Sheet: VFO

File: vfo.sch

Sheet: BFO

File: bfo.sch

Sheet: Buttons

File: buttons.sch

Sheet: AF Amplifier

File: af-amplifier.sch

Sheet: CW Tone

File: cw-tone.sch

Sheet: AGC

File: agc.sch

Sheet: Filters

File: filters.sch

Sheet: Power Amplifier

File: power-amplifier.sch

+12V 13.8V nominal voltage
11.0V minimum voltage

C1
680u/25V

+12V

D2
1N5818

+12V

D1

D3

D4

S-meter backlight: 3 x white LED

R1
680

TIA stands for "Termination Insensitive Amplifier".
All TIAs here are 22 dB amplifiers. See http://w7zoi.net/bidirectional_matched_amplifier.pdf
or https://eax.me/files/2021/07/hbr-schematic.pdf for the exact schematic.

All mixers are 7 dBm double balanced diode ring mixers.
See https://eax.me/compact-diode-ring-mixer/ on how to build
one or simply use SBL-1, ADE-1, ADE-6, or similar.

+12V

R2
10K

RXTX_CTL

Q1
IRF4905

C2
0.1u

Q2
IRF4905

R3
10K

C3
0.1u

RX_12V

TX_12V

R4
100K

C4
0.1u

D5
1N4007

Flyback diode.

RX_12V

BPF_OUT

U1
TIA

U3

U2
TIA

XFLTR_IN

U4
TIA

U5
TIA

TX_12V

MIX2_LO

VFO, 7dBm
About 5.000-5.070 MHz for 20M
and 16.000-16.070 MHz for 40M

RX_12V

MIX1_RF

to AGC detector

U6
TIA

U7

VVA_OUT

MIX1_IF

U8
TIA

TX_12V

MIX1_LO

BFO. About 9 MHz, 7 dBm.
The actual frequency should be xtal filter center frequency minus 1 kHz.

