The KW Vanguard…Some further notes

A restoration project for 2002

By Colin Guy, G4DDI

VFO instability

Soon after putting my KW Vanguard into regular service it developed a peculiar kind of frequency drift. Not the usual slow steady drift most vintage gear suffers from, but random jumps in frequency of a few hundred cycles or so. This was noticeable on 'net', when the note almost sounded like an FSK data signal at times. It was also noticed by those with whom I was in contact, so I decided to take a closer look.

A look at the VFO circuitry (Fig.1) reveals that the frequency determining components are: the variable capacitor and its associated trimmers, inductors L1, L2 and L3, switch S1A, the 6J5 valve, the 100 and 420pF grid and cathode coupling capacitors and possibly the 100kΩ grid resistor and cathode choke L4.

Initial observation revealed that the fault was present to a similar degree on all bands, and also that it couldn't be instigated or affected by physical prodding of the ganged variable capacitor or the switch, this led me to rule out these components at an early stage. The valve was also exonerated by substitution. A digital voltmeter and an oscilloscope connected to the 150 volt supply at pin 7 showed that the supply was rock steady with no noise present. The 100pF capacitor coupling the VFO to the buffer stage was disconnected and the VFO alone monitored on the receiver; the fault was still present. As I had already found many resistors in the Vanguard to be noisy or off spec, I changed the grid resistor, although it measured close to its correct value, again with no effect. This only left the three silver mica capacitors; changing the two 420pF ones effected a complete cure!

In my unit they were in fact 390pF, and replacing them with the same value close tolerance polystyrene capacitors necessitated a complete recalibration of the VFO on all bands, so I guess the originals were well off spec in any case. As a precaution I have now replaced all of the pink silver mica capacitors used in the VFO, and I now have a unit that is very reasonably stable on all bands, including 10m.

Two other people have mentioned a similar effect to me, one with a Vanguard, and one with a Minimitter Mercury, which uses a similar VFO circuit.

I have since been told that certain types of old silver mica capacitors are prone to throwing minute particles of the silver coating off the mica substrate when subjected to RF and this is what causes the effect. Well, that's one plausible explanation!

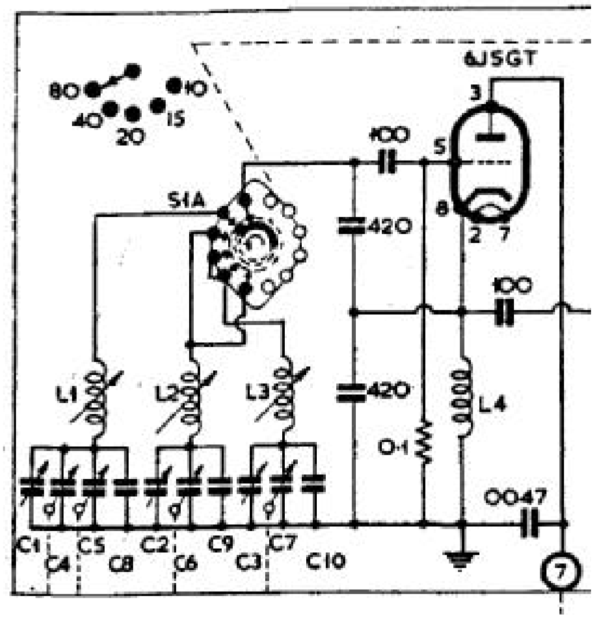

Fig.1 Vanguard VFO circuit

Safety chokes

Writing in NS15 Gerald Stancey mentions the lack of a 'safety choke' across the aerial. I agree with his comment that in the Vanguard this would have to be a substantial component to have any useful effect. The intention of this idea is to provide a DC path to earth in the event that the output coupling capacitor should become short circuit. To be effective, a fuse of suitable rating would have to be provided in the PA HT supply as well as the safety choke and I have never seen this advised by those who suggest that the safety choke is a 'must'.

In any transmitter of this type (even a 19 set!) I always replace the coupling capacitor with a modern high voltage 'pulse' capacitor of the type intended for TV timebase applications, just in case. But what voltage does this component have to stand? This is how I have always worked it out; if I'm wrong I'll stand corrected!

Taking the Vanguard as an example,

DC supply to PA	= 425V
Voltage at peak of modulation cycle	= 850V (1)
RMS output power	= 25 W
Assuming 50Ω, RMS output voltage	= $\sqrt{25x50}$
	= 36 V

Peak voltage =	= 36x1.4
	= 51 V (2)
Total voltage across capacitor (1)+(2)	= 901V

This calculation assumes:

1. A 50Ω load, which may be far from correct!
2. Sinusoidal modulation – in reality any spikiness of the audio waveform may produce transients much higher.

So I would say that for a safe margin a capacitor with double the working voltage as a minimum is necessary. In fact, 4,700pF 2,500V disc ceramic pulse capacitors are a standard easily obtainable TV part, and are ideal for this application and power level.

Another precaution that is worth taking is to wire a carbon resistor of say 10kΩ across the aerial socket, simply to provide a discharge path for this capacitor. Whilst it does not store a lot of energy, the aerial socket can give you a nasty surprise if you touch it after switching off the supply – this definitely happens with the 19 set, guess how I found out!