'Trojan' Top band Transceiver

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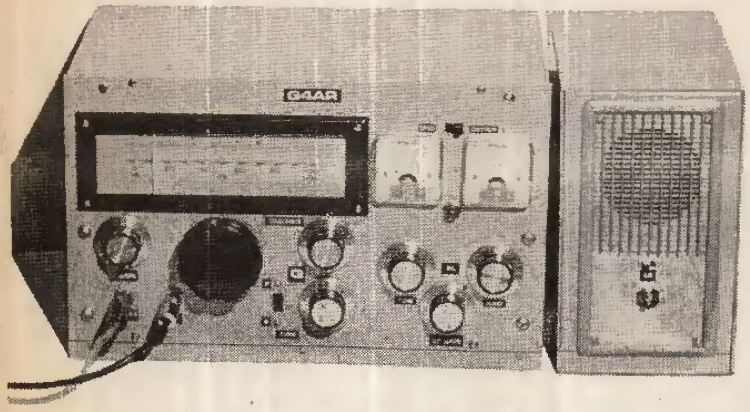
G4AR

PART TWO



Final Assembly When the two circuit boards and the panel are completed as far as is possible they can be fitted to the aluminium framework, shown in Fig. 7, forming the sides and back of the chassis. The back has a hole for the outlet of the power supply cable form and another to allow adjustment of the transmitter mixer anode coil L4. The co-axial aerial socket is the only fitting on the back member.

In practice only the side members were fitted initially the back not being fitted until the transceiver was completed and aligned, the co-axial socket being allowed to float in the meantime. This allowed full access to the chassis, another advantage of this method of construction.

headphone and key jacks. The four switching diodes D3-6 are mounted on a piece of Veroboard and fitted close to the key jack.

The main tuning capacitor VC2 is mounted on a small aluminium bracket across the cutout in the left hand board and a certain amount of "packing" with washers may be found necessary to ensure that the spindle lines up with the tuning drive coupler.

The wiring between the panel components and the boards may now be completed and a general check-over of all the wiring made for short circuits or errors.

Power Supply Unit The circuit of the supply unit, Fig. 3, shows that the transformer T1 provides the h.t., the negative bias for the transmitter and the relay operating voltage as well as the heater supply. On the h.t. side choke input is used in order to improve the regulation and to keep the voltage down to around 270V so avoiding the use of wasteful dropping resistors.

Switch S2 is mounted on the back of the unit and is essential during the alignment procedure for cutting the h.t. to the p.a. The speaker is a 4in. one with a matching transformer T2 and slide switch S3 cuts out the speaker when headphones are being used.

