

Digital VFOs for Dummies - Eric Sears ZL2BMI sears@xtra.co.nz
see www.mightymessage.com for more info
Making Digital Vfos without programming skills - a homebrewer's primer.

When I first started building homebrew qrp radios for tramping (bushwalking or hiking for those outside NZ) the only real option for frequency was an analogue vfo or a crystal and then later a ceramic resonator.

Over the last 40 years I have built dozens of QRP rigs - mostly for others who felt unable to build anything.

But friends in the last few years have wanted digital vfos - and since I can't write programmes, I began by buying a fairly expensive kitset from USA . Apart from the expense, it was also really bigger than what I wanted.

Next I bought the Ozqrp CDV from VK2DOB. This was a real gem, and anyone who wanted a digital vfo in a rig I built, was directed there. I regard this as one of the finest I have used. You will see this in my Sprat article of 2020 in my SSB rig. It was also a good price. Sadly the site suddenly closed and they were no longer available.

Then along came the ZL2PD (Andrew's) sugar cube - a vfo so small that I have fitted one into a 50mm x 75mm x 26mm DSB rig doing 5W. Even better - it was cheap to build and needed no writing of programmes. Well not as such. But you do need to learn how to write a hex file for the eeprom - and then put 2 hex files onto an Attiny85, plus set the fuses.



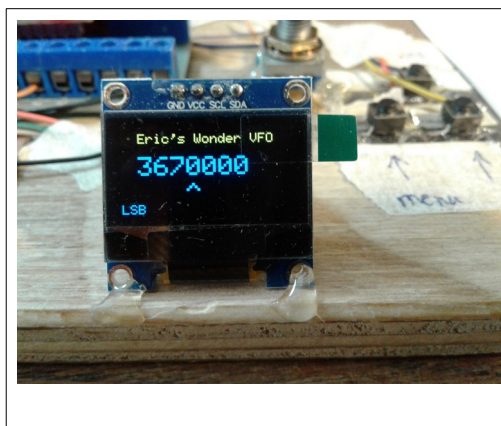
A finished sugarcube for a radio

Andrew and I exchanged notes and soon I had a .hex file and a simple way of writing a EEPROM file to make my own VFO and could customize it as needed. This is an amazing VFO but the writing of the EEPROM file may not be for the fainthearted. And as I said, you also have to learn about setting fuses. And you need to reprogram it for any new use.

But in the last short while, I contacted Neville ZL2BNE, a local ham and GQRP club member, who I knew had been writing programmes for his own vfos. Within a very short space of time he produced what he called the EWV (Eric's Wonder VFO!).

All it requires is an Arduino and a generic Si5351 board - plus the necessary cheap cables to write the hex file to the Arduino. Neville has given permission for this to be released.

Not only does it feature a menu but it has one specially written feature for my SSB rig. By putting a low on a digital pin, the bfo and vfo exchange outputs for transmit/receive. Amazing!



Now many hams have written programmes for vfos - but few write them in a way that the non-programmer can just use the hex file. Nor do they release it, though they seem happy to share the sketches – which those without programming skills cannot easily use.

So what can you do? Well if you search "ZL2PD" you will find the details you need to be able to put together a vfo. He has very full descriptions of what is needed – but you can email me if you get stuck.

Then if you want to give the EWV a try, you can find the hex file on this website www.mightymessage.com. Scroll across the top bar to the amateur radio button.

This site is maintained by my tramping partner of many years, Richard ZL2RDY; both of us being retired Anglican ministers. There are many more pics plus info here.

The biggest issue for me has been !

...Getting the programming cable - the USBASP to *talk to the computer!*

And you need this to work before you can do anything.

The first computer used ran Win 8.2 and I almost gave up.

Various programmes are mentioned by Andrew ZL2PD, including Khazama, Avrdudess and eXtremeburner - I find Extremeburner easiest to use. This sends the code to the chip, either an Attiny85, or an Atmega 328 Arduino board, to control the Si5351.

However on Win8.2 it simply refused to believe I had the programmer cable plugged in. Eventually I download the Zadig drivers and got it working. Then that computer crashed and I lost it all!

