

BUILD INSTRUCTION IMPEDANCE TRANSFORMER FOR END FED ANTENNA'S	HOME
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Build instruction impedance transformer for end fed antenna's

The feeding point of a multiband End Fed antenna is practice that the end fed wire antenna, which has a very high impedance of 50 Ohm. This impedance suits best to most transformer windings and from 14 secondary windings. This gives a ratio than the source voltage and the current is seven times lower transformation of $7 \times 7 = 49$. That increases the impedance to 2450 Ohms. To create the impedance transformer, you wrap properties.

The above number of windings can be used for antennas use band. If the antenna is used only for the lower frequencies (8 primary and 21 secondary windings).

The enclosure

We start by marking and eventually drilling the holes to be at relief. It is especially recommended to use a strain relief for a permanently. The hole for the stainless steel eye should be connection should be drilled with a 5 mm drill. The place where



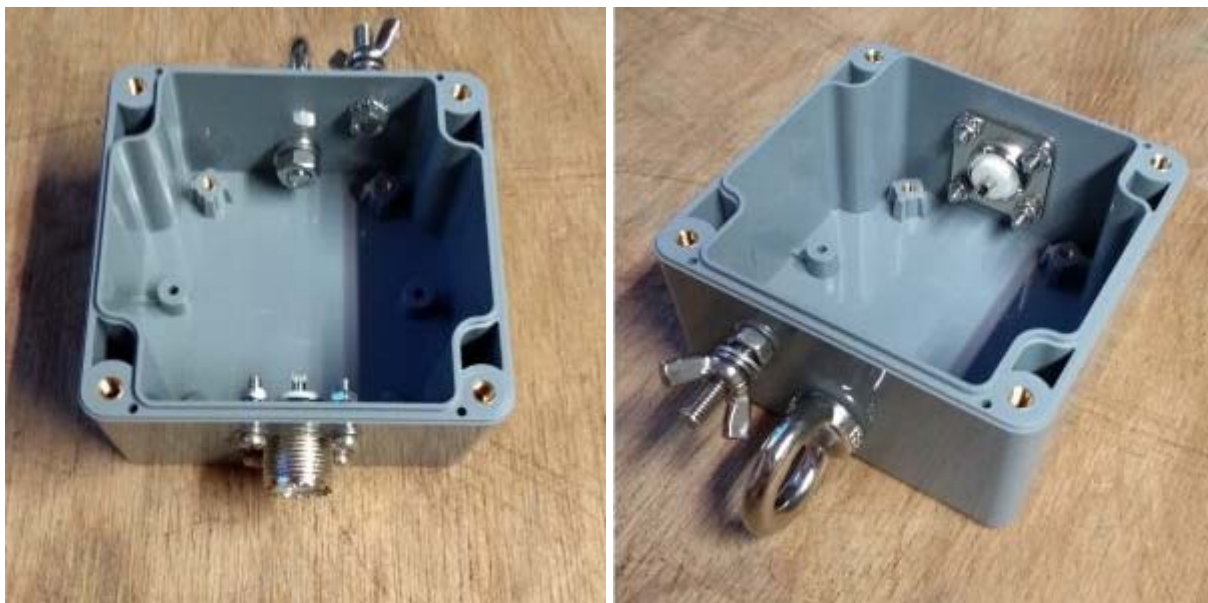
After this step, we continue by marking and drilling the hole for the connection of the coax connector. The diameter of this hole should be 16 mm. This is a large hole and therefore it is easiest to create it with a 'sheet step drill'. (if you have never heard of that, Google is your friend for looking up what you need)



After drilling the 16 mm hole, I placed the chassis part into the hole, to determine the location of the fixing holes. I picked a chassis part where I fix the part with 4 screws, but 2 screws could also work. These holes can be drilled with a 3,5 mm drill.

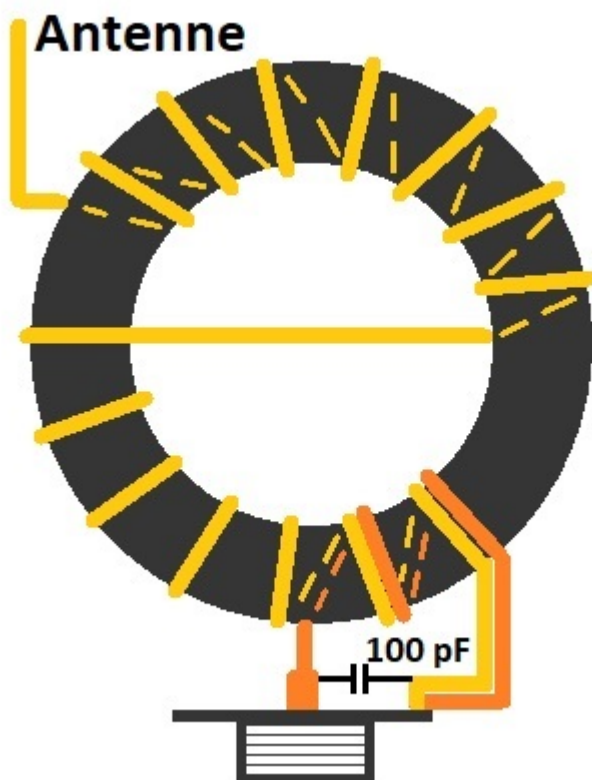


After drilling all the holes, we can find out if everything fits the way it should. Here you can see the result of drilling the holes and tightening the screws.

