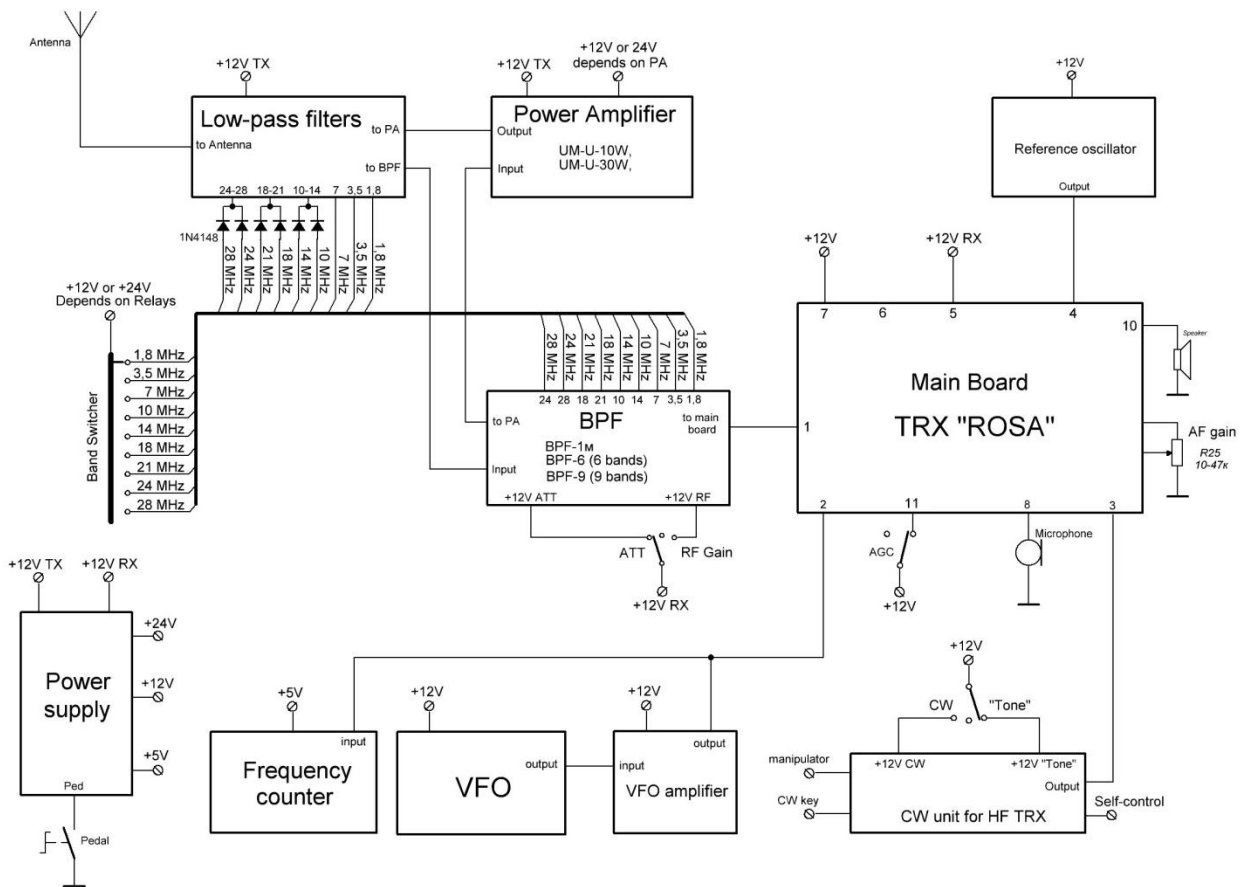


Amateur HF Transceiver "ROSA"

"Rosa" is Amateur HF Transceiver of single frequency conversion. It is designed to work in SSB and CW modes. The transceiver is very popular for beginners in ham radio because of its simplicity of design and a minimum of scarce parts. Long-term usage of the device has shown its high parameters, reliability and ease of adjustment. The transceiver performs the functions of receiver and transmitter, providing performance at the following Amateur HF bands: 1,9; 3,5; 7; 10, 14; 18, 21; 24, 28 MHz. Depending on the permissions of the station can be connected the different types of power amplifiers. In receive mode the transceiver has a sensitivity when the ratio of signal to noise ratio 10dB – not more than 0.5 mV. Bandwidth is determined by the quartz filter. In TX mode the power output in 75 Ohms is 10 or 30 watts. The transceiver may be a base when creating a VHF transceiver. The transceiver is designed according to the block principle.