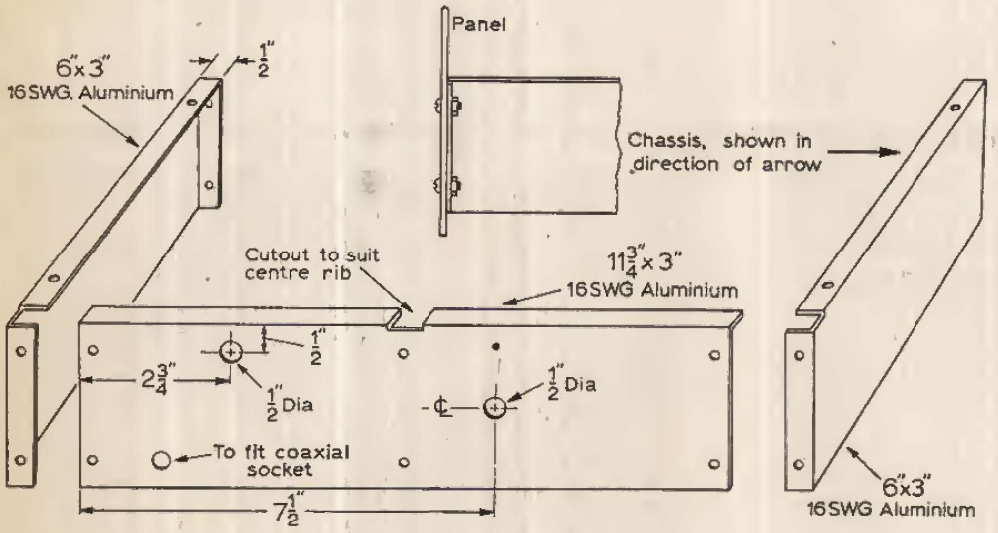


Fig. 7. Exploded view of chassis members. Note that panel extends below the bottom of the chassis, see Fig. 6. Part One. Since the rear member carries only the coaxial socket it can be left off until all wiring and constructional work is completed.

The boards are attached to the chassis with self-tapping screws, two along each edge except at the front. An aluminium bracket supports the two boards at the centre of the chassis and is bolted to the front panel and the back member. This can be seen clearly in the photograph of the underside of the completed transceiver.

The remaining components can now be fitted to the panel, namely the r.f gain control VR1, Q multiplier tuning capacitor VC4, i.f. gain control VR2 and the

In wiring the two low voltage windings in series regard must be taken of their relative phase to ensure that the voltages are additive and reversing one winding if the relay operating voltage is low. The diodes and resistors are mounted on the bottom of the unit on a piece of Veroboard as can be seen in the photograph of the unit.

The eight leads from the transceiver are taped together and fitted to an octal plug, the leads being about twelve inches long. The receptacle on the power

unit is an ordinary octal valveholder. Note that the earth lead is duplicated to reduce the resistance of this lead.

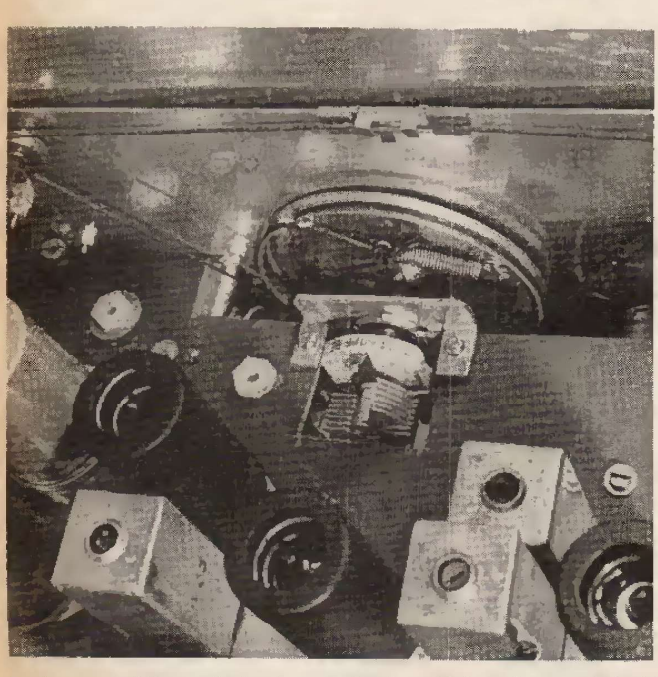
A speaker fret $6\frac{3}{4}$ x $3\frac{1}{2}$in. in grey plastic (G. W. Smith Ltd.) was bolted to the panel of the power unit, part of the fret being cut away as shown in the heading photograph in Part One of this article. The cabinet was finally sprayed with a grey enamel to match the transceiver cabinet and panel.

ALIGNMENT

Before alignment, checks should be made to ensure that the various h.t., bias and heater voltages are approximately correct. Initially the transmitter valves V5, V6 and V7 can be removed. The i.f. gain control is set at half way and the b.f.o. and first oscillator coils L2 and L3 shorted out, as is the diode D2 in the product detector. The Q multiplier valve V8 can also be removed temporarily.

Connect a low reading a.c. voltmeter across the primary of the output transformer via a blocking capacitor of about 0·1μF. Feed a modulated signal at 465kHz from a signal generator to the grid of the second i.f. amplifier V4 and adjust the cores of i.f.t.3 for maximum output, at all times keeping the signal input as low as possible consistent with a reasonable output meter reading.

