

THE KENWOOD TS-950SD HF TRANSCEIVER

EQUIPMENT REVIEW BY RON FISHER VK3OM
"GAALANUNGAH" 24 SUGARLOAF RD BEACONSFIELD UPPER 3808

Kenwood's new super rig has arrived at last. I say that because it was confidently expected to be on show at the Dayton Hamvention that I attended in 1988. No doubt the same expectation was there in 1989. Well at least we picked the right type number. The TS-950SD has quite a reputation to live up to. Its predecessors the TS-930S and TS-940S have not only set standards of performance but also standards of desirability. Ask any amateur which rig he would most like to own and chances are the answer would be a TS-940S. Add to this the superb transmitted and received audio quality that these rigs can produce and you certainly have the formula for success.

The overall design and concept of the new TS-950SD is of course based on the earlier TS-930S and TS-940S. With the advent of the TS-940S, there were many new features added over the TS-930S, but I cannot think of anything that was left out. The TS-950SD however does not follow this principle entirely; you certainly get more features but some of the excellent operating aids of the TS-940S have been dropped.

The TS-950SD Features And Functions

First impression of the TS-950SD is its size and weight. Just as the TS-940S was larger than the TS-930S, the TS-950SD is bigger again. Let's look at the overall dimensions. When I carried the box out to the car, I thought that I was puffing somewhat more than I should. After all it's only a transceiver. I later discovered that the packed weight is close to 30kg. The transceiver alone weighs in at 23kg. Over-all size is 409mm wide, 154 high and 446 deep. This last measurement is a whopping 96mm greater than the TS-940S. By the way, the overall weight is up 3kg. Before you buy a new TS-950SD, check the size of your desk.

The TS-950SD receives from 100 kHz to 30 MHz and tunes this range in 10 kHz steps. The large main tuning knob is weighted and has a good fly wheel effect but, as with the TS440/140/680 transceivers, the tension on the knob is now adjustable by holding the flange and rotating the control until the desired "feel"

is obtained. In addition to the main tuning control, a "VFO Channel" knob has been provided. Again this has the same function as the equivalent control on the TS-140/680, and allows the frequency to be stepped up or down in 10 kHz steps. This is a very handy feature to go from one end of the band to the other.

This control also acts as the memory channel selector when in the memory mode. Of course, it's also possible to select a frequency via the direct entry key board. The RIT/XIT has a range of +/- 9.99 kHz and the offset can now be preset before it is actually switched in — a very handy feature. Of course, there are two VFOs and a new form of VFO switching has been incorporated. Amateur band selection has been greatly improved. Direct access to each of the bands has as usual been provided via the keyboard, but now the last used frequency on each band remains, so that a sked set up on a particular frequency is not lost when another band is selected. However, the one feature that really sets the TS-950SD apart from its predecessors is the dual receive capability. The "Sub VFO" as it is called enables you to listen on any other frequency within plus or minus 500 kHz of the main receiver. The sub receiver shares the front end of the main receiver but has entirely separate IF and audio channels. It also has a separate frequency

read out and, of course, its own tuning control.

The TS-950SD sports 100 memory channels and these are all accessible from the front panel. It's no longer necessary to open the hatch on the top to select the various "banks" of memory channels. The memories are now capable of storing all sorts of information in addition to the required frequency. All 100 channels can store frequency, mode and required IF filter combination. Channels 0 to 89 can also store tone frequency data and tone on/off data. Channels 90 to 99 can be set up as tunable VFOs with the band limits programmed. Many of these features have of course been carried on from those first featured in the TS-140/680 transceivers.

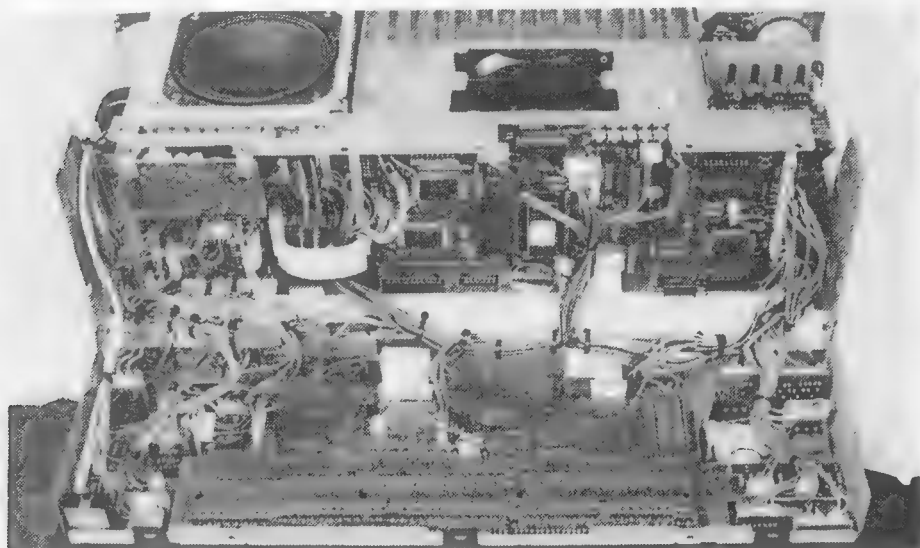
A new feature is the selection of the IF filters in both the 455 kHz and 8.83 MHz IF's from a front panel control. A total of nine filters can be fitted, and our review transceiver had a full complement. They are as follows; At 8.83 MHz bandwidths of 6k, 2.7k, 500 Hz and an LC filter (wide band). At 455 kHz the choice is 12k (FM only), 6k, 2.7k, 500 Hz and 250 Hz. As there are independent controls for each IF frequency, any combination of filters can be selected. Of course, with two filters of the same bandwidth selected, the actual selectivity will be less than either. Just how this works out in practice will be discussed later.



