Short construction manual for nuxcom 144 MHz and 432 MHz yagi kits

Source: http://www.nuxcom.de/pdf/nuxcom_construction-manual_vhf-arrays.pdf

Please check the completeness of the delivered antenna kit with the parts list on the invoice. All parts needed for self construction should be in the kit, except a mast clamp and a boom support. They can be purchased separately if needed.

This manual is only a recommendation on how you can build up a working antenna with the delivered parts. Individual adjustments are possible. In all cases the customer is responsible for the proper function of the antenna.

All lengths and measurements of our antennas have to be followed exactly, otherwise you will not have the predicted results.

Foreword

These antenna arrays are always two yagis in 25 Ohm design. They are connected together with two transformations lines. At the connection point there is a 50 Ohm impedance (at the resonant frequency) for connecting your 50 Ohm coax cable and transceiver. **Therefore without changes it is not possible to use a single antenna of this array**. To get the predicted electrical data (gain, radiation pattern) you should also use the mentioned stacking distance for your system.

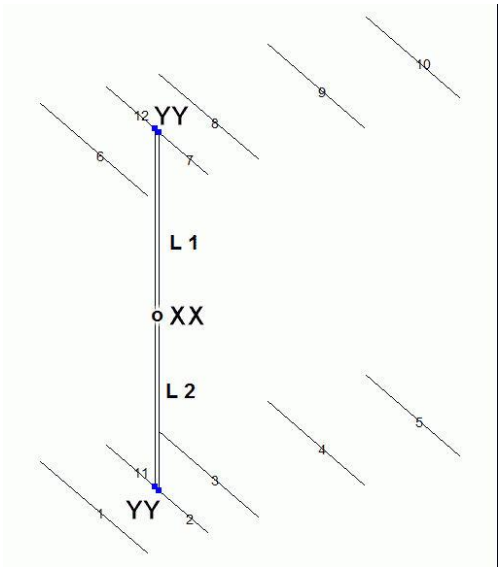
Handling of the boom rod:

If the boom rod is split, mount the boom connector first to have the full length of the antenna. Please check the right order of the boom parts to avoid collisions between boom connector and elements. Then mark the points for element mounting according the dimensions table (element positions). Leave 10mm space to the ends of the rod. **Never measure from element to element, use a folding rule to mark all points continuously related from the starting point.** You will avoid that one measuring error will continue on the whole antenna. When you have marked all points, you can disassemble the boom for further work.

Mounting reflector and directors:

Now you can drill a hole at the destined position for the parasitic elements (directors, reflector) on the boom, either 3.5 or 4.5mm, depending on the screw diameter. At the end you can mount your parasitic elements like shown in the picture.

Feeding and functionality:



Two yagis with 25 Ohm impedance can be stacked easily. You need two pieces of 50 Ohm coax cable with an odd-numbered multiple of λ/4 length (e.g. 3λ/4, 5λ/4 and so on) considering the velocity factor of the cable type (e.g. 0,67 for RG58 or 0,82 for Aircell 5). For practical usage a length of 5λ/4 is perfect. It's also possible to use 7λ/4 or longer, but you will have more cable losses.

The 25 Ohm at point "YY" will be transformed to 100 Ohm at point "XX". If you connect these two ends at "XX" in parallel, you get 50 Ohm impedance at the arrays feeding point – perfect for your 50 Ohm cable and transceiver. The ends of the transformation lines at points "YY" will be wind up to a choke to suppress common mode currents on the cable shield. The two chokes will stay in the dipole boxes, so you don't need addition coax sockets and connectors. This will save some additional losses in the system.

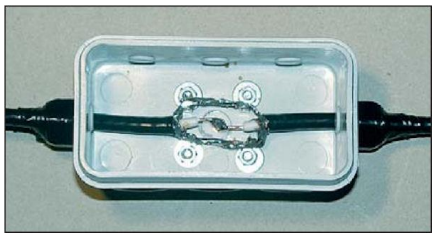
In practice the given length of the cable means the totally shielded length of the cable, without connection lines at the end.

Note: It is recommended to measure the lines as mentioned later before assembling the whole system. In practical tests we have found out that cables like Aircell 5 or Aircell 7 have variations in their electrical data and the transformation lines had to be shortened some centimetres for correct work. Also if you use RG58 you should check this first, because there are some cheap quality types of RG58 on the market which could cause also problems. Always use "MIL-C-17" marked RG58 cables – they are produced after a standard. We always deliver our kits with RG58 in MIL-C-17 standard.

