Oscillations! ***Richard Hankins G7RVI***

One fault most repairers hate is that of “instability”, “howl”, “feedback” – call it what you will, it usually involves nasty noises when there should be silence. Sometimes the oscillations are silent, but wreak havoc on VHF receivers – this is the “spurious oscillation”, which is often prevented by odd resistors appearing near valve electrodes. In this article, I offer a couple of pertinent examples.

WS19 audio howl on CW

Arthur Stevens, M1FFU, was the last in a long line of people to ask why the WS19 can apparently put out an audio howl when using the set on CW (see Feb NL.). The problem – and the fix – were found long ago, as this excerpt from EMER Tels F279 Miscellaneous Instruction No.14, issued March 1960, shows:

WIRELESS SET NO 19 MK 3 AND 3/1

TECHNICAL HANDBOOK - MISCELLANEOUS INSTRUCTION

Audio frequency self-oscillation

INFORMATION

1. When Wireless set No 19, Mk 3 or 3/1 (WS 19) is used with only one set of Receivers, headgear, SI, double, No 1A (Y1/YA9595) in vehicle installations, trouble may be experienced in the form of an audio frequency howl in the headphones. This has been traced to self-oscillation of the output stage of the set when insufficient loaded. The impedance of the headgear mentioned being 150Ω against the 100Ω of the original headgear used.

2. The installations on which self-oscillation may occur are those which include Connector, 5-point, No 40, 6 in. (ZA 46970) or 12 in. (ZA 47686) and details of these installations are given in the following EMERs (Installation Instruction No 1 in each case):-

Comms Inst: C195, C205, C215, C225, C265, C505, C515, C525, D405, H515, H525, H575, K235 and K635.

3. Instructions for modifying the connectors referred to in para 2, to eliminate self-oscillation of the WS 19 when used in these installations, will be published in the form of amendments to the EMERs. The modification consists of fitting a 150Ω resistor between pin 4 and the housing of Socket, 12-point, No 3 which is the socket at the wireless set end of the cable.

A14HP low frequency oscillation

A number of people have noted that the A14HP can howl when used on HP transmit. Some people report this happens only when using the wrong handset (the A13 handset is one example). The correct A14 handset has a screened lead, so it has been suggested this is an RF feedback problem, where RF gets into the audio stage and is demodulated to allow audio feedback to occur.

The problem I have seen on the A14HP I am working on *may* be this fault. On my set it occurs on AM, when transmitting on HP – though no RF needs to be present to trigger the problem. In other words, if you remove the RF feed to the amplifier, then press the pressel, the oscillation will probably start. Since its frequency is only 37Hz (on my set), the only symptom you are likely to note without instruments is that the batteries go flat very fast indeed – my power supply (feeding the amplifier) current limited at 2.5 amps!

Fig.1 Shows the waveform found at the base of VT6 (modulator input) – at this point it is roughly 15 volts p-p at 37Hz. Decoupling the 24 volt supply rail in the amplifier modulator stopped the oscillation. When the decoupling was then removed, the oscillation did not restart, indicating that the modulator system is *just* stable, but only needs the slightest nudge to set it off.

