

# SOTA Beams

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# SB270



**LIGHTWEIGHT HIGH-PERFORMANCE PORTABLE YAGI SYSTEM**

## Introduction

Thank you for purchasing the SB270 Portable Yagi System. This beam has been designed with lightweight portable radio operating



**TIP**—Throughout these instructions you will see boxes with tips and notes. Tips are things that you may wish to do to enhance the performance of your system.

in mind. Every component and aspect of its design has been carefully considered to make it as easy as possible to assemble, carry, and use. It has been designed by Richard Newstead, G3CWI, who has over 25 years of portable radio operating experience in places as wild as Antarctica! The art

of effective portable operating relies on good preparation so read these instructions carefully and practise with your new antenna at home before you take it into the wilds.

Please also note the important warnings on page 14.

## Preparing the system for use

Before using your SB270 there are a few simple tasks to undertake:

- 1) Assembly of the antenna elements
- 2) Construction of the feeder system
- 3) Assembly and adjustment of the guying system
- 4) Learning how to erect the system.

You may have many years of experience or perhaps you are new to radio but either way, we suggest that you read and follow these instructions before trying to use your SB270.

## Tools

You will need the following simple tools:

- Tape measure (a metal measuring tape is best)
- Ruler

# Warnings

**Never use your antenna on a hill-top when there are thunderstorms nearby or if they are forecast.**

**Always ensure that your antenna is erected in such a way that it does not represent a hazard to yourself or others.**

**Never erect an antenna near to power lines.**

Snagging: updated Jan 2012

Elements don't screw in...

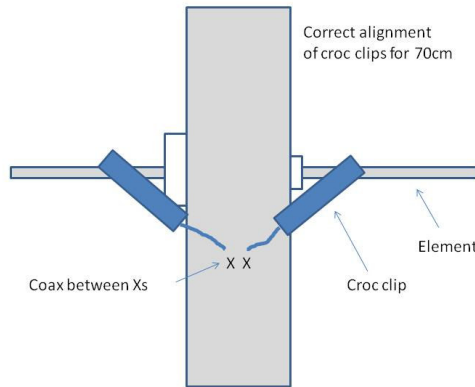
Most SOTABeams work fine straight away! However an occasional problem can be that the elements don't screw in properly. Where this happens it is most likely due to the plastic boom having been slightly distorted (oval). Fortunately this is easily fixed!

Note that the elements have been designed for speed of assembly on the hill. Thus the threaded section on the element only just catches the threaded hole in the boom. Half a turn or so and it's tight!

If the thread does not quite catch, just squeeze the boom a bit to allow it to catch, then tighten one complete turn. Often this is enough to return the boom to its correct shape permanently. If not, re-engage the thread, tighten for one or two complete turns, then gently warm the boom near the element with a hairdryer. This softens the plastic slightly. Once cooled, remove the element and it should screw back in easily!

Poor VSWR on 70cm...

On 70cm, the length of the pigtails is critical. They must be as short as possible! The ideal length will leave the crocodile clips connected at an angle to the element.

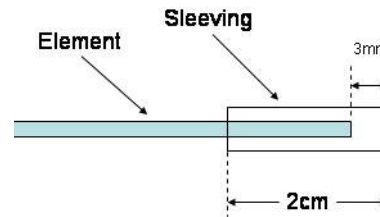


- Craft knife
- Soldering iron and solder
- Safety goggles
- Wire cutters
- Hot air gun (paint stripper gun)
- Pencil

## 1) Assembly of the 2m Antenna Elements


Remove the soft plastic cap from the boom of the antenna (the 1m tube with the brackets attached) and tip out the antenna elements (metal rods). Cup them in your hand to stop them falling on the ground! There are three rods which have been precision cut to work first time. These are the 2m elements.

Find the red and black lengths of heat-shrink sleeving and, using a craft knife, cut three red and three black pieces each 2cm long. Make sure that you cut squarely across the tubing. Keep the remaining sleeving—it will be used later.



Select the longest element (about 1m long). Slide one of the 2cm red pieces of heat-shrink sleeving over one end of the rod so that the rod is about 3mm from the end of the sleeving (see diagram). Shrink the sleeving onto the element with the

hot air gun. Do the same on the other end of the reflector with another piece of red sleeving. The colours are used to identify the elements RED-RED = Reflector. This completes the reflector.



