SOTABEAMS™
AMATEUR RADIO FOR THE GREAT OUTDOORS

# PICO TRAPS

**Pico 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

| | |
|---|---|
| 7-Oct-2015 | First draft |
| 9-Oct-2015 | Incorporated advice on parallel tuning of traps |
| 15-Oct-2015 | Turns added to toroid table |
| 21-Oct-2015 | Parallel test method added |
| 02-Apr-2016 | Suggestions and mods from Barry N1EU and Randy K7TQ (esp. 20m toroid) |
| 26-May-2020 | Updated voltage rating of capacitors, and contact details |
| 20 December 20024 | New photos added |

## Packing List

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

| Item | Number | Comments |
|---|---|---|
| Capacitors 100pF 200 Volts | 2 | Surface mount – on card |
| Toroids | 2 | T50-6 |
| Pico Trap PCBs | 2 | V1.1 or higher |
| Nylon nuts | 2 | |
| Nylon washers | 2 | |
| Nylon screws | 2 | |

If anything is missing, just get in touch for help.

support@sotabeams.co.uk

## Construction Instructions

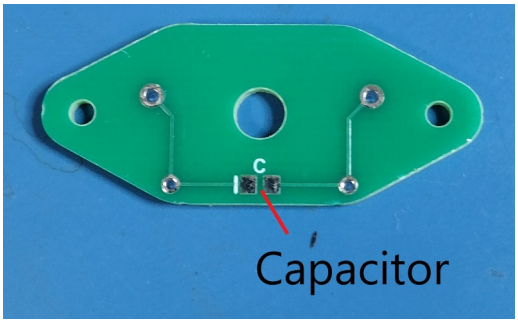
See the last page for version 1.1 pcbs

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, traps are made. The instructions will apply equally 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.

The first components to install are the surface mount capacitors. These are stuck on a card. They are in small plastic carriers with a transparent film cover which can be peeled off with tweezers.




You will need a temperature controlled soldering iron with a needle tip, fine solder and some good tweezers. The keys to success are a clean, well lit working area and I always work on a large tray as you will discover that surface mount parts have a habit of pinging off!

This video shows how to do it:

**http://tinyurl.com/PicoTrapSMD**

Note that the resistors are **not** required – leave the pads for them vacant.

If you do have problems, drop me an e-mail!

Next comes the toroid design.  The toroid has to have the correct inductance to form a resonant tuned circuit with our chosen capacitor (100pF). The table below shows the number of turns required for various resonant frequencies. Note that every time the wire passes through the hole in the toroid counts as 1 turn. You can't wind half turns on a toroid!

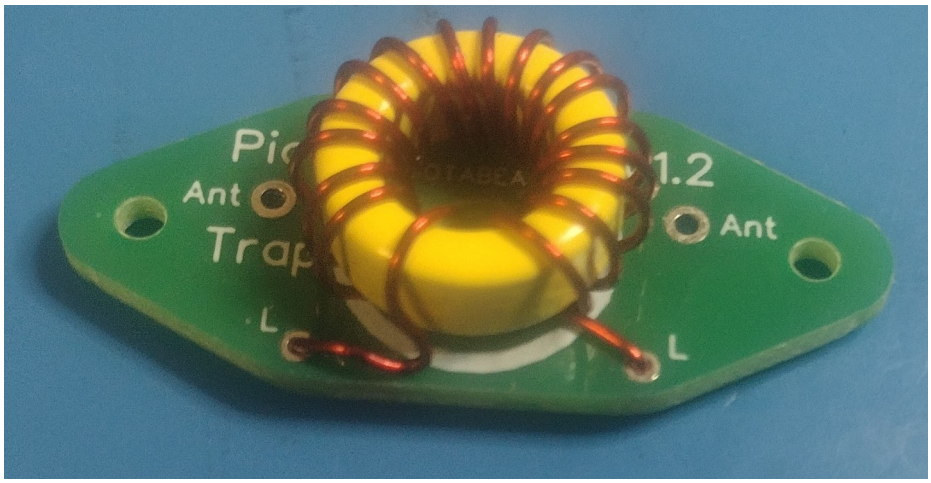
It's a good idea to mount the toroid temporarily at first as the exact number of turns can vary slightly depending on the tolerances of the components and your winding technique.

