

THE SOTABEAMS 20m GROUND-PLANE KIT

Thank you for buying our 20m ground-plane kit. The kit is easy to assemble and makes a very effective lightweight ground-plane antenna. Ground-planes are one of the most popular antennas for use on the higher HF bands as they combine low angle radiation with a simple antenna making them great for DX working. A ground-plane is an omni-directional antenna – it works in all directions. This makes it easy to use as it does not need to be turned for best signals.

The antenna consists of one vertical wire which will be connected to the centre core of the coaxial cable. This is the radiator or monopole. Three radial wires are connected to the outer shield of the cable. These radials form the artificial ground-plane which gives the antenna its name.



A VHF Ground Plane Antenna

Before starting assembly, take a few minutes to read through the instructions. If anything is not clear, I am here to help you. I want you to succeed!

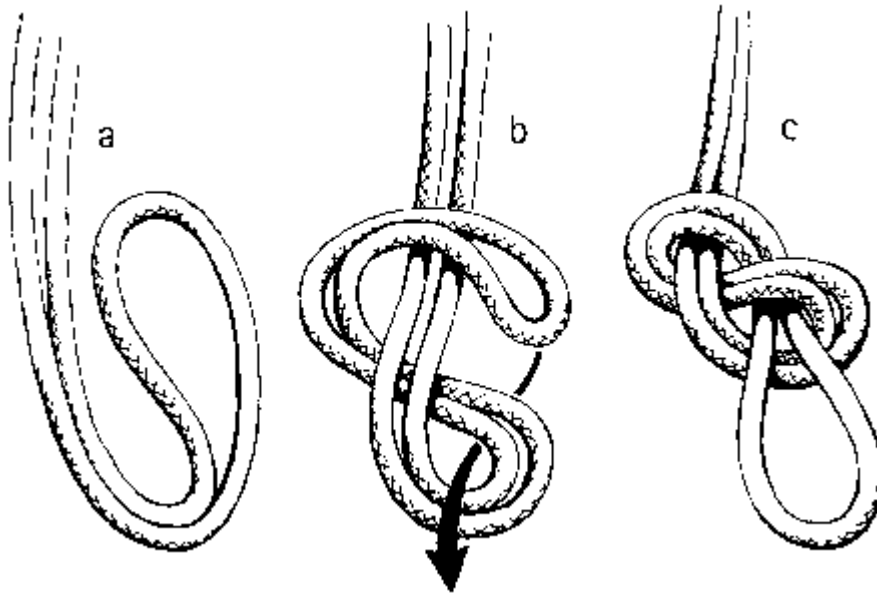
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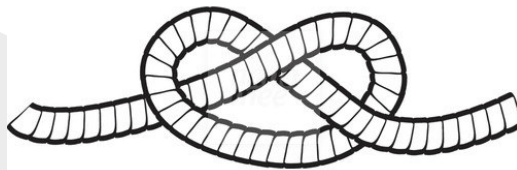
Making your antenna

Just follow the steps here. Tick each one as you go to show it has been done.

- ☐ Cut the yellow wire into 4 x 5.13 metre lengths – accuracy important.
 - discard any spare wire
- ☐ Cut the cord into 3 x 2 metre lengths
 - keep the spare length of cord
- ☐ Seal the cut ends of the cord using lighted match (care). This stops them fraying.
- ☐ Tie a figure of eight knot in one end of each cord to form a pegging loop about 3cm long.

