

# A REVIEW OF THE KENWOOD TS-700A TWO METRE ALL MODE TRANSCEIVER

The new Kenwood TS-700A is a fully self-contained AM, FM, CW and SSB transceiver. Full coverage of the 144/148 MHz amateur band is provided in four 1 MHz bands. Whilst now on the Australian market, a version with 144/146 coverage has been available on the Japanese and European markets for some time. It would seem that providing a full four megahertz coverage on a transceiver of this type is not without its problems as other companies now producing VHF gear have yet to market a transceiver of this type. With the addition of the TS700A, Kenwood are now well represented on the Australian scene with a complete range of fine equipment.

### FEATURES OF THE TS-700A

The TS-700A has a full VFO coverage of the two metre band from 144 to 148 MHz in four bands. The VFO and its associated tuning mechanism is similar to that found on normal HF transceivers except that there is 1 MHz coverage instead of the usual 500 kHz. The only feature not included in the basic package is VOX. This is, however, available as an external plug-in extra.

Enclosed in a steel cabinet measuring 278 mm wide, 124 mm high and 320 mm deep, it has a smaller front panel than its HF relation the TS-520, but is almost the same depth. Appearance bears a strong relationship to other current Kenwood models. The effect of the grey panel and cabinet with a brushed chrome trim around the panel and control knobs contrasts with the vivid green illumination of the "S" meter and main dial calibration scale to produce one of the prettiest rigs available at the moment. Facilities include both normal and reverse repeater off-set for FM operation; selectable upper or lower sideband on SSB; provision of 11 crystal controlled channels for fixed frequency operation (crystals are, of course, optional for this facility).

The front panel meter reads either relative power output, signal strength or as a centre zero discriminator indicator to facilitate netting on FM.

Transmitter power output is rated at more than 10 watts on FM and CW, 3 watts on AM and 20 watts DC input on SSB. The reason for rating SSB on an input basis is not stated. An AC power supply is built in and AC or DC operation is selected simply by plugging in the appropriate power cord, both of which are supplied with the set.

Receiver offset tuning is available on all modes as is a noise blanker for SSB reception and a squelch control for FM. Another optional extra is a tone generator

for tone access repeaters. This would not be needed for Australian repeaters.

The main tuning dial has two speeds, one giving a 25 kHz per turn rate and the other 100 kHz per turn rate. The dial plate at the back of the tuning knob assembly is calibrated in 1 kHz segments.

Accessories supplied with the TS-700A include a push to talk dynamic microphone, an assortment of plugs and spare fuses, AC and DC power cords, and a pair of extension feet to enable the front of the transceiver to be tilted up slightly.

The circuit is fully solid state and uses a total of 63 transistors, 17 FET's, 3 IC's and 100 diodes. Construction is on nine main printed circuit boards which are connected together by a comprehensive wiring harness. Accessibility for service would not seem to be one of the TS-700A's good points. However, the front panel can be easily removed and the final amplifier can be detached by removing several bolts securing it to the rear panel of the rig.

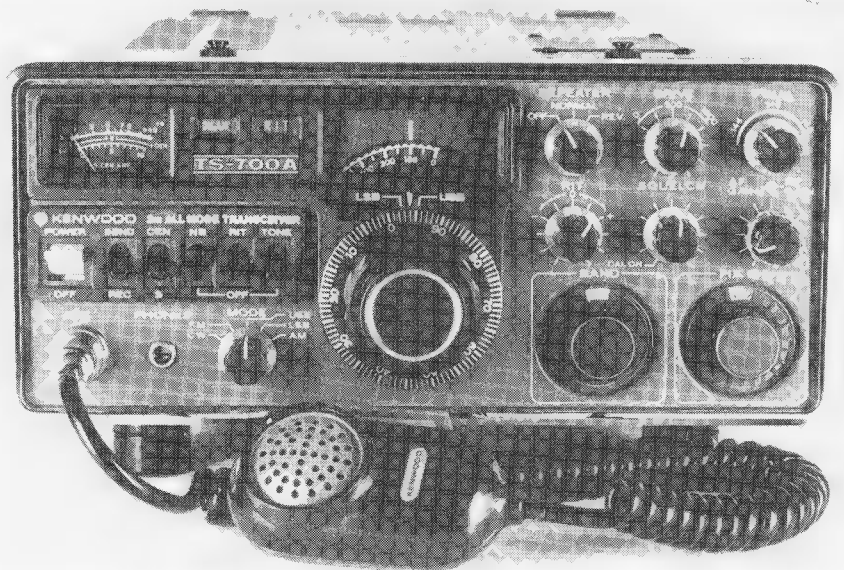
### THE TS-700A CIRCUIT

Although the TS-700A is naturally a complex piece of equipment, the circuit is easily sorted out. Firstly it should be noted that no phase locked loops are incorporated and that the signal paths are straight forward, more or less on the lines of the more familiar HF transceivers. On SSB, AM and CW the transceiver operates in a single conversion set-up with a 10.7 MHz IF and a filter that provides 2.4 kHz selectivity on all these modes. For

