The µBITX CW/USB Transceiver Kit Build

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Just before Christmas last year I was attracted when Ashhar Farhan, VU2ESE advertised his newly-launched µBITX CW/SSB transceiver kit at a special promotional price of $109 (now $129). I was immediately hooked and placed an order the same day. (http://www.hfsignals.com/index.php/ubitx/). A local enterprise in Hyderabad provides employment for local women winding the toroid coils and assembling and testing the PCBs for the µBITX

Strictly speaking, the µBITX is not a kit. However, it needs to be assembled. Two complete units are supplied; the main PCB and an LCD display mounted back to back with an Arduino microcontroller. The two assemblies plug together at a right angle to each other. All the controls, switches, plugs and sockets need to be wired and soldered, although everything is supplied with the kit, including a microphone.

The user needs to supply an enclosure for the project. Custom enclosures are available from various suppliers on the internet. I constructed my own enclosure from double-sided PCB material, soldering the internal seams together. I then cleaned, lightly sanded and applied several coats of clear lacquer to the outer surfaces.

For the price, the specifications of the µBITX are incredible. It is a double-conversion superhet. RF output is about 10 Watts on 7 MHz but power decreases with increasing frequency. My rig's output reduces to 3 Watts on 28 MHz. The preloaded software on the Arduino is fairly basic but several amateurs have developed improved software which can easily be downloaded to a PC before uploading to the Arduino using a USB cable. In my case I use Ian Lee's (KD8CEC) software. The upgrade was well worthwhile, adding many enhanced features.

It took eight weeks for my order to arrive by post from India. On inspection, I noticed that one SMD resistor was standing up vertically with only one end soldered to the main PCB (tomb-stoned). I rectified this before assembling the kit. Just a note of caution; NO WARRANTY is offered and the kit is supplied as is. However, there is an excellent online support forum offering technical help and advice.

I assembled the kit and wired up all the peripheral controls, switches, plugs and sockets. I applied power through a 1A fuse. There was no smoke and I could hear signals when I connected an antenna. I replaced the fuse with one of 2.5A value and tested the µBITX on transmit. It produced a nice pure sine wave on my oscilloscope.

Some programming commands require pressing the PTT switch, so I added a separate PTT push-button to the rear panel for convenience. The original Version 1 hardware and software specified that the µBITX could be wired for a straight key or twin paddle but not both. I modified the wiring and used a toggle switch which allows either type of key to be selected. Switching is now possible with upgraded software, but I find it more convenient to select by the flick of a switch instead of having to go into the menus.

I operate almost exclusively on CW and have previously built several memory keyers using the K16 chip by K1EL. I decided to incorporate one into the rig. This chip is programmable using Morse Code from a twin paddle. I didn't want to overcrowd the front panel with push-buttons so I only installed one memory button and programmed it with my CQ call.

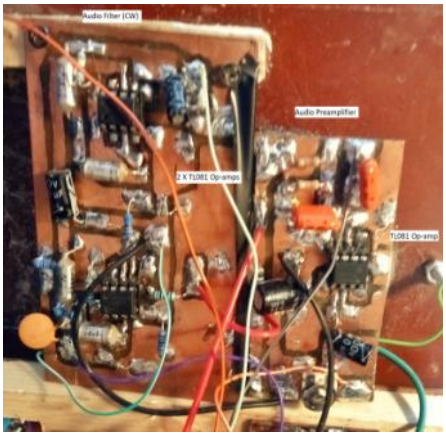
I then installed a narrow CW filter and lifted the circuit from the QRP Notebook by the late Doug DeMaw, WIFB. It peaks at about 700 Hz. The original design consisted of a dual operational amplifier. I modified the circuit to use two single more recent low-noise TL081 devices. I also built an audio preamplifier ahead of the filter to overcome any attenuation of signals through the filter. That circuit was also lifted from the QRP Notebook and I likewise substituted another TL081 for the original device. The filter is selected by a toggle switch on the front panel.

I designed all of my own PCBs for the modifications by hand before etching and populating them. I have uploaded a YouTube video illustrating this construction method. Just search for EI5EM on YouTube if you are interested.

