A Multi Band Tube 10- Wtt QSK Transceiver

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In the SPRAT # 67 (SPRAT is the journal of the G-QRP- Club) was published a circuit of a tube DC receiver. I made this G0ILL receiver and enjoyed of it perfect reception. Later I modified the receiver to transceiver. It was tried several versions of the transceiver. The final one was made on a PCB-board 200 x 240- mm with plug- in inductors in old tube sockets. So, the transceiver was tested on all amateurs HF- Bands. The frequency stability was not good enough at 24 and 28- MHz but was good on the lower bands. **Figure 1** shows the schematic of the tube DC transceiver.

Circuit Details:

RX RF Amplifier made on V1. V4 is mixer. Audio Amplifier made on V7. Audio amplification is adjusted by R16. RF amplification is adjusted by R5.

VFO and Doubler made on V2. Circuit L3C3C2 is tuned on frequency twice below the used.

Circuit L6C7 is tuned on main frequency. V5 is driver, V6 is PA. Transceiver works at QSK mode, i.e. to turn the transceiver for TX just press key. Cathodes of the driver and PA are grounded, RL1 grounded RX antenna.

Table 1 International Alternatives for Russian tubes (thanks to G3FCK)

V	Russian	B7G	B9G	Int Octal
1	6Ж2П, 6Ж38П, 6Ж9П, 6Ж8	-	EF50, EF80	6F6, 6J7, 6AG6
2	6Ж2П, 6Ж38П, 6Ж9П, 6Ж8	6AU6, 6AK7, EF91	EF50,6BW6, EF80	6J7
3	СГ1П (150- V- Stab)	0A2	-	VR150/30
4	6Н2П, 6Н1П, 6Н15П, 6Н14П	6J6	12AX7,12AT7, 6BQ7A, 12AU7	6N7, 6AS7, 6SL7,6SN7
5	6Ж2П, 6Ж38П, 6Ж9П, 6Ж8	All as for V2		
6	6П15П, 6П9	6AQ5	6CL6, 6BW6, 5763, EL84	6F6, 6AG8, 6V6, 6L6
7	6Н1П, 6Н2П	All as for V4		

