SDR Receiver – Part 3

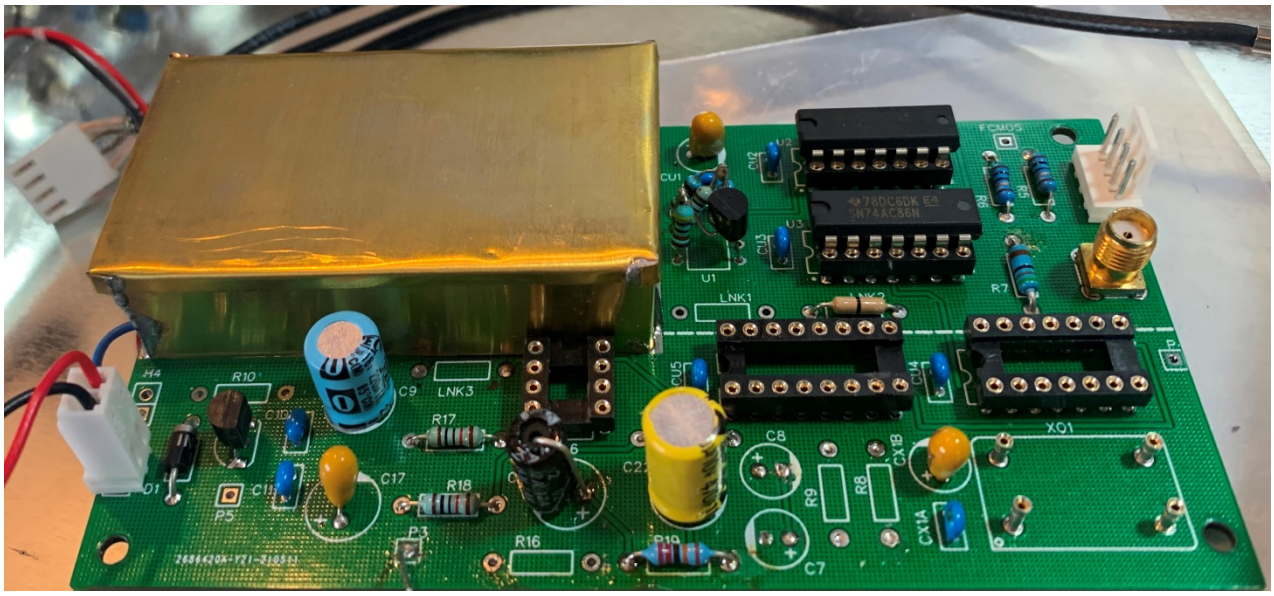
Components

I published a construction article in the March 2022 publication of Practical Wireless Magazine.

Electronic viewing of the magazine, as part of a subscription, is here: https://pocketmags.com/eu/practical-wireless-magazine

Here is some information on various components, etc.

The PCB is purpose made with exposed ground plane around the VCO on which you can solder an enclosure. The enclosure for the VCO was not shown in the article with its lid on – the photo below does.



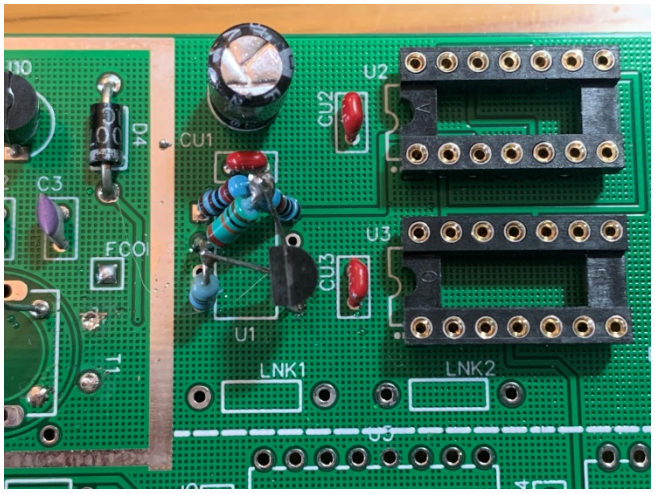
The enclosure is made from brass, thin enough to be cut by scissors and bent over my bench vice. I used brass from a shim kit I bought from Radionics (part number 681-249) but I see it is very expensive. I note that a lot of shops online that stock materials for artists sell sheets of brass that would be suitable.