Transfer signal to grid of V3 and repeat tuning procedure with i.f.t.2 finally feeding the signal to V2 and peaking i.f.t.1. Without changing the frequency of the input signal on 465kHz switch off its modulation, remove the short circuit from the b.f.o. coil L3 and the diode D2 and tune the core of the b.f.o. coil until a beat note is heard which should be



A close-up of the main tuning mechanism. Note cut-away dial plate to clear potentiometers and mounting bracket for VC2.

adjusted to zero-beat with the input signal.

The next step is to adjust the first oscillator for full coverage of the Top Band, i.e. 1·8 to 2·0MHz. Remove the short circuit from the coil L2 and feed in a modulated signal of 1·8MHz to the grid of the mixer valve V2 again shorting out the b.f.o. coil and the diode D2. With the main tuning capacitor VC2 near to maximum capacity adjust the core of L2 until the signal at 1·8MHz is heard. The oscillator itself should now be on 2265kHz which must be checked with a dip oscillator.

Turn the dial so that the capacitor is near minimum and feed in a signal at 2·0MHz and adjust trimmer TC1 until the signal is heard. These last two steps must be repeated until the required coverage is obtained.

RF Stage With the r.f. gain control about half way feed in a signal to the aerial socket at 1·9MHz and swing the p.a. tuning capacitor VC1a-b remembering that this peaks both the p.a. circuit and the receiver mixer grid circuit. It will be found to peak the 1·9MHz signal at two points on the dial corresponding to these two circuits. Adjust the core of L1 until the two peaks coincide when VC1 will be found to be near maximum capacity.

Q Multiplier The Q multiplier valve V8 can now be replaced. With the receiver working normally choose a quiet spot on the band with no signals and with the Q multiplier tuning control VC4 at mid point and switch S2 in the "peak" position tune the core of L7 until the background noise is at its lowest pitch. The selectivity control VR3 should be set at minimum.

If VR3 is now rotated a point will be reached when the stage will go into oscillation. On tuning in a signal the Q multiplier tuning control can be adjusted to peak the beat note at the same time increasing the selectivity control to just below the point of oscillation.

Without altering the main tuning dial any signal in the passband can be peaked, the maximum selectivity being just about all that any c.w. operator could desire.

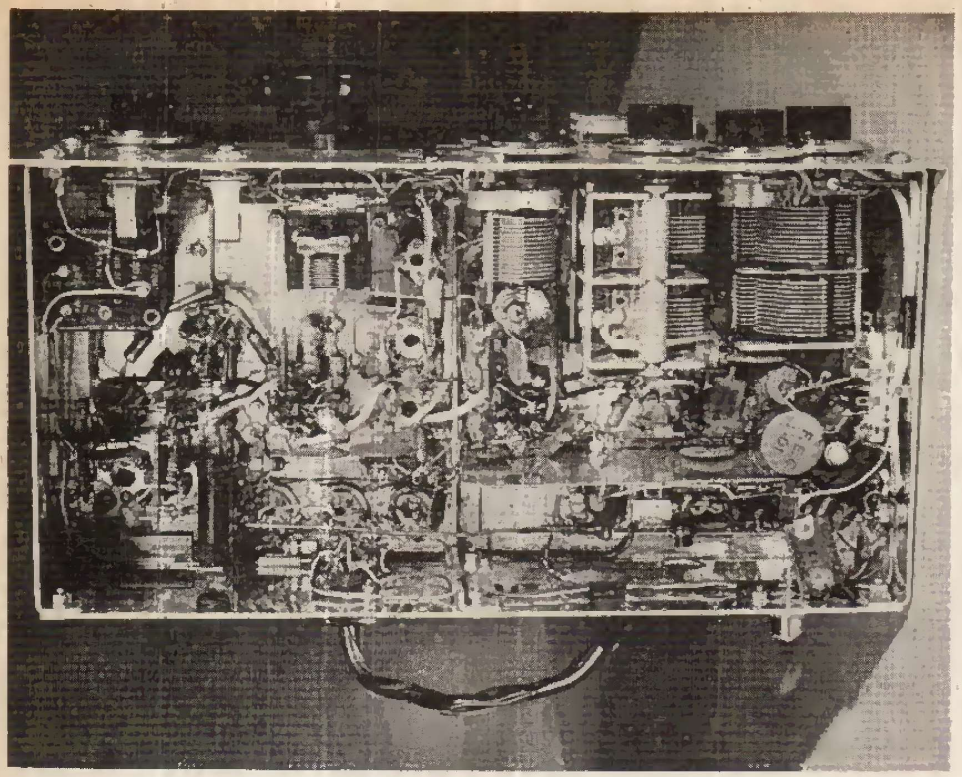
With S2 in the "null" position interfering signals can be severely attenuated with the Q multiplier controls.

