OptiBeam Tech Tip

OptiBeam OB9-5HD
9 Element 5-Band Yagi

This Tech Tip is from Tom, President of OptiBeam Antenna Technologies, call sign DF2BO, known on the air as DF2BlueOcean.

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A customer questioned if he could get a manual for the OB9-5HD Antenna

Regarding manuals to be e mailed in an electronic form. This unfortunately, is not so easy.

Our manuals are not single pdf files. We have 65 diverse antenna models in line (and more onthe way), and with this huge amount of diversity I had to organize my “manual logistics“ in a way that all is more economical.

Therefore I work with components, each being valid for many antennas, and these components then are composed to manuals.

In case changes are required, I implement the change into a component and this way have changed the corresponding parts of the manuals of many antennas at the same time. I have found this to be the most effective way to keep current up-to-date information on all of the antenna instruction manuals.

On the other hand it has the disadvantage of fiddling around with several attachments in case someone desires to get an electronical copy of the corresponding manual.

The corresponding manual components regarding your OB9-5HD are:

-> manual text, first part in German, followed by the English version
-> balun mounting instruction
-> picture pages showing the most important items
-> schematic drawing showing all dimensions
-> list of contents (parts list).
(All of these items are shown in this Tech-Tip)

I hope that this will provide the information you are looking for.

It would be great to work you on the bands when your OB9-5HD will be up in the air. I talk to a lot of customers from North America on the bands and it is always fun to hear one of our antennas from overseas.

I hope that the above information helps show you that you would make an excellent choice with the OB9-5HD.

73,

OptiBeam Antenna Technologies
President
(Thomas Schmenger), Tom, DF2BlueOcean

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optimum short-wave antennas

computer-designed / computer-optimized

developed by hams for hams

O B 9 - 5 (heavy duty)

9 E l e m e n t Y a g i 2 0 / 17 / 1 5 / 1 2 / 10

!!! Q u a l i t y m a d e i n G e r m a n y !!!

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1. Introduction

The OB9-5 is a high performing five band antenna for the 14, 18, 21, 24 and 28 MHz amateur radio bands.

OptiBeam shortwave antennas are designed and optimized through the use of modern techniques such as computerized antenna simulation and are fine tuned by extensive tests in practise.

The core of the OB9-5 antenna consists of a direct coupled 5 element driver cell whereby the drivers are connected with a square tbe phasing line.

Furthermore there is a separate reflector for each of the 20m, 17m and 15m band and for the 10m band a separate director which also works as a director for the 12m band.

By utilizing this new concept of feeding the driven elements in combination with a special order of all elements and the exclusive use of full size elements we achieve highest efficiency, optimum bandwidth concerning high gain, clear pattern and low SWR plus unlimited power handling.

In the following table the essential electrical and mechanical data can be seen:

Bands	20m / 17m / 15m / 12m / 10m
Gain (dbd)*	4,3 / 4,5 / 4,7 / 4,5 / 4,5
Gain (dbi)**	11,7 / 12,0 / 12,3 / 12,3 / 12,3
F/B (db)	18 / 20 / 25 / 25 / 25
SWR: **14,00 - 14,19** **18.13** **21,00 - 21,25 - 21,45** **24.95** **28,00 - 28,50 - 29,50**	1,3 - 1,0 - 1,2 1,1 1,6 - 1,1 - 1,6 1,0 1,6 - 1,2 - 1,5
Impedance (Ohm)	50
Elements	9
Active elements per Band	2 - 3
Max. element length (m)	10,94
Boom length (m)	5,10
Weight (kg)	30
Windload at 130 km/h	578 N / 0,72 m^2 / 7,8 $feet^2$

* = average gain over a dipole in free space
gain of monobanders for comparison: 2-element Yagi: 4 dbd, 3-element Yagi: 5-6 dbd

** = average gain at 20m above ground

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2. Assembly

The included schematic diagram is needed for the assembly, showing the following information:

-> Type of element (R=Reflector, S=Driver, D = Director) and the position on the boom
-> Measurements of the element sections (length and diameter)
-> Lengths of the element halves
-> Distances between the elements.

The lengths are given in m (meters) and the diameters are given in mm (millimeters).

2.1 Sorting the parts

The antenna, as delivered, partly consists of already pre assembled parts.
All parts of the antenna are marked at the factory.

For faster and easier assembly it is recommended to sort the parts on a per band basis.

2.2 Assembly of boom

The square boom consists of three parts which have to be assembled each by two coupling pieces that are already installed at one side of the boom segments.
For each coupling piece 4 screws are required. The screws have to be tightened, but not before the separate boom segments **fit and align** with each other perfectly.