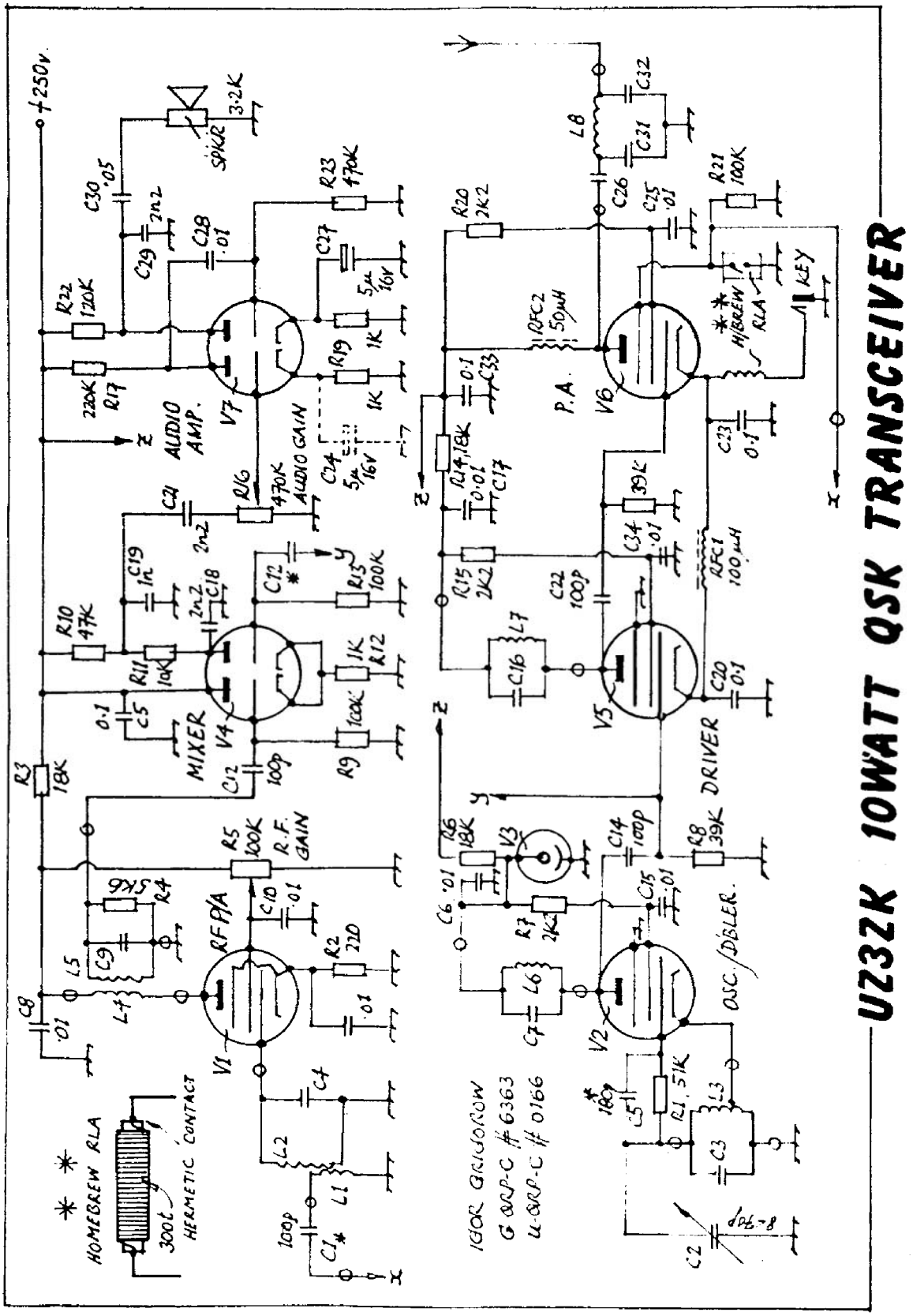

Figure 1 Tube DC transceiver

Tuning and Adjustment

Transceiver made from right parts should work straight away. You need only to tune (by GDO or RF- Voltmeter) the plug-in inductors for the needed frequencies. At self-exciting of the RF-Amplifier at the any band vary the value of the R4 that is installed at plug- in inductor. C24 can adjust amplification of the audio amplifier. The audio amplifier works well only with high- ohmic headphones.

The transceiver has no special circuit for frequency shift at RX/TX mode. The shift occurs automatically because of a difference in parameters “cold” and “hot” V5.

In my case the shift was near 300- Hz at 160 and 80- meters and more the 1000 Hz at 10- meters. You may install the shift by playing with C7, C14 and C16.

***Note from I.G.:** At the old times, when the transceiver was made (80- 90s) I had a box with headphones. There were old headphones (from 1941- to 1980) from receivers and phone systems. The headphones were made in different countries- Russia, German, Britain and Poland and may be in some others. I tested the phones at first with a simple crystal (diode) receivers then with DC- receivers and choose most sensitivity ones. With such phones I could receive very weak stations that at less sensitivity headphones were not unheard. If you have box with high-ohmic head phones (or several samples anyway) try to find mostly sensitivity ones from them.*

Table 2 Data for Inductors

Band, MHz	1,8	3,5	7	10	14	18	21	24	28	Note
L3 *	-	-	28	18	15	15	15	14	11	1
	120/30	70/20	-	-	-	-	-	-	-	2
C3	1000	800	600	600	500	400	300	300	200	pF
L2 L5 L6 L7 *	-	-	25	19	15	14	11	10	10	1
	120/20	60/20	-	-	-	-	-	-	-	2
C4, C7 C9, C16	200	200	180	150	120	100	100	91	62	pF
L8 *	53/45	27/45	14/40	10/45	8/45	7/45	7/45	6/45	6/45	**
C31	150	150	120	120	100	100	80	50	30	pF
C32	2000	2000	1500	1200	1000	600	600	500	300	pF
C26	1500	1000	1000	1000	470	470	390	300	300	pF

Note 1. Inductors made on Russian resistors MLT-2 (value more the 100- kOhm), winding on all the length. **Figure 2** shows the resistor.

