RSGB REVIEW*

Spiderbeam Model 160-18-4WTH

160m Vertical

A ‘compact’ antenna for Top Band

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MANAGEABLE SIZE. Top Band has its devotees but, for many amateurs, the space needed for a decent DX antenna makes it impractical. With a half-wave dipole coming in at around 83m (about 270 feet) – and that needs to be mounted high for the best results – it isn't surprising that many amateurs just don't have the space. A quarter wave vertical (that would favour DX) is more than 40m (130+ feet) tall unless loading coils are used. So anything that can make a Top Band antenna size more manageable is going to attract a potential buyer's attention.

CAPACITY HAT. Spiderbeam thinks it may have the answer with its capacity hat-loaded fibreglass vertical. The antenna is based on the company's 18m (60ft) Spiderbeam pole. These have been around a while now and have gained a good reputation.

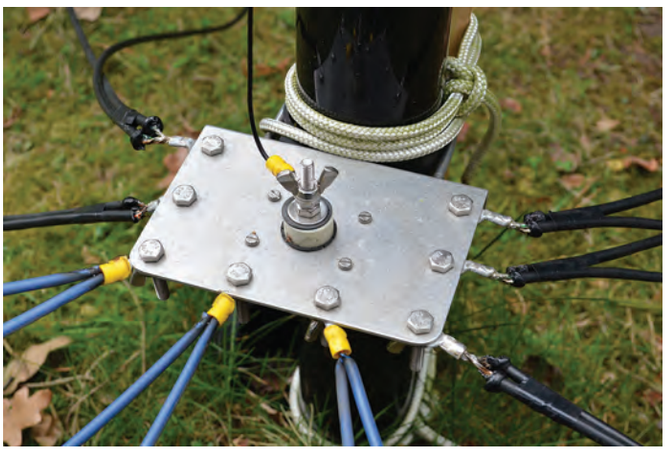
The company claims that despite being less than 1/8 wavelength in overall height, the Spiderbeam 160-18-4WTH delivers performance that is very close to that of a full-size vertical antenna on 160m – provided you have adequate space for proper installation of the top-hat wires and radial network.

The antenna uses the fibreglass pole to support a vertical wire, which is then coupled with four other wires connected towards the top that act as a capacity hat and bring the whole antenna to resonance. The capacity hat electrically 'lengthens' the antenna, so it doesn't have to be a full quarter-wave long.

Chris, G0DWV raises the fibreglass poles.

SPACE. But before we go any further, one warning – by the time you have added the capacity hat and eights sets of guy wires (each around 25m) the antenna sits in a virtual square with each side about 35m (115ft) in length. Do make sure you have the space before going ahead with the project.

This antenna 'build' took place over three days in Spring, separated by the UK's rotten weather with high winds, near or sub-zero temperatures and snow. You should be able to do it in one or two days in the middle of summer with little or no wind!



The feedpoint and attachment plate for the radials.

The Spiderbeam pole itself starts out very rugged at the bottom (73mm diameter / 2mm wall thickness) and still has 40mm diameter / 1.5mm wall thickness at 10m height.

The upper sections are slim and light (1mm wall thickness), preventing the pole from becoming top-heavy and keeping it balanced. A special reinforcing winding technique using several layers of fibreglass wound in alternating directions (criss/cross winding) provides increased lateral and linear strength.

Although Spiderbeam says that one person can easily 'walk the pole up' by pressing the bottom against a rock, tree, car or ground anchor, I would suggest that erecting the Top Band vertical is a two-person job. Experience erecting it at Chris, G0DWV's QTH confirmed this as it was much easier with two pairs of hands.

BUILDING THE ANTENNA. So how do you build the antenna? It is actually quite simple, although a little time consuming and fiddly. The antenna comes with a very comprehensive build manual, which runs to more than 30 pages. The first thing you need to do is cut the supplied wires to the correct lengths. The antenna kit came supplied with some suitable wire, but we still had to roll it out and cut the four capacity hat wires, made from 26 AWG stranded Copperweld at 15m (49.2ft) long, plus the single vertical element, made from 18 AWG stranded Copperweld, which is 18m (59ft) long.

The vertical element is cut longer than needed, to allow for trimming to resonance once finished. The capacity hat wires are also folded back to leave 12.5m lengths.

You then have to take one end of each of the capacity hat wires and connect them to the supplied PVDF 1mm monofilament line. Special lightweight ultraviolet resistant polyethylene connectors are supplied for this and once again it is best to measure out the monofilament line before you start.

The antenna also has eight guys, four each fixed at two points. These are Dacron-covered UV-resistant Kevlar and you have to cut them to the desired lengths – 17m (55.8ft) for the top guys and 14m (46ft) for the lower ones.

Once you have done that you can start the construction. You will need some way of securing the pole – we opted for a wooden stake driven into the ground. As the test was going to be a temporary one we opted to bind the fibreglass pole to the stake with cord and cable ties, but if you were going for a more permanent solution I suggest you make this attachment a little more rigid. The instructions recommend nylon camping straps as used to secure sleeping bags to

back packs. Don't use compression clamps or you run the risk of damaging the pole.

Once you have the pole mounted I suggest you get hold of a step ladder, which will make the whole process a lot easier.

It is then a case of soldering the capacity hat wires and vertical element together, and waterproofing and fastening them to the second joint from the top with the supplied clip. The antenna is then pushed up one joint at a time, clamped, and the first nylon fabric guy 'ring' is connected at the fifth joint down.

