

## The KW Vanguard

by **Colin Guy GADDI**

At the present time there seems to be more KW rigs on the air than any other vintage gear, indeed I recently heard the suggestion on the 80m net (tongue in cheek I hope) that VMARS should be re-named the 'KW Club'. In reality I suspect that the current popularity of the various KW rigs is simply because they are easily obtainable and do not fetch the sometimes silly prices now commanded by military gear, are easy to restore and operate, and invariably put out a decent quality signal.

The subject of this article was the first major offering from KW Electronics and is an AM/CW transmitter offering a power input of 50 watts on all bands 80 – 10 metres. The manufacturer also offered a modification to enable topband coverage at reduced power (10 watts). The Vanguard was offered as a complete kit at £56/14/0 or ready built at £66/3/0, in each case the topband coverage was extra. A review of the kit version appeared in the March 1958 issue of Shortwave Magazine.

The Vanguard was designed around the then popular Italian made Geloso 4/101 'Signal Shifter' VFO unit, which was generally available to amateurs and also provided an easy way to build a homebrew transmitter. A full description of this unit appeared in SWM, March 1957. The VFO unit consists of a Clapp oscillator (6J5), buffer/multiplier (6AU6) and a 6V6 output stage. This unit can directly drive a PA stage up to 50 watts input. For higher output a 6L6 could be substituted for the 6V6 with some minor component changes. The commercially manufactured high power version was known as the 4/102, the only difference between the two models being in the inductance values of the output stage, to take account of the different capacity of the alternative output valves and the higher input capacity of the larger PA stage. Later versions of the Vanguard used the 4/102 unit.

The Clapp oscillator covers 3.5 – 4.0 Mc/s for the 80m band, 3.5 – 3.6 Mc/s for 20 and 15 metres and 7.0 – 7.45 Mc/s for the 40 and 10 metre bands. The 6AU6 isolator stage is fed by a 100pF capacitor from the cathode of the oscillator valve, and functions as an untuned aperiodic amplifier on 3.5 and 7 Mc/s. On 14, 21 and 28 it functions as a tuned frequency doubler. The output stage operates as a tuned amplifier on 3.5 and 7, as a doubler on 14 and 28, and as a tripler on 21 Mc/s. Drive level can be adjusted using a wirewound potentiometer which varies the screen voltage on the output valve. The large, clear dial when illuminated looks good is easy to read and once set up is accurate.

The VFO unit drives a 6146 PA valve which has in its output a Geloso band switched pi output network and a tuneable harmonic trap. The PA can be cathode



keyed for CW, or high level anode and screen modulated for AM.

The modulator consists of a pair of 6L6 valves in push-pull, driven by a 12AX7 phase splitter and a 6BR7 microphone amplifier. This arrangement, together with the high quality modulation transformer provides adequate audio power to achieve full modulation without distortion, these are one of the nicest sounding AM rigs on the band even today.

The power supply consists of three separate mains transformers, one to supply all heaters including the HT rectifiers, one to supply the modulator HT and one to supply the RF section HT, each having its own rectifier. Transmit and receive keying, netting and AM/CW selection is achieved by applying the mains supply to the primary of one or both transformers and switching the PA cathode as necessary. The front panel transmit receive switch also provides for aerial changeover and receiver muting. Metering is provided to indicate grid drive, PA current and modulation depth. The latter operates by rectifying a portion of the audio on the secondary side of the modulation transformer. In this way account is taken of the loading effect of the PA under different tune-up conditions, the meter giving a fairly accurate indication of the modulation depth under all conditions. Cathode keying of the P.A. is used for CW.

### Topband Coverage.

As the Geloso components do not cover topband, KW issued a modification to enable coverage of this band. This was described fully in the May 1958 issue of

Shortwave Magazine. Basically it involved adding a series inductance to the 80m VFO and driver coils with a small rotary switch to change between 80 and 160 by shorting out the extra coils on the 80m band. The switch is positioned between the bandswitch and driver controls; in this position very short wiring can be used, but as there is little space between the two controls there is no room for a knob on the switch, instead a small screwdriver is used to change between topband and 'normal'.

