HF ANTENNA TRAPS

HF antenna traps offer an easy and efficient way of making a multi band wire antenna. Our traps are quick and easy to make – and have a unique design making them perfect for use in the field or at home.

Revison History

1 March 2015	First draft
22 June 2015	Revised set-up procedure
8 October 2015	Peter Dodd's test set-up incorporated plus tips on parallel tuning.
21 October 2015	Parallel tuning using antenna analysers added
12 January 2016	Included instructions for V3.0 pcbs
5 November 2020	Updated links and contact information
24 February 2021	Added instructions for W3DZZ kit
20 December 2024	Updated and added more photos

Packing List

It's a good idea to check that you have all the parts before you get started:

Item	Number	Comments
Toroids	2	T94-6 (100W) / T68-6 (20W) / T94-2 (W3DZZ kit) ("-6" toroids are yellow, "-2" toroids are red)
Enamelled copper wire		Approx. 1.5 metres (HF trap kits) / 2 metres (W3DZZ kit)
Trap PCBs	2	
Nylon nuts	2	PCB mounted
Washers (large plastic)	2	(100W kit or W3DZZ kit only)
Washers (nylon)	2	(20 W kit only)
Nylon screws	2	
Capacitors	4	100pF 1kV

Note - older trap kits (pre v3.0) have two 47ohm resistors included. These are not needed. See last page if you have a pre v3 kit

If anything is missing, just get in touch for help: support@sotabeams.co.uk

Construction Instructions

Our traps are easy to make. We give you step by step instructions together with lots of photographs. It will take around 30 minutes work.

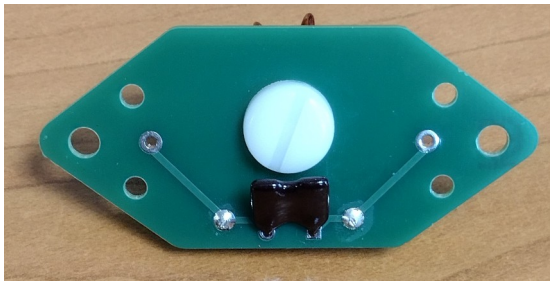
For the purposes of these instructions I will describe how 20 m, 20 Watt traps are made. The instructions will apply equally to the 100 Watt traps and for any other band.

Having decided that we want traps for 20 m – perhaps to make a dual band 20 – 40 m dipole we can start to design them. First decide on a nominal design frequency. Usually this will be at the bottom edge of the band = 14.0 MHz. Having done this we can start making the traps.

Install the capacitors. We supply 4 x 100pF capacitors and they can be wired in various ways, depending on the frequency you want the trap for. The table below describes our recommendations:

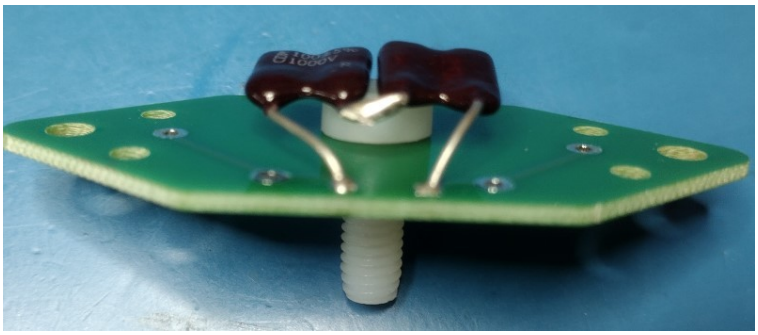
Freq Range	Capacitor configuration	Capacitance
18-30MHz (yellow toroids)	2 x 100pF in SERIES	50pF
10-18MHz (yellow toroids)	1 x 100pF only	100pF
7-10MHz (yellow toroids)	2 x 100pF in PARALLEL	200pF
7MHz (W3DZZ, red toroids)	1 x 100pF only	100pF

For for 100pF install just one capacitor on each board. This goes on the position below the toroid. The capacitor is installed on the reverse side of the board (the side with no writing).



