IMPROVING THE HW-100

SOME NOTES ON USEFUL MODIFICATIONS

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THERE are many HW-100 transceivers in use throughout the world, and a fair proportion of these are in the U.K. In the writer's opinion, they represent the best way of getting on the air with SSB for the initial outlay. It may be gathered from that remark that the station of G4ABS consists of one HW-100, built some fifteen months ago. Coupled with two good antennae, it has performed beyond expectations.

Whilst it is a very easy rig to operate, as time passed, it was realised that there were one or two little points that could perhaps be improved upon for little or no cost. These were, briefly:—(1) Cabinet did not open up easily; (2) The knob of the tuning mechanism was too slack; (3) The sensitivity of the Rx could be improved; (4) There was no Independent Receiver Tuning (IRT) facility.

The first point was overcome by removing all eight screws that fix the cabinet top to the cabinet bottom, and those that secure the backplate to the chassis. The screws that fix the backplate to the cabinet top were left in place. A $\frac{5}{16}$ in. diam. hole was then drilled through both cabinet halves, at a point approximately an eighth of an inch from the rear of the cabinet, and in line with the other holes in the cabinet sides. One spring nut and bolt were then replaced either side in these new holes, leaving out the other screws along the sides. This enables the lid to hinge back quite nicely.

However, when first tuning the rig, the sloppy fitting of the main tuning knob on the Heath Harmonic Drive unit was noted. Two washers were cut from a heavy polythene bag, and placed on the plastic boss around which the tuning knob revolves. This cuts out the sloppiness and makes a firm, smooth action when tuning. They are cut so that they cannot be seen when the knob is replaced.

It is understood that there will be available very shortly a two-speed Jackson drive unit especially made for the HW-100, requiring fitting only, with no other alteration to the rig.

When aligning the HW-100, it was found that there were two positions of sensitivity—one for maximum performance on "receive," and the other for maximum output on "transmit". Wanting both, it was found that a 6HS6 in the first RF amplifier, V10 (as now used in the HW-101) in place of the 6AU6, gave slightly increased sensitivity, moving the S-meter indications up by one S-point.

It was then discovered, from an equivalent noise resistance valve table, that the 6AU6, 6HS6 and the 6AK5 all had fairly high e.n.r., but certain valves, including the 6AK5, when connected triode-fashion, had an extremely low e.n.r. Connected in pentode, the e.n.r. of these three valves is around the 2,100-ohm mark, but the 6AK5 is only 385-ohms when connected as a triode. Whilst triode-fashion would not be acceptable, it was decided to try the 6AK5 in as a tetrode. Not wishing to alter the rig, pin 2 of the valve was cut off and carefully inserted into the socket—care is needed because there is a gap left between the pins of the valve that is the same as the gap between pins 1 and 7. A little re-peaking of the IF's then gave a worthwhile increase in sensitivity and, more important, considerably reduced the receiver background noise. The S-meter needle is also more lively, very closely following the modulation level of an incoming signal, and now gives a more accurate indication of the signal strength on the 10 and 15 metre bands.

There is one point to bear in mind when incorporating this modification, and that is to use two 6AK5's, one in V10 and one V11. This balances out the slight difference in heater current between the 6AK5 and the 6AU6, and V10-V11 are coupled together.

The "Transmit" Side

The next thing was to re-peak the rig in the "transmit" mode for maximum output. This was done with the aid of the SWR bridge, using low power. The difference in output was sufficient to raise signal reports on the HF bands, to a consistent 5 & 7 to 8, and sometimes 5 & 9. Reports like 5 & 7 from JA's, VS6's, KG's and 5 & 9 to 9+ from ZL, using a home-built Yagi at 30ft., more than justify this modification.

One of the greatest pleasures in operating is to be in a net. Now a net, as you already know, poses its problems of difference in frequency, and in order to follow the QSO, independent tuning of the receiver is almost essential in a transceiver. This took a little thought, because spoiling the appearance of the front panel was to be avoided. It was decided that with a little care, IRT could be incorporated quite successfully.

Using a slight modification of a circuit by F5AD, a vari-cap diode alters the capacitance of the VFO. The essentials are a stabilised DC voltage of about 6-12 volts, and some means of varying this voltage and applying it to the diode. The method is shown in Fig. 1. This allows an excursion of $2\frac{1}{2}$ kHz above and below the main VFO setting. Figs. 2, 3 and 4 show the arrangement adopted. Whilst the positions shown are not mandatory, there is sufficient room at these points to work comfortably. (*See* overleaf for diagrams.)

A pencil to mark out and a centre-punch before drilling will prevent the drill from spiralling across the paintwork. Also, careful choice of switch, lamp and knobs will enhance, rather than spoil the appearance of the rig.

Voltage for the divider network is taken from the 300v. DC source, with a 68K 1-watt resistor soldered directly to the circuit board at the 300-volt point (HW-100 handbook Figs. 1-18, audio circuit board). The hook-up wire for this, and for the relay connections, can be taken alongside the main wiring harness, and attached to it. The relay connections (spare) are for the Tx/Rx balance wire; omission of this will cause a difference in frequency when on IRT. The use of the relay allows the IRT to be cancelled out when in the "transmit" mode, and this ensures that you stay on the net frequency.