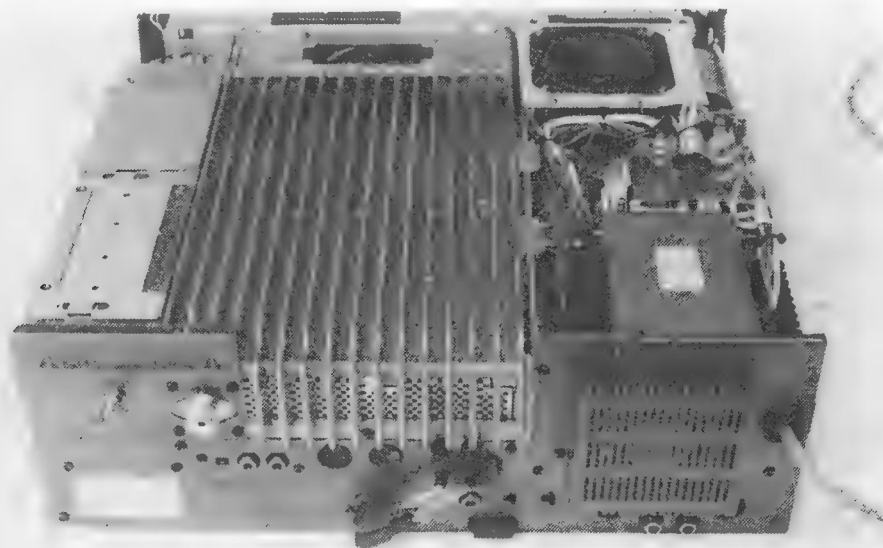
Here it is - the new Kenwood TS-950SD Digital



Bottom view of TS-950SD Digital. Note filter bank at top



Front panel drops down for easy access



Note the extra large final heat sink. Power supply cooling fan is on the left

Another new feature is the meter; (or should I say meters?) The old analog moving coil meter is gone, and in its place is a multifunction fluorescent display meter. Now, before you start thinking of the LED type meters on VHF and UHF transceivers and that particular one on a certain HF transceiver of several years ago, let me explain. This is about the closest approximation to a real moving coil meter that you could imagine. It has all the advantages of an analog meter plus the instantaneous action of an electronic display. In addition, when in the transmit mode, up to three functions can be metered at the same time. The metering functions are; "S" meter, compression with speech processor operation, SWR with no forward setting required, ALC and Ic (transmitter final amplifier collector current). In the transmit mode, metering of RF power output is always on plus a choice of SWR and ALC, or compression and ALC, or Ic and either SWR or compression. The scales are very bright and easy to read. I can see that this is the way that future transceivers will be going. AGC selection now offers a medium delay position in addition to the normal slow, fast and off.

All the usual, and excellent, selectivity aids are included. These include the SSB slope tuning. This is a dual concentric 32 position stepped rotary switch providing adjustment of the lower and upper skirt positions in the SSB mode. The CW VBT is used for controlling the selectivity in the CW and RTTY modes, and a notch filter allows rejection of single frequency heterodynes.

The main digital frequency display is a good sized fluorescent type and is very easy to read. The 10 Hz readout is now normal and doesn't require connecting, snipping or switching to enable it. However it can be disabled if necessary. The digital/analog display under the main frequency readout can be set to give a full scale of either 1 MHz or 100 kHz.

There are three other frequency displays. Firstly there is the RIT/XIT. This is now capable of 10 Hz resolution as against 100 Hz on the TS930/940S. The two other frequency readouts to the right of the display area are the sub receiver readout and the transmit frequency display. (If split operation is taking place.) In between these and the RIT readout is the memory channel indicator. Also included in the main display area is the filter selection indicator, the VFO A/B indicator and the memory channel selection indicator. All in all, there is an indicator to tell you everything — except when it's time to eat.