I also managed to get it working on a Win10 computer – but I think some "downdating" stopped it again (why do they call it UP when it stops things working!) I also wasted 3 hours trying to get it going on a friend's Win10 (unsuccessfully).

But I may now have found the trick. First get a USBASP programmer and cables (Asian suppliers about \$3 -4.) It needs to be plugged in while you do the install. Also get one Attiny85 programmer board (together with the Attiny85) and/or an Arduino nano board.

After downloading eXtremeburner try to install it.

If you have WinXP HURRAY! It has installed and run perfectly on the four I have tried.

But if you have Win8 or above you may have problems.

At this point google Zadig and download all the drivers, I finally went to Control Panel and checked the USB settings. It told me the device (which was plugged in) was not working. I let it choose a driver. Still didn't work. So then I asked it to let ME choose a driver from a list. On the list I thought I recognized one downloaded by Zadig – so I chose it. Immediately the programme burst into life!

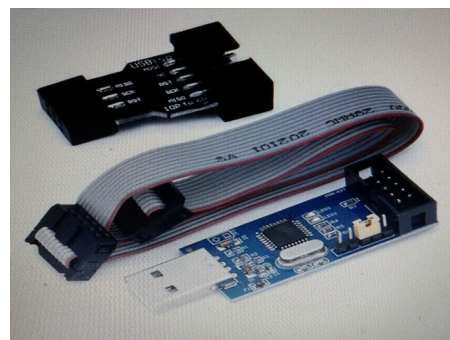
You will know its working if you can read the flash file from the Nano or the 85.

Once you can do this – you are well on the way to putting a digital vfo together.

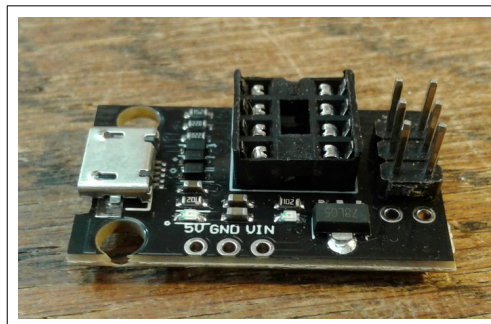
AND FINALLY - a CHALLENGE!

To those clever bodies in our club who DO know how to write programmes. What about producing a good general VFO with onscreen menu -

Using a 128x64 or 128x32 OLED, cheap rotary encoder, Si5351, Nano board (adapts to mini pro



USB programmer and cables
Get the set of three



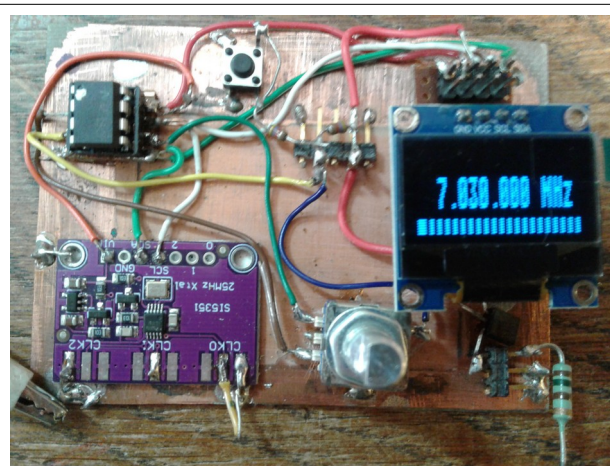
Attiny 85 board for the Sugar cube

if needed for smaller size); and release the hex file which other members can download to use. If I had had this 5 years ago it would have made life simpler. Maybe they are there and I haven't found them.

In the last couple of weeks I have finally delved into the Arduino IDE and can make a few changes to the sketches – though at 78 I will never remember enough to be a competent programmer! But a good friend here, Pete ZL2FSK, has compiled a sketch we found online from J Cesar – and we are working on giving it a rudimentary menu. It does have a very full display with a bargraph that could be used in a number of ways, but at present you will need to write bfo frequencies into the eeprom as hex numbers, like the sugarcube. For much more info and lots of pics go to the next files below.

So for all who want a digital vfo without learning to write programmes – give it a go!

Eric Sears. ZL2BMI Info at www.mightymessage.com



This is a sugar cube with generic Si5351 board and larger display.