Block Diagram TRX "ROSA" with analog VFO



Main Board of Transceiver "ROSA"

The Main board consists of the following blocks:

- The reversing amplifier (VT1)
- The reversible mixer (VD3-VD10)
- The matching reversing stage (VT2)
- The crystal quartz filter
- The reversing amplifier (VT3),
- Modulator-demodulator (VD15-VD18)
- The low-frequency amplifier of the receiver (VT4, DA1)
- The scheme of Automatic Gain Control (AGC) - (VT9,VT10)
- The microphone amplifier (VT7, VT8).

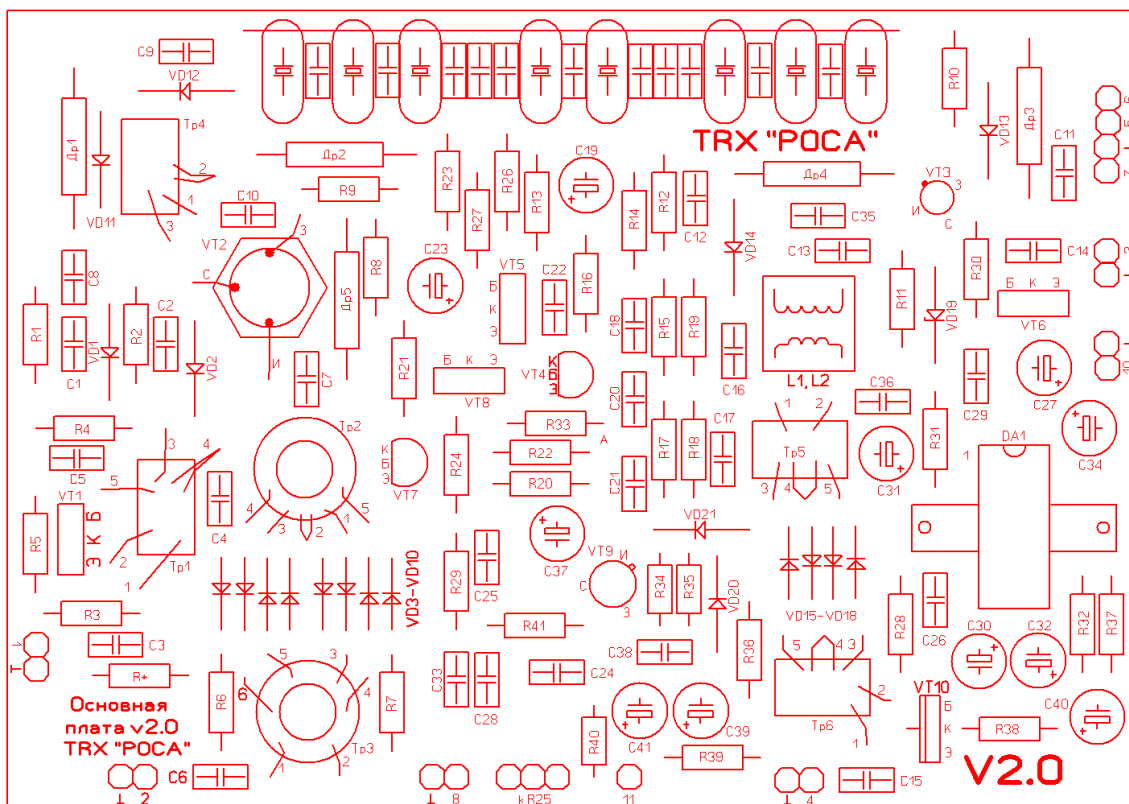
In RX mode, the voltage from the bandpass filter, amplified by a broadband amplifier VT1 and going to the primary winding of the transformer Tp2. When receiving the VT1 transistor works as amplifier with common-base. The signal converted by the mixer is sent to the matching stage of transistor VT2. It works in RX as amplifier with common-gate. The connectivity with quartz filter is supported by auto-transformer TP4.