Transmitter Mixer Valves V5, V6 and V7 may now be replaced. Since the b.f.o. and first oscillator are now on their correct frequencies it is very likely that an indication of grid current will be shown on pressing the key. Switch S1 must be set to read grid current and the h.t. to the p.a. switched off.

The cores of the transmitter mixer and buffer amplifier coils L4 and L5 can now be adjusted to peak the grid current at the centre of the band and should reach around 3mA. Check and double check that the output is on Top Band using an absorption wavemeter.

A dummy load carbon resistor of between 50 and 70 ohms should now be connected to the aerial socket. This resistor should have a power rating of at least 5 watts and may be made up of several higher value resistors in parallel but they must be of carbon and can be mounted on a coaxial plug for convenience.

Turn the p.a. loading capacitor VC3 to maximum and peak signals with the p.a. tuning control. On pressing the key the anode current will be about 45mA and the p.a. tuning should be quickly tuned for a dip in anode current to about 20mA. Decrease the value of the loading capacitor and re-dip the tuning. Repeat this until the dipped value of the anode current is about 35mA. This represents an input of about 10W, the legal maximum on Top Band. Check again that the output is on the correct frequency using the absorption wavemeter.



Below-chassis view of transceiver. The main components may be identified by referring to Fig. 5. Part One. The inner edges of the boards are supported by the aluminium bracket running vertically downwards in the centre of the chassis.

If it is found that the dip in the anode current on transmit does not quite coincide with the position of the p.a. tuning for maximum signals on receive, the transmitter should be carefully tuned and signals then peaked by adjusting the core of the receiver mixer coil L1. This should be done around 1·9MHz when it will be found that the alignment will hold over the whole band.

Once the transceiver has been aligned and the output frequency checked and found correct the r.f. output indicator can be used for tuning up the transmitter.

Final Alignment When the transceiver is working properly in all respects the whole alignment procedure should be repeated and although this may sound quite formidable in fact it takes only a few minutes.

In particular the tuning of i.f.t.1 will have been upset by the addition of the Q multiplier stage.

NOTES

As the finished chassis is a close fit in the cabinet the flanges on the sides of the cabinet must be cut away to provide clearance.

Holes are cut in the back of the cabinet, one to clear the power lead octal plug and the other for the co-axial aerial socket. Chassis cutters of $1\frac{1}{2}$in. and $\frac{3}{4}$in. respectively were used for this purpose.

Aluminium angle trim was glued to the bottom front edge of the transceiver cabinet and the power supply cabinet, as a finishing touch, as well as to lift up the fronts of the units from the table. Conventional rubber or plastic feet can also be used to achieve the same effect.

Letraset was used to make up labels for identifying the various panel controls, switches etc.

If the receiver only is required there is no reason why this part of the transceiver should not form a project on its own. In this case the cathode returns of the r.f. stages should be returned to earth and the p.a. coil L6 replaced by a Denco Range 3 aerial coil.

The transmitter portion of the transceiver can be utilised on its own by feeding outputs from the first oscillator and the b.f.o. of a Top Band receiver into the transmitter mixer valve V5. Remember that any interference with these oscillators will affect their calibration. Other arrangements would have to be made for the changeover from receiver to transmit.

