

## PICO BALUN KIT ASSEMBLY INSTRUCTIONS

### Revision History

10 Jan16 First issued  
18 Jan16 Revised to correct core type and clarify loop type  
Feb 2022 Updated V2 PCB

### PCB version 1 instructions

Please see [Version 1 instructions](#) if you have the older V1 PCB

### Pico Balun Packing List

It's a good idea to check that you have all the parts before you get started: If anything is missing, just get in touch for help.

Ref	Item	Qty	Comments
1	PCB	1	V2
2	Toroid (grey)	1	FT50-43
3	65cm 24swg enamelled wire	1	
4	5cm 24swg tinned copper wire	1	
5	100 ohm test resistor	2	Either brown-black-black-black, or brown-black-brown
6	Nylon screw, nut and washer	1 of each	Attaching toroid to PCB
7	Cable tie	1	

## Pico Balun Instructions

The Pico Balun kit is easy to make and you will end up with a very useful balun. The balun can be built as a standard 1:1 balun for dipoles, or as a 4:1 balun for full-wave loops etc.

Instructions for the 1:1 balun are on page 3. Instructions for the 4:1 balun are on page 9.

Step by step instructions together with lots of photographs will make it easy to build your balun. It will take around 30 minutes work. As with any construction project, as soon as you feel tired, stop. If you don't, mistakes will follow!

For all the assembly work, find a light place to work with plenty of room.

## Spotted a mistake or need help?

Please let us know if you need help! Email [support@sotabeams.co.uk](mailto:support@sotabeams.co.uk)

## Tools needed

- 1 Small screwdriver (flat blade)
- 2 Small vice, pliers or grips
- 3 Soldering iron and solder
- 4 Long nosed pliers
- 5 Craft knife
- 6 Metric (cm) ruler
- 7 Wire cutters

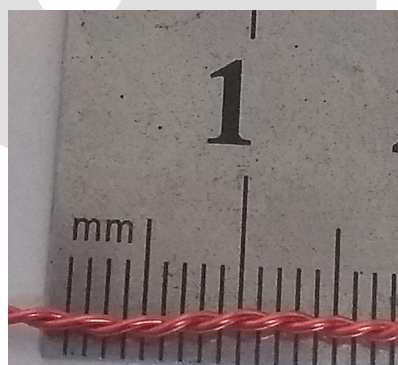


### 1:1 Balun instructions

- ☐ Straighten the enamelled copper wire and fold it in half.
- ☐ Fasten the open end in a vice and twist the wires using a screw driver in the loop end.  
Note:- If you do not have a vice, then hold the other end with pliers. Mole grips or locking pliers will be fine. You might need an assistant to hold the pliers.



- ☐ Aim for about 5 twists per centimetre ( 3/8"). The number of twists is not critical. This process makes a low impedance transmission line.



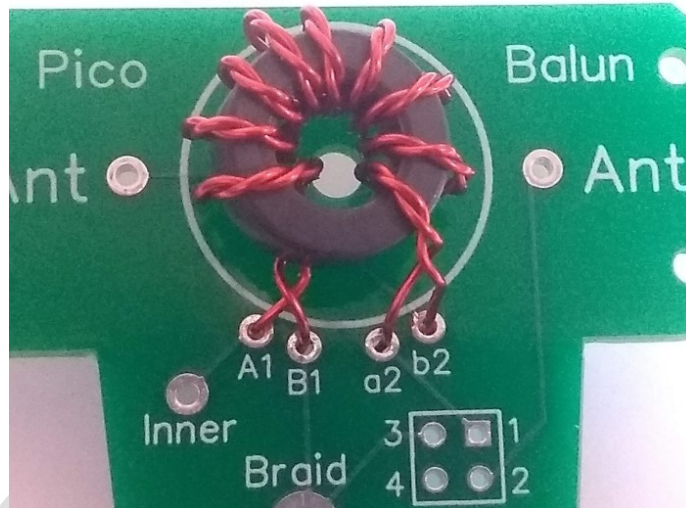
- ❑ Wind 9 turns through the core. Each pass through the centre of the toroid is counted as a turn (if you are going to use your balun below 7 MHz you can increase the number of turns to 11 to improve the low-frequency performance).