Topband coverage for the PA is achieved by adding an extra coil in series with the first 80m position on the PA bandswitch (two positions were thoughtfully provided by Geloso, only the second one is needed unless one needs to tune into a high impedance aerial on 80m). The then compulsory reduction to 10 watts input was achieved by switching a 3.5k $\Omega$  20 watt resistor in series with the PA HT supply. This reduces the HT voltage to the PA, and also dissipates the unused audio power from the modulator.

### Getting it going

I came across a Vanguard chassis (no case) lurking under a table at a local rally a couple of years ago, it looked very sad and sorry for itself, appearing to have spent the last 20 years in a farm building. When I asked the stallholder he told me that this was exactly what had happened. The set appeared complete, so I parted with the requested tenner and sneaked it back into my garage under cover of darkness in the hope that the 'management' wouldn't spot it. There it remained until the recent appearance of data signals on 3,625 forced a frequency change onto the VMARS net, and my reluctance to buy any more crystals for my AM rig made me decide to think again about the Vanguard.

Surprisingly, although I knew of several people who were operating these sets, there has been nothing published about their restoration as far as I am aware. A request for information brought the usual very helpful responses from VMARS members, and armed with copies of the manual and articles mentioned above, (thanks Roger and Mike!) I dug the set out of the garage one morning when the XYL was out, cleaned off the grime and bird poo from the chassis, and stripped down the front panel.

Mercifully all of the grub screws in the knobs were free, and with the panel removed I could clean it properly with foam spray. It came up surprisingly well with only very slight rusting around the edges. The knobs all came good with an application of 'Bake-O-Brite' and the perspex VFO dial cover was

in excellent condition.

So much for the aesthetics, the next worry was the transformers, which were very rusty, as were the metal 6L6 valves. I hid the chassis in a cardboard box at the back of the airing cupboard for a couple of weeks to thoroughly dry it out, then introduced it to the shack, whereupon I checked for leakage to earth and inductance in all three of the transformers. All appeared well here, though I didn't like the look of the small feedthrough capacitors incorporated into the mains filter, so I removed these and connected up a new mains lead and plug, with a Radiospares in-line mains filter in place of the original feedthroughs and chokes. (Regular readers will know that I am keen on safety where mains supplies are concerned!).

It was at this point that I noticed that the Yaxley switch used for transmit-receive switching consisted mostly of a pile of ash; as mentioned earlier this switch carries mains voltage to the primary of the HT transformers. I joined the appropriate wires together and applied the mains. There was no signs of anything nasty happening after a few minutes, so I inserted all of the valves except the rectifiers and left it connected for a couple of hours. Sigh of relief as all seemed well and a check at the rectifier anodes revealed equal voltages at each. (Unequal voltages are a sure sign of HT transformer trouble).

There is a bunch of six electrolytic capacitors under the chassis for smoothing, the appearance alone of these suggested that they were no good, so I obtained a quantity of 47 $\mu$ F 450 volt capacitors from our TV parts supplier, these were minuscule, and designed for printed circuit mounting, compared with the originals, which were all held down with a metal clip. I therefore mounted them onto a piece of Veroboard, and for good measure added a 470k $\Omega$  resistor across each one to make sure each received its fair share of voltage. (This is not an attempt at concours restoration, just getting it operational!) A further check for leakage across the HT rails looked good, so I applied

