

Butternut HF6V vertical antenna repair

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The Butternut HF6V is a 6 band vertical antenna, without traps. It uses large coils and capacitor to accommodate the 6 HF bands 80m, 40m 30m, 20m, 15m and 10m. In my case it also operates reasonably on 12m and 17m with the help of an antenna tuner.

I installed the antenna in 2021 in its current installation, after I owned the antenna since 2015, besides the occasional installation in the backyard it spent most of its time in storage until now.

The Butternut HF6V is installed on top of my two-story home and my QTH is located on a small hill, therefore the antenna experiences frequent strong wind gusts. I also guyed the antenna over the 30m coil as recommended by Butternut.



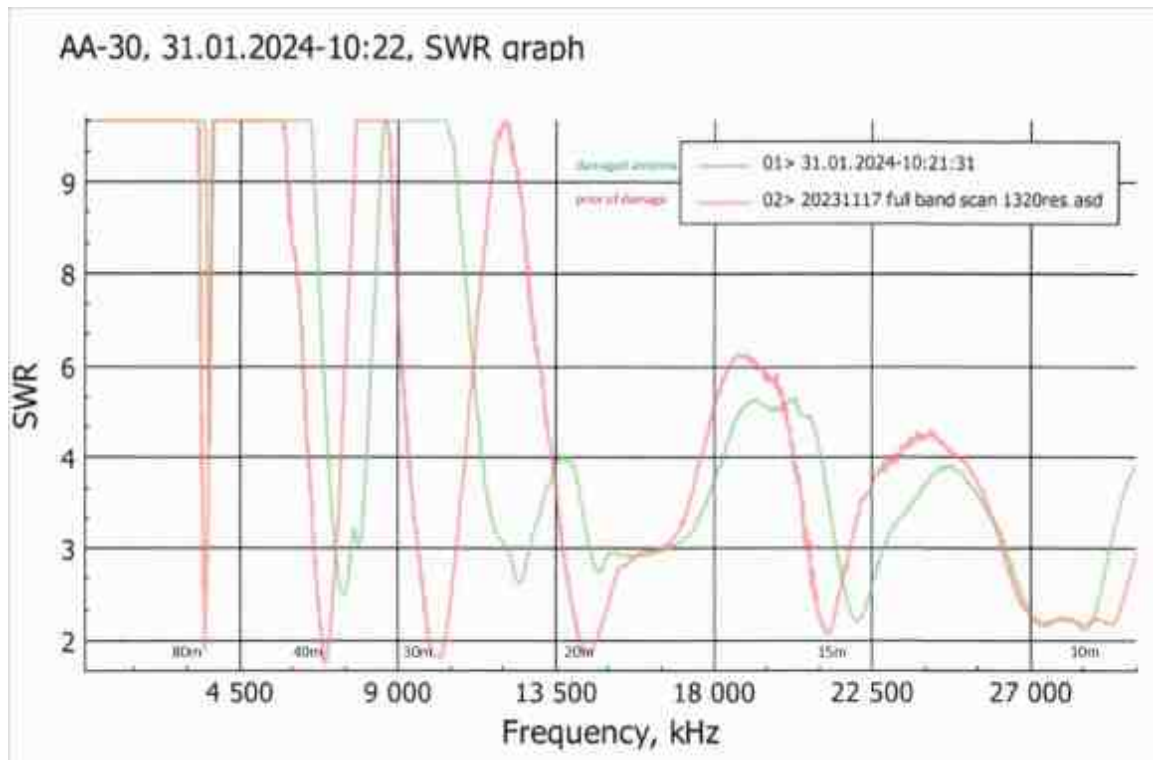
During one of the strong winds

Somewhere around mid January 2024, I noticed a sudden worsening of the SWR for the 20m and 30m band, other bands had a moved resonance frequency. This was initially intermittent with good and bad days until the end a complete failure of the 20m and 30m band.

Based on the build of the Butternut HF6V my suspicion fell immediately on the 30m assembly of the antenna which influenced the 20m and 30m band. I posted a description of my problem in the forum of eHAM.COM and got a lot of good replies which lead me to believe that the culprit is very likely the 68pf doorknob capacitor of the 30m assembly.



The measurements of the antenna with an antenna analyser confirmed the observation of a major change in the SWR curve..



GREEN shows the damaged antenna, compared to RED which shows the antennas SWR before.

