How To Build A Simple 160 Meter Antenna (With A Bonus)

N4PC comes up with another unique use for arboreal elevation, this time for top band.

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The 160 meter band is a land of intrigue. I have had many telephone calls requesting that I design an antenna for 160 meters that can be erected on a city lot and that will perform well. Here is my response.

This antenna is shorter than a G5RV. It will give a good account of itself on local contacts, and it will also work some of the closer DX. The bonus is that it will do a fine job on 80, 40, and 30 meters. Additionally, it is inexpensive, easy to put into operation, and does not require a backyard full of radials.

Background

A few years ago I came across an interesting antenna in Doug DeMaw's antenna book (*W1FB's Antenna Notebook*, p. 74). The antenna was a vertical loop that consisted of a one-half wavelength of wire that was placed in a rectangular configuration. The antenna was placed in the vertical plane and fed at a lower corner. The upper corner opposite the feed point was open to provide an acceptable feed-point impedance. The horizontal wires were about 95 feet and the vertical wires were about 40 feet 10 inches. This configuration had the physical dimensions I was looking for, so the next step was to model the antenna.

I modeled the antenna using EZNEC by Roy Lewallen, W7EL. When I analyzed the antenna with the top wire at 60 feet, the pattern was vertically polarized with a predicted take-off angle of 26 degrees. This is a very desirable characteristic for a DX antenna, but I wanted more of an overhead component for the local contacts. I changed the dimensions and continued my analysis.

Next I modeled the antenna with the feed point moved to the center of one of the vertical wires, and opened the wire opposite the feed point. This configuration produced the pattern I was looking for (see fig. 1). There was significant energy in the overhead component for reliable local contacts, and the predicted take-off angle was 33 degrees. In both cases the horizontal pattern was omnidirectional. This was what I was looking for on 160 meters, but what was in store for other bands?

The total wire length was one-half wavelength on 160 meters, which translates to one wavelength on 80/75 meters. To keep the impedances at a reasonable value, the wire opposite the feed point needed to be closed. When this was modeled, EZNEC predicted a pattern perpendicular to the plane of the loop and a radiation angle of 22 degrees. This seemed to be a good antenna for DX on 80/75 meters (see fig. 2).

