25 WATT GU-50 AM TUBE SHORTWAVE TRANSMITTER

(PART 5 of 5)

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Table of Contents

Part 1

- Introduction
- Warning
- The case
- Initial design considerations
- First transmitter design
- Final transmitter design
- The transmitter circuit - RF stages
    - Figure #1 circuit diagram of the RF section of the transmitter

Part 2

- Mains distribution
- Control supplies and relay switching
    - Figure #2 circuit diagram of mains switching and distribution
    - Figure #3 circuit diagram of the control supplies and relay switching
    - Figure #4 circuit diagram of the power supply for the RF stages & mod
    - Figure #5 circuit diagram of the modulator
- RF HT power supply and modulator power supply
- Modulator unit

Part 3

- Construction of the transmitter
- Detailed construction
    - Figure #6 picture of power supply components
    - Figure #7 picture of the MOSFET amplifier
    - Figure #8 picture of the rear panel
    - Figure #9 picture of the underside of the RF deck
    - Figure #10 picture of the Top-side of the RF deck
    - Figure #11 picture of the FAT-MAX speech processor

Part 4

- Front panel
    - Figure #12 picture of the front panel
- Shoe-horning
    - Figure #13 picture of internal construction
- Cable forms
- Testing the transmitter
- FAT-MAX
- Boxing Day
- Your 43 meter band rig

Part 5

- Instant HT
- Hum-free with residue
- Possible solutions
- New approach
    - Figure #14 picture of reed switch
    - Figure #15 circuit diagram of the voltage doubler
    - Figure #16 picture of the voltage doubler
    - Figure #17 picture of the arial changeover relay
- Ratings

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- Part 1: Click here to download PDF
- Part 2: Click here to download PDF
- Part 3: Click here to download PDF
- Part 4: Click here to download PDF
- Part 5: Click here to download PDF
- Part 1-5: Click here to download ZIP

Instant HT

Modern components and techniques were used resulting in a FCC-compliant transmitter with respect to power output and transmitted modulated RF bandwidth. I used a solid-state rectification in the HV and LV DC power supplies with modern, compact, high-value electrolytic capacitors typically 110 µF at 770 VW (made up of two 220 µF, 385 VW components in series) on both sides of a HT smoothing choke; this ensured a hum-free supply rail. However, this arrangement generated another problem which will be explained in this paper.

Hum-free but with residue…

The PTT sequence switching for the power supplies was by 12 V DC relays with 10 A contacts, eminently suitable for interrupting AC mains and low voltage DC but not for HV DC use due to internal sparking; consequently none of the relays were used for switching the HV supply. It was noted that in use, on changeover from transmit to receive, an 'RF tail' of fading-to-zero plain carrier was evident over the received audio from the on- coming station. This was caused by the two 110 µF capacitor banks discharging slowly and keeping the 12BY7A crystal oscillator stage running for up to 4 to 5 seconds.

Possible solutions

I envisaged at least two solutions to the problem though one such solution was not possible in this case. It was recommended that VFO control not be encouraged for AM operation on 6925 kHz due to the tight constraints of absolute stability on nominated spot frequencies. Had a VFO been employed, then a voltage could have been switched across, say, a varicap diode connected across the frequency determining components in the oscillator when the PTT switch was released, shifting the VFO frequency away from the operating channel. With crystal control this approach is not as easy to effect as the operating frequency would only be moved by a kHz or so. The other option is to disconnect the DC supply rail between the PSU output section and the rest of the circuit. Suitable HV relays are not easy to source and, for this reason, I accepted the inconvenience of missing a few words after changing over to receive.

New approach

Figure 14. Reed switch used to switch the HV supply

As is often the case, components collected over the years and bought at rallies can sometimes be found a use when least expected. I had acquired a supply of HV-rated reed relays, these were of substantial construction as illustrated in **Figure 14**. A glass tube containing the normally open reed switch with a filling of an inert gas is partially encapsulated by a potted epoxy moulding. Two insulated lead-out wires are used for coil control and the glass phial has gold-plated spills for the HV connection. The unit is mounted by means of a single tapped 4BA hole in the epoxy base. It appeared that the reed coil was designed for 18–24 V operation and, of course, with all the control supplies in the transmitter being 12 VDC, there was a problem with operating these relays. However, a voltage doubler circuit (**Figure 15**) driven from the 12 VAC heater supply produced c. 19 V on load. The circuit comprises the voltage doubler, the Meder relay RA1 and a small 12 VDC pilot relay, RA2, which connects across the coil of the antenna changeover relay. I fabricated a small printed circuit board to hold all the components.

