Self-Powered Top Band Tx

PHONE/CW WORKING ON ONE-SIXTY

R. H. WEBB (G6XY)

This article gives the essential information on the design and construction of a transmitter for the 1.7 mc band, adaptable for whatever suitable parts may be available. The main points are the circuitry, values and general arrangement—it is not necessary to have the particular components used by the author. His idea is to show how a good-sounding transmitter can be built up from parts that may be to hand.—Editor.

THE design and construction of the transmitter to be described were prompted by a number of factors, the most important ones being as follows:

(1) Capital outlay; (2) use of available components—this requirement is very closely allied to No. 1; (3) compactness—the whole rig, including modulator, power pack and aerial change-over relay to be contained in a small metal cabinet; (4) a desire to break away from the inevitable 6V6/6L6 or 6V6/807 valve sequence in common use on the 160-metre band.

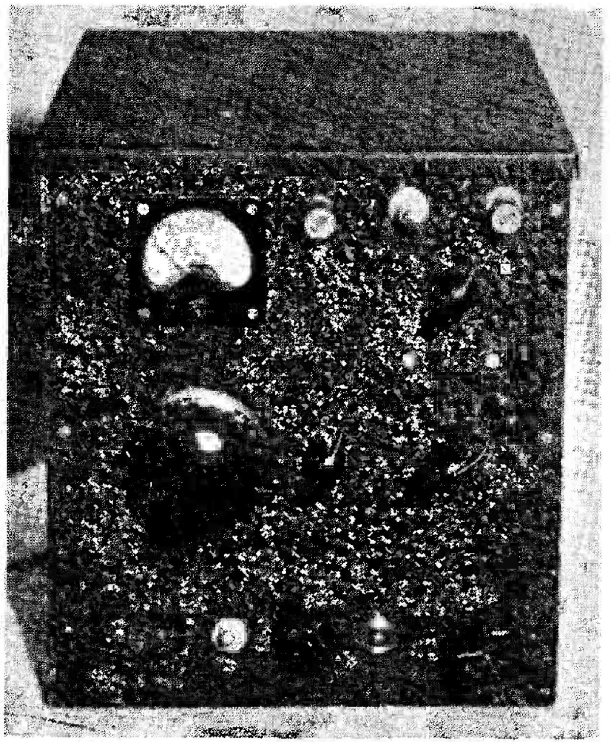
With these requirements in mind, a search was made through what is popularly known as the "junk box," and the following pieces of gear unearthed:—A BC610 exciter tuning unit, type TU61, a small metal cabinet 9 ins. × 9 ins. × 10 ins., a rather battered SCR-522 transmitter, a slow motion dial taken from a TU5 unit, an 0-100 mA meter, a receiver replacement-type mains transformer, a surplus 6v. change-over type relay, and the usual array of minor components. Nothing new was purchased for the construction of this transmitter with the exception of the electrolytic smoothing condensers.

Having spread the foregoing conglomeration on the bench a little contemplation resulted in the transmitter almost designing itself with the exception of the choice of valves. Now valves are never consigned as junk at this station; even the most unlikely types removed from surplus apparatus are carefully packed away in a tea chest with the thought that "it might come in useful for something one day." A careful survey of the contents of the tea chest resulted in the happy discovery that the RF and modulator sections of the transmitter could utilize miniature or near-miniature valves, thus fulfilling (3) and (4) above. The fact that suitable valves were on hand also took care of (1) and (2).

General Design

The layout chosen was 9003 ECO, Z77 FD, VT501 (TT11) PA, Z77 speech amplifier, 6C4 driver and 12AX7 zero-bias Class-B modulator. A 5Z4 rectifier and VR150 stabiliser completed the valve complement. The only valve which may not be familiar to most people is the 12AX7, a miniature high *mu* twin triode which will give around 6 watts of audio in zero-bias Class-B with 300 volts HT. A British-made version of this valve is readily available in the Brimar series.

