

## "VANGUARD" 160 METRE OPERATION

1. Turn V.F.O. wavechange switch to 80.
2. Turn switch on right of V.F.O. switch by means of screwdriver to 160 m. position.
3. Put Power switch at rear to 10 watt position (up).
4. Put P.A. Band Switch to 160.
5. Tune as for other bands.  
Adjust P.A. grid current to approx. 2.5 m/a.  
Load serial to 36 m/a P.A. current.  
(i.e. 275 v. at 36 m/a = 9.9 w.).
6. Adjust Mod. Gain Control for peaks to 50% mod. on metre (this is equal to 100% mod. with 10 watts input).

NOTE: (i) It is possible to double frequency in the P.A. to 80 metres. Under these conditions a 'dip' in anode current will occur with the P.A. Tune Control around 0 - 1 degrees. Resonance for 160 metres will be between 6 and 9 degrees.

(ii) Should an aerial system with a very low impedance feed be employed, it may be necessary to connect an additional 1000 pf. ceramic condenser across C29 (Ae. Coupling condenser). This additional condenser can most conveniently be connected across the aerial socket outside the P.A. screening box or in the A.T.U. when one is used.

To assist in correctly matching an aerial system for 160 metres to the P.A. Pi circuit, a tap is provided on the 160 metre P.A. Coil. This can be connected instead of the end of the coil thus providing a smaller inductance in circuit. Under this condition the P.A. Tune Control should have a resonant point between 8 and 10 degrees.

### Calibration

The 160 metre V.F.O. is set up for 1900 kc/s to correspond with 50° on the outer scale. It will be found that the dial reading for 1800 kc/s is approx. 10° and 2000 kc/s is at approx. 90°.



# Geloso VFO Unit and K.W. "Vanguard" on Top Band

MODIFICATIONS FOR  
160 METRES

R. G. SHEARS, B.E.M., A.Brit.I.R.E.  
(G8KW)  
(K.W. Electronics, Ltd.)

*This article will be of great value to all who own a Geloso VFO Unit, whether or not it is incorporated in a Vanguard transmitter. For those who possess this Kit, as described in our March, 1958, issue, the notes here will be of particular interest; they show how the Vanguard can be modified for 160 metres, thus making it into a six-band CW/Phone Transmitter, matching into a wide*

THE Geloso "Signal Shifter" (Models 4/101 and 4/102), now enjoying world-wide popularity, provides an excellent VFO and adequate drive for either a single or a pair of 807's, or 6146's, on 10, 15, 20, 40 and 80 metres.

Many Top Band operators have, however, been compelled to build a separate transmitter for 160 metres when the Signal Shifter is included in their HF bands transmitter. As the Geloso Signal Shifter is incorporated in the K.W. "Vanguard," it was decided to investigate the possibility of a modification to make the Transmitter operable on Top Band without impairing efficiency on any of the other bands, and thus making the Vanguard a six-band job.

Three main problems had to be considered: The conversion of the VFO and driver stages in the Signal Shifter and the switching to return the circuitry back to normal: the modification of the PA tuned circuit; and the method of reducing power from 50 to 10 watts, while yet maintaining a satisfactory match between modulator and PA.

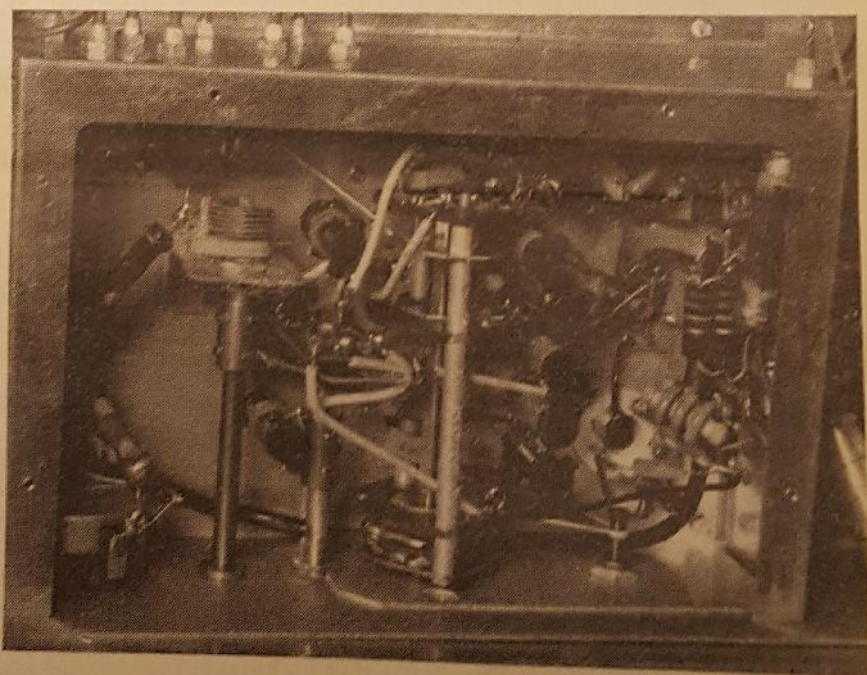
range of output impedances. The modifications evolved by our contributor can, of course, be applied to any transmitter incorporating Geloso RF units. He also shows a much more efficient way of reducing PA input (for Top Band) than the methods commonly used.—Editor.