The next modification I carried out was fitting a receive preamplifier and a bypass relay at the antenna BNC socket. This is selected by a toggle switch on the front panel. However, I ran into a problem here. The single transistor in the preamplifier failed twice and had to be replaced. It turned

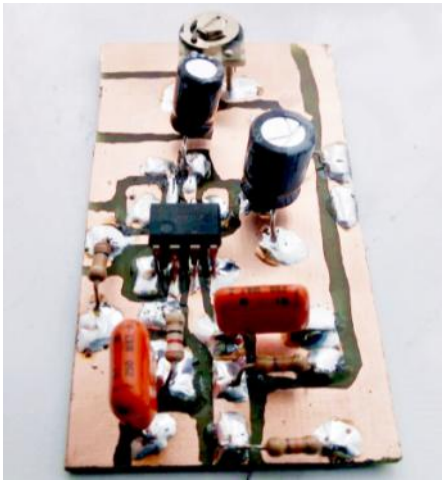
Double-sided PCB Panels for the Case

Spot Solder



Audio Section preamp and filter

RF amp fitted

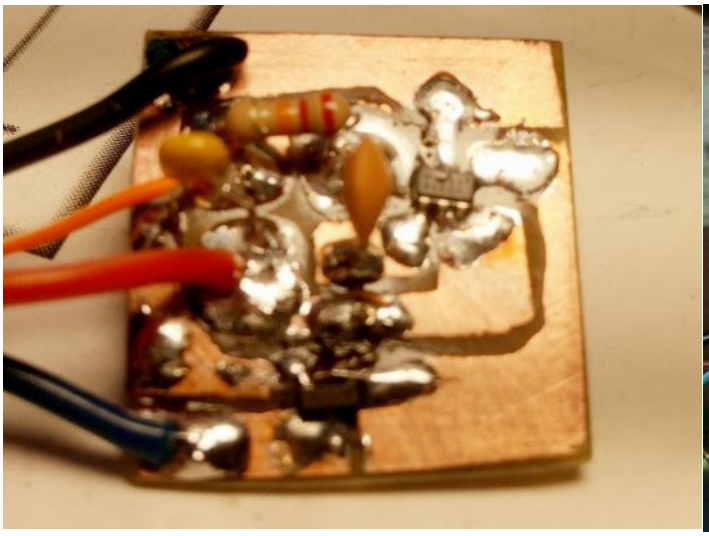


Audio preamp

BCI Filter

Some views of the project during construction by EI5EM

CWFilter



Populated PCB Touch Pad

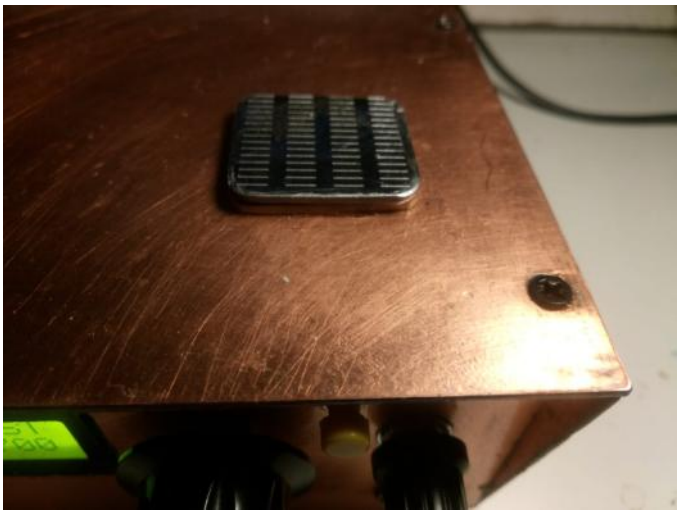
K16 Keyer Chip Fitted

out that the relay I was using was sluggish when dropping out, allowing RF to feed directly into the preamplifier output for a few milliseconds on switching to transmit, thus destroying the transistor. Two reversed germanium diodes on the output sorted the problem out. Luckily, I had ordered a pack of five transistors and had three to spare!

According to some users, the µBITX is prone to broadcast band interference breakthrough on the 80 metre band, although I have to admit I didn't experience this. Nonetheless, I incorporated a BCI high-pass filter allowing frequencies above about 2 MHz through but blocking frequencies below. Perhaps this was just an excuse to carry out another modification! This rendered the 160 metre band unusable but I have seldom used top-band, so for me it is not a problem. Fitting the filter involved cutting a track on the main board and connecting the BCI filter across the break.

