

RESTORATION OF A T1509 TRANSMITTER *Richard Hankins G7RVI*

The T1509 is a RAF transmitter, dating from the mid to late 1940s. And it is large – very large – by the standards of most us, who collect man-pack or vehicle sets. Stuart McKinnon was lucky enough to acquire one of these beasts earlier this year, and he was of course eager to try it on the air as soon as he got it home (quite an undertaking in itself, when you recall it weighs some 8cwt!).

Unfortunately, the results were disappointing. Sure enough, an enormous carrier was present OK, but the modulation quality was abysmal, and modulation level very low. Listening to it on the 80m net, the best report I could give Stuart was R1-2, S9+++ ! The modulation was so awful that it really was impossible to make much sense of what he was saying, despite a wonderfully quiet background.

Stuart tried all the adjustments, new microphones and so on, but although changes were evident, no real improvement was achieved. Finally, a technical “hit squad” was assembled (Mike, G1EDP, Tony, G3YNT & myself) to visit Stuart and sort the beast. We went armed with scopes, mod meters, dummy loads and spare components, not knowing quite what to expect.

When you first see a T1509, you get a shock – particularly when it’s situated in someone’s living room! It really is enormous! I’m not sure what negotiations Stuart had to undertake with his wife, Anne, to persuade her to give it house room – all I can say is, he must be better at it than most of us!

The hit squad – having played with all the knobs, drunk lots of Anne’s tea/coffee, and admired the innards of the T1509 – finally got to work. We homed in quickly on the speech amplifier system as being the most likely culprit. Fortunately, this item is on a separate sub-chassis that can be easily removed from the main rack. Suspect resistors were soon spotted, found to be out of tolerance and changed. We thought we must have the cure once we found a cathode bypass electrolytic fitted in reverse polarity – but on testing, the distortion was as grim as ever! We soldiered on all day, until scratching our heads at 5pm, I volunteered to take the speech amp home, and get it on the bench for some rigorous testing.

On rigging it all up in a test bed, I found that that the amp would produce only about 10mW of output into a 1k Ω load (which is what the 813 modulator valves have across their grids, and they are in class AB1, so take no grid current). Strangely enough, its quality was reasonable, showing none of the distortion evident on Stuart’s radiated signal.

Once I had tested all the valves, and checked all the DC voltages, and waveforms at every stage, and found nothing amiss, I had to admit to being pretty well stumped. At this point, the experienced say to themselves: “This circuit has worked at some time in its past – its either still got a hidden fault somewhere, or its not actually built to the circuit as published”. It can be hard to believe that when you think you have tried everything – and some things several times over!

I then thought about the origins of this particular T1509 – an ATC squadron, with lots of young cadets, who would just love to poke about in the guts and try fix things. “Perhaps”, I thought, “some spotty teenager has been at this gear and done some re-arranging?” Suffice to say, once started on this approach I quickly began to spot some interesting things.

Firstly, I found the audio input transformer had been miswired. The secondary has two outputs, as shown in Fig.2, one to feed the audio chain, and the other to a local telephone handset to allow the remote and local operators to talk to each other. These had been swapped over, so that the telephone tap (with the much lower audio output) had been wrongly connected to the pre-amp input. I corrected this, and suddenly I had masses of output, 7 watts in fact, and my two dummy loads started to smoke!

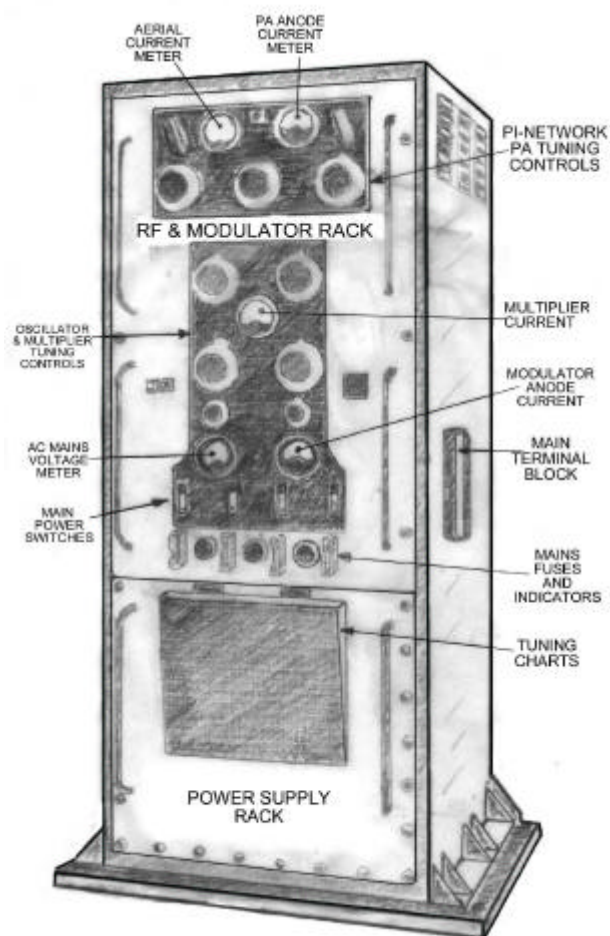


FIG.1 SKETCH OF T1509 Tx

It was not, however, a steady 7 watts: it would suddenly drop back on a random basis. This turned out to be dicky relay contacts, again in the audio feed, as shown in Fig.2. Listening to the output, I then noticed a strange, regular “breathing effect” superimposed on the audio. A scope showed that the supposedly decoupled HT supply to the pre-amp and amplifier stages was cycling up and down, at about 0.5Hz, in sympathy with the breathing. I decoupled this supply and it stopped. I then found the real decoupling cap, which proclaimed itself as a 2µF paper job, measured only 0.01µF!