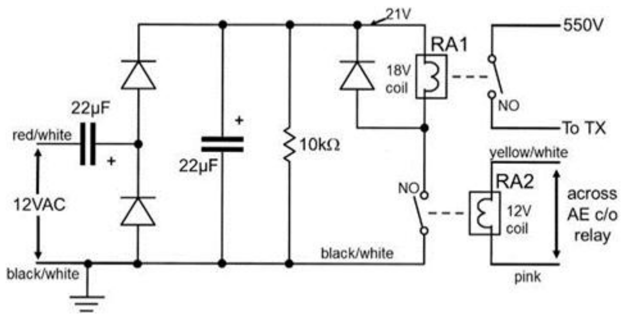

Figure 15. Voltage doubler circuit and switching arrangement. RA1 is an HV reed relay with 18 V coil and RA2 is OMRON GD6-ASI series with 12 V coil. The diodes are 1N4004 or better

There was no room for an additional printed circuit board so a small tagstrip (**Figures 15 and 16**) was used for the doubler components with the reed relay RA1 being in one position and the pilot relay RA2 in another. On test, the doubler voltage was 24 VDC off-load. 100 µF 50 V electrolytic capacitors were used in the doubler rather than 22 µF 63 V components.

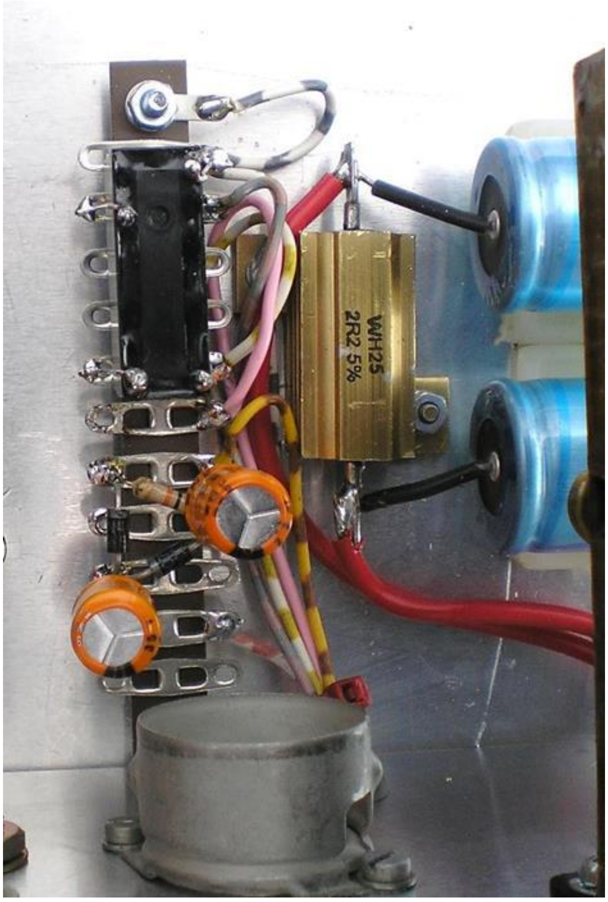

Figure 16. The voltage doubler tagstrip in the transmitter

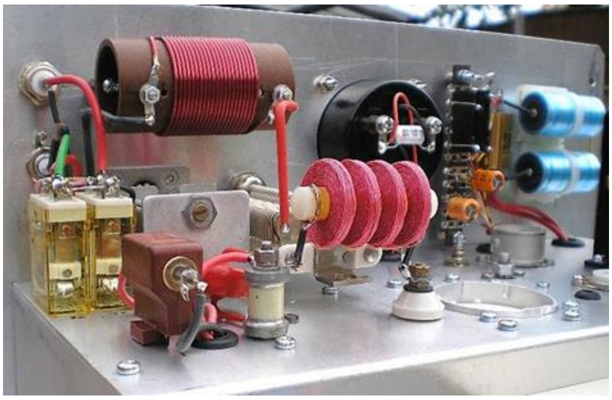
Figure 17. The aerial changeover relay (left) with the reed relay in front, and the voltage doubler tagstrip (right)

Ratings

Concerns were raised that the reed switch may have been of insufficient power capacity to support the DC requirements with specified power ratings to 50 W. However, the ranges of reed switches marketed by Meder have voltage switching capabilities of up to several kV and some up to a current of 3 A and hence the actual rating of the relay in question is not clear. So far the transmitter has not shown has shown any problems with a reliable switch-over and only time will tell if the Meder component is fit-for-purpose.

End of part 5

END