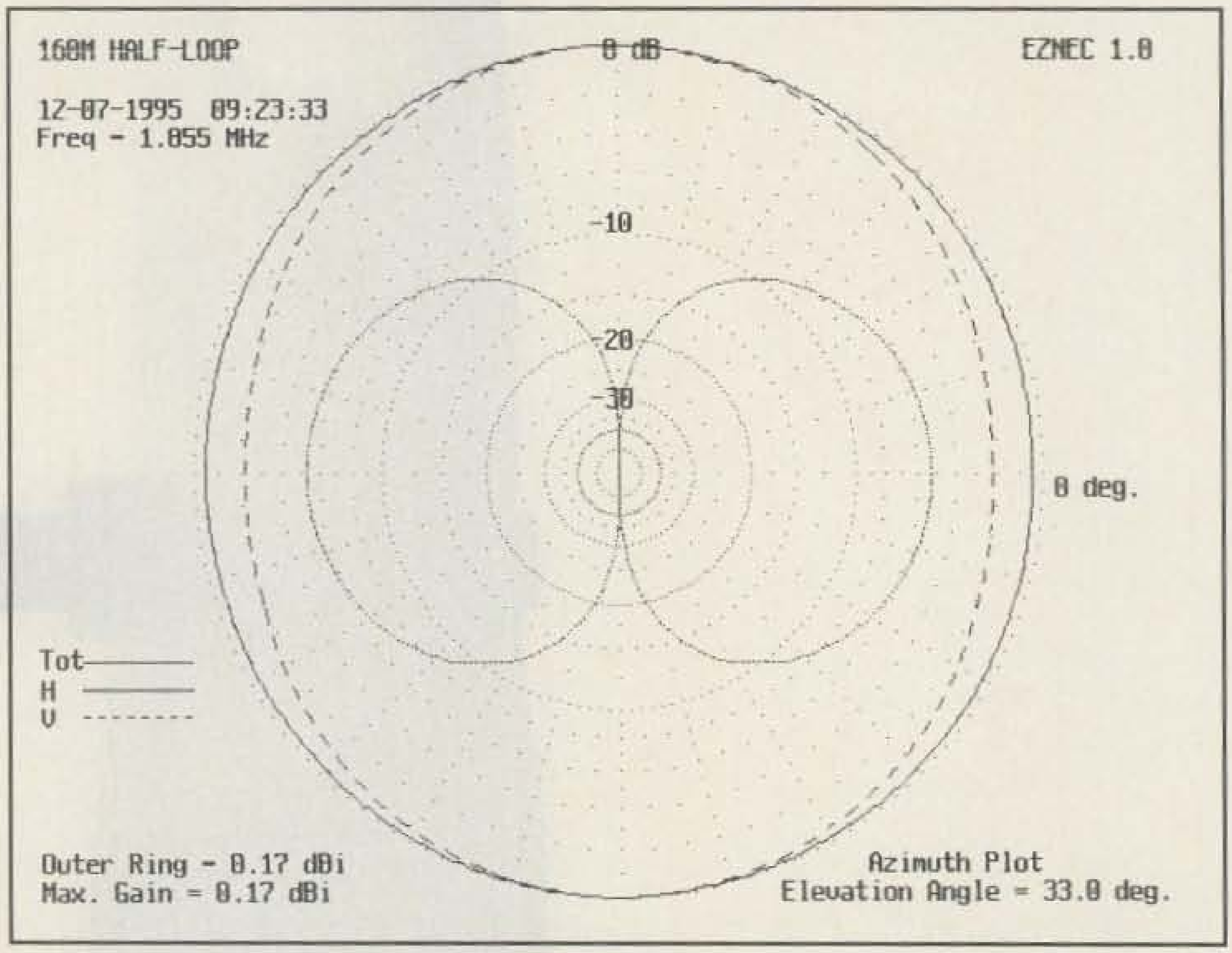

Fig. 1A– The azimuth plot for the 160 meter half-loop antenna.

I could not resist seeing what was predicted for the antenna on 40 and 30 meters. The best patterns resulted when the vertical wire opposite the feed point was open. The resulting pattern on 40 meters was perpendicular to the plane of the loop, and the elevation angle was 18 degrees. The predicted pattern on 30 meters was a 4-leaf cloverleaf with a 15 degree angle of elevation. In both cases, the impedances lend themselves to a balanced feed line.

I had no need for an antenna for the higher bands, but this antenna would probably give a good account of itself on 20 through 10 meters. The pattern will tend to move toward the axis of the wire.

Construction

The antenna is very simple to build. You need 266 feet of antenna wire, six insulators, and a balanced feed line. Measure 133 feet along the wire and cut the wire. Using the first piece of wire as a gauge, cut another wire the same length. Place two insulators on each wire. For the moment just let them dangle on the wire in the same manner you put the coax-connector sleeve up the coax before you attach the connector. These four insulators will be used as corner supports (A) as shown in fig. 2(A). Next connect the loop mechanically via two insulators (B), one becoming the feed point, and the other at the opposite side which can be closed or shorted for 80/75 meter operation.

When attaching the wire to the insulator opposite the feed line, be sure to leave enough wire so you can attach two alligator clips. These will be used to close the loop on 80/75 meters. Measure 21.5 feet from the feed-point insulator and the insulator opposite the feed point and secure the corner insulators. I used nylon cable ties, but you may have a better idea. Place two alligator clips at the non-feed-point ends of the wires. To keep these clips from normally touching, I clip them back to the wire that they terminate. Double check all work and ensure that the feed line is properly soldered. The antenna is ready to go into the air.

Antenna Placement

I am extremely fortunate inasmuch as I am blessed with tall southern pines around my

