RESTORING A HOMEBREW TRANSMITTER

By Colin J. Guy G4DDI

I first came across this transmitter at one of the well known(!) junk auctions held at Spilsby, Lincs. many years ago. There was this pile of chassis and components in a box, which attracted no bidders and, as is the usual way with such things, it was piled in with the next lot, which I wanted, and knocked down to me for something ridiculous like 20p or so.

After a cursory glance, these chassis remained in my garage for several years. I didn't have the heart to dispose of them: there were several meters, transformers etc. on them, which, as always, I told the XYL "might come in useful one day". My real love of amateur radio is homebrew, and AM, and after I joined VMARS and discovered that AM is still used on HF, I remembered about this gear, and dug it out for a closer look.

The completed Tx with the Audio Unit on the left and RF unit on the right

What have we got then?

The main RF unit consisted of an AC power supply with a Parmeko mains transformer, a 5R4 rectifier, 3x 4uF paper condensers, a hefty Parmeko choke, and a PA stage consisting of three 807's. Added on the back of this was a crystal oscillator using a metal 6V6, and a driver using a 6L6. The latter had a tuned anode, the tuning control being a broadcast Rx type tuner. The PA coil was also obviously not original, being wound on a piece of plastic drainpipe, and the driver coil had been crudely modified at some time too. It was also obvious that the PA had originally consisted of just two 807's, the third being added at a later date. Adding the fact that there was a 963 kc/s crystal fitted, it was pretty certain that the Tx had seen service on the MW band. In fact, tuning it up on this frequency produced some 75 watts of RF (into a dummy load!!)

Top view of RF unit

The second chassis contained a modulator with its own AC supply, with a Gardner's mains transformer, a TV set type choke (there is a hole in the chassis where a choke to match the mains transformer could have been fitted) and some more 4uF paper caps. A pair of 6L6G valves drive a modulation transformer of American origin, and are in turn driven by two 6SN7's, the first as a microphone amplifier, and the second as a phase splitter. The third chassis consisted of several octal and B5 valve holders and a long switch assembly. This would originally have been a frequency multiplier using the Labgear wideband couplers.

At first I thought that this was a marine type transmitter, but I soon came to the conclusion that it had in fact been a very good homebrew, but it had been hacked about a lot in the intervening years. Incidentally, there was not an electrolytic capacitor anywhere on the chassis.

RF – and no smoke!

After some initial insulation tests, I powered up the RF unit, and was very soon rewarded with some 75 watts of RF. Now, to get onto the

Rear view of RF unit before restoration

amateur bands. To start with, I set it up on topband, using a 1,980 kc/s crystal. I had to remove the obviously added turns on the driver anode coil; the tuning range was then such that it covered 1.6 to 4 Mc/s, nice for topband and 80. Again I was rewarded with a substantial amount of RF, and no sign of smoke, despite extensive testing.

And now the modulator

I now turned to the audio unit, which had a long lead attached, consisting of several lengths of twin-cored rubber mains lead, terminating in a 8 pin Jones plug. One pair carried mains voltage between the two units, another pair carried the audio from the mod transformer secondary and the third carried an earth connection between the two chassis, and a control wire for a 12 volt relay on the modulator. Due to the state of the insulation, I removed this lot, fitted a separate mains lead, and wired the rest up with modern PVC insulated cable.

The first stage of the microphone amplifier had been disconnected; the grid of the second stage was connected directly to a 5-pin DIN socket mounted on the front panel. There was an added ECL80 valve and a small output transformer, which was connected to a jack socket on the rear panel marked "speaker". This must have been added to act as a monitor amplifier in its MW application, and was promptly removed by me.