The VFO is removed by following the instructions in the handbook, taking care not to damage the plastic dial. The components to be mounted inside the VFO

box should be fitted as rigidly as possible, *e.g.* solder the components D1, R6 and C2 in a small triangle, and take them directly to the phono-plug earth-tag. Stiff hook-up wire was then used to make the connections to the VFO coil. Use a beehive capacitor for C1, but it was found not necessary to adjust it after installation, and a fixed capacitor of 10-20 $\mu\mu$F could be used. This capacitor determines the amount of detuning possible.

All other components are at DC only, and DC is coupled to the VFO *via* the feedthro' connector. This connector is not absolutely essential, as the wire for the connection, if insulated, can be taken out of the VFO box through the small space at the side of the spade bolt. This saves drilling a further hole in the VFO box.

The positioning of the other components can be left to individual choice, but the layout used is as shown in Figs. 2, 3 and 4. If the extra dial lamp for indicating IRT is not required, an SPDT switch could be fitted, and a rotary switch would enable a Heath knob to be used, to match the IRT knob. Wanting the state of the receiver

Table of Values

Fig. 1. Circuit of the Modification

C1	10 $\mu\mu$F	R4	3,300 ohms
C2	·01 μF	R5	4,700 ohms
R1	68,000 ohms, ½ watt	R6	10,000 ohms
		VR1	5,000 ohms Lin.
R2	4,700 ohms	Z	12v. Zener diode
R3	6,800 ohms	D1	BA102 or similar

Notes: The HT connection to R1, Fig. 1 (*see* circuit) should go to the +300v. point, as text. The zener diode should be connected between junction R1, R2 and ground. For D1, the BY-100 (3-20 $\mu\mu$F) would substitute, or OA21 (20-75 $\mu\mu$F) would be ideal. S1 can be DPDT sub-miniature, or SPDT if extra IRT panel lamp (*see* text) not required; IRT lamp if used is 12·6v. sub-miniature, supply taken from main lamp line by breaking brown wire and coupling both lamps through S1. Use HW-100 manual to check on all wiring modifications and placing of new parts.

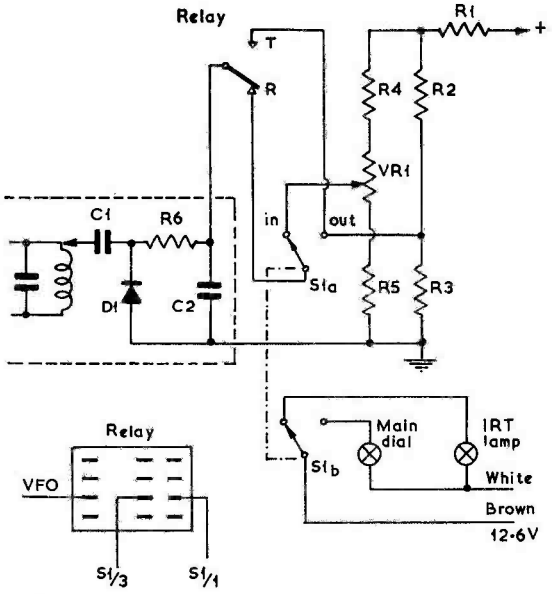


Figure 1

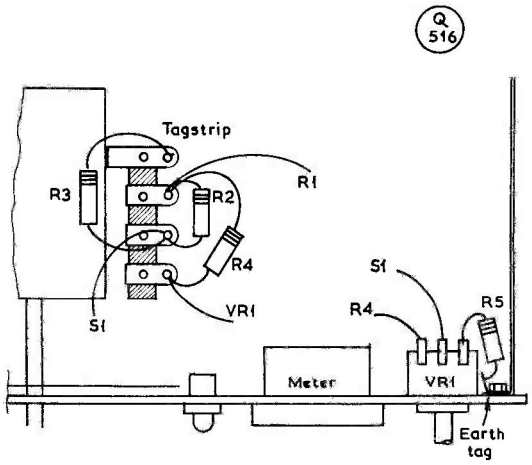


Fig. 2 IRT (Top view).

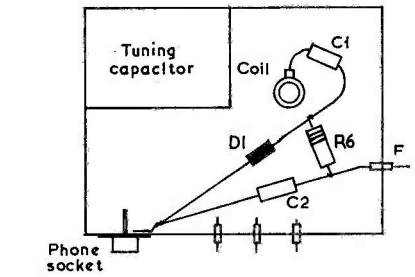


Fig. 3 VFO (Bottom view).

