

# Bulleye LNB modification for external clocking

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## 1) Bulleye LNB:

The Bulleye LNB was obviously for commercial application, I have tested it thoroughly and my opinion is that it is very good both in terms of sensitivity and frequency stability as using a TXCO as reference for the PLL. After about 1 hour to allow full stabilisation, I could not notice any frequency drift on the SSB narrowband QO-100 transponder, thus fully adequate for QO-100 purposes. Even more I noticed about 1-2dB better S/N than with the Octagon LNB on DATV therefore it seems also better in terms of sensitivity.

## 2) Purpose of modification:

Therefore one will probably wish to ask why I bother to make any modification as so good, the purpose for me is to be able to monitor DATV carriers with my Promax HD Ranger which is a professional satellite finder. Making it easier for pointing and for measuring performance of my antennas as the Promax needs an IF of over 950MHz, also for standardization with my Octagon LNB IF which are now set at 1.089 GHz with external CPSDO clock and also for easy referencing with QO-100 reception which is 10.89 GHz. But also to have much better frequency precision for eventual Doppler test such as made in the past see: <https://destevez.net/2020/04/wiggles-in-the-go-100-local-oscillator/> and <https://destevez.net/2019/03/measuring-qo-100-beacons-frequency/> as examples of what we can do having high frequency precision (+/-1Hz at 10Ghz), all the components such as SDR, LNB must have a precise clock.

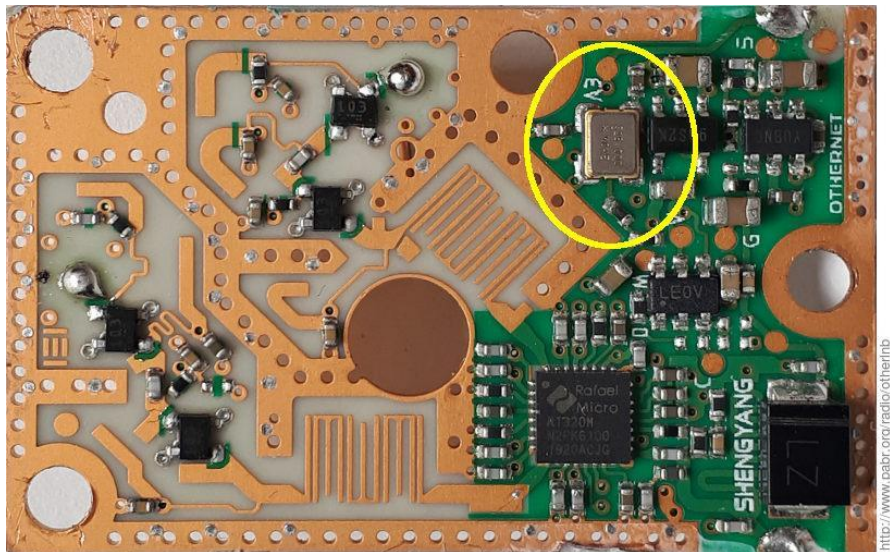
**3) Bulleye LO:**

The Bulleye has a TXCO at 25 Mhz, so the multiplication factor is 390,  $25 \times 390 = 9750$  MHz as local oscillator (LO) frequency.