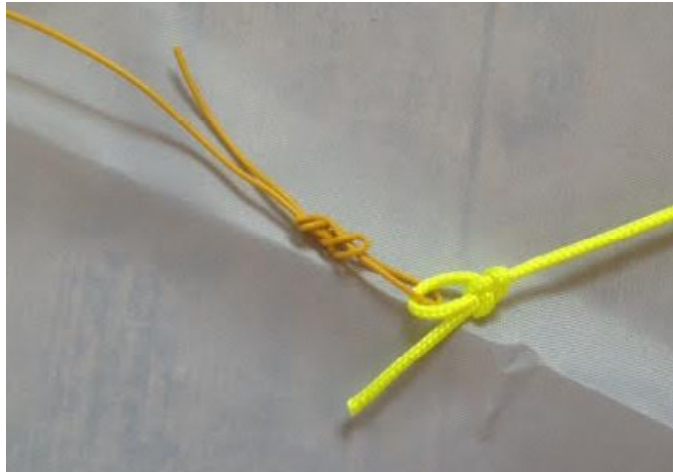


- ☐ In one end of each of the four wires, **accurately** fold over 10cm and tie a figure of eight knot.
- ☐ Get three of the wires and tie them onto the three cords using two overhand knots. Tie the cord to the loop you tied in the wire. When you have done this you will have completed making the three radials for your antenna.



Overhand Knot

TM

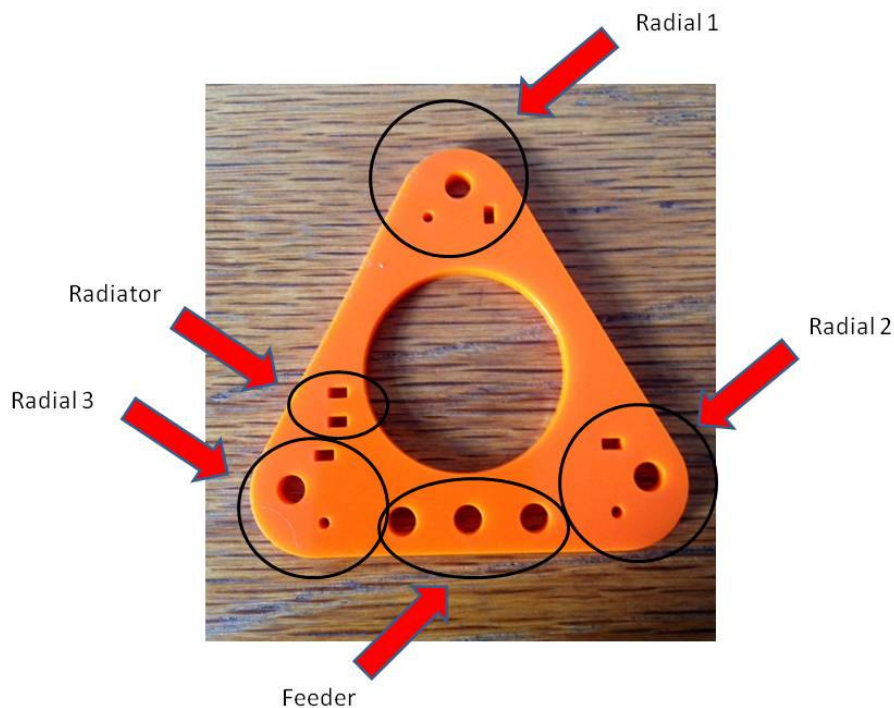


- ❑ Hold the three pegging loops in the cord and wind all three cords and wires onto the Wire Winder using a figure of eight motion. Leave about 1 metre of each of the three wires not wound onto the Wire Winder.





- ❑ Locate the triangular base plate. This has various holes and slots in it which must be used correctly. The diagram below shows that there are three sets of holes and slots for the radials.