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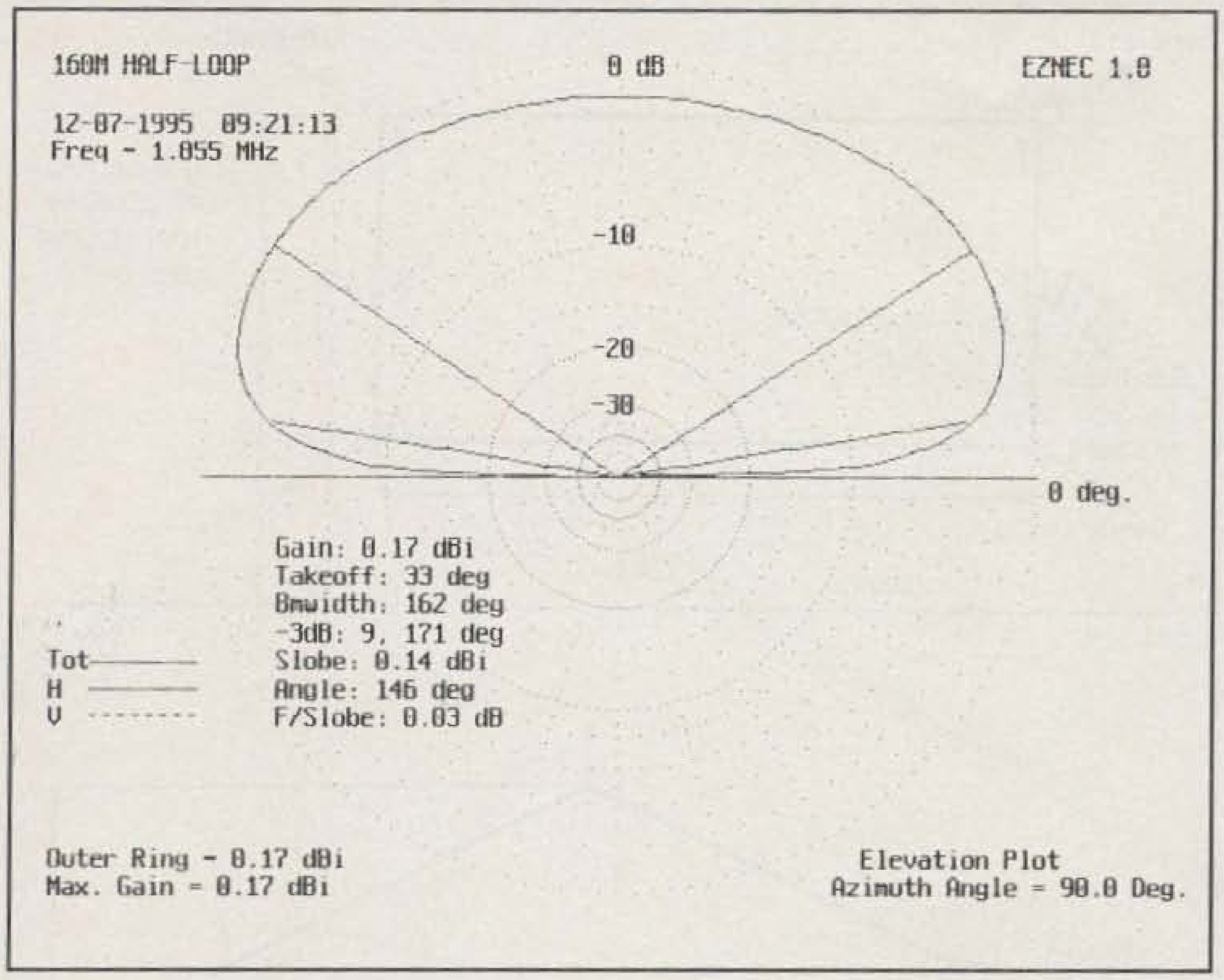

Fig. 1B- This is what the elevation plot looks like.

house. I chose two trees with nice branches about 65 feet off the ground and a horizontal spacing of about 100 feet. I used a slingshot to place a monofilament line across the respective branches, and used the line to pull halyards into proper position.

Use these halyards to raise the antenna into the air. Attach two more lines to the lower corners of the loop to properly tension the antenna, and hold in the proper geometric configuration. Route the balanced feed line away from the vertical wire as far as practical to maintain the impedance. The antenna is ready to test.

Connect the feed line to the balanced output of a transmatch. For test purposes, I used an MFJ-259 SWR analyzer as a signal source. This allowed me to check the antenna fully without putting a transmitted signal on the air. The antenna tuned smoothly across the entire band during this test. Next I ran the same test on 40 and 30 meters. Again the antenna loaded smoothly on both bands. Three bands were completed—one more to go.

I lowered the end opposite the feed point and connected the alligator clips together, which makes it a closed full-wave loop on 80/75 meters. The same test procedure was used to tune the antenna on this band. Again, the test was favorable.

On The Air

I could not wait to put the antenna on the air. I had been listening to a group of amateurs on 1.855 MHz, and I knew these gentlemen were congenial and always ready with a helping hand. I was immediately welcomed and made to feel that I was a part of the group. They were interested in the type of antenna I was using, and they were quick to give the antenna their "stamp of approval."

The initial tests were conducted while using a small linear. The next time I joined the group, I used only my exciter. Again, there were reports of "solid copy" around the southeast. I had only one more test that I wanted to run.