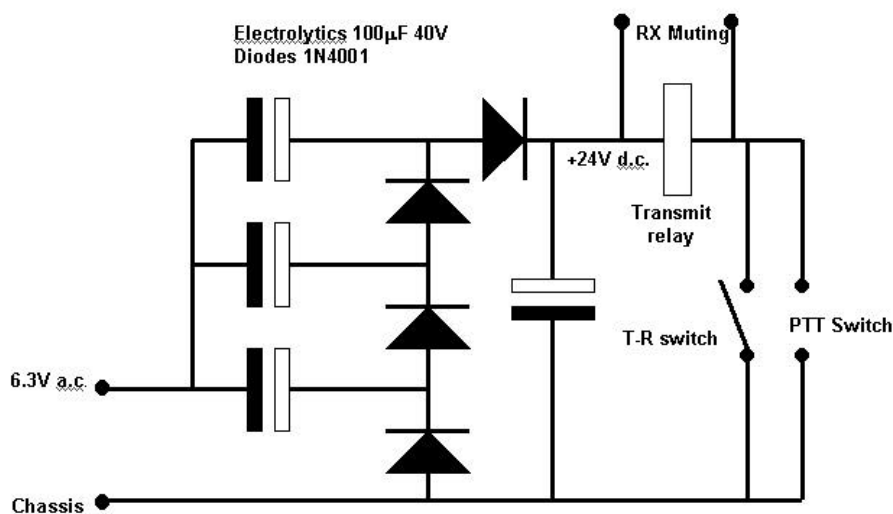


Fig. 1 Deriving a 24 volt relay supply from 6.3 volts a.c.