## Modifying the Geloso Signal Shifter

It will be seen from the circuit diagram of the Geloso Signal Shifter, on p.22 of the March, 1957, *Short Wave Magazine*, that this unit employs a Clapp type VFO with three switchable grid inductances. Two of the inductances are on approximately 80 metres with different L/C ratios to provide satisfactory bandspread. One is for the 80-metre band and the other, when multiplied in frequency, gives good band-spread calibration on 20 and 15 metres. The third coil is operating on 40 metres and is proportioned for adequate band-spread on this band and also on 10 metres.

In order that sufficient bandspread for a 160-metre VFO could be obtained, it was decided to use the existing circuit arrangement for the 80-metre band and to pad out to 160 by switching in additional inductance in series with L1, as shown in Fig. 1a here. Details of this inductance and others used in the modification are shown in the Coil Table.

The same treatment was applied to the 80-metre inductance L7 in the anode circuit of the output stage (6V6G or 6L6G)—see Fig 1b and



The under-chassis modification for Top Band, applied to the Geloso Type 4/102 VFO Unit, and equally applicable to either mark of Geloso "Signal Shifter." The additional switch unit SA1/SA2 (see Fig. 1a/fig. 1b) is fitted alongside the existing main band-change switch, with coils LA1 and LA2 adjacent; the actual positioning will immediately be clear on examination of the Geloso VFO with this photograph.



full circuit p.22, March, 1957. No modification to the 6AU6 is required, as on 80 metres this is already operating as an aperiodic untuned amplifier stage and provides sufficient drive for the following valve. The method of switching in the additional band had to be considered and the

writer suggests that the neatest and most compact way would be to replace switch wafers S1A and S1C (in the original Geloso Unit) with a 6-position wafer—but this would also require modification to, or replacement of, the 5-position selector. As these changes constitute a major undertaking, it was decided to incorporate an *additional* 2-position change-over switch of the wafer type to give 160 metres in its position 1 and normal (giving 80, 40, 20, 15 and 10 metres) in its posn. 2.

The fitting of this switch and coils can be seen in the under-chassis photograph; it should be noted that the metal mounting bracket for the additional switch (SA1 in Fig. 1a) permits sufficient screening between the two additional coils (LA1 and LA2). The position of the switch is not critical but it is convenient to locate it adjacent to the centre wafer of the main unit.

