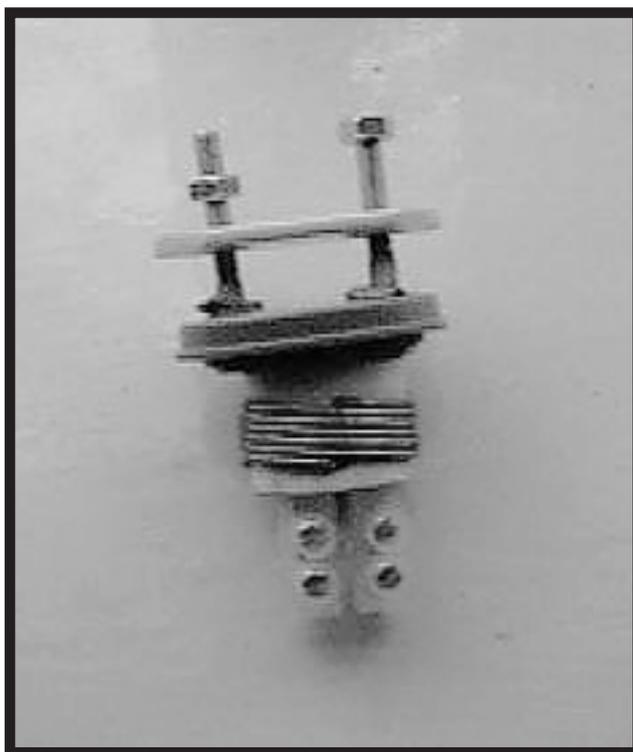


# **The Paul Hayes Quadrifilar Helix Antenna Trifilar Balun construction for QHA**

**Balun design by Bob Thorpe G4UNU**



# Trifilar Balun: Tool and parts requirements

## Tools Required

- 1) Pub Dart or sharp pointed awl to make 1mm holes
- 2) Hand or power drill, with assorted drills 2mm to 10mm
- 3) Fine sandpaper to clean enamel off copper wire
- 4) Soldering iron with fine tip and rosin cored solder

## Parts required

- 1) 5 - 10cm of 22mm outside diameter plastic drain piping. This will be cut down to 18mm
- 2) OPTIONAL Copper jig made from 3cm of 22mm ID copper tubing, drilled with W1 to W3 holes
- 3) 35mm plastic film case with a flat top for balun assembly. The flat top makes sealing easier
- 4) 35mm ridged film case top, for end cap.
- 5) Plastic spacing washer to go with balun assembly. I use the plastic from the sides of old kitchen unit drawers, I am sure most people have similar bits lying around the shack.
- 6) 2 way plastic screw terminal block for connecting RG-58
- 7) Two 2.5 mm \* 25mm bolts and four nuts.
- 8) About 50cm of 18swg enameled copper wire, for balun
- 9) Superglue or quickset epoxy for securing windings
- 10) Weatherproof putty for sealing RG-58 exit from film can

## Notes for those who don't live in the United Kingdom

Most of the components specified here, such as the film can, enamelled copper wire, and so on, are almost universally available worldwide. You will have to improvise to get those parts that are not available. The only advice I can give is to make any substitutions as close as possible in physical dimensions and electrical specification to the original specified.

However, to realise full balun performance, it's important to stick to the specified O.D. of the coil former. If you can't get the right thing, I suggest you make a former out of something like a toilet roll cardboard centre, or similar non-conductive material.

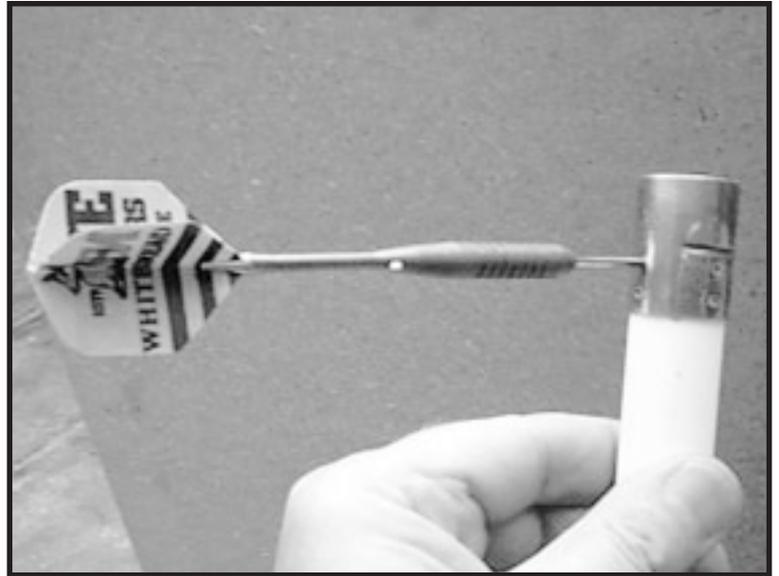
# Trifilar Balun: Construction And mounting

Illustrative references are opposite the text.