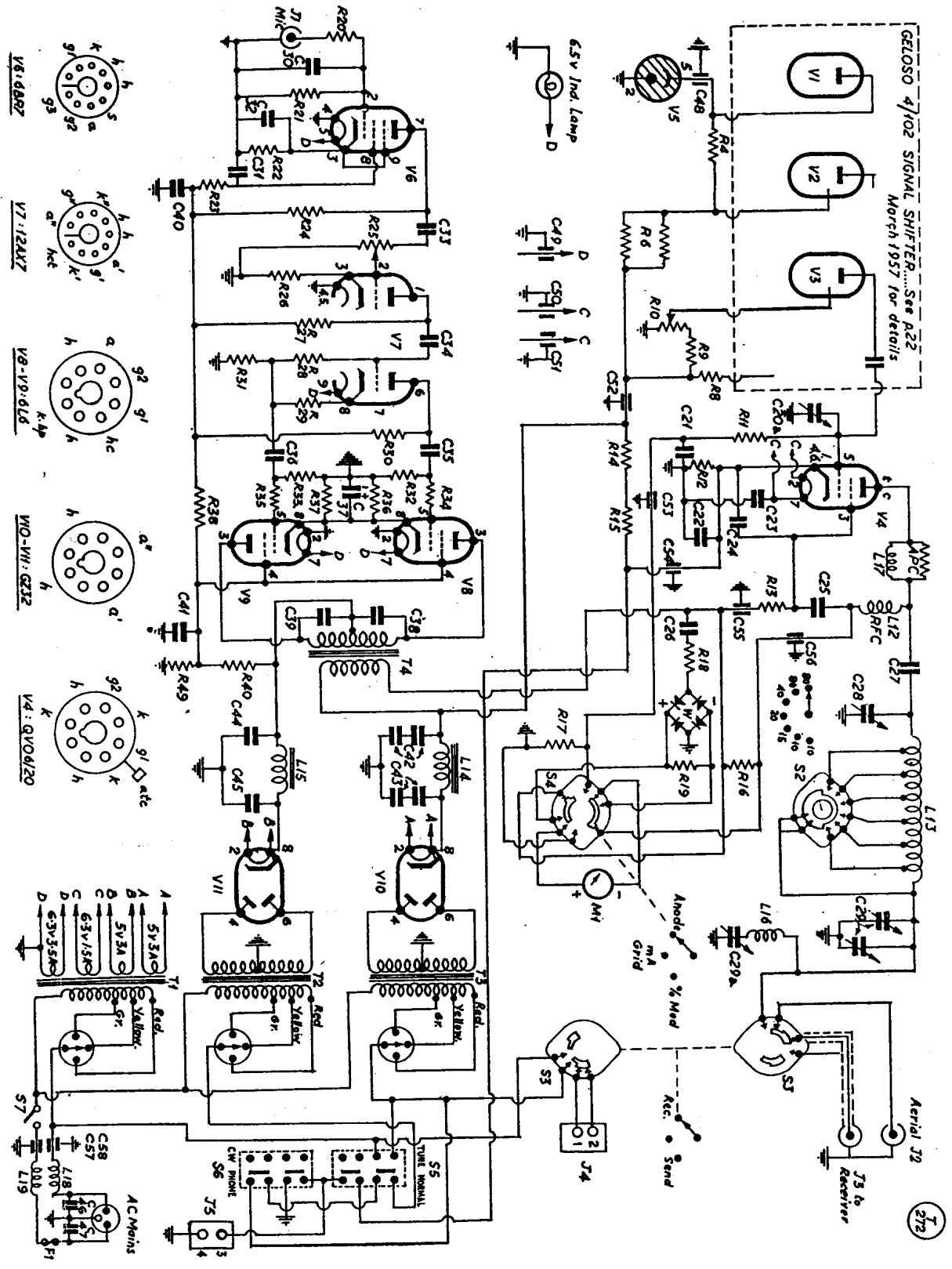


Fig. 2 Complete circuit of the KW Vanguard

**Table of Component Values**

C1 – C19 Incorporated in Geloso 4/102	C26 .01 $\mu$ F 500V	C31 0.1 $\mu$ F	C40, C41 8 $\mu$ F 450V elect.
C20 100pF silver Mica	C27 .002 $\mu$ F silver mica 1000V	C32 25 $\mu$ F 12V elect.	C42, C43 2x 32 $\mu$ F 450V in series
C20a 15pF variable	C28 200pF variable	C33,C34 300pF silver mica	C44 32 $\mu$ F 450V elect.
C21, C23 .001 $\mu$ F ceramic	C29 2x 500pF gang	C35, C36 .01 $\mu$ F	C45 8 $\mu$ F 500V elect.
C22 3x .001 $\mu$ F on 6146 cathode pins	C29a 50pF air spaced	C37 25 $\mu$ F 25V elect.	C46, C47 .001 $\mu$ F silver mica
C24, C25 .005 $\mu$ F silver mica	C30 100pF ceramic	C38, C39 .005 $\mu$ F 800V	C48 – C58 500pF feedthrough
R1, R2, R3, R7 Incorporated in Geloso	R13 27k $\Omega$ 2W	R21 1M $\Omega$	R32, R33 220k $\Omega$
R4 15k $\Omega$	R14, R15 68k $\Omega$ 1W	R22 1k $\Omega$	R34, R35 47k $\Omega$
R5 2.2k $\Omega$	R16 Meter shunt	R23 2.2M $\Omega$	R36, R37 470W 2W
R6 7.5k $\Omega$ 5W	R17 470 $\Omega$	R24, R27, R28 470k $\Omega$	R38 22kW 1W
R8 3.3k $\Omega$ 2W	R18 27 k $\Omega$	R25 1M $\Omega$ potentiometer	R39 47kW 1W
R9,R11 22k $\Omega$ 2W	R19 100 $\Omega$	R26 4.7k $\Omega$	R40 4.7kW 5W
R10 30k $\Omega$ 3W	R20, R30, R31 100k $\Omega$	R29 2.2k $\Omega$	R41 33W 2W
R12 33k $\Omega$ 1W			

the mains again with the rectifiers in but the PA valve out. An oscilloscope revealed healthy levels of RF at the PA grid pin on all bands.

**Tidying Up**

This Vanguard had obviously been one of the kit ones, and not so well built either; at this stage I knew I had a viable transmitter, so much of the under chassis wiring and components were removed, together with a very tatty attempt to add another PA valve, a futile exercise I would have thought, as there would not have been enough power from the modulator to fully modulate two valves! The chassis had been very brutally drilled for another valveholder using the 'ring of holes' technique. I had to resort to a hammer and anvil to straighten out this part of the chassis, then blank off the 'hole'.

With the under chassis wiring all sorted, I turned my attention to the transmit-receive switching. As previously mentioned, the original Yaxley switch carried the mains to the HT transformers, and provided aerial changeover and receiver muting. After some pondering, and as I prefer to have push-to-talk operation anyway, I decided to install a three pole 10 amp relay behind where the switch was and use this to do the hard work. The relay has a 24 volt coil, and as the RA117 receiver, with which I intended to use the Vanguard also uses 24 volt muting, I built up a 24 volt DC power supply driven from the 6.3 volt heater supply (Fig.1). A small rotary switch mounted in place of the

original transmit-receive switch provides this function and retains the authentic appearance of the front panel.