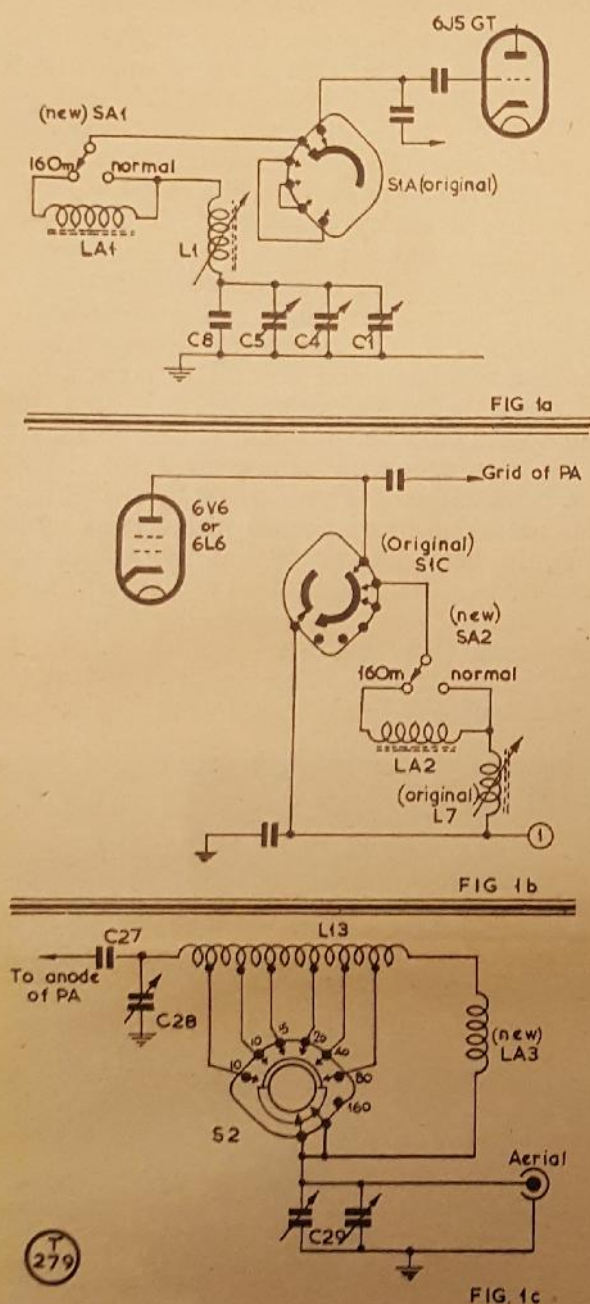
It should be noted from the Coil Table that two details are given for LA2—one is for use with a Signal Shifter Type 4/101 driving a single 807, 6146 or similar valve, the other is for a Model 4/102 driving a single valve with a grid resonating trimmer (such as in the Vanguard), or when the 4/102 is used with a pair of valves in parallel.

Wiring out for these modifications should be kept as short as possible, using 20g. tinned copper wire with sleeving.

For those who wish to carry out these modifications to their Vanguard transmitter as already constructed, it must be borne in mind that, due to the small amount of panel space available, the control spindle for the extra switching SA1/2 must be brought through the front panel exactly mid-way between the VFO switch and drive control knobs. (The writer does not use a knob for operating the switch but a flat key, or a screw-driver.)

### Modifying the Vanguard RF Amplifier

The Vanguard transmitter PA has a Geloso pi-coil assembly, Type 4/112. This Coil Unit is fitted with a 6-position switch providing two positions for 10 metres and one position each for 15, 20, 40 and 80 metres. As an additional switch position is required for 160 metres it is necessary to modify the coil unit. The first 10 metre position remains unchanged. The wire between the second tap on the coil and the second switch position is cut out. The wire from 15 metre tap is reconnected to position 2 of the switch; the 20 metre tap is re-



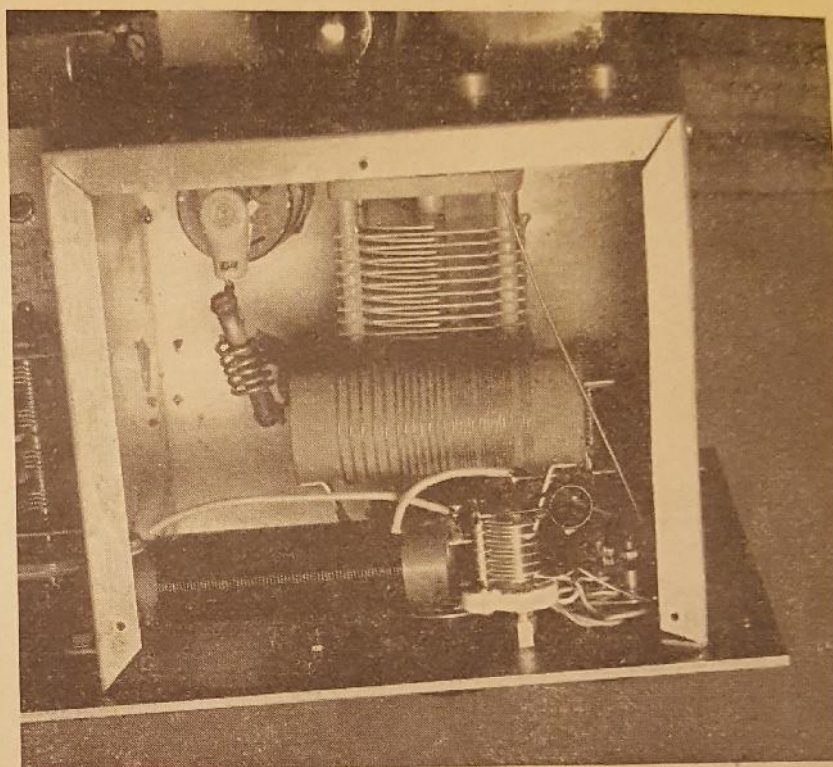
In this sketch, Fig. 1a shows the modification required to the frequency-generating side of the standard Geloso 4/101 or 4/102 unit for operation on 160 metres. The lead connecting the top end of L1 is taken off S1A and rewired with the additional items LA1 and SA1 to the circuit given here. In Fig. 1b is shown the modification to the output stage of the Geloso "Signal Shifter," applicable to Models 4/101 and 4/102 when they are to be used on the 160-metre band. Fig. 1c gives the alterations to the standard Geloso 50-watt PA pi-coil assembly for operation on Top Band. The coil LA3 is wired in as shown, and its position in the PA tank compartment of the Vanguard transmitter is illustrated in the photograph on the opposite page.