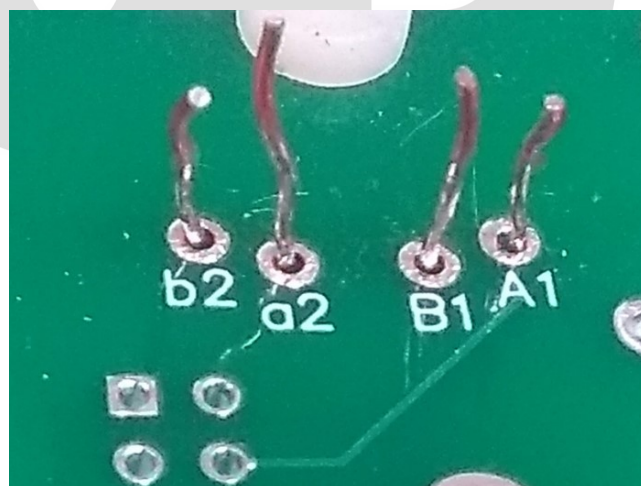
- ❑ Fan out the ends of the wire.



- ❑ Mount the toroid on the PCB. One end of the twisted pair goes into A1 and B1, the other end of the twisted pair goes into a2 and b2. The order of wires within each pair [A1, B1] and [a2, b2] does not matter for the 1:1 balun.

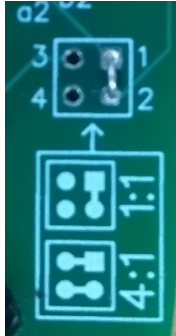


- ❑ On the reverse side of the PCB, clean the enamel off the wire by scraping off the enamel with a sharp knife or sandpaper. Alternatively, burn off the enamel using a small bead of solder on the tip of a hot iron. Be careful not to damage the wire itself.
- ❑ Attach the toroid to the PCB using the nylon nut, screw and washer. Do not over-tighten as it is easy to strip the threads. The washer and nut are fitted on the toroid side.





- ☐ Trim and solder the four copper wires on the reverse side of the PCB.
- ☐ Using the tinned copper wire, make a link to join 1 and 2. Solder the link in place.



- ☐ If using RG174, thread the coax through the hole on the balun.



- ☐ If using RG58, lay it against the PCB.



- ☐ Trim the end of the coax, and solder as indicated on the PCB.
- ☐ Fasten the coax with a cable tie.

### 1:1 Balun Testing

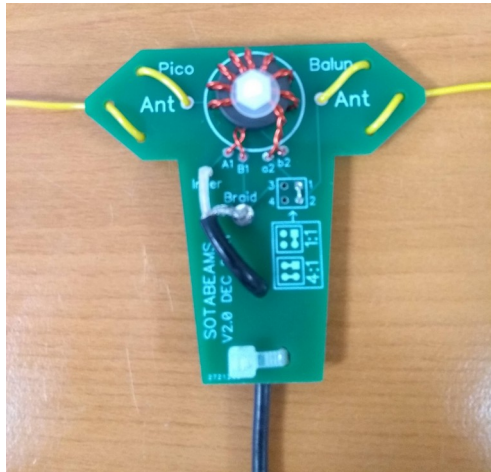
- ☐ Twist the leads of the two test resistors together so that they are in parallel (= 50 Ohms). Poke them through the antenna holes (marked ANT) on the PCB so that they make a temporary connection - no need to solder them.
- ☐ Attach an antenna analyser to the coax cable.
- ☐ Check that the VSWR is less than 1.5:1 between the lower and upper frequencies that you intend using it for (range between 1.8 MHz and 30 MHz).