Modifications

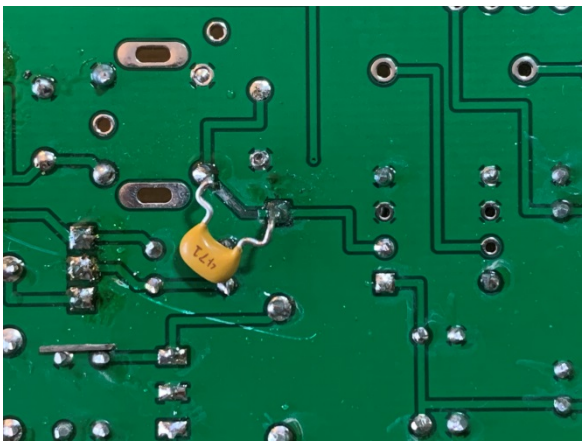
The circuit in the PW article has a lot of components stripped out that appear on the schematic on EasyEDA at the link above. All of the components used to play with different inductors (like T1) and all the components used to play with the huff-puff concept where removed from the schematic in the magazine.

The major difference that required some hardwiring was the removal of U1 a MAX913 and replacing it with C11, Q2 and a few resistors (R11, R13, R14 & R15).

In the picture below you can see how I added the transistor and the resistors in the holes for U6.



C11 is mounted underneath the board and requires the track between L3 pin 4 and U6 pin 2 (4) to be cut and C11 mounted to bridge the cut. This is shown below.



Otherwise all components are orientated as per the silkscreen and all/most of the component designators are in the right positions.

The one part I am concerned about is the **varactor diodes.** I used a Motorola part MV409 as I have a large bag full but I see that at some component suppliers (Radionics) you cannot buy a through-hole varactor diode and I could not find any supplier selling MV409's.

If you can make a SMD part work then the BB639 and BB814 appear to be suitable devices – both currently available from Radionics. Be careful as some contain a single diode and other packages contain dual diodes.

Having these MV409 varactor diodes and the coil means they were chosen first and then C3 was selected to get the right tuning range. If you start with different varactor diodes then a new value of C3 might be required.

The J310 FET

I bought a small bag of these from EBay very cheaply and I regret it as it nearly drove me mad. I have built many, many oscillator circuits but could not get this particular design, which I had used many, many timed before, to work.

I changed capacitors, suspected the coil but nothing worked until I changed the J310 for one I had bought from Radionics. The whole bag of EBay bought devices tested as JFETs on my component tester but would not oscillate above about 1 MHz. That bag went into the bin and now I only use well known manufacturers (onsemi) from reliable component suppliers.

The Potentiometer (RV1)

The schematic of the VCO contains a potentiometer called RV1 for which I used a high quality, linear, ten-turn, 50K potentiometer.

I used a Bourns device model number 3590S-2-503L. These are available from RS Components (aka Radionics) as part number 107-0808P or from Mouser as part number 652-3590S-2-503L. They cost €15 to €19.

Using a 10-turn device gives you an order of magnitude greater resolution than for example, using a single turn potentiometer.

This high quality device has:

- a resistor tolerance of ±5% (not so important);
- good resistance to both shock and vibration (important);
- a maximum backlash of 1% (very useful); and
- a temperature coefficient of ± 50 ppm/^{o}C (see below).

If you wanted a potentiometer with a reduced temperature coefficient then you will need to double the amount you need to pay. There are ± 20 ppm/^{o}C devices available at RS Components (e.g. 460-7598) but they cost €25.

I have no personal connection with or financial interests in EasyEDA, JLCPCB, Radionics, etc.

Samuel