Now what's missing compared with the TS-940S. That wonderful sub-dis-

play that actually told you what was happening with such varied things as the automatic antenna tuner. It contained a clock which could switch the transceiver on and off at selected times, and it gave a visual indication of the SSB slope tuning controls. These are all gone in the face of progress.

The increased size of the transceiver seems to be taken up by the extra large heat sink for the final amplifier. This is a large diecast panel than runs almost the entire depth of the rig. The cooling fan is now placed at the front — just behind the front panel. Air intake is through two small grills in the cabinet top panel. The cooling fan for the power supply is mounted at the rear, where its associated heat sink appears to be somewhat smaller than usual.

A speaker of reasonable size is mounted under the cabinet top cover, just behind the front panel on the right hand side.

Subjective Tests On The TS-950SD

Our review transceiver was the fully-optioned TS-950SD or Digital model. This included a full array of filters, the high stability master oscillator and the highly rated DSP-10 digital signal processor.

Initial setting-up of the transceiver is very easy. The only problem was getting it onto my desk. I certainly could not fit it where I have my TS-930S. It didn't take long to realise that the overall performance is very similar to my old TS-930S. However a few things stood out. The tuning knob on the TS-950SD actually spins a little easier than the TS-930S but I found that there was a small amount of horizontal slop in the control bearing. Hitting the edge of the knob to keep it spinning produced a disconcerting knock. I quickly checked the calibration accuracy on the BBC and Radio Australia on 21.7 MHz and found them spot on. Perhaps it's a good time to describe how this is done. I tune the station in the SSB mode, either upper or lower sideband until music sounds right. Note that speech will not do as 10 or 20 Hz variation will not be always evident, whereas this much error will be very noticeable on music. Now note the readout frequency, then change to the other sideband. If things don't sound quite the same you are off frequency. Of course, I am assuming that the BBC and RA are on the correct frequency. I think they are. Enough to say that the TS-950SD thinks that they are too. By the way, this test needs to be done at the highest possible frequency.

Tuning around, I got the impression that the received audio quality on SSB was not quite as good as my old TS-930S.

So, I set up the two transceivers side-by-side through a coax change over switch for some comparative tests. On a direct comparison, the received audio from the TS-950SD sounded rather muffled and no combination of IF filters changed the situation. I then decided to put the TS-950SD on to my noise and distortion meter and see what the story was. First the product detector distortion measured lower than any transceiver that I have yet tested at only .3%. Both the TS-930S and TS-940S measured around .6%. My guess is that the audio channel of the TS-950SD is tailored to cut off rather well down the high frequency end. This effect was also noticeable on AM where the response sounded very dull compared to the TS-930S.

It was now time to test the dual receive function. Firstly let's look at the two receivers. The main receiver is the one that has all the facilities like slope tune for SSB, filter selection etc. The "Sub" receiver has only one QRM reducing device, a noise blanker. It is a straight receiver with fixed SSB selectivity. However, for the purpose it's intended to fill, this is an excellent compromise. As it is controlled by the main synthesizer, the frequency stability and read-out accuracy is the same as the main receiver. The audio gain of both receivers is controlled by independent controls. I am not sure that this is an ideal system. Perhaps one audio gain plus a balance control might have been a better choice. As mentioned earlier, the "Sub" receiver only works over a +/- 500 kHz range of the main receiver. In other words, you are confined to the same band. I note with interest that at least one other make of transceiver is claiming full general coverage with their sub receiver — however this does introduce problems with antennas. If you have mono-band antennas which don't work very well on other frequencies, the actual sensitivity would be a long way down. If you are looking for dual band capability, a second transceiver might well be the easiest way around the problem (and cheapest). Having said all of that, the TS-950SD sub receiver works very well. I found that it was great for checking clear channels on 20 metres. I found it more satisfactory to listen to a clear channel than to try to listen to two conversations. However, it would be a great way to exercise your party ability to check the conversation next to you.

The most off-putting feature of the sub receiver is however the tuning control. The knob used is the same size and type as the RIT/XIT control and is just too small and fiddly to encourage much use. I forecast that, when the 960 is released (don't ask me when), this control will be

at least double the diameter, and hopefully also have some fly wheel effect.

Next, I tried out the transmit capability on both local and DX contacts. Kenwood make some interesting claims for their digital signal processor, and as it was installed in our review transceiver, it was a good opportunity to see how well it performed. It is claimed that the DSP-10 produces SSB signals of higher quality than normal through "modulation by the 10th phase shift network that digitally treats signals".

In the CW mode, "excellent characteristics are obtained through digital form-restoration of the wave shape".

