Simple SWL HF- VHF Receiver

From the book ***"DX Reception"*** (by Igor Grigorov (RK3ZK), Belgorod, 1994), pp.:76- 81.
(Article published with inessential cutting)
See ANTENTOP- 01- 2007, p.p.: 73- 74.

Using only 4 cheap surplus transistors and 1 mixer SBL- 1 you can do a HF- VHF receiver that provides good reception on HF (12- 29- MHz) and ex- Soviet BC FM VHF- 61- 88 MHz. Receiver catches AM and FM with deviation more the 25 kHz. Such receiver allows very quickly to find a propagation on the spectrum of HF and VHF bands.

The chart of the receiver is shown on **Figure 1**. Receiver includes balanced mixer (1), low-pass filter (2), high-pass filter (3), VFO that works at 16- 33 MHz (4), superregenerative detector aka IF amplifier on 45 MHz (6). Switched filters are formed a working band of the receiver (HF or VHF). The receiver has two struck points. First lays on 22. 5 MHz the second one is on 65.5 MHz. If you want to have reception on the frequencies just move the IF of the receiver (with help of C11) up or down.

Figure 1. Chart of the simple SWL receiver

Note: The figure is original scan from the "DX Reception" book. English commentary are given inside oval.

The simplicity of design of the receiver and its high sensitivity (just at connection of an antenna in 1 meter length the receiver provides satisfactory reception on the HF and VHF bands) is reached by a superregenerative detector. However the superregenerative detector gives basic lacks of the receiver – low selectivity and low dynamic range. There is no SSB reception. **Figure 2** shows the circuit diagram for low-pass (**Fig. 2a**) and high-pass (**Fig. 2b**) filters. The filters were made for 50 (75) input/ 50 (75) Ohms output, i.e., the filters require a 50 (75) Ohms antenna and mixer having 50 (75) Ohms input. SBL-1 is okey for that. However the receiver works well with an antenna having almost any input impedance. **Figure 3** shows the circuit diagram for the receiver. If you have no SBL- 1 you may do the mixer according to **Figure 3.**

Figure 2. Circuit diagram for low-pass (**Fig. 2a**) and high-pass (**Fig. 2b**) filters
(Values for all capacitors are given in picofarads)

Note: The figure is original scan from the "DX Reception" book. English commentary are given inside oval.

Figure 3. Circuit diagram for simple SWL receiver

Note: The figure is original scan from the "DX Reception" book. English commentary are given inside oval.

Table 1 shows data for inductors of the receiver and filters. All coils are wounded by insulated copper wire in diameter 1-mm (18 -AWG), all coils are air-wounded. The filters are assembled in a box (80X40X40- mm) soldered from two- sided PCB. The receiver is assembled in a box (155x 90x 55- mm), soldered from two- sided PCB. **Figure 4** shows component layout for the receiver. The components are sitting on the wiring strips from an old tube receiver. When the receiver will be tuned close the box, where the receiver is assembled, by a plate of a PCB. The plate should be soldered at several places to the box.

Figure 4 Components layout for simple SWL receiver

Design and Tuning

Low-pass and high-pass filter made strictly to **Table 1** and **Figure 4** does not require any tuning.

VFO made from good parts according to the schematic works straight away. Only the tuning is the set up of the frequencies range. Needed frequencies range do rough by the pressing- stretching of the L9, fine with the C2. Arrange L10 near L9 to maxima and equal across the band sensitivity.

