Assembly instructions manual

Spiderbeam Balun (Coax choke)

Parts list Spiderbeam kit SKU **A900**

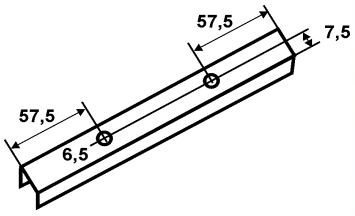
SKU	QTY	Description
PA007	1	Aluminium 'U'-Rail 15x15mm, length 200mm
PA009	4	M6 x 30 bolt, stainless steel
PA010	2	M6 x 16 bolt, stainless steel
PA012	12	M6 nut, stainless steel
PA013	10	M6 washer, stainless steel (outer diameter 18mm)
PA015	4	M3 slotted head screw, stainless steel, length 10mm
PA016	4	M3 nut, stainless steel
PA115	4	M3 washer, stainless steel
PA017	6	Rubber sealing washer for M6
PA027	4	M6 tubular cable lug, tin plated copper, with 90°angle
PA030	1	Predrilled black plastic enclosure, 120x90x55mm, waterproof, UV-resistant
PA031	1,05m	Teflon Coax cable RG142
PA032	1	Ferrit toroid ring FT-240-61
PA033	1	PL Coax socket SO239
PA034	1	Rubber gasket for coax socket
PA035	1	M3 soldering lug
PZ01-1	5	Cable ties, black 200x4,8mm

Technical note for use with Spiderbeam Yagi antennas:

First of all kindly note: Hundreds of hams who have never built a balun before in their life, have successfully built this easy-to-build Spiderbeam balun. If you follow our instructions, you can too!
The feed point impedance of each driven element is very close to 50 Ω. The short pieces of 100 Ω transmission line do not have a significant effect on this impedance, so 50 Ω is seen at the balun. Thus, there is no need for impedance transformation. However, the symmetrical feedlines from the 5 radiators must be attached to an unsymmetrical 50 Ω coax, thus a 1:1 current balun is necessary to avoid common mode current. All Spiderbeam Yagi antennas use a 1:1 choke-balun with "cross-over" winding, developed by Joe Reisert, W1JR. It is wound onto the FT-240-61 Toroid, and has 12 complete turns of RG-142, Teflon-insulated coax, with 6 turns on each side. The crossing to the other side is numbered here as a "turn" for the sake of understanding, but in fact it is not a turn around the ferrite (see the photo on page 2 with 13 marked bends). The balun described below (as a coax choke) can be used not only for our antenna, but also in the entire frequency range from 1.8 - 30 MHz, e.g. for dipoles of all kinds.

Plastic-Enclosure

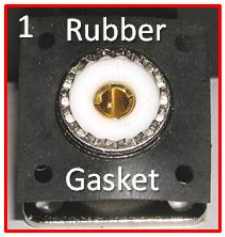
The plastic box is shown here in light-colored plastic for better visibility. However, the housing supplied by us is black, as this makes it more UV-resistant. The box supplied by Spiderbeam for the kit is complete with seal, pre-drilled and ready for installation.

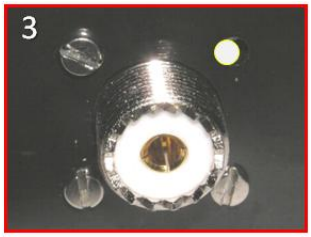


Aluminium U-Rail

The aluminum profile is provided with two 6.5 mm holes for fastening. It serves as a "mounting bracket" for attaching the balun to the standpipe. Insert two stainless steel M6x16mm bolts through the U-Rail, and then mount it against the back side of the plastic case, by pushing the two bolts through the bottom holes of the case. From inside the plastic case, first slide an M6 rubber washer over each bolt, then an M6 stainless steel washer, and finally an M6 stainless steel nut. Tighten the nuts with an M10 wrench (spanner).

