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## Installing A Yagi In A Tree

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### PREPARING A TREE

Most tree Yagi installations require an unobstructed mounting at the top of a tree with a straight trunk, such as a pine or fir. In other words, the top of the tree needs to be removed. Topping the tree, unfortunately, can't be avoided. While arborists discourage tree-topping for several reasons, many homeowners do it to reduce the size of a tree and its wind load so that it is less likely to be blown down by a windstorm. My advice is to be as gentle as possible. This means leaving limbs and branches growing as high on the trunk as possible so they continue to bring sap up the trunk. **Do not** strip the limbs on the upper part of the tree; with no living branches to bring up the sap, the tree trunk will quickly rot and your installation will eventually fail.

### VHF/UHF ANTENNAS

VHF and UHF vertical antennas can be successfully tree installed. A tall tree will give your antenna coverage that may astound you. The worst part of any tree installation is that nothing is square or plumb on the tree. You might have to put up with a little lean or tilt to your installation. The easiest way to mount a VHF vertical is on a pipe, lag screwed to the trunk at the top of a tree where it has been topped.

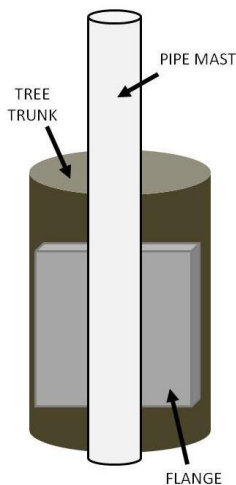
Use a 1½" galvanized water pipe (or an appropriate size if you are installing a rotator for a Yagi), drill three or four holes in it for the lag screws, then use 3/8" × 4" or 5" long galvanized or stainless steel (SS) lag screws to attach it to the trunk.

If you are not topping the tree, you must fabricate some type of standoff to get the antenna a reasonable distance from the tree trunk; plus you'll have to clear the branches up above. Installing the vertical among the branches is less desirable since VHF/UHF signals will be attenuated somewhat by the tree. Get the antenna on top and in the clear if possible.

## HF BEAMS

Trees can be very useful for small HF triband Yagis and even two-element 40 meter beams. A large triband Yagi is about the limit –a tree-mounted KLM KT-34XA installed by the author was up without problems for 15 years. Since trees are very poor conductors, there are no steel tower or guy wires for the antenna to interact with. As a result, a tree-mounted HF beam is a wonderful performer because it's electrically floating in space.

Use the same procedure described above; top the tree and use a four to five-foot section of 1½" galvanized water pipe with four ½" × 6" galvanized or stainless steel lag screws to attach it to the trunk. Notice I've moved up from 3/8" to ½" lag screws. The HF beam exerts much more force on the installation than does a VHF/UHF installation and requires stronger hardware. Be careful about using hardware store grade lag screws; you can easily twist the heads off common grade or ungraded lag screws. The galvanized or SS versions are generally stronger and their heads won't twist off.



An improvement on the pipe-mount method is to have a flange or bar welded on at right-angles to the pipe so that it presses against the trunk and resists rotation. (see figure at left) This will handle the torque-related forces better and increase the reliability of larger installations. Next, bring up the rotator with the control cable attached and install it on the top of the mast. Bring up and install the mast next.

A three or four-foot piece of galvanized water pipe is plenty. It's better to have it too long than too short because you may want to use the mast for a gin pole for installing the antenna; you'll want a pick point high enough above the rotator to bring up the antenna while providing enough installation clearance. Now you're ready for the antenna.

## ROTATORS

Using a pipe mast for the tree mount requires a mast-mounting bracket to be attached to the bottom of the rotator. Since the rotator is not mounted inside a tower, which would give it its maximum strength and rating, you must be more conservative with the wind loading for mast-mounted loads: Reduce the rotator capacity by approximately 50%. While the *HAM -IV* from HY-GAIN has enough

capacity for mast-mounting small tribanders (15 square feet inside a tower vs. 7.5 square feet when mast mounted), I usually recommend the *T2X Tailtwister* because its physical strength and bearings have more capacity and reliability for tree installations. You want the most reliable installation possible, because if you have a rotator problem it's not as easy to replace as one mounted on a tower. A stress test done on a *T2X* at the factory showed that it took 3,000 pounds of force on the rotator before it broke.

