Build A Double Bazooka Antenna

Whisky Kadman | septiembre 27, 2016

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(K3DAV Version)

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The dipole antenna is said by many to be the perfect antenna for a specific frequency. For the most part, this is true. If you want to use a dipole for a band of frequencies, you cut it to the center frequency on that band, and hope it has a low enough SWR at each end of the band. A dipole is very simple to build. It is 2 long wires, each cut to 1/4 wave of the frequency. One wire gets connected to the center conductor of the coaxial feedline, and the other wire gets connected to the shield of the coaxial feedline.

Dipoles are usually strung up horizontally so it beams the signal in 2 horizontal directions. So it is important to have the antenna facing in the 2 directions you most want to transmit in. The signal emits off the long sides. The signals emitting off the ends of the dipole are greatly reduced.

A dipole can also be strung up in an «Inverted Vee» configuration. This means the center of the dipole is mounted on a mast or tower several feet up, and each side of the antenna from the center are angled downward on a 45 degree angle (Give or take a few degrees). It looks like an upside-down (Inverted) letter «V». Hence the term Inverted Vee. An inverted Vee is still somewhat directional in the same 2 horizontal directions, but it now has more of an omnidirectional pattern. This is due to the wires being sloped downward on each side. The signal can now radiate off the wire in partly a vertical, and partly a horizontal polarization. It actually works better in more directions with stations using both vertical and horizontal antennas.

Dipoles have a narrow bandwidth due to the simple 2 wire design. There are no loading coils and no DC ground. They are also subject to noise and static. There is a way to help both the bandwidth and static problems. It's not a cure for those problems, but it really helps.

It's Called A «Double Bazooka»

The Double Bazooka is a unique design alternative to a dipole. It is made of coax cable, instead of a single strand of copper wire. The braided copper shield of the coax is the actual RF radiator, and the center conductor acts like a balun or matching transformer to provide a DC ground. The larger diameter of the shield-braid acting as the actual elements, gives the Bazooka a wider bandwidth, and reduced noise over the old wire dipole. So it covers a wider range of frequencies on each band with lower SWR. As with the dipole, the feedline can be either 50 ohm coax or 400 ohm ladder line. Every comparison has shown the Bazooka to outperform a standard dipole. Now I am going to show you just how simple this antenna is to build.

The Double Bazooka is a very popular antenna. But the following design is my slightly modified version from the original. The main difference is in the tails. The original uses an added piece of twinlead or solid copper wire. My version uses an extended unshielded portion of the center conductor for added strength, and easier SWR tuning.

First, Some Important Notes Before You Begin

Before we get into the instructions, it is very important that all measurements are checked and checked again to be sure that everything is correct. I can not stress this fact strong enough. To many guys make a quick measurement and starting cutting and slodering. Then the antenna does not perform correctly. The reason is they made a big mistake in the measurements.

If the length of the main covered section on one side of the feedpoint is longer or shorter than the same section on the opposite side of the feedpoint, the antenna will not perform at it's best. You will not be able to get a low SWR and the broadbanding will be poor. So be extra carefull to make sure that the main covered elements on each side of the center feedpoint are exactly the same. This is a crucial point to making the Bazooka live up to it's claim.

ALSO Very Very Very Important To Know

Do NOT use any coax that has a foil shield wrapping. It will work, but the Bazooka was designed to work best with a leaky type of coax. A foil shield wrap will defeat this concept and the antenna will not perform as well.

Another thing about foil shield coax is the center feedpoint. The instructions for the Bazooka will describe how to separate the shield wire in the center to make 2 separate elements. The foil shield is also part of the braided shield line. The foil shield must also be cut and removed in the center. If this is not done, the 2 main elements will be directly shorted at the feedpoint.

Do not use thin RG-58 coax. It won't be any better than a basic 2 wire dipole. The severe thinness of the braided shield of RG-58 will allow the Bazooka to perform no better than a basic straight wire dipole.

And DO NOT worry about the Velocity Factor of the coax you use to build this antenna. It does not matter and will have no effect on the length calculating formulae. Check out this article about Velocity Factors of coax.

