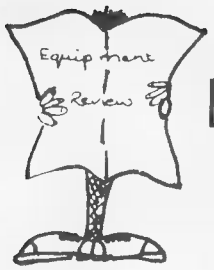


# Equipment Review

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## KENWOOD TS-140 & TS-680 TRANSCEIVER

Since the demise of the TS-130S transceiver, Kenwood have had to rely on the TS-440 as their lowest priced HF transceiver. With the fall of the Australian Dollar over the last few years, the price of the 440 is now around the $2000 plus mark. This must be something of a shock to amateurs who payed less than $1000 for their last rig. In the days when the 130 and 430 were running-mates, they were very different pieces of equipment with the 130 being a basic amateur band only transceiver while the 430 had full general coverage receive, two VFOs and that great advancement of all modern equipment, memories. The gap has now closed. Not completely, of course, but certainly to the point where you need to look very closely to see where the differences are. At the present price of these units, I am sure that Kenwood will be rushed with orders.

Let us look at the two transceivers and see just what they have to offer and also how they compare with the still current TS-440S.

The TS-140 and TS-680 are identical in all respects except two points. The 140 transmits on all amateur bands from 160 to 10 metres, has a general coverage receiver from 50 kHz to 30 MHz, while the 680, in addition to all of this, also covers the six metre amateur band. Both transceivers have a nominal 100 watts output from 160 to 10 metres, with the 680 having 10 watts output on six metres. As a sort of payoff for this, the 680 does not have VOX for SSB which the 140 does, but both have an excellent full break-in keying system for CW. Naturally they are both fully solid state and are designed to operate straight from a 12 volt DC source and do not contain any internal power supply. If you are contemplating the purchase of one of these rigs, you should keep this in mind as a DC power supply with a peak current output of 20 amps will be required for home station use. For portable or mobile use, just hook it up to your 12 volt car battery.

Both are the same size and weight, 281 x 107 x 305 millimetres and the weight is 6.1 kilograms. Presumably, the weight of the six metre module in the 680 is exactly equal to the VOX unit in the 140. They are, in fact, just a fraction smaller than the 440S and .2 kilogram lighter assuming that the auto antenna tuner is installed in the 440S. Now, what don't you get in the 140/680 that comes as standard in the 440S. Firstly, there is no provision for a built in auto ATU. If you require one, it is necessary to purchase the AT-250 external automatic ATU. Both the 140 and the 680 have provision to interface with it. The only filter option available is for narrow CW. There is no provision for a narrow SSB or narrow AM filter. The excellent notch filter on the 440S is missing, but the useful IF shift feature is retained on the 140/680. The keyboard frequency entry of the 440S is not there nor is the automatic SWR meter or the provision for the optional voice frequency readout. Memories have been reduced from 100 in the 440 to 31 in the 140/680. I don't expect this will worry many as it is rather hard to use 100 memories! As we shall see later, the 140/680 have a few rather nice facilities that are not in the 440.

Tuning via the tension adjustable tuning knob is in 10 Hz steps for CW and SSB and in 50 Hz steps for AM and FM. This gives a tuning rate of 10 kHz and 50 kHz per knob revolution. Battery back up is provided for the tuning and memory systems, so that the last used frequency reappears when the set is switched on. An interesting addition to the tuning system is the VFO channel knob just to the left of the main tuning control. This control allows fast stepping from any selected frequency in 10 kHz steps. The first steps takes you to the nearest 10 kHz point and from there it goes in even 10 kHz steps. For the standard broadcast band these steps can be changed to a 8 kHz stepping rate to suit our broadcast band plan. When the memory mode is selected, this same control becomes the memory selector. The band up/down buttons are multi-function. In the normal mode they select the amateur bands in sequence. But, with the 1 MHz button pushed, the tuning range is stepped in 1 MHz or 500 kHz segments. This latter provision, like the 9/10 kHz broadcast stepping, is selected (as are others) on initial switch on of the transceiver. As is common these days, two VFOs are included, but in addition to this, memories 20 to 30 can act as 11 extra VFOs. As an example, by programming 14 MHz and 14.350 MHz into memory 30 it is possible to tune between these two frequencies when memory 30 is selected. By programming your favourite band segments into these memories gives rapid selection of them, a very handy feature. Frequency readout is available in either 10 or 100 Hz resolution, again available on initial switch on. Mode selection is signalled in Morse code and several alarm signals are spelled out in Morse code. Examples of these are, microprocessor reset signalled ***RESET*** in Morse, as does ***UNLOCK, CHECK MEMORY, EMPTY*** and ***FULL.*** These last two relate to the status of the memory system. Well, at least it provides some good Morse practice.