2.3 Construction of the elements

For the element to boom brackets 4-cornered plates are used and the insulation of the elements is realized by 2 (driver platform uses 4, see below) special synthetic tube holders (see picture page).

According to the diameter of the elements there are 2 plates with 30mm (S20 / R20), 2 plates with 25mm (S17 / R17) 2 plates with 20mm (S15 / R15) and 3 plates with 16mm (S12 / S10 / D10) tube holders.

Note that the driver element platforms are a bit longer. On them you find a pair of tube holders left and right plus the bottom half of a tube holder in the middle to reinforce the centre of the driven element which is split with the insulator.

The middle sections of the elements have to be fixed **exactly centred** on the plates (orientation = black middle line on parasitic elements / insulator centre on driven elements which ultimately has to sit centred in the pre assembled bottom half of the support tube holder). The element center sections have to be put in to the tube holders (note that for the driven elements one tube holder has to be opened for this process). Then the screws of the tube holders have to be **tightened firmly**. The screws of the driver middle sections within the insulators have to point **straight upwards**.

Next the other element sections have to be assembled. Insert the smaller diameter section into the previously assembled larger sections with their side which has two drill-holes **equal in size**. The tubes have to be inserted until the drill-holes of both sections overlap perfectly (regarding the outer 12mm tubes of the driven elements the **middle hole** of the three drill-holes has to be chosen).

Then the corresponding screws (30mm tube = longest screw, M6 / the following screws are M4: 25mm tube = second longest screw / 20mm tube = third longest screw / 16mm tube = shortest screw) have to be pushed through **from the side of the enlarged drill-hole** of the previous segment. On the opposite side the washers have to be inserted and the self securing nuts have to be screwed on and **tightened firmly** (hold the screw heads with the included special screw-driver against turning, the screw heads bury into the enlarged drill-hole, see picture page). This method results in an extremely solid mechanical connection and rattling within the segment overlaps is thus totally avoided.

By following these instructions the correct lengths of the element halves will be achieved.

While mounting the elements pay attention that all screw heads show **upwards**. Keep in mind that the elements hang below the boom. Therefore the screw heads have to be on the same side of the elements where the plates are located at.

2.4 Attaching the elements to the boom

The elements fixed on the 4-cornered plates have to be mounted on the **underside** of the boom at the marked positions while the connecting screws of the boom should remain horizontal. The square boom makes the need for aligning the elements in the vertical plane unnecessary.

The 4-cornered plates are attached to the boom using 2 square brackets which embrace the boom from the top and 4 self securing nuts (see picture page). When tightening the square brackets pay attention that all elements are **parallel** to each other.

While mounting the element platforms for S10 and R15 to the boom first insert the **metal loops** of the boom truss (see chapter 2.7) into the square bracket which points towards the centre of the boom. When the element platform is fixed to the boom the metal loop of the boom truss should sit in the centre of the square bracket **above** the boom.

The driven elements (from the rear S15, S20, S17, S10, S12) should not be tightened before the installation of the phase line is performed (see chapter 2.5) as they might have to be moved slightly on the boom.

The plates of the outer elements end directly in line with the tips of the boom.

For ease of assembly in general we recommend assembling all element middle sections to the boom first, as well as the phase line bars (see chapter 2.5), the termination stubs and the balun.

Afterwards, all of the remaining element sections can then be inserted and fixed in place.

2.5 Installation of the phase line

The five driven elements are connected by two 20mm square tubes (i.e. phase line) which run in parallel and which are broken at one point, at S17, by a **crossing** that consists of two flat aluminium pieces.

The phase line is terminated at its beginning and its end by a **stub** (see schematic diagram).

The square tubes have to be in **direct contact** with the elements (put the washers only below the screw heads). First remove the element screws and washers. Then insert the predrilled square tubes (move the elements slightly if needed) by means of the element screws. The 2 slightly **longer** square tubes represent the connection from S15 over S20 to S17, the 2 **shorter** square tubes complete the connection between S10 and S12.

Insert the phase line crossing at S17. One piece of flat aluminium has to be fixed at the **top** and the other at the **bottom** of the phase line (see pictures on picture page).

Furthermore mount the stubs on the underside of the phase line (i.e. elements are positioned below the boom), one at the beginning of the phase line at S15 and the other at the end of the phase line at S12. The stubs are fixed with insulators to the boom at their far end (see pictures on picture page).

Likewise install the balun at the bottom of the phase line (i.e. elements below boom) directly with the screws of S10 (10m driven element), alternatively if not using a balun, then connect the coax cable directly at S10.

Finally the square tube phase line bars have to be **tightened firmly** to the driven elements (i.e. important electrical contact) and the driven elements have to be mounted below the boom by means of the element plates (see chapter 2.4).