50 ~vs~ 75 Ohm Coax

The Bazooka was originally designed to work with a 50 ohm coax that is a little leaky, and a foil wrap defeats that idea. The 2 most popular coax types are typical RG-8 or RG-8X (Mini). The RG-8 is the best for this design. RG-8 is a larger diameter radiator which makes the antenna a little more broadbanded. But the RG-8X (Mini) is a good second choice but slightly less broadbanded.

If you decide you want to use a 75 ohm type of coax to build your Bazooka, just consider these facts before you make the decision. 75 ohm coax will not make the Bazooka perform better. Using the low grade 75 ohm RG-59 coax will not perform as well as a basic wire dipole. In fact, the wire dipole will work better. A 75 ohm RG-11 type coax will work fairly well as long as it is the type that does NOT have a foil shield wraped around the center wire.

You Must Convert The Decimal Point To True Inches.

One last detail that is crucial to making your measurements and calculations. There have been many Bazooka antennas built that just did not work right. They could not get a low SWR. It was not broadbanded…..etc..

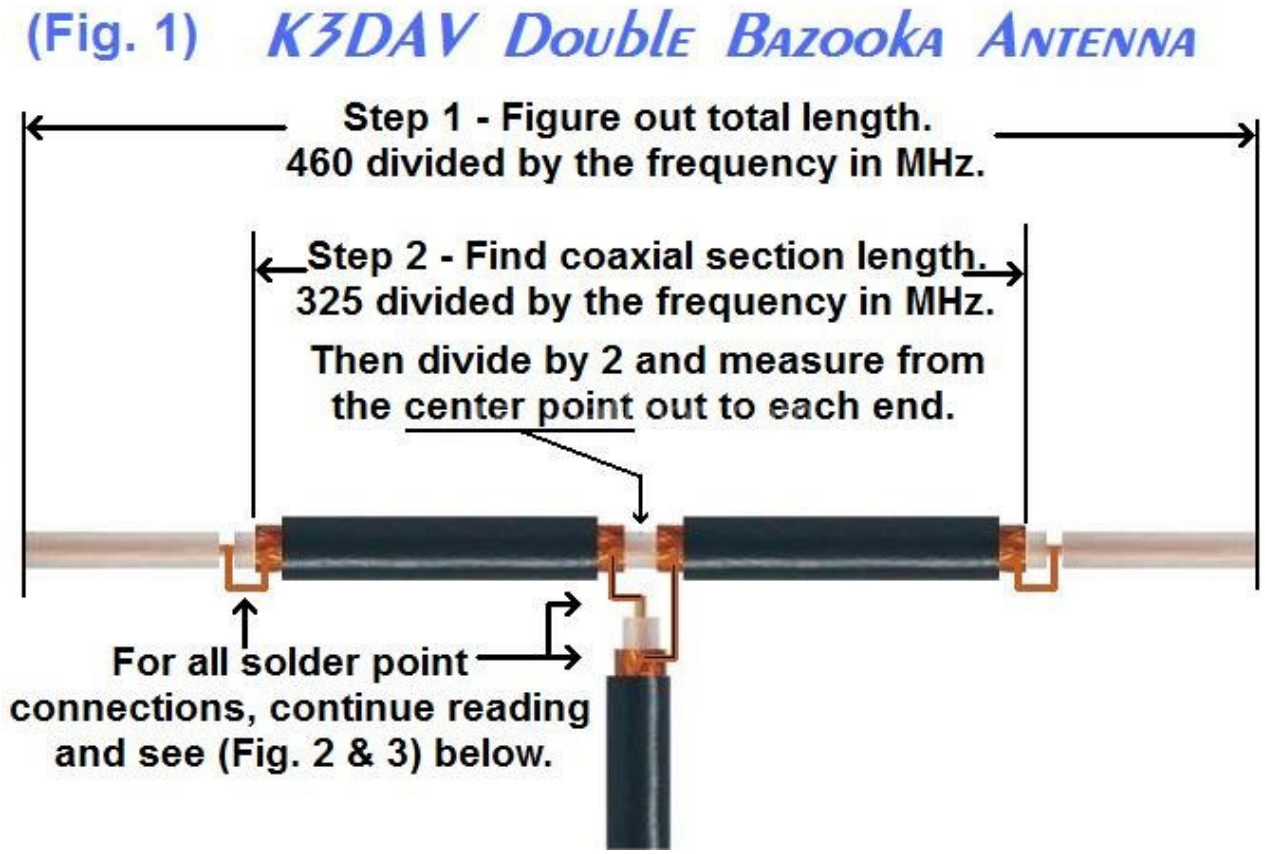
The reason in many cases is the builder did not convert the number in the calculator that is after the decimal point. A final calculation of 12.5 feet does NOT mean 12 feet and 5 inches. 12.5 feet really means 12 feet 6 inches.