+12V

+9V

U9
L7809

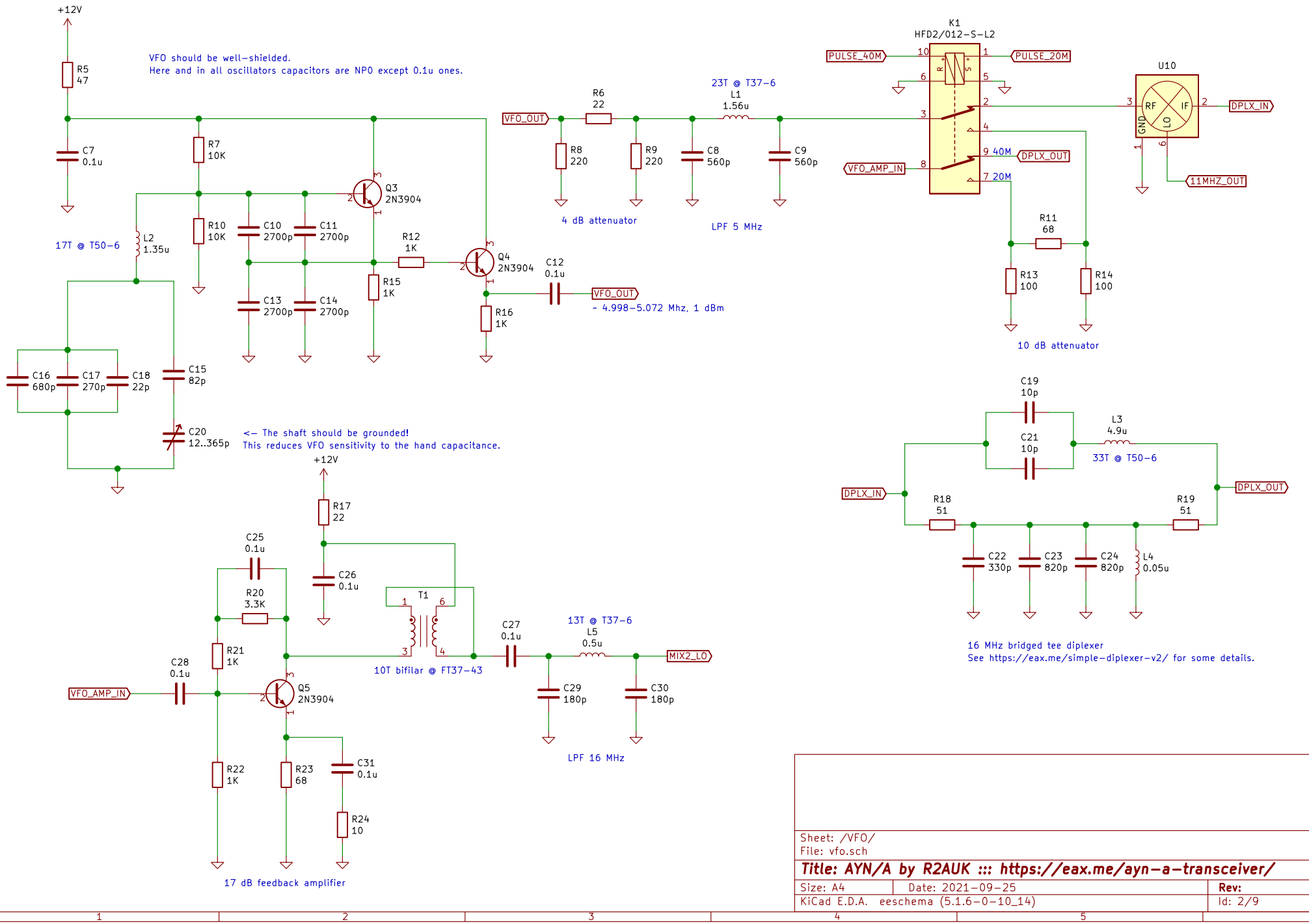
C6
10u

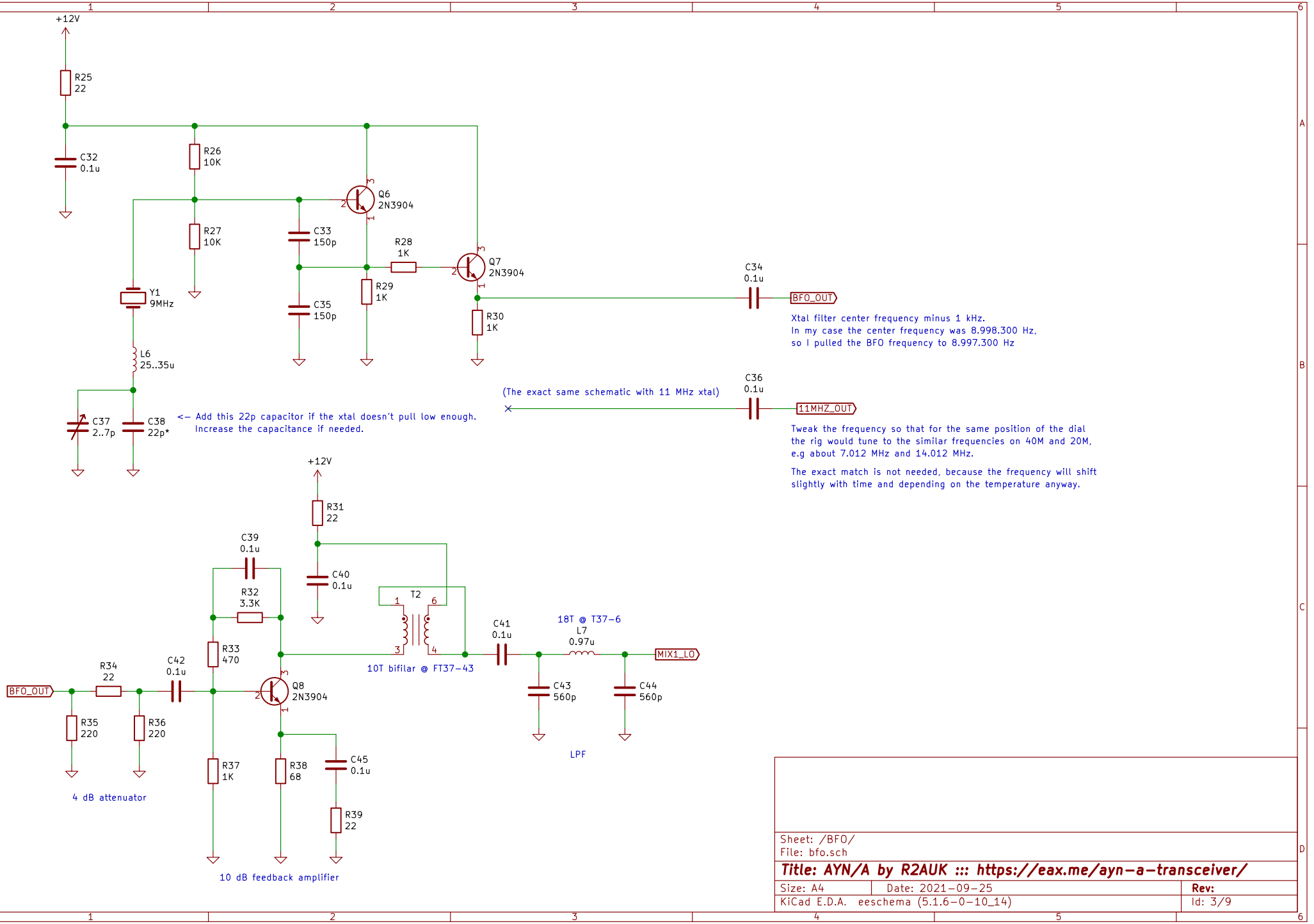
C5
0.1u