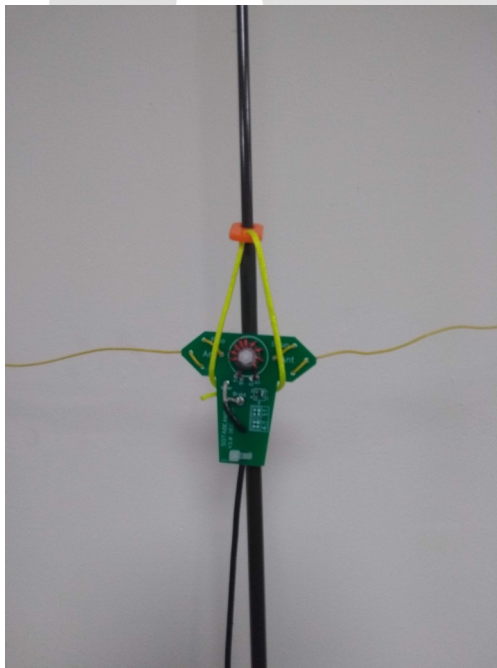
- ☐ Your balun is now ready to use.

## Attaching the Antenna

- ☐ Thread your antenna wire through the strain relief holes and solder.



- ☐ The Pico Balun can be mounted to a fiberglass mast using our [Versatile Top Antenna Insulator](#) and cord.



- ☐ Your Pico Balun will need to be protected from rain. You can coat it with our [Liquid Electrical Tape](#) which does not affect the operation of the circuit (once fully dry). Some other sealants will reduce the Q of the circuit and the acid solvents used may corrode the exposed wire and PCB pads – beware.

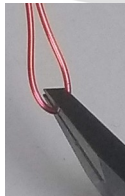


#### 4:1 Balun instructions

- ☐ Straighten the enamelled copper wire and fold it in half.
- ☐ Wind 9 turns of the doubled wire through the core (do not twist the wires together). Each pass through the centre of the toroid is counted as a turn.



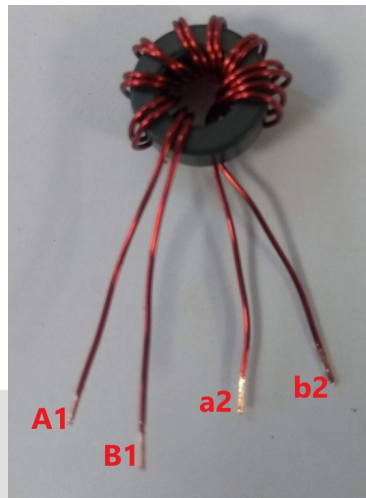
- ☐ Cut the loop where the wire was folded in half.



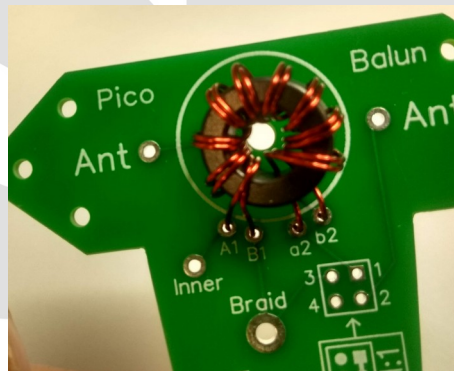
- ☐ Fan out the ends of the wire. Clean the enamel off the wire by scraping off the enamel with a sharp knife or sandpaper, or alternatively burn off the enamel using a small bead of solder on the tip of a hot iron. Be careful not to damage the wire itself.

- ❑ Using a multimeter, check for continuity between the wires on the left and right side of the toroid. Label one wire as A1, a2 and the other wire as B1, b2.

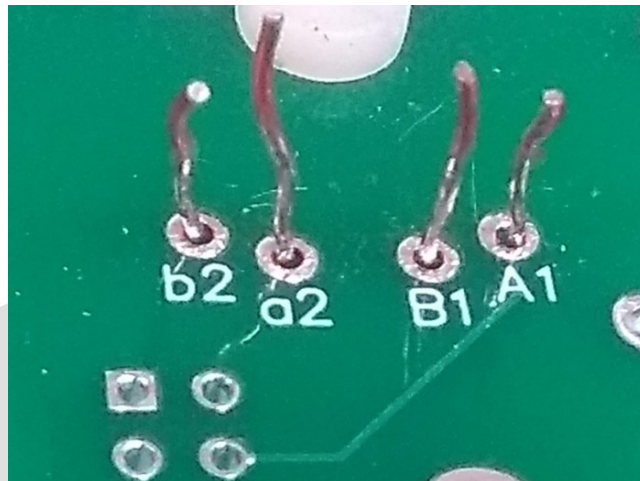
A1 → a2 = 0Ω      B1 → b2 = 0Ω



- ❑ Mount the toroid on the PCB. Ensure that the correct wires are in A1, B1, a2 and b2. The toroid should fit flush with the PCB.