If a foot was just 10 inches long, we would not have this problem. That's because a calculator thinks in multiples of 10, so it would be a perfect calculation. But a foot is NOT 10 inches, it has 12 inches. That means the number after the decimal point does not mean real inches. It represents a fraction of 12 inches and must be converted. For example, .5 of a foot means half of a foot which is 6 inches. And .75 of a foot means 3/4 of a foot which is 9 inches.

Don't worry, there is a simple way to fix this and get the correct measurement. Re-enter only the number after the decimal into the calculator. You must use the decimal point followed by the number after the decimal. For example… If the answer is 12 .8473 feet, it means 12 feet plus .8473 of a foot. Here is the simple way to figure it out.

Enter the .8473 then multiply times 12 (for 12 inches). 10.1676 is the answer. This means 10.1676 inches. After you convert the number to the correct inches, just round up to the next inch after the decimal point. This fraction of an inch will not have a noticeable impact on the antenna.

So we have determined that the original 12.8473 feet actually equals 12 feet 10 inches after converting the number after the decimal to real true inches. Failure to do this important conversion will most likely produce an incorrectly measured Bazook that will not perform well.



NOTE: If you would like a photo like the one above, but already showing all of the cut measurements for each HF band and 6M, just click on the (Fig 1) pic above.

Fig. 1 shows the completed antenna. First you need to figure out the length of coax you need to make the Double Bazooka. There are simple formulas to figure out each section length. The formula we are going to use will work with any frequency band. For our example, we will use 40 meters to show how the formula works.

How Long To Make The Bazooka????

For the full length of the antenna enter the following formula into a calculator. The average center frequency of 40 meters is 7.150MHz, so this is the frequency we will stick with to build our 40 meter Bazooka.

The simple formula is 460 ÷ 7.150 = 64.335664. This is roughly 64 feet 4 inches. So the entire length of the antenna is 460 divided by the frequency in MHz (7.150) which equals 64′ 5″. It is always best to cut the antenna longer than you actually need. So cut the coax length at 65 feet. You can always cut off what you don't need later to match the SWR.

Now you have the total length of the antenna. Next measure exactly half of the entire length to find the very center of the antenna, and mark it with a small wrap of electrical tape. This will be important for building the rest of this antenna.

Measuring for the main element.

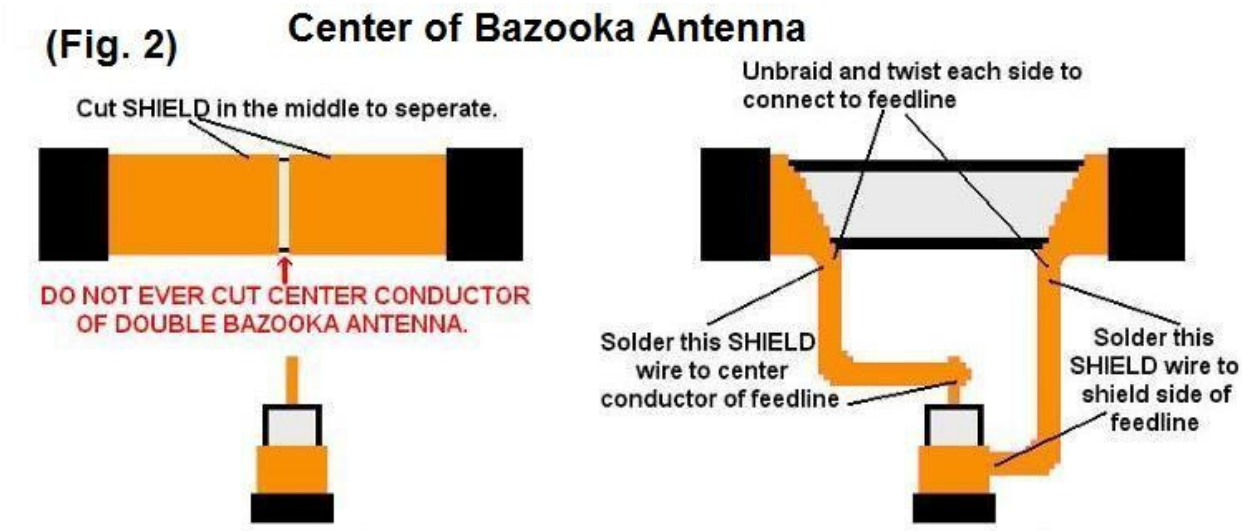
Next you need to calculate the amount of the wire that will retain the shielding, and how much will not retain the shielding for the tails. In fig. 1 above you see the black part of the antenna that represents the radiating