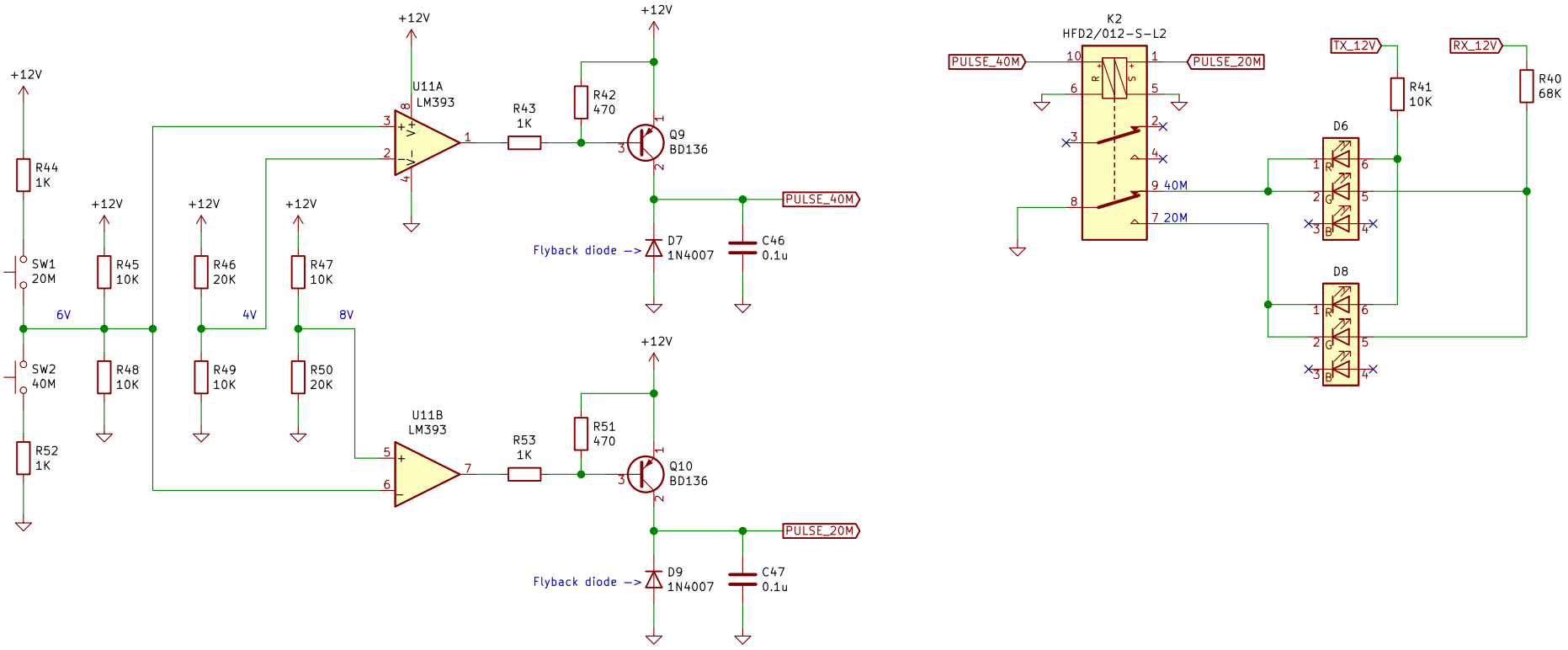
Sheet: /
File: Main.sch

Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/