Although a higher voltage on the p.a. would be desirable from the point of view of efficiency by using a capacity input filter in the power supply it was decided to stick to choke input for the better voltage regulation that it provides.

The importance of using a calibrated absorption wavemeter for checking the transmitter output cannot be too highly stressed. It must be remembered that the r.f output indicator will respond to any r.f. output including any spurii which may occur during alignment.

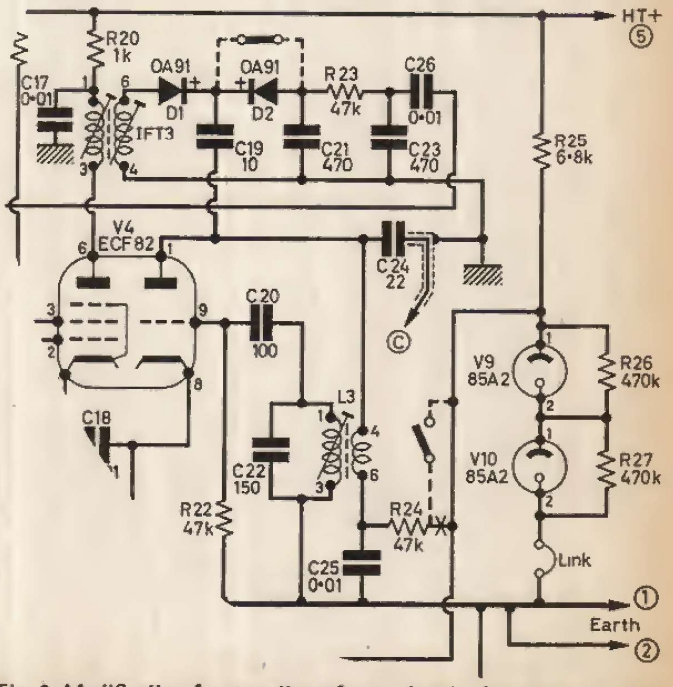


Fig. 8. Modification for reception of a.m. signals. One pole of a slide switch shorts out diode D2, the other pole opens the h.t. feed to the b.f.o., V4. Existing feed to b.f.o. must be broken at point X.

MODIFICATIONS

Since completing the transceiver the following modifications have been made to improve its versatility.

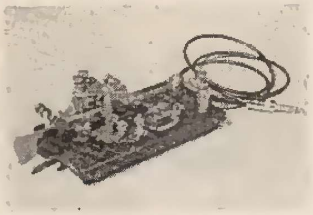
AM Reception As it stands the transceiver can be used to receive a.m. signals by tuning the carrier to zero-beat. This is not entirely satisfactory so a double-pole changeover slide switch was fitted to the panel. One pole is wired in series with the h.t. line to the b.f.o. and the other is wired across the product detector diode D2 which is shorted out on a.m. Thus on a.m. the b.f.o. is off and D1 becomes a normal diode detector, Fig. 8.

AM Transmission In order to be able to use a.m. telephony an open circuit jack socket was fitted to the back panel of the power supply unit and connected in parallel with the transmitter h.t. supply switch S2.

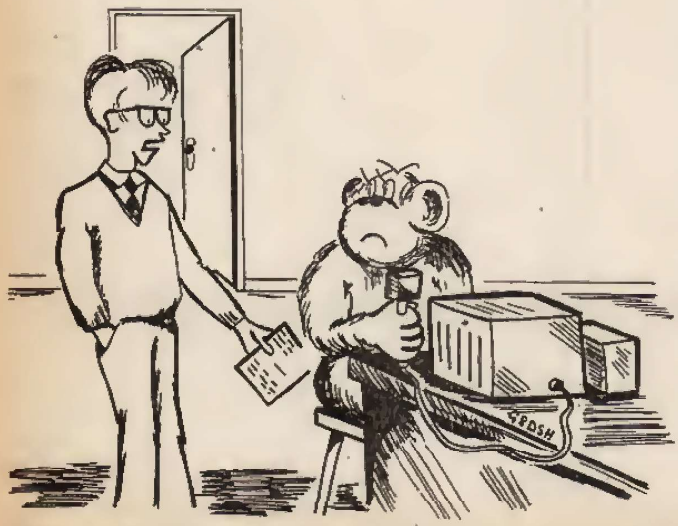
With the switch open the output of a small modulator can be plugged into the socket and the transmitter adjusted for proper modulation in the usual way.

