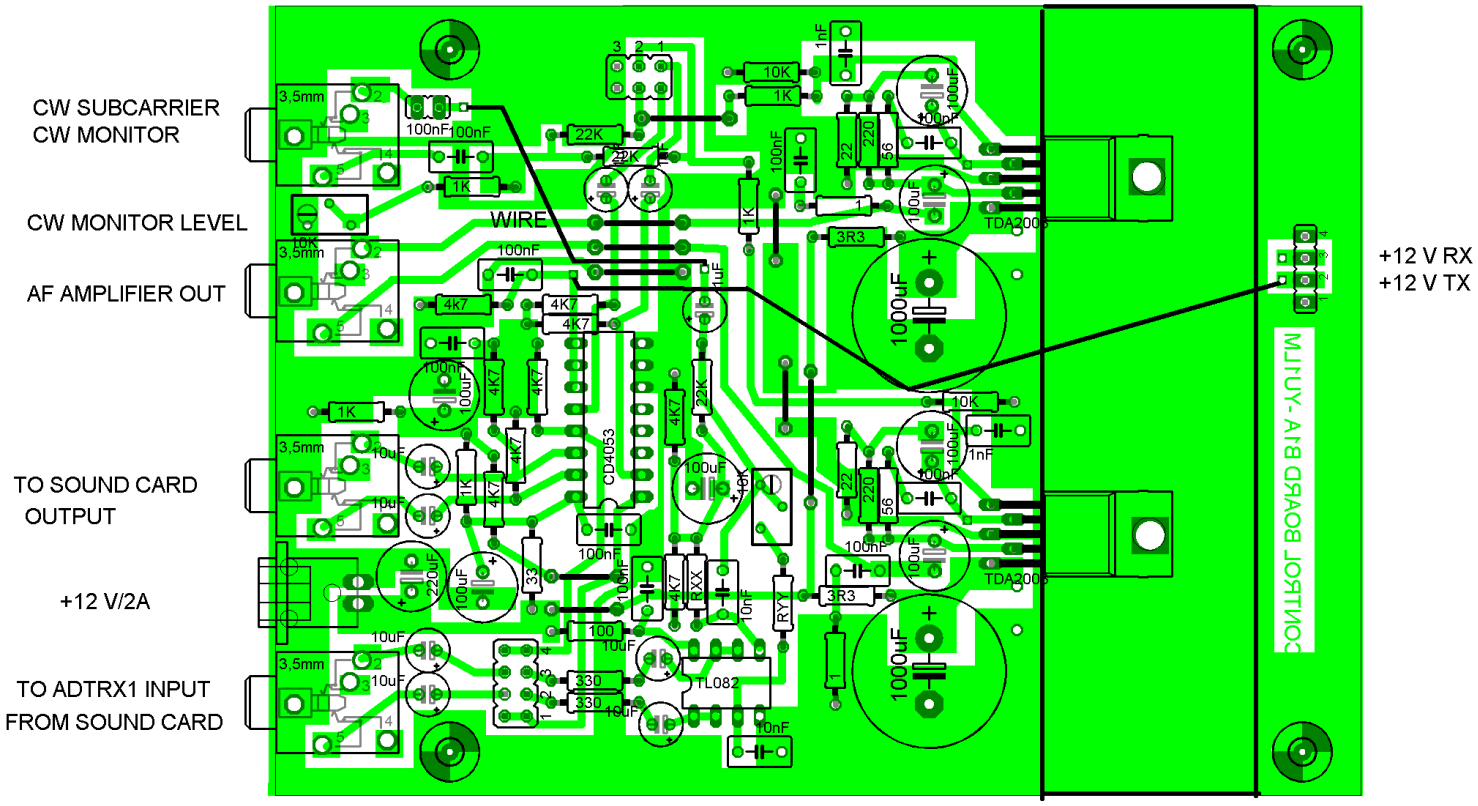
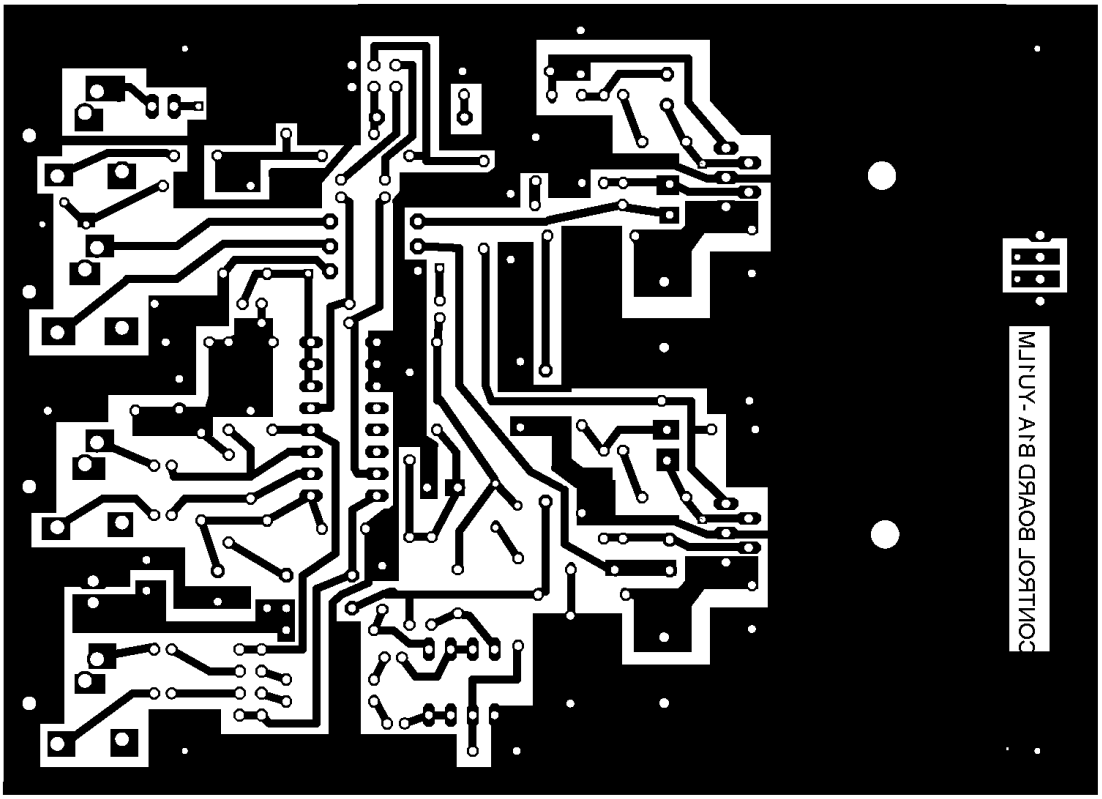
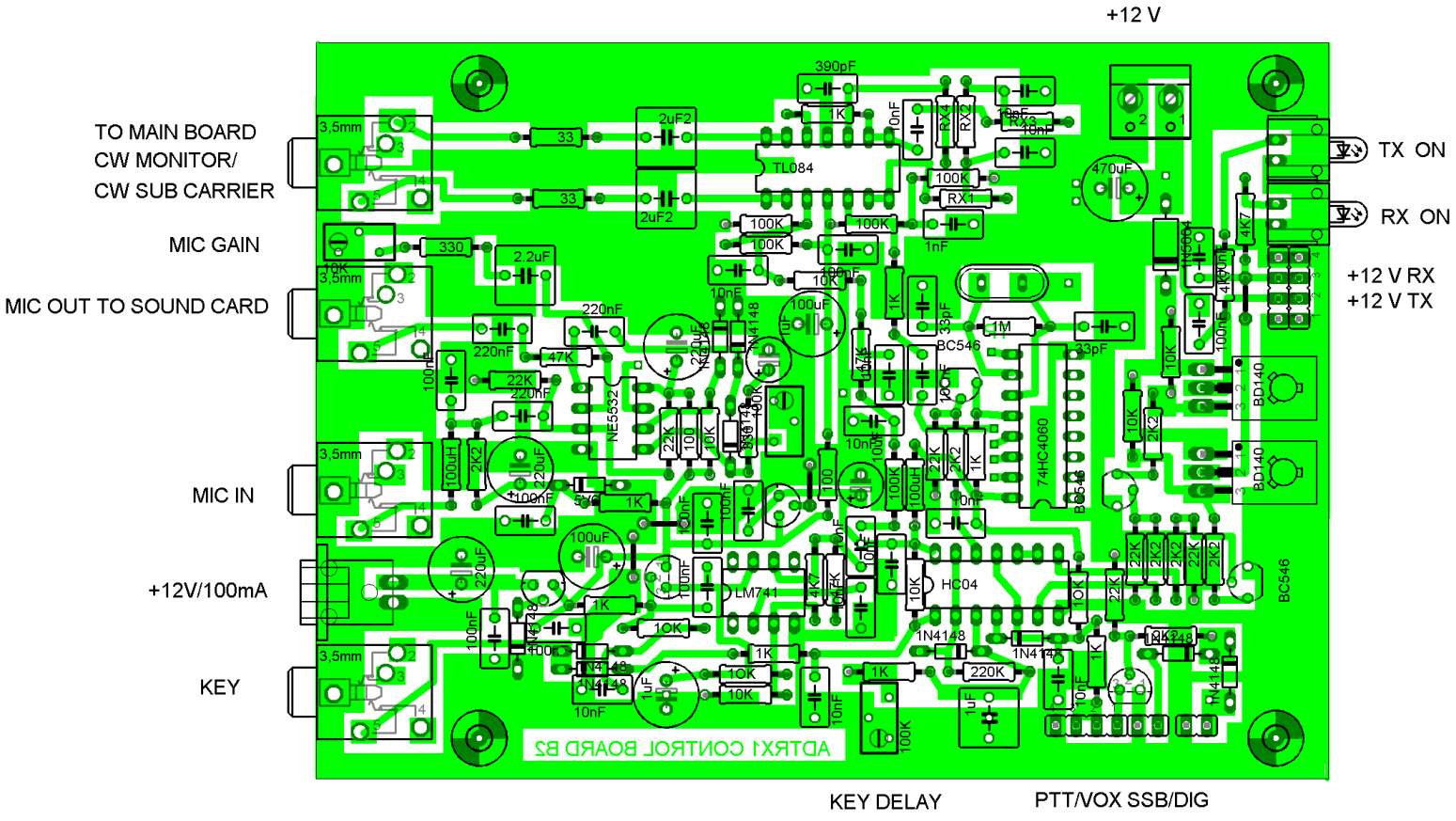
## *Low power SDR HF I/Q S/H (Sample and Hold) Transceiver CW, SSB..- ADTRX1 From 30 kHz-35 MHz- With Built in LO Local Oscillator and PC Control Boards B3 and B4 -part 3*

Before I keep on with new third part I have to apologize for mistakes on PCBs B1 and B2 in part 2. Low power SDR HF I/Q S/H (Sample and Hold) ADTRX1 transceiver is based on use IC 74HC4053- from 30 kHz-35 MHz now with two new boards B3 and B4. These new boards will enable easy RX/TX control interface with PC in all software. Operation is possible at 3 bands harmonically related. The boards have built in 4 channel crystal oscillator with QRP 5Wout power amplifier with input/output LP/BP.