- ☐ On the reverse side of the PCB, clean the enamel off the wire by scraping off the enamel with a sharp knife or sandpaper. Alternatively, burn off the enamel using a small bead of solder on the tip of a hot iron. Be careful not to damage the wire itself.
- ☐ Attach the toroid to the PCB using the nylon nut, screw and washer. Do not over-tighten as it is easy to strip the threads. The washer and nut are fitted on the toroid side.



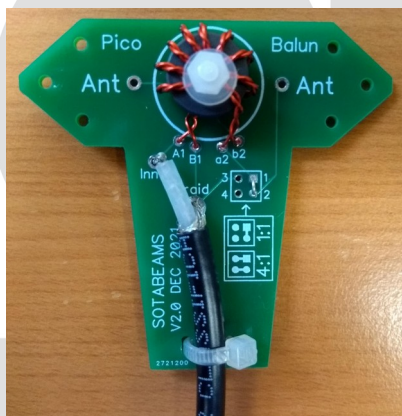
- ☐ Trim and solder the four copper wires on the reverse side of the PCB.
- ☐ Using the tinned copper wire, make two links to join 3 to 1 and 4 to 2. Solder the links in place.



- ☐ If using RG174, thread the coax through the hole on the balun.



- ☐ If using RG58, lay it against the PCB.



- ☐ Trim the end of the coax, and solder as indicated on the PCB.
- ☐ Fasten the coax with a cable tie.

## 4:1 Balun Testing

- ☐ Twist the leads of the two test resistors together so that they are in series (= 200 Ohms). Poke them through the antenna holes (marked ANT) on the PCB so that they make a temporary connection - no need to solder them.
- ☐ Attach an antenna analyser to the coax cable.
- ☐ Check that the VSWR is less than 1.5:1 between the lower and upper frequencies that you intend using it for (range between 1.8 MHz and 30 MHz).

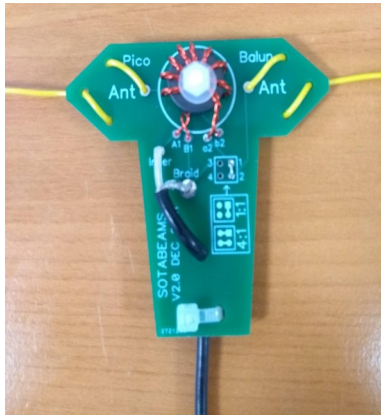


- ☐ Your balun is now ready to use.

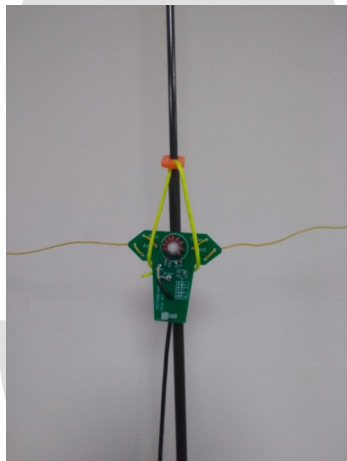


## Attaching the Antenna

- ☐ Thread your antenna wire through the strain relief holes and solder.

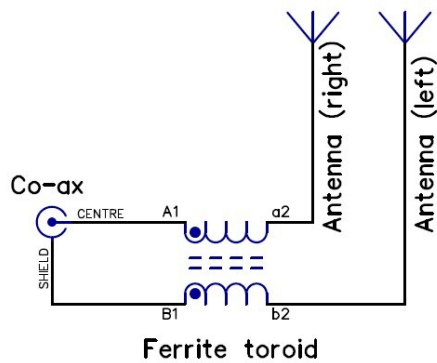


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### 1:1 Balun diagram



### 4:1 Balun diagram