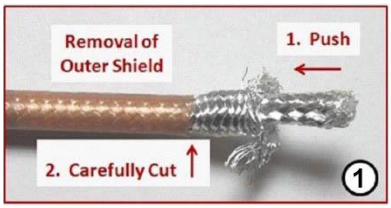
Mounting the SO-239 Coax socket connector

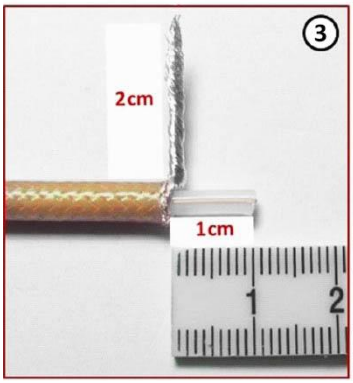


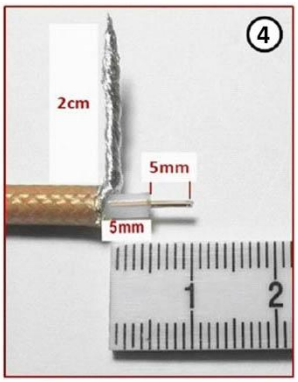


Begin by sliding a rubber gasket over the SO-239 coax connector (photo 1). Then insert the socket with rubber gasket from the inside through the recess so that the screw plug faces outwards (photo 2). Insert the M3x 10 mm screws from the outside and slide the M3 soldering lug on the top right screw (photo 2 and 3) inside the box. Then fasten the socket and solder lug inside with the M3 nuts inside. (Ready mounted to see in the photo on page 3)

Preparing the Coax

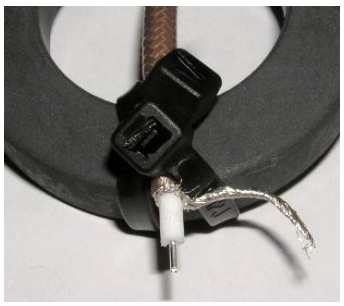






Before beginning to wind the coax onto the toroid, carefully remove the 2 cm of the insulation from one end of the coax. The coaxial shield consists of two layers of braid. You will only need the inner braided shield. Carefully remove the outer braided shield by pushing back, taking care not to damage the inner braided shield (image **1**). Then cut the outer braided shield away without damaging the inner shield (**2**). Using a pointed object such as a nail, un-braid the shield and twist it together to the side (**3**). Cut off the tip of the center conductor, such that it is 1 cm (2.5 in.) long, then carefully remove 0.5 cm (⅕ in.) of the center conductor's plastic insulation. (**4**).

Winding Coax onto the Toroid



Secure the short end of coax to the top of the Toroid using two small cable ties (see photo on the left). Wind 6 turns of coax through the middle of the Toroid and towards the right. (No. 1-6 on the image below) The next turn also begins over the top of the Toroid, folding over the top, then routed back towards the beginning of the winding, passing under the Toroid, just to the left of the cable ties. Wind 6 more turns (No. 8 – 13 on the image below) onto the left side of the Toroid, with turn 8 passing under the Toroid. Once again, secure the end with two cable ties.
This completes attaching the coax to the Toroid.

Please pay as much attention as possible to the dimensions and the correct winding! Otherwise it may not fit properly in the housing.

Preparing the Long End of the Coax

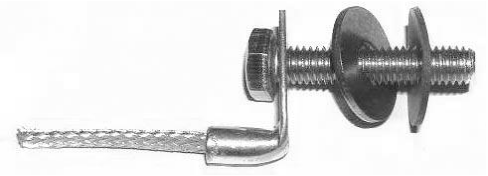
Leave approx. 0.6 cm of the coaxial cable untouched behind the ferrite at the cable ties (point 13 in the photo), then cut off the coaxial cable after 10 cm. Again the insulation and outer shield of the coax must be removed carefully without damaging the inner braided shield, as described above.

Important: **don't discard the 10cm of the outer shield.**

We will later use this shield to connect the balun to the top bolts.

Then the inner braided shielding is also very carefully removed at this end, twisted and formed into a longer lateral connection piece (as described for the start of the cable and visible in the image). The other lateral connection piece formed by the coax center conductor (core) should keep a 1 cm long piece of the white insulation as a protection distance, leaving a 9 cm piece of the coax core free for further use. (see image)

Preparation and connection of the cable lugs



Now the cut-off piece of braided shielding is used here. It is cut into two parts and the pieces are then each inserted into cable lugs and soldered on. They will give the cable lugs the connectivity as you can see in the images below.

Note: If possible, the cable lugs should **not** be soldered/heated while mounted in the plastic enclosure, as they conduct heat very well and can therefore quickly melt the plastic enclosure.
So solder the cable lugs and preassemble with the bolt and washers as shown in the image above.

The two cable lugs prepared in this way are passed through the two upper holes of the enclosure from the inside using the M6x30 screws. A steel washer and a rubber sealing washer are placed between the cable lug and the inside wall of the enclosure, then a steel washer and the nut are attached to the outside of the housing. The length of the braided shield is shortened later before connecting.