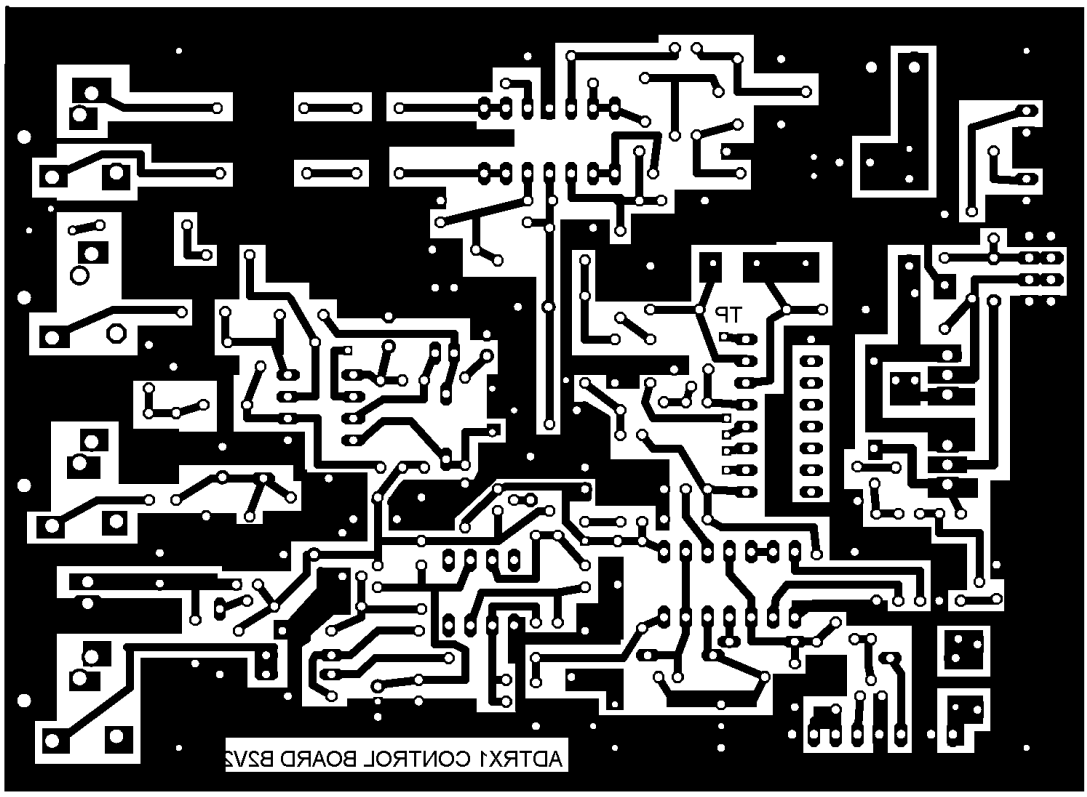
But let start from part 2 in which I made some errors on PCBs. I have to apology for inconvenience to all who tried to make them. I made all published PCBs B1, B2 but I didn't complete with components on final version PCBs. In meanwhile I made new more practical PCBs B3 and B4 which enable me easiest operation with PC unique control in all software without transmission problems explained in part 2. B3 and B4 PCBs are my help for all who still made ADTRX1-1 transceiver to complete SDR transceiver with output power amplifier and LO. Special acknowledge goes to my friend Gabriel Scevlik from Slovakia who detect all errors. First big error that I mirrored ICs TDA2003, possible solution is to solder ICs from bottom side like Gabriel was or to make new PCB version, see pictures down.



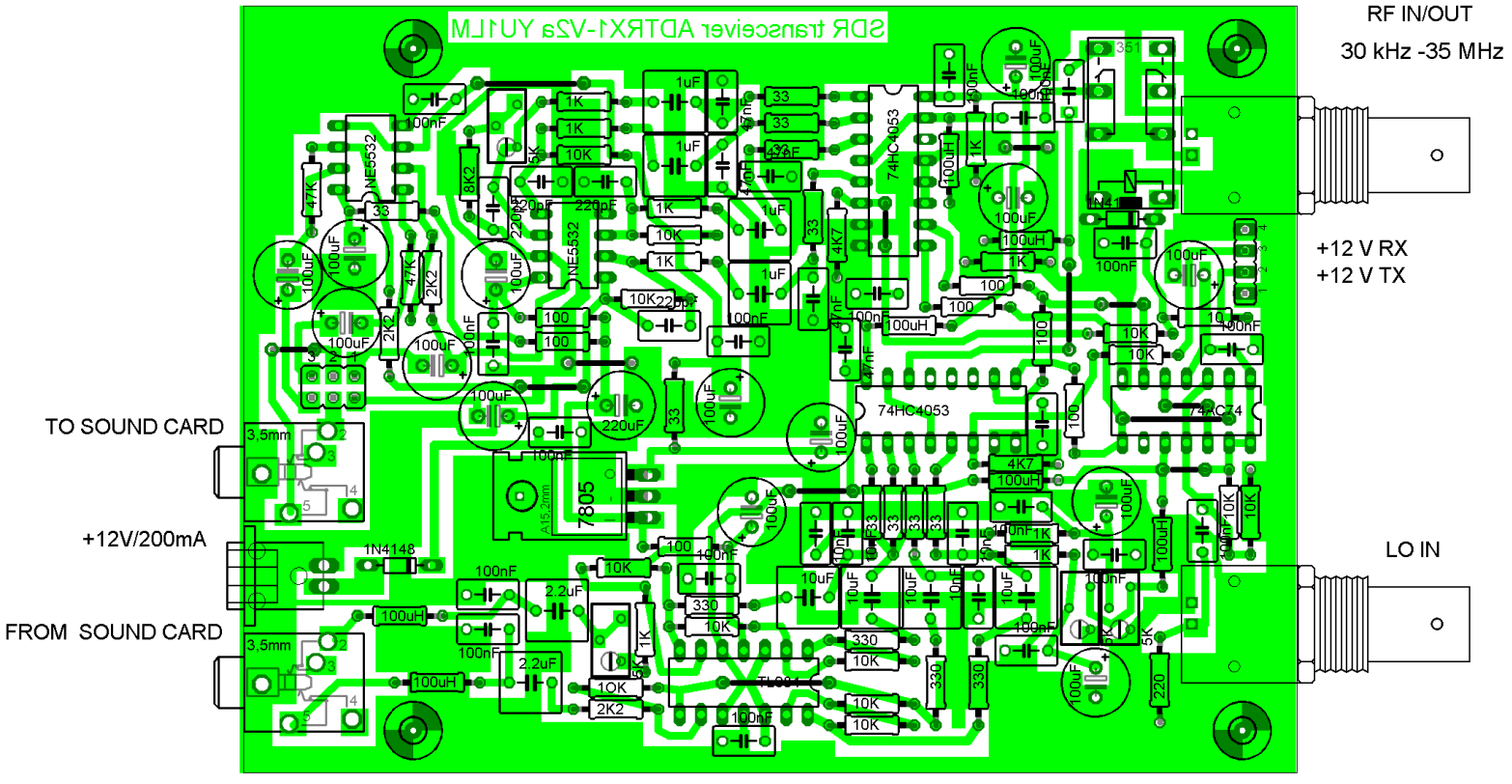


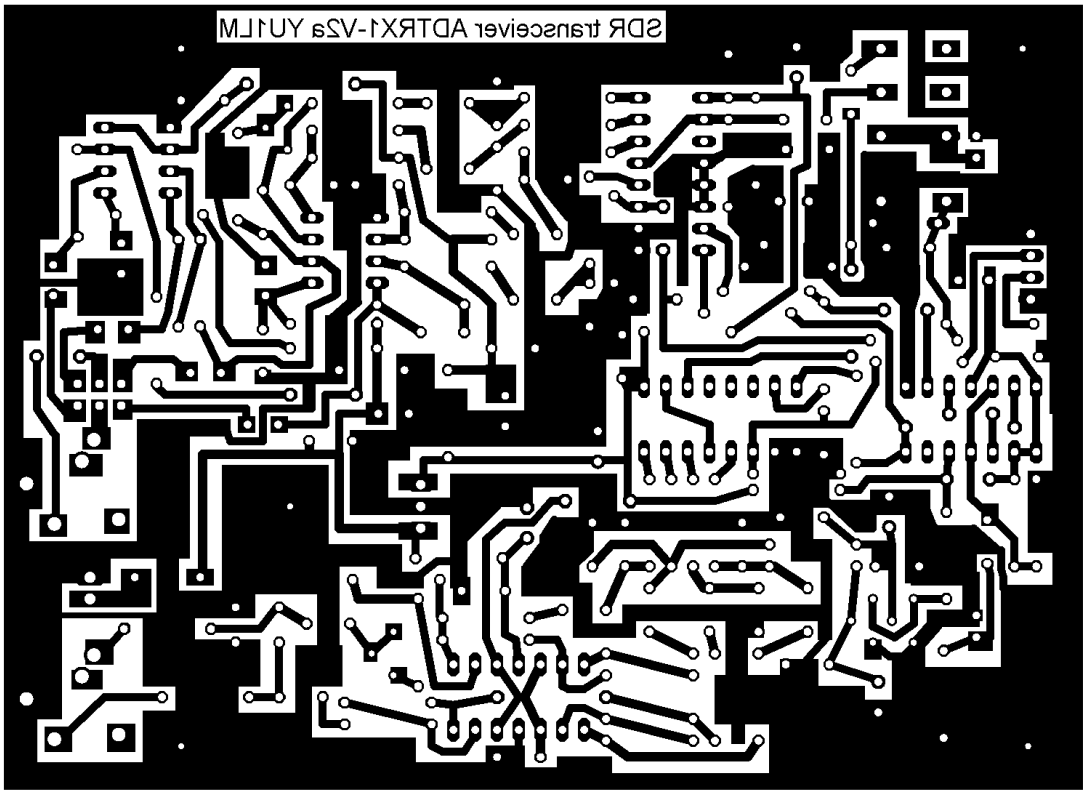




New version control board PCB B2V2




Previously version of B2 board had some errors in gate connections IC HC04. I made new version of PCB ADTRX1-V2 also to improve IMD/SFDR specifications and isolation between RX and TX path. I substituted PIN diodes RX/TX switch with relay OMRON G5V-2. All control signals and physical positions are the same as it was at previously PCB.