Start with a piece of 22mm diameter plastic overflow pipe.

(Can't you tell I was in the pub darts team?)

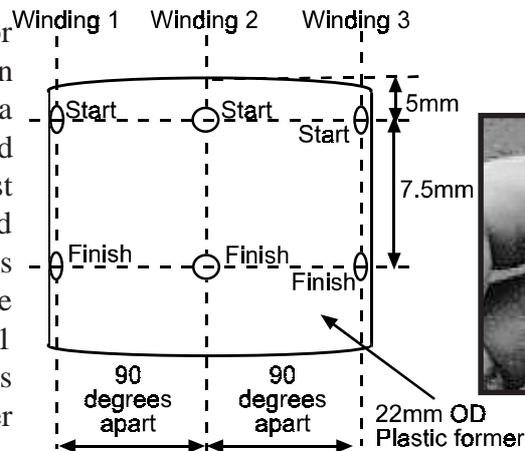
Because I make quite a few baluns, I made a jig to assist in making the holes in the plastic former. This is a jig that slides over the plastic pipe, and has the holes pre-marked. The plastic former should be 18mm long, but leave it longer for now. Mark in from the edge 5mm then make a hole big enough to take the 18 SWG (1.25mm) wire.



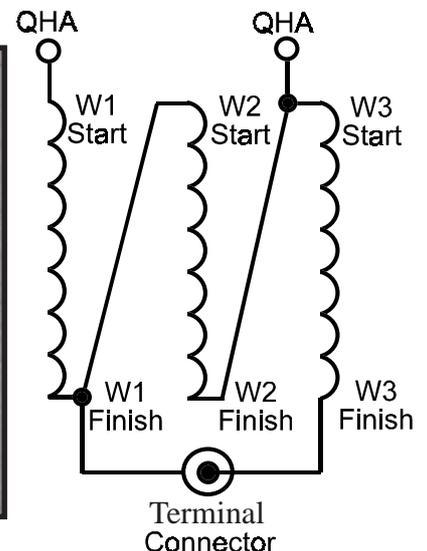
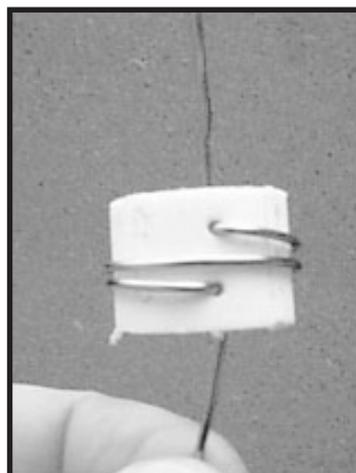
Drawing not to scale!!

Measure 5mm from the top of the former. Drill or punch a hole to take enamelled copper wire. Then measure 12.5 mm from the same edge and make a hole directly in line with your first hole. This should give you a gap of 7.5mm between holes. The first hole is the start of Winding 1 (W1) and the second hole is the finish of W1. Turn the former 90 degrees anticlockwise. In line with W1 start, make a hole for W2 start, but 90 degrees offset. In line with W1 finish, make a hole for W2 finish, but 90 degrees offset. Do the same with W3, but turning another 90 degrees anticlockwise from W2