### ON-AIR

These are delightful transceivers to handle. With the exception of the memory section, it is possible to get things going quite well without the help of the instruction manual. The tuning control has the same smooth feel as the 440S and the adjustable tension is a good feature. For home station use, I preferred this set to the loosest position but the increased tension setting would be ideal for mobile operation.

The front panel display is excellent. The actual frequency readout is similar to all of the current Kenwood HF transceivers. It is bright and clear under normal lighting conditions but it does become hard to read with direct sunlight shining on it. Overall, I prefer it to the LCD type display. Incorporated in the display are indicators for mode selection, VFO, scan, memory channel, split operation and RIT. Frequency and RIT readout are in blue and the other status indicators are in red.

Perhaps the worst feature of the front panel layout is the four slider controls on the right. These are for power output, microphone gain, RF gain and noise blanker level. Initially, is is unfortunate that the RF gain is included at all among these. It should be concentric with the audio gain control. However, the squelch control has been placed here for some strange reason. I must say that this is not common to Kenwood. Both Icom and Yaesu have done the same thing. I feel that squelch is a "set and forget" control whereas the RF gain is in use for a good part of the operating time. The squelch is inoperative on all modes except FM. The trouble with the slide controls is twofold. First, the overall travel is only about one centimetre and it is necessary to use a finger nail to operate them. Then, most of the control function occurs over a millimetre or two making adjustment of power and microphone gain particularly critical. On the plus side, it does give the front panel a very uncluttered look.

The AGC can be switched for fast or slow decay times, but I feel that the slow release is not slow enough. This is accentuated by the difficult action of the RF gain control as mentioned above. A look at the circuit seems to show that it may be possible to modify the slow AGC fairly easily by the addition of about .1 or .2 MFD across the existing delay capacitor.

The noise blanker has two settings plus a lever control. The second setting is to reduce the woodpecker. In use, I did not find the blanker to be all that effective. With the level control advanced beyond halfway, a good deal of cross modulation became obvious. Car ignition was well suppressed but general electrical hash was not reduced to any marked extent.

The RIT control is excellent. Again, with the initial power on function, the offset can be changed from $\pm$1.2 kHz to $\pm$2.4 kHz. It does this by changing the RIT action from 10 to 20 Hz steps. This is the first dual speed RIT I have seen since the old Uniden 2020. Unfortunately there is no XIT, transmitter incremental tuning which most DX operators find so useful.

One of the highlights of these transceivers is the memory system. This certainly breaks new ground and is quite unique. Memories 00 to 09 can store one frequency and one mode each. Memories 10 to 19 can be programmed to store either single frequencies plus mode or split frequencies plus mode. This means that 10 metre FM repeaters can, as an example, be stored into these 10 memories. But, perhaps the most interesting are the last 11 memories (20 to 30). These can be programmed with the highest and lowest frequencies of any desired band which is then tuned in the normal way with the main tuning

control. I set up several amateur band segments that I normally use and found that, using the memory selector switch to change bands was much quicker than using the band up/down buttons.

Scanning facilities are most comprehensive. With the memory mode selected, memories are scanned and the speed is adjustable by using the RIT control. With the RIT set at its normal central point, the scan delays on each memory for about four seconds. In the full clockwise position this is reduced to something less than one second, while in the full counter clockwise position, the delay is 14 seconds.

When in the VFO mode, a programmable band scan can be initiated again with the speed adjustable with the RIT control. The scanning range is selected by entering the upper limit into memory 30. The scan then takes place between the selected VFO frequency and that frequency. Also, when in the VFO mode, up down scanning can be initiated with the buttons on the supplied hand-microphone. This is fully manual and lasts only while the button is depressed. When in the memory mode, these buttons also select the memories.

