STATION QRP
TUBE SHORTWAVE TRANSMITTERS

25 WATT GU-50 AM TUBE SHORTWAVE TRANSMITTER

(PART 2 of 5)

IMPORTANT: *The published circuit diagrams of Station QRP are for educational purposes only. These are offered for the furtherance of the readers' knowledge regarding Radio Frequency design and principles. At all times during operation an assembled unit must be connected to a dummy load. In most countries law prohibits the unlicensed operation of transmitters when connected to an antenna or even to have such equipment present in a fully or partially installed state. All responsibilities for the ultimate use of the diagrams are borne solely by the builder and/or operator.*

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Mains distribution

The circuit diagram of the mains switching and distribution arrangement is shown in **Figure 2**.
Mains passes via a fuse and an illuminated on/off switch to the heater transformer. My transformer actually is rated at 50 VA with two separate 12 VAC windings; the first supplies the heaters (one side earthed) and the second, a bridge rectifier, smoothing capacitor and a 7812 series regulator producing a 12 V bus rail. A 'Uni-Timer' module detects the presence of 12 VDC and times up to 40 seconds to allow the tube cathodes to heat up before closing a relay to permit other supplies to be switched. A neon lamp indicates when the delay is cleared. The delay relay is a Japanese IDEC type RHIB-U 12 VDC and is currently available as a box of ten for $3 a box.

Control supplies and relay switching

Control supplies and relay switching The circuit diagram of the control supplies and relay switching is shown in **Figure 3**.

Four 12 V relays are used for transmitter control; two are mounted next to the output of the π-network and the SO-239 antenna socket adjacent to the receiver BNC socket. In the de-energised, NC condition, the antenna feed is passed straight through to the receiver. In the transmit, energised, condition, the output of the π- network is connected to the antenna and the receiver input is earthed. Both these relays are controlled by a front panel-mounted 'function switch' which is a three way, four pole break-before-make unit. Only three of the four poles are used; F1 and F2 control the relays and F3 provides switching to indicate 'standby', 'tune' and 'PTT' by LEDs on the front panel.

When in 'standby' mode, the transmitter is powered to heaters awaiting HT, with the antenna connected straight through to the receiver. When set to 'tune', F1 closes to energise the transmit and receive antenna change over relays and also closes the 'RF HT on' relay, which permits tune-up of the transmitter while radiating plain carrier with no modulation, as the BY133 diode prevents the modulator mains supply relay from operating. Switching from 'tune' through 'standby' to 'PTT' allows the microphone PTT switch to be executive and operation closes all the relays resulting in full transmit condition with modulation.