**TIP**—Make sure that you shrink the sleeving completely. While the glue inside is still soft, roll the sleeving between your finger and thumb to make sure that it fits the element as snugly as possible.

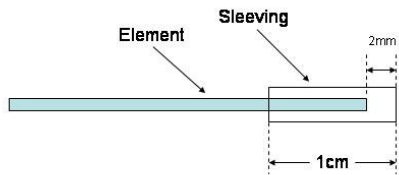
Select the shortest element (around 90cm long). Carry out the same process as above but this time using black heatshrink sleeving. BLACK-BLACK = Director. This completes the director.

Finally select the middle-sized element. You should have a 2cm length of red sleeving and a 2cm length of black sleeving left. Shrink these as before onto the ends of the element. RED-BLACK = Driven element.

This completes the work on the 2m elements. They can now be returned to the boom tube for safe keeping.

## 2) Assembly of the 70cm Antenna Elements

The 70cm antenna elements are supplied in a separate container. They will fit in the boom together with the 2m elements although a special method of doing this must be used—described later.



Carefully tip the 70cm elements out of the storage tube. There should be six elements together with some heatshrink sleeving. Cut three pieces of red sleeving and one piece of black

sleeving, each 1cm long. Identify the longest element (the reflector). Using the method used previously on the 2m elements, shrink red sleeving on each end (use a 2mm overlap). Identify the next shortest element (the driven element), shrink a red sleeve on one end and a black sleeve on the other.

The remaining four elements are the directors and here great care must be taken. They are all very similar in length ...but all different! First cut 10 pieces of red heat shrink sleeving, each 2mm long. Identify the shortest element—double check as it is easy to make a mistake here. Slide one piece of sleeving along the element as

## Help!

Additional photographs of the construction techniques and the beam in use are at <http://www.sotabeams.co.uk/sb270-help.htm>. This page will also show any updated construction information.

A SOTABeams user group is at:

<http://groups.yahoo.com/group/sotabeams/>

## Still stuck?

If you have any problems or questions about the beam, please contact us by e-mail ([Richard@sotabeams.co.uk](mailto:Richard@sotabeams.co.uk)) or by post to: SOTA Beams, 89 Victoria Road, Macclesfield, Cheshire, SK10 3JA. You can also contact us by phone on +44 (0)1625-425700 during normal UK working hours; 0900-1700 Monday-Friday.

## Guarantee

These beams have been designed for portable operation. They are not suitable for permanent home-station use. We guarantee these beams to be free from manufacturing defect for 12 months from the date of purchase. If you have any problems or questions about the beam, please contact us by e-mail ([Richard@sotabeams.co.uk](mailto:Richard@sotabeams.co.uk)) or by post to: SOTA Beams, 89 Victoria Road, Macclesfield, Cheshire, SK10 3JA. You can also contact us by phone on 01625-425700 during normal working hours; 0900-1700 Monday-Friday.

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## Operating tips

“Location, location, location” is the cry of estate agents but it is equally applicable to radio amateurs. Getting the best out of your beam demands choice of the right location. Height makes a big difference on VHF and UHF so aim to get to a local high point.

Most antennas work best if the ground falls away in the direction you want to make contacts in. Operating from the middle of a high plateau is therefore often discouraging while operating nearer the edge will improve things a lot.

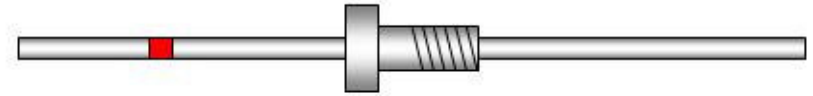
Mount the antenna horizontal for SSB (elements parallel to the ground) and vertical for FM. FM sounds nicer but far greater range will be achieved with SSB!

For 2m FM the calling channel is 145.500MHz. For 2m SSB the calling channel is 144.300MHz (USB). On 70cm the FM calling channel is 433.500MHz. Move off the calling channel once you establish contact.

On 70cm SSB there is no calling channel. However the centre of activity is 432.200MHz. There is no need to move off this frequency once you establish contact.

Be considerate when operating portable. Don't put guys across paths and generally avoid getting in people's way. Don't make lots of noise on the hills either—people often come to hilltops to enjoy some peace and quiet so please don't give them a bad impression of our hobby.

shown in diagram. It is important to slide it on from the correct end as this makes assembly in the field easier. Shrink the sleeving into place with the hot air gun.



