uSDX mOnO – A mono band HF all mode SDR Transceiver Kit

Build and Operation Manual

(Manual Version 1.2)

uSDX mOnO is a single band SDR all mode HF transceiver covering 80m through 10m HF bands. Although it is classified as a single band HF transceiver in reality it can be used in more than a single band by swapping LPF Band modules which are plug in band specific Low pass filter modules. These modules give uSDX mOnO a multiband HF Transceiver capability.

uSDX mOnO consists of three basic modules or boards.

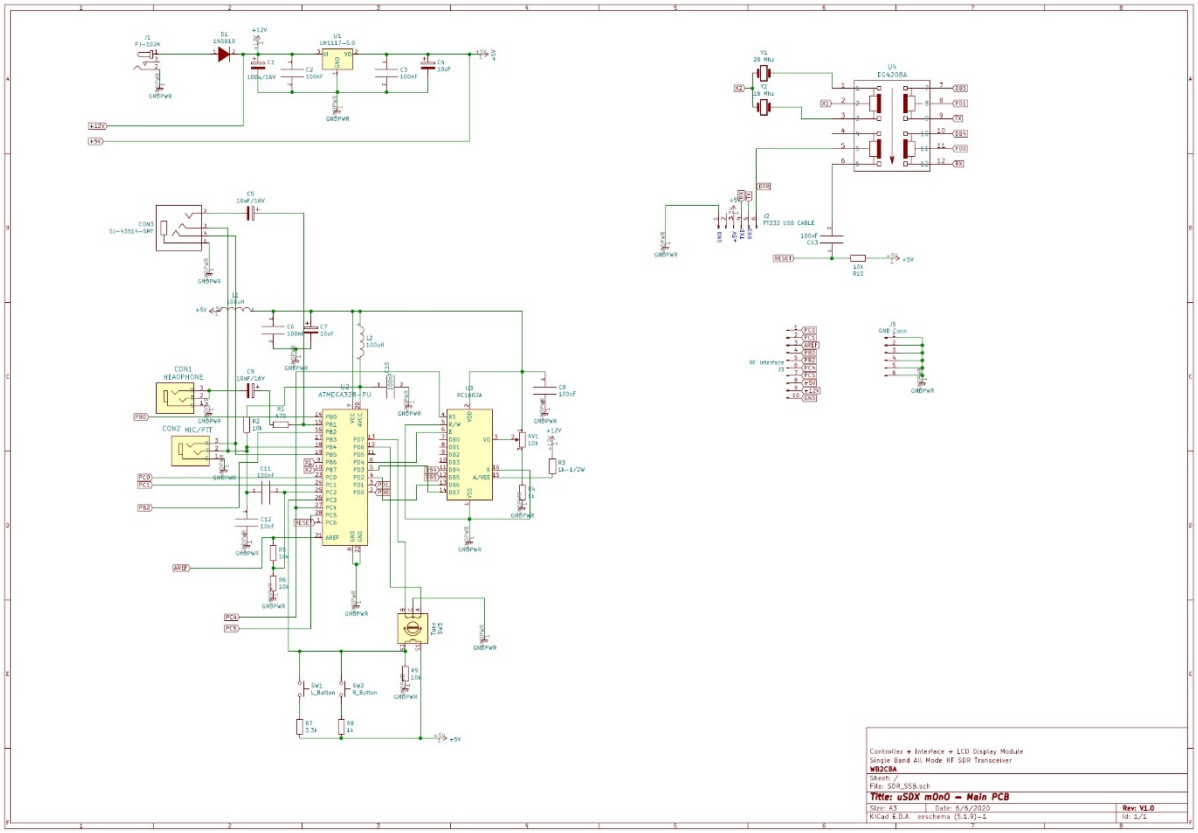
- Main Module
- RF Module
- LPF Band Modules

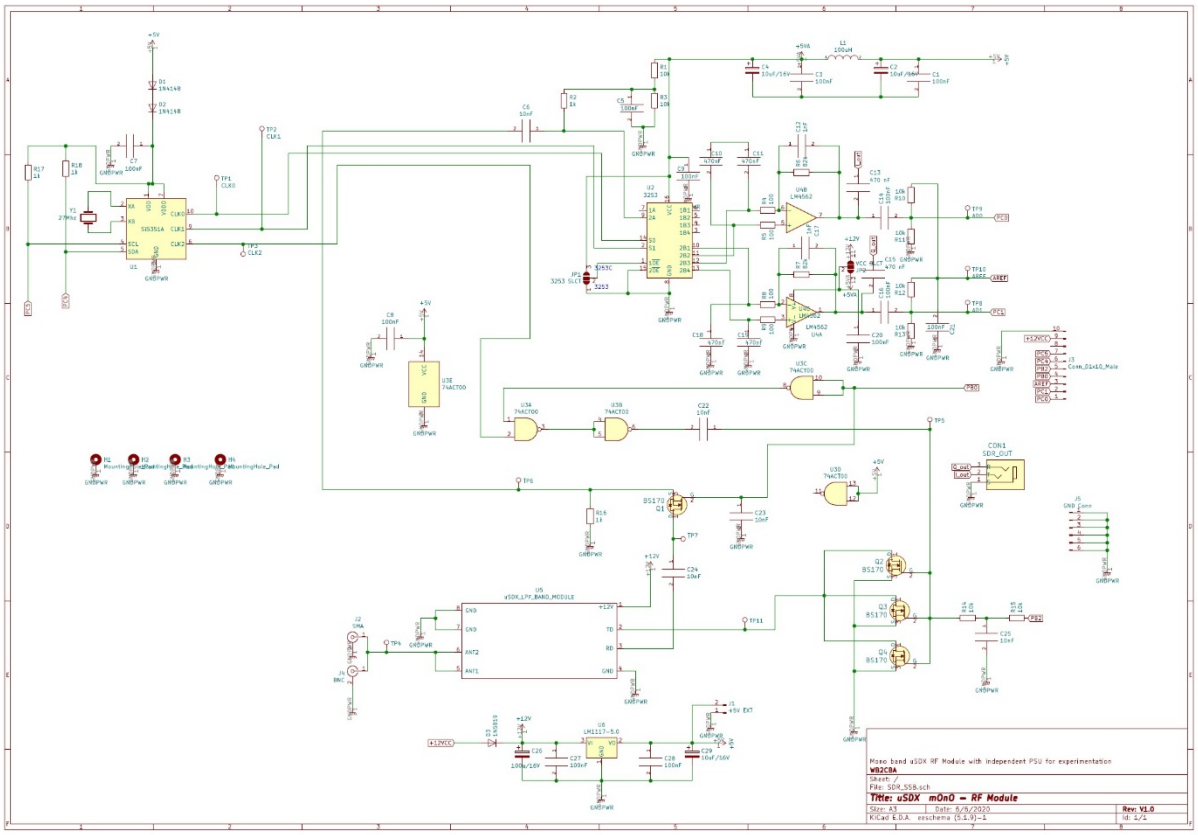
Top board is called main board and holds all digital and interface hardware such as buttons, tuning encoder and LCD display, ATmega328P microcontroller, MIC/SPK , MIC/PTT and HEADPHONE jacks, DC Power barrel connector and other relevant bits and pieces.

Bottom board is called RF board and as the name implies holds everything related to RF aspects of transceiver. This board has Power amplifier mosfets, LPF band low pass filter module header, Receive Tayloe detector unit and related opamp as well as SI5351 PLL VFO. This board is designed as a breadboard friendly module with it's own 12V to 5V regulator independent of main board so that it can be used as an experimental RF board for uSDX testing purposes with other microcontroller alternatives to make development easy for experimenters.

LPF Band module is a tiny LPF module with all band specific components on it. These modules gives flexibility to plug in different modules for different bands and achieve multiband capability with a simple plug in module design for all bands building with different band dependent filter components.

These are schematics of uSDX mOnO Main module, RF Module and LPF Band Module. Detailed PDF version of schematics are available in this link: https://github.com/WB2CBA/uSDX-mOnO




Mono band uSDX RF Module with independent PSU for experimentation
WB2CBA
Sheet: /
File: SDR_SSB.sch
Title: uSDX mOnO – RF Module
Size: A3 | Date: 5/5/2020
KiCad E.D.A. eeschema (5.1.9)-1
Rev: V1.0
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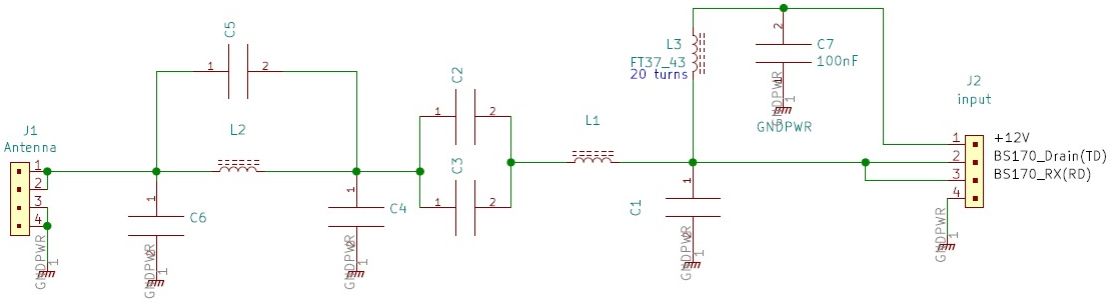

J1
Antenna
L2
C5
C6
C4
C2
C3
L1
L3
FT37_43
20 turns
C7
100nF
C1
J2
input
+12V
BS170_Drain(TD)
BS170_RX(RD)
GNDPWR

