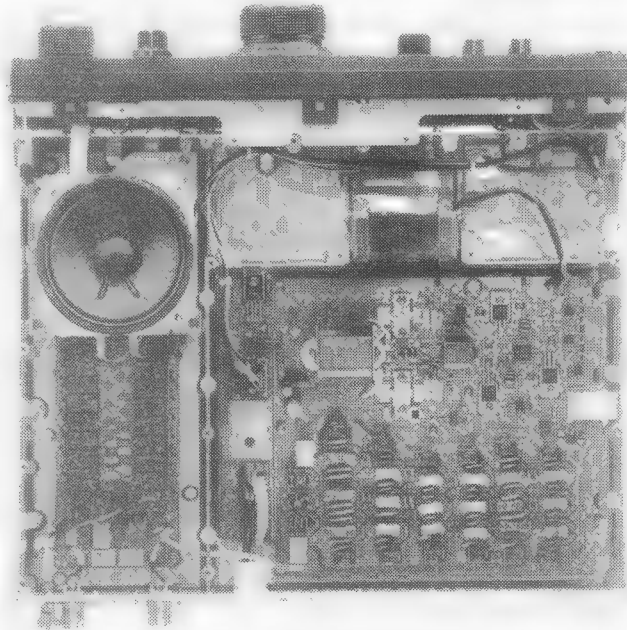


Photo 4: A top view of the FT-950 with the case removed.

within 20 cm of the power supply end. If you want to shorten this lead, replacing the fuse holders would be difficult.

The power lead consists of two entirely separate heavy current (20 A) wires, one red, one black. The separation of the wires decouples their mutual fields which can no longer cancel and will increase the likelihood of stray RF field pickup. In most installations this may not be a problem, but in some situations it certainly will not be helpful. The connection to the transceiver is via the new style "standard" four pin power plug.

On initial setup, the bright display was very much appreciated. However, the labelling for all of the knobs and switches on the front panel is in grey which, in dim light, made control identification somewhat difficult. White would be preferred! Incidentally, one great improvement over the FT-450 is the adjustable height feet under the front of the cabinet.

The receiver

The main tuning control, which is a weighted knob 50 mm in diameter, has a very smooth flywheel effect with the tension being adjustable. Tuning steps are menu adjustable for 1, 5, and 10 Hz on SSB and CW. The 5 Hz step was preferred by the reviewers. AM and FM steps are 100 Hz, and the 'Fast' button increases all the steps by a factor of 10. Frequency readout on the dial is to 10 Hz on SSB and CW.

The second VFO tuning knob, for VFO B for split frequency operation, is 35 mm in diameter. The buttons to select either VFO are brightly illuminated when pressed and make it very easy to understand which VFO is in operation. This control is also used for RIT and XIT operation and for fast tuning in 100 kHz to 1 MHz steps (menu selectable).

The DDS/PLL frequency synthesiser utilises high frequency clocking from a 0.5 PPM TCXO with a divide by four function to minimise close-in phase noise, which confers a cleaner signal on both transmit and receive. In addition, there are four VCOs to cover the frequency range of the FT-950.

99 memories are provided which store all transceiver settings, including frequency.

On initial switch-on, it was found that the receiver audio was somewhat lacking

in high frequency response. Adjustment of the 'Width', 'Shift' and 'Contour' controls overcame this to some extent, while menu adjustment of the carrier oscillator made another worthwhile improvement.

The 'Width' control varies the receive bandwidth from a narrow 1.8 kHz to a wider 3.0 kHz. The 'Shift' control moves the band-pass within the confines of the filter. The 'Contour' control enables you to shape the receiver band-pass by rolling off the high or low frequency components in the received signal. Adjustment and experimentation with these three controls will enable the user to adjust the frequency response of the received signal to suit themselves.

The menu system on the FT-950 is similar to that of the FT-2000 and the FT-450. It contains 118 selectable items, many of which would not be used unless the optional accessories, such as an external automatic ATU, the optional RF μ Tuning kits, or the DMU (Digital Management Unit) were connected.

Any menu item can be consigned to the 'CS' button which is immediately above the 'Menu' button. However, there are a number of often used menu items, such as the DNR (Digital Noise Reduction), the DNF (Digital Notch Filter) and the transmit power output which are a little clumsy to use in a hurry from the menu system. What a pity that Yaesu did not include a stacking register on the 'CS' button to enable quick selection of, say, five or six menu items!