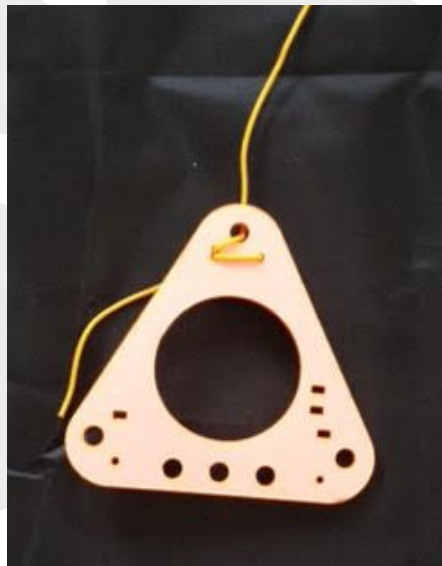


- ❑ Take the end of one of the radials (the wires wound on the winder). This will be Radial 1. Measure 12cm from the end of the radial. Pass this down through the larger circular hole in the Radial 1 group. Next pass it up through the rectangular slot. Then pass it down through

the small hole and finally up through the slot. The pictures below show what it should look like.

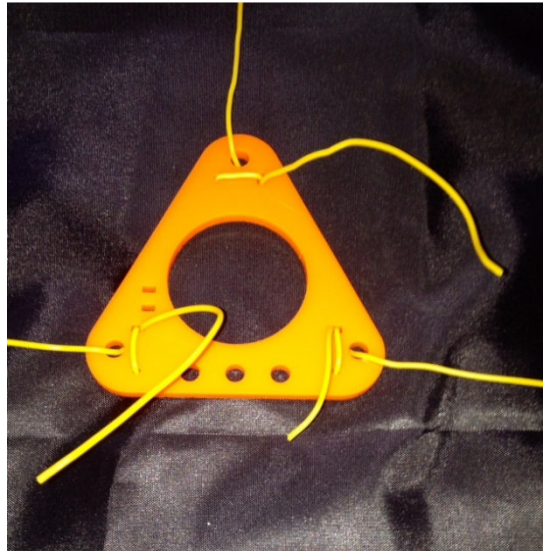


Top view of threading for radial 1



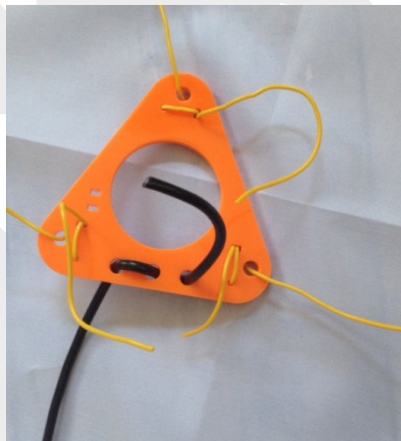
Bottom view of threading for radial 1

- ☐ Find the end of another of the three radials on the winder. This will be radial 2. Measure 8cm from the end of this radial and thread it as above but using the radial 2 position.
- ☐ Using the end of the third and final radial, measure 13cm and using the radial 3 group of holes repeat the process. With all three radials threaded the top should look like the photograph below.



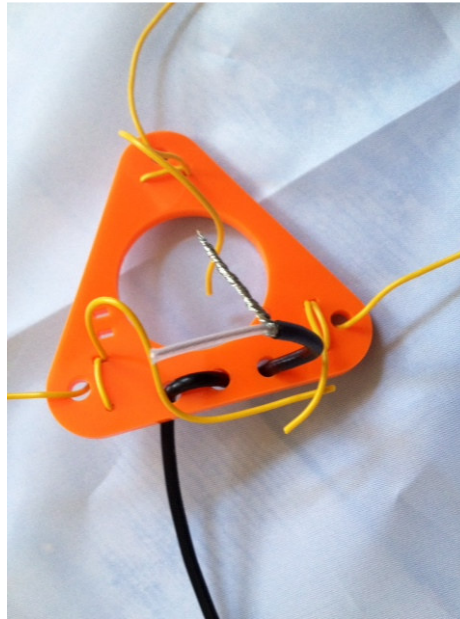
All three radials threaded

- ❑ Find the coaxial cable – a thicker black wire with a silver plug on one end. Measure 9cm from the end of the cable and thread as shown on the photograph below. It goes up, down, up through the three holes left to right.