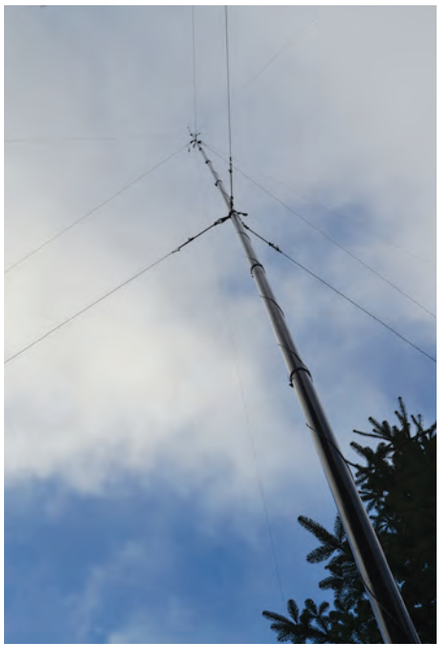
You have to spiral the vertical wire around the pole about one turn per metre as you raise the vertical elements – this keeps it taut to the pole.

To complete the installation Spiderbeam recommends using its rubber padded stainless steel clamps to safely secure the telescoping elements from slipping down. This is a heavy pole and clamps are a better solution than using tape. In fact, I would say they are essential.

IN THE AIR. As the mast is pushed up you have to take care to make sure that the capacity hat elements and guys do not get tangled. This is easier said than done, so take your time! You also have to add the lower guys. As the mast is pushed up higher and higher it gets increasingly heavy – so much so that two pairs of hands are really needed towards the end. One person holds the mast in place while the other tightens the mast clamps with a nut driver.

Towards the bottom, Spiderbeam recommends twisting the vertical element around the pole even more close-spaced to add inductance and also keep it tight to the pole. This gives you the spare wire that can then be cut to tune the antenna. Once up you can then secure the guys and the capacity hat elements.

If you have done a good job this should be quite easy, but you can end up with a tangled mess, which is why it is best to have two pairs of hands.



The antenna must be well guyed.

The bottom of the vertical wire element is then connected to the supplied connector, which is fixed to the radial plate. But how many radials do you need and how long? Spiderbeam recommends at least 16 radials that are all at least 20m (66ft) long. If you can fit 32, 64 or even 120 radials then do so, although it becomes a law of diminishing returns in terms of performance.

TUNING. Once installed you then have to tune the antenna. An antenna analyser makes the whole process a lot easier. Out of the box we found that the antenna resonated below the 1.8MHz limit of our MFJ analyser, indicating that it was too long. This is good news as it is easier to cut the vertical wire element than add material to it and this is what the instructions suggest should happen.

Spiderbeam says remove about 20cm per 10kHz as your initial formula – AND ONLY REMOVE HALF THE LENGTH THAT YOU CALCULATED! You are unlikely to cut too much off, but an analyser is a must and take your time.

We ended removing around a metre or so of wire to pull the resonant point up to about 1.830MHz with a SWR low of about 2.7:1 at the feedpoint. According to the instructions this is to be expected and if you really are a perfectionist you can adjust the angle of the capacity hat wires, add more radials, plus add series capacitance at the base to tune out the reactance (see the sidebar about improving SWR by Rick of Spiderbeam).

At the shack end of the 100m long RG-213 coax we found the SWR to be less than 2:1 and decided to 'stick' at this point as Spiderbeam says that any improvement below 3:1 is unnoticeable. So does it perform?

ON THE AIR. In the shack the 3:1 SWR bandwidth was from below the band edge to 1.875MHz – we optimised it for the CW end of Top Band. The rig's internal ATU was easily able to bring this to 1:1 across the band.

As it was daylight when we finished in April we started by listening to some medium wave stations and were astonished that the vertical could hear European MW stations at very good strengths that were in the noise on Chris's 160m half-wave dipole at about 40ft. This bodes well for its performance on Top Band.

At night, despite being mid summer, the antenna outperformed the dipole quite considerably, picking up lots of 160m stations that were virtually inaudible otherwise.

The acid test will be this winter, but as that is six months away we thought it was best to let you find out more about the antenna now, giving you time to purchase and install one before the bad weather sets in!

CONCLUSION. The Spiderbeam 160-18-4WTH 160m vertical is a well-made antenna that should perform well for DX. While it is 'only' 18m tall its performance is first class. But if you think that it is a space saver I suggest you measure your garden before placing an order.

Just remember its lightweight guys and the capacity hat each come down to ground around 25m (82ft) from the vertical pole.

Our thanks go to Rick Westerman, DJ0IP at Spiderbeam for the loan of the antenna. You can find out more at www.spiderbeam.com. Or from LAM Communications.

IMPROVING THE SWR

Though improving the SWR from 2.7 to 1.5:1 really won't make any noticeable difference to the station receiving your signal, it might keep your transmitter happier.

It is very easy and cheap (around £5) to drop the SWR to about 1.8:1, with the simple addition of a hairpin match. Rick at Spiderbeam recommends a hairpin match with about eight or nine turns of thick copper wire, wrapped on a wine bottle. The bottle can be removed after the coil is completed. The coil simply shunts the coax at the feedpoint.

Since his landlord would not allow him to put up a second fibreglass pole near the house, he built a 160m vertical in the woods, about 100m away from the house. The vertical wire runs about 17m up a tree.

He could only fit a single elevated radial, running zig-zag through the woods, about two to three metres in the air. Rick used an optional RF choke at the base. The coil just shunts across the feedpoint and single radial. Note: because the radial is elevated, it must be resonant.

The RF choke is not an official Spiderbeam product, but was built with components found in its online shop. Simply 18 turns of RG-142 wrapped on a toroid. The choke is probably not necessary, but it never hurts to use one.

On the left is a picture of Rick's feedpoint.

It's not a perfect match but it's well under 2:1. SWR is tuned by pushing the turns of the coil together or pulling them apart. More info at www.dj0ip.de/vertical-antennas/hairpin-match/.

Cheers!
Rick, DJ0IP