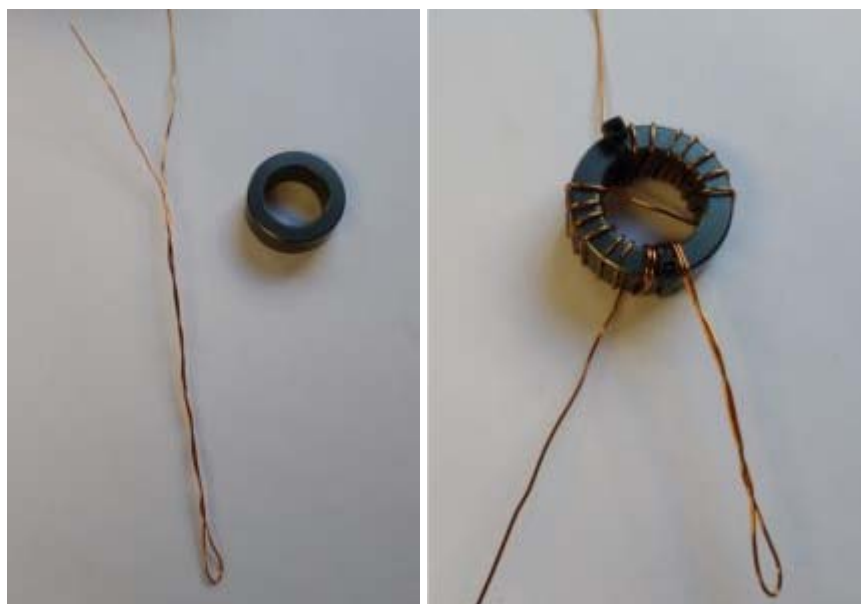


The Impedance transformer

We are going to start on the impedance transformer.



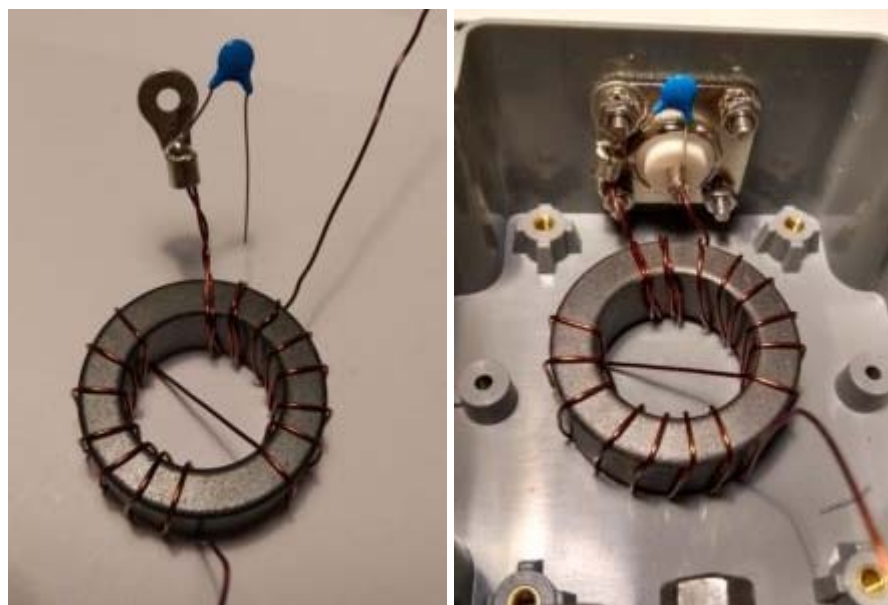
First, fold approximately 15 to 20 cm of the enamelled copper wire in half. This will create 'two' pieces of wire. One long and one short part. Then twist the material slightly over the first 15 cm to hold it together. Make sure to not twist the copper too much, because this might create strange effects in the transformer at a later point. Now take the point where the two pieces of wire become one and place this on the toroid. Now wrap the double part of the wire around the core twice and attach this with a tyrap. After this step is finished, you can wrap the rest of the 12 turns around the toroid. See picture. Make sure to cross the wire halfway.