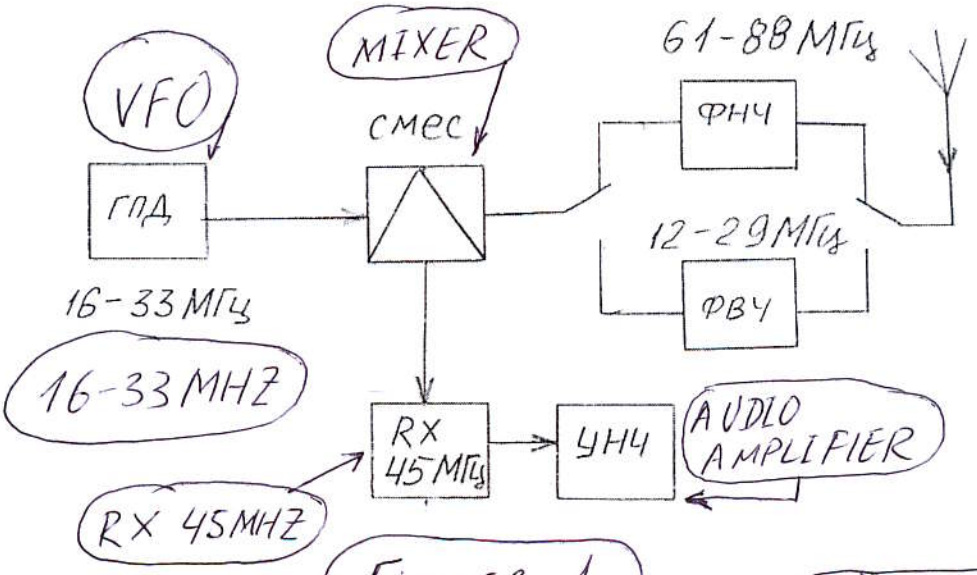

Figure 1

Рис 1

English commentary *

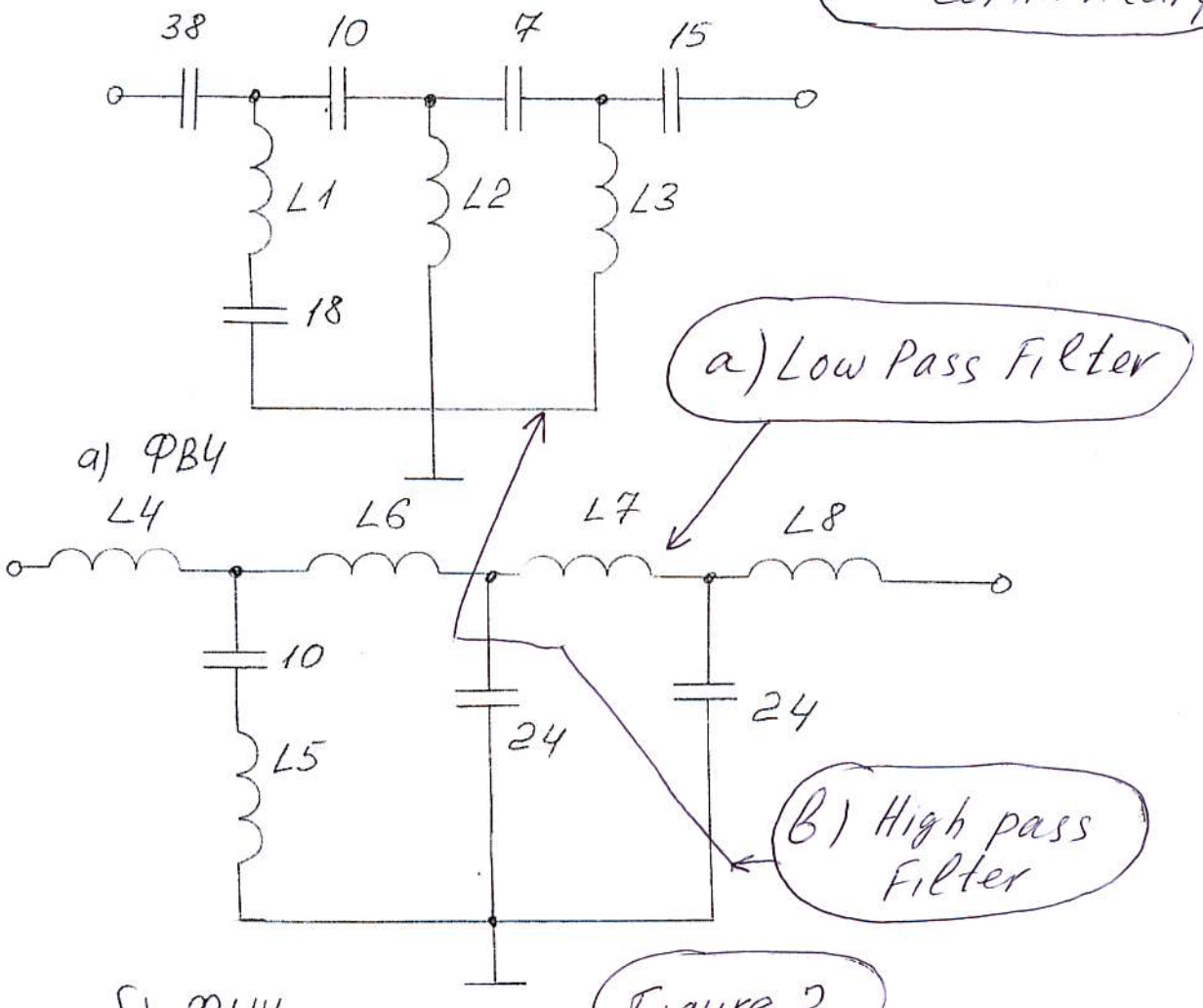

Figure 2

Рис 2

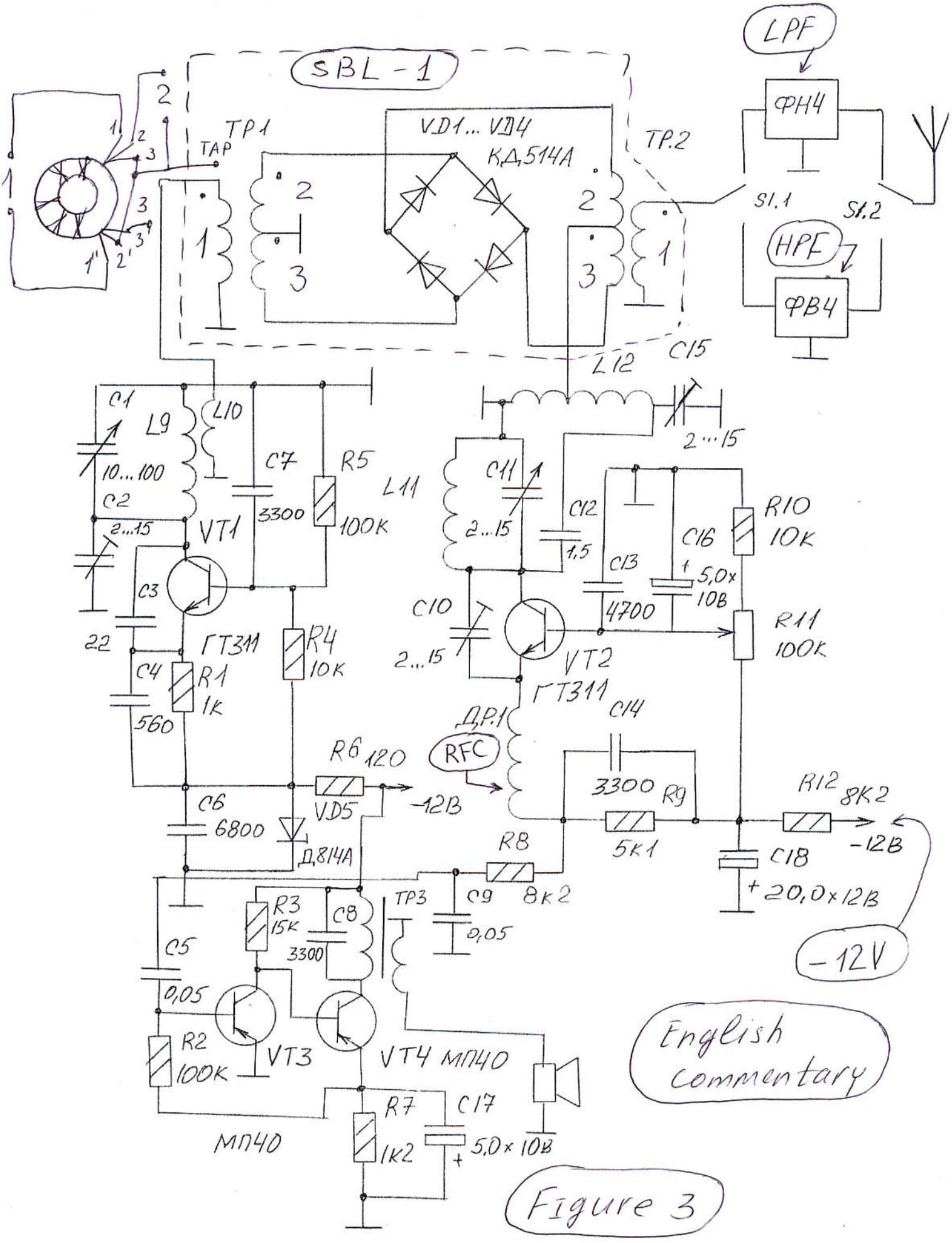
SBL-1
LPF
ФНЧ
TP1
TAP
TP2
VD1... VD4
КД514А
S1.1
S1.2
HPF
ФВЧ
L12
C15
2...15
C1
L9
L10
10...100
C7
3300
R5
100K
L11
C11
2...15
C12
1.5
C13
4700
C16
5,0x
10B
R10
10K
C2
2...15
VT1
C3
22
ГТ311
R4
10K
C10
2...15
VT2
ГТ311
R11
100K
C4
560
R1
1K
Д.Р.1
RFC
C14
3300
R6 120
-12B
VD5
C6
6800
Д814А
R9
5K1
R12
8K2
-12B
C18
+ 20,0x12B
R8
8K2
C9
0,05
TP3
R3
15K
C8
3300
C5
0,05
R2
100K
VT3
VT4 МП40
МП40
R7
1K2
C17
5,0x 10B
-12V
English commentary
Figure 3