RG58 C/U MIL-C-17: Length = 173,5cm
Aircell 5: Length = 204cm (measured length)

From this length you have to wind up at the end 45cm onto a 25mm PCV tube for the coke.

Connection box:

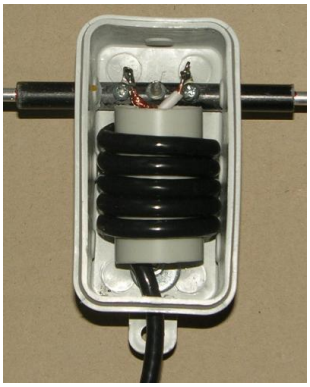


Before you build up the dipoles, make the connection box first. So you will be able to check the transformation lines before assembling. As connection box use the 85x45mm plastic box. In the bottom of the box mount the coax socket with four screws K3x12mm together with a solder lug on each screw in the box. On the short right and left side of the box mount the cable glands for leading the transformation lines (the pictures show a box without cable glands). The ends of the transformation lines are soldered to the coax socket. The inner conductors to the middle contact, the shield to the ground of the socket onto the four soldering lugs. Use all four soldering lugs to ensure symmetry.

Measurement:

Before you build up the dipoles please measure your transformation lines. Instead of the dipole rods connect a 25 Ohm terminating resistor at the ends. Don't forget to wind up the coax choke before connecting the termination (5 windings on 25mm PVC tube). Use resistors with low induction, for example 4x 100 Ohm or 2x 50 Ohm metal film resistors with low tolerance. This terminator simulates the 25 Ohm dipole. Now check SWR with a VHF capable SWR meter and a transceiver with low power (alternatively an antenna analyzer) on 144.300 MHz. You should get an SWR of 1.1 or better. If the best SWR is lower in frequency, you may shorten the transformation lines to adjust this. Don't forget to make all changes symmetrically on both transformation lines!

Mounting the dipole boxes



Attention: The picture shown left shows a connection box for the lightweight construction. For our aluminium version a bigger 85x85mm box is being used. The small box should be used for the connection box!

The two available connection lugs at the box can be used to fix the dipole on the boom. This makes it easier to disassemble the antennas. If you want to mount the antennas for permanent usage, you may also connect the screws in the box with the boom. But after dipole and choke are mounted, it will not be easy to get to the screws for disassembling. Please consider this.

On the upper left and right side of the box make 8mm holes for the dipole rods. Please be careful to make them symmetrically that they are not shifted vertically or horizontally. Put the dipole connector between the two holes and push the two dipole halves from outside through the holes into the dipole connector until stop. The middle hole could be used for connection to the boom if using a longer screw. The left and right holes are for the contact screws from the choke to the dipole rods. Drill 2,5mm holes through the holes in the dipole connector into the dipole rods. Throw the 2,9x9,5mm screws each together with one solder lug into the holes in the dipole rods.

At the lower end of the box cut a whole into the box and mount the cable gland in it. Through this cable gland you can lead the transformation cable. For this you have to wind down the coax choke again. Alternatively you may also disconnect the cables in the connection box. Then close the cable gland.

Please solder the end of the transformation line to the solder lugs at the dipole rods. Inner conductor to the one side, shield to the other side. The connection lines from the choke to the dipole rods should be as short as possible, because they lengthen the dipole mechanically. The given dipole length is always from tip to tip, including the break and the dipole connector in the middle.

Important: Connect the lines from the choke to the dipole rods on both antennas identically to ensure phase balance.

Last workings and fine tuning

If all dimensions are according the dimensions table and you have checked the transformation lines befor, the antenna array should work without any tuning.

Because of the connection of these two antennas it is not simple to check only one antenna, to find errors for example. If you want to check only one antenna, please follow the following steps:

Mount only one antenna. Short the end of the transformation line of the second antenna with a 25 Ohm terminator as mentioned above. This measurement implies that you have checked for correct coax length before. If the lines are not correct, this test will not work correct. Now you are ably to test only one antenna and possibly make corrections.

The boom rods are closed with the quadratic lamella plugs. Close the end of the dipoles with some glue or silicone to prevent moisture in the dipole boxes.

Only for stationary mounting:

Leave a small hole in the box on the future bottom side of the box, so that condensed water can flow out.

If you have critic or suggestions regarding this manual, please contact us:

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Disclaimer: Drilling, cutting and other technical work have to be done carefully and can hurt you. We are not responsible for any accidents which result in following our instructions in the manual. Please be careful.