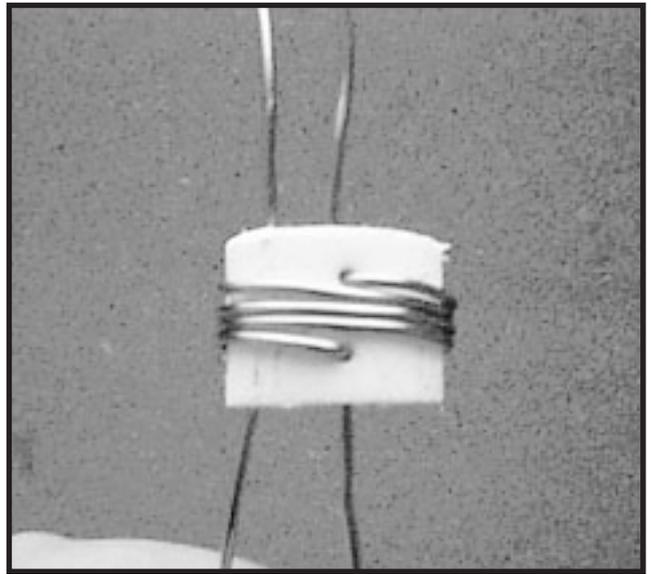
See the drawings at right



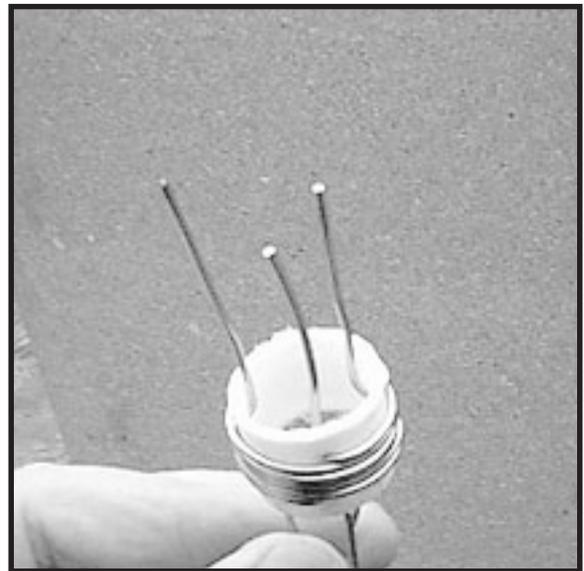
Measure 18mm from the top of the former, and cut the former to 18mm long. You should now have three pairs of holes, offset by 90 degrees from each other. Starting from the top left hole, feed some wire through the hole leaving about 25mm protruding out through the tube, then start wrapping the wire anticlockwise around the former. Wind the wire 360 degrees then go another full turn (720 degrees or 2 turns total) so that the winding finishes at the hole opposite the one you started from. Cut the wire so that after you have fed the wire through the former you have about 25mm of wire sticking through.



Winding anticlockwise, feed another piece of wire through W2 start, and wind it 720 degrees (2 turns) ending at W2 finish. W2 wire is closely interleaved with W1.



Feed a final piece of wire through W3 start, interleave with W1 and W2, and end at W3 finish. The start and finish ends exit opposite ends of the former. You now have three start wires coming out of one end, and three finish wires coming out the other end. Scrape off all the enamel from the ends that come through the former.



This bit gets a little confusing but here goes!

W2 start is now bent down through the inside of the former and twisted around W1 finish.

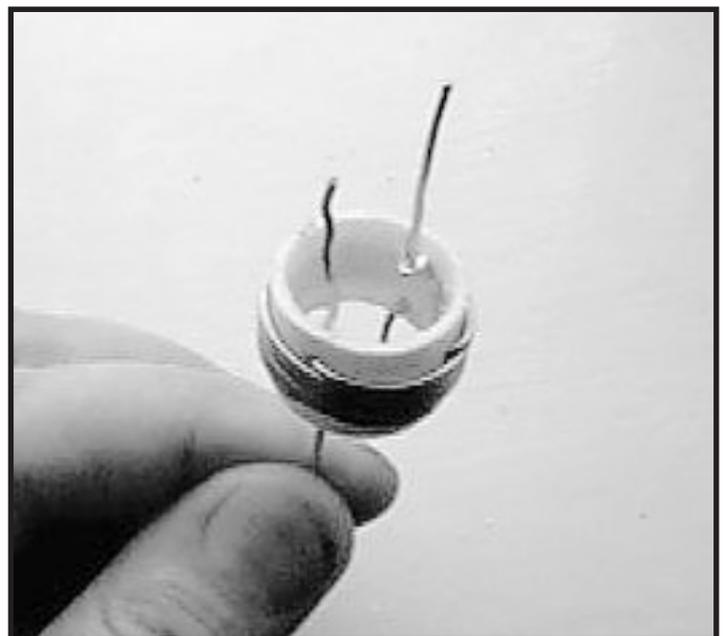
W2 finish is bent up through former and twisted around W3 start.

Looking at the former so that W1 start is at the top, W3 start should have W2 finish attached and W1 finish should have W2 start attached.

Ensure both ends of W2 are the same length.

Solder the joints between W3 start-W2 finish & W1 finish-W2 start.

Now double check and if it's wrong don't blame me ;-)