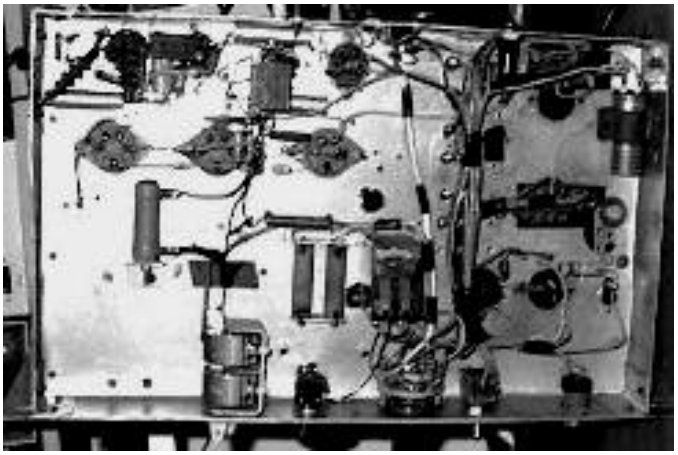
I reinstated the first stage of the mic amp, the DIN socket was handy as I use these for microphone connections anyway, and applied power. Keying the relay produced a full scale reading on the 150mA front panel meter, which I discovered was wired to read the output stage anode current. Investigating this, I found that there was a bias supply; this included a small selenium rectifier, which was of course kaputt. Replacing this with a (hush) silicon diode, enabled the standing current to be adjusted at will with the chassis mounted bias pot, to anywhere between zero and FSD on the meter. Tests with a scope and audio generator showed that a distortion free output could be produced with the standing current set to 25 mA.

Nice signal, but…!

Turning back to the transmitter, I found that maximum RF was produced when the PA current was around 200mA, which at 600 volts represents 120 watts DC input. I thought this a lot for two 6L6's to modulate, and this did prove to be the case, with only about 75% modulation being achieved before distortion started in the audio amplifier. Just as an idea, I removed the added 807: this reduced the PA current to 150 mA, and, to my surprise, made very little difference to the RF output. 100% modulation could now be just about achieved, so I tuned up on topband one Sunday morning before our local net came on air. This brought on G3TMA, who is our local high power expert, who reported that I was a considerably louder signal than usual with my normal 3 watts, but with nice sounding modulation. When I explained what I was doing I was reminded that we are only allowed 15dBW *[about 32 watts – Ed]* on topband. Gosh the things we forget - so the QSO was rapidly terminated, and thoughts turned to the 80m band.

Moving to 80m

I obtained a 3,625 kc/s crystal, the driver tuned up OK, but the PA didn't, so I removed the PA coil, which was substantially wound on a piece of plastic drainpipe, and made several tapings on it. These I wired to a ceramic switch, which fitted nicely into an existing hole in the front panel previously used for this purpose. I could now obtain some 60 watts of RF out, for around 150mA DC, representing an efficiency of 66%. Not bad. I fiddled around with the bias components in the modulator, and added a couple of electrolytic cathode bypass capacitors, and got things so that 100% modulation was



Bottom view of RF unit

achievable.

Initial calls into the Saturday morning net produced some reasonable reports, but conditions deteriorated so much during the morning that soon very little could be worked. So after that I pulled down much of the rig to set about making it look nice, and looked into making it keyable for CW operation.

The final touches

I sprayed the front panels (which were horribly corroded aluminium) with a "leaf green" car paint, which is quite a military looking colour, and labelled it up with some white Letraset I had kicking around. This made quite a presentable appearance.

After reassembling the Tx, I fitted a closed circuit jack socket in series with the driver cathode. I then realised that as there is no fixed bias on the PA, a high current is drawn during key-up. I was reminded that the solution to this was to use a clamp valve, so a quick look up in my bible (a 1968 edition of the *Radio Communications Handbook,* which I found at a car boot sale for 50p) to see how this worked. I then realised that the hole the extra 807 had occupied would have originally been for a clamp valve. All the necessary components were already there; all I had to do was fit an octal valve holder and connect it up. With a 6V6 in this position the Tx keys quite nicely, though I haven't yet tried for a CW QSO: I need to sharpen up my CW skills a bit, and I'm working on that.

I've fitted a multi-position switch to give AM/CW/netting facilities, and a relay to switch the HT supplies to allow PTT operation, and a 12 volt supply (more silicon diodes!) for the relays.

I soon had several AM QSO's in the early evening, when conditions seem to be much better, and the adrenalin was flowing. I felt again the thrill of making a contact with relatively crude homebrew gear, something I've not experienced for a long time now. I've (re)learnt a lot too, and I've made a steel case to house the units and make them a permanent part of my shack.

The whole exercise has been really worthwhile. I really do believe that those amateurs who only ever operate commercial "black box" gear with the mains plug already fitted, are missing out on something, and I hope that whoever originally built this gear, probably 40 or 50 years ago, and wherever he may be, knows it is still giving pleasure today.