wired to switch position 3 and so on. (The 80 metre end connection is cut from the switch rotor and re-wired to switch position 5). The 160 metre coil is connected between position 5 of the switch and the switch rotor. With the variable condensers specified, tuning over all bands 10-80 metres with a wide range of output impedance (approx. 40-2,500 ohms) can be expected. If one is prepared to accept a low impedance output (say, 40-350 ohms) on 80 metres only, the second 80-metre switch position can be disconnected and utilised to bring in the 160-metre coil, as shown in Fig. 1c. The placing of the additional coil, LA3 does not appear to be critical, but the writer found the most convenient place to be that as illustrated in the photograph (alongside) of the PA compartment.

The detail given for the PA inductance (LA3) is suitable for low-impedance aerial feed when operating on low power only. This provides an impedance range of about 60-500 ohms over the band. Should a lower impedance feed be required, a ceramic condenser of .001 may be connected across C29—that is, across the aerial socket. To obtain a higher impedance feed, LA3 should be made 80 turns of 22g. enamelled copper on the 1in. dia. former.

It is of interest to note that the inductance value of LA3 should be reduced for 50-watt operation; 40 turns of 20g. enamelled will give a



Positioning of the additional 160-metre coil in the Vanguard RF power amplifier compartment, with the PA valve itself (a 6146) at upper left; the small winding close up to the top cap of the valve is an anti-parasitic choke, L17 in the original circuit diagram on p.34 of the March 1958 issue of "Short Wave Magazine." The 160-metre PA coil itself is the winding at lower front, and consists of 70 turns of 20g. on a 1-in. diameter former  $4\frac{1}{2}$  inches long—see text. (In later "Vanguards" the 160 metre P.A. Coil is mounted on the right hand side of the box behind the Geloso Pi Coil).

feed impedance range of approximately 60-500 ohms. This is due to the PA anode load impedance being almost halved when running 50 watts compared with 10 watts.

### Reducing Power to 10 watts

The method of reducing power in the Vanguard transmitter from 50 watts is shown in Fig. 2. (It may also be considered for use with other transmitters.) Systems whereby power is lowered by increasing the value of the screen resistor to a PA stage using a pentode or tetrode, or by reducing the voltage output from the PA power supply, can cause a serious mismatch between modulator and PA. The value RA1 in Fig. 2 has been calculated to fulfil three main considerations. (1) Suitable working voltage for the PA valve; (2) Impedance match between modulator and PA; and (3) Dissipation of audio volts not required when on low power. It will be seen that, with switch SA3 open, the audio volts appear across the PA load of the modulation transformer secondary (4,000 ohms in the Vanguard) and the resistor RA1 in series, equalling 7,500 ohms together. This reduces the PA anode voltage to about 275 volts. The aerial

### COIL TABLE

FOR GELOSO VFO/PA UNITS ON TOP BAND  
(Refer to Geloso and Vanguard Circuit Data)

LA1	— 50 turns 38g. enamelled, close-wound on 3/8-in. diameter Aladdin former with iron-dust Core.
LA2	— (For Type 4/101): 64 turns 38g. enamelled, close-wound on former as for LA1. (For Type 4/102): 58 turns as above.
LA3	— 70 turns 20g. enamelled, close-wound on 1-in. diameter Paxolin former $4\frac{1}{2}$ -ins. long. (Or 40 turns for 50-watt operation — see text).
RA1	— Power dissipating resistor, 3500 ohms, wire-bound, rated 20 watts.
SA1/SA2	— Double-pole change-over wafer switch (see text).
SA3	— On-off toggle switch, insulated for 500v., for PA input reduction.



loading should be adjusted to draw 36 mA anode current; this will give a power input of 9.9 watts and an anode load of approximately 7,500 ohms, which is a good match to the modulator.