1- uSDX mOnO boards – soldering and installing

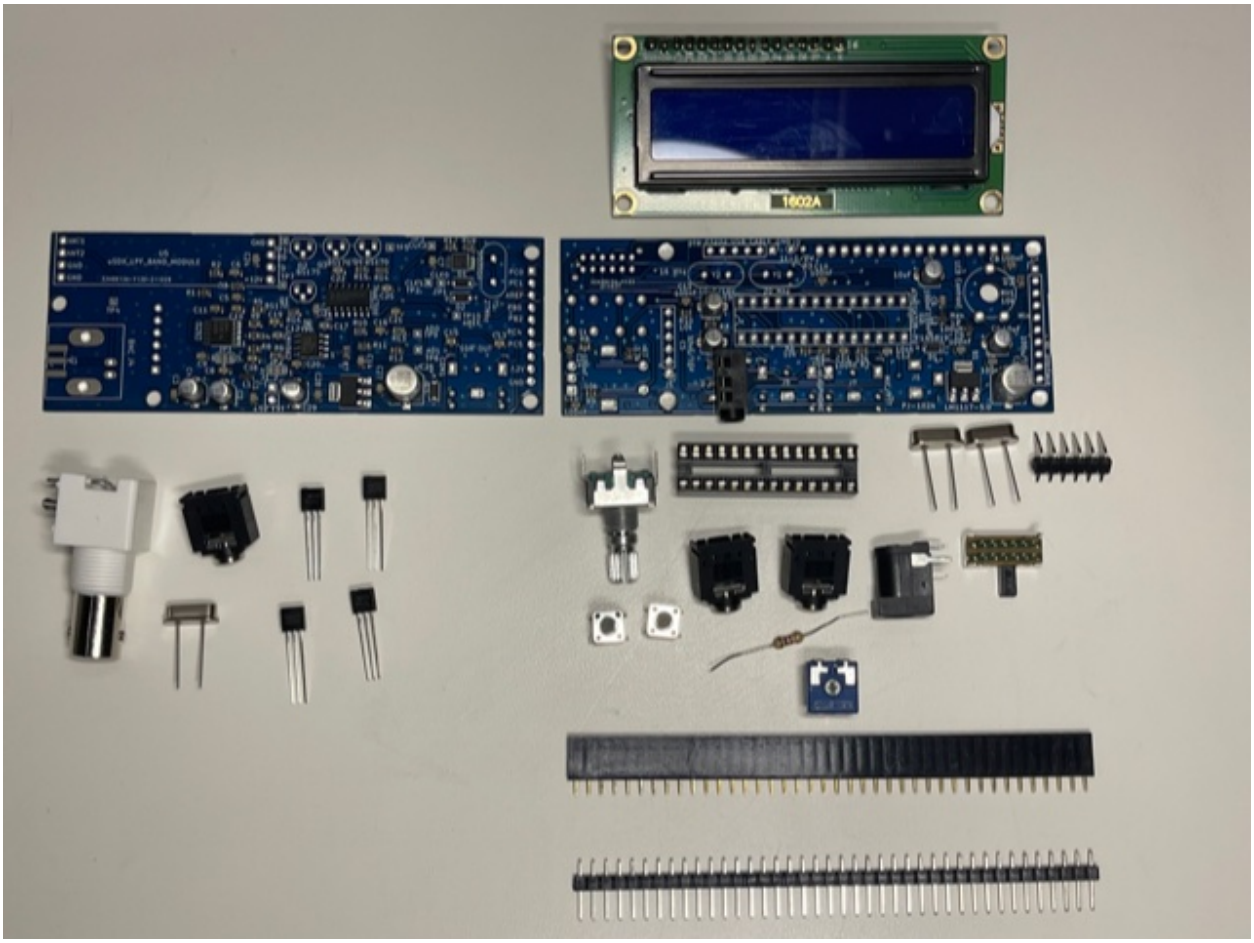
uSDX mOnO consists of two smd manufactured PCB boards and five LPF band Boards. Three LPF Band Boards will be supplied with all components for building 40m, 30m and 20m bands. Two blank LPF band boards will be supplied with non-band dependent capacitors and T37-6 toroids. Band dependent capacitors C1 to C6 are left to the builder and depend on the band chosen.

This is an illustrative photo of all through hole parts as well as two pcb units that needs to be soldered (LPF band module is not included in this photo) :

Before we start soldering our uSDX mOnO boards let's outline that there are two types of main board and RF board for this kit. One with Through hole audio jacks and one with smd pre soldered audio jacks.

Functionality wise they are exactly same boards only difference being the audio jack mounting type. If your uSDX mOnO kit comes with Through hole audio jacks then you need to solder them in place.

If your uSDX mOnO kit comes with pre soldered smd audio jacks then it is always a good idea to touch solder joints with a bit of solder to secure the smd jacks better in place for future wear and tear as we



will constantly insert jacks in and out. Smd pick and place soldering is minimal to hold these jacks in place that's why we are touch soldering them.

One more point to consider is world chip shortage! Due to chip shortage some of the chips are not pick and place in smd manufacturing plant as they are out of stock. At the moment 74ACT00 and LM4562 opamp on RF board are not in stock. 74ACT00 and LM4562 opamp will be supplied with the kit soldered in place.

- **uSDX mOnO RF Board:**

We will start our soldering parts adventure with RF Board. There are three steps to follow for soldering all RF board parts.

This is the BOM List for RF board:

4 x BS170 or BS270 Mosfet Power Amplifier Transistors (whichever is supplied with your kit)

1 x SJ3523N 3.5 mm stereo audio jack for SDR I/Q Output

1 x 27 Mhz Crystal

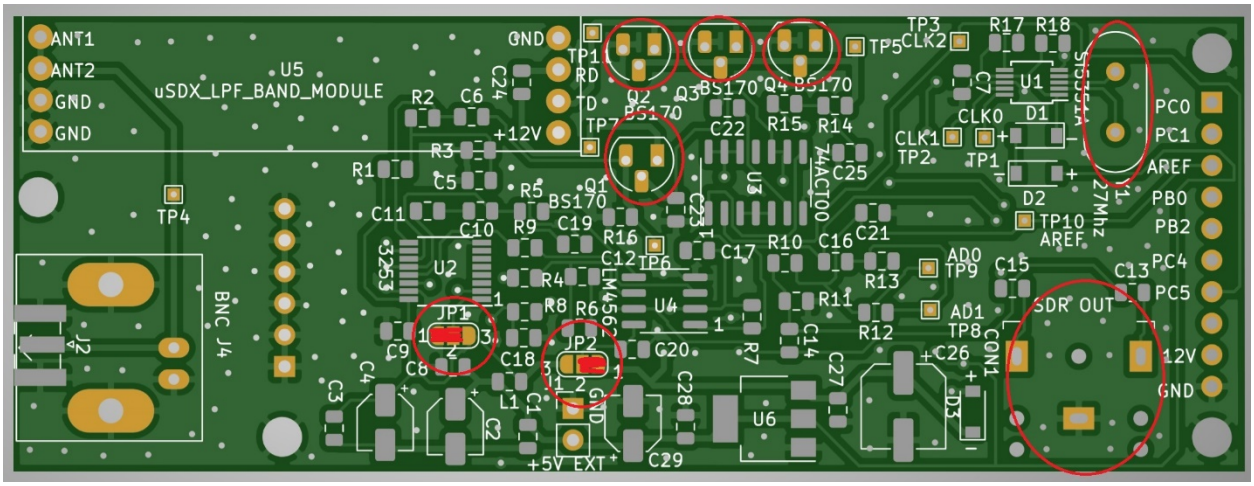
1 x BNC Antenna Connector

10 pin male pin header (we will cut this from supplied 40 pin male header)

6 pin male pin header (we will cut this from supplied 40 pin male header)

2 x 4 pin female pin header (we will cut this from supplied 40 pin female header)

STEP 1:



In step 1 parts to be soldered outlined with red:

2 x Solder Jumpers JP1 and JP2 as in the photo. JP1 – Solder between pads 1 and 2, JP2 – Solder between pads 1 and 2.

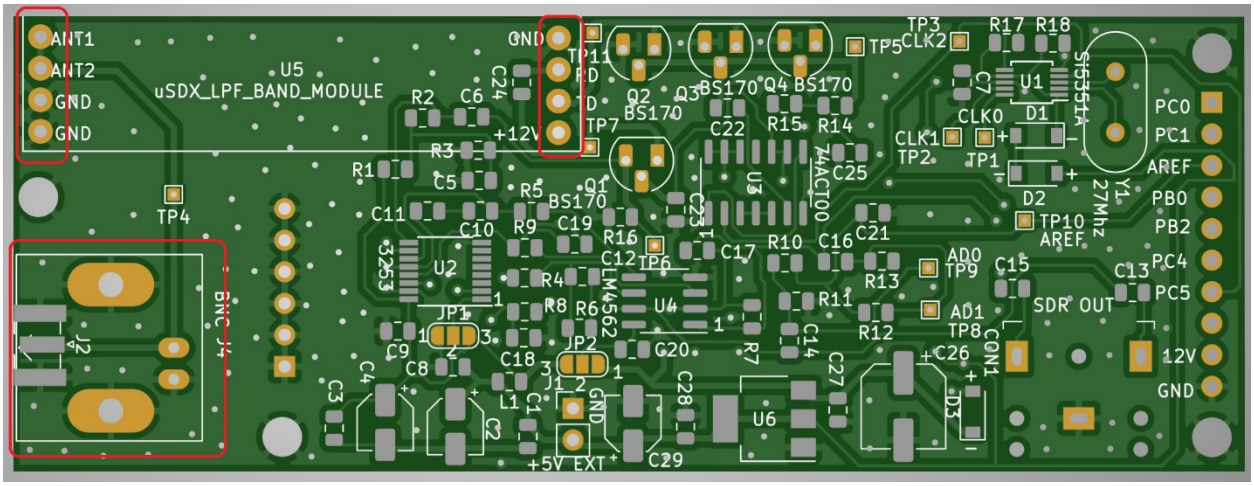
4 x BS170 or BS270 Mosfet Power Amplifier transistors (whichever supplied with your kit).

1 x 27 Mhz Crystals

1 x SJ1-3523N 3.5 mm Audio Jack

Note: JP1 and JP2 jumpers are soldered in as part dependent jumper selection. JP1 Jumper is used to select various types of 3253 IC and JP2 is to allow to choose between +5V and +12V Vcc Opamps for flexibility.