Рис 2

English commentary *

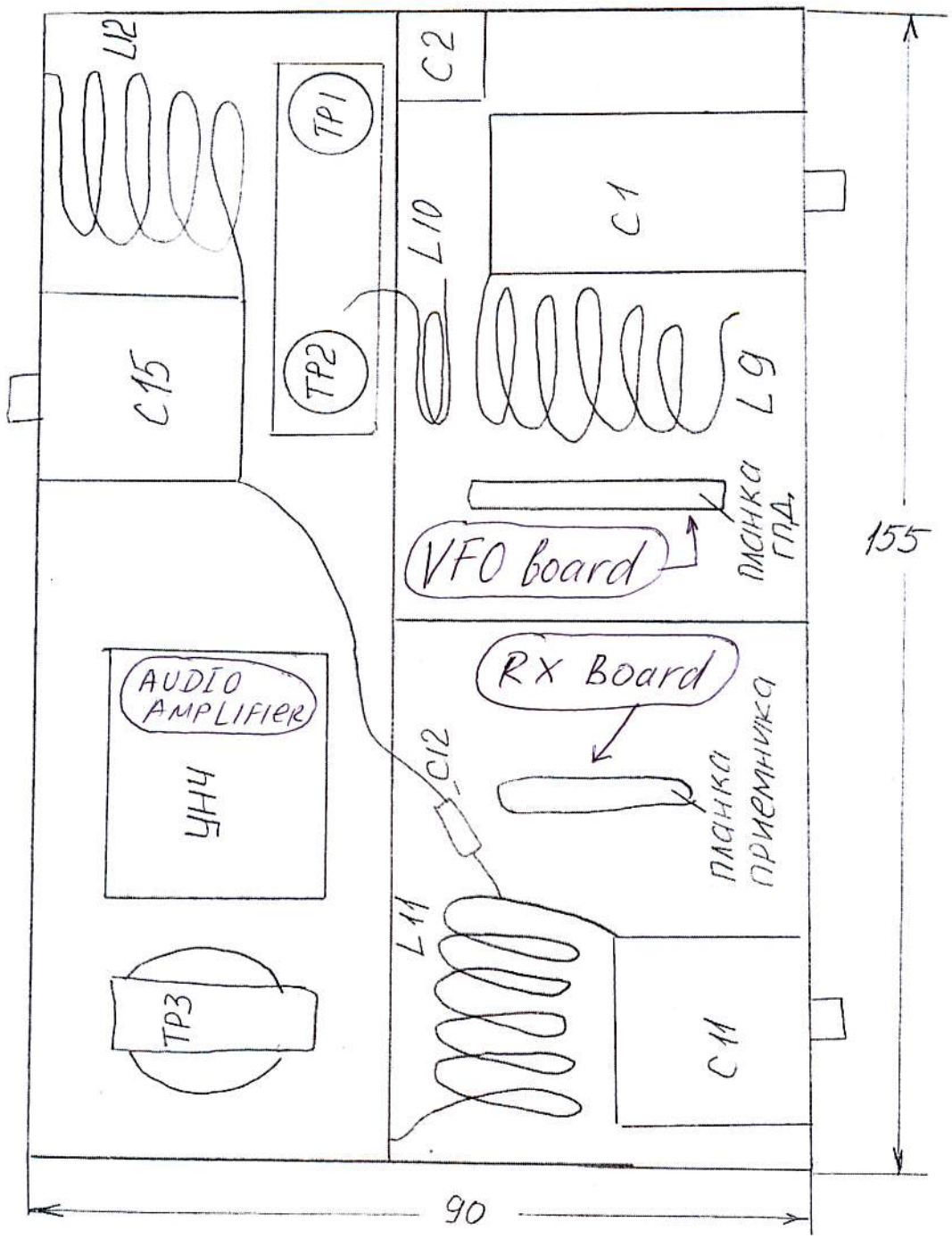

РИС. 4 Figure 4

Table 1. Data for inductors

# Inductor	Diameter of the Inductor, mm	Length of winding, mm	Quantity of Coils	Note
L1	14	10	8	Athwart to L2, L3
L2, L3	14	20	7	
L4	14	5	4	
L5	14	10	7	Athwart to L6, L7, L8
L6	14	20	11	
L7	14	20	14	
L8	14	10	6	
L9	18	25	7.5	
L10	18	4	2	Near “cold” end L9
L11, L12	18	14	8	Tap from 2 Turn from “cold” end

Superregenerative stage adjusted with R11 and C10. When superregenerative stage is working properly you hear specific noise in the speaker. Frequency of the stage (IF) set up with help of C11. After that do tuning L12C15 to maxima sensitivity of the receiver.

Audio Amplifier made from good parts according to the schematic works straight away. Almost any low power, low noise (better high- gain) transistors work well at the receiver. Transformer TP3 was used from an old transistor radio. Was used a 16 Ohms Speaker from an old transistor radio. It is possible (ever better) switch on a high- impedance head phone instead the TP3.

Parts List

Resistors:

R1: 1 k
R2 100 k
R3: 15 k
R4: 10 k
R5: 100 k
R6: 120 Ohm
R7: 1.2 k
R8: 8.2 k
R9: 5.1 k
R10: 10 k
R11: 100 k , potentiometer
R12: 8.2 k

R10: 10 k
R11: 100 k , potentiometer
R12: 8.2 k

K = multiply to 1000 Ohm
All resistors 0.125 W

Capacitors:

C1: Variable, air dielectric, 10- 100 pF
C2: Variable, air dielectric, 2- 15 pF
C3: 22 pF
C4: 560 pF
C5: 0.05 uF
C6: 6800 pF
C7: 3300 pF
C8: 3300 pF

C9: 0.05 uF
C10: Variable, air dielectric, 2- 15 pF