New ADTRX1V2 with relay for RX/TX switching, single side PCB dimensions 125 x 92 mm

This new designs are based on new SDR HF transceiver AVALA-01 and please read this article I shall not explain again all what is written there. I have still compact sandwich style and minimal number of PCBs interconnections. PCBs are now going in the next order first B4 than ADTRX1-1(2) and B3. As I wrote this is compilation previously published designs with small changes from practice. Oscillators are now with TUN BC546 BJT transistors they are offering much stable operation than BFR93 with tendency to UHF parasitic oscillation. Also I notice if Qo of quartz crystal is very high for example Qo>120 000 it is problem to make stabile operation in oscillator for 4 frequency especially at 5 and 7 overtone mode. For 3rd overtone mode there is no problem. With adequate 4 crystals (56,192MHz, 56,576MHz, 56,96MHz and 57,344MHz) it is possible cover over 360 kHz at 14MHz or whole amateur band with 96kHz sound card sampling rate, 200kHz at 7 MHz and 132kHz at 3,5MHz. With new crystal frequency set (28,12MHz, 28,576MHz, 28,96360kHz and 29,344MHz) we are covering whole 7MHz band, 216kHz at 3,5MHz(from 3,5MHz to 3716MHz) and 120kHz at 1,8MHz(from 1,8MHz to 1,882MHz).

Unique PC control enable SDR operation in all software with one (Duncan's M0KGK) SB card or two SB cards Power SDR and Rocky. It is possible usage IAMBIC key operation also. When we have one SB card during SSB/Digital operation it is necessary to turn of CW monitor output to headphones with one toggle switch. Unique PC control I done according to very good and useful article written by Guido PE1ENZ for PewerSDR-SR40. It is very important to notice that all pins of control from back side are "flying" type take care when you connecting paddle for IAMBIC operation or PTT/CW control. I am using next setup at serial port:

Pins  female D9 at PCB

**4** DTR  always high

**5** GND

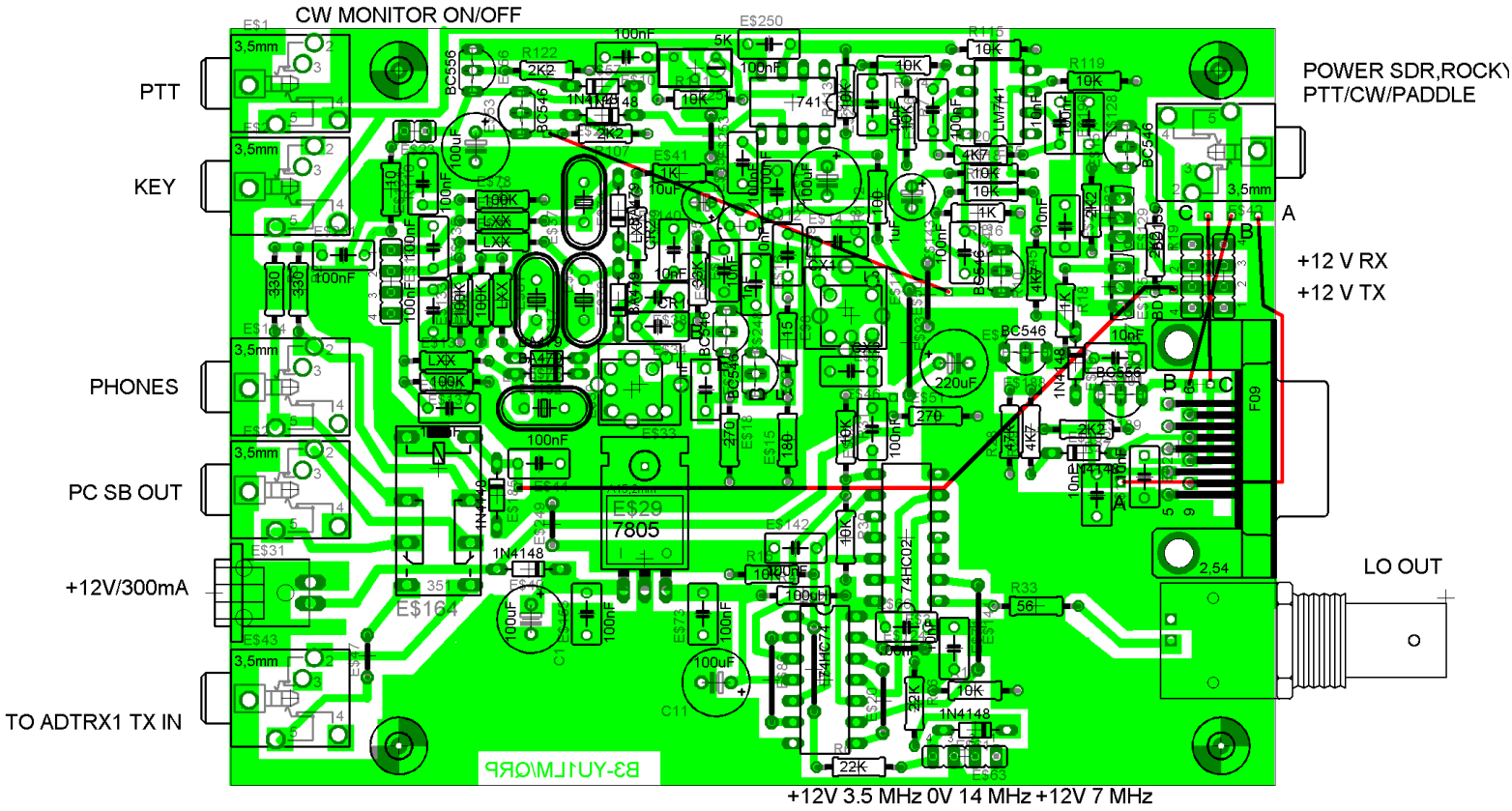
**6**  DSR  PTT/dot connect to DTR

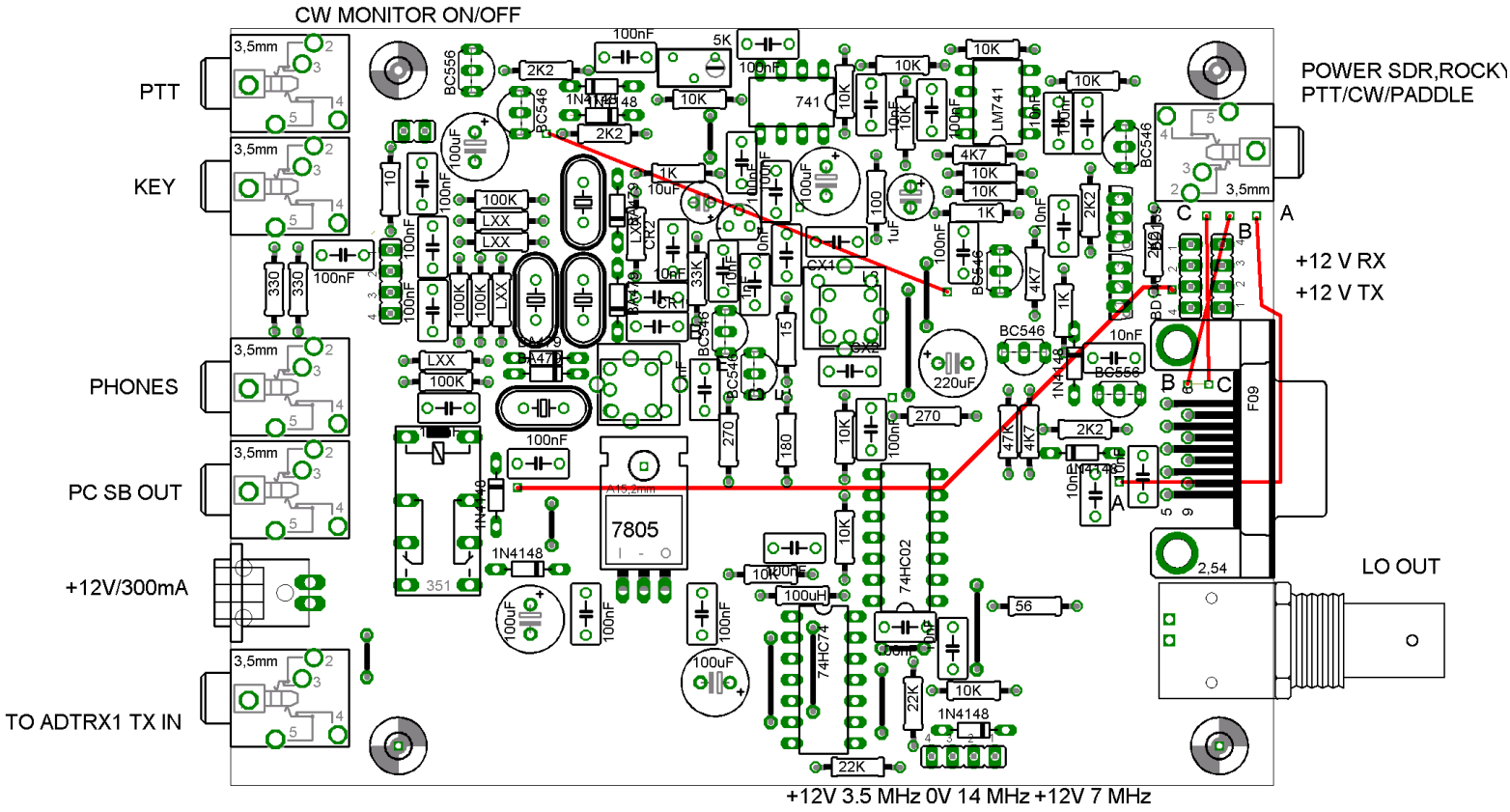
**7** RTS  TX high

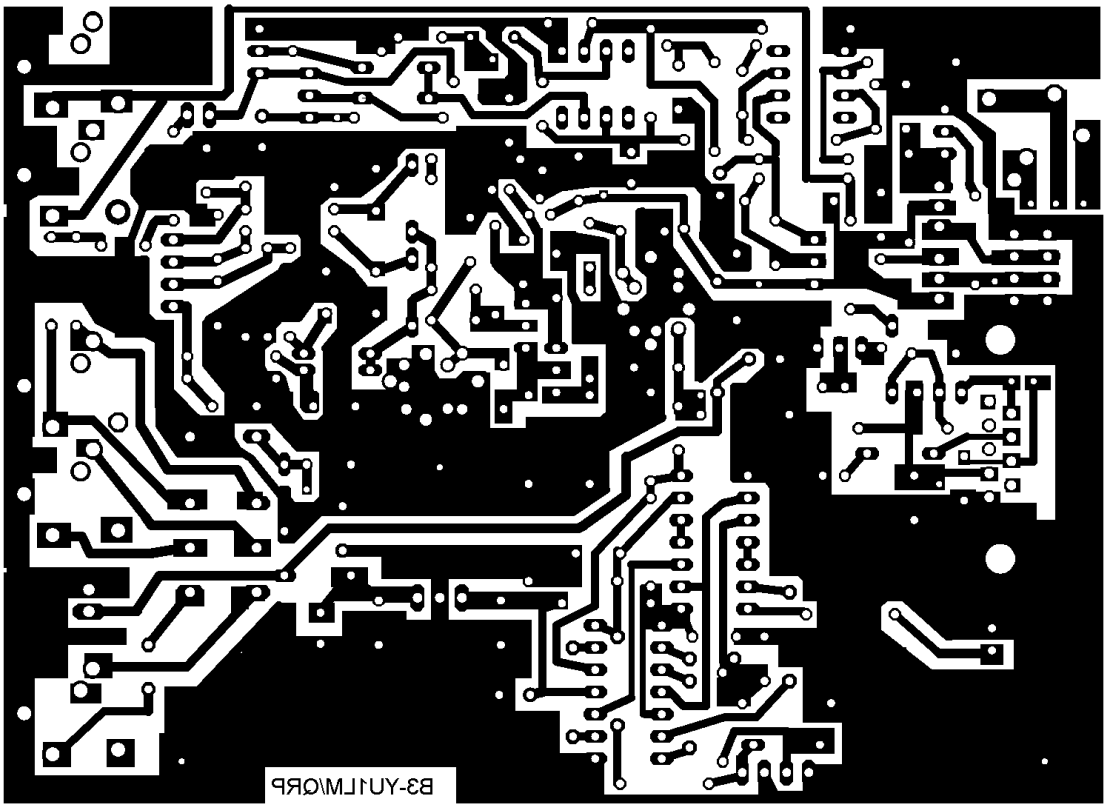
**8** CTS  dash  connect to DTR

All other pins are not connected!

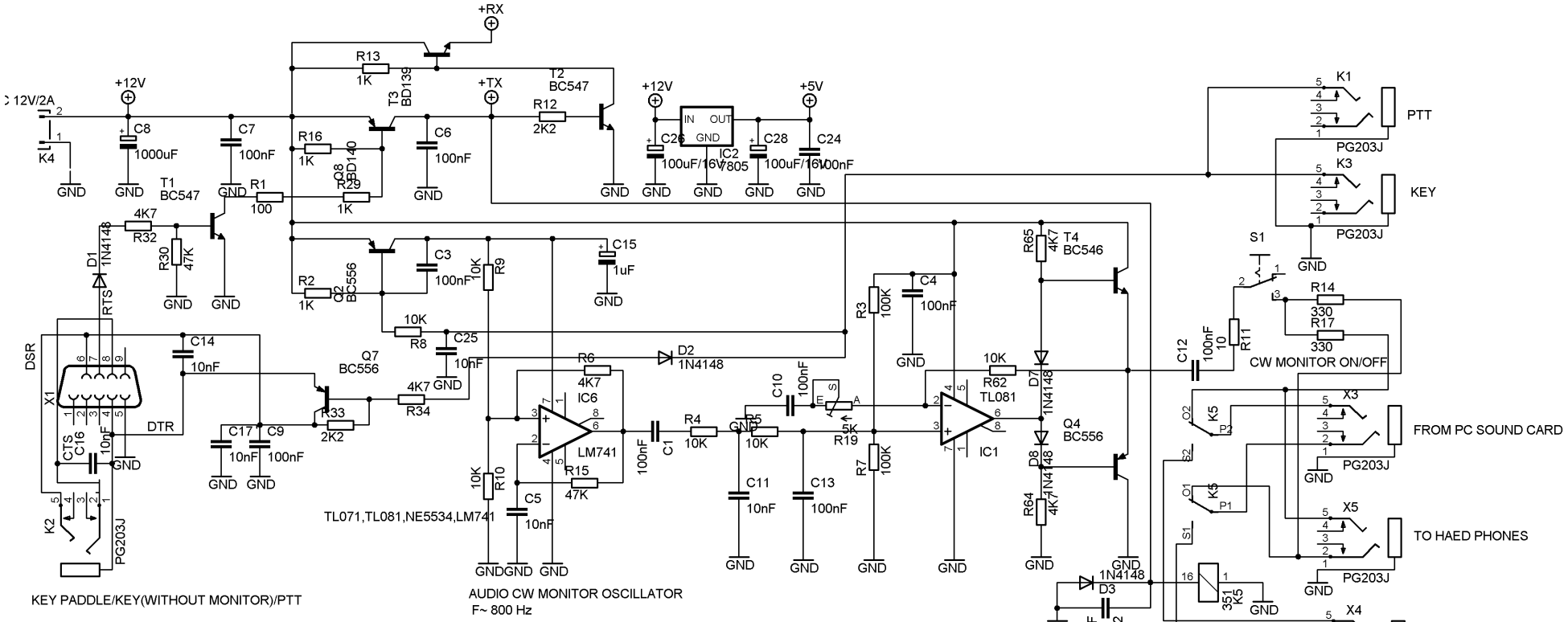
If you are using LO from other source(synthesizers or DDS) omit parts at schematic related to LO generating.