A start was now made upon the actual construction of the transmitter. The TU61 unit was stripped and yielded the VFO coil L1, together with fixed and variable tuning condensers and the grid condenser C3; the doubler coil and tuning condenser and the PA anode coil and input condenser of the Pi-tank network. The DPDT switch is used as the



Front panel view of the self-contained 160-metre transmitter. The only externals required are microphone and/or key, AC power point, earth connection and a random-length wire for the aerial.

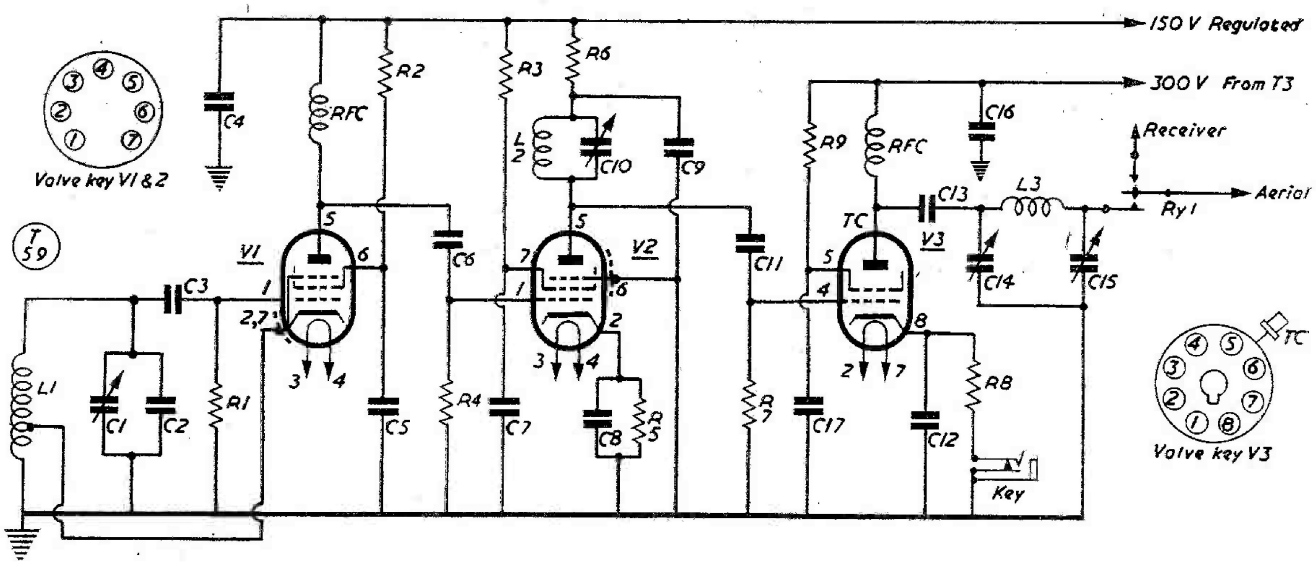


Fig. 1. Circuit of the VFO-controlled self-powered 160-metre transmitter described by G6XY. The network L3, C14, C15 permits a random aerial length to be accurately matched and loaded.

Table of Values

Fig. 1. RF Section of the 160-Metre Transmitter.

C1, C3,		R1	= 82,000 ohms.
C6, C11	= 100 μμF.	R2	= 50,000 ohms.
C2	= 75 μμF.	R3, R7	= 22,000 ohms.
C4, C5,		R4	= 100,000 ohms.
C7, C8,		R5	= 680 ohms.
C9, C12	= .01 μF.	R6	= 100 ohms.
C10	= 120 μμF.	R8	= 470 ohms.
C13, C16,		R9	= 33,000 ohms, 1-w.
C17	= .001 μF.	RFC	= RF chokes.
C14	= 180 μμF.	Ry1	= Relay (*see text*).
C15	= 600/1,000 μμF. (*see text*).	V1	= 9003.
		V2	= Z77 (EF91, 6AM6).
L1, L2,			
L3	= *See text.*	V3	= VT501 (TT11).