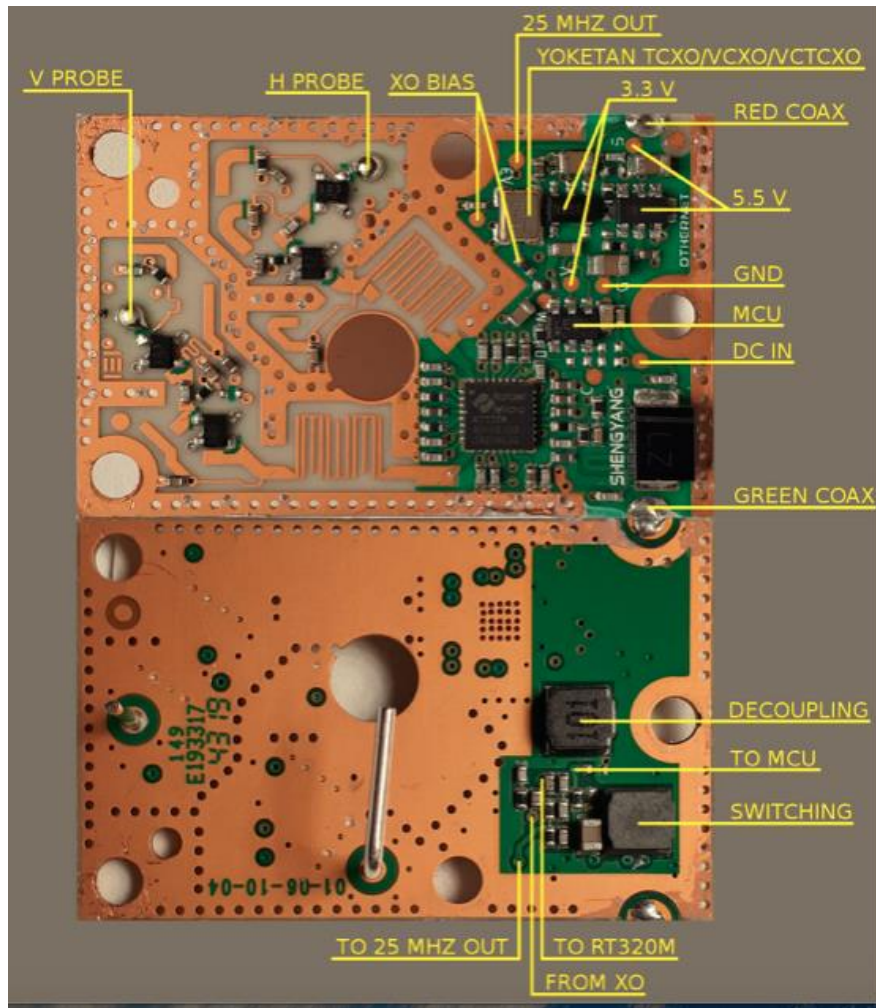
**4) LO required for 1089 MHz IF:**

To get an IF of 1089 Mhz I needed to change the LO to 9400 Mhz thus I had to remove the 25Mhz TXCO and provide a reference clock signal at 24.102564 Mhz ( $9400/390$ ). This was achieved by using the LEO Bodnar GPSDO. The modification is as describe below:

i) See board layout below, thanks to <http://www.pabr.org/radio/otherInb/otherInb.en.html> :



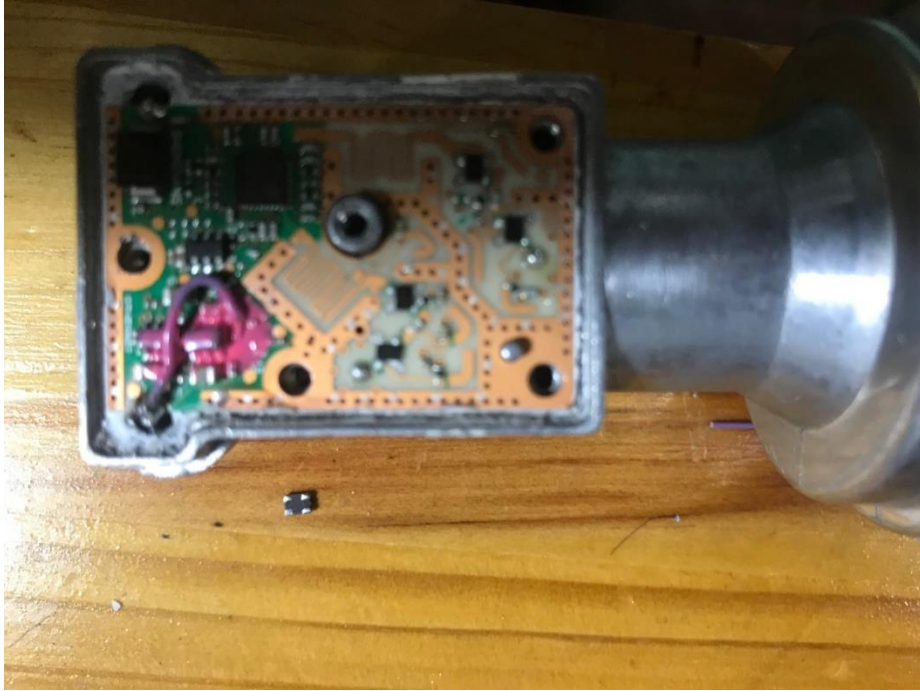
ii) More from same source, which was very helpful, please note the 2 capacitors on the lower picture (underside of the board) at the “from XO note” as quite important as they isolate the LNB circuitry from any possible damaging DC injection both ways (in/out):



iii) After studying it, I found out that the modification was quite straight forward as a simple wire connecting the lower right pad (on above PIC) of the TXCO (after removing it) and linking it to the original “clock out” F-type connector socket was enough to inject the external clock, we don’t have to worry about the circuitry for the original clock (below the board) as of high impedance.

Unfortunately I forgot to take a picture before applying nail varnish to the wire to secure it well in place.

You may also see below the LNB PIC the TXCO which is about 2mm wide and 3 long, desoldering it was quite easy by just using the soldering iron on top of it and push it with a sharp point (needle) when the solder melts, the heat must have surely destroy the TXCO but who cares.



Same modification done by 3B8FA on 2609/2023:

The PIC below is showing where exactly the link is soldered.



## **5) Results:**

The modification work out well, many tests were done today and receiving QO-100 ATV beacon with a C/N of about 12dB, MER of around 10dB and Rx power of about 50dBuV on a 1.2m dish at 10.4915 GHz.

Also the modification is much easier to do than with the Octagon and it seems that the Bulleye is about 1-2dB better than Octagon (to be confirmed) in terms of C/N.

## **6) Conclusion:**

If you have to buy a LNB for QO-100 just go for it (with or without modification) as it is worth the extra money (now about US\$ 19 on the internet).

The one I modified (PICs above) has been working 24/7 for over 2 years with no noticeable drift.

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