

VK5ABN's Multi-Band ALE Antenna

One of the biggest challenges facing ALE operators is the requirement for an antenna system covering all HF bands. The antennae available to me at the time of joining the HFLINK project included a 4el four band Yagi, an inverted Vee for 7MHz and a horizontal folded dipole for 3.5MHz. All of these antennae combined would not provide sufficient coverage over the required operational frequency spectrum. I was initially attracted to various forms of traveling wave antennae including the T2FD and Australian Dipole. Its attraction is their compact design whilst providing wide frequency coverage. These systems use loading resistors in the range of 450-900 Ohms to provide a suitable impedance match typically over a frequency spectrum of 2-30MHz. Due to its design, a substantial amount of RF energy is dissipated in the loading resistor reducing the aggregate of RF energy available for radiation significantly and hence its efficiency. There had to be a better way!

Inspired by discussions with other ALE operators and from research on the Internet the following list emerged with the design criteria for my ideal antenna -

- Coverage for all HFLINK frequencies
- No need for an antenna tuner unit
- Good radiation efficiency
- Low cost
- Simple construction
- Easy installation

The result is the antenna system shown in the following diagram. It consists of a horizontal loop tuned to the 80M band and a dipole cut for the 30M band. A loop antenna resonates on every multiple of its designed base frequency and, when tuned to around 3550KHz, can be used on all HF bands except for 30M. In combination with a 30M band dipole, this system provides frequency coverage for the 80M-10M HF bands.

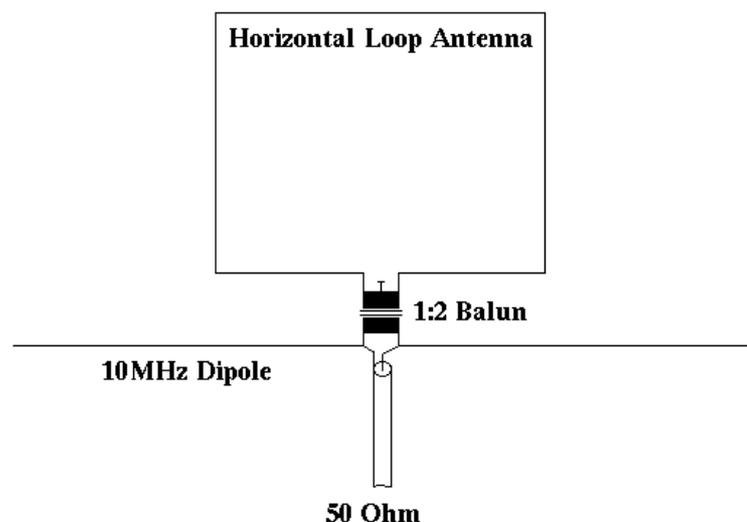


Illustration 1: VK5ABN ALE Antenna

The initial length of the wire for the loop was a little over 85m to allow for tuning by cutting small length of wire until a good SWR was achieved on all bands. A 1:2 balun is used to provide matching of the antenna loop to a 50 Ohm coaxial feed line. The antenna loop forms a triangle at about 10m above ground level and is feed from one of its corners.

The dipole antenna with its 50 Ohm impedance is directly connected to the coaxial cable and has no influence on the tuning of the loop antenna. Its initial length was 7.6m for each leg which was trimmed until a match for 10145KHz was obtained. The dipole is suspended from the balun with each leg sloping down at an angle of about 45 degree to form an inverted Vee.

An Amidon BN43-7051 binocular core ferrite was used for the construction of the balun. The a primary winding has 2 turns whilst the two secondary windings have 1.5 turns each. Multiple ferrite cores may be used to increase power handling of the balun. A picture of the balun is shown below.