The resistor RA1 and Switch SA3 can be placed at the rear and under the chassis in the Vanguard. A good quality switch should be used for SA3 as this must withstand DC volts in addition to the modulator voltage swing. To return the transmitter ready for 50-watt operation, it is only necessary to close SA3.

### Adjusting the Vanguard for Top Band

The switch SA1/2 and PA pi-coil switch should be put in their 160-metre positions.

First, it is necessary to align the VFO. In the Vanguard this can be done by putting the netting switch to "Tune." Set a receiver, with BFO switched on, to 1900 kc and set the Geloso dial pointer to 50° on the outer scale. Adjust the iron-dust core in LA1 until a beat note is heard in the receiver. This will allow the 160-metre band to be spread in an almost linear manner from about 1800 kc at 5° to 2000 kc at 94°. This calibration will be slightly affected by the tuning of L1 and C1 in the "Signal Shifter," but these should be made correct for 80-metre calibration and not touched thereafter. Next, put the switch SA3 to the low-power position, return the netting switch to "Normal" and turn Send/Receive Switch to "Send." Adjust the iron-dust core in LA2 for maximum grid current with the VFO about the middle of the 160-metre band and the grid tuning condenser (C20A in the circuit on p.54, March, 1958, issue) about half-way in. Drive will then remain constant over almost all the band. The level of drive should be adjusted, by means of the drive control, for a PA grid current of 2.5-2.8 mA. Adjust the "Aerial Coupling" and "PA Tuning" controls in the normal manner, so that the PA is loaded to 36 mA plate current. The modulation gain control should be turned down lower than the position used for 50 watts input. The speech peaks on the modulation percentage meter should not be allowed to go higher than

the "50% modulation" mark when operating 160 metres.

Keying is not affected by this 160-metre modification and may be used in the manner prescribed for 50-watt operation.

### Conclusion

Many users of the Geloso "Signal Shifter" will find this a very simple way with which to obtain excellent results on Top Band. It may help those who have a separate transmitter for 160 metres to dispose of it and make room for something else! It may also help others to give Top Band a try and thus to meet a new circle of very good friends.

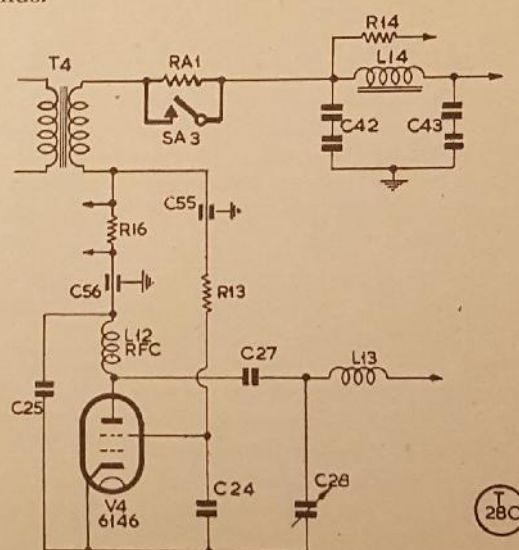


Fig. 2. The method of reducing PA input when the Vanguard is operated on 160 metres. The resistor RA1 is so proportioned that, with the modulation transformer secondary, it produces the correct modulator/PA load when the RF stage is run at 10 watts input. It should be noted that C25 in the original circuit (p.34 March) is now connected between L12 (the RF choke) and the 6146 cathode. Switch SA3 has to carry full DC plus the modulating voltage, so should be selected accordingly; the resistor RA1 should be mounted clear, as it also carries the voltages across the switch.

The writer wishes to thank all those in the London area, Kent and Essex, who so willingly stood by for tests and gave useful reports on the 160-metre test transmissions from G8KW while this modification was being evolved.

## K. W. ELECTRONICS LIMITED

VANGUARD WORKS, 1, HEATH STREET DARTFORD, KENT, Tel.: Dartford 5574.