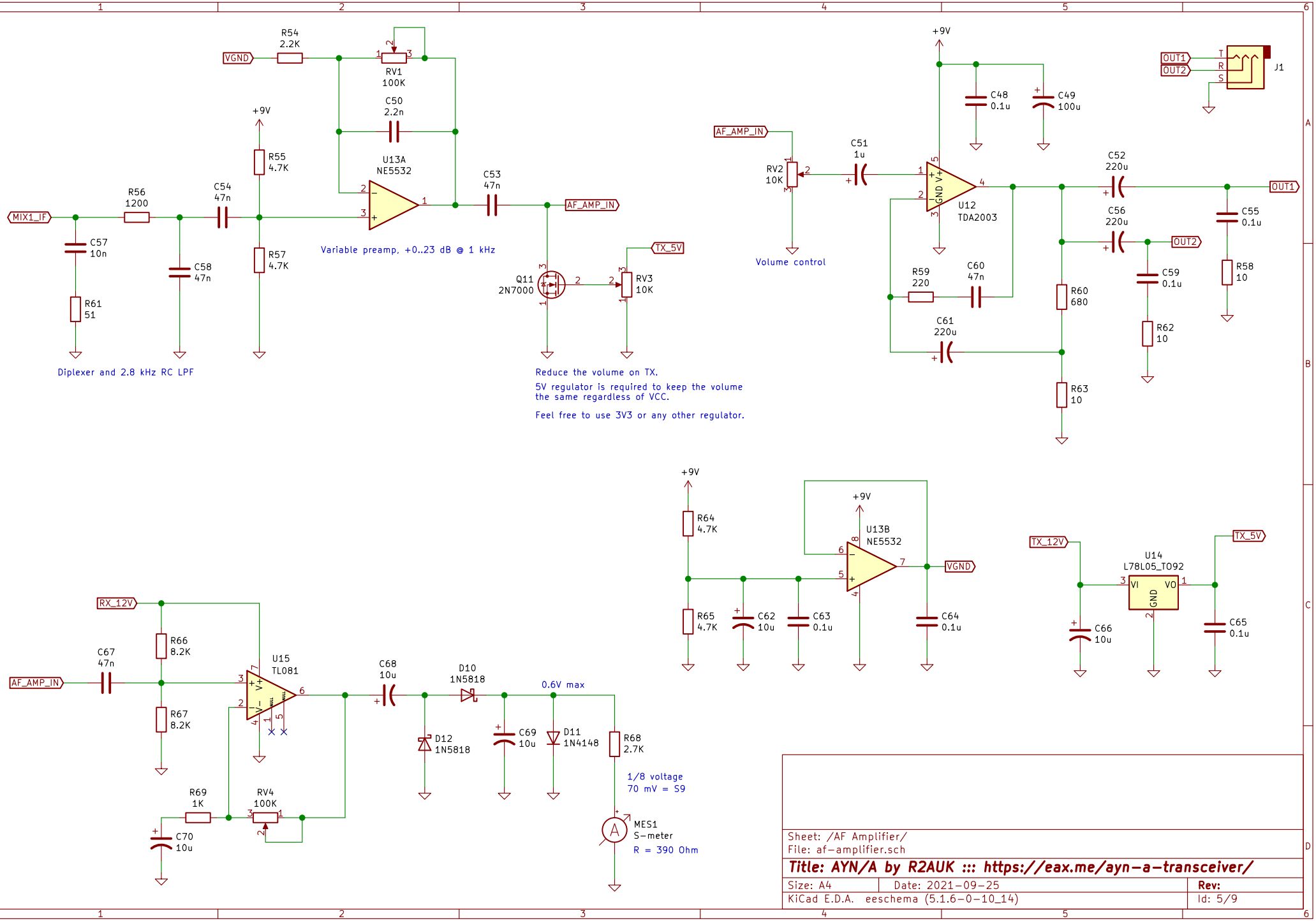
Size: A4	Date: 2021-09-25	Rev:
KiCad E.D.A. eeschema (5.1.6-0-10_14)		Id: 1/9

