how to add an inverted V or delta loop to your tower

An easy way to obtain low-angle coverage for 40, 80 or 160 meters using a simple mast extension on your high-frequency beam antenna installation

Over the past few years, and especially since the introduction of the 5BDXCC and 5BWAS awards, numerous articles on antenna systems for 80 and 40 meters have appeared in the amateur magazines. These systems were basically trying to accomplish one purpose: a lower radiation angle on these bands. All too often, however, impractical heights or a considerable amount of real estate were involved.

Presented here is an inexpensive means of extending the height of your tower so you can mount one of the popular inverted-vee or "drooping dipole" antennas for the lower frequencies. The only requirement is a tower of some height with the antenna rotor installed inside the tower.

description

The basic idea is a mast extension at the top of your tower. To this extension a swivel joint is affixed. Above the swivel joint, another 6 to 12 inch (15-30 cm) length of identical mast is mounted, which acts as a mounting base for a low-frequency antenna. A typical setup is shown in **fig. 1.** When erected as shown, everything below the swivel rotates when you rotate your beam. Antennas for 80 and 40 meters, or for that matter, any bands you wish, then serve to guy the installation and keep the short section of mast above the swivel from rotating. Simple? You bet! The cost for the entire assembly, not including antennas, will be less than $20.

design considerations

The upper mast extension is needed so your beam element ends will clear the low-frequency antenna (or antennas) as the beam antenna is rotated. The mast extension length depends on the size of your beam antenna. A typical tribander, such as the Classic 36 or TH6DXX, will require a minimum extension of about 22 feet (6.6m) above the plane of the elements. This is the minimum extension. In practice, about a foot (30cm) should be added to allow for ample clearance. Dimension X in **fig. 2** is the minimum value that will allow the beam antenna to turn freely under a low-frequency wire antenna drooped 45 degrees from the horizontal. Dimension X is determined by simple geometry:

$$X = \sqrt{Y^2 + Z^2} \qquad (1)$$

where X is the clearance height, Y is the distance from the rotator mast midpoint to the end of the boom, and Z is the distance from the boom end to the end of the longest element. Remember that dimension X is the

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minimum value needed to clear your beam antenna; it's not the maximum value for the mast extension.

construction

The mast extension was made of ordinary *heavy-duty* TV mast, available in 5- and 10-foot (1.5 and 3m) sections. The longer sections are easier to work with and are recommended for the main part of the extension. A 5-foot (1.5m) mast section is best for building the swivel-joint portion. If three 10-foot (3m) sections and one 5-foot (1.5m) section are used, the extension gained will be about 30 feet (9m) above the plane of the beam elements. This will allow about 5 feet (1.5m) of the extension to be enclosed by the rotator mast. While probably feasible, extensions longer than 35 feet (10.6m) have not been tried here.

The swivel joint is the key to the whole system. It may be as simple or as elaborate as you wish. My first one was made with parts from an old tricycle. The latest model was made from a 0.75-inch (19mm) water pipe union joint (Sears part no. 42G 12673) and two short pieces of water pipe screwed into the union joint. The union was tightened snugly, while allowing it to still rotate, then it was secured with a sheetmetal screw to prevent further movement. The water pipe sections, each about 1 foot (30cm) long, were then built up with pieces of aluminum scrap tubing until a force fit was obtained inside the 5-foot (1.5m) mast section.

installation

My low-frequency antennas are fed with baluns. I believe in feeding a balanced antenna with a balanced feed system. The baluns are easily attached to the short section of the swivel and serve nicely as attachment points for the antenna wires. They will also keep the low-frequency antennas separated at the top of the extension. Tape the feedline securely to the sides of the mast extension. This will keep the weight of the feedline more along the centerline axis of the mast and prevent excessive bowing as the mast is raised.

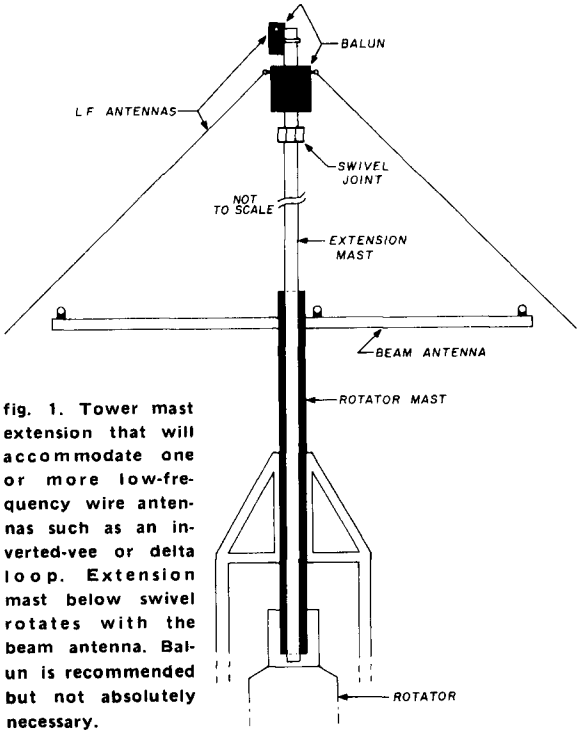

fig. 1. Tower mast extension that will accommodate one or more low-frequency wire antennas such as an inverted-vee or delta loop. Extension mast below swivel rotates with the beam antenna. Balun is recommended but not absolutely necessary.

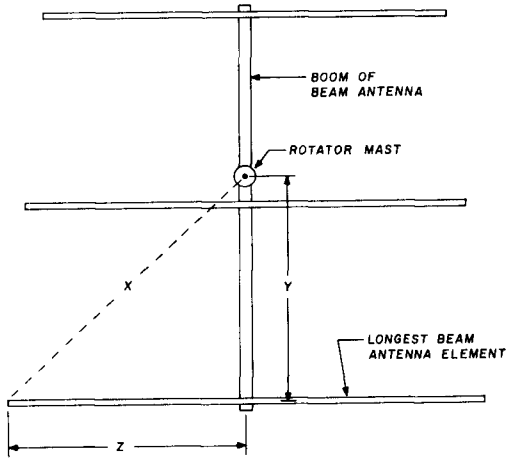

fig. 2. Geometry for determining minimum (see text) clearance of wire antenna that will allow beam antenna to turn freely.

The assembly is easiest to erect if all masting is placed inside the tower, then joined in proper order and fed out the top of the rotator masting. This will usually require removing the rotator. Since the swivel joint will most likely not pass through the rotator mast, it should be fitted in place (with all antennas attached) as the next lower section of masting is pushed upward. Continue feeding the mast extension out the top. When fully extended, secure the base of the extension. I do this by just slipping the rotator back into place.

Tie off the ends of the antennas to obtain the best vertical positioning of the extension mast. Don't worry if the mast leans or bends over slightly while it's being extended. When fully erected, the wire antennas do double duty as guys.

performance

If your tower is in the 50 to 60 foot (15-18m) range, you'll probably have a couple of inverted-vee antennas tied off below the top. With this mast extension, the high-current portion of your antennas will be about 80 to 90 feet above ground (24-27m). On 40 meters, this will lower your radiation angle from about 35 to around 20 degrees.

If your present system is in the 50 to 60 foot (15-18m) range, most of your 80-meter signal will radiate straight up. The system described here will lower that radiation angle to around 45 degrees.

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