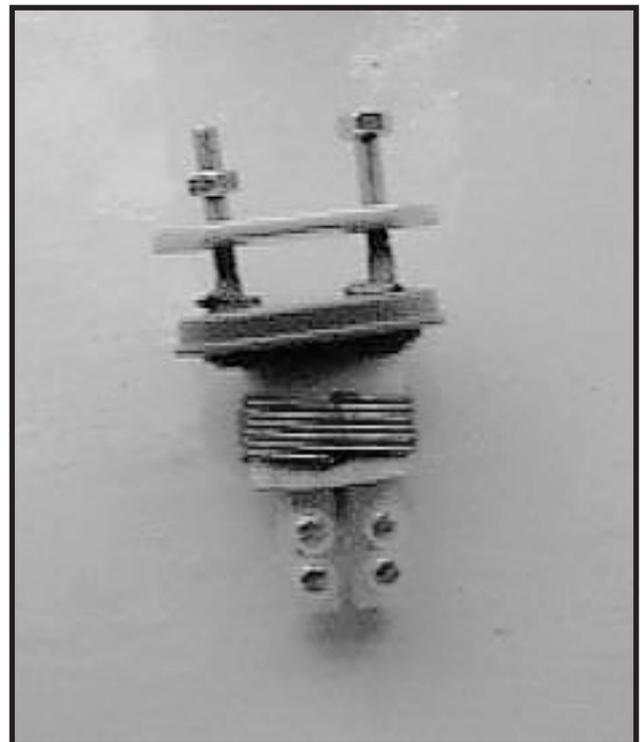
Shape W1 start and W3 start wires as shown, and tin the scraped ends. Form the ends into a circle to accept the head of a threaded bolt (6BA or similar). Fit the bolts.



Scrape and tin the ends of W1 finish and W3 finish and fit a screw connecting block as illustrated. *Note that the RG-58 braided screen goes to W1 finish.*



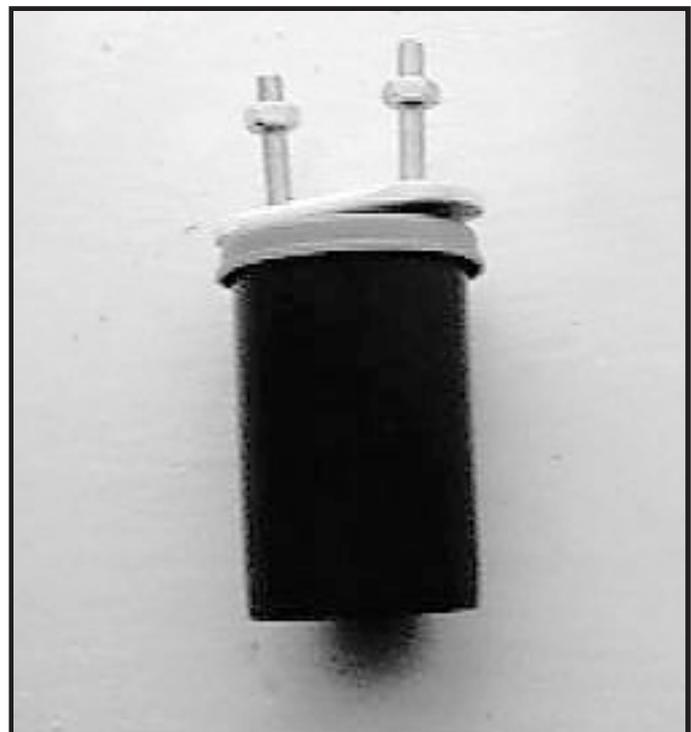
Drill the 35mm canister top to clear the bolts (about 22mm centres). Fit the 35mm canister top, then seal the coils with superglue. Note: make sure your windings are close together (a tip from Bob Thorpe) before glueing. You can also wrap some self amalgamating tape around windings.



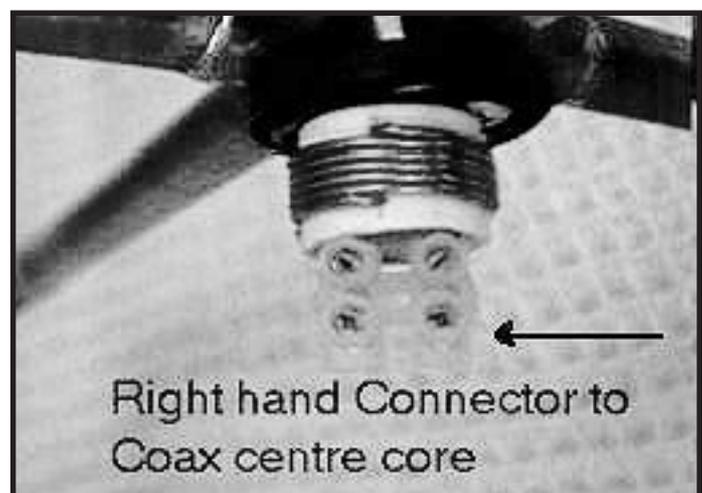
Drill the Plastic spacer as shown with holes on about 22mm centres. Check spacing with the bolts in place  
Fit the plastic spacer.



Drill the bottom of the film canister to clear the RG-58 cable, Prepare the RG-58 and connect to the terminal block, making sure that W1 finish goes to the RG-58 screen. Finally, fit the bottom of the film canister to the top and seal the RG-58 exit hole with weatherproof putty.



All you need to do now is fit the balun to your QFH.  
Remember when connecting your coax to fit the coax centre core to the right hand connecting terminal



Please let me know if you see anything wrong. Any comments to Paul Hayes please.