With a nice new 6146 inserted I again applied power, and was rewarded with around 30 watts of RF output on 80m, checking through the bands produced some output on all bands, but drive was low on the higher ones. Checking the calibration with a modern frequency counter (how did we ever manage without them?) revealed that it wasn't too far out on 80, 20 and 15, but on 40m the rig very suspiciously covered about 6.5 – 7 Mc/s. I wonder what it was last used for? Maybe the burnup on the T-R switch put paid to that operation! A run through the alignment procedure soon sorted that and I had at least 25 watts on all bands. An odd effect whereby the output reduced markedly as the drive was increased beyond a certain point was traced to an almost open circuit 22k $\Omega$  PA grid resistor. I also had to replace some of the resistors and capacitors in the audio stages, with that done I had 100% modulation and reports on topband and 80 confirm the good audio performance that these sets are capable of.

The Vanguard has now become my main station AM rig, and so far has provided some good contacts on 160 and 80 and also stateside on 10m. These, and the similar Valiant are well worth looking out for at junk sales; they provide a very easy way into the joy of AM radio.

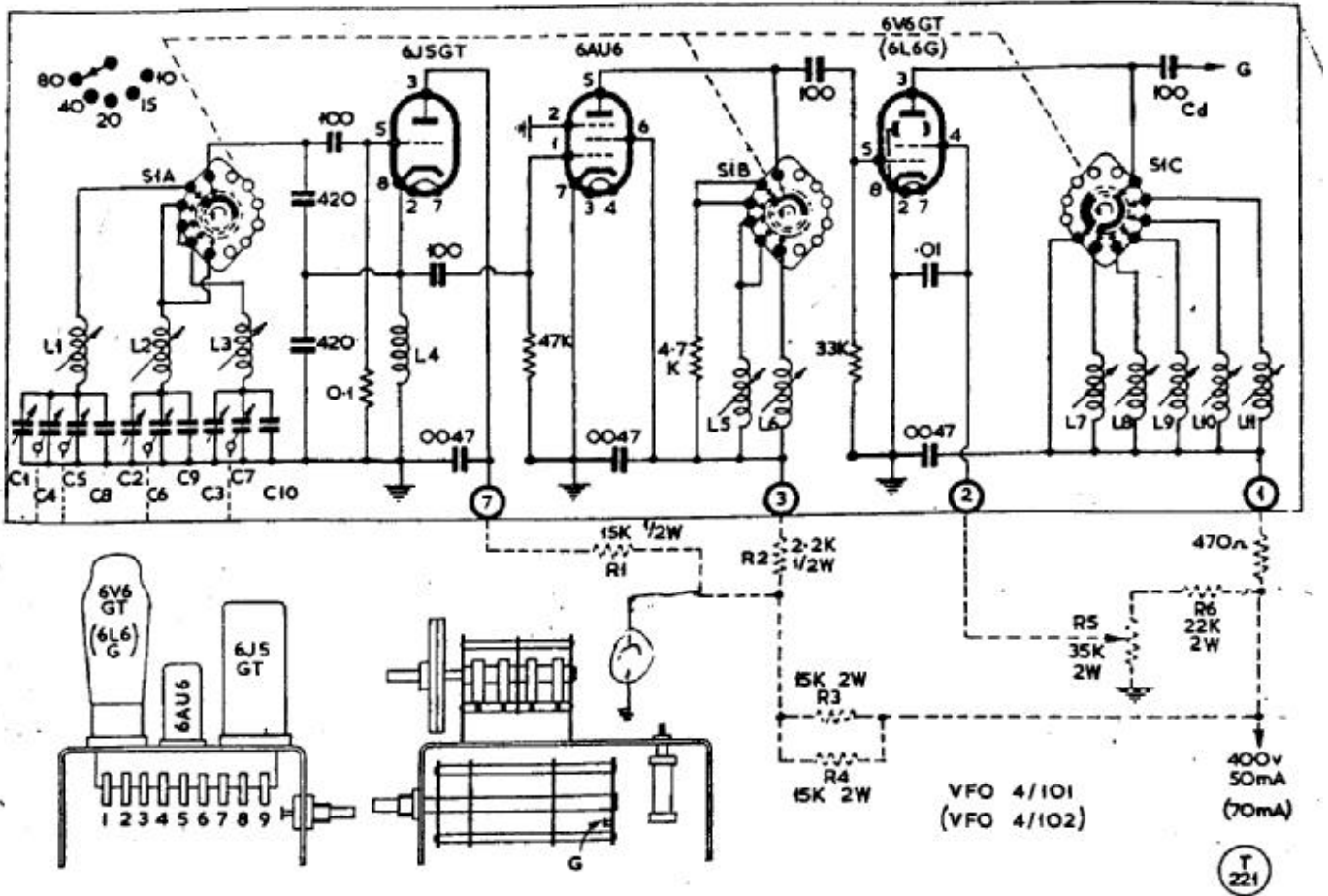


Fig.3 Geloso 4/101 VFO Unit.

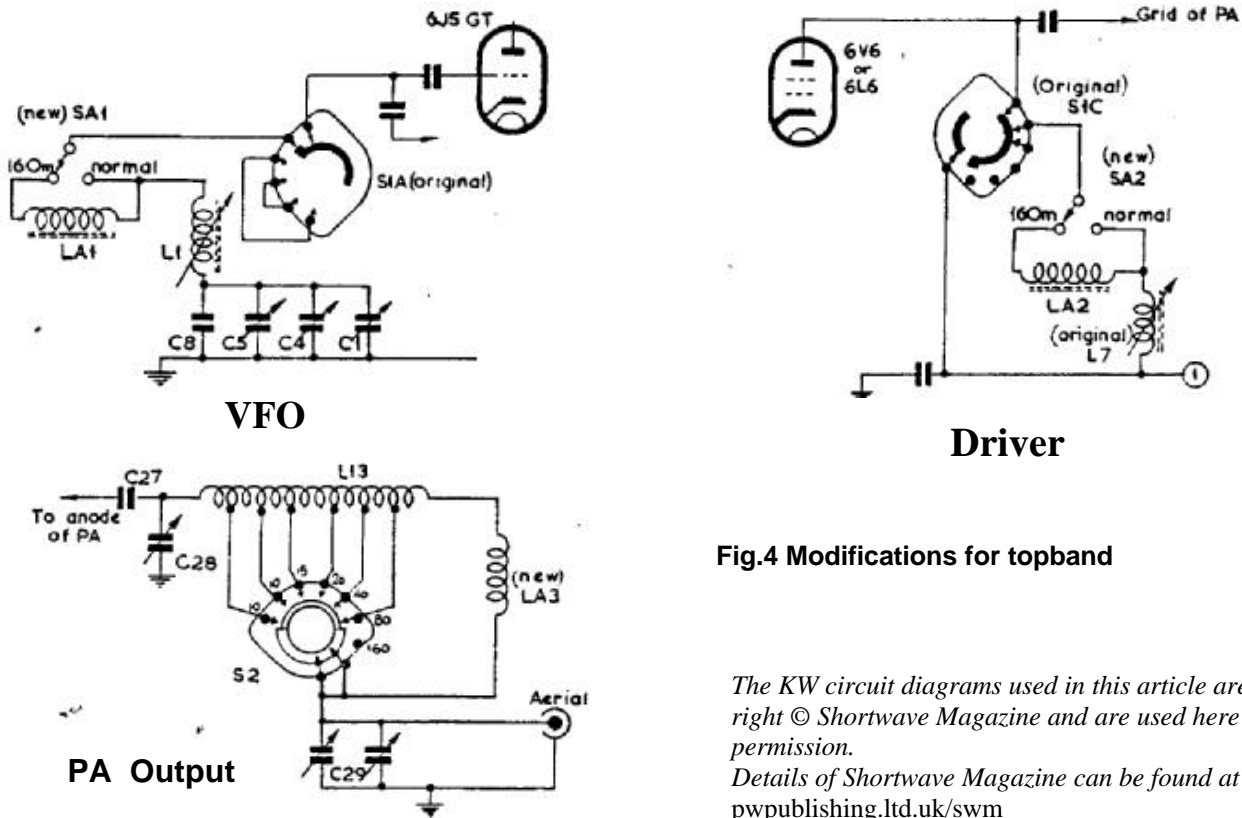


Fig.4 Modifications for topband

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