By now, I had 7 watts of pretty good quality audio. Stuart agreed when he came to collect the amp. He rushed home with it, to try it out. The mod level was now improved – but the quality? Well, it had improved from abysmal to mediocre!

So the head scratching continued. I figured it had to be more miswiring – but it could not be in the modulator stage, since we had previously checked it all. Somehow, it had to be in the speech amp, in such a way that it would not show up on the bench. The clue lay in the connection from the speech amp output to the two 813 grids: there are completely separate audio feeds to allow each valve to be separately biased. If one of these had incorrect phasing, we would have a push-push stage, instead of push-pull, and the output would be.....well, pretty distorted!

Sure enough, the next visit to Stuart’s showed that our over-keen, Mr fix-it friends had again done their mischief! Swopping two wires, finally gave the magic cure! The results can be heard most Saturdays on the 80m net – and Stuart is now often complimented on the quality of his audio!

Data file for T1509

- Frequency range: 1.5 – 20 Mc/s (Xtal operation limited to 2Mc/s at low end)
- Service types: CW, MCW, R/T (AM)
- RF power output: 300 watts carrier for all service types
- Power input: AC mains, 180 to 250 volts, 50 Hz
- Size: H = 4’ 11”, W= 2’ 5”, D = 1’ 10¹/₂”
- Weight: 800 lbs
- Remote Control: Type 310. (About the size of a R109!). It has a number of valves, all running off a 24 volts HT rail, so that powering from batteries would be easy.
- Special facilities: High speed keying, Remote control by a single cable pair from a Type 310 Control Unit (distance is only limited by a maximum cable resistance of 1,000 ohms).

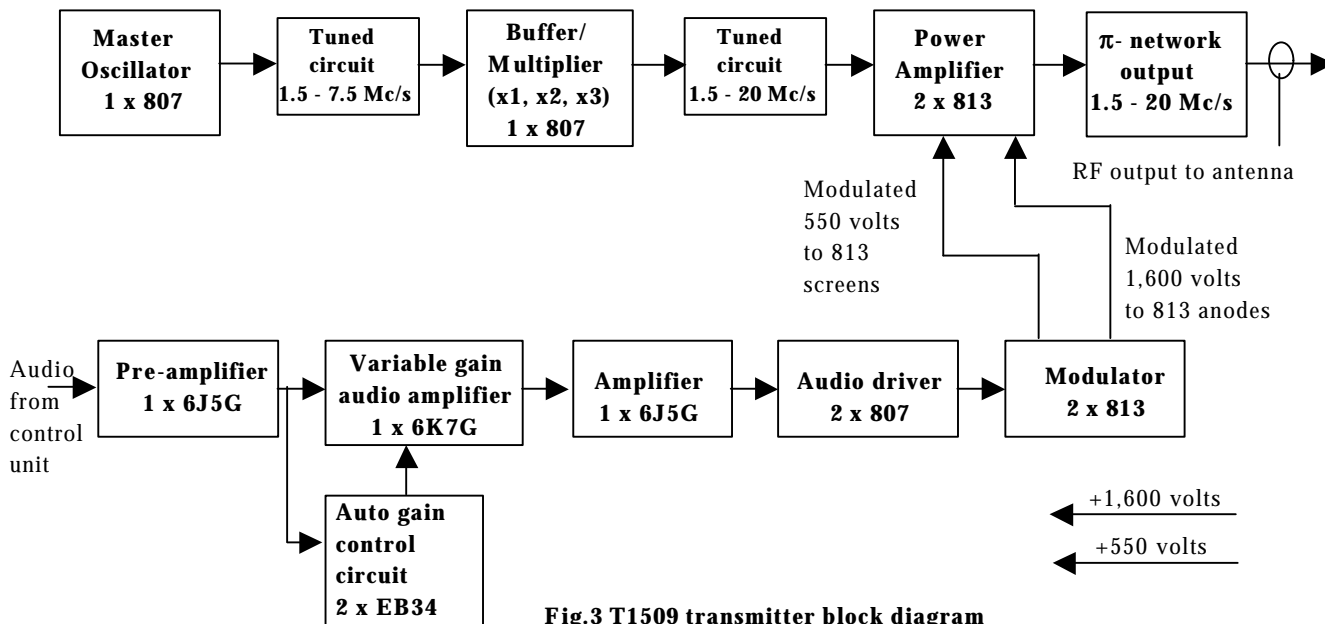


Fig.3 T1509 transmitter block diagram

This article is Copyright © Richard Hankins G7RVI and may not be reproduced elsewhere without permission of the author.