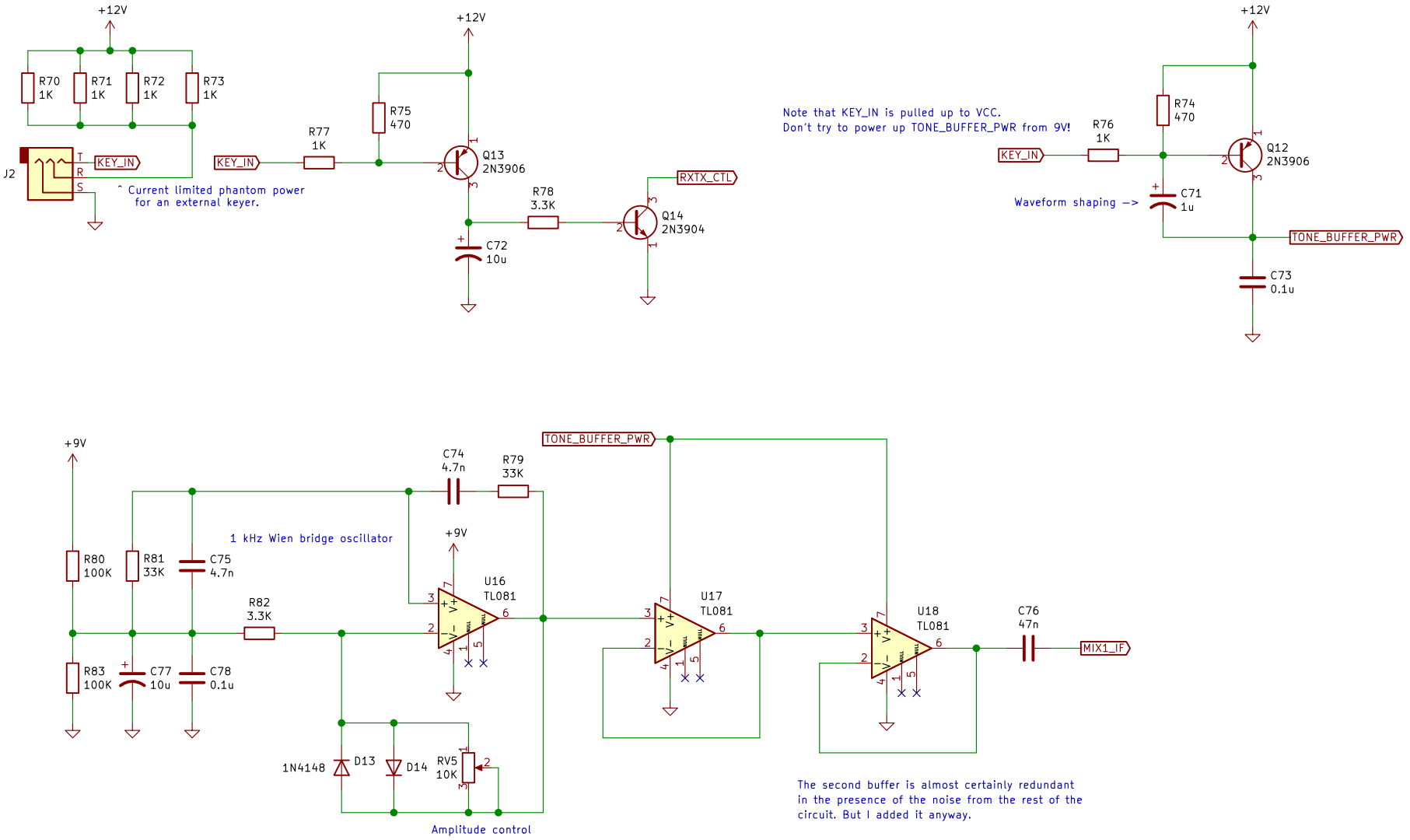

+12V
R5
47
VFO should be well-shielded.
Here and in all oscillators capacitors are NP0 except 0.1u ones.
C7
0.1u
R7
10K
R10
10K
C10
2700p
C11
2700p
C13
2700p
C14
2700p
Q3
2N3904
R12
1K
R15
1K
Q4
2N3904
R16
1K
C12
0.1u
VFO_OUT
~ 4.998-5.072 Mhz, 1 dBm
17T @ T50-6
L2
1.35u
C16
680p
C17
270p
C18
22p
C15
82p
C20
12..365p
<- The shaft should be grounded!
This reduces VFO sensitivity to the hand capacitance.
VFO_OUT
R6
22
R8
220
R9
220
C8
560p
C9
560p
23T @ T37-6
L1
1.56u
4 dB attenuator
LPF 5 MHz
K1
HFD2/012-S-L2
PULSE_40M
PULSE_20M
VFO_AMP_IN
9 40M
DPLX_OUT
7 20M
U10
RF
IF
LO
GND
DPLX_IN
11MHZ_OUT
R11
68
R13
100
R14
100
10 dB attenuator
C19
10p
C21
10p
L3
4.9u
33T @ T50-6
DPLX_IN
DPLX_OUT
R18
51
R19
51
C22
330p
C23
820p
C24
820p
L4
0.05u
16 MHz bridged tee diplexer
See https://eax.me/simple-diplexer-v2/ for some details.
+12V
R17
22
C25
0.1u
C26
0.1u
R20
3.3K
T1
10T bifilar @ FT37-43
C27
0.1u
13T @ T37-6
L5
0.5u
MIX2_LO
C28
0.1u
VFO_AMP_IN
R21
1K
Q5
2N3904
C29
180p
C30
180p
LPF 16 MHz
R22
1K
R23
68
C31
0.1u
R24
10
17 dB feedback amplifier
Sheet: /VFO/
File: vfo.sch
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/
Size: A4
Date: 2021-09-25
Rev:
KiCad E.D.A. eeschema (5.1.6-0-10_14)
Id: 2/9


+12V
R25
22
C32
0.1u
R26
10K
R27
10K
Q6
2N3904
C33
150p
R28
1K
Q7
2N3904
R29
1K
C35
150p
R30
1K
C34
0.1u
BFO_OUT
Xtal filter center frequency minus 1 kHz.
In my case the center frequency was 8.998.300 Hz,
so I pulled the BFO frequency to 8.997.300 Hz
Y1
9MHz
L6
25..35u
C37
2..7p
C38
22p*
<– Add this 22p capacitor if the xtal doesn't pull low enough.
Increase the capacitance if needed.
(The exact same schematic with 11 MHz xtal)
C36
0.1u
11MHZ_OUT
Tweak the frequency so that for the same position of the dial
the rig would tune to the similar frequencies on 40M and 20M,
e.g about 7.012 MHz and 14.012 MHz.
The exact match is not needed, because the frequency will shift
slightly with time and depending on the temperature anyway.
+12V
R31
22
C39
0.1u
C40
0.1u
R32
3.3K
T2
R33
470
10T bifilar @ FT37-43
C41
0.1u
18T @ T37-6
L7
0.97u
MIX1_LO
C43
560p
C44
560p
LPF
BFO_OUT
R34
22
C42
0.1u
Q8
2N3904
R35
220
R36
220
4 dB attenuator
R37
1K
R38
68
C45
0.1u
R39
22
10 dB feedback amplifier
Sheet: /BFO/
File: bfo.sch
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/
Size: A4
Date: 2021-09-25
Rev:
KiCad E.D.A. eeschema (5.1.6-0-10_14)
Id: 3/9



Sheet: /Buttons/ File: buttons.sch		
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/		
Size: A4	Date: 2021-09-25	**Rev:**
KiCad E.D.A. eeschema (5.1.6-0-10_14)		Id: 4/9