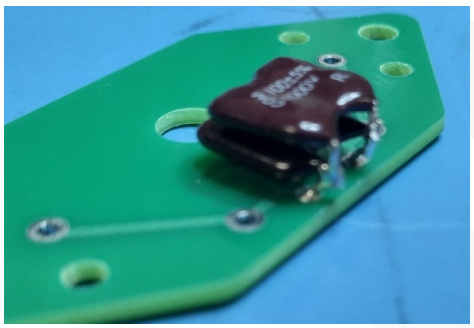
In series (50pF)

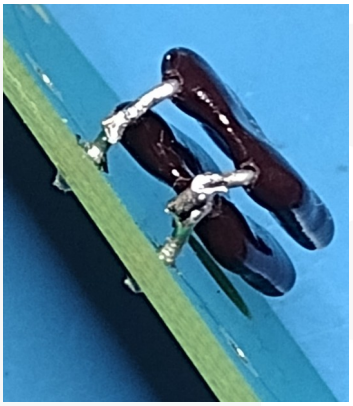
Solder two leads together and solder to the pcb with the capacitor sitting on top of the screw



In parallel (100pF)

Solder the first the pcb with the capacitor raised above the pc solder the second capacitoer to the leads of the second.





Next comes the toroid design. This has to have the correct inductance to form a resonant tuned circuit with our chosen capacitors (100pF).

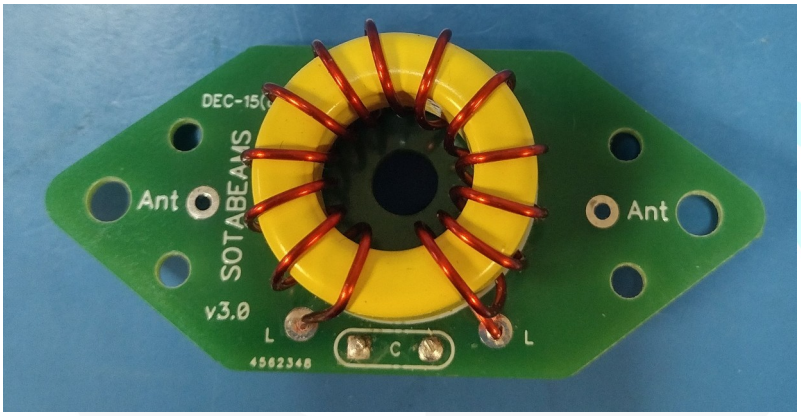
We suggest using the following table for the design. The number of turns is approximate – it is common to have to add or remove one turn to get the range correct.

Frequency (MHz)	20 Watt Traps capacitance + turns	100 Watt Traps capacitance + turns
7.1 (W3DZZ, red toroids)	n/a	100pF + 23T
7.0 (yellow toroids)	200pF + 22T	200pF + 18T
10.1 (yellow toroids)	100pF + 22T	100pF + 18T
14.0 (yellow toroids)	100pF + 16T	100pF + 13T
18.06 (yellow toroids)	50pF + 17T	50pF + 14T
21.0 (yellow toroids)	50pF + 15T	50pF + 12T
24.89 (yellow toroids)	50pF + 12T	50pF + 10T

Cut the enamelled copper wire into two equal lengths and wind the toroids. Each time the wire passes through the core counts as a turn. Space the turns so that they spread over about 80% of the circumference of the toroid.

Cut the wire so that the tails from the toroid are about 1.5cm long. Using a hot soldering iron, tin the enamelled copper wire. The enamel will melt in a bead of solder on your iron. If your soldering iron does not get hot enough to melt the enamel, you may need to scrape the enamel off with a blade.

Insert and solder the leads into the holes marked “L”.



Do not install the nylon mounting hardware until the trap has been tested

Testing

The traps can now be tested using an antenna analyser. Thread a piece of wire through the centre of the toroid and connect it to your analyser. The resonant frequency of the trap will be indicated with a pronounced and sharp dip in the SWR reading. The actual reading is not important – it's the dip that matters.