Select the next shortest element and repeat the process but this time with 2 pieces of sleeving. Do the same with the third and fourth directors but with three and four pieces of sleeving. At the end of the process the shortest director will have one sleeving marker and the longest director will have four sleeving markers. Put the 70cm elements back in the storage tube.

## 3) Marking the Boom

For easy assembly on a hilltop it is a good idea to mark the boom. This will avoid mistakes when you are assembling the aerial in less-than-ideal weather conditions. There are lots of holes in the boom (18 in fact) but which is which is quite simple to decide.

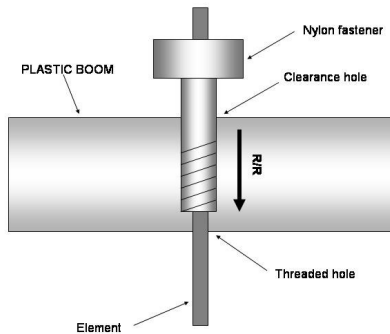
The first marking we recommend is to show which end is the front on the aerial. For this we suggest you mark an arrow at either end pointing towards the end with the removable soft rubber cap—that is at the front of the beam. We have supplied a special pen for marking the boom.



Permanent plastic plug

Next, take the 2m elements out and identify the side of the boom

that has three holes along its length. These are for the three 2m elements. The elements will only fix one way round. The diagram below shows how they are fastened. **Don't over-tighten the elements!**



Again use an arrow to indicate how the elements pass through the boom and a code to show which element is which (i.e R/R = Red Red) and indicates an element with two red ends.



Marking the boom will lessen any chance of making mistakes on a hill!

#### 4) Preparing the feedline

**Need: ruler, craft knife, wire strippers, soldering iron, solder, small vice, heat gun.**

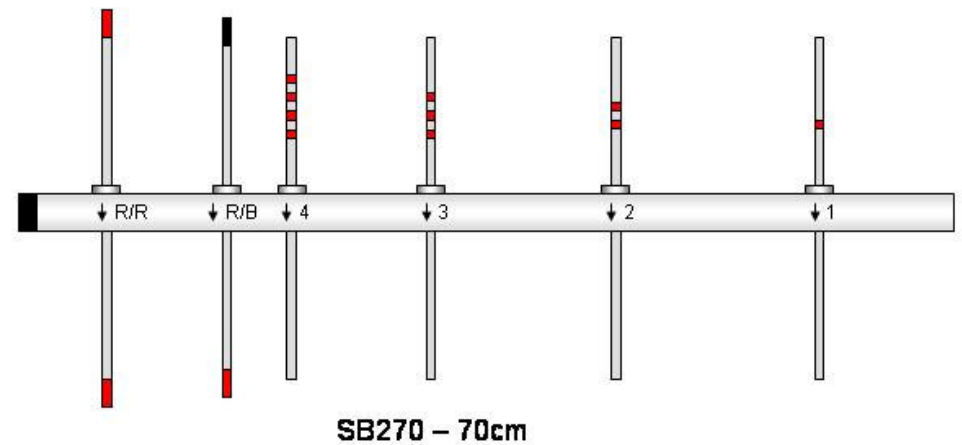
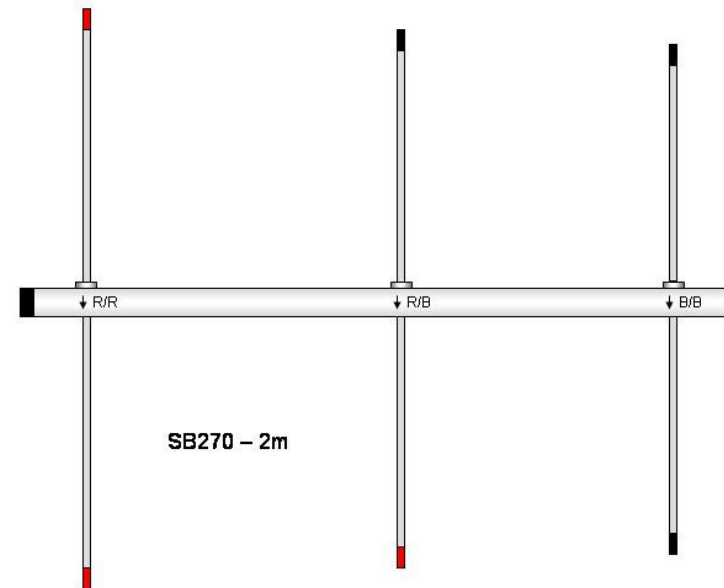
The SB270 is supplied with feeder cable that is fitted with a BNC plug. Take the unterminated end and feed 80cm up through the choke sleeve as illustrated.