element. This part has to be calculated exactly.

This time we will use the magic number of 325 as the formula, and the same center frequency of 7.150. So on your calculator enter 325 ÷ 7.150 = 45.454545 This is close enough to 45 feet 6 inches. This becomes the entire length of the black part (Radiator) of the antenna. Now divide the total 45′ 6″ ÷ 2 which equals 22 feet, 9 inches.

Now measure from the center mark of the antenna, 22 feet 9 inches towards one end of the Bazooka, and mark it clearly and exactly. Then do the same from the center mark to the other end of the Bazooka and mark it clearly and exactly. Now you have marked the full length of the main radiating element, and the extra length beyond the new markings will become the tails.
We will get back to the tails in a moment.

Attaching The Feedline To The Bazooka



Now we are going to connect the coax feedline to the antenna. As shown in Fig. 2 above (left side of pic), you need to use a sharp knife to cut away the black jacket of the coax to expose the copper braid. From the center mark remove 2 inches to the left, and 2 inches to the right of center. As in Fig. 2, you should have removed 4 inches of the black jacket. Be careful not to cut into the copper braid. You just want to remove the black jacket only.

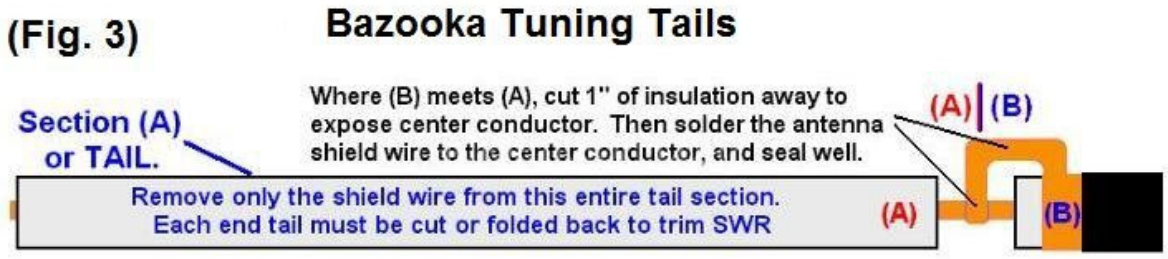
Now, with the knife, cut the copper braid in the exact center, all the way around the coax in a circle. But do NOT cut into the white foam that covers the center conductor. All you are doing here is separating the braided shield in the center to make 2 separate braided wires on each side of center. As shown in Fig.2 above, (right side of pic), un-braid the copper shield, and twist the wires together to make 2 pigtails, 1 from each side. One of the pigtails will connect to the center conductor of the coax feedline. The other pigtail will connect to the braided shield of the coax feedline.

Special Note: If you use 400 ohm ladder line as the feedline, attach one pigtail of the Bazooka to one lead of the ladder line, and of course, attach the other pigtail to the other lead of the ladder line. Be sure to use stand-offs with the ladder line so it is not close to the metal tower or mast. This will change the impedence of the ladder line and increase the SWR. The ladderline can also act as part of the antenna and radiate some of the signal. And it can act as a balun to make the Bazooka more broadbanded. But using coaxial cable for feedline will work perfectly as well. Both options are good ones, but the final decision is yours on which to use.