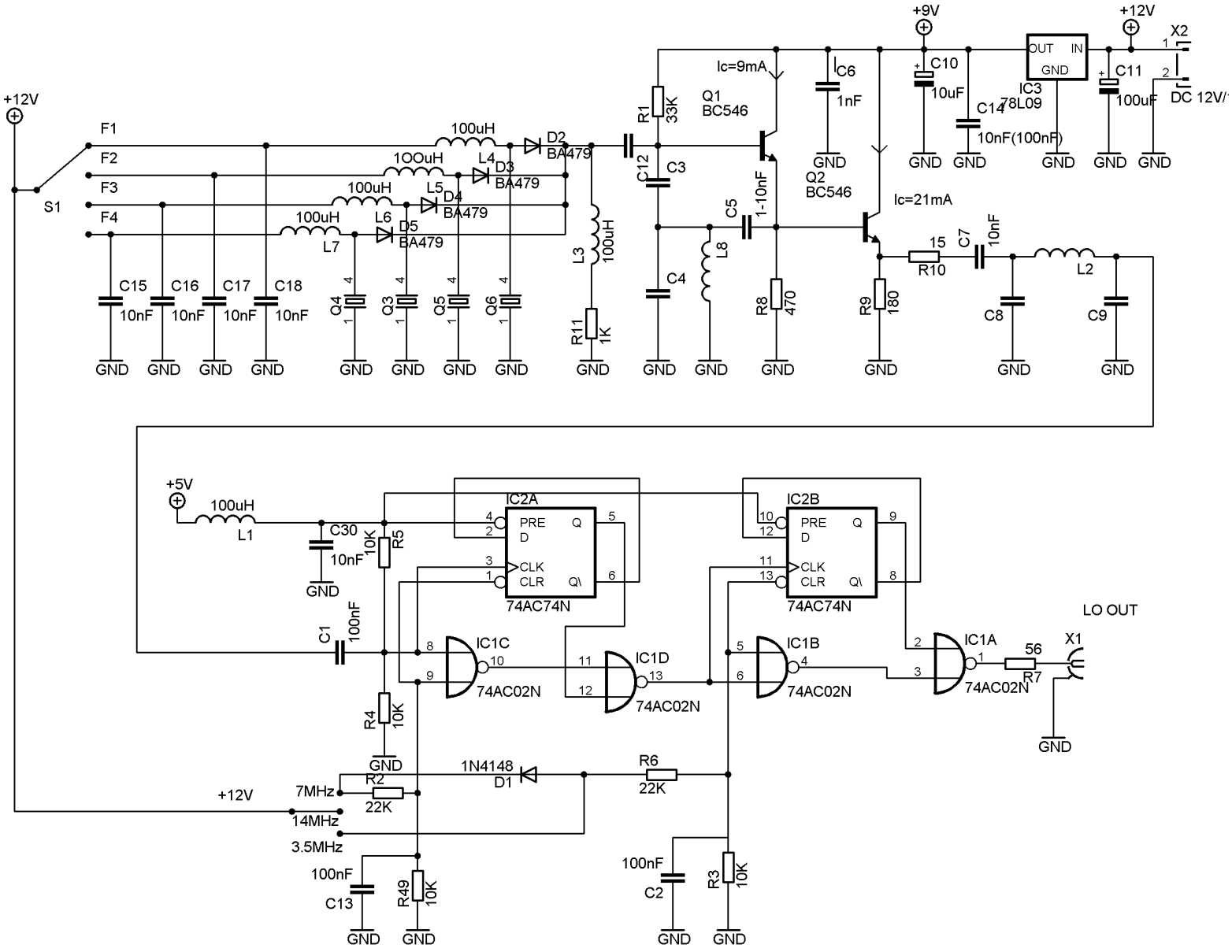


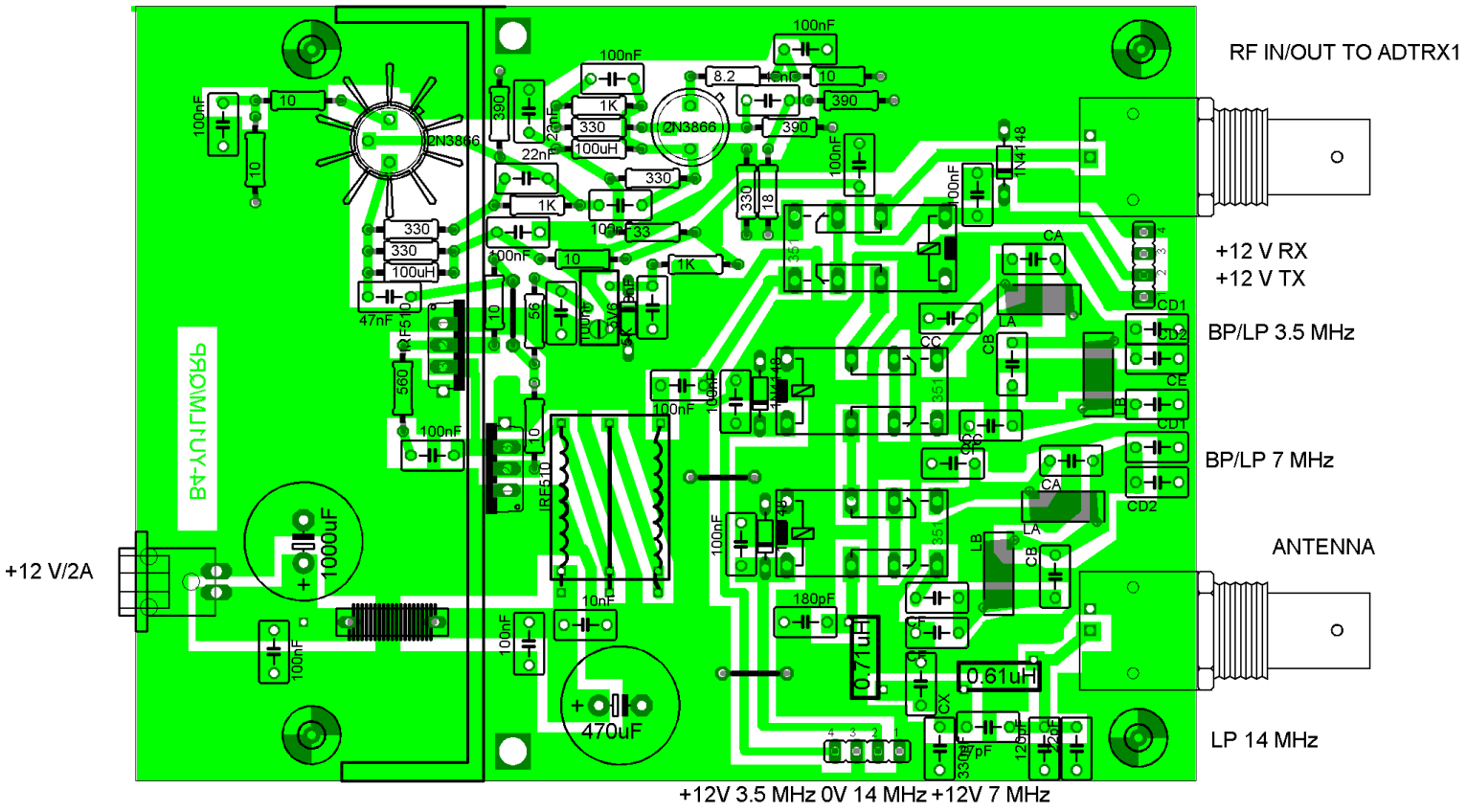
B3 single side PCB dimensions 125 x 92 mm