2.6 Installation of the boom to mast plate

The boom to mast mounting is a pre assembled aluminium plate that has to be attached **between S20 and S15,** here find the the centre point of gravity.
The small square aluminium blocks have to be placed in a way that the boom will be positioned between them and the corresponding counter plates with the pressed in nuts.
This is required to provide some off set as the boom to mast mounting occurs in the phase line area and therefore the boom has to be kept at a distance from the square tube phasing lines.
The mounting plate has to be mounted so that the longer part is oriented downwards.
Details can be seen in the pictures below.

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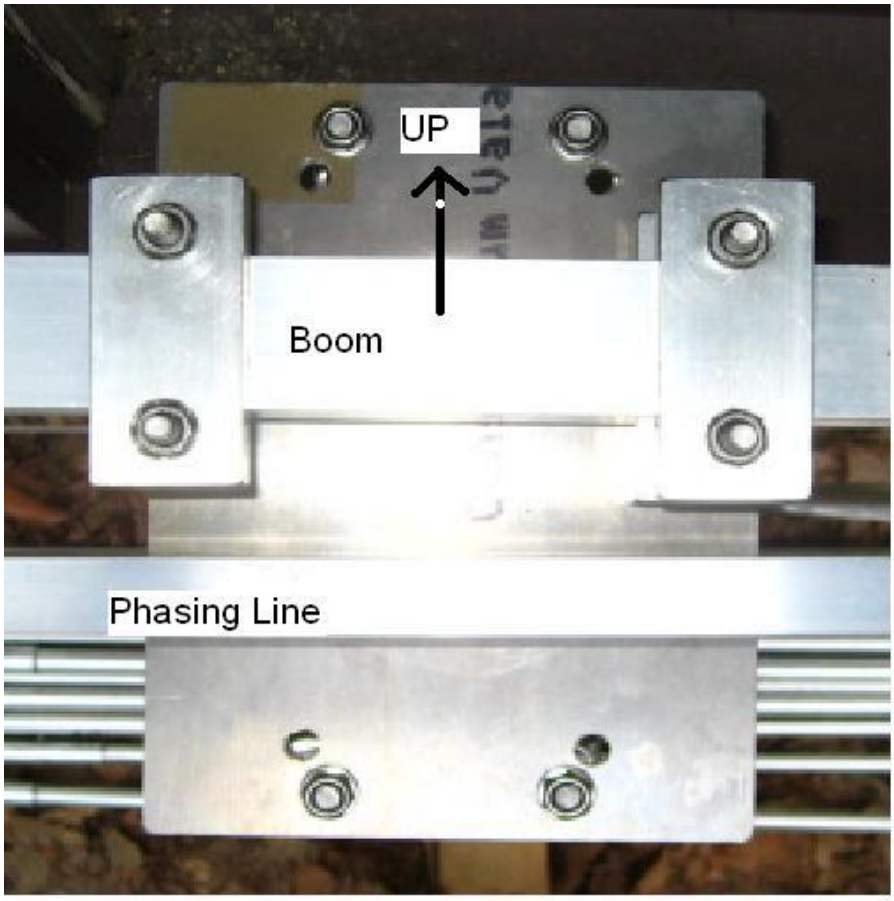

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2.7 Installation of the boom truss

The boom of the completed antenna when mounted to the mast has to be trussed. This is achieved by using the included stainless steel rope of 4mm in diameter. Both ends of the steel rope have a metal loop which had to be inserted into the inner square brackets of the element platforms S10 and R15 during their assembly to the boom (see chapter 2.4).

After mounting all elements to the boom and fixing the antenna to the mast install the included U-bolt at the bottom of the mast loosely so that it still can be moved. The two shanks of the U-bolt have to be oriented **at a right angle to the boom**.

The steel rope has to be fed above both shanks of the U-bolt in between the two big washers.
Now, push the U-bolt upwards on the mast until the boom becomes horizontal and then fix the U-bolt by tightening the two nuts in the rear.

Finally, the two big washers on each shank of the U-bolt have to be tightened with the two self locking nuts on the front until the steel rope is fixed between the washers firmly.

The entire installation can be seen on the second picture page.

3. Connection of coax cable

The antenna should be fed with 50 Ohm coaxial cable.
For connection a coax connector is required (usually type PL-259)
The connector should be **sealed against water entry** at the area where it is slid onto the coax cable (by using shrink tubing, silicon, self-amalgamating tape or something similar).

The coax cable now has to be solidly screwed onto the socket of the balun.
Also here, where the plug and the connector meet, **seal against water entry** (by the use of shrink hose, Silicon or something adequate).

4. Adjustment of the antenna

Normally, adjustment of the antenna is not necessary if the specified dimensions are exactly observed.