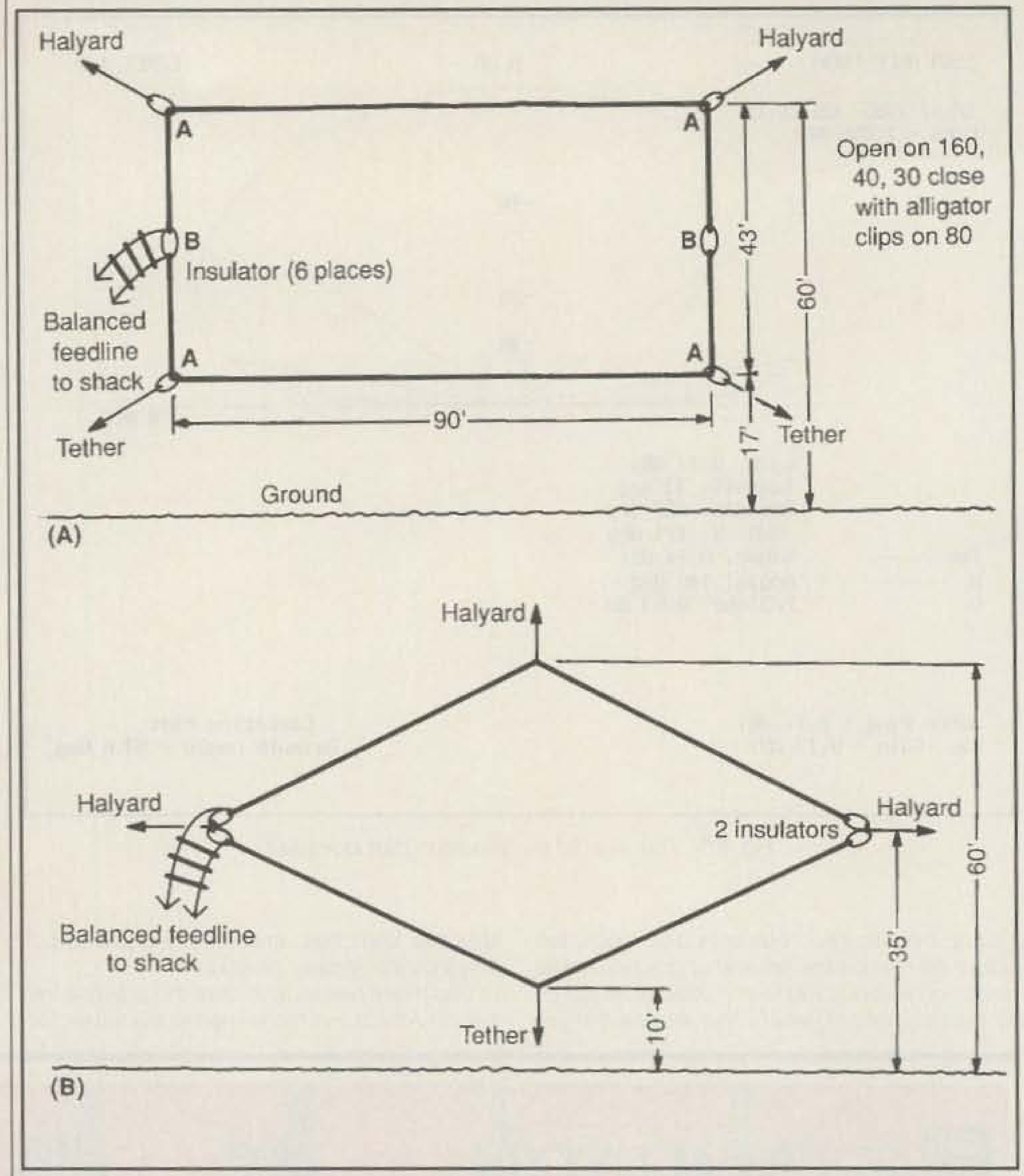

Fig. 2– (A) The basic rectangular configuration described in the text. (B) This variation was suggested by W7ZQ and is applicable for those with only one tall antenna support.

What about QRP? The next night I made my appearance running only 5 watts PEP. The results were the same. I was solid copy across the southeast.

I made a comparative test of the antenna on 75 meters between the loop and a half-wave horizontally polarized antenna placed at a height of 60 feet. The horizontally polarized antenna was superior on signals around the southeast, but on DX signals the loop was better. This seemed to verify the low radiation angle predicted by EZNEC.

I ran a few tests on 40 and 30 meters with this antenna. The results were as I felt they would be. The horizontally polarized antenna was better on stateside stations, and the loop had the advantage on DX stations.

Afterthoughts

I think that this antenna has fulfilled my design requirements. I now have an antenna that will fit on a city lot and give a good account of itself on the "top band." No, it's not the antenna to end all antennas, but I think that it will make many people happy who have heretofore found 160 meters out of reach.

Theoretically, I think the antenna could be considered an inverted "L" with a raised mirror-image counterpoise. Regardless of what it is called, I think it is about the best use of a one-half wavelength of wire for 160 meters that will fit on a city lot.

Shortly after I completed the antenna, I bumped into my friend Jim Lindsay, W7ZQ, on 17 meters and I described the antenna to him. Jim suggested that if an individual had only one tall support, the antenna could be placed in a diamond configuration. I modeled the antenna again using Jim's suggestion and that configuration proved perfectly acceptable (see fig. 2B).

Acknowledgements

My thanks go to the gentlemen who occupy 1.855 MHz in the evening. Their help and encouragement have certainly done a great deal to bring this project to a successful conclusion. If you are so inclined, join us some evening and enjoy a good measure of southern hospitality. See you on 160 meters!