STEP 2:

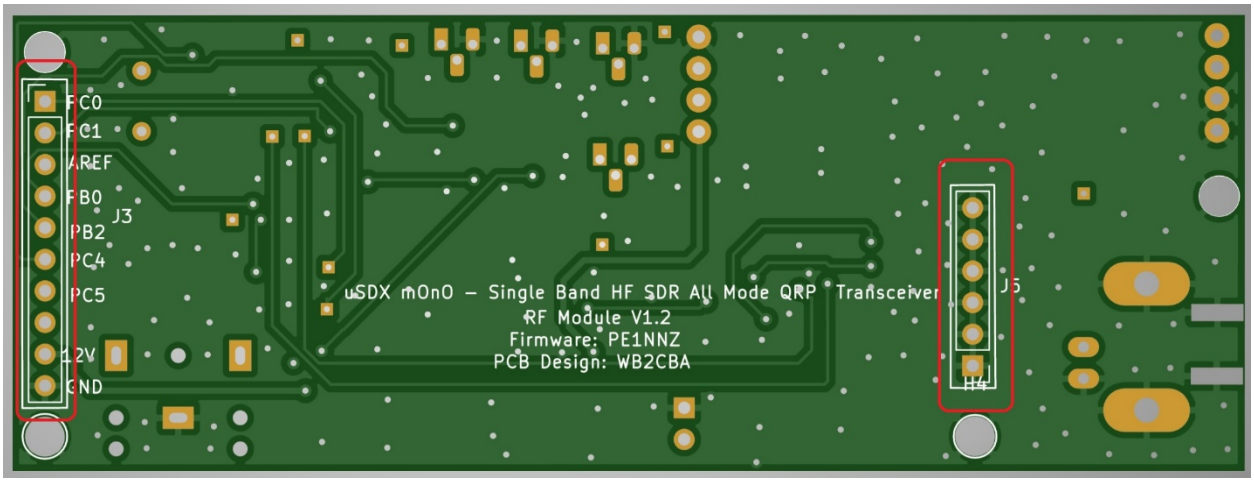


In Step 2 parts to be soldered outlined with red:

2 X 4 pin female headers (Cut from supplied 40 pin female header strip)

1 x BNC Antenna Connector

STEP 3:

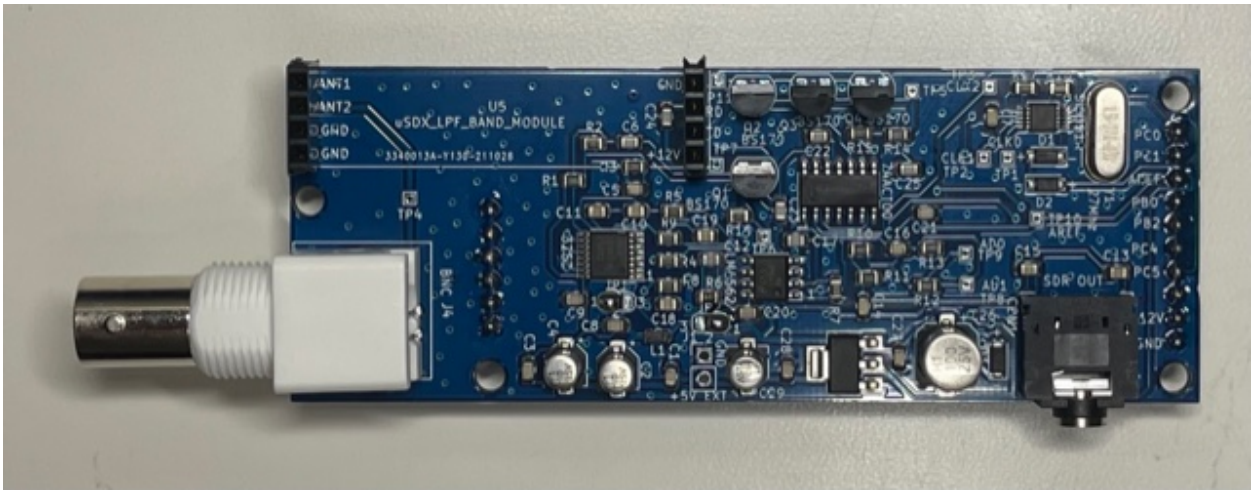


In Step 3 flip the RF board to solder side and solder parts outlined with red:

1 x 10 pin male pin header (we will cut this from supplied 40 pin male header)

1 x 6 pin male pin header (we will cut this from supplied 40 pin male header

Finished RF board should look like this:



<u>uSDX mOnO Main Board:</u>

BOM Part list for uSDX mOnO Main Board:

1 x Programmed ATmega328p Microcontroller

1x 28 pin DIP IC socket

1 x 2x16 Character LCD Display

1 x two position slide switch

2 x 6x6x15 mm tactile switch

1 x Rotary Encoder

1 x 20 Mhz Crystal

1 x 16 Mhz Crystal

1 x 10k Trimpot potentiometer

1 x 1k ½ watt Resistor

2 x SJ1-3523N 3.5 audio jack

1 x DC power barrel connector

10 pin female pin header (we will cut this from supplied 40 pin female header)

6 pin female pin header (we will cut this from supplied 40 pin female header

1 x 6 pin male 90 degree pin header

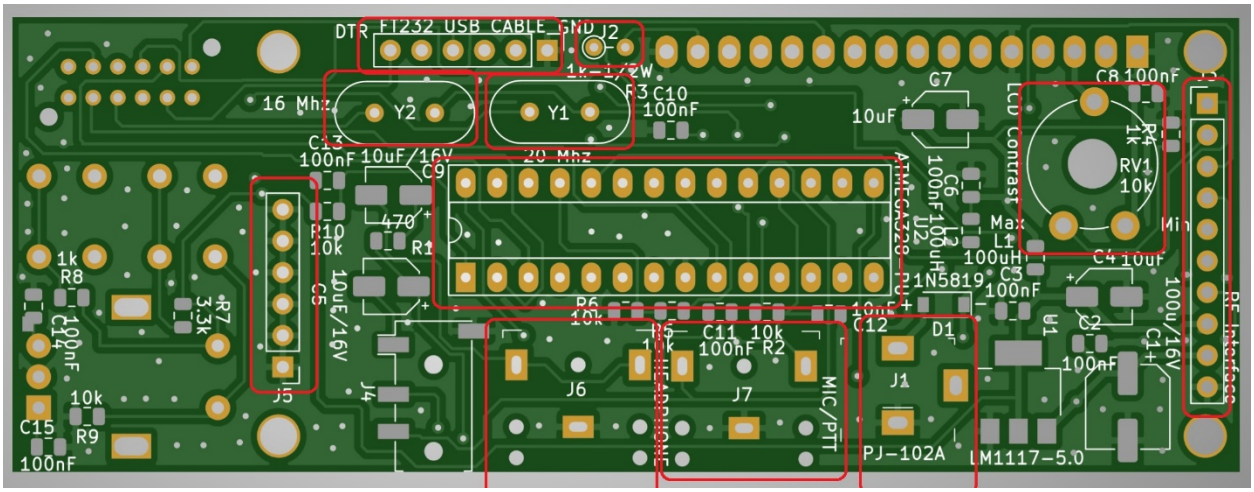
1 x 16 pin male header (we will cut this from supplied 40 pin male header)

1 x Top panel pcb

4 x M3x12mm plastic bolts

4 x M3x0.5mm plastic nuts

STEP 1:



In step 1 Solder parts outlined with red:

1x 28 pin DIP IC socket

1 x 20 Mhz Crystal

1 x 16 Mhz Crystal

1 x 10k Trimpot potentiometer

1 x 1k ½ watt Resistor

2 x SJ1-3523N 3.5 audio jack

1 x DC power barrel connector

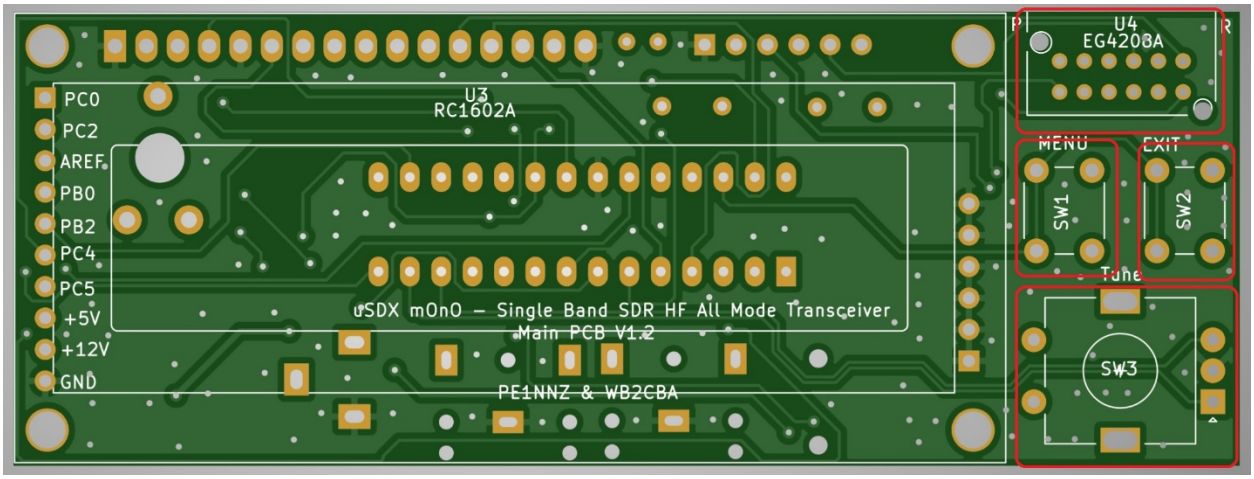
1 x 6 pin male 90 degree pin header

1 x 10 pin female pin header (we will cut this from supplied 40 pin female header)

1 x 6 pin female pin header (we will cut this from supplied 40 pin female header

Insert Programmed ATmega328P to it's 28 pin IC socket

STEP 2:



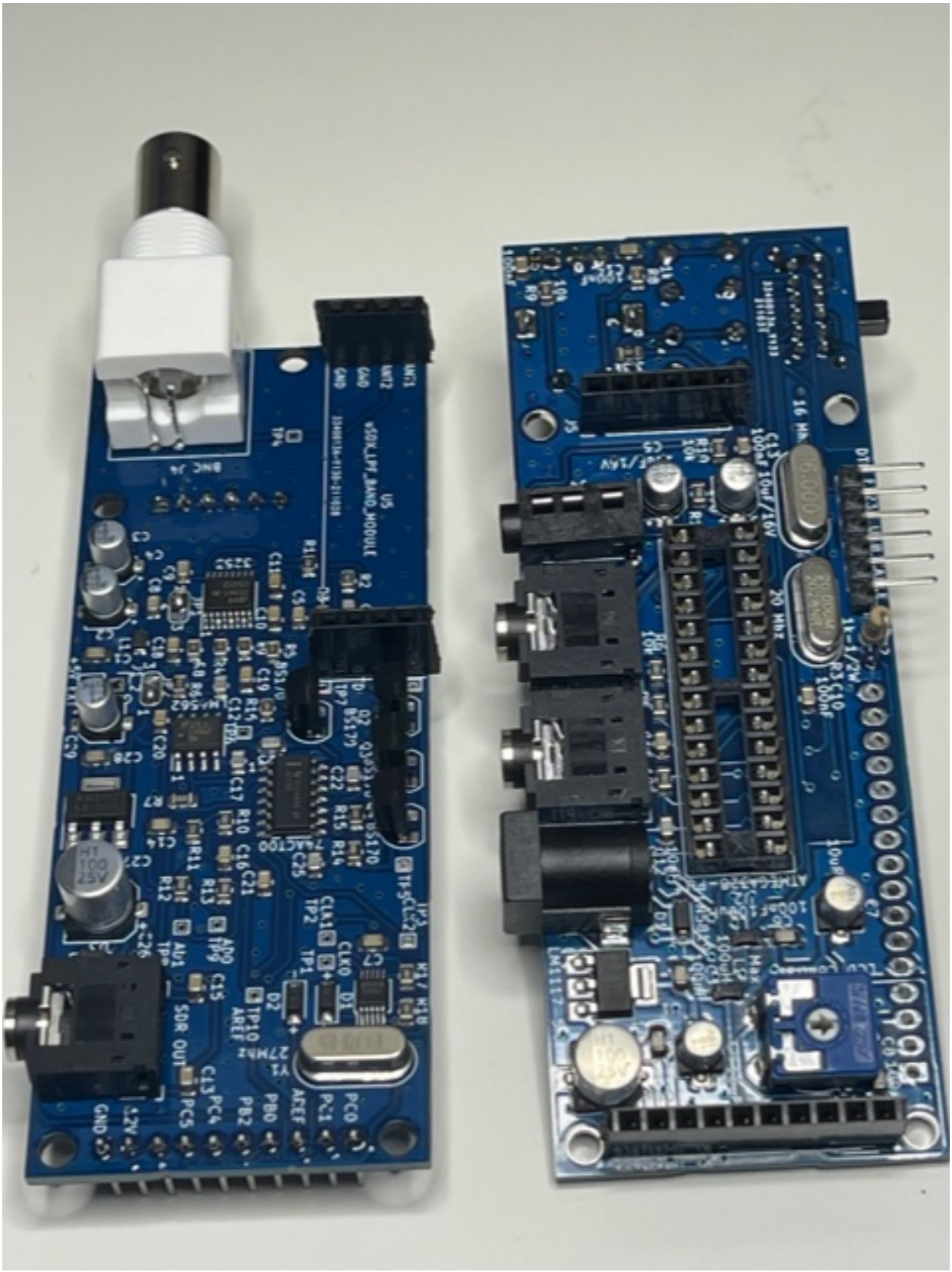
In step 2 Solder parts outlined with red:

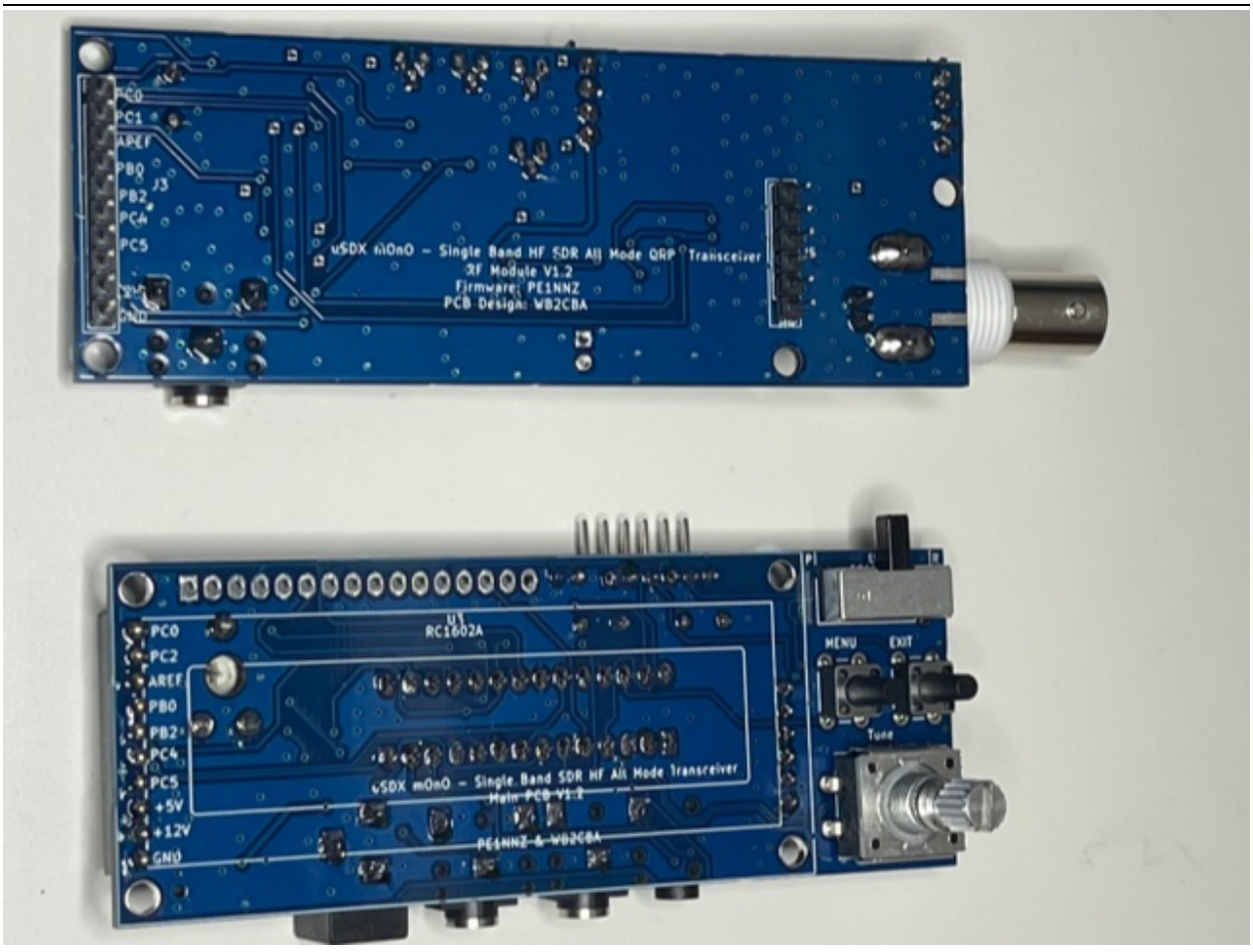
1 x two position slide switch

2 x 6x6x15 mm tactile switch

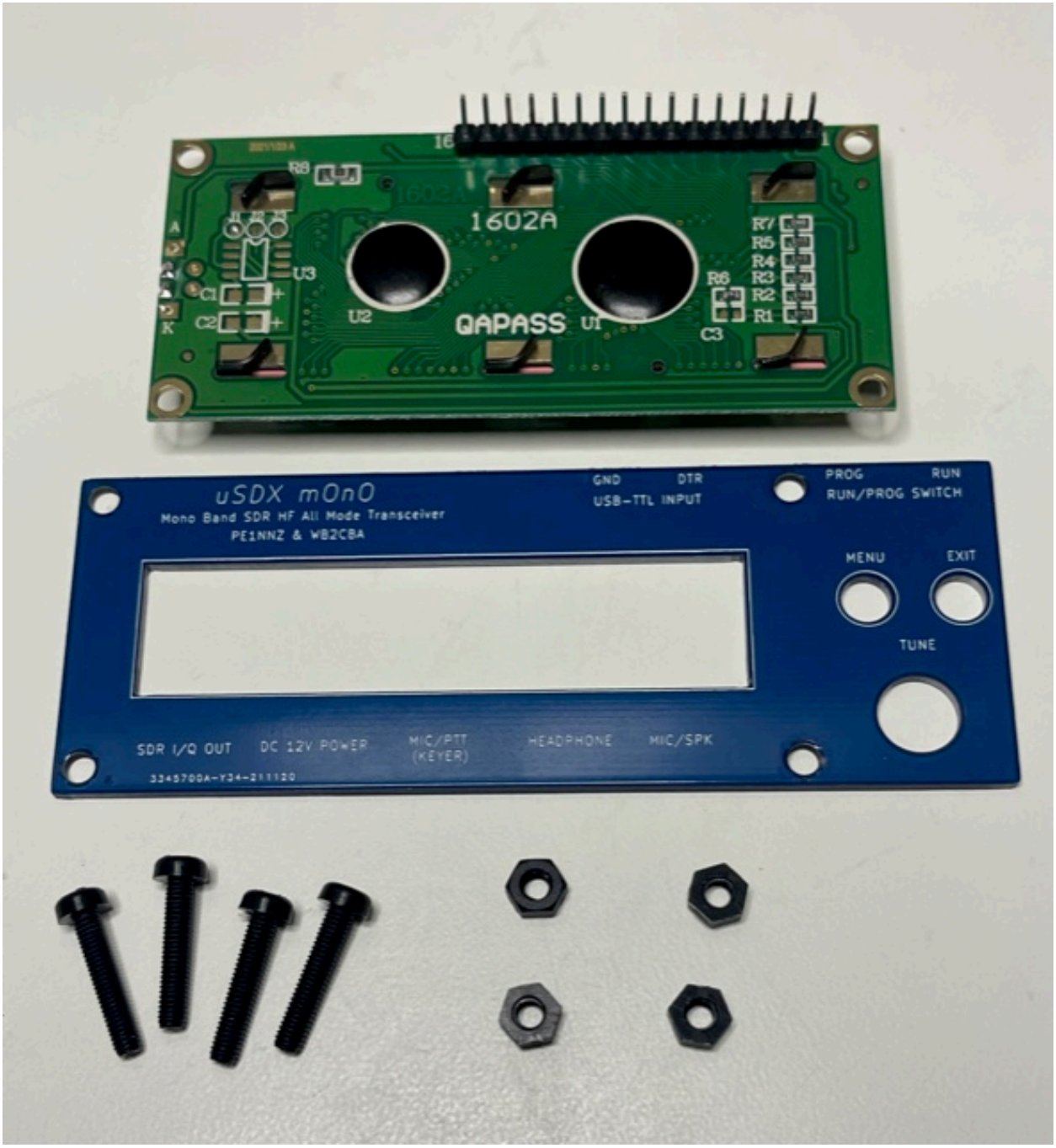
1 x Rotary Encoder

Soldered Main board and RF Board should look like this:




PC0
PC1
AREF
PB0
PB2
PC4
PC5
J3
uSDX mOnO – Single Band HF SDR All Mode QRP Transceiver
RF Module V1.2
Firmware: PE1NNZ
PCB Design: WB2CBA
U1
RC1602A
PC0
PC2
AREF
PB0
PB2
PC4
PC5
+5V
+12V
GND
MENU
EXIT
Tune
uSDX mOnO – Single Band SDR HF All Mode Transceiver
Main PCB V1.2
PE1NNZ & WB2CBA

STEP 3: Preparing and soldering LCD Display:



In this step we need these parts listed below:

1x LCD Display - 2x16 Character

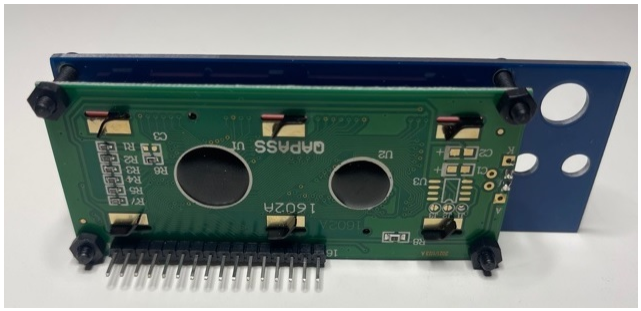
1x 16 pin male header (Cut from 40 pin male header)

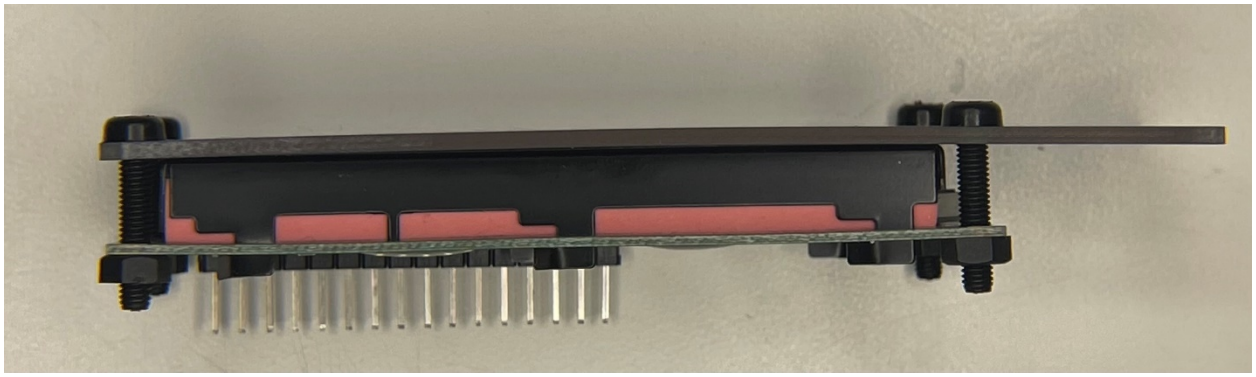
1x Top panel pcb

4x M3x12mm plastic bolts

4x M3x0.5mm plastic nuts

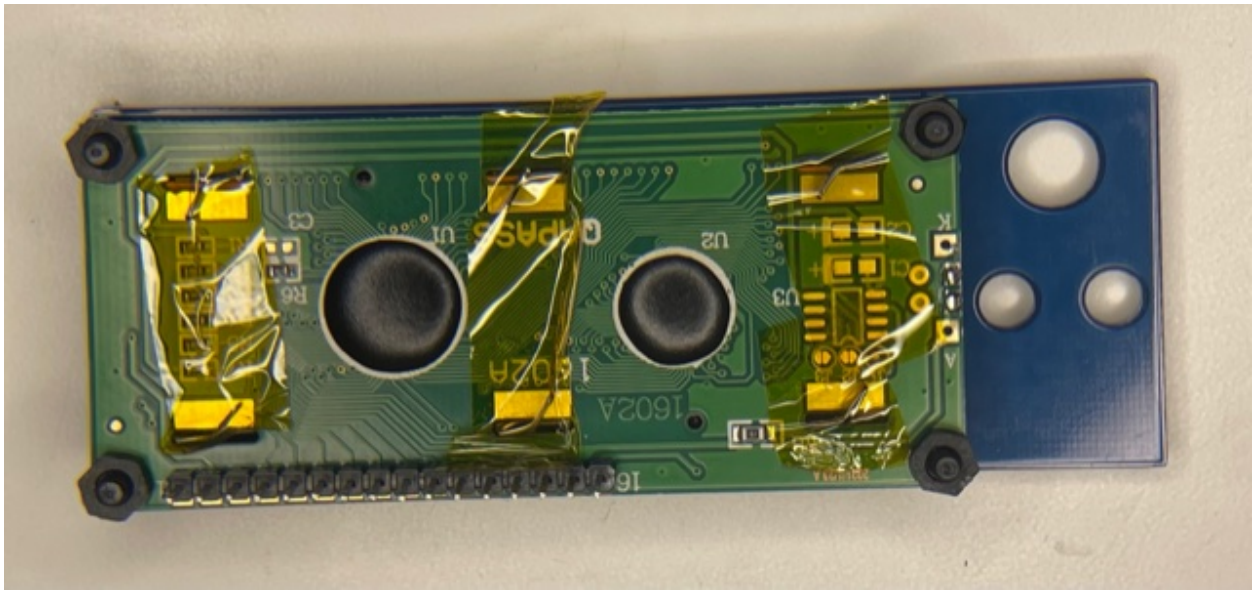
- Solder 1 x 16 pin male header as in the above photo to LCD display.
- Install Top Plate pcb as in the photos below using 4 bolts and 4 nuts supplied:





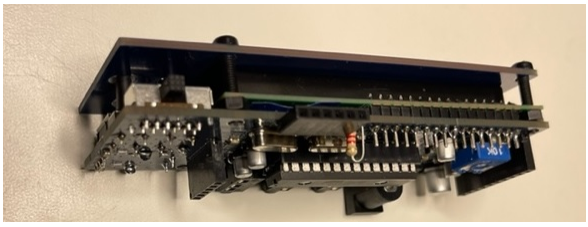
Do not over tighten bolts which can bend LCD pcb and cause it to crack! Just snug tight will do the job!

- Using some electrical insulation tape cover LCD Display metal tags as in the photo. This is a preventive measure to prevent any shorts with the main board solder side when we solder LCD Display on main board.



- Now solder LCD Display to Main board as snug tight as possible.

Finished Main board from side should look like this:



Installing RF Board back plate:

These are the parts required for RF board back plate installation:

1 x RF back plate

4 x M3 x 15mmx6mm plastic stand off

4 x M3 x 4 mm plastic bolts

4 x M3 x 0.5 mm plastic nuts

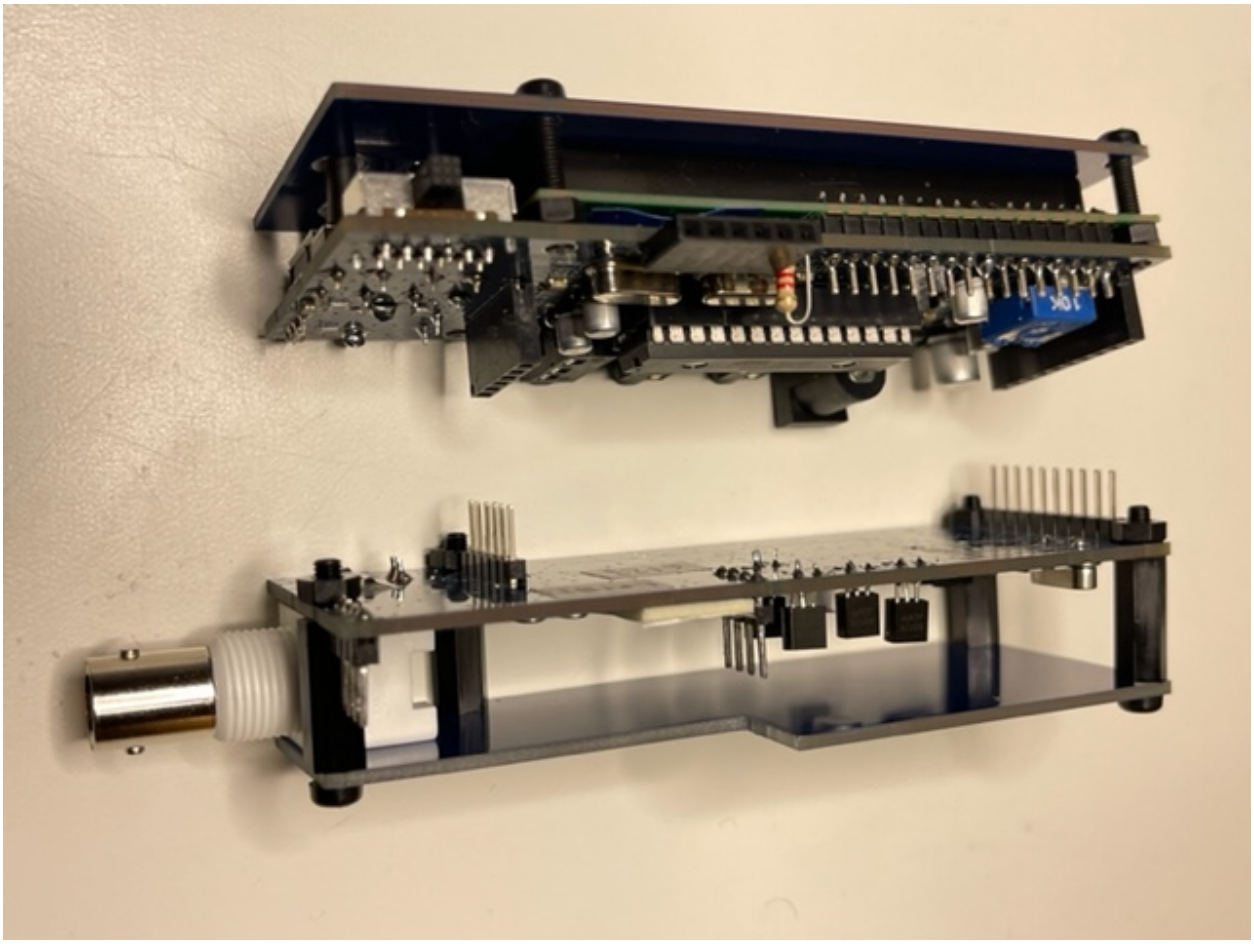
STEP 1:

- Install 4 stand offs with M3 plastic nuts as in the photo above.
- Place a piece of electrical tape at LPF board area as in the photo above. This is to prevent and short when we install the pluggable Band LPF board.