The resonant reversing amplifier (VT3) works in RX as amplifier with common-gate. On Source of VT3 is set the resistor equal to the output resistance of the crystal quartz filter. The load of this amplifier is the modulator-demodulator of the balanced type, assembled on broadband transformers Tp5 and Tp6 and diodes VD15-VD18. This modem is energized with a quartz reference oscillator (QRO). The main gain of the signal is by the amplifier stages of low frequency. The first stage is performed on a low noise transistor VT4 (KT3102E) having a high gain. The power amplifier is DD1 (K174YH4). Stabilized power supply DC 9V is performed on the transistor VT6 (KT815). The VT5 transistor (KT815) is an electronic key, which is shunted a tract of the low-frequency amplifier of receiver in the TX mode. The AGC consists of a pre-amplifier AGC (transistor VT10 – KT315, the input of which is the signal output from the low-frequency amplifier of receiver), the AGC detector diodes VD20, VD21 and control element – transistor VT9 (KП302). The output of the AGC system (point "a") is connected to the emitter of the transistor VT4 (KT3102E).

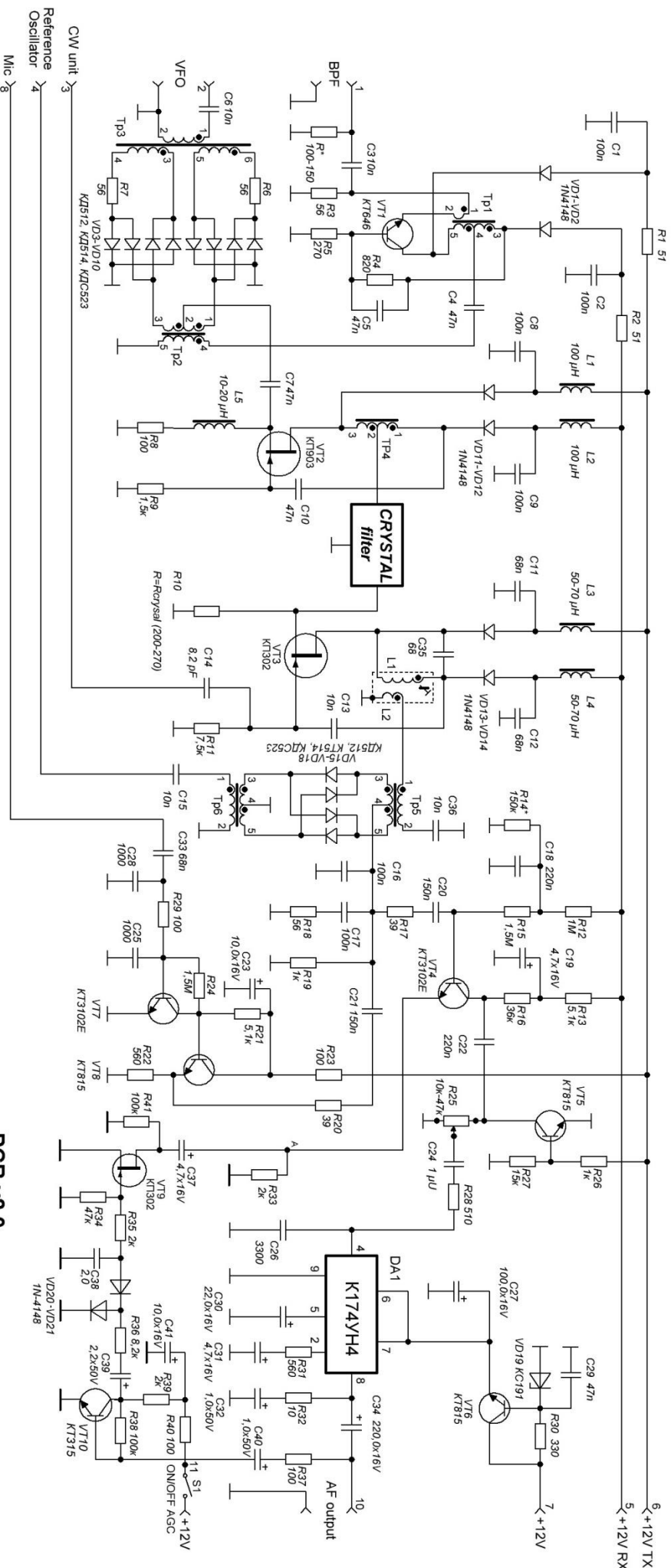
In TX mode, the power (+12V TX) is connected to a microphone amplifier and an electronic key; the supply (+12V RX) from the first cascade low-frequency amplifier of receiver is disabled. Reversible cascades are switched into source mode (VT2 and VT3) and the emitter (VT1) repeaters and operate as the power amplifiers. The useful signal, having passed all stages of the main processing and transformation, is going from bandpass filters.