(*Resistors all ½-watt rating except as stated*).

transmit/standby control. If a TU61 unit is not available suitable coils may, of course, be wound to standard formulae and available variable condensers utilized. From the SCR522 transmitter came the modulation and driver transformers T2 and T3.

VFO Construction

The VFO was built in a small metal box (an Eddystone diecast box may be used), all components being mounted on inside walls of the box, the power leads going through a small hole at the bottom and a corresponding hole in the chassis, and the lead to the grid of V2 through the lid, exactly opposite V2 grid pin. The doubler was made in exactly the same manner in a similar box and bolted to the chassis alongside the VFO, as may be clearly seen in the interior photograph. The PA valve is mounted on the chassis proper and is directly below the relay in this view. The two variable condensers and the coil comprising the Pi-tank network are mounted on the panel in front of the PA valve, the coil being located

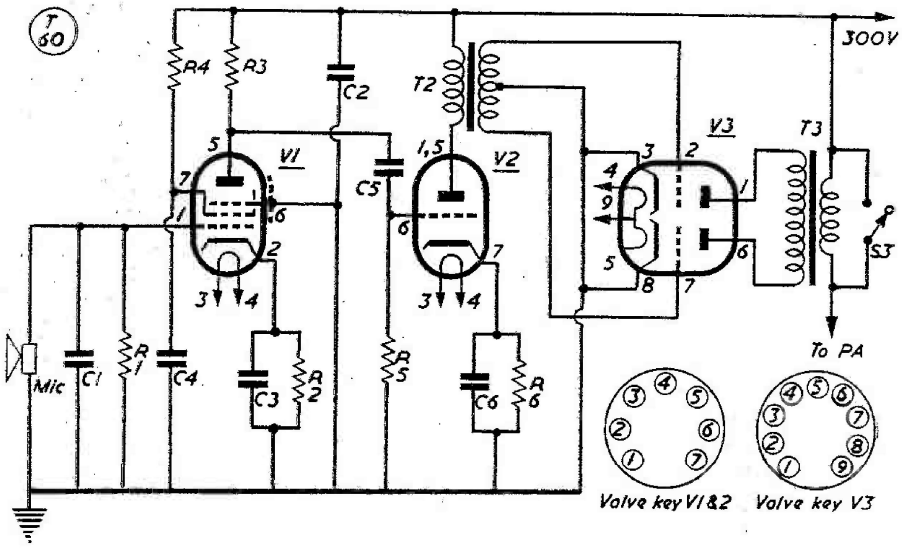


Fig. 2. Modulator section of G6XY's 1.7 mc. transmitter, described in the accompanying article. Other valve types could, of course, be used with any necessary changes in values. The placing of the modulator parts can be traced in the plan view. (*Note: In this circuit there should be an HT feed connection to the centre-tap of T3*).

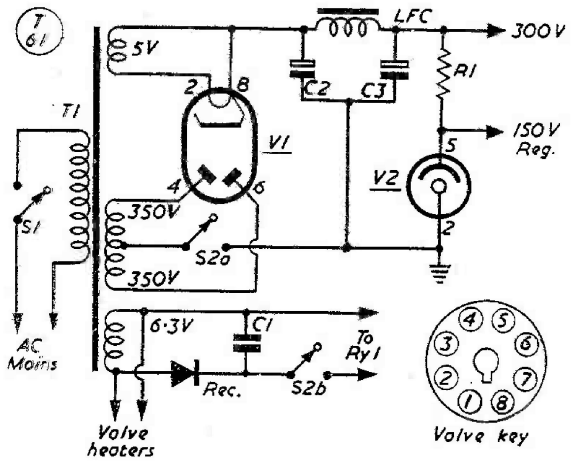


Fig. 3. Power pack as used by G6XY for his 160-metre transmitter, and built into the cabinet containing the RF and modulator sections. The transmitter is thus entirely self-contained.

between the condensers. The aerial change-over relay is bolted to the side of the cabinet and wired up after the chassis and panel are in the cabinet.