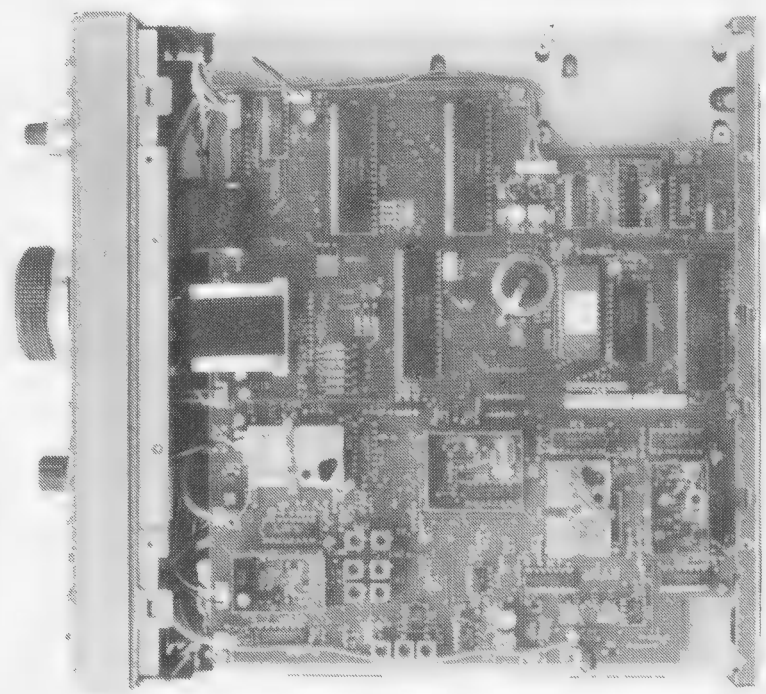
Received audio quality is generally satisfactory especially if a good external speaker is used. The in-built speaker produces about the same quality as the 430/440 which is quite satisfactory. AM received audio was okay, but perhaps a little on the thin side with a noticeable lack of low frequencies. AM selectivity again was okay for general listening but if you are a shortwave broadcast band DXer you would possibly want tighter skirt selectivity. As mentioned earlier, no optional improved AM filter is available. Our review transceivers did not have the optional CW filter fitted so I cannot comment on its performance. Its' specified bandwidth is 500 Hz at -6 dB which should be ideal for the casual CW operator.

Transmit performance was also very good and very straight forward. Just present the output with a 50 ohm load and you are in business. Transmit metering is either ALC or power output calibrated in watts. The non-linear power meter reads about 35 watts at centre scale and 150 watts full scale actually shows PEP output on SSB although the response is a little too fast to get an accurate reading. Again, a slight modification in this area might be in order.

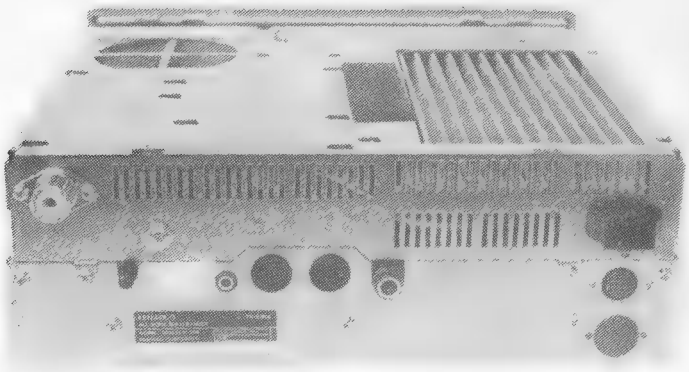
Transmit quality with the supplied hand-held microphone was quite satisfactory but somewhat smoother using the MC-60A optional microphone. The speech processor certainly gave the transmission some extra punch, but under strong signal conditions made the audio rather breathy. The processor is similar to the one used in the earlier TS-130/430 and the current 440. It is an audio limiter/compressor unit and certainly not comparable to the RF processors used in the TS-930/940 transceivers. Perhaps the greatest complaint on transmit was the action of the microphone gain control. To get the ALC reading right, an almost microscopic adjustment was needed. The power output control operates on all modes but has rather different effects on each. On CW, the power can be varied from virtually nothing to full output of about 100 watts. FM power is set to about 50 watts maximum and can be reduced to around five watts. AM, like CW, can be varied from 100 watts down to zero although maximum should be kept to about 30 to 40 watts output on carrier to allow for modulation. SSB is the one that is different though. Output can be reduced to only about 20 watts and, at this power, some funny things happen. It appears that the ALC is not effective until it is actually activated. The first speech peak produces an output of 100 watts and after that it settles down to 20 watts. If there is a pause for a few seconds, the same thing happens again. This strange happening is easily picked up on a scope and PEP power meter, and is even noticeable at full output!