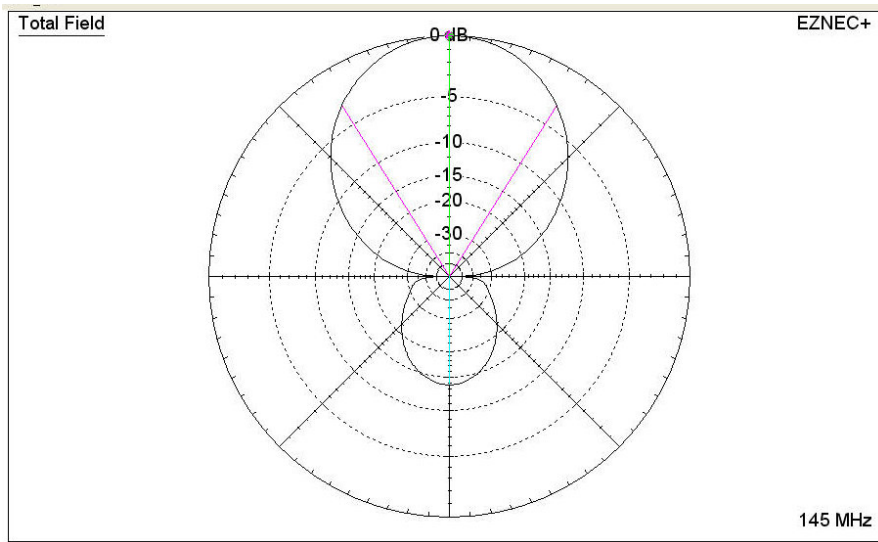


Wind seven turns of cable on the sleeve (tightly) and pass the unterminated end down through the hole in the other end of the choke sleeve. You should now have about 8cm of co-ax protruding from the choke sleeve. Trim this until it is 5cm long.

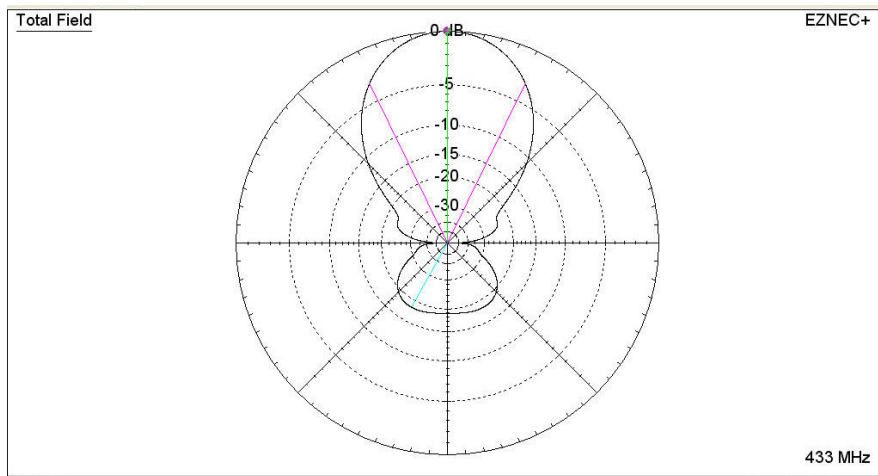


Note: picture shows prototype. Yours will have 7 turns.





2m Gain = 8dBi



70cm Gain = 10.4dBi

Strip exactly 20mm of the outer insulation and make a pigtail (not a pig's ear) of the braid. Strip 5mm of insulation of the centre core and tin 5mm of the ends of the braid and core. Cut two pieces of heat-shrink sleeving (supplied) 10mm long. Slide these over the centre core and braid as far down and away from the tinned area as possible (see photo).