The audio section is to the left in the plan view photograph, the speech amplifier being at the front, followed by the driver valve with pre-set gain control between, and the modulator valve between the driver and modulator transformers. The mains transformer is at the upper right with rectifier beside it, also the VR150 (removed in the photograph). No detailed chassis drilling measurements are given as these will vary according to available components, but the general layout may be readily seen from the photographs.

The Pi-tank output condenser in the original is an old high capacity receiving type, but a small surplus twin-gang tuning condenser could be used with the sections in parallel to give slightly greater range of loading. A normal tank circuit can be adopted if desired, but the Pi-tank does enable almost any random length of wire to be loaded up as an aerial, and is therefore very useful where portable operation is contemplated; it does also considerably suppress any harmonics which may otherwise be troublesome in TV fringe areas. No TVI

Table of Values

Fig. 2. Circuit of Modulator Section.

C1	= 50 $\mu\mu$F.	R5	= 500,000 ohms.
C2	= 8 μF.	R6	= 1,000 ohms.
C3,C4,C6	= 1 μF.	T1, T2	= *See text.*
C5	= .005 μF.	S3	= Phone/CW switch, SPST.
R1	= 2 megohms.	V1	= Z77.
R2	= 1,500 ohms.	V2	= 6C4.
R3	= 330,000 ohms.	V3	= 12AX7.
R4	= 1 megohm.		

Table of Values

Fig. 3. Power Pack for the 160-Metre Transmitter.

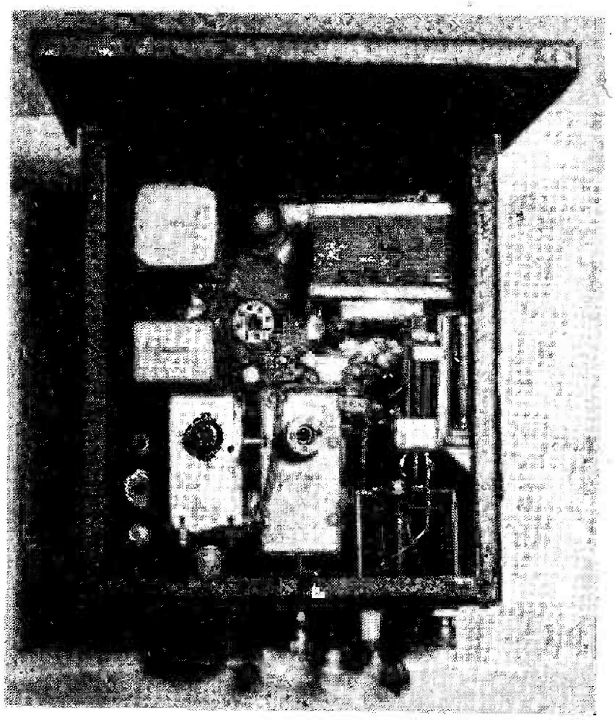
C1	= 25 μF., 25v.	Rect	= Suitable 6v. rectifier.
C2	= 8 μF., 500v.		
C3	= 16 μF., 500v.	S1	= SPST switch.
R1	= 5,000 ohms, 10w.	S2a, S2b	= DPDT switch (*see text*).
LFC	= 10 Hy. 100 mA Choke.	V1	= 5Z4.
T1	= 350-0-350v., 100 mA Transformer.	V2	= VR150/30.

is caused by this transmitter in a district near Sutton Coldfield.

CW Operation

It will be seen that the cathode circuit of the PA is keyed for CW working; this is purely a personal preference as the writer does not like the sound of most keyed VFO's on the air. If break-in operation is essential it is suggested that the screen of the VFO be keyed, the cathode bias on doubler and PA being sufficient to safeguard the valves under no-drive conditions.