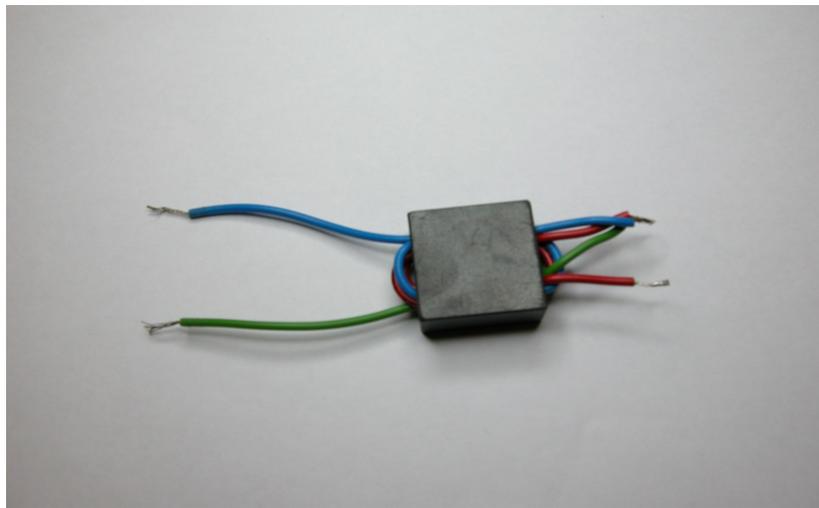


Illustration 2: 1:2 Balun

The next picture shows the balun mounted inside its enclosure

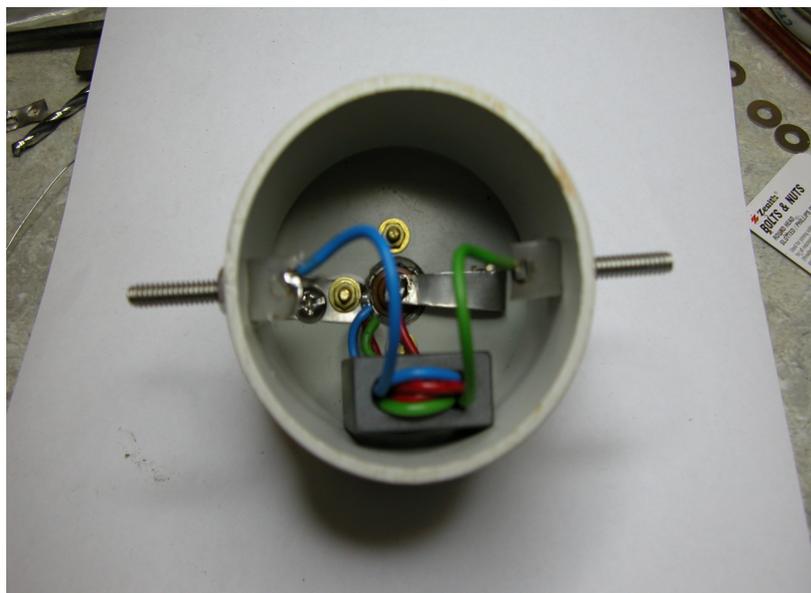


Illustration 3: Balun Enclosure

Here is a picture of the fully mounted balun prior to being pulled into position on the tower. The top wires are that of the horizontal loop antenna with the dipole mounted on studs at the bottom.



Illustration 4: Final Assembly

Here a picture of the antenna in its its final position



Illustration 5: Final Installation of Antenna

Can you spot the antenna?



A software simulations of this antenna system predicted a SWR of <2.0 on all HF bands. It came as a pleasant surprise when in practice the SWR was better than 1.5 on all HF bands. The antenna was easy to built with the majority of parts sourced from a junk box only requiring the purchase of the binocular ferrite core, stainless steel screws, PVC pipes and end caps at a total of less than \$20.00. The antenna is now part of the my HFLINK setup and has continued to provide excellent performance. Its size may not be suitable for everyone, but this antenna system will be a great asset to anyone who can afford the space. Enjoy...

73, Berndt
VK5ABN

Bill of Material:

1 x BN43-7051
1 x SO239 socket
100m copper wire
1 m of copper wire for balun construction
4 x 3/16"x1 1/2" stainless steel bolts
12 x 3/16" stainless steel nuts
4 x 3/16" spring washer
4 x 3/16" washers
1 x small length of PVC pipe
2 x PVC end caps to suit pipe