STEP2:

- Using 4 x M3 bolts screw down back plate to RF board via previously installed stand offs.

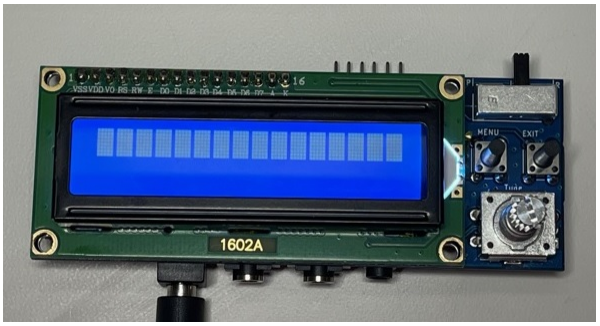
Now we will have two completed halves of the uSDX mOnO as in the photo:



Before joining two halves together to complete transceiver build up we need to power up main board to adjust LCD contrast.

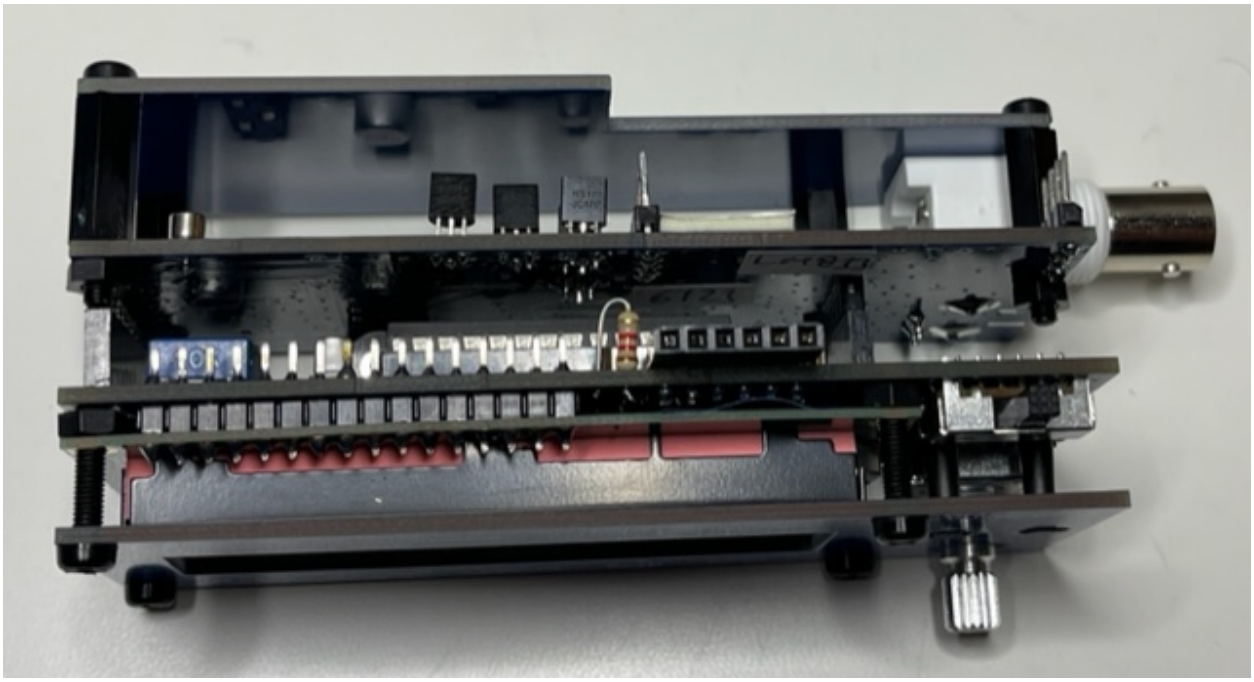
In order to do that follow these steps:

1- Take Main board unit only and connect to +12V DC power supply. Do not install RF board half yet to Main board half for this power up.
2- Adjust potentiometer VR1 until top row squares are visible and clear. Please see below photo:



3- Unplug DC 12V.

Now plug Main board to RF board matching headers carefully without skipping any pins. This will complete uSDX mOnO soldering and installation. The finished Transceiver should like this:



This completes soldering and building uSDX mOnO Trasnceiver.

Band specific LPF(Low Pass Filter) BAND Modules:

uSDX mOnO Transceiver uses Serial Resonance Low pass filter modules for each band it operates. For each band we choose to operate on we need to build a Band LPF Filter Module. We will swap these modules for the band we will operate on. Let's say a contest is going on in 40m/7Mhz band and we want to operate on that band. Then we will grab and plug in 40m/7Mhz Band Module and Voila! Now we can operate uSDX mOnO on 40m/7Mhz. Same applies to other bands. Although uSDX mOnO is a mono band transceiver these plug in band modules gives it a multiband capability and flexibility.

These modules can be built using supplied 5 pieces of Band Low pass filter module pcb boards. If more LPF band module PCB's are needed then those can be ordered by using GERBER file for uSDX mOnO LPF band Module from this link: https://github.com/WB2CBA/uSDX-mOnO

uSDX mOnO Kit comes with all parts needed for building 3 bands, 20m/14Mhz, 30m/10 Mhz and 40m/7 Mhz Band filter modules. These parts are capacitors and Toroid cores. Two blank LPF band boards will be supplied with non-band dependent capacitors and T37-6 toroid. Band dependent capacitors C1 to C6 are left to the builder and depend on the band chosen.

These Band filter modules can be built either using surface mount device (SMD)capacitors or through hole device(THD) capacitors.

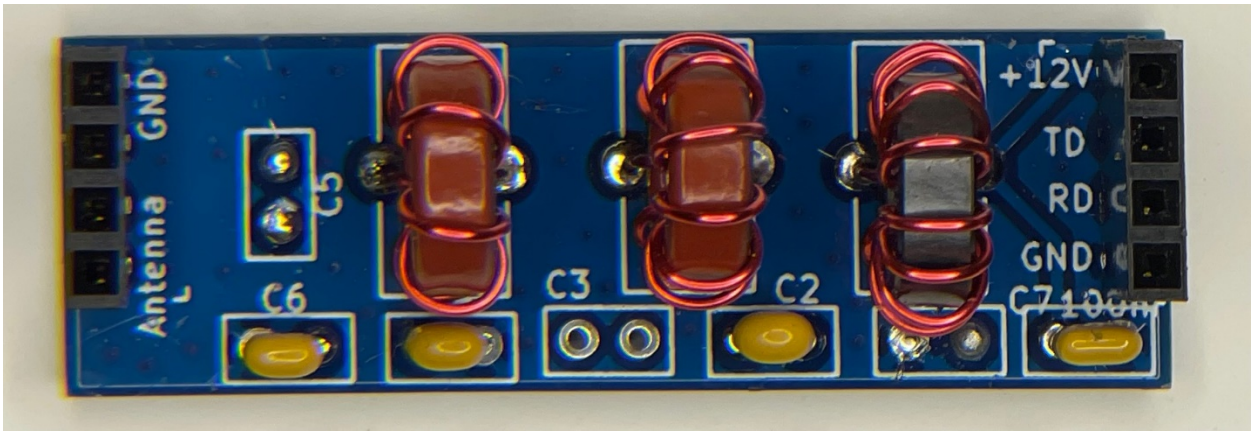
Capacitor footprint on band module pcb allows to use 0805 or 1206 footprint standard SMD(Surface Mount Device) capacitors or 2.54 mm lead spacing THD(through hole) capacitors.

Toroids used are:

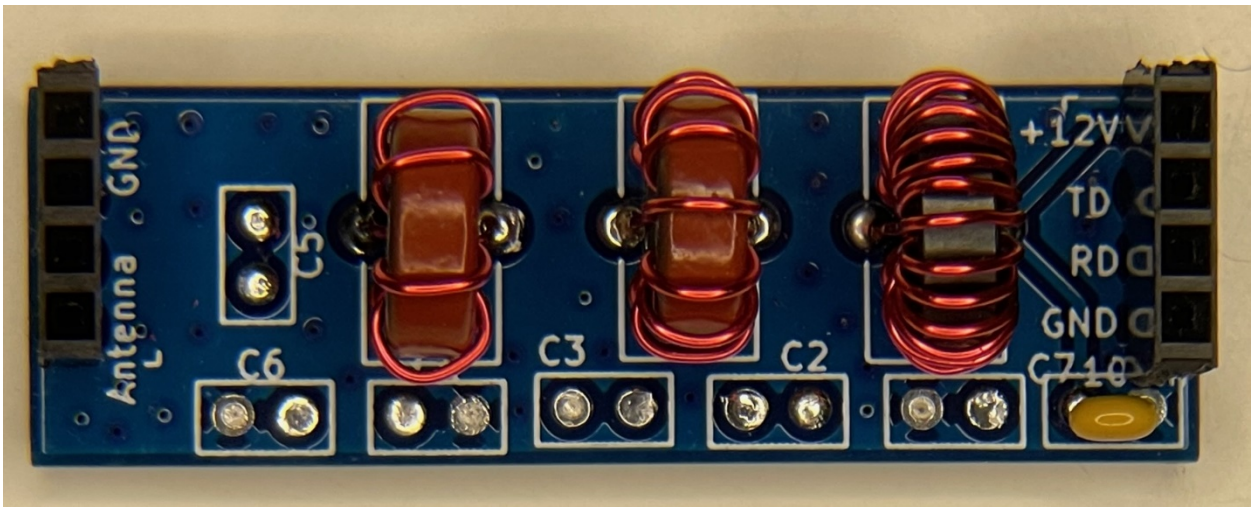
1 x FT37-43

2 x T37-2 Red toroid or T37-6 Yellow toroid depending on band selection for each band module. Up to 20m/14Mhz band T37-2 toroids work pretty good. From 17m/18Mhz band to 10m/28Mhz band T37-6 yellow toroids are used.