C11: Variable, air dielectric, 2- 15 pF
C12: 1.5 pF
C13: 4700 pF
C14: 3300 pF
C15: Variable, air dielectric, 2- 15 pF
C16: 5.0 uF/ 10V
C17: 5.0 uF/ 10V
C18: 20.0 uF/ 12V

Polarized capacitors are electrolytic

Diodes:

VD1… VD4: Any small low power RF Shottky diodes
VD5: Zener diode 9.0V/15 mA

Transformers:

TP1, TP2: Core: Amidon analog is T37- 10
10 turns by trifilar insulated wire OD 0.15 mm (34 AWG), winding to 1 cm length.
Uniformly onto the core.
So, primaly winding 1- 10 turns, secondary winding 2- 10 third winding 3- 10 turns.
● – winding phase

TP3: Audio transformer from an old transistor radio
Note: Diodes VD1- VD4 and transformers TP1 and TP2 may be changed to IC SBL-1.

Transistors:

VT1: Small power RF germanium transistor, gain 80-100, upper frequency 250 MHz
May be changed to silicon transistor with equal data.
VT2: Small power RF germanium transistor, gain 80-100, upper frequency 250 MHz
May be changed to silicon transistor with equal data.
VT3, VT4: Any high gain (100- 200) small power transistors

Switch:

S1: Any Toggle DPDT

RF Choke

RFC: OD: 3.5… 5 (not critical)mm
Length of winding: 15… 20 (not critical)mm
Coiled by insulated wire OD 0.15 mm (34 AWG)
Winding: Turn to turn, uniformly

73! I.G.

From forum QRP- ARCI (QRP- F- Forum)

Posted by: John AE5X,

Posted On: 07/15/07,

Subject: Russian woodpecker antenna

From UA0AAM here is the antenna used at one of the radar sites that we copy on the ham bands at times. I'd sure love to have this baby on 40m some winter evening. I wonder if it's rotatable...?