Note 2. Inductors made on Russian resistors WS- 2 (value more the 100- kOhm), winding on all the length. **Figure 3** shows the resistor.

* First column- numbers of turns, second – length in mm

** Diameter L8- 34- mm

L1 (numbers of coil near 30% from L2) is wound above L2. L4 (numbers of coil near 30% from L5) is wound above L5.

Parts

At the transceiver I used Russian tubes. **Table 1** shows their international alternatives (thanks to G3FCK)

Table 2 shows data for inductors. Values of capacitors C31 and C32 are real for specific impedance of your antenna. If you would like use several antennas with different impedances you need use plug- in inductor (L8C26C31C32) for each antenna (or use variable C31 and C32).

Design

Transceiver was made on a chassis with dimensions 200 x 240 x 40- mm made from two- sided copper plate PCB. Pattern of the parts at the chassis the same as the pattern at the **Figure 1**. Plug- in inductors was made on the base from old octal tubes. **Figure 4** shows the design. It is possible to add some modifications to the transceiver- milliampermeter for metering plate current at the V6 and install variable capacitors instead fixed C31 and C32. Dimensions of the transceiver would be increased but operation in the Air improved.

Beware: Turn off high voltage when change the plug- in inductors!

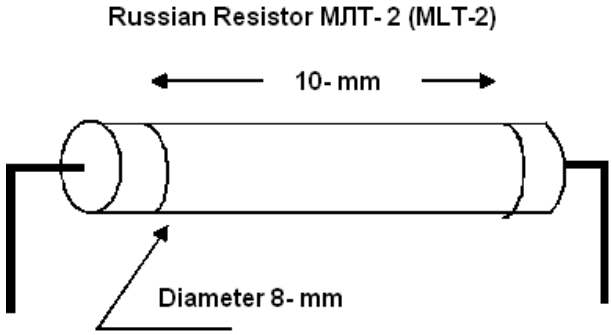

Figure 2 Russian Resistor MLT- 2

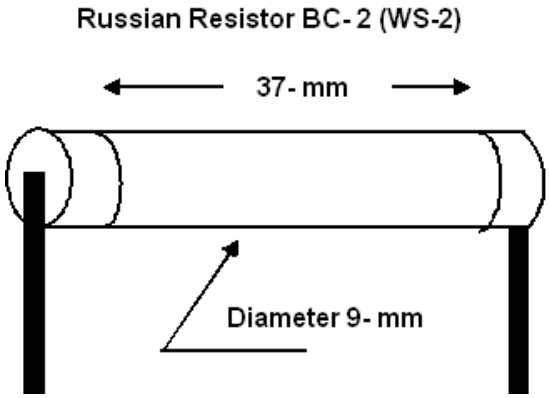

Figure 3 Russian Resistor WS- 2

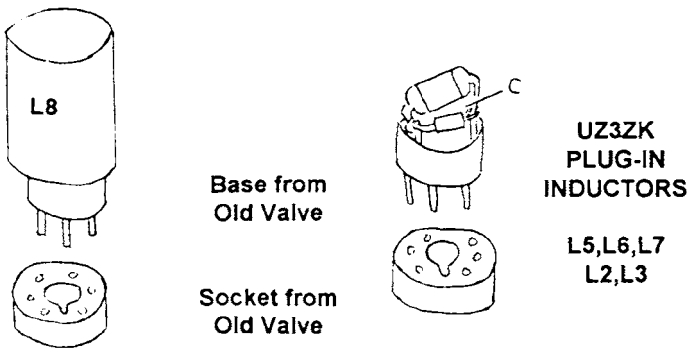

Figure 4 Design of the Plug- In Inductors