Similar claims are made for AM, FM and FSK operation. The frequency response of the transmitted signal is adjustable via two rotary switches and four DIP switches in the DSP-10 unit, which is mounted in the bottom panel of the transceiver cabinet. These are really set and forget functions, as they are not readily accessible with the transceiver in normal use. For the purpose, I reasoned that if set to the widest response this would produce the best results. In the SSB mode, the High end can be set at 2600, 2750, 2900 or 3100 Hz. The low end at 400, 300, 200 or 110 Hz. In the AM mode it's interesting to note that the high end response is actually lower than SSB at 2900 Hz, but the bottom end can be extended down to 75 Hz. The response curves published in the manual show very sharp cutoff beyond these points. As I do not have access to a spectrum analyser, I cannot tell what effect the digital modulator has on the overall width or distortion of the transmitted signal. Certainly up to now, most distortion on SSB signals has been produced in various linear amplifiers in the form of 3rd, 5th and higher order intermodulation distortion. This could well be one area in which the TS-950SD excels with its new 50 volt operated final amplifier. However back to the test. I tried the TS-950SD and TS-930S in turn for comparative tests on dozens of contacts using my MC-60 microphone. The results are most interesting. 50% of the stations contacted stated that they could pick no difference between the two transceivers, and the other 50% said that the TS-930S sounded slightly better!

The manual also infers that the digital signal processor is also used on receive. I quote from the manual; "SSB Mode (received) AF slope tuning is provided by the digital filter, to suit the slope of this transceiver". If you know what this means please let me know.

I look forward to seeing an analysis of the digital signal unit taken on appropriate equipment in the future.

The CW operator has been very well catered for on the TS-950SD. Let's run through the facilities. Firstly you have a variety of optional CW filters, but even if you don't feel inclined to purchase any of these, the IF VBT control is able to narrow the receiver to a degree that will satisfy all but the most ardent of CW operators. To back this up, the AF VBT adjusts the audio selectivity. There is also a CW pitch control which allows adjustment of the CW note without actually shifting the received or transmitted frequency. Semi or full break-in keying is available. An electronic keyer is built in and both manual and automatic weight adjustment is provided. In the auto position, either a longer dash for a slower keying speed or a shorter dash for a faster keying speed is selectable. If you are a keen CW operator then the TS-950SD has been built with you in mind. Talking about morse code, all mode selections are accompanied with the appropriate morse identification.

An improved automatic antenna tuner is built into the TS-950SD. This is capable of matching a load of about 20 to 150 ohms, or in other words an SWR of about 3 : 1 maximum. While tuning, the power output of the transceiver is set to about 10 watts to protect the final amplifier (and I suspect the ATU as well) while the system is unmatched.

The ATU now has a memory function that retains the setting for each band and it automatically retunes as the band is changed. I found that a match was obtained within about three or four seconds. Note that this ATU like many other

contemporary units is designed to feed an unbalanced load only. It is not designed to couple into a balanced feeder system.

Again, like the TS-140/680S, many functions can be modified as the transceiver is first switched on. Just to run through a few of them, VFO channel 10 or 5 kHz stepping, meter peak hold on/off, 1 MHz up/down changed to 500 kHz, beep tones on/off, program scan hold on/off. In all there are 17 different changeable functions that can be preset in this way.

Of course the TS-950SD is fully computer compatible. All that is required is the optional IF-232C interface. Most of the transceiver's functions can be controlled from your computer.

I note in the Kenwood advertisements that a new line of matching accessories have been released. A matching loudspeaker unit and a new matching monitor scope are included. I look forward to seeing each of these in due course. The existing range of Kenwood microphones are recommended for use with the TS-950SD and a standard MC-43S hand microphone is supplied as standard equipment.

One final point. I was surprised to find that the AC power cord now goes directly into the transceiver through a grommet in the rear panel. The handy IEC power connector has disappeared.

The TS-950SD Instruction Manual

The instruction manual deserves high marks. Not 100% mind you. I still think

most manuals don't contain enough technical information these days, and this one is no exception. Operating instructions are in general well covered. There are 88 controls on the front panel which all require individual explanation, and this is done in a clear and concise manner. At the start of the front panel explanation section, a diagram of the front panel is shown divided into seven segments. Each of these segments is labelled with the page number where the explanation can be found. There is even a short (page and a third) technical description of the transceiver. There is information on the installation of the optional filters (950S) and a few basic adjustments.

The TS-950SD Conclusions

I have to say that the new TS-950SD is not up to what I thought it might be. A few things didn't turn me on. I didn't like the very sombre black cabinet and front panel. (Very much a matter of opinion I agree.)

However, having said that, I am sure that this will again be a top seller for Kenwood. There is no doubt about it, this transceiver has the capability of giving excellent results in all modes, and for the keen operator it offers facilities not currently available in any other transceiver. Our thanks to Kenwood Electronics Australia Pty Ltd for the loan of our review transceiver. ar

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