The transmit/standby switch uses one section to break the HT centre tap and the other section to actuate the change-over relay, power for this being taken from the 6v. heater supply *via* a small surplus rectifier and 25 μF smoothing condenser. The Phone/CW switch merely short circuits the modulation transformer secondary for CW and leaves HT on the audio valves; this again is a matter of choice, but,



Plan view of the G6XY Top Band Transmitter, showing the general arrangement inside the box. Further details are given in the text.

if HT is removed from these valves, care must be taken that the voltage applied to the PA does not rise to allow the input to exceed 10 watts or the PA valve to be over-run under CW conditions. The audio arrangement outlined will give ample gain for full modulation from a crystal microphone.

No PA grid current meter is provided, the grid current being measured during preliminary testing and adjusted, if necessary, to between 2 and 3 mA by selection of the doubler screen dropper resistor.

General Notes

Using the TU61 components specified above gives the transmitter a frequency range of 1.7 to 2 mc. The panel layout as shown in the front view photograph is as follows: Bottom row, l. to r., microphone input, standby switch, Phone/CW switch, keying jack. Middle, l. to r., VFO tuning, FD tuning, PA tuning. Top right, PA loading. The three terminals at the top right are for connection to Aerial, Earth and Receiver input, the last-named being in the centre in the photograph.

This article is not intended to be a step-by-step "How to make it" complete with specifications for all parts used, but is rather an indication of how components already in possession at the average fairly active station may, with the exercise of a little ingenuity, be combined into a cheap, serviceable transmitter of reasonable appearance and modern design.

Design for a Communications Receiver

AF AMPLIFIER, POWER SUPPLY AND CRT MONITOR UNITS—PERFORMANCE TESTS

PART II

W. H. SEGROTT (G8SI)

The first part of this interesting article appeared in our April issue, with a block schematic of the receiver layout and circuits for the RF and 1st and 2nd IF/AF amplifier units. The general design as here discussed can be adapted to individual needs and ideas.—Editor.

(a) AF Section. V1 (6AB7) functions as a microphone pre-amplifier which, in conjunction with V2a-b and V3a-b, enables the unit to be used as a speech amplifier for the modulator of the transmitter. Circuitry is conventional and provides ample gain for use with a crystal microphone. A balanced 600 ohm output from the output transformer (T2) transfers the audio to the grids of the push-pull Class-B modulator through a low impedance line and hence the modulator may be located at any convenient distance from the receiving position (Fig. 5).

(b) Power Supply Section. Circuitry here is conventional except possibly for the inclusion of V6 (6H6G) as a rectifier for the negative bias supply. The purpose of this bias is to reduce the overall gain of the receiver during transmission periods, *i.e.*, receiver muting. Two voltages are available each being independently adjustable, RV2 (Send Bias) and RV3 (Net Bias). This provides for the independent adjustment of receiver gain in both the "transmit" and "net" positions.

Four octal sockets, fitted to the rear of the chassis, provide outputs for the AC and DC voltages to the various units. Additional sockets are also fitted for the AF outputs from transformer T2. Interconnecting cables between units pass through half inch diameter conduits fitted to each side of the equipment rack. These conduits, which run the full length of the rack, are split at appropriate points to allow exit of cables to the various units.

CRT Monitor and S-Meter Unit—Fig. 6

This unit performs the following functions :

(i) Visual display of the 465 kc, 50 kc or AF outputs of the receiver according to the setting of S2a-b. This permits observation of the keying characteristics of CW signals or the modulation depth on Phone signals.
(ii) External use as a general purpose oscilloscope.
(iii) Visual alignment of the IF transformers in the 1st and 2nd IF/AF Units.
(iv) Keying and modulation checks on own transmissions.
(v) Panoramic reception and display.[6]

(a) CRT Power Supply. The EHT for the CRT (VCR 139A) is obtained in a rather unorthodox manner, but has given satisfactory service over the past few months. An AF transformer, T1 (Ferranti AF3) is utilised (230 volts AC across the primary) which, in con-