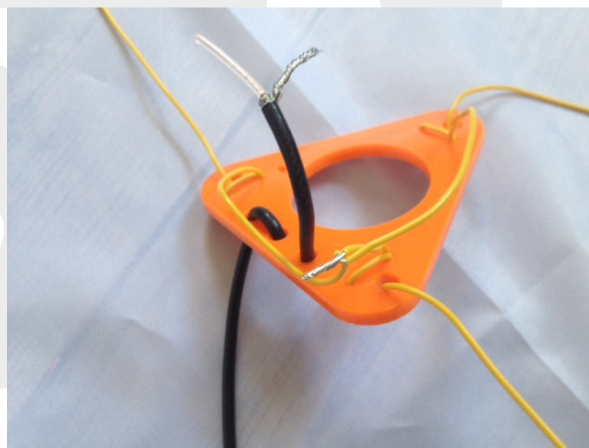
Co-axial cable threading

- ❑ Using a craft knife (care) strip 2cm of the outer black plastic insulation from the co-axial cable. Be careful not to damage the tinned copper braid inside. Tease the braid to one side of the insulated centre core of the co-axial cable. Twist the strands together as shown in the photograph below.



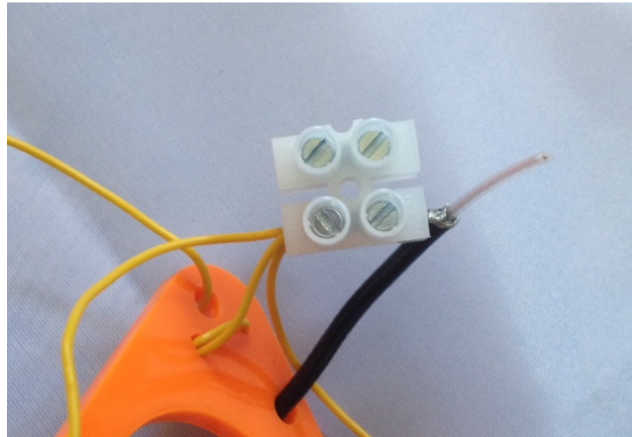
Co-axial cable prepared

- ☐ Strip 1cm of the insulation off the ends of the radials and twist them together. See photograph below.



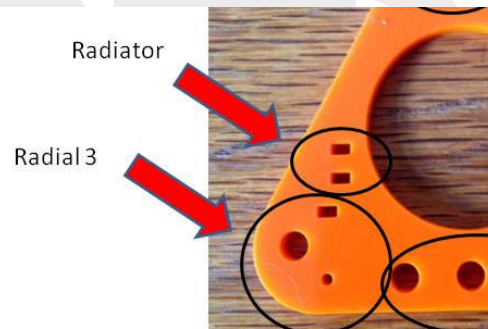
Radials prepared

- ☐ Locate the connector block. Insert the three radials into one side and screw the terminal down. Insert the co-ax braid into the other side and screw down.

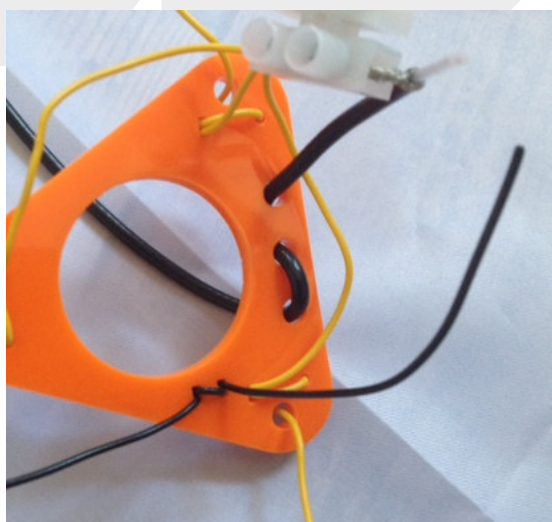


Radials and co-ax braid in connector block

❑ You should still have one wire left – the radiator. This will have a loop in one end. Using the other end (the one without the loop). Measure 10cm from the end. Thread this down through one of the radiator slots, up through the other one, back down the first one and up again through the second slot. The order is not very important. Our photograph shows this done with a black wire for clarity.