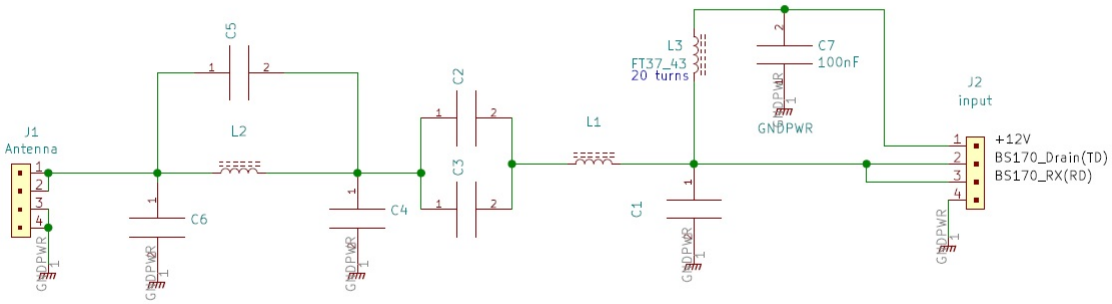
Here is a photo of Band filter module built using THD(Through hole Device) capacitors:



Photos of same filter built with SMD capacitors:



Schematic of Band LPF Module:



BOM for LPF Band Module:

2 x 4 pin header – These headers can be male or female headers depending on what is soldered on RF board. These band module headers should the opposite mate of RF board 4 pin headers. i.e if we used male 4 pin headers on RF board then Band modules must have female 4 pin headers to plug in and vice versa.

1 x C1 – Band Dependent THD or 0805 NPO 100V or more Capacitor

1 x C2 – Band Dependent THD or 0805 NPO 100V or more Capacitor

1 x C3 – Band Dependent THD or 0805 NPO 100V or more Capacitor

1 x C4 – Band Dependent THD or 0805 NPO 100V or more Capacitor

1 x C5 – Band Dependent THD or 0805 NPO 100V or more Capacitor

1 x C6 – Band Dependent THD or 0805 NPO 100V or more Capacitor

1 x C7 – 100 nF THD or 0805 Capacitor (Non band dependent capacitor)

1 x L1 – T37-2 RED or T37-6 YELLOW toroid - Band dependent

1 x L2 – T37-2 RED or T37-6 YELLOW toroid - Band dependent

1 x L3 – FT37-43 Ferrite Toroid – 20 turns. Non band dependent and same detail applies to all band LPF Modules.

AWG 26 or 0.40 mm enameled copper wire can be used for Toroid turns.

So how are we going to know which capacitor values for each band required and what Toroid to be used for L1, L2 and L3 and turn for each band?

This table will help us choosing all band dependent component values and details for each band.

uSDX mOnO "Serial Resonance LPF Band Module" Band dependent components list

Band	C1	C2	C3	C4	C5	C6	L1	L2	L3
80	680pf	360pf	1500pf	1800 pf	620pf	1800pf	21Turn/T37-2	15 Turn/T37-2	20Turn/FT37-43
60	430pf	620pf	620pf	1200pf	390pf	1200pf	17Turn/T37-2	12Turn/T37-2	20Turn/FT37-43
40	300pf	470pf	470pf	1000pf	300pf	1000pf	14Turn/T37-2	9Turn/T37-2	20Turn/FT37-43
30	200pf	330pf	330pf	680pf	220pf	680pf	12Turn/T37-2	8Turn/T37-2	20Turn/FT37-43
20	68pf	470pf		470pf	150pf	470pf	10Turn/T37-2	7Turn/T37-2	20Turn/FT37-43
17	91pF	180pF	180pF	360pF	120pF	360pF	11Turn/T37-6	7Turn/T37-6	20Turn/FT37-43
15	68pF	300pF	15pF	300pf	100pF	300pF	11Turn/T37-6	7Turn/T37-6	20Turn/FT37-43
10	39pF	240pF		240pF	75pF	240pF	9Turn/T37-6	6Turn/T37-6	20Turn/FT37-43

CLASS E RF POWER AMPLIFIER BASICS and Some useful tinkering knowledge:

uSDX Transceivers use Class E type RF power amplifier scheme. Class E is an efficient class of power amplifier which can go up to 85 to 90 % efficiency which means less thermal heat dissipation on RF power transistors and lower supply current vs more RF power output. These are the advantages of Class E RF amplifiers. Disadvantage of this amplifier type is it is harder to tune and get the required efficiency when compared to other classes like Class A,B or C amplifiers. uSDX mOnO uses this efficient class E amplifier like every other uSDX transceiver out in the wild. 3 x BS170 or BS270 mosfet transistors parallel when tuned properly can easily give up to 5 watts RF output power without dissipating any excess heat.

uSDX mOnO LPF band filter board consists of all parts related to fine tune uSDX mOnO Class E mosfet Power amplifier. Above table has component values of each LPF Band Filter which will give a reasonable power efficiency on all 8 bands covered. Efficiency values for each band can be further tweaked and it is a great way to learn and experiment with class E amplifiers. uSDX mOnO uses so called serial resonance LPF design for Class E and all values are calculated by WA0ITP's excellent excel Class E design spreadsheet: http://www.wa0itp.com/class%20e%20design.html

uSDX mOnO kit has all components for 40m, 30m,20m LPF band modules. Also there will be 2 more LPF band module blank pcbs with some extra toroids and non-band dependent capacitors in the kit. These are for experimenting with different bands with Class E design using builder's own capacitor values calculated by WA0ITP's Excel design sheet.

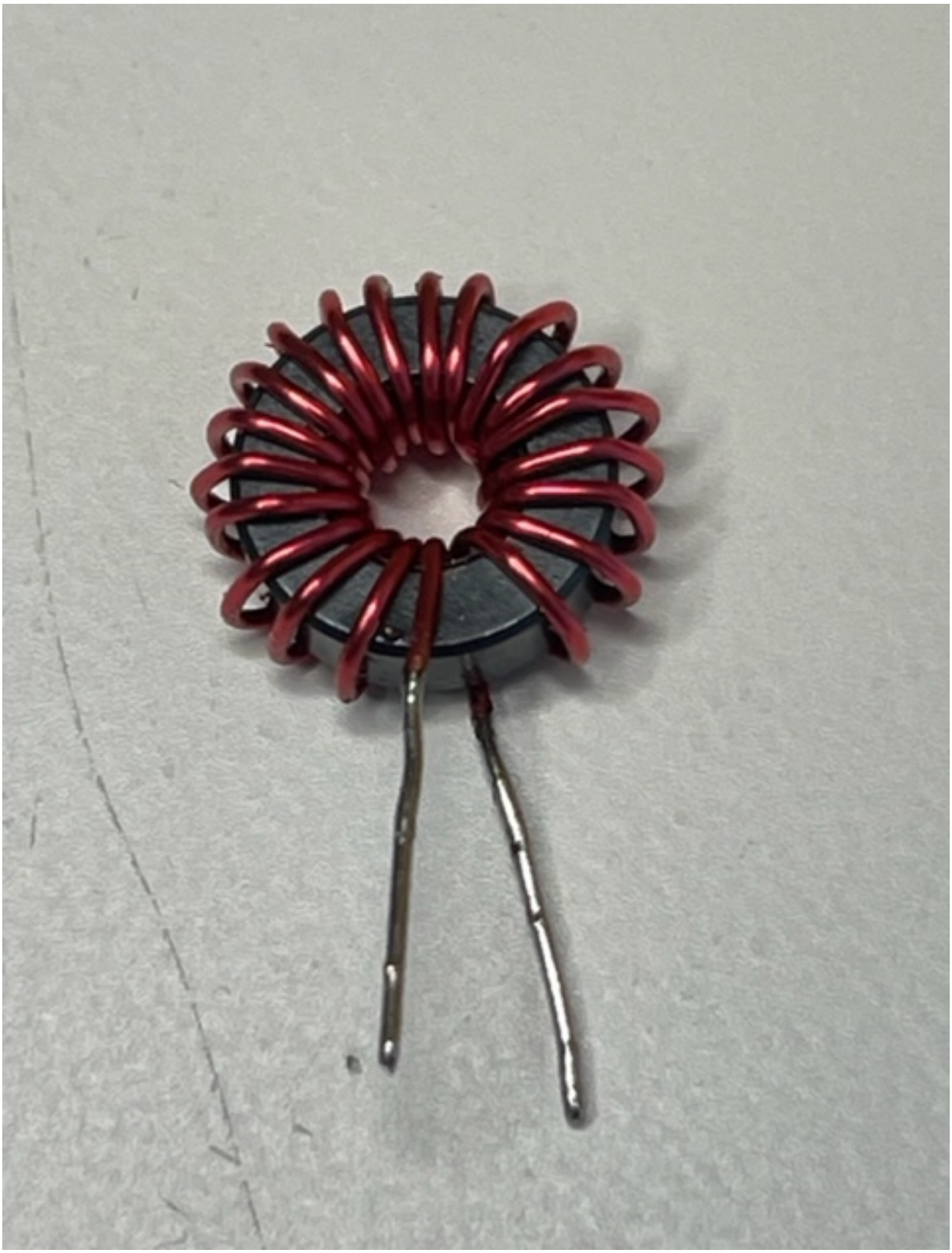
Here are some class E readouts for curious uSDX mOnO kit Builders:

http://www.norcalqrp.org/files/Class_E_Amplifiers.pdf

https://people.physics.anu.edu.au/~dxt103/class-e

TIPS on TOROID Winding:

This is T37-2 RED Toroid with 7 turns of enameled copper wire.



This is FT37-43 L3 Toroid with 20 turns of enameled copper wire.

- One turn means enameled copper wire passes once inside the toroid ring. For example, in 7 turns T37-2 toroid in the above photo wire passes 7 times inside the ring.
- Always after passing the turn stretch the wire so it is tightly wound around the toroid.
- When all turns are in count carefully every turn that passes through the inner ring of toroid. The best method to do is to take a close up photo of the toroid and count the turns. This way it is easier to see turns and you won't miss a turn.
- Never ever let one turn go over another one. Every turn should be side by side! This is important in toroids that have 20 or more turns and it is easy to overlap turns.
- Always scrape ends of toroids to clean enamel coating for soldering. To clean enamel coating there are two methods which can be used separately or together.
  Scraping enamel coating with a cutter knife thoroughly and then apply a bit solder coating.
  Second method is to heat up wire with soldering iron so that enamel coating just burns out and then cover with a solder coating. Scraping first and then burning the residue enamel coating is the best approach! Then apply a bit solder coating before soldering toroid into pcb.
- Before soldering wound toroid try to spread as even as possible as in the photos above.
- After soldering toroid in its place check with a continuity tester if solder joints are okay and connected electrically.

uSDX mOnO 3.5 mm audio jacks pin layout and functionality:

- **3.5 mm Jack pin outs:**

- **Headphone Jack:**
- Headphone connector is 3.5 mm standard TRS jack.
  Tip – Audio out
  Ring – Audio out
  Sleeve– GND
- This jack audio output is lowered with a 470ohm resistor to suit feeding straight into PC mic input, earphones etc.