Transmitted FM quality was rated as excellent and I am certainly waiting for 10 metres to really open up to put this mode to use. However, it is surprising that more amateurs don't use 10 FM for their "private" local nets.

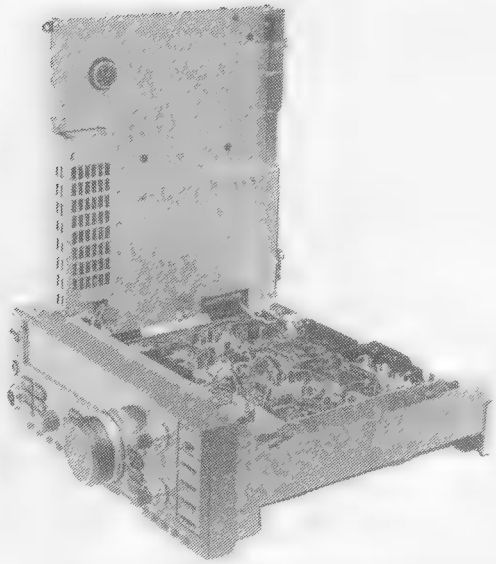
The CW and data operators are well catered for with these transceivers. They keyed very well and the full break-in facility will be appreciated by the keen Morse operator. The instruction book has information on connecting a packet, AMTOR and RTTY terminal via an accessory connector at the rear of the transceiver. It is noted that the 140/680 is not rated for continuous full power output while using data modes, as was possible with the TS-440. Recommended output is 50 watts.



Some of the intricate circuitry when the cover is lifted.



Rear view of the transceiver.



Inside view showing final amplifier compartment hinged up for easy accessibility.

While testing these transceivers on air, a question frequently asked was; "do those transceivers run hot, because they don't have a heat sink for the final, do they?".

At first glance, this may appear to be true. There is no heat sink protruding from the back panel in the usual way. However, there is a heat sink and a good-sized one at that. Lifting the top half of the cabinet discloses the missing item. It is a large diecast section covering a good-sized area. There is also a fan built in to aid the cooling when things get hot.

However, it must be said that the cooling is not as good as the TS-440 and this shows in the specifications. The 440 is rated at 100 percent duty cycle on all modes, the 140/680 is not. In normal use during a Melbourne winter there was no sign of over heating at all, even when running processing on SSB.

As a final point in this section, it is interesting to look at the overall frequency coverage of the TS-680. The general coverage receiver section covers from 50 kHz to 34.999.9 MHz and then from 45 MHz to 59.999.9 MHz. That is quite some coverage! Perhaps the next model will include the two metre band as well.

One complaint (not from me) mentioned to me by several prospective 680 buyers was that there should have been a separate antenna connector for six metres. Well, I guess that you cannot have everything!

## ON-TEST

Using our normal line up of test equipment, I put the transceivers on test.

RECEIVER TESTS: The receiver audio output via the external speaker socket was terminated in our dummy load watt meter and bridged with the noise and distortion meter.

| | |
|---|---|
| SSB/CW distortion at .1 watt output | 1.3 percent or -38 dBm |
| Audio output for 10 percent distortion | 2.1 watts at 4 ohms<br>1.7 watts at 8 ohms |
| Audio amp noise with audio gain at minimum | -59 dBm |
| SSB frequency response | LSB at 3.6 MHz |

| 200 | 300 | 500 | 1k | 1.5k | 1.8k | 2k | 2.5k | 3k |
|---|---|---|---|---|---|---|---|---|
| 0 | +2 | +2 | 0 | -3 | -5 | -5.5 | -7.5 | -11 dB |

Receiver sensitivity for 10 dB S + N/N

| | 1.8 MHz | 3.5 MHz | 7.1 MHz | 10.1 MHz | 14.2 MHz | 18.1 MHz | 21.2 MHz | 24.9 MHz |
|---|---|---|---|---|---|---|---|---|
| SSB/CW | .25 | .18 | .15 | .18 | .18 | .15 | .18 | .18 |
| AM 70% mod | .5 | .4 | .3 | .4 | .4 | .3 | .4 | .6 |

| | 28.5 MHz | 51 MHz |
|---|---|---|
| SSB/CW | .15 | .1 |
| AM 70% mod | .5 | .6 |
| FM 3 kHz dev | .15 | .13 |

28 and 51 MHz measurements are taken with the preamplifier in.