If you followed all the steps, you should see something like the picture below. A capacitor of 100 pF can now be placed over the primary side of the transformer, so we can compensate any (unwanted) secondary capacity. This is only relevant if you use the 15 – 12 – 10 meter band. If you don't use this, the capacitor isn't necessary. Now you can connect the primary side of the transformer to the coax connector. It should look like the picture below.

Make sure that the enameled copper wire is completely released from insulation material. You can easily remove this insulation by using a knife. Make sure to do this properly and carefully, so a good solder connection is established.

Finishing up



After this precise work, you are able to connect the secondary part of the transformer to the antenna connection. For this you can use the included toothed spring washers and place them below and above the M5 cable lugs (which means that these are inside the housing and not on the outside). In this way, the bolt will never turn when the connection to the antenna wire is established.

UPDATE: HF Kits created a solution to fix the toroidal core. Every antenna DIY kit for a 82 x 80 mm enclosure contains a mounting plate with four M3 bolts. With this mounting plate it is easy to connect the toroidal core with few cable ties. You can see an example on the pictures below.





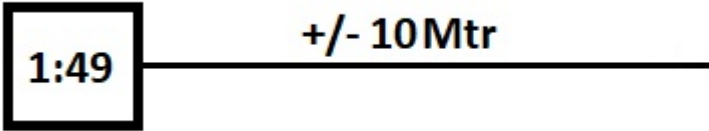
You can test the End Fed antenna impedance transformer by using a resistance of about 2500 Ohm (for example 2K7) on the ground of the coax connector and antenna connection. In this way, the SWR meter should show a standing wave ratio of approximately 1:1.5 or lower. Of course it is also possible to test with a half wavelength of wire.

Applications

It is easy to come up with lots of antenna varieties that you can match with the 1:49 impedance transformer. In theory it's possible to connect any half wavelength or a multitude of this to the transformer, in order to get a resonant antenna. Here are a few examples: 5 meters of wire is a half wave for a 10 meter band. 10 meters of wire is a half wave length for the 20 meter band and two times a half wave length for the 10 meter band. 20 meters of wire is a half wave length for the 40 meter band, but also full wave for the 20 meter band, double full wave for the 10 meter band and 3 half wave length for the 15 meter band. The advantage of the amateur bands is that the frequency doubles every time. So 3.5 MHz, 7 MHz, 14 MHz, 21MHz etc. This makes it very easy to create a multiband antenna for these bands.

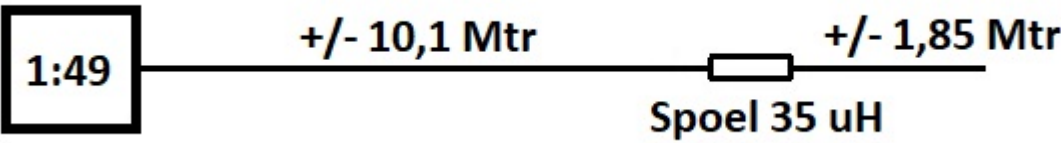
When you apply a coil in the End fed antenna, something interesting happens. The coil forms a high impedance for the higher frequencies, so the last part of the wire will not participate. This last part, including the entire antenna, only participates for the lower frequencies. In case of the 10,20,40 meter End Fed, only the first 10,1 meter of the wire will work on 10 and 20 meter. The entire antenna is 12 meters long mechanically, but forms an electric length of 20 meters for the 40 meter band because of the coil. This means it creates a half wave length for the 40 meter band. The disadvantage of working with a shorter antenna is that you will have a limited bandwidth.

10 and 20 meter band



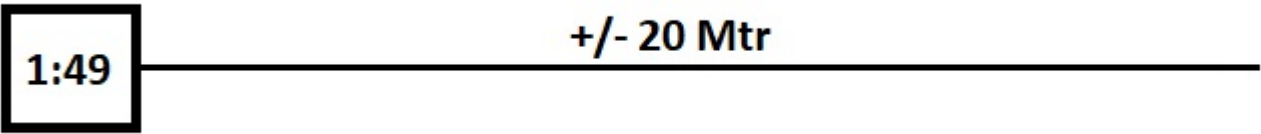
Total length +/- 10 meters.