Solder both connections well. Make sure connections are solid, clean, and can not touch each other. Then seal the entire open wire area with silicone or any non-conductive epoxy to make the area water proof, and allow to completely harden. Just remember that once the sillicone has hardened, you can not go back and repair the connections. So be sure to do it correctly the first time.

As an option to give the Bazooka a connector feedpoint, you can cut the feedline that you have just soldered to the Bazooka, a few feet down and put a PL-259 on it with a double female coupler. This gives you a new feedpoint that accepts a PL-259, and makes it easy to disconnect the feedline and work on the antenna .

Now It's Time To Make The Tails



You are almost done. Now you have to make the tails. Remember the earlier measurement you made of 22 feet 9 inches from the exact center of the antenna? Then you marked that point on each side of the antenna? Good. Now, from the 22′ 9″ mark to the very outer end, remove the black jacket to expose all of the copper shielding.

Next, you will remove all of the copper shielding except for about 2 inches from the black jacket. But do NOT remove any of the white foam that covers the center conductor. Leave the white foam insulator on the center conductor to protect it from the weather. See Fig. 3 above.

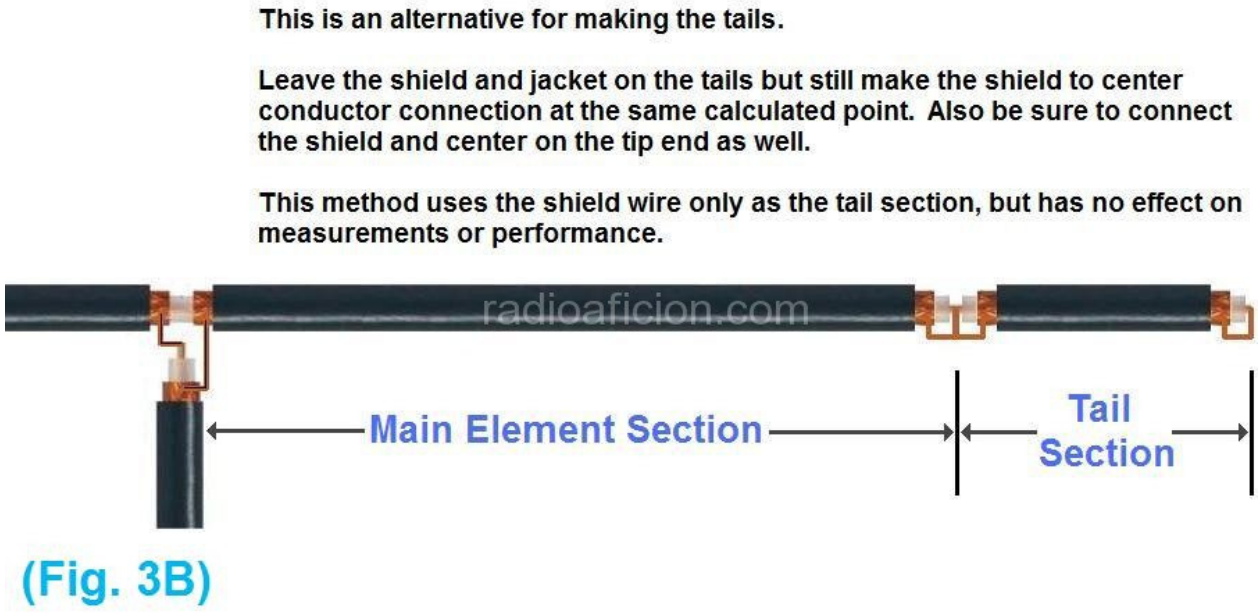
Unbraid the 2 inches of the copper braid and twist the wire strands together to make another pigtail. As in Fig. 3 above, make a slice in the white foam about 1 inch from the black jacket. A thin slice in a circle around

the foam, but do NOT cut into the center conductor. Pull the white foam back about ½ inch to expose a tiny part of the copper center conductor. If you can not slide back the white foam, then you will have to remove a small portion of the white foam. But not more than 1 inch. And remember, do not cut into the center conductor.

Wrap the pigtail around the bare center conductor, and solder them together well. Then slide the white foam back as far as possible to the solder point. This new open wire area also needs to be sealed very well with silicone or non-conductive epoxy to make it water proof. Now repeat this entire step at the other end of the antenna. Your antenna is now built and ready to be strung up.