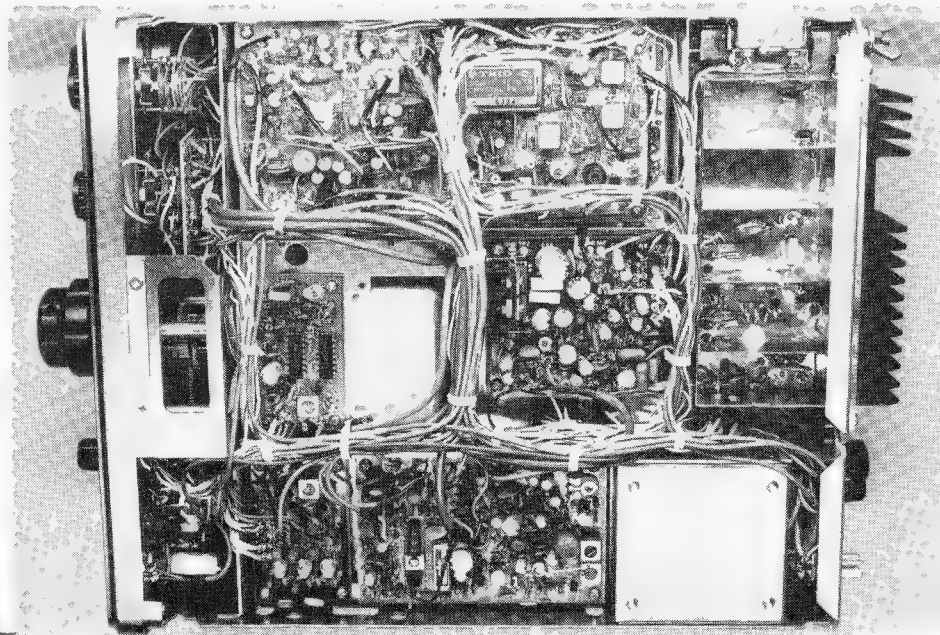
FM, the 10.7 MHz IF is followed up with a 455 kHz section to provide the correct selectivity and required limiting for this. Naturally the 10.7 MHz take off point for this section is before the high selectivity filter used for SSB.

The VFO used in the TS-700A is of the same design as the one employed in the TS-520 but modified to provide a full 1 MHz coverage. The actual tuning range of the VFO is from 8.2 to 9.2 MHz. The output of the VFO is mixed with the heterodyne oscillator to give the actual output frequency. The heterodyne oscillator employs six crystals, four of which mix with the VFO to give the four bands in normal operation. The other two are selected with the repeater offset selector and operate on the 146 and 147 MHz segments only. These two crystals are switched in and out automatically for either transmit or receive depending on whether normal or reverse repeater operation is selected. The heterodyne oscillator frequencies are 125.1, 126.1, 127.1 and 128.1 MHz for simplex working with the two repeater off set crystals on 126.5 and 128.7 MHz. Extensive use is made of balanced mixers throughout the transceiver which is perhaps one of the factors why spurious responses are practically non-existent.

Transmitter output and receiver input are both fed through a band pass filter network which is tunable via the front panel 'FINAL' control. This serves two purposes. It gives the receive section



KENWOOD TS-700A — PHOTOS BY KEN REYNOLDS VK3YCY



INSIDE THE TOP COVER OF THE TS-700A

excellent front end characteristics with a total absence of cross modulation. It also assures a transmit output free from spurious signals. A calibrator provides 100 kHz marker points. These are derived from a basic 10 MHz crystal followed by a buffer stage and two divide by ten stages.

Three different modes are produced in the transmitter generator unit. The SSB carrier generator which also acts as the receive BFO, feeds a four diode balanced modulator for SSB generation. On CW the balanced modulator is unbalanced to produce the carrier required. A separate low level AM modulator delivers normal double sideband signal, however, the carrier output from the transmitter has to be kept to about a quarter of the normal CW output to make allowance for the peak output of the AM signal. All modes are produced at 10.7 MHz plus or minus a small amount for USB, LSB or the AM/CW frequencies.