| **Frequency (MHz)** | **Turns** |
|---|---|
| 10.1 | 22 |
| 14.0 | 17 |
| 18.06 | 14 |
| 21.0 | 11 |
| 24.89 | 9 |

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 10mm long. Either scrape off the enamel or using a hot soldering iron, tin the enamelled copper wire. The enamel will melt in a bead of solder on your iron.

Solder the toroid to the pcb  pads marked L



## Testing

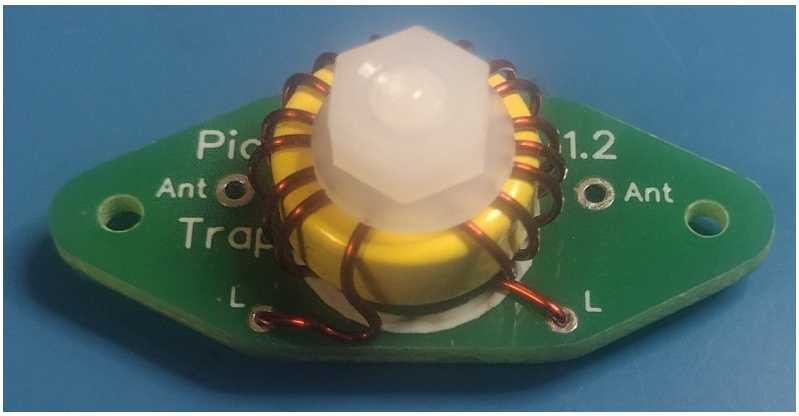
The traps can now be tested using an antenna analyser. Thread a piece of wire through the centre of the toroid and connect it to your analyser. The resonant frequency of the trap will be indicated with a pronounced and sharp dip in the SWR reading. The actual reading is not important – it's the frequency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


**Photograph shows a trap being tested**

Adjust the resonant frequency by moving the turns on the toroid (squeezing them together). 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.




### Other test methods

The following links show alternative methods of testing traps. These can be used to verify the method above in the event of any doubt.

