Dr. Frankenstein's CB Beam

Ravage the countryside with ten-meter rf! Create your antenna with refuse from the Citizen's Band graveyard.

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After receiving so many inquiries and letters from numerous countries throughout the world asking about the design and dimensions of my 10-meter antenna, I decided that it was time to write an article and reveal the facts about this unique piece of hardware. So, if you enjoy serious 10-meter DXing, read on.

The 10-meter band has always been my favorite band for good DX contacts. It has plenty of operating space with its 2 MHz of band spectrum. The 10-meter band is one of the best DX bands during the peak sunspot cycle, and during low sunspot activity it offers very good daytime DX propagation—provided you have an adequate antenna system.

If you're a Novice or have just upgraded to General class and have not yet decided which transceiver you would like to purchase, 10 meters offers a possible cheap solution: working QRP with a converted Citizens Band SSB transceiver. If you do not own one, they can be found at hamfests at reasonable prices.

Living in a highly populated residential area, with television Channels 2 and 5 being watched regularly by neighbors, presented a problem for me with TVI complaints whenever I cranked up the amplifier on 10 meters. Every effort was made to tame the TVI which my amplifier caused, but the end result was that my signal was overpowering that of the television stations located forty miles away.

Thinking of how to increase my gain and directivity for DX communications on 10 meters led me to put the amplifier in the closet for a while and concentrate on a highly efficient antenna for my 10-meter operations. Obviously I couldn't erect a monstrous beam on a small residential lot, so whatever antenna I would choose to erect would have to have each element operating to its maximum efficiency.

The antenna I chose to build was a compromise between two of the leading directional antennas used in the 11-meter Citizens Band. These two antennas were manufactured by the Avanti Antenna Company: the PDL 2 and the Moonraker 4.

I chose the PDL 2 design for my driven element because of these factors:

- It is an actual 1½-wavelength antenna, claiming 5 dB gain over a ½-wave dipole.
- The system is easily adjustable with the gamma rods.
- The PDL 2 offers vertical as well as horizontal polarization.
- The end-to-end length of the element is only 13 feet.

The reflector was of quad design similar to that which is used with both the PDL and Moonraker.

The two directors used were yagi design as used in the Moonraker antenna. The use of quad directors did not show any benefits as far as gain or directivity, so the yagi-style directors from the Moonraker were utilized to keep antenna weight and size to a minimum.