Photograph shows a trap being tested

Adjust the resonant frequency by moving the turns on the toroid. Squeezing the turns together will lower the resonant frequency of the trap.

Occasionally you may need to adjust the number of turns on the toroid. The characteristics of toroids are rather variable and the table we provide is only a guide. Taking turns off will make the resonant frequency higher. Don't worry if you cannot quite reach your design frequency, traps are not very critical, anywhere within a few tens of kHz will be fine.

Once adjusted, fasten the toroid to the trap PCB using the nylon hardware. Have the washer and nut on the same side as the toroid. Be careful not to move the turns while doing this.

Alternative Tuning Methods

The following links show alternative methods of testing traps. In general parallel testing is the most reliable method to use. Note the methods below all assume that the trap has been configured as a parallel tuned circuit (i.e. the link is in place – see below).

http://www.qsl.net/dk7zb/Trap/trap.htm

http://www.marcspages.co.uk/tech/2104.htm

http://www.sark110.com/application-notes/measuring-traps

https://www.vk4adc.com/web/4ADC_PDFs/Tuning%20HF%20Coaxial%20Antenna%20Traps.pdf

http://www.iw2fnd.it/sites/default/files/docs/Trappole_01_EN.pdf

Final Assembly

Once you are happy that your trap is tuned up properly; tighten the nut to hold the turns firmly.

Test your trap by connecting an Ohm meter between the antenna pads - marked "Ant". The resistance should be less than 0.5 Ohms.

The antenna connections are marked on the trap. The three larger holes can be used to thread your wire through and tie off to ensure that the pull for the antenna does not strain the solder joints.

For permanent installation I suggest that the traps are suspended below the antenna.

Note that some interaction between antenna sections is normal when making trapped antennas so the adjustment can be time-consuming!

Flexible mounting arrangements

Typical mounting arrangement for a portable antenna. The trap is shaped to reduce snagging on vegetation.

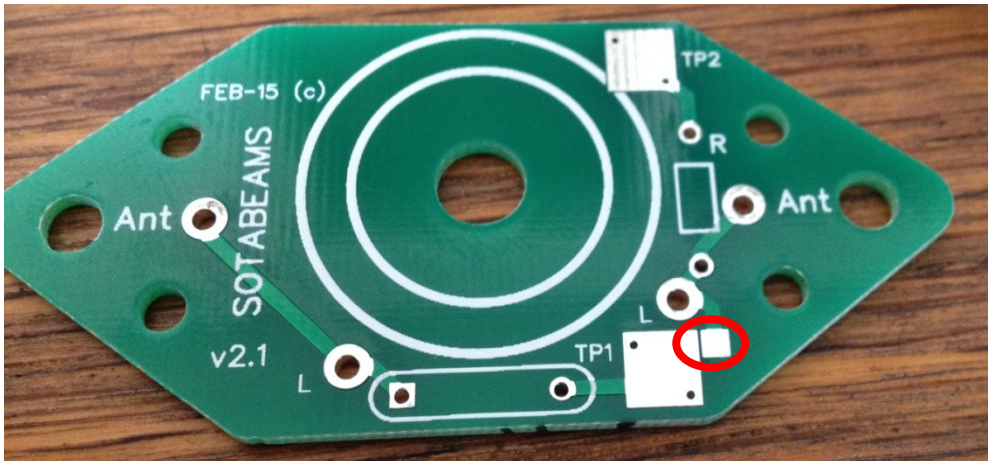
For use in permanent installations we recommend suspending the trap below the antenna.

The traps will need to be made waterproof for extended use. This is easily done by coating them with Liquid Electrical Tape – a widely available brush-on insulating rubber solution (available from SOTABEAMS).

Pre v3.0 pcbs

NOTE: we no longer recommend series tuning. You do not need to install the resistors.

[**This step is red writing is not required for pcbs V3.0 and later**].Next install a link across the pads indicated in the photograph below. The leg you cut off the capacitors will do well. Do this for both traps.



Spotted a mistake or need help?

Please let us know!

Email support@sotabeams.co.uk