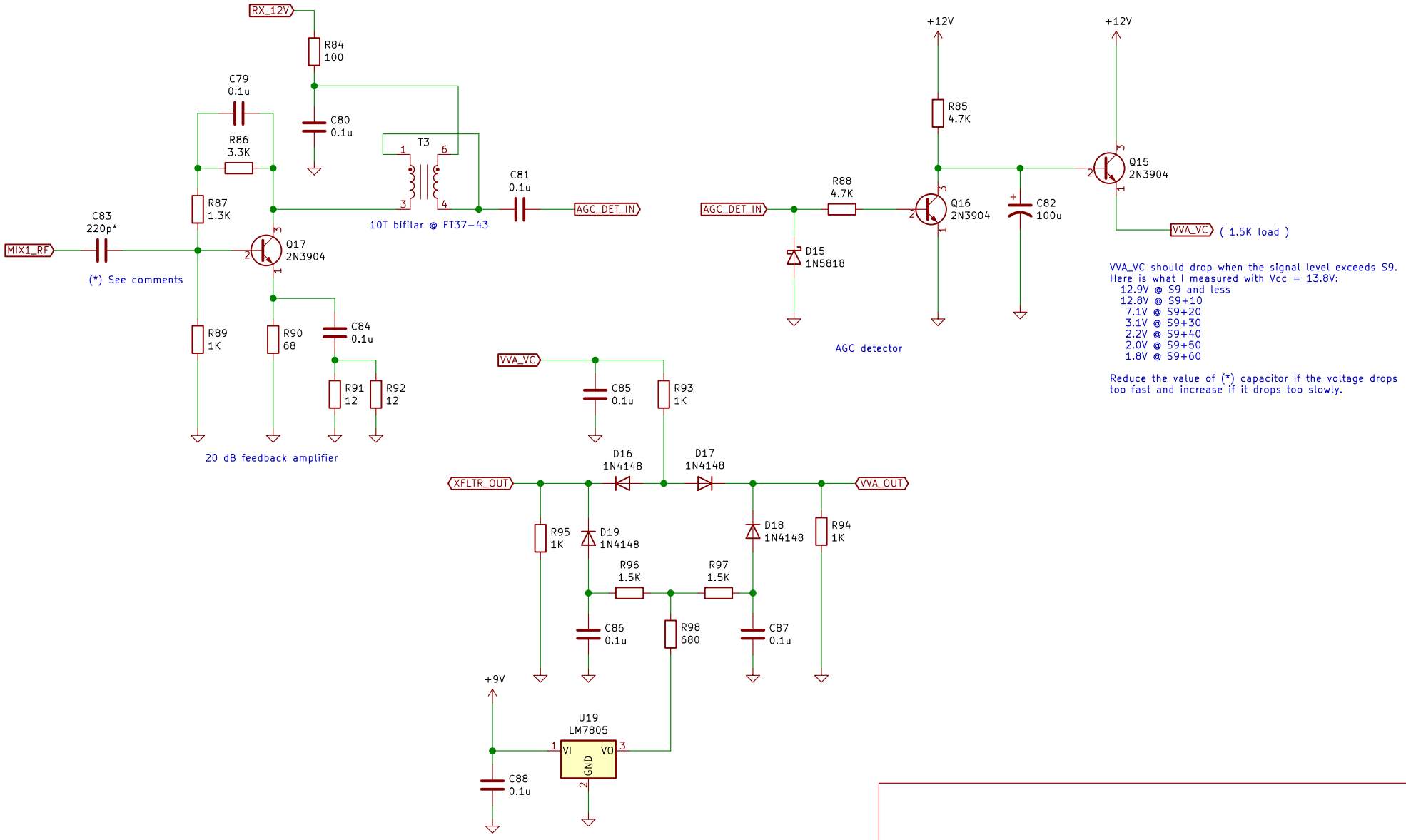

R54
2.2K
VGND
RV1
100K
C50
2.2n
+9V
R55
4.7K
U13A
NE5532
R56
1200
C54
47n
C53
47n
AF_AMP_IN
MIX1_IF
C57
10n
C58
47n
R57
4.7K
R61
51
Variable preamp, +0..23 dB @ 1 kHz
Diplexer and 2.8 kHz RC LPF
Q11
2N7000
RV3
10K
TX_5V
Reduce the volume on TX.
5V regulator is required to keep the volume
the same regardless of VCC.
Feel free to use 3V3 or any other regulator.
+9V
C48
0.1u
C49
100u
OUT1
OUT2
T
R
S
J1
AF_AMP_IN
RV2
10K
C51
1u
U12
TDA2003
GND
V+
C52
220u
OUT1
C56
220u
OUT2
C55
0.1u
R58
10
C59
0.1u
R62
10
R59
220
C60
47n
C61
220u
R60
680
R63
10
Volume control
+9V
R64
4.7K
U13B
NE5532
VGND
R65
4.7K
C62
10u
C63
0.1u
C64
0.1u
TX_12V
U14
L78L05_TO92
VI
VO
GND
TX_5V
C66
10u
C65
0.1u
RX_12V
R66
8.2K
C67
47n
AF_AMP_IN
U15
TL081
R67
8.2K
C68
10u
D10
1N5818
0.6V max
D12
1N5818
C69
10u
D11
1N4148
R68
2.7K
1/8 voltage
70 mV = S9
R69
1K
RV4
100K
C70
10u
MES1
S-meter
R = 390 Ohm
Sheet: /AF Amplifier/
File: af-amplifier.sch
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/
Size: A4
Date: 2021-09-25
Rev:
KiCad E.D.A. eeschema (5.1.6-0-10_14)
Id: 5/9