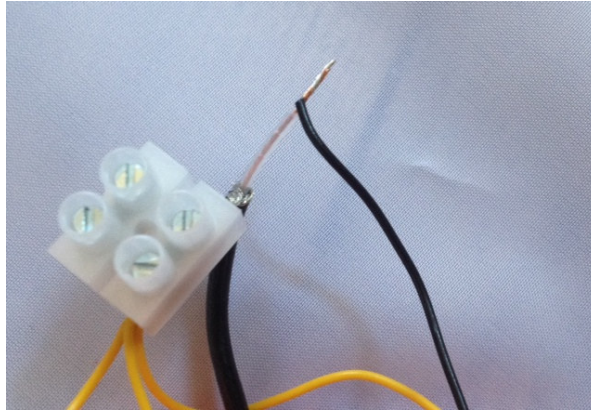
Identify the radiator slots



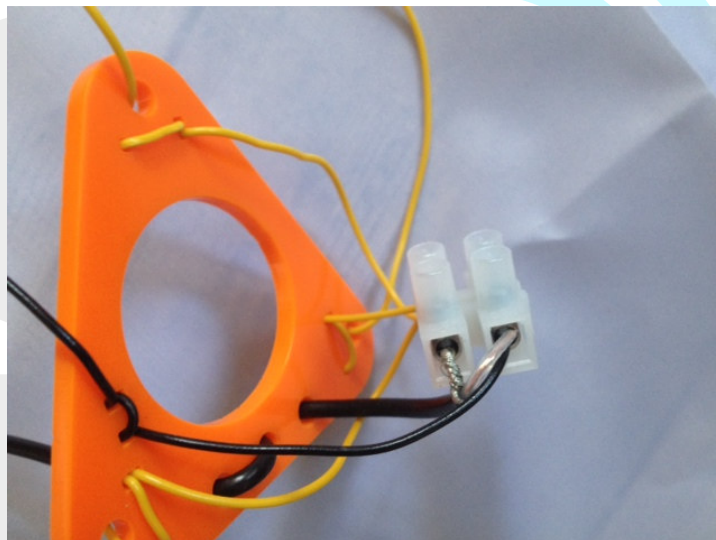
Radiator threaded

❑ Strip 1 cm of the insulation off the end of the radiator wire.

- ☐ Strip 1 cm of the insulation of the centre conductor of the co-axial cable
- ☐ Twist the stripped part of these two wires together and insert into the unused side of the terminal block. Tighten the screw to hold these wires in. The photographs below show this process.



Centre of co-ax and radiator twisted



Centre of co-ax and radiator fastened in connector block

- ☐ Now wind the co-axial cable onto the wire winder, over the radials that are already on it.
- ☐ Slide the base plate down your extended telescopic pole (easiest done on the ground outside) such that the connector block is on the side of the base plate pointing towards the top of the pole (on the left in the photograph).



- ☐ Lay the radiator out alongside the pole. It should come to about 1.5 metres from the top of the pole.
- ☐ Slide the top insulator down the tip of the pole (the tip through the smallest hole in the top insulator).



- ☐ Using the cord that you have left, tie the loop in the radiator to the top insulator. You will need to adjust the length of the cord so the base plate sits as low as possible.



- ☐ Remove the radiator from the pole and wind it onto the wire winder over the radials and co-axial cable. Fasten with the stretchy cord on the wire winder.



- ☐ Store your antenna in its nylon bag with the three pegs hooked inside the peg pocket.

Using your antenna

Setting up your antenna is easy.