Alternate Tail Construction

On those extra long tails that you get with 40, 60, 80, and 160 meter Bazookas. It may be a lot harder to remove the coax jacket and shield wire from such long lengths of the coax. So here is an alternative method.



In figure 3B (Above) The jacket and braided shield are still on the tails section. But the shield and center wires are connected together at the same solder point as before.

Where the main element ends and the tail is calculated to begin, do the following work.

Step 1: Cut at least 2 inches of the black outer jacket away with a knife or razor blade. Cut only the jacket and not the wire.

Step 2: Cut ONLY the braided copper shield in the center of the exposed area, all the way around the outer surface so you can separate the shield into 2 sides. Much like you did when you separated the 2 shields in the center of the Bazooka to connect the feedline. You should now have 1 inch of shield on the main element side, and 1 inch of shield on the tail side. Fold both copper shields back over the black jacketed part of the coax to fully expose the 2 inches of foam insulation covering the center wire.

Step 3: Remove 1 inch of the foam center conductor insulator from the center of this area, but do not cut into the center conductor wire. You only want to remove an inch of the insulation to expose the copper center

the center conductor wire. You only want to remove an inch or the insulation to expose the copper center conductor wire.

Step 4: Sleeve both braided shield wires back over the now exposed center conductor wire and wrap them together so both shields and the center conductor wire are all connected together.

Step 5: Use a gas torch type soldering device to solder this section well. Make sure that all 3 wires have soaked up enough solder to make a good soild connection to each other. Then seal up the entire area for waterproofing.

Step 6: At the very tip-end of the tail, cut away the insulation to expose just enough of the braided shield and the center conductor wire so they can be tied together and soldered well.

You are now using the braided shield and center wire as one single large diameter wire for the tail that is the same size as the main radiating element. This keeps the tail larger for good wide broadbanding, and strengthens the total length of the Bazooka which is all one uncut or spliced antenna.

The only drawback to using this method is a minor one, but mostly just an inconvenience. If you need to cut the end to trim for SWR, you must recut and resolder the center and shield wires back togther again each time to cut more off. If both conductors are not connected at the tip-end, the tails will not tune the Bazooka correctly and a high SWR will result.

This method does not change any of the calculations used to build the Bazooka, nor does it have any different effect on its performance. It is simply an alternative to making the tails without having to strip away all of the jacket and shield on longer Bazookas for lower HF bands.

Just remember that the tails are just an extension of the main element and is a single wire conductor. The tails can be made from any type of single wire conductor like solid or stranded electrical wire, several smaller wires all tied together at each end of the tail, even speaker wire, or any kind of wire conductor. The 2 methods I have shown above were used as the best for strength and support. But it is up to you what to use to make the tails.