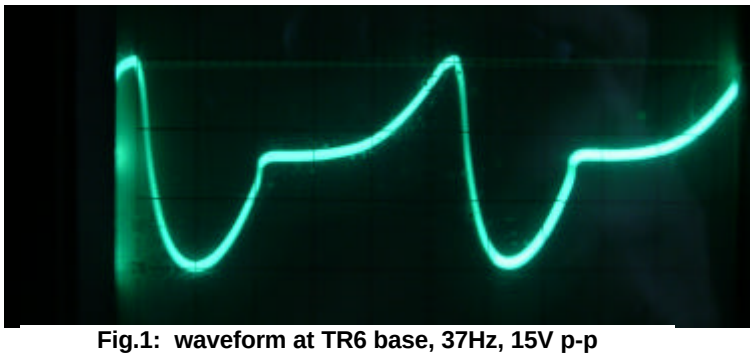


Fig.1: waveform at TR6 base, 37Hz, 15V p-p

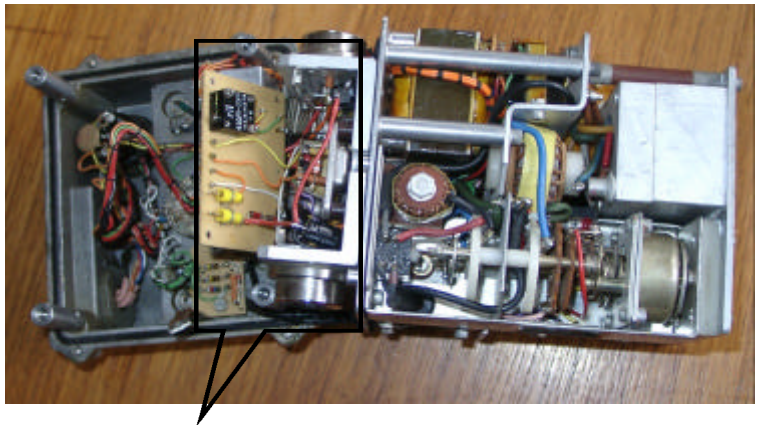
Further experimenting with the decoupling showed that a 220uF capacitor (at 25V working voltage) was insufficient, but 470uF was OK. You may well ask what is causing this oscillation? As I said in my opening words, finding the exact cause of instability can be very difficult indeed – professional engineers rarely bother to do so, being satisfied if a reliable solution is found. The A14HP modulator is a complex system – part of the audio amplifier is in the set, with the high power audio stages in the amplifier box. What I suspect is happening is that the supply impedance, which includes many switch, connector and relay contacts, has increased over the years, and this is the critical factor that has led to instability. The design team probably never saw the problem because everything they worked with was brand new! Rather than attempt to prove this by cleaning every contact, I think

the capacitor decoupling solution is better, since it will not depend on contacts remaining clean (which they won't!).

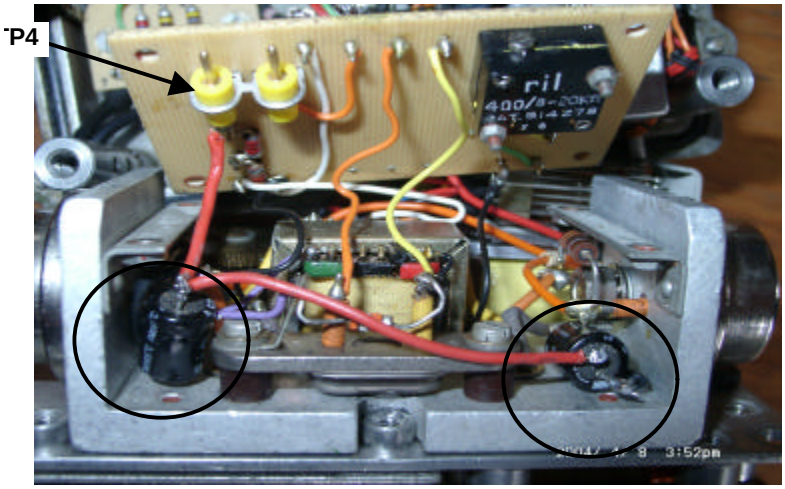
Fixing it

Unfortunately, there is nowhere to fit a typical 470uF 25V capacitor in the very confined space available in the amplifier, so I used two 220uF 25V capacitors in parallel. You do not need to have higher voltage capacitors, since the maximum voltage on the modulator is 24 volts. This solution appears to have no unfortunate side-effects, and I recommend it to other users of this set.

This picture (left) shows the A14 amplifier after being taken apart to allow fitting of the two capacitors., within the modulator assembly. You might manage the job without this level of disassembly, but that's up to you!



Modulator assembly



The front panel assembly is removed from the rest – take great care with relay RLA, as its contacts are unprotected and easily bent.

The picture on the right shows the two 220uF capacitors (ringed) being crammed into two tiny bits of spare space, inside the modulator. They are connected in parallel, negative to chassis (collectors of VT2 And VT3) and positive to the supply rail at TP4.