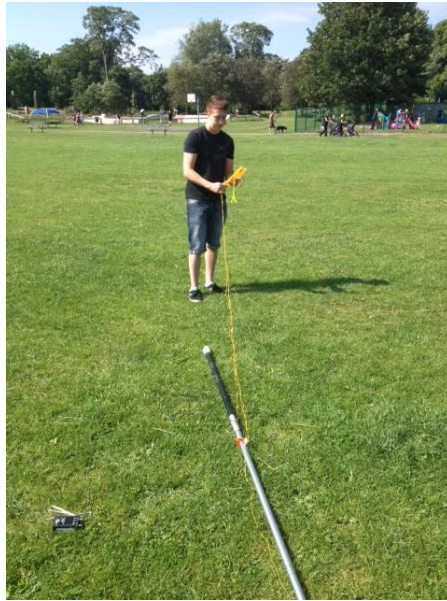
- ☐ Extend your telescopic pole.
- ☐ Unwind the radiator part of the antenna – this should be the last part you wound on so it will come off easily.
- ☐ Slip the base plate down the pole. Lay the radiator along the pole.



- ☐ Slip the top insulator onto the pole.



- ☐ Unwind the feeder, putting it on the ground near the base plate.
- ☐ Unwind the radials so that they are in a line going the opposite way to the radiator.



- ☐ Peg out two of the radials at an angle to the top of the pole. Do this so that they are not twisted.



- ☐ Peg the ends of the radials.



- ☐ Lift the pole into the vertical position and move the base of the pole so that the two pegged radials/guys are not slack.



- ☐ Take hold of the third guy/radial and, keeping some tension on it walk back and peg it out.



- ☐ Make any final adjustments to your guys to space them evenly around the mast.



Your antenna is now ready to test.

Testing your antenna

Connect an antenna analyser to your antenna. The Voltage Standing Wave Ratio¹ (VSWR) should be below 2:1 across the 20m band. Typically it will be below 1.3:1. Normally these antennas do not need adjusting if they have been made correctly.

If the VSWR is higher than 2:1, check the connections – you probably have a short at the connector block.

If the VSWR is below 2:1 your antenna is ready to use. Some people like to get the VSWR as low as possible although it does not make any measurable difference to how the antenna performs. Your antenna analyser shows the lowest VSWR is low in frequency, shorten the radiator slightly. as a guide, cutting off 6cm will move the resonant frequency up by about 100 kHz. If your antenna is resonant too high, it is too short. You may be able to gain some length by re-tying the figure of eight knot at the top with a smaller turn-back. If that does not work you can add some length to the radiator using some more wire and a connector strip section.

If you do not have an antenna analyser, a radio transceiver and an SWR bridge will do the job just as well. Simply measure the VSWR at several points across the 20m band.

Once you are happy with the VSWR, your antenna is ready to use.

Tips

When packing your antenna always wind the parts on in the same order:

1. Wind all three radials together.
2. Wind on the feeder.
3. Wind on the radiator.

If you are using a pole other than our standard 7m SOTAPOLES you may need to use a bit of ingenuity to use your antenna. On longer poles the triangular base-plate will sit higher up and thus to get the guying right, you may have to extend the cords at the ends of the radials. Aim to have an angle between the line of the cord and the ground of no more than 40 degrees.

If you don't have a pole, the radiator can be pulled up using a cord thrown over a tree branch.

If you envisage using your antenna in the rain, the connections should be waterproofed. We recommend Liquid Electrical Tape – sold by SOTABEAMS.

After use in the rain, ensure that you dry your antenna out completely before packing it away.

The three pegs can be stored in the pocket inside the antenna bag.

For most portable operating this antenna works fine without a balun. If used in a more permanent manner or if you find problems with RF feedback, a common mode² choke is a useful addition as it stops the outer part of the coaxial cable from forming part of the antenna system.

¹ VSWR is a measure of how close the antenna/feeder system is to a resistive 50 Ohm match at the point of measurement.

² <http://www.yccc.org/Articles/W1HIS/CommonModeChokesW1HIS2006Apr06.pdf>