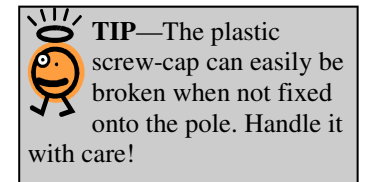
Put one crocodile clip in a vice and lightly tin the end. Put the braid into the clip, bend over the cable support tabs and solder. Solder quickly to avoid excess heat shrinking the sleeving. Slide the sleeving over the crocodile clip as far as possible and shrink using a heat gun. Repeat the process with the centre core. To waterproof the open top of the co-ax, use a good quality sealant such as our Liquid Electrical tape.

### 5) Preparing the Guys

See separate sheet with guying kit.

### 6) Preparing the Pole for use

For VHF/UHF only use, it is often easiest to remove the three thinnest sections of the 7m telescopic pole. Do this by unscrewing the plastic endcap and sliding the three thinnest sections out at the base of the pole. Replace the screw cap.



### 7) ...And finally

Locate the three reusable cable ties (specially selected to be use-able with gloves on!) and store them with the 2m elements inside the long boom section.

You are now ready for your first 2m expedition. However, we advise that your first expedition is to your garden or a local park on a fine day as you can then practice the techniques that will allow you to use your SB270 successfully under all conditions.

### Getting on the Air

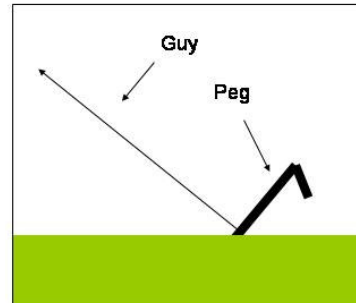


**TIP**—The friction lock is quite reliable in most cases but may fail in very windy conditions, causing one or more sections to collapse. This is likely to damage the aerial and pole. To avoid this happening, you may like to make a safety lock system by taping the joins with insulating tape.

On arrival at your operating location choose a flat area of ground about 5m by 5m. Check to see which direction the wind is coming from. Extend the pole. Start by pulling out the smallest section first. Lock each section by pulling

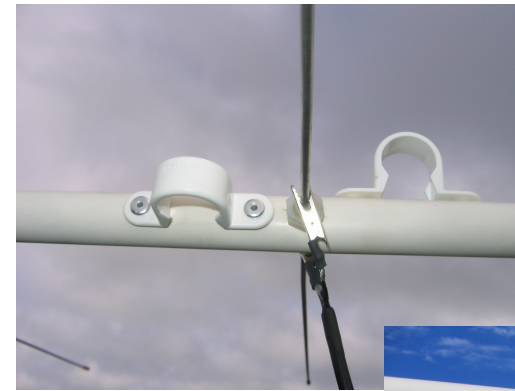
firmly at the same time as twisting the section. This makes the sections lock in place using friction.

Lay the pole on the ground with the tip facing into the wind. Slide the guying ring down the mast as far as it will go. Peg out two side guys and a back guy. Erect the pole and peg the final guy. Adjust the guys so that they are all at 90 degrees to each other and are all well pegged. The guys will need to be fairly tight to keep the runners in place (see guying kit instructions).



**TIP**—Always insert pegs so that the guy-line comes off at right-angles to the peg .

Once the pole is guyed telescope the sections back inside so that just the top section is sticking out. Run the feeder along the length of the mast such that the choke is at the top of the mast. Loosely clip the feeder to the mast with two cable ties about 1m and 1.5m down from the top. Slide the beam onto the mast using one of brackets. Mount in with the elements horizontal for use on SSB and vertical for use on FM.



Clip the crocodile clips onto the elements as shown in the photograph. Make sure that they get a good “bite”. Tighten the cable clips such that there is no strain on the crocodile clips from the feeder running down the mast.

This is **VERY** important!

Once the beam is on the mast and the feeder is attached, extend the mast again. You are now ready to operate.



### Storing 2m and 70cm elements in the boom

First put any three 70cm elements in the boom. Next put the three 2m elements in. If they don't go in all the way, gently tap the end of the boom on the ground until they do—don't try to force them in. Finally insert the remaining three 70cm elements.

### Technical Stuff

The polar diagrams of the SB270 are shown overleaf. These are the Free Space diagrams. The VSWR should be below 1.6:1 across either band. The recommended maximum power rating of the SB270 is 100W.