Sheet: /CW Tone/
File: cw-tone.sch

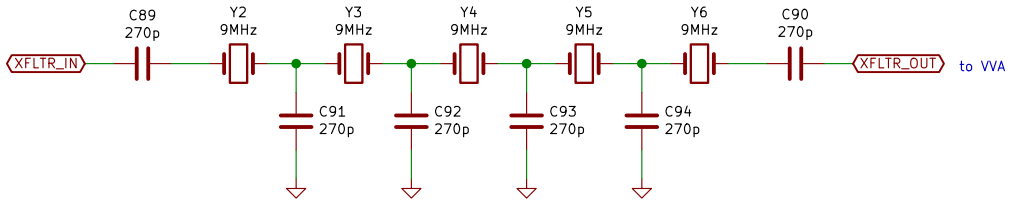
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/

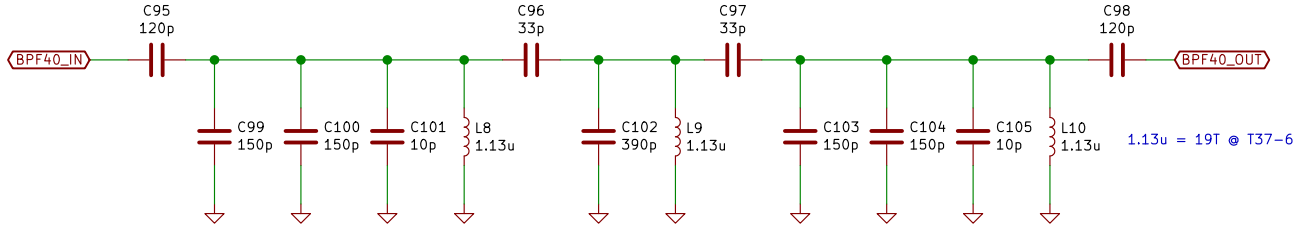
Size: A4	Date: 2021-09-25	**Rev:**
KiCad E.D.A. eeschema (5.1.6-0-10_14)		Id: 6/9

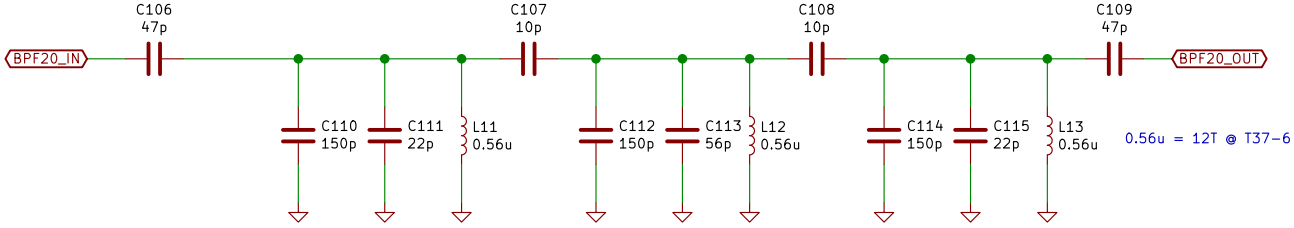


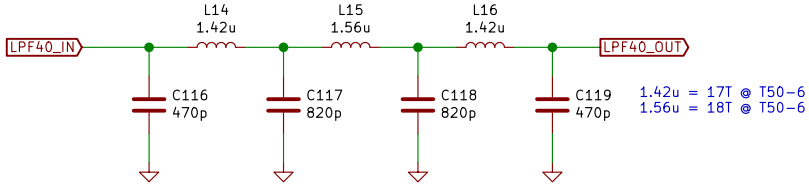
Sheet: /AGC/		
File: agc.sch		
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/		
Size: A4	Date: 2021-09-25	**Rev:**
KiCad E.D.A. eeschema (5.1.6-0-10_14)		Id: 7/9

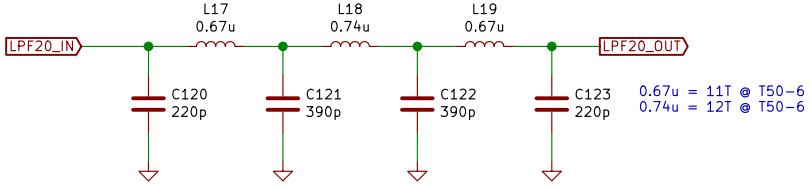
Don't make the bandwidth of the xtal filter too narrow.
The VFO frequency varies with time and depends on the temperature.
It may shift 200 Hz or so when transmitting for 10+ minutes.
The effect is especially noticeable around 14.060 MHz.
I recommend the bandwidth of 400–500 Hz.
Wider bandwidth also reduces the insertion loss of the filter.