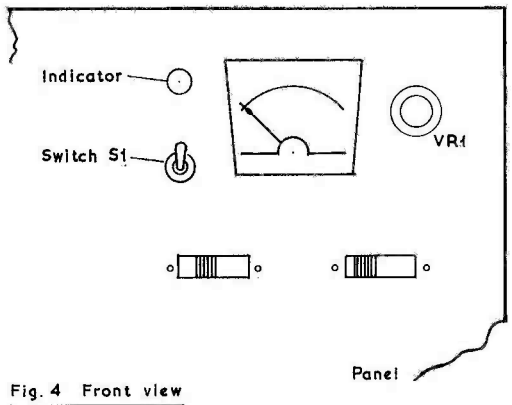


Fig. 4 Front view

to be shown at all times, and when on IRT, the appropriate indicator lights up, and the main dial lamp is switched out.

An earth tag placed under the nut of the bolt securing the frontplate to the side support plate, on the right-hand side of the meter, this provides a convenient tag for the resistor R5. The tag strip is used to support R3, R2 and R4, and as a tie-point for the connection from the relay. The 5K 1in. pot. that controls the tuning is positioned at the right side of the meter, with a suitable matching knob.

It only remains then to re-set the dial in the normal way by pressing the zero-set button and using the calibrator. There is no need to re-adjust the VFO coil or trimmer.

The unit works in the following manner: A fixed voltage of 12v., regulated by the zener diode, is obtained from the 300v. source *via* R1, and this biases the diode D1 to a determined capacitance. The second voltage divider with the control P allows this voltage to be varied, and in so doing the capacity of the diode is changed proportionately, so giving fine tuning of the VFO. The fixed voltage from the first divider network cancels the effect of the second divider network, and fixes the capacitance of the diode at its determined level. By coupling this first divider voltage through the Tx/Rx changeover relay, the variable network is by-passed on "transmit," thereby reverting to the main VFO frequency and allowing the transceiver to be used in the normal way, without the need to be constantly switching the IRT in and out. This facility has been used many times since installation, and the writer just wouldn't be without it.

The only other modification made to the HW-100 is to produce a much lower audio response from the speaker. A ·01 μF was put in parallel with C303 (handbook circuit) across the primary of the output transformer. This gives the necessary amount of treble-cut to make for comfortable listening.

The writer would like to thank G3ZZQ and EI3AJ for their co-operation and advice.

ALL-TRANSISTOR TEN-WATT TRANSMITTER FOR TOP BAND

RUNS OFF 12 VOLTS, BENCH OR CAR — FULL INPUT ON 160 METRES

M. RATHBONE (G3ZII)

THIS design came about as a replacement for the rather "tatty" valve rig which had been used since first being licensed. Instead of going for the old 6BW6/EL84 routine again an all-transistor job was attempted and results have exceeded all expectations. It has been found excellent for mobile working, no inverter packs or heaters being required. The current consumpton is about the same as just the heaters on the old rig and that only while actually on the air.

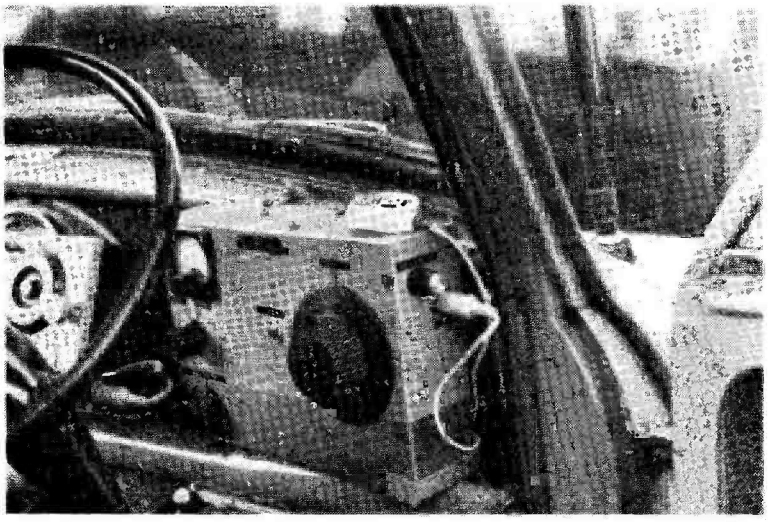
The Circuit (*See* pp.230-231)

VFO: This takes an OC170 in collector-emitter feedback though any good circuit could be used. Output from the collector goes to an emitter follower buffer to isolate the Oscillator from the following stages. Both these transistors are fed from a simple series stabiliser Tr3 with its base held at 10v. by ZD1.

All these stages are built in a box made of copper clad P.C. board soldered at the corners.

Driver Circuit: Many arrangements were tried here, including wide-band couplers and tuned circuits, but the choke coupled arrangements of Tr4/Tr5 was found to perform best; these are surplus silicon types and can be allowed to get quite warm.

Tr4 is run with some bias but Tr5 is switched by the



The 160m. battery-powered Tx fitted in a vehicle for mobile operation. By spinning off one wing-nut and pulling out aerial and power (car battery) plugs, the Tx can be quickly removed for bench operation. Box bracket mounting lined with sponge rubber prevent vibration and rattles.