#### THE TS-700A ON THE AIR

Firstly the transceiver was put through a series of tests to determine its actual capabilities. Just how these findings translate into actual operation in the shack will be discussed later.

Receiver sensitivity was checked first. 20 dB of quieting was achieved at an input of .25 uV on 148 MHz and .18 uV at 144 MHz. This of course was on FM, and with the squelch control set just on the mute opened with .14 uV input at 146 MHz.

Sensitivity for SSB was measured at 144 MHz and the following results were obtained: .1 uV produced a 4 dB signal to noise ratio, .5 uV gave 22 dB, and 1 uV gave 26 dB. The calibration of the 'S' meter was next tabulated.

For FM		For SSB	
S1	2.0 uV	S1	.8 uV
S3	2.4 uV	S3	.9 uV
S5	2.9 uV	S5	1.9 uV
S7	5.6 uV	S7	2.6 uV
S9	25.0 uV	S9	9.0 uV
S9 + 20	2.0 mV	S9 = 20	100 uV

As received the 'S' meter would not read above S9 + 20 dB and all readings were taken with the meter set as received. However, it is possible to re-adjust this with an internal preset control.

The maximum deviation accepted by the receiver was  $\pm 7.0$  kHz. Above this figure the distortion on the received audio increased rapidly.

Transmitter power output was next on the list. CW and FM output at 146 MHz was 14.0 watts and SSB peak output at 144 MHz was 10 watts. Somewhat higher output on SSB could be obtained higher in the band.

Transmitted FM deviation was set at 6 kHz as received from the agents, but the FM microphone gain control was set far too high. When this was reset the transmitted audio quality on FM was judged to be fairly good, although somewhat lacking in high frequency response. Transmitted audio on SSB was judged excellent with a very acceptable degree of balance between highs and lows. Received audio quality on FM was slightly lacking in high frequency response, but on SSB it was excellent and quite comparable with any good HF transceiver.

VFO stability was checked and found to be very good. From a cold start the total shift did not exceed 500 Hz but the linearity of the dial calibration was only fair. Setting against the calibrator at the low end of the band, the calibration error increased up to a maximum of four kHz at the centre of the band and then gradu-

ally returned to reference at the high end of the range. So long as the calibrator is used frequently when moving up and down the dial no real problems should exist.

The FM discriminator was out of balance on our review transceiver. With the meter switched to the centre zero position, the zero point was accurate and stable but on tuning through a signal, the needle swung much further one way than the other. We did not check this further but it could have been the reason why the receiver was very critical to deviation over 7 kHz. At 144 MHz the calibrator was 700 Hz off frequency.

Next we transferred to the shack to actually try the TS-700A on the air. The tuning control had a rather odd feel about it. On rotating the knob every tooth in the gear drive could be felt and when using the fast speed tuning to traverse the band a noise like filing metal was produced. Several visitors were invited to try the tuning and opinion was divided, some liked it, others did not.

Tuning up was easy. The FINAL control could be set for the desired portion of the band, the actual peak being very broad. The DRIVE control was peaked on transmit in either the FM or CW mode and again it proved to be very broad. In fact it had only minimal effect on output. Indicator lights signalled the 'ON AIR' condition and also the selection of receiver offset operation.

Reception of SSB signals was excellent with good quality and very low audible distortion, due no doubt to the excellent AGC action and the balanced diode product detector. The AGC release time was slow, taking about three seconds to decay from the 'S' 9 point. Fast acting AGC is automatically provided for CW and AM operation. The noise blanker action was fairly good. It was effective on car ignition noise but, perhaps in common with most blankers, its effect was variable on power line and domestic appliance type noise. Using the blanker did not seem to produce any cross modulation.

#### INSTRUCTION BOOK

The TS-700A instruction book is well written and gives clear information on all aspects of operation. Most of the internal adjustments are covered but, as is usual these days, no actual service information is included. At this point in most reviews we make some criticism of this fact but not in the case of the Kenwood. Available from the distributors at nominal cost is a complete service manual that would delight the heart of any enthusiast. If you are the "fix it yourself" type then all the information you will need is included — circuit board layouts, full parts list, and complete alignment procedure. If you are just the type who likes to see how things work, again this is for you.

In any case, full service facilities are available from the Melbourne agents for Kenwood, Vicom International, 139 Auburn Road, Auburn from whom our review TS-700A was obtained. ■