My first SMD project was last year when I, with some trepidation, constructed a capacitive touch twin-paddle (also on my YouTube channel). The bright idea then crossed my mind to include a single touch pad as a straight key on the lid of my µBITX. This is one half of the circuit that I had used previously for the twin paddle. Once again, a steady hand and an illuminated jeweller's loupe were required for designing, etching and populating a small PCB for this SMD sub-project.

I bought a stainless steel can opener from the local Flying Tiger shop for €1. I cut and filed this down and mounted a small 25mm square piece as a touch-pad on the lid (*see above photo*), insulating it from the case with a piece of Veroboard. I soldered a sense wire to the tracks on the upper side of the Veroboard which made contact with the metal touch-pad



above it. These were then glued together followed by gluing the insulated lower side of the Veroboard to the lid. The insulated sense wire passes through a small hole drilled in the lid to the PCB below.
I called it a day with modifications at that stage, resisting the urge to add the larger Nexion colour display as many other constructors have done. In any case that would have required a larger enclosure and that didn't appeal to me. I have to say that I am very pleased with the end result of my endeavours. I have made some nice QSOs with the rig. This project has provided many hours of enjoyment over several months and I gained a lot from the experience.

Some early kits suffered a problem with the TDA2822 audio chip overheating and failing. The audio path has been redesigned on later versions to prevent this. However, Peadar EI2IF ran into this problem, although I didn't encounter it myself. To solve Peadar's audio problem, I constructed an outboard audio amplifier using the ubiquitous LM386 chip preceded by a single op-amp. This setup bypassed the damaged audio chip, which was left in situ. While I was constructing the new audio amplifier I decided to build a CW filter as a bonus for Peadar. His µBITX is now working fine also!

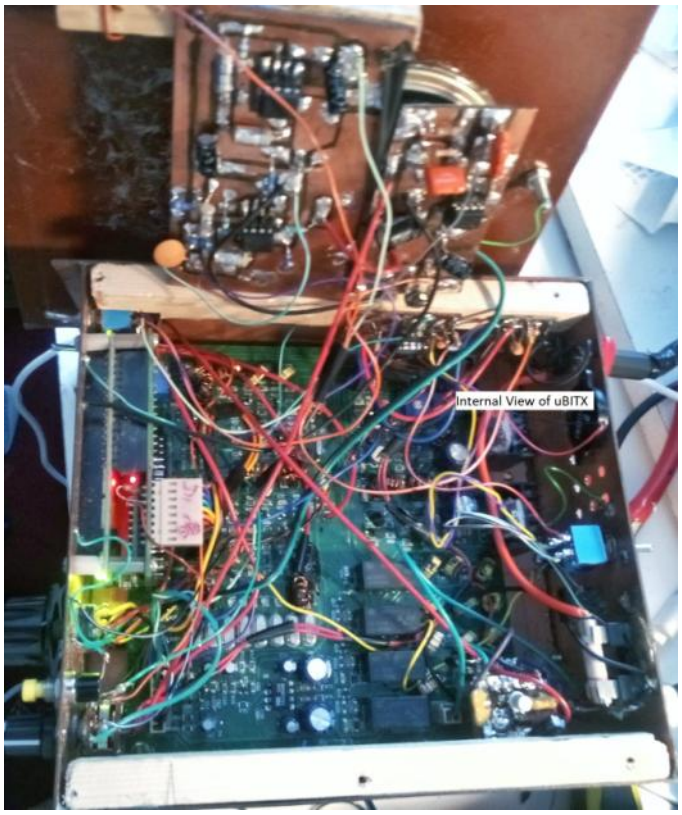
There are many improvements in later hardware versions of the µBITX. However, I am very pleased and satisfied with the modifications and improvements that I carried out on my original version. I have several YouTube videos uploaded of my µBITX build. Just search under EI5EM and uBITX if you are interested in viewing. You might also be interested in the EI QRP and Homebrew Facebook page where several constructors have uploaded videos and comments on their own builds.

I subsequently built a combined, compact L-match ATU and SWR meter to go with the µBITX, but sin scéal eile!

I ordered all the components for my PCBs online from Farnell. This company has a fantastic range of products delivered by courier the next day, an incredible free service. See https://ie.farnell.com/

By the way, the µBITX is also known as uBITX and mBITX if you are looking for additional information on the internet.

Slán go fóill de Tony, EI5EM



Internal view of µBITX