There are two mast mounting brackets available from HY-GAIN; one is a medium-duty version for their *HAM-IV*; the other is a heavy-duty bracket for their *T2X Tailtwister*. Since the bolt patterns are the same, you can use the heavy-duty version on a *HAM-IV* installation as well.

Yaesu rotators also have a mast-mounting bracket plus they're reasonably reliable so they would be a good choice as well.

### TRAM UP THE ANTENNA

Tree limbs make hoisting an HF beam up the trunk of a tree all but impossible. The secret to getting the beam above the branches is to use the tramline and tramming technique described in the *Antenna Book* chapter **Putting Up Antennas and Towers**. Use a sling around the top of the rotator bell for your anchor and pulley attachment point; then rig your tramline as you would normally. **Do not** rig the tramline high on the mast above the rotator; it'll create a large-sized moment of force on the system and may damage your rotator or mount.

### TAG LINE

The other key to getting the beam up is to attach a tag line to one of the elements in the middle of the boom, using it to tip the elements upright as they approach the tree. Use a lightweight line, such as 1/4" polypropylene, tie one end of the tag line to the center of the boom, then route it down the element that you want to use to pivot the antenna. Twist it around the element two or three times to give it a little extra friction, then tape the tag line to the element 2/3's or so from the boom. You want the rope far enough out to give good leverage but also to give it a sturdy part of the element that it's attached to.

The person handling the tag line has a job that requires proper timing and finesse. Since you want the elements to be almost vertical as the beam approaches

the tree on the tram line, the tag line handler should be just behind the antenna itself, so that by pulling down on the tag line, the elements become nearly vertical to clear the branches.

The tag line shouldn't be released until the antenna has cleared the branches and the antenna has landed at the top of the tree. As the tag line is released, the antenna should settle back to horizontal and, if done properly, should be right at the top of the rotator. It doesn't take much force to tip the antenna using the tag line; a minimal pressure is all that should be applied.

When the antenna has successfully landed at the top of the tree, the tree person can untie the tag line from the boom. The ground crew can give it a tug to pull it down. The tag line should pull right through the tape that's holding it and drop right to the ground. To insure that the tag line will run through the tape, pull it back and forth a few times while it's still on the ground to loosen the adhesive grip on the tag line.

### **HOISTING THE ANTENNA INTO PLACE**

If you've followed my advice by having your tramline secured to the top bell of the rotator, then you'll need a second step to hoist the antenna into place. Secure the antenna to something convenient, such as another sling around the mast or rotator then have the ground crew slack off of the tram line. When it is slack, detach it and release it back to the ground; you don't need it anymore. Before dropping the tramline, alert your ground crew with a warning such as "I'm going to drop the cable," then "Here it comes!" or some other command.

Next, remove the pulley and slings and re-rig them to the top of the mast, or at least high enough to give you adequate clearance. Reattach the haul line to the antenna bridle then have the ground crew pull it up into position. Bolt the boom-to-mast clamp with its hardware and tighten everything. There you go; the beam's installed – congratulations!

### **SECURING THE FEED LINE AND CONTROL CABLES**

Cables may be secured to the trunk with eye screws, nails or just about any type of standoff; then the cables can be tie-wrapped (black only!) or taped to the standoff. Don't tie-wrap around a limb; it's convenient but it will kill the limb. To

anchor cables coming down the tree, I use fairly good-sized nails every 8-10 feet and then tie-wrap the cables to the nail.

### **PREVENTIVE MAINTENANCE**

Compared to a tower-mounted installation, a tree is relatively high-maintenance. Every three to five years someone should go up and do some pruning of new growth. Little limbs and sucker branches are amazingly strong and can prevent your beam from rotating. Since this is a wooden structure, it should be inspected for rotting as well.