Unfortunately the cost of the original replacement 67pF doorknob capacitor imported from the US would almost have been 150\$ AUD for one. Luckily I found a supplier in the Ukraine specializing on such items and I purchased two 68pF doorknob capacitors for 50\$ AUD shipped withing 2 weeks.



New capacitor



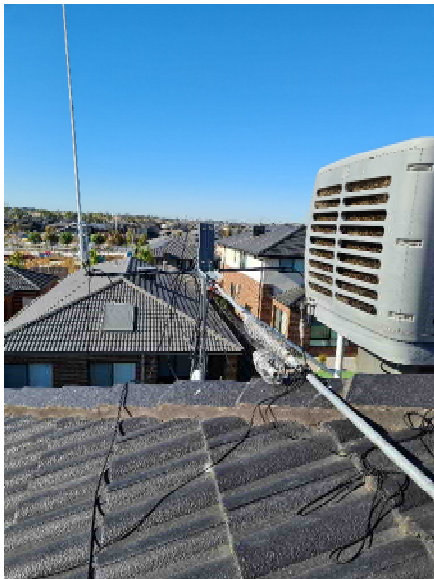
Above damaged capacitor

I also found through the replies in *eHam.com* a modification and detailed description provided by Phil AD5X with whom I exchanged several emails about this issue. The experience seems that the 30m doorknob capacitor is exposed to mechanical stresses due to its assembly. The modification was simply to build a small aluminium bracket and connect one side of the capacitor with a flexible wire to the antenna. See picture below.



Replacement of the 30m, 67pF doorknob capacitor with a 68pF and the modified mounting.

In my case the antenna is mounted on top of a two-story home. I build a tilt mechanism which allows me an easier access to the antenna, which when tilted down allows the antenna to lay flat on the roof for easy access and maintenance.



You can also purchase commercial fabricated tilt mechanism.

Nevertheless over the more than two years on the roof exposed to strong wind gust, some screws lost their nuts otherwise the antenna looked mechanically fine. I replaced the lost nuts, some rusted screws with marine grade (SEA316) steel items and tightened the rest. After replacing the capacitor the first scan with the antenna analyser showed that the antenna was back in operations, just out of tune (tuned out of band) and required tuning again. This activity was done the next day, due to the complex tuning process for the HF6V.

As it is with any multiband vertical antenna, the tuning after the repair took in my case about 2hours on the roof tilting the antenna down and up multiple times. I needed to move some adjustments,

which required the cleaning of the oxidised aluminium with sandpaper and the re-application of the conductive copper cream. Its good to have a handheld antenna analyser to measure the antenna directly on the roof.

After this repair the antenna was back to its original SWR curve and functioning very well.

Six month later

After six month my antenna failed again this time 80m and 40m went dark. First intermittently, than completely. An inspection on the roof could not identify the issue and I decided that after having the antenna for over 10 years (4 years on the roof and >6 years in the garage) that maybe the contacts gone bad due to oxidation of the aluminium and the constant vibration caused by strong winds.-

I took the antenna apart into two easy to transport section and brought it down from the roof on ground level.

Here on a table, easy to access, I started to take the antenna apart and to clean the contact points, with a solution of vinegar and lemon juice. Initially I was sceptical about the effectiveness of the solution but it removed the oxidation well. I also sanded the clean area down in addition. In the reassembly process I reapplied the conductive past provided with the antenna.

Initially I suspected the 200pf 80m doorknob capacitor, but it measured fine, so did the 67pf 40 doorknob capacitor, which kept me at a loss.



80/40m assembly, Doorknob Capacitors (left 200pF/80, right 67pF/40m)

I also decided to disassemble the shown above 80/40m assembly to clean the contact, during this activity I noticed that the 67pF doorknob capacitor for 40m had a loose assembly socket, which could be moved left right. This is the same doorknob capacitor as for 30m. It seemed that they are easy to get damaged due to external mechanical forces. In line with the previous repair I decided to install a stress relieve point to remove the direct mechanical force on the doorknob capacitor, I was also lucky that I purchased 6 month ago two of this kind.



Replacement capacitor with stress relieve (right)

Prior to disassembling the coil section of the antenna I took detailed measurements of the location of all assembly points. I also modified the guy point from above the recommended 30m coil and moved it up to 1.5m, where I hoped that this would limit the stress on the resonant parts of the antenna.



Picture above the 40m and 30m assembly with stress relieve for the two identical doorknob capacitors.