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

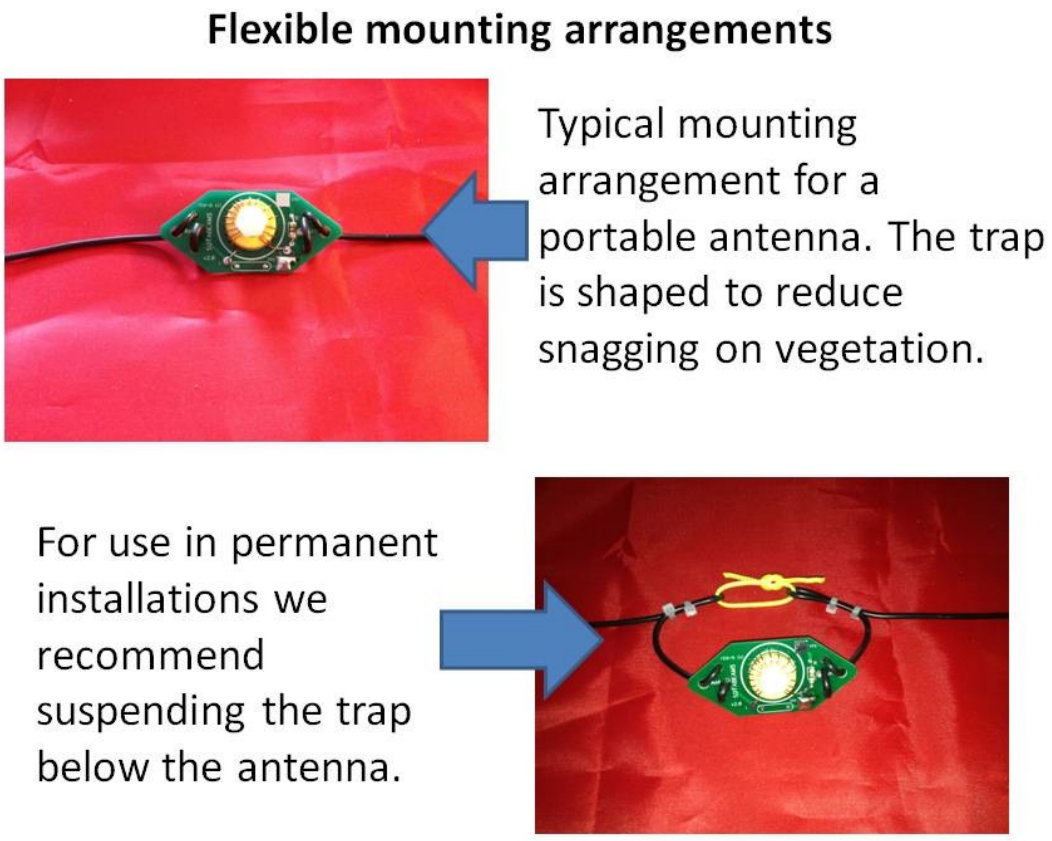
## Final Assembly

The antenna connections are marked on the trap. The 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!

## Using your traps – a few tips




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).

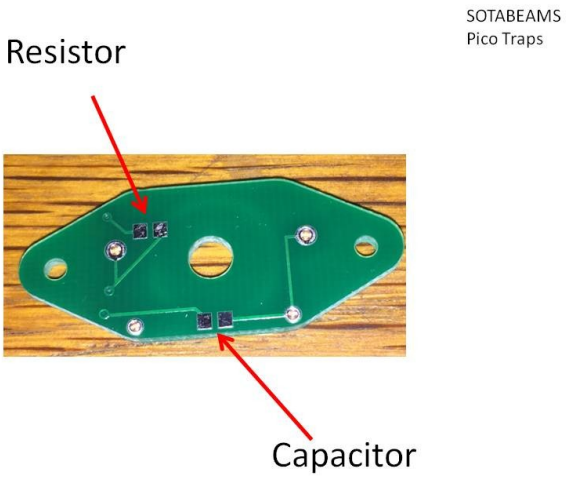
## Spotted a mistake or need help?

Please let us know!

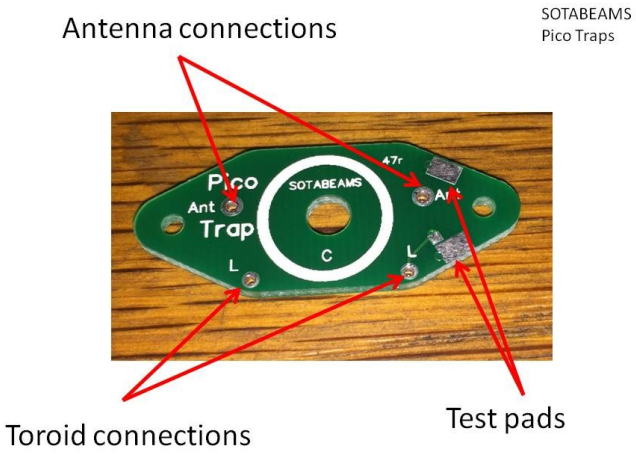
Email support@sotabeams.co.uk , telephone +44 (0) 1625 501643

## *Version 1.1*

Fit the resistor to the pads




**NOTE: NO RESISTOR REQUIRED OR FITTED PCB V1.1 AND ABOVE.**




***NOTE: TEST PADS NOT PRESENT OR REQUIRED PCB V1.1 and abov***

***Once the toroid is installed, measure the resistance between the antenna terminals on the trap. It must be less than 1 Ohm. If it is not, your problem is likely to be the toroid connections.***