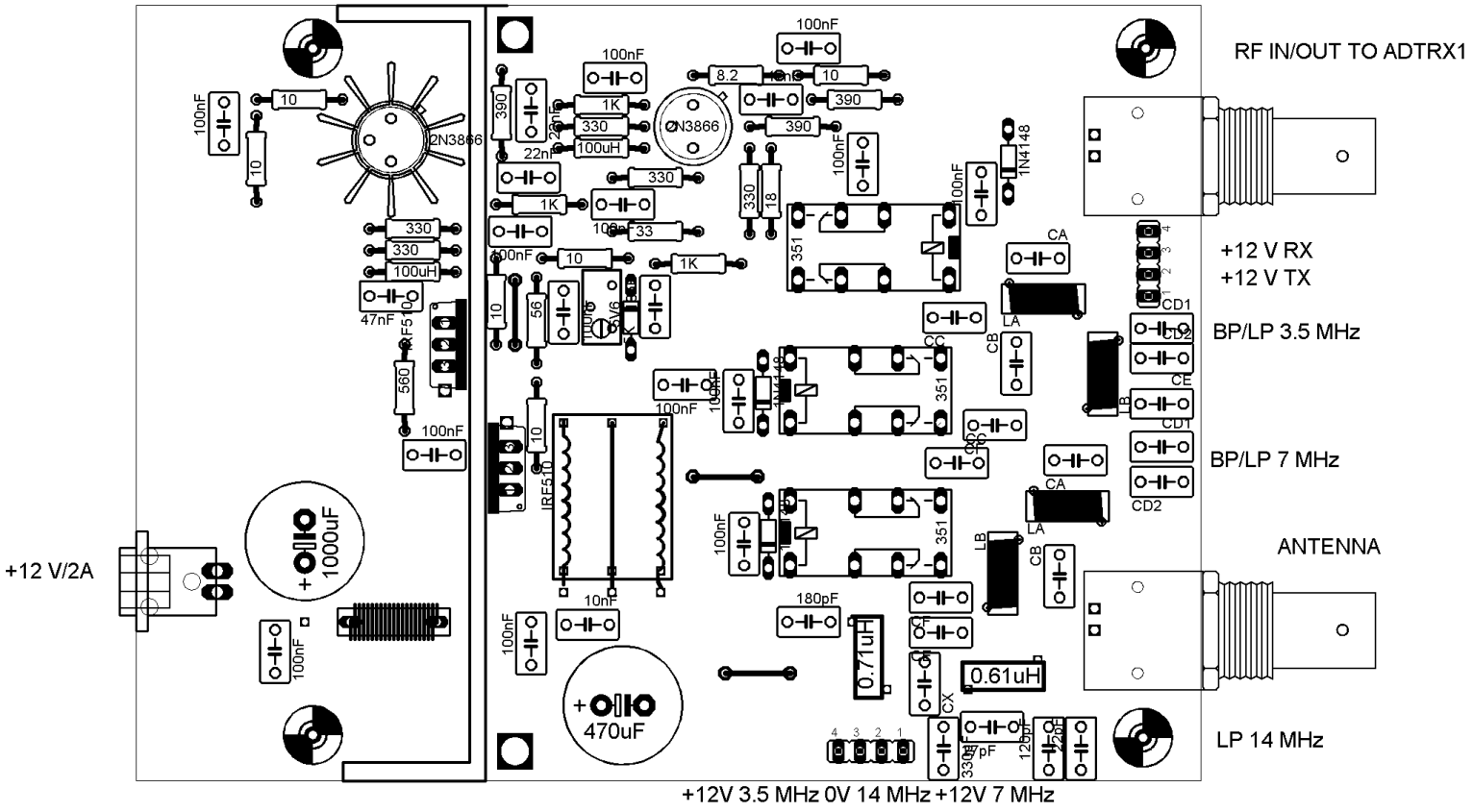



# B3 PCB ADTRX1-1 PC CONTROL + CW MONITOR -YU1LM

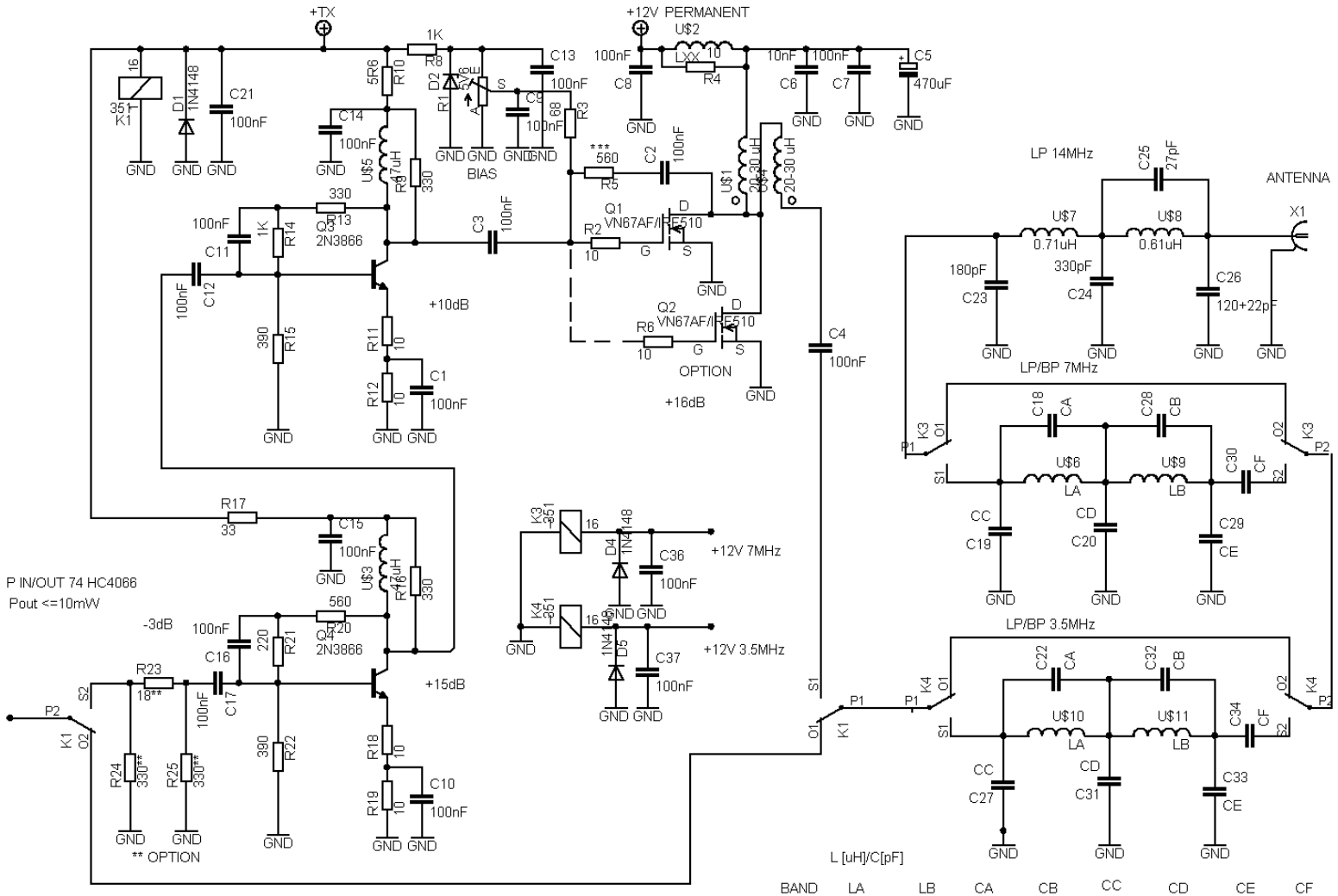



# B3 PCB ADTRX1 LO GENERATOR YU1LM/QRP


RF IN/OUT TO ADTRX1
+12 V RX
+12 V TX
BP/LP 3.5 MHz
BP/LP 7 MHz
ANTENNA
LP 14 MHz
+12 V/2A
+12V 3.5 MHz 0V 14 MHz +12V 7 MHz
2N3866
1000uF
470uF
0.61uH
0.71uH
180pF
IRF510
1N4148

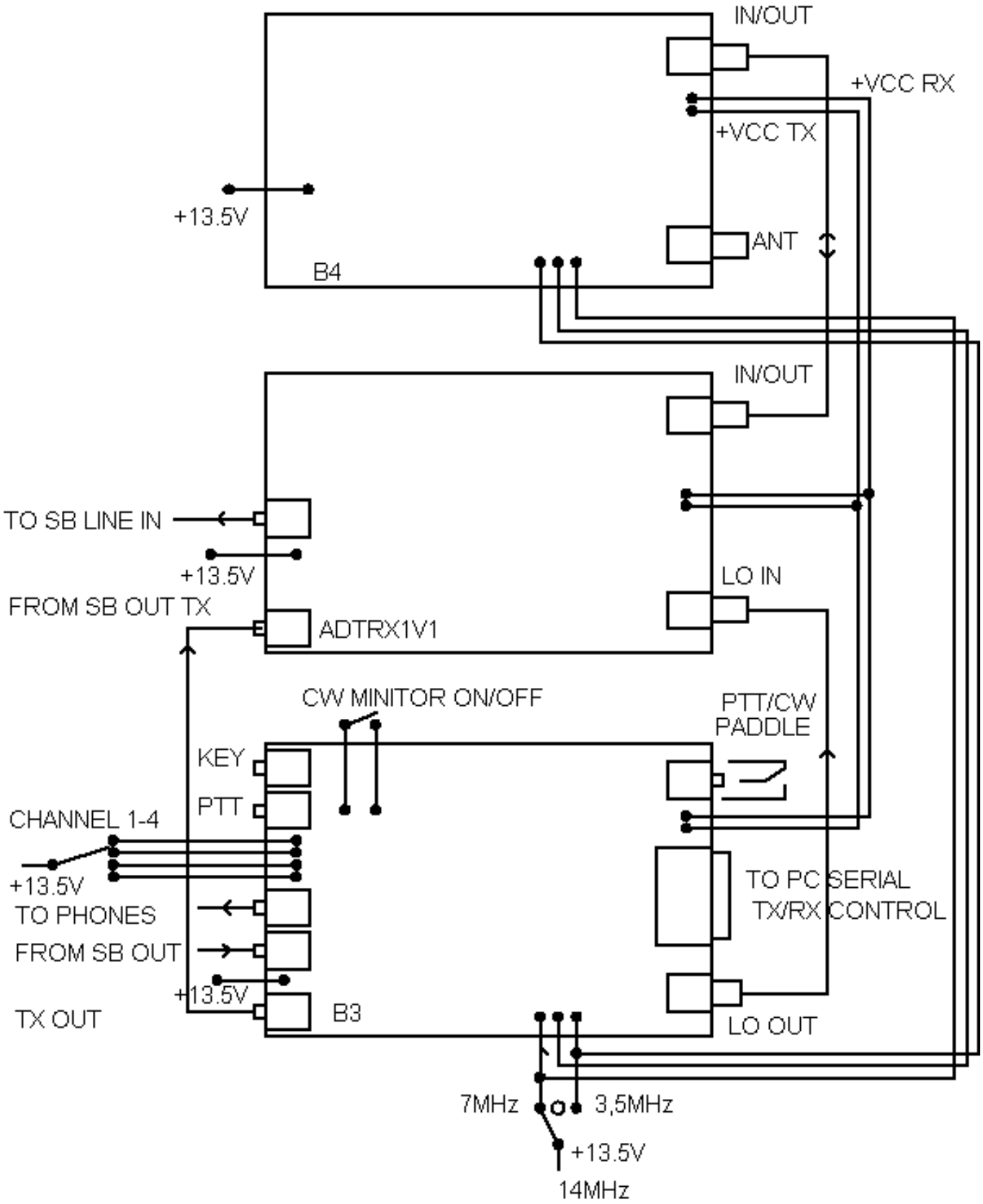

RF IN/OUT TO ADTRX1
+12 V RX
+12 V TX
BP/LP 3.5 MHz
BP/LP 7 MHz
ANTENNA
LP 14 MHz
+12 V/2A
+12V 3.5 MHz 0V 14 MHz +12V 7 MHz
2N3866
1000uF
470uF
0.61uH
0.71uH
180pF
IRF510
1N4148

POWER AMPLIFIER 1.5-30 MHz (50 MHz) 2.5-.5 W(1 W 50 MHz) SINGLE TRANSISTOR
WITH 2 PARALLEL Pout 3-10 W

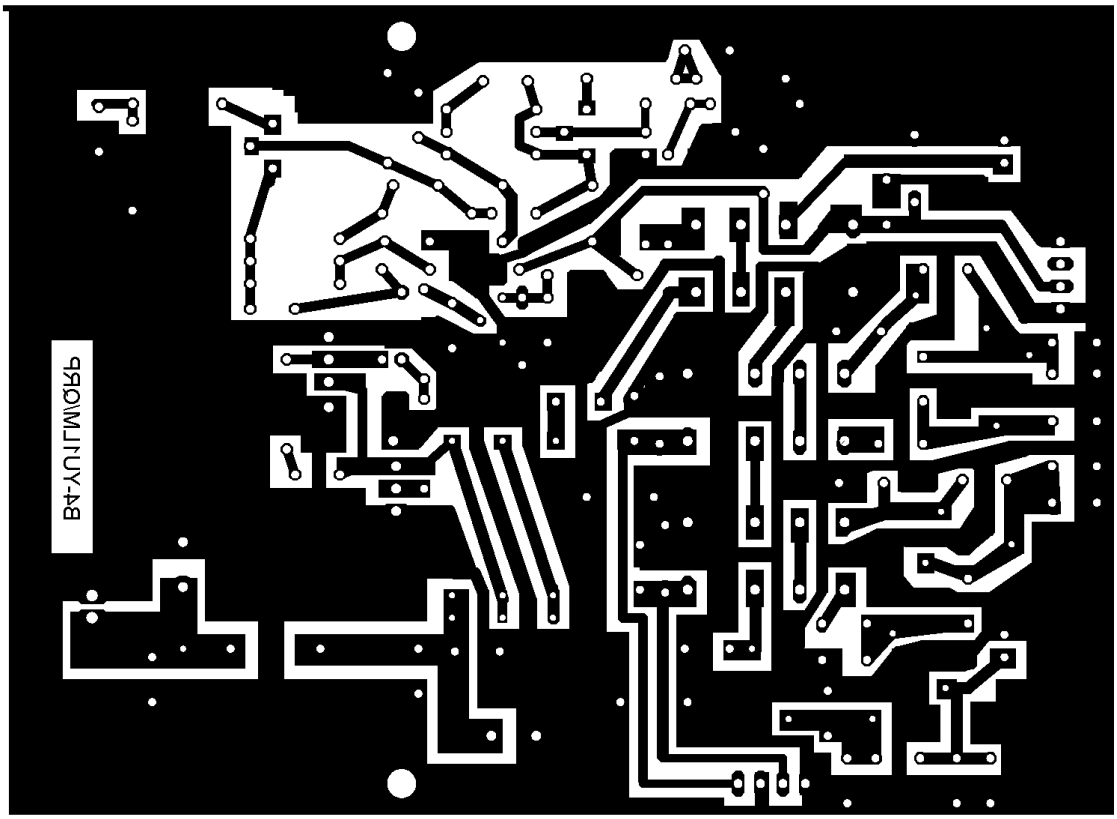



| BAND | LA | LB | CA | CB | CC | CD | CE | CF |
|---|---|---|---|---|---|---|---|---|
| 1.8 MHz | 3.35 | 5.86 | 240 | 360 | 2700 | 3300 | 91 | 1000 |
| 3.5 MHz | 1.8 | 3.35 | 120 | 150 | 1000+330 | 1800 | 100 | 470 |
| 7 MHz | .91 | 1.64 | 56 | 68 | 680 | 910 | 39 | 270 |