The S-meter calibration was checked at 14.2 MHz.

| S1 | S3 | S6 | S7 | S8 | S9 | +10 | +20 | +30 dB |
|---|---|---|---|---|---|---|---|---|
| 1.6 | 4 | 10 | 20 | 25 | 50 | 100 | 300 uV | 1 mV |

Input for S9 reading was checked on the following bands

| MHz | 3.5 | 7 | 10 | 18 | 21 | 24 | 28 | 50 |
|---|---|---|---|---|---|---|---|---|
| uV | 40 | 40 | 50 | 50 | 50 | 60 | 50 | 40 |
| Preamp in (680 only) | | | | | | 15 | 12.5 | 20 |

The AGC was checked and found that the signal generator output was increased from 1 uV to maximum, the audio output increased by 1 dB.

The above figures are very good in most respects. The SSB frequency response shows that the carrier frequency is a little too close to the filter. A slight adjustment here would possibly improve the received and transmitted quality. Frequency stability and frequency readout accuracy were most impressive. After several hours use, the transceiver did not drift more than 100 Hz. The frequency readout was accurate within the same limits.

TRANSMITTER TESTS: The transmitter output was terminated with a 50 ohm dummy load watt meter and bridged with a monitor scope. The following power output was noted.

| | 160 m | 80 m | 40 m | 30 m | 20 m | 18 m | 15 m | 12 m | 10 m |
|---|---|---|---|---|---|---|---|---|---|
| CW/SSB | 110 | 115 | 112 | 110 | 105 | 100 | 100 | 97 | 95 |
| FM (10 m only) | | | | | | | | | 50 |

CW/SSB

6 m (680 only) 9.75 FM 9.75

AM: As the AM output should not exceed about 30 to 40 watts it was possible to achieve this on all bands. At 30 watts it was possible to obtain close to 100 percent. Finally the current drain was checked.

| | |
|---|---|
| Receive with no audio output | 1.2 amps |
| Receive with .5 watt output | 1.5 amps |
| Transmit, LSB. No output | 2.0 amps |
| Transmit, CW. 90 watts output | 15.0 amps |

Modulation with low distortion was indicated on the monitor scope. AM quality was rated as good with supplied hand-held microphone and excellent with the optional MC-60A. So why not try the AM on 160 and FM on 10 and enjoy some good quality phone on the HF bands.

## INSTRUCTION MANUAL

The same manual is issued for both transceivers. A block diagram for each transceiver is printed but the circuit diagram supplied appears to be for the TS-140. Presumably, to get a circuit for the 680, it might be necessary to purchase the workshop manual.

Operating instructions are well covered and, in particular, the section on the memory is very well done.

The book's various sections are as follows:

1. Before operation
2. Specifications and accessories
3. Installation and connection
4. Operation
5. Circuit description
6. Maintenance and adjustments
7. Optional accessories
8. Reference data.

There are 48 pages in all. In general, it is well written but the reference under mobile operation to bond the accelerator to ground using a heavy ground strap might need a second look.

The adjustment section gives information on the following:

1. Sidetone level
2. Beep tone level
3. Adjustment for data communications level input
4. Microphone sensitivity level adjustment
5. Semi break-in delay time
6. Linear amplifier control
7. Digital display calibration

However, if you want to set the SSB carrier suppression or the S-meter zero or sensitivity, you are out of luck. It seems to me that another page or two of basic adjustments would not be out of place. Overall, the instruction manual scores seven out of 10. Not bad, but could be better.

## CONCLUSIONS

I think Kenwood have got a winner with these two transceivers with the 680 taking first prize by a short margin. I think I can live without VOX. Few amateurs seem to use it these days, but the chance to try out six metres over the next few years is tempting to say the least.

Our thanks to Kenwood Australia for the loan of the two transceivers from which this review has been compiled.

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