- **MIC/PTT(KEY) Jack:**
- This jack is also 3.5 mm standard audio jack in TRS combination. This jack also doubles as CW key input jack.
- **In MIC/PTT INPUT MODE:**
  Tip – Mic input
  Ring – PTT
  Sleeve – GND
- **In CW KEY INPUT MODE:**
- Tip- DAH
  Ring- DIT
  Sleeve – GND

- **SPK/MIC Jack:**
- This is a 4 pole jack configured as TRRS.
- This is used to connect a hand Speaker/Microphone combination and uses BAOFENG UV-3R handheld cheap speaker/microphone similar to this one: https://www.ebay.com/i/401863211871?chn=ps&norover=1&mkevt=1&mkrid=711-117182-37290-0&mkcid=2&itemid=401863211871&targetid=1068323860270&device=c&mktype=pla&googleloc=9003562&poi=&campaignid=10459841961&mkgroupid=104612009980&rlsatarget=pla-1068323860270&abcId=2146002&merchantid=6296724&gclid=CjwKCAiA25v_BRBNEiwAZb4-ZRvy1rwtRGU3fC6uOA1VcBckiyfsw1ZDwmYpcbaxb-eFdBSkii7VZRoCYVgQAvD_BwE
- **Connection points are as follows:**
  TIP :SPEAKER
  RING 1:MIC
  RING 2:PTT
  SLEEVE: Gnd

- **SDR OUT Jack:**
  Tip – I output
  Ring – Q output
  Sleeve – GND

This audio jack is used for I/Q SDR receiver output. If these outputs are fed into stereo microphone input of a PC sound card RX can be be decoded with the help of a SDR PC software such as HDSDR.

https://www.hdsdr.de/

It can be used as any SDR receiver showing waterfalls etc. This jack is located on RF board.

The limitations being the narrow bandwidth waterfall and all associated elements of a classic SDR can be observed.

2- uSDX mOnO Transceiver Smoke test (Testing,Tuning procedure):

To work through testing smoothly we need instruments. And here are these:
– A multimeter

– A bench power supply with 12V, 1 amps capacity at least and current limit is a great first start up benefit.

– A Frequency Counter with hertz resolution up to 30 mhz. A scope will be also helpful to analyze wave form.

– A RF powermeter capable of measuring up to 10 watts.

– A dummy load up to 10 watts.

With these instruments it's a breeze to work out adjustment and testing of this rig.

Test procedure:

Connect your dummy load at PA output.

Connect your power supply in series with current measurement mode on your multimeter. Use a second voltmeter if you have for observing voltage. Of course if you have a bench power supply with Voltage and Current displays then ignore these steps. Just connect your PSU to uSDX mOnO.

Limit your power supply current to 150 miliamps. Now power up and see how much current drawn on RX. It should be around 70 to 100 miliamps.

Let's say we are testing on 20m band with 20m LPF Band module plugged in. so tune to USB 14000000 mhz in the LCD screen then enter menu by pressing left button and scroll up to menu item 8.3 Freq which is local oscillator frequency. Connect your frequency counter probe to SI5351 "0" output and ground connection. Now click rotary encoder once then rotate the encoder such that you see 14000000 mhz on your frequency counter. Don't pay any attention to LCD display of uSDX at this point. As you rotate your encoder your crystal frequency will change from initial 2700000 mhz. The trick is to match displayed frequency on frequency counter to SI5351 output frequency which is 14000000 mhz in our example. If you see 14000000 Mhz then your display screen matches your local oscillator frequency by hertz. Now click left button once more to store and then click right button to exit from menu. You are done!

Now we will adjust RF power output. Set your power supply current limit to 1 Amps. Select the desired band. Plug in your microphone to MIC/PTT input and connect your rf power meter.
Select CW mode with pressing right pushbutton(EXIT pushbutton).
Press left button and enter the menu area and scroll until 8.2 PA Bias MAX and lower that to 100. Then scroll to 8.3 PA Bias Min and scroll until 20.
Now press PTT and check your power output. If all is good then you should see something between 3.00 to 5.00 watts rf power output depending on your selected band. Now record your power output with your current drawn at this output.

Now enter menu 8.2 PA Bias max and increase from 100 in increments of 10 and transmit in each increment to watch your rf output and current. If you are in a state that current is increasing but rf power is staying at where it is without significant increase then we are saturating the PA mosfets into inefficient zone so we need to roll back until rf power stays same but current decreases slightly. When we see rf power also roll back then we are set, leave it like that.

Now uSDX mOnO is ready for a qso!

3- uSDX mOnO on board USB ATmega328P Programming functionality:

uSDX mOnO comes with an ATmega328p microcontroller that is already programmed with Arduino bootloader and latest available uSDX firmware. So no need to do any prior programming to build and use uSDX mOnO.

If there is a future firmware update and a new firmware for uSDX comes out then we need to know how to use on board programming feature. This is outlined below:

Latest uSDX firmware can be downloaded from Guido's github repository. The latest firmware which is uploaded already in your uSDX mOnO ATmega328p microcontroller is V1.02W.

Here are steps for checking for new versions, downloading, and uploading to uSDX mOnO's ATmega328p:

1- Download latest firmware from this link:
https://github.com/threeme3/usdx/blob/master/usdx.ino

2- Open in Arduino ide and comment these lines (Add // at the beginning of line):

//#define LPF_SWITCHING_DL2MAN_USDX_REV3 1 // Enable 8-band filter bank switching: latching relays wired to a TCA/PCA9555 GPIO extender on the PC4/PC5 I2C bus; relays are using IO0.0 as common (ground), IO1.0..7 used by the individual latches K0-7 switching respectively LPFs for 10m, 15m, 17m, 20m, 30m, 40m, 60m, 80

//#define CAT 1 // CAT-interface

3- Connect FTDI pin compatible USB to TTL cable or USB to TTL adapter as in the below photo:

FTDI USB to TTL cable or adapters can be found in many forms and shapes from online retailers such as amazon or ebay. Here is an example link for such a cable:

https://www.amazon.com/Serial-Adapter-Female-FT232RL-Windows/dp/B07RBK2P47/ref=sr_1_5?crid=28SKH1EYDIO0&keywords=ftdi+cable&qid=1640298942&sprefix=ftdi+cable%2Caps%2C475&sr=8-5

An example for adapter:

https://www.amazon.com/HiLetgo-FT232RL-Converter-Adapter-Breakout/dp/B00IJXZQ7C/ref=sr_1_1_sspa?crid=2MTEWNA4B44PX&keywords=ftdi+adapter&qid=1640299003&sprefix=ftdi+ada%2Caps%2C74&sr=8-1-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUEyUDFUM00wWVlLVEkmZW5jcnlwdGVkSWQ9QTAzODIxMDhMTUtKT0FQTVZSMEQmZW5jcnlwdGVkQWRJZD1BMDIzNjI4NjEwVDlaMVZYQ1dIVFkmd2lkZ2V0TmFtZT1zcF9hdGYmYWN0aW9uPWNsaWNrUmVkaXJlY3QmZG9Ob3RMb2dDbGljaz10cnVl

Match GND and DTR pins with corresponding GND and DTR pins on uSDX mOnO USB to TTL header.

USB port will power on uSDX mOnO rig so no need to connect external 12V power. Actually it will better not to connect external 12V DC. This will avoid +5V lines to interfere.

4- Position slide switch to PROG position.

5- Select Arduino UNO as board on Arduino IDE and program as programming an ordinary Arduino uno board.

6- When uploading is done unplug USB to TTL adapter and push slide switch to RUN which will run the rig in normal operation speed of 20 Mhz.

We are done with programming ATmega328p!

NOTE: LCD display won't work when Programming switch is on PROG. This is due to re-routing of two of the LCD ports of ATmega328p to TX/RX pins of USB to TTL adapter as they are shared. So no need to panic! All will be working as they are supposed to be when Programming switch is back into RUN position and LCD will be alive after a power recycle!

4 – Using uSDX mOnO:

uSDX mOnO is a menu driven Transceiver. It has two push buttons and a digital rotary encoder.

Pushbuttons are labeled as MENU and EXIT. With the MENU pushbutton it is possible to enter menu system. Rotary TUNE encoder is used for scrolling through menus.

A menu item can be selected either pressing menu button again or pushing rotary encoder.

Again any value in any menu item can be browsed by using rotary encoder.

To return to operating screen press EXIT pushbutton.

Rotary encoder short cut functions:

On operation screen mode:

- momentary push of rotary encoder will change band resolution or increment steps.
- double clicking rotary encoder will switch bands.
- Pushing rotary encoder and turning will increase or decrease volume
- Pushing rotary encoder while powering up will reset all internal setup parameters to default Beware that this requires a complete setup of the transceiver as described in section 2 Tuning and testing procedure of this manual!

All menu items and further details of those menus and more info on operating uSDX type transceivers is in uSDX Github page.

https://github.com/threeme3/usdx

There is a forum group for uSDX transceivers which has vast amount of technical and usage information. This is the link for that group:

https://groups.io/g/ucx/topics

5 - Caution when operating!

1- Do not power uSDX mOnO with more than DC 14Volts. The limit of smoke for LM1117-5.0 regulator is 15 volts!

2- Do not transmit without a dummy load or antenna connected to Antenna connector in order not to damage BS170 or BS270 RF power transistors!

3- DO NOT transmit without LPF band module plugged in. Again this will damage BS170 or BS270 rf power transistors!

4- When plugging LPF band module be sure to match correct pins of LPF band module to correct pins of RF module. As both sides of LPF band module has 4 pin headers this point is important not to smoke RF power transistors!

5- When operating uSDX mOnO Transceiver always keep both halves of transceiver plugged in to each other. These are Main board and RF board halves. Only main board won't function as firmware checks ADC voltages and pull up resistors of RF board to boot properly! You will get a blank LCD screen otherwise!

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