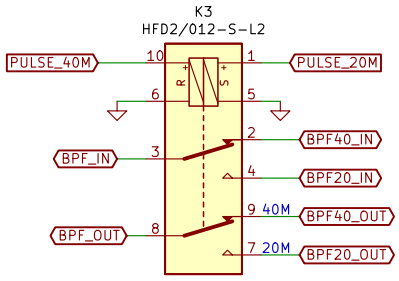


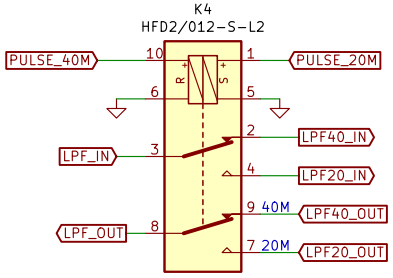










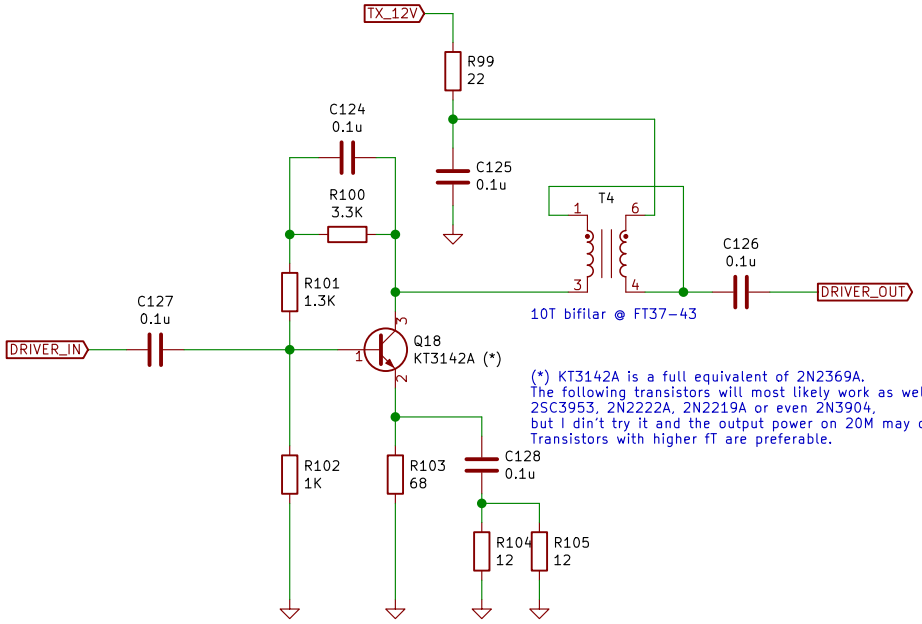


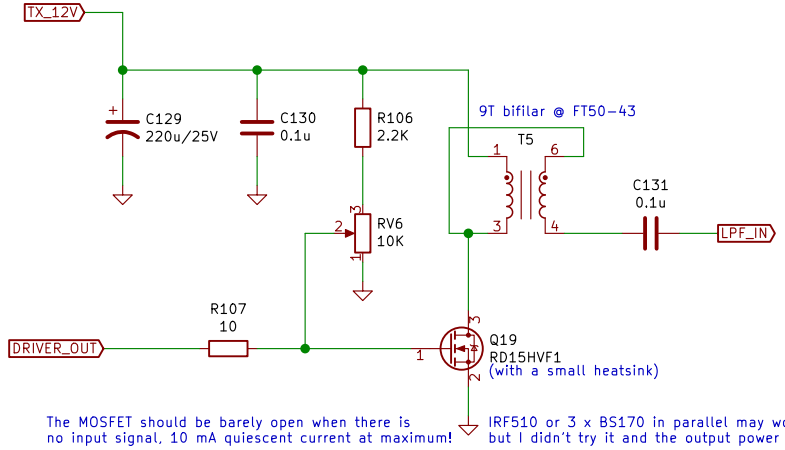
Sheet: /Filters/
File: filters.sch

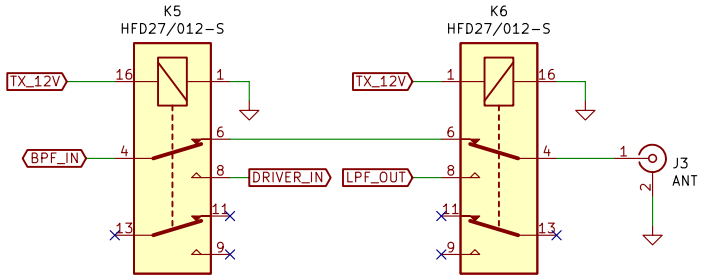
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/

Size: A4	Date: 2021-09-25	**Rev:**
KiCad E.D.A. eeschema (5.1.6-0-10_14)		Id: 8/9

This is a class C PA. When driven with 0 dBm the output is 5.3-7.6W on 80-10 meters.
For additional information see https://eax.me/class-c-qrp-power-amplifier/
Since we are not interested in frequencies above 14 Mhz in this rig more available
parts will most likely work just fine, however some experimentation may be required.







Sheet: /Power Amplifier/		
File: power-amplifier.sch		
Title: AYN/A by R2AUK ::: https://eax.me/ayn-a-transceiver/		
Size: A4	Date: 2021-09-25	**Rev:**
KiCad E.D.A. eeschema (5.1.6-0-10_14)		Id: 9/9