Through some external influences of the direct antenna surroundings it may happen that the resonance of the antenna (i.e. point of lowest SWR) shifts on one or more bands.

By minimal changes of the corresponding driven element lengths (i.e. shortening or lengthening of the outer 12mm sections) the resonant frequency of the correspond band can be shifted to the desired resonance point.

A slight decrease of the lengths of both element halves (set the outer section to the last drill-hole) the resonant frequency will be shifted upwards, an increased length (pull final section out to the first drill-hole) the resonant frequency will be shifted downwards.

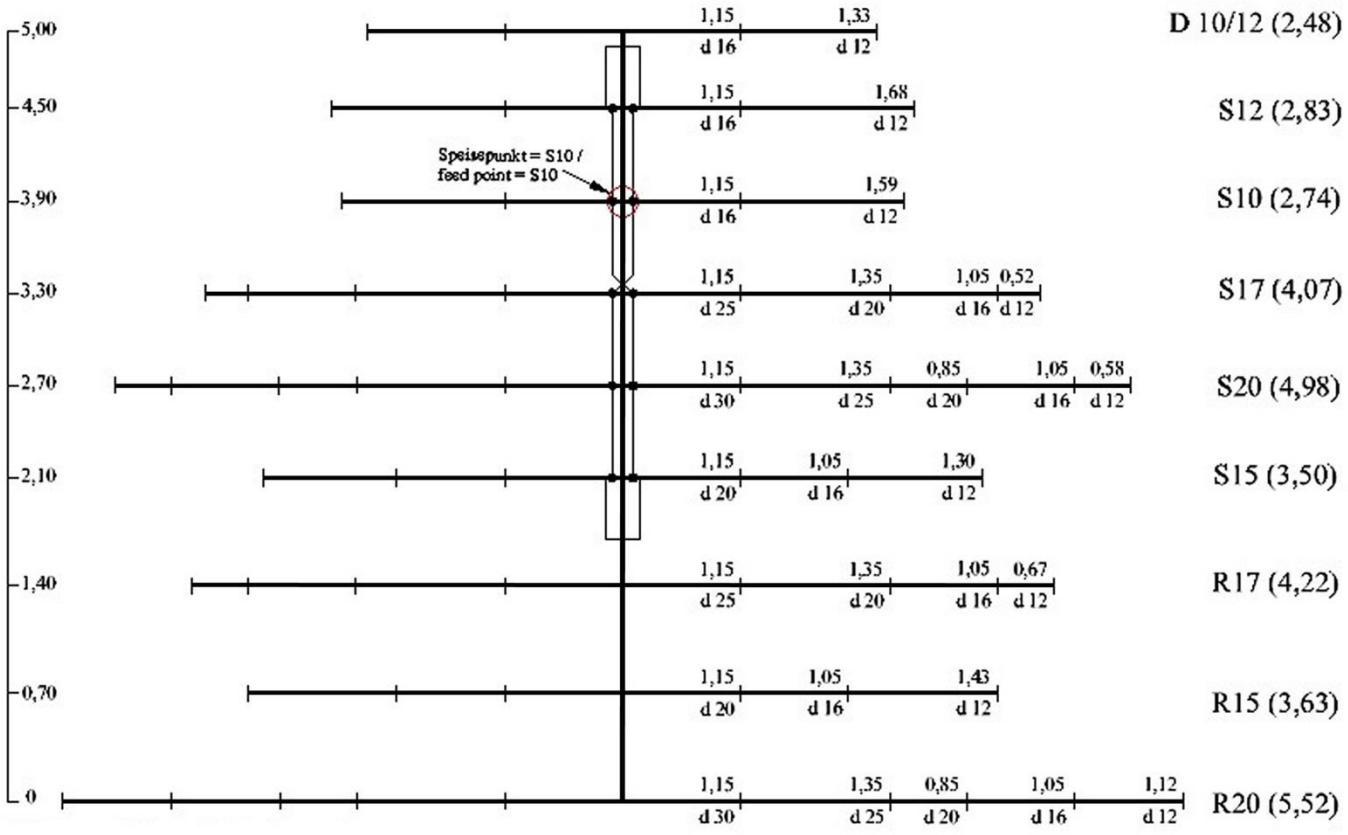
Normally these adjustments don't have to be performed as the antenna does not react much to external influenceswithin the antenna surroundings and the SWR curve typically is flat anyway accross all bands.

5. Position of the antenna during strong winds

During strong winds the antenna should be orientated in such a way that the tips of the elements **show directly into the wind** which means that the boom stands broadside to the prevailing wind.

Hereby physical stress to the full size elements is minimised and their longevity is increased.

OptiBeam OB9-5 (heavy duty)



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