Adjustment

The adjustment starts from the low frequency amplifier – Connect VT4 Emitter to ground. Set the voltage at the collector of VT4 close to 4-5V via selection R14. The quiescent current of DD1 (K174YH4) must be in the range of 10-15 mA. Mode of reversible tract of intermediate frequency amplifier for VT3 is set automatically. Its adjustment is setting the resonance to the frequency of the circuit L1. During that procedure, a quartz reference oscillator needs to be connected to the modulator-demodulator: Tp5, Tp6, VD15-VD18. High-frequency voltage of reference generator at the modem input should be equal to 0.9-1V. The working current of matching reversible cascade on the VT2 should be close to 20 mA – selecting via R8. The quiescent current of the transistor VT1 (KT646) under the above component values should be 30-35 mA. This cascade can be excited. This can happen in two cases. First, when the upset of the input bandpass filters, but most of the self-excitation occurs because of a mismatch in the output. In this case you need to adjust the resistor R4 (in the direction of increasing its value). Sometimes deliverance from self-excitation brings connection of resistor 100-150 Ohms to the output bus of the Board bandpass filters or the connect the resistor 5-7 Ohms in series with the winding (1,2) of the transformer TR1.



Main Board TRX "ROSA"



PCB V2.0

Data of inductance and transformers:

Tp1	2x7 turns	Ferrite coil 10x6x5	Wire 0,28-0,35mm	Two twisted wires; then 1 turn over the coil. pin 1,2
Tp2	3x7 turns	Ferrite coil 10x6x5	Wire 0,28-0,35mm	Three twisted wires
Tp3	3x5 turns	Ferrite coil 10x6x5	Wire 0,28-0,35mm	Three twisted wires
Tp4	2x7 turns	Ferrite coil 10x6x5	Wire 0,28-0,35mm	Two twisted wires
Tp5, Tp6	3x5 turns	Ferrite coil 10x6x5	Wire 0,28-0,35mm	Three twisted wires
L1	24 turns	Skeleton form 6mm	Wire 0.16mm	Turn to turn
L2	5-6 turns	Skeleton form 6mm	Wire 0.16mm	Winding over the L1.

Technical characteristics of crystal filters:

- Crystals 8,867238 MHz
- the Squaresness ratio in levels 6 and 60 dB – 1.5 – 1,7;
- Attenuation over a bandwidth < 80 dB;
- flatness in the passband is 1.5 - 2 dB;
- the bandwidth at a level 6 dB – $2.7 \pm 0,15$ KHz;
- Input and output resistance of 202 ± 10 Ohms.