The DNR provides 15 different noise analysis parameters for digital noise reduction. No doubt it is very effective under some circumstances, but the reviewers were not overly impressed with its performance.

The manual notch filter provides a depth of more than 60 dB and is very effective in all modes. The digital notch filter (DNF) automatically notches out multiple interfering tones in the passband, but its effectiveness is reduced with noise or other signals in the passband.

A feature of the FT-2000, FT-450 and this FT-950 transceiver is the inclusion of roofing filters. The FT-950 has three roofing filters at 3, 6, and 15 kHz bandwidth which can be automatically selected by mode. No doubt these make a worthwhile difference under busy band conditions, but the reviewers had difficulty, when tuning around the bands,

in noticing any worthwhile improvement in reception.

Eric VK3AX put the FT-950 through its paces on his comprehensive test bench and found that the claimed performance figures are met and/or exceeded in all major areas.

Eric did not tabulate the measured figures, but commented in one area, that the MDS (minimum detectable signal) performance was exemplary. The MDS for SSB on 14.180 MHz was -135 dBm (0.05 μ V). This figure was typical for all bands from 160 through to 6 metres and was within 0.1 dB band to band. This is most impressive! To explain MDS for those not familiar with the term, MDS is where the minimum detected signal causes a 3 dB increase in the audio output above the internally generated noise of the circuitry of the radio.

The transmitter

On the transmit side, one of the first things to note is the built-in automatic ATU (antenna tuning unit) which operates only on transmit over the amateur bands from 1.8 to 50 MHz, and will provide matching to an antenna feeder with up to 3:1 VSWR. With 100 memories to store various ATU settings, rapid and accurate reselection is obtained.

A speech processor, VOX and a transmission monitor are provided for voice modes. Initial on-air reports of transmit audio quality on SSB again reflected a severe lack of high frequency response. Much menu adjustment and experimentation with the parametric microphone equaliser, and the transmit bandwidth selection (2.2 to 2.9 kHz), finally resulted in a pleasant sounding quality, particularly when using a good desk microphone, such as the MD-1, in lieu of the supplied hand microphone.

With the transmit bandwidth set to 300 to 2,700 Hz we did a frequency response test feeding a calibrated audio oscillator into the microphone input and measuring the transmitter power output. The results were as follows: with 1 kHz set at 0 dB as the reference,

250 Hz was -20 dB;
300 Hz was -12 dB;
400 Hz was -1.0 dB;
500 Hz was -1.0 dB;
1.5 kHz was -1 dB;
2.0 kHz was 0 dB;
2.5 kHz was -2.0 dB;
and 2.7 kHz was -17 dB,

there was no reading at 3.0 kHz input.

This compared favourably with the response of my tried and trusty FT-1000. The response of the FT-1000 was slightly better at 2.7 kHz which was 10 dB down at this point. The bandwidths mentioned in the manual give no indication of the responses in that bandwidth.

When the speech processor was switched into circuit, reports of distortion, without much added 'kick' in the signal, were received. No doubt, after judicious adjustment of the parametric microphone equaliser settings for the speech processor, better results could be obtained.

The transmitter power output is very close to the specified 100 W for each band, plus or minus a very few watts.

The 128 page FT-950 Operating Manual is well illustrated and does a good job of explaining the radio's features and operation. It is well worthwhile spending some time going through the manual and trying all of the features and settings. Yaesu offers a PDF version of the manual on the Web.

Conclusions

Perhaps there are some areas that could be better (such as the menu selection facility), but the FT-950 is a good looking radio with many very nice features and an excellent overall performance.

The Vertex Australia Pty Ltd list price for the FT-950 is \$2,800, but it may be available from Yaesu dealers at a discounted price. Whatever the price, the FT-950 is good value for money.

Thank you to Yoshi and the gang at Vertex Standard Australia Pty Ltd (particularly Peter and Mark) for making the review transceiver available to us.

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Comment from Vertex Standard (Australia)

With reference to the difficulty in obtaining the 10 pin mini DIN plug for the external linear control, this plug (Part number T9207451), complete with 2 m of cable with bare ends, is a standard stock item in our warehouse. Contact any of our authorized dealers if you require one.

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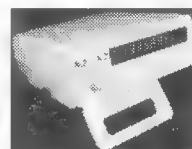
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