Hanging Support Mount

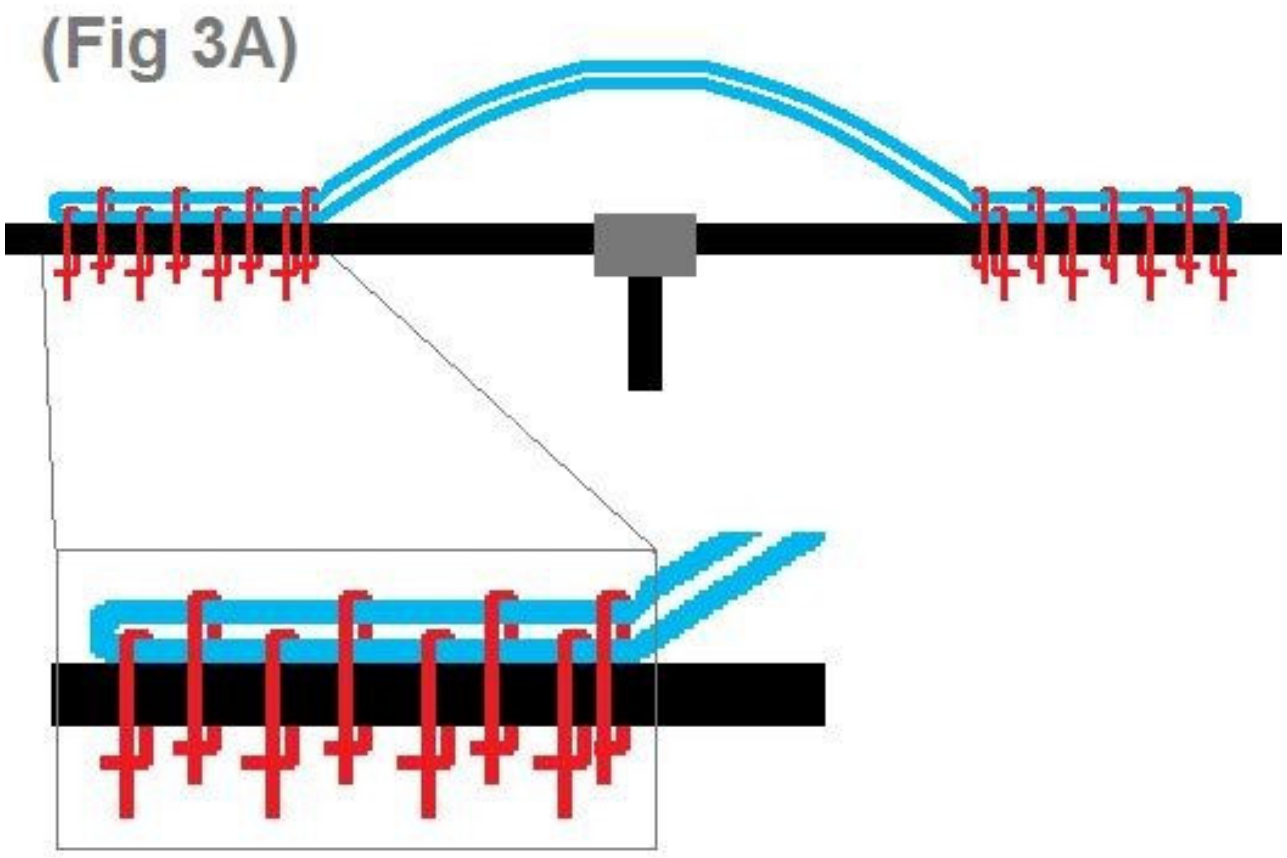
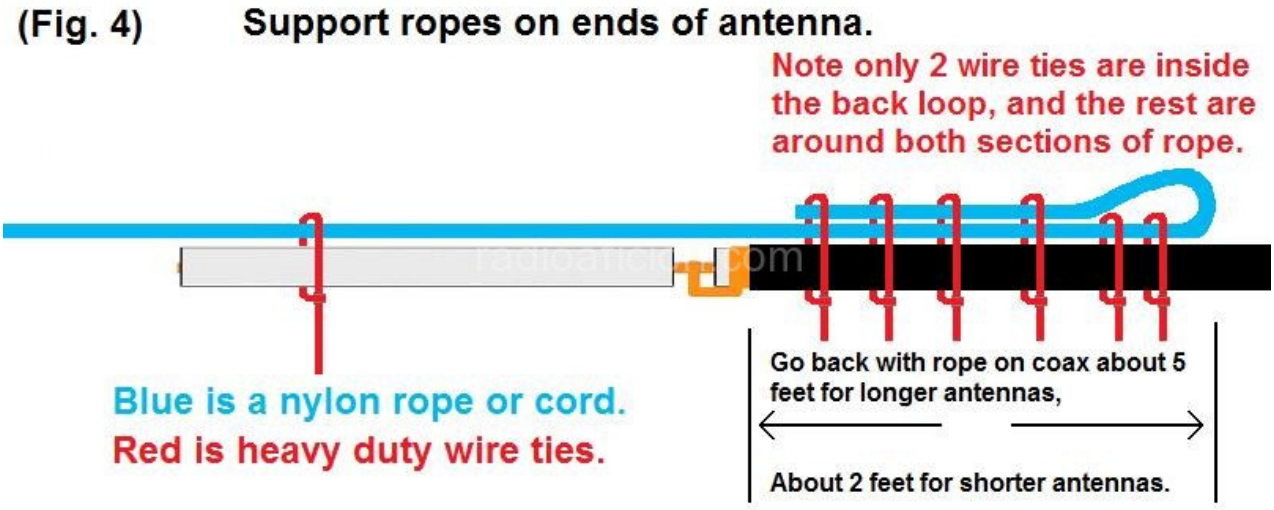