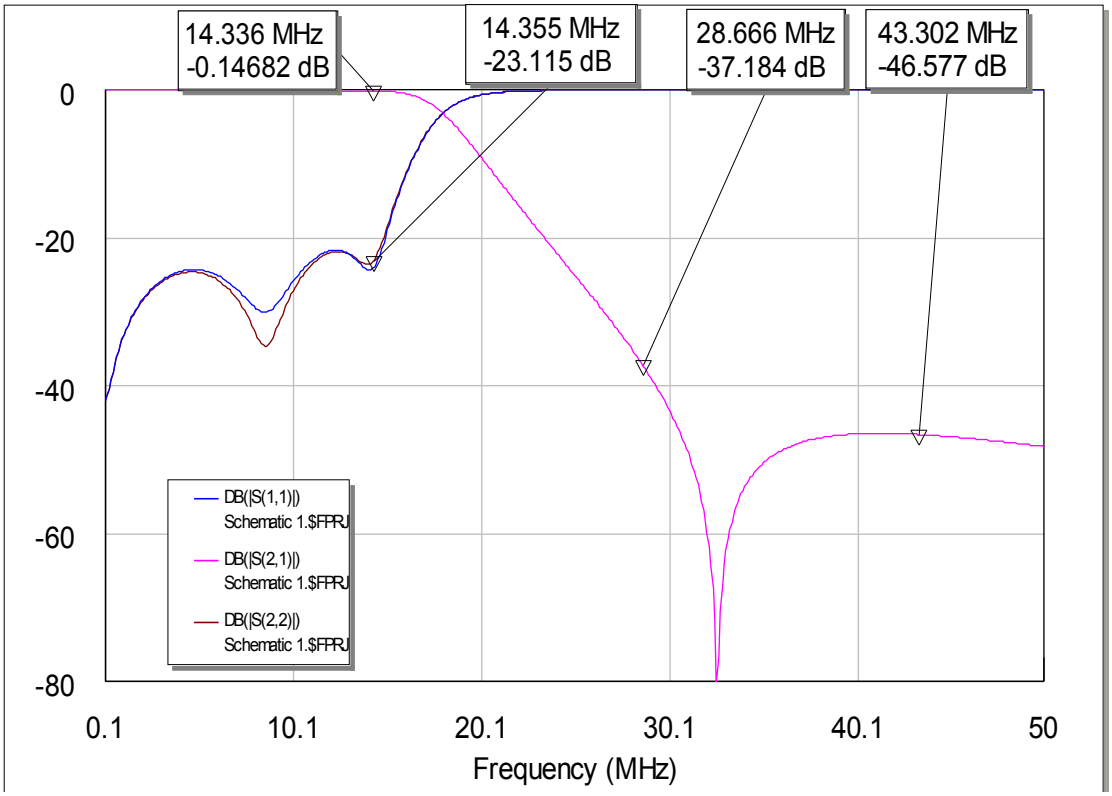
# ADTRX1-V1 POWER AMPLIFIER - YU1LM/QRP



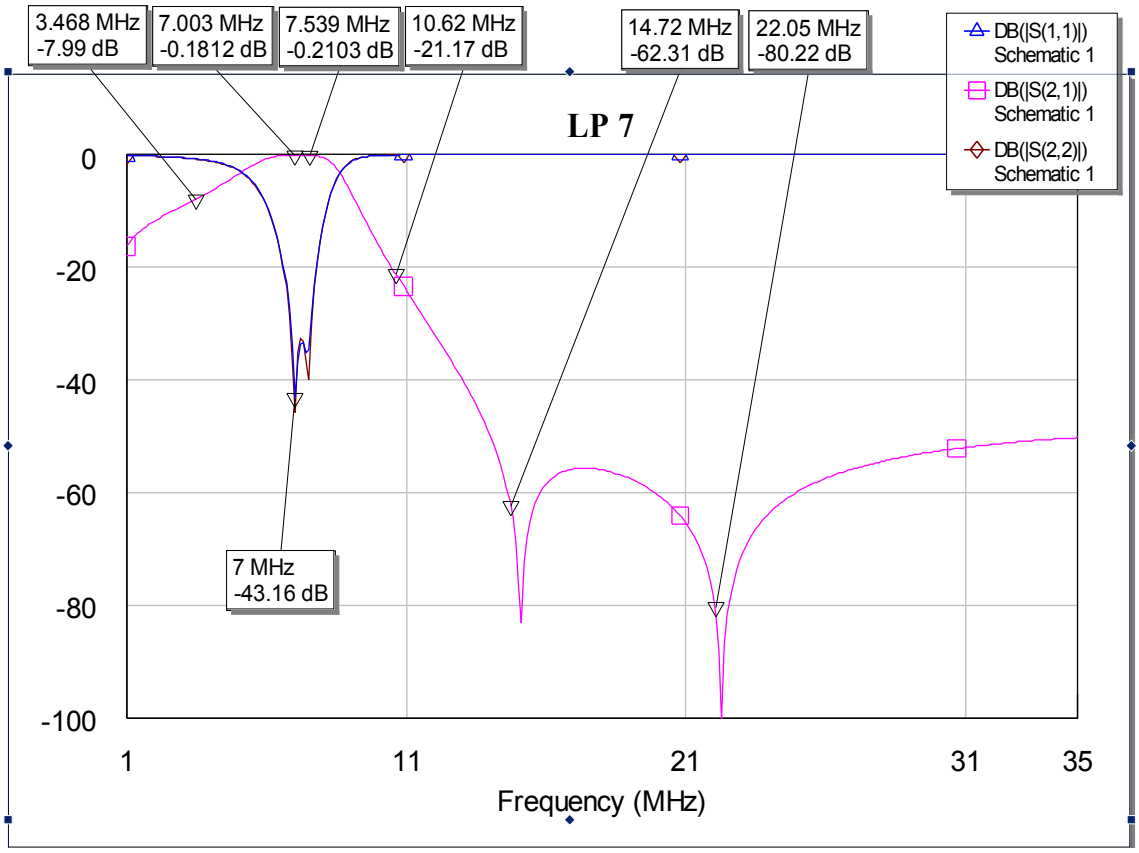

ADTRX1-V1 and B3,B4 interconnections (sandwich position starting from top)



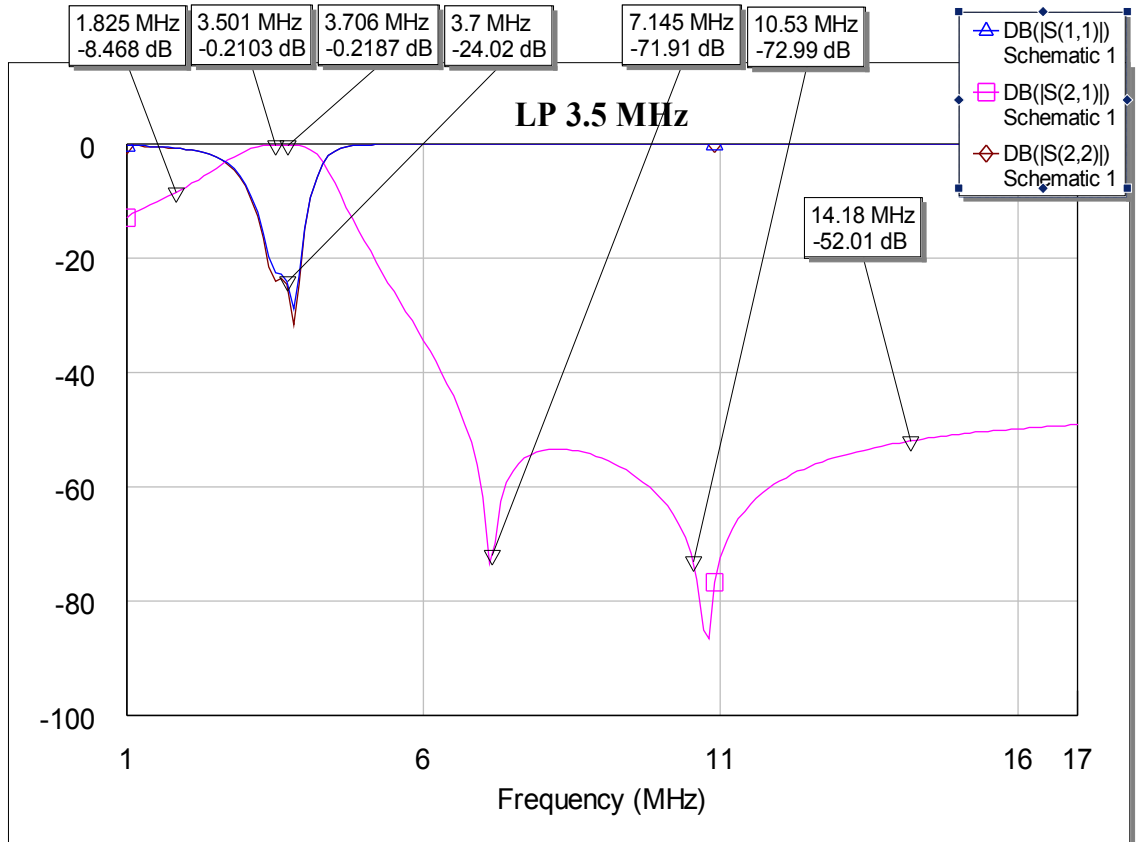

B4 BP/LP filters and RF QRP power amplifier, single side PCB dimensions 125 x 92 mm