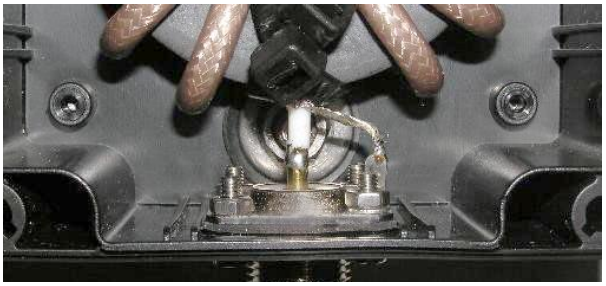
Fitting the installation

The prepared ferrite with the attached coax windings is now provisionally placed in the housing so that the open ends of the coax core and the twisted end of the braided shield are aligned with their respective side holes. Both ends must now be trimmed so that the ferrite core is centered, and the ends would reach exactly to their hole in the side wall of the enclosure, fitted with a cable lug.
Then remove the ferrite and solder the cable lugs to the already cut ends. (See the image)

Then reinsert the whole thing and fasten the two cable lugs with an M6x30 screw each through the holes in the side walls. Insert a steel washer both inside and outside. On the inside of the enclosure, a rubber sealing washer is inserted under the steel washer for sealing.
Hold the cable lug in position and tighten the screw on the outside with the M6 nut as tightly as possible.
The fed elements of the Yagi antenna (10m / 12m at the top, 15m / 17m / 20m at the sides) are later connected to the 4 open M6 bolt threads (2 at the top and 2 at the sides outside of the enclosure).
After the coax core and the braided shield have been attached to the side screws of the enclosure with its soldered-on cable lugs, the two free braided shield ends of the upper cable lugs (for “Top Wires” 10m and 12m) must now be folded around the respective crossing conductor from below, the excess cut off and soldered on cleanly. This creates these stable connections as displayed in the image on the right.

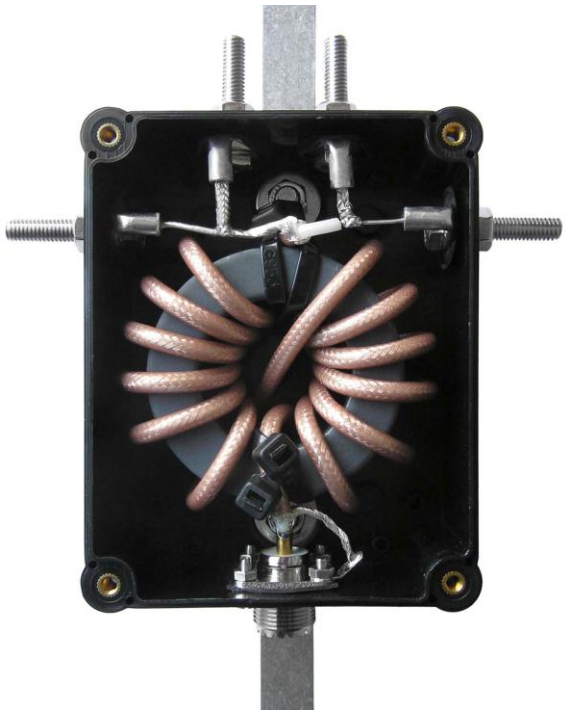
Connect the Coax Socket

Finally, solder the core from the beginning of the coaxial cable to the bottom inside of the coaxial socket and the twisted braided shield protruding from the side to the small M3 soldering lug that was previously attached to the coaxial socket (see image on the right).



Complete and test the Spiderbeam Balun

The balun is now complete and can be electrically tested. Ideally, you should check all its solder joints for continuity and the balun itself for short circuits with an Ohm meter. Perhaps you can wait a day and check all bolted/mechanical connections again and retighten if necessary.
If everything is fine, screw on the enclosure lid.
Please ensure that the seal is clean!



The balun is now ready for use and corresponds exactly to our prefabricated **Balun** with item no. **A902**.

Special version: Dual Core Balun

If you want to operate your balun permanently with more than 1000W, you can build the balun with 2 ferrite ring cores. The only difference is that the 2 rings are placed exactly on top of each other and fixed in place with cable ties. The two ring cores are then wound with a correspondingly longer piece of coaxial cable in the same way. The protrusion at the beginning of the coaxial cable should remain slightly longer so that the connection to the coaxial socket fits well here.
About 1 cm longer should provide sufficient flexibility during installation.
The **Spiderbeam Dual Core Balun kit** with item no. **A901** contains more material and also additional cable ties to fix the ring cores together. You can also buy the **Dual Core Balun already prefabricated** and tested from us with item no. **A903**.