Figure 3A above is one good way to hang the Bazooka. Using a non conductive nylon rope, (Shown as BLUE), make a loop of the rope. About 9 inches from the center of the Bazooka, attach the nylon rope as shown above in figure 3A. Use 4 heavy duty plastic wire ties (shown as RED) around the Bazooka and one piece of the rope. Then use 4 more wire ties that go around the Bazooka and both pieces of the rope. Do this to both sides from the center of the Bazooka. You now have a rope that can hang on a hook on the tower or mast. Or you can wire tie the rope to a brace on the tower or mast. Remember to leave a large enough loop of the rope to give the antenna flexabillity.

Special Note: If you hang this antenna from a tower, it would be a good idea to use an arm brace that holds the Bazooka out and away from the metal tower by at least 1 foot. If any part of the Bazooka is resting against the metal tower, it will effect the SWR and broadbanding of the Bazooka. However, hanging the Bazooka from a simple pole or single thin mast, or any non-conductive support mount, will not effect the performance of the antenna. The only metal that should ever come in contact with a Bazooka antenna, is the feed line. This is why I stress the importance of using non-conductive sillicone and epoxys, and using nylon rope to support the Bazooka.

Supporting The Tails & Adjusting The SWR



Here is the best way to support the ends of this antenna. Only use a non-conductive nylon or rope to hang this antenna. This is important because the rope runs along side the antenna radiating element, and it can not contain any metal to interact with the antenna. In Fig. 4 above, you see the rope (in BLUE). From the area that was soldered and sealed, take the rope back about 4 or 5 feet along the black jacket. In the middle of this section, put a couple of large heavy duty wire ties around the rope and coax, and tighten firmly. Then fold back the rope to overlap itself, as shown in Fig 4 above. Then put 4 or more of the same heavy duty wire ties around both pieces of rope and the coax to hold the rope firmly to the antenna. I said to go back with the rope 4 to 5 feet. This is for longer antennas on low HF bands. For shorter antennas you can cut back to 2 or 3 feet.

Use your own judgement as to what you feel is a safe amount for supporting this antenna. Just don't use too little. The rope that is supporting the antenna will have a lot of stress on it to hold the long length of the Bazooka tightly in place. So use enough rope along the black section of the Bazooka to safely support it.

Simple SWR Adjustments

To adjust the SWR of the Double Bazooka, you just need to cut off the ends of the tails in 1/4 inch increments. If the SWR is lower at the lowest frequency of the band, than it is in the center of the band, begin cutting off the tails by 1/4 inch at a time. Since the antenna was cut longer than it needs to be, you will most likely be cutting off some of each tail more than once.

IMPORTANT NOTE: Equal cuts must be made at both ends on each tail at the same time. When you cut 1/4 inch off one tail, go to the other end and cut off 1/4 inch from that tail also. Then check the SWR again. If it is still lower at the lowest end of the band than in the center, keep cutting 1/4 inch off each end until the SWR is lowest in the center of the band at our original 7.150 MHz. Then put a wire tie near the end of the tail around the tail and the rope to support the tail section. This antenna is ready to talk some DX.

However, if the SWR is lower at the highest end of the band than it is in the center of the band, you made a mistake in one of the calculations, and need to add wire to the tails. But if you followed my instructions, this is unlikely to happen.

>>>>> A Special Mention <<<<<

Bill – WX4AR in NJ has made a YouTube video showing how he built a Bazooka using my design with a

small but effective modification to the feedpoint connection. Bill took it upon himself to make the video and I want to extend my appreciation to his efforts and giving my website article the credit for his project.

His video also shows a direct comparison of the Bazooka he made and his Comet HF antenna. You can see and hear the difference in the noise floor levels between the antennas, but how the incoming signals are still strong.

Bill obviously built his Bazooka correctly as he mentions that he had a super low SWR across 40 meters and did not have to make any SWR adjustments.

CLICK HERE to watch Bill's Bazooka video on YouTube

My thanks to Bill for his excellent video and a personal mention to me for the design.

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