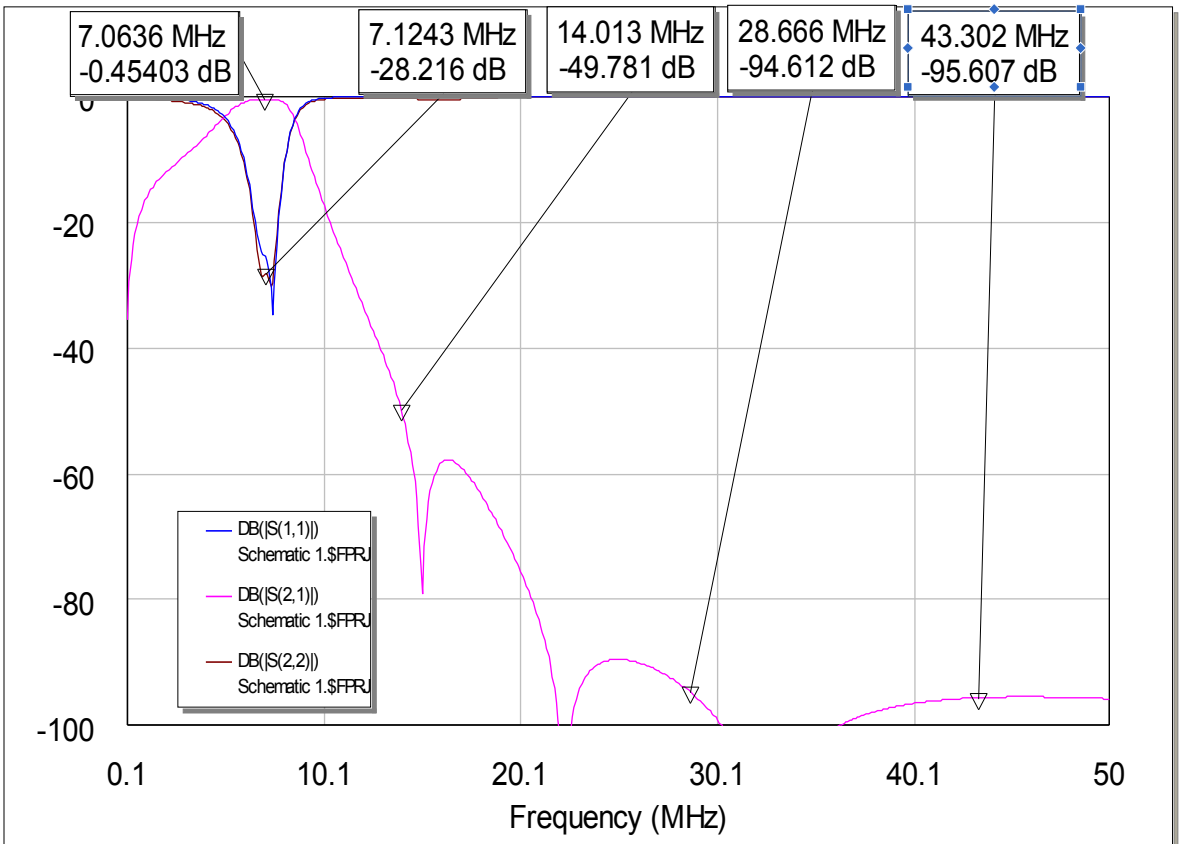

B4 PCB LP transfer characteristic for 14MHz



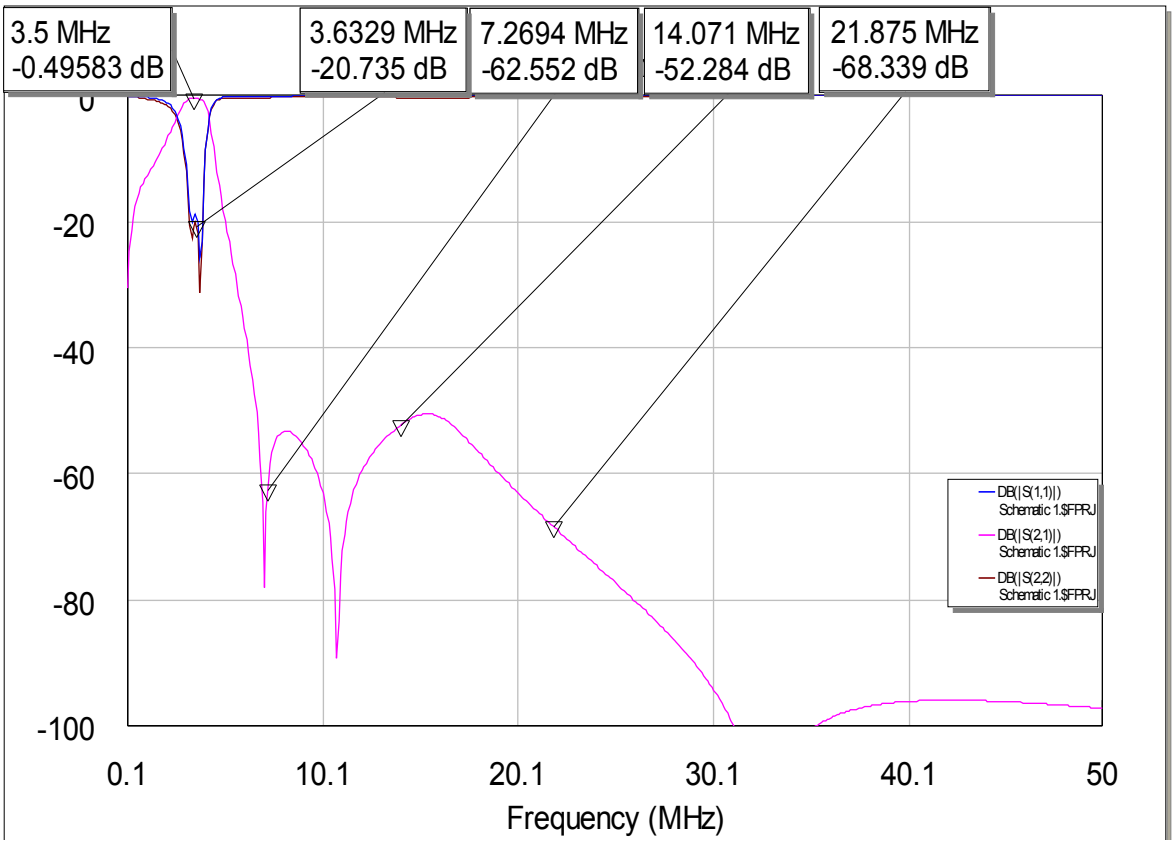

BP/LP for 7MHz characteristic alone




BP/LP for 3.5 MHz characteristic alone




LP for 14 MHz +LP/BP 7MHz




LP for 14 MHz +LP/BP 3.5MHz

Measuring results which I made with transceiver ADTRX-1V1 +B3+B4

1. Receiving range is going from 30 kHz to 35 MHz for DIL ICs version.
2. IIP3 28-30dBm and it depends from setting and used programs
3. MDS -112 to -116 dBm also with 24 bit external USB SB card Audigy NX2
4. Image rejection is from 35 -65 dB with hardware realization only
5. Sensitivity 0.8-1.2uV for 10 dB S/N ratio, max S/N ratio I measured was 68dB.
6. SFDR (Spurious free dynamic range) is 88-92 dB, this results are with signals spaced 5 kHz and more. Results are not changing very much if we spaced two signals to classical 20 kHz or more.
7. Output power 3-5W
8. Carrier suppression goes from 35-55 dB(1.8 MHz)
9. Image rejection in transmitter part is 35-49 dB.
10. Harmonics suppression 50dBc

Some excellent performances aren't without other side:

1. First and very big disadvantage is 4 times higher LO. And it is not possible cover completely all 3 bands
2. Image rejection is changing through receiving /transmitting bands and results are done for frequencies 12 kHz from central receiving frequency. There is also degradation in image rejection as frequencies are increasing.

ADTRX-1V1 +B3+B4 adjustments are simple and done in two steps if we omitted ADTRX1V1 adjustment explained previously .:

1. Adjust first LO with part with coil to stable operation and max output power if we are using overtone oscillator. If it is fundamental mode oscillator there is no adjustment.
2. Adjust CW monitor level with trimmer 5K.to pleasant monitoring level.

I wish you successful ADTRX-1V1 +B3+B4 realization and I apologize for some possible mistakes. I made great effort to make SDR projects and share them with all who are interesting for. Anyway send me your comments positive or negative, results or photos of your realization please.

**VY 73/72 and GL in SDR homebrew Tasa YU1LM/QRP**

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**stasic@eunet.yu**

***References:***


1. ***www.yu1lm.qrpradio.com/homebrew***
2. ***http://forum.cqham.ru/viewforum.php ?f=28***
3. ***Skidan@mail.ints.net T03DSP UR3IQO http://users.ints.net/skidan/T03DSP***
4. ***http://www.nitehawk.com/sm5bsz Leif LINARD***
5. ***http://www.flex-radio.com SDR1000 Gerald AC5OG***
6. ***http://www.njqrp.org/mbrproj/9850dds.html***

***www.analog.com/en/prod/0,,770_843_AD9850,00.html***

***http://www.qsl.net/pa3ckr/signalgenerator/***

***http://www.k6ese.com/DDS_Project.htm***

***http://ham.kiev.ua/pic/dds_ham2.html***

***http://www.qsl.net/om3cph/dds/rx.html***

***http://www.seboldt.net/k0jd/othervfo.html***

***http://perso.wanadoo.fr/f6itv/p2063001.htm***

***http://koti.netplaza.fi/~jonverro/ad9854.htm***

***http://www.labyrinth.net.au/~steve/freq/***

***http://members.aol.com/Dl4JAL/DDS.html***

***http://hem.passagen.se/communication/dds.html***

7. ***Recent Advances in Shortwave Receiver Design Dr. Ulrich Rohde QST Nov 1992 page 53***
1. ***RF Design 6/1995***
2. ***Philips- Application note AN97090( IC gate overtone oscillator design)***


***Software LINK for SDR radio receiving and transmitting***

1. ***http://digilander.libero.it/i2phd/ SDRadio software ver 1.0***

   ***www.qsl.net/i2phd Alberto I2PHDhttp://gpsdo.i2phd.com/***

2. ***ik2czl@weaksignals.com <ik2czl@weaksignals.com>ik2czl@weaksignals.com <ik2czl@weaksignals.com>Vittorio***
3. ***www.weaksignals.com WINRAD***
4. ***www.ciaoradio.com***
5. ***www.m0kgk.co.uk/sdr***
6. ***www.g8jcf.dyndns.org Peter G8JCF***
7. ***http://www.nitehawk.com/sm5bsz Leif LINARD***
8. ***http://www.flex-radio.com SDR1000 Gerald AC5OG***
9. ***dl6iak.ba-karlsruhe.de***