When receiving a.m. signals the Q multiplier selectivity control may need backing off to obtain adequate bandwidth for reasonable speech quality.

It is important to note that when transmitting in the a.m. mode the b.f.o. must be on. The slide switch, mentioned above, must be moved to the "on" or "c.w." position before pressing the key to transmit. ■



MAXWELL



"It's the man from the G.P.O. about your party-political broadcast"

THE MW COLUMN

CENTRAL USSR and its Asiatic Republics to the south are usually neglected by the medium wave enthusiast. Local broadcasting in this area is on European frequencies and since the time zones are ahead of GMT, the majority of stations will have signed off before interference from Western Europe subsides for the night. Although there are a few all-nighters to be heard the best time for DX is at sign on, which occurs between 0100hrs and 0300hrs GMT. Saturday night is unfavourable owing to the extended schedules of many Europeans. **Harold Emblem** of Mirfield, Yorkshire, has been DXing this region and reports reception of Gorki on 827kHz; Simferpol Crimea 1313kHz (which was heard behind Stavanger at 1800hrs); Kharkov 1322kHz at 0240hrs; Saransk 1061kHz. DX logged recently by the writer includes Murmansk Lapland 656kHz at 2330hrs GMT; Ufa Bashkir 692kHz at 0106hrs; Kuybyshev 809kHz at 0140hrs; Garm Tadzhikistan 980kHz at 0050hrs; Baku Azerbaijan 1016kHz at 0130hrs. Those heard signing on at 0200hrs GMT were Yerevan Armenia 863kHz; Stavropol Caucuses 881kHz and Tbilisi Georgia 1043kHz. Others logged later in the night are Astrakhan 791kHz at 0206hrs; Markhagkala Dagestan 917kHz at 0205hrs; Tashkent Uzbekistan 1025kHz at 0230hrs. From nearby Iran, Tabriz 645kHz is often strong when it signs on at 0228hrs with a haunting Iranian melody played on a vibraphone, followed by a 3-pip time signal and the call 'Radio Iran.'

Identification can sometimes be a problem with USSR stations. Those that do identify locally use the word *Govarit* if in Russian, *Geplevar* in Turkmenian, *Danishir* in Azerbaijanian, *Khosum* in Armenian followed in each case by the place name. Radio Tashkent identifies in Uzbek with *Tashkentdan Gapiramis*. Harold points out that the BBC transmissions in Russian on 809kHz might be mistaken for Kuybyshev, but USSR stations usually transmit the 'Midnight in Moscow' interval signal two minutes before the hour or half hour, followed by a 6-pip time signal, while many carry the *'Programma Mayak'* which is mentioned in the identification. Sometimes a station broadcasts on one of the Tropical Bands as well as on the MWs. The writer has checked Ashkhabad 200kHz on the long waves against Ashkhabad 4825kHz on the 60 metre band and found the same local programme on each frequency.

Medium wave stations in the Caribbean are often prominent at this time of year. Listen between midnight and 0100hrs GMT for JBC 750kHz Point Galina, Jamaica; ZFY 760kHz Georgetown, Guyana; 4VEC 830kHz Cap Haitien, Haiti, in French; Radio Belize 834kHz in British Honduras; Radio Caribbean 840kHz in St. Lucia in French; WBMJ 1190kHz San Juan, Puerto Rico in English, ZBM1 1235kHz Hamilton, Bermuda; PJD2 1295kHz St. Martin in Dutch and English; Martinique 1310kHz in French.

Charles Molloy