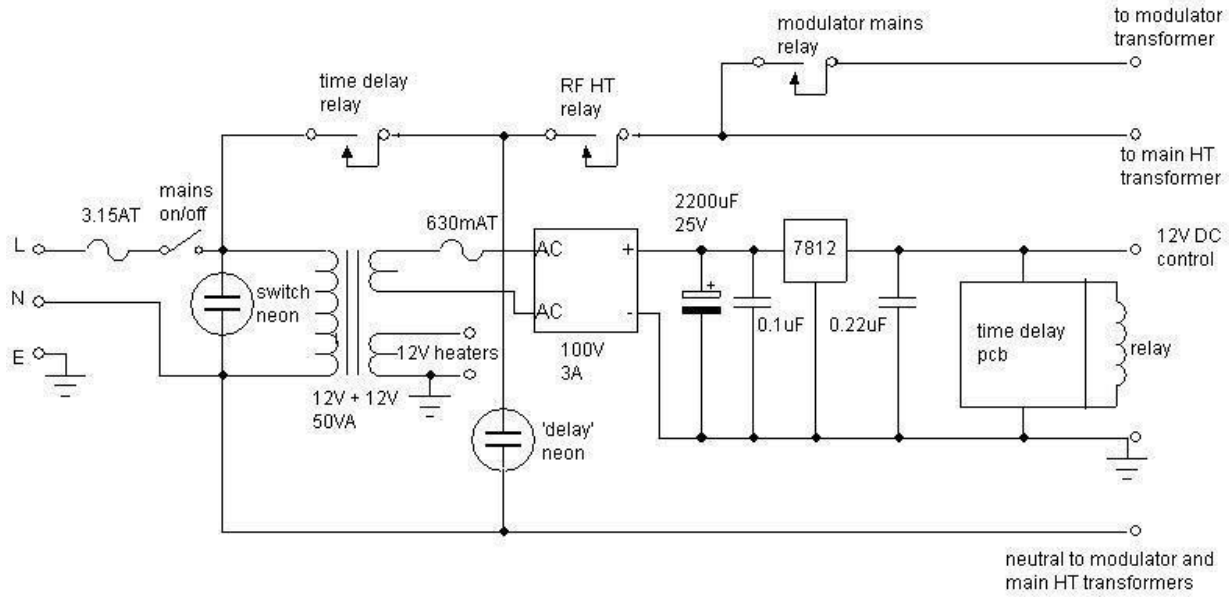

Figure 2. Circuit diagram of mains switching and distribution

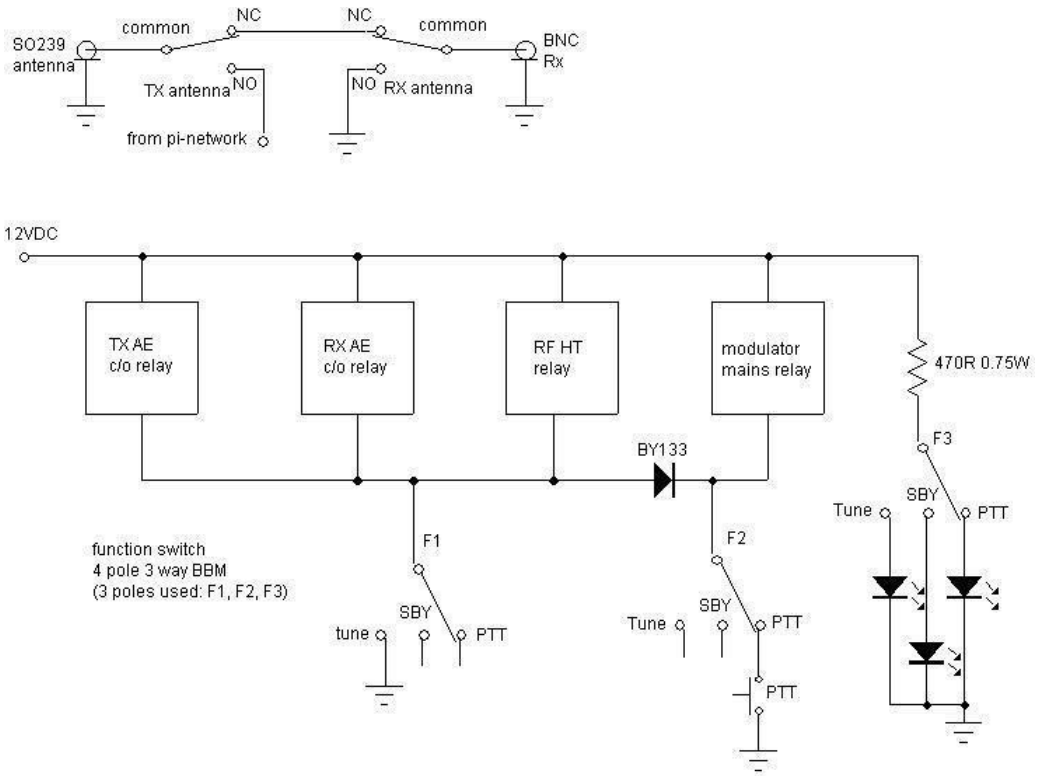

Figure 3. Circuit diagram of the control supplies and relay switching

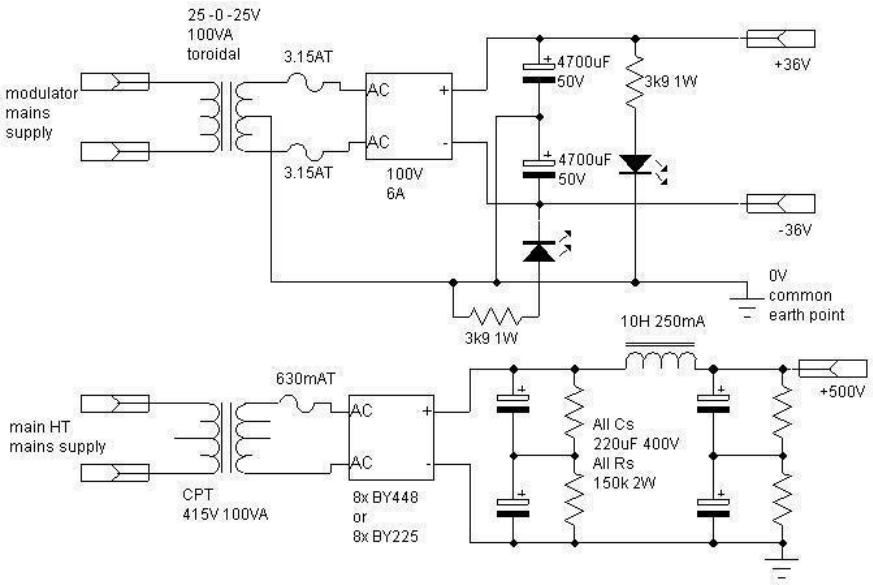

Figure 4. Circuit diagram of the power supply for the RF stages and modulator

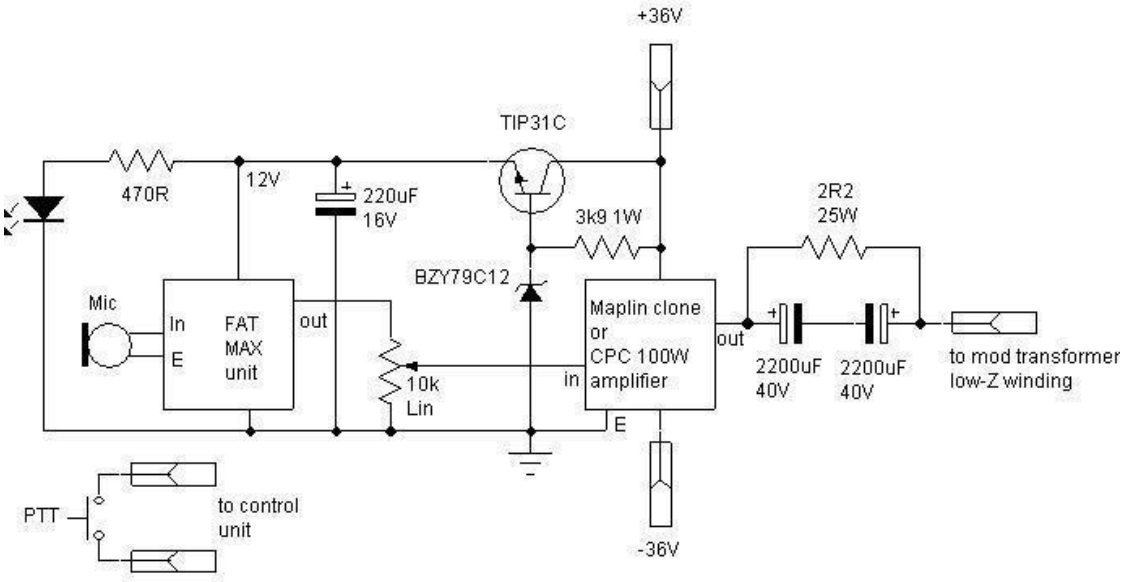

Figure 5. Circuit diagram of the modulator

RF HT power supply and modulator power supply

The circuit diagram of the power supply for the RF stages and the modulator is shown in Figure 4. A CPT rated at 100 VA supplies 415 VAC via a 20 mm 630 mA anti-surge fuse to a bridge rectifier consisting of eight BY448 diodes. Smoothing by a π-filter consisting of 110 µF, 10 H and 110 µF ensures a ripple-free supply of 500 VDC.

Modulator unit

For the modulator, a 100 VA toroidal transformer delivers 25+25 VAC to a 100 V, 6 A bridge rectifier, the outputs of which are connected to a pair of 4700 µF 50 VW electrolytics. An earthing centre point is provided between the two capacitors and all the 0 V connections on the modulator are made to that point. Thus, two rails of ±36 V are generated and monitored by LEDs with series-connected 3.9 kΩ, 1 W resistors. The circuit diagram of the modulator is shown in **Figure 5**.

A series pass NPN transistor, TIP31C, is zener-regulated to 12 V on the base and 11.3 V is available for the 'FAT- MAX'. An LED is provided to show that the supply is present.

Processor output is via a 10 kΩ linear-taper potentiometer 'mod gain' and the signal passes into the Maplin 'clone' MOSFET power amplifier.

Transformers fed with high-power audio at low impedance do not behave in the same way as 'mainly resistive' loudspeakers and, for this reason, a buffer network to protect the amplifier against unpredictable inductive loads is essential. This network comprises two back-to-back 2200 µF, 40 VW electrolytics and a 25 W panel-mounted 2.2 Ω resistor.

End of part 2