10, 20 and 40 meter band, with coil



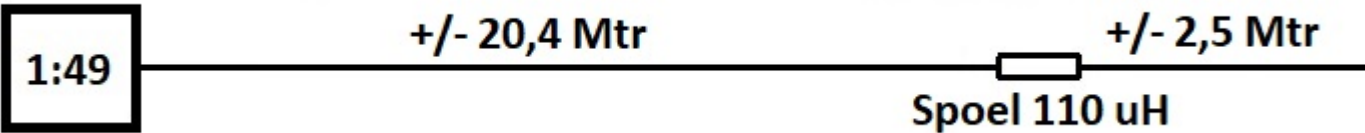
Total length +/- 12 meters

10, (15), 20 and 40 meter band



Total length +/- 20 meters

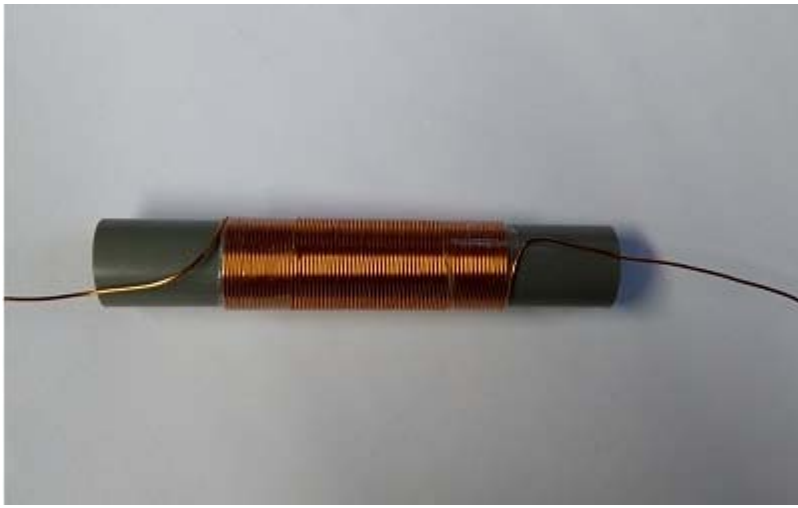
10, (15), 20, 40 and 80 meter band, with coil



Total Length +/- 23 meters

The coil

You might use several ways to incorporate the coil into the antenna wire. Below is a visual representation of a w that works properly. To be able to get a 35 uH coil around 19 mm of PVC, 80 turns of 0,75 mm winding wire can be made. In case of a 110 uH coil, 170 windings of 0,5 mm of winding wire is used. For deviating coils or a different diameter of winding wire, the following tool exists. Download link to Mini Ringkern Rechner: [Click here!!](#)

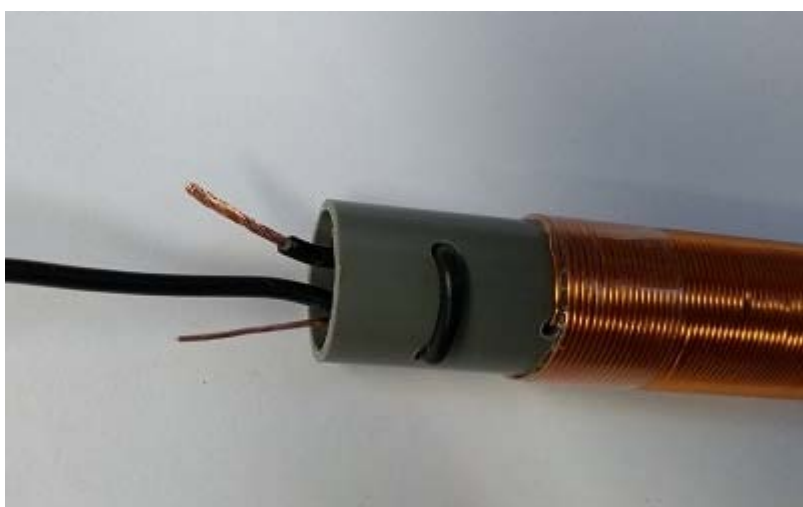


Try to wrap the coil as tight as possible, so there will not be any space left between the windings. Then fix the entire piece with some tape. Continue by drilling two small holes, right next to the coil, where you can stick the ends of the wire in.





The next step is to drill two more holes as shown in the photo above. These holes will be used to put the wire through, which will be used as the strain relief. Finish this step by tying a knot in the wire and pulling it tight.



The excess wire can be cut off from the winding wire and the antenna wire. Leave just enough so there will be enough material for soldering. Make sure that the winding wire is completely stripped of the enamel layer. This can easily be done with a sharp knife or some sandpaper. Now solder the wire to the coil and put this into the pipe.



Now apply the heat shrink and heat evenly until the heat shrink fits nicely.

Fine tuning

Place the finished End fed antenna in the desired spot, with some extra wire length attached to it. The first step is to then tailor the wire for the higher frequencies. This is the piece of wire that is connected directly to the impedance transformer. Keep in mind: it's possible to cut it off, not to put it back on. So don't cut too enthusiastically. If the higher frequencies show an average and acceptable SWR, you can start to tailor the part of the wire behind the coil for the lowest band.

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Need counter poise capacity?

Many discussions on the use of counter capacity in End fed antennas exist on the internet and in literature. Interested to read more about it? The following article elaborates on this topic.

[End fed antenna's, a critical view.](#)

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