



**Cushcraft 3 & 4 Element
20-15-10 metre Yagi with the A743 40m
add-on.**

**The Project gets another
popular HF antenna—the
Cushcraft A4S.**

**We replaced a malfunctioning A3S with its bigger
brother—and discover another rebuild “rule.”**

A3S Specifications

Elements: 3
Forward Gain: 8 dB
Front To Back Ratio: 25
VSWR 2:1 Bandwidth: 500+ kHz.
Power: 2000 watts CW (really?)
Longest Element: 27.75 Ft. (8.45 m)
Turning Radius: 15.5 Ft. (4.72 m)
Boom Length: 14 Ft. (4.27 m)
Boom Diameter: 1.5 inches (3.81 cm)
Wind Load: 4.36 sq. feet
Connector: UHF (SO-239)
Weight: 27 Lbs. (12.9 kg)

With Field Day fast approaching, the last thing you want to have happen is one of your major antennas showing high SWR on one or more bands. But when Bill put out an urgent call for a work party to take the A3S down and assemble another “gift” of an A4S to replace it—we knew his was worried.

With the expert team assembled, a new box of cheap red wine at the ready and the weather looking like the sky would open any minute—it was perfect for another antenna raising!

A4S Specifications

Elements: 4
Forward Gain: 8.9 dB
Front To Back Ratio: 25
VSWR 2:1 Bandwidth: 500+ kHz.
Power: 2000 watts CW (In your dreams!)
Longest Element: 32 Feet (9.75 m)
Turning Radius: 15.5 Feet (4.72 m)
Boom Length: 18.5 Feet (5.48 m)
Boom Diameter: 2 inches (5.1 cm)
Wind Load: 5.5 sq. feet
Connector: UHF (SO-239)
Weight: 37 Lbs. 16.8 kg)

The antenna going up was of course in pieces. Partially assembled pieces this time, so not so much of a puzzle as previous bundled antennas. The manuals were still available off the Internet and were essential in getting the right measurements.

As there were no markings or ID of any kind left on any of the aluminum traps or elements, I took my best guess and assembled the A4S on our test mast. I didn't think anything of it, when Al pointed out the diagrams in the manual didn't resemble the trap configuration of my assembled jig saw puzzle, just after I had added the A743 40m add-on to the driven

element. I hooked up the coax and made a few MiniVNA tests. Beautiful gentle SWR curves from band edge to band edge—but most outside the Ham band! It was then that Bill mentioned the 40m add on was adjusted by the previous owner for the 30 metre band.

Another hour was spent redoing the measurements, finding out I was using two different charts and getting Al confused, we realized one of the trap pairs was in the wrong way around and a short piece of aluminum tubing was also in the wrong spot. Amazing how it becomes clearer once you realize the parts aren't interchangeable and have to be assembled in the right order—according to the picture in the manual!! The expression “RTFM” came to mind once again. We switched from wine to water at this point, since it was becoming obvious it was to blame for these delays in getting the antenna together properly!

When we were done, checking and double checking the measurements, I hooked up the MiniVNA and it looked great. Al (VA7MP) then proceeded to torque down all the clamps, screws and nuts. We took one more set of measurements before it was to go up the pole.

Nothing was working right! Bad SWR and resonant frequencies outside the bands!! **WTF!**

As it turned out, the black substance all over the tubing joints wasn't a conductive anti-oxidant left behind by the previous owner, but the residue of two decades of weathering and as it turned out, somewhat *semi*-conductive.



At that moment, Al declared our newest and most important rule of antenna reconstruction—**CLEAN THE FRIGGEN TUBING BEFORE YOU REASSEMBLE IT!!**

Another hour passed by, cleaning and polishing every section of the driven element, applying new anti-oxidant compound and re-measuring the dimensions once last time.



When it finally made up the mast [in the twilight of a day that started 10 hours earlier] I ran the MiniVNA through its paces. We were pleased with the outcome;

On 40 metres, the 2:1 bandwidth was 7.162 to 7.280 with a resonant point at 7.222 MHz at 1.37:1 SWR

20 metres gave us a 2:1 BW of 14.0336 to 14.3437 and resonance at 14.1771 at 1.14:1

15m was less than 1.5:1 across the entire band, showing a 1.09:1 SWR at 21.2637 Mhz.

10 metres was less than 1.3:1 from 28.0 to 29.1 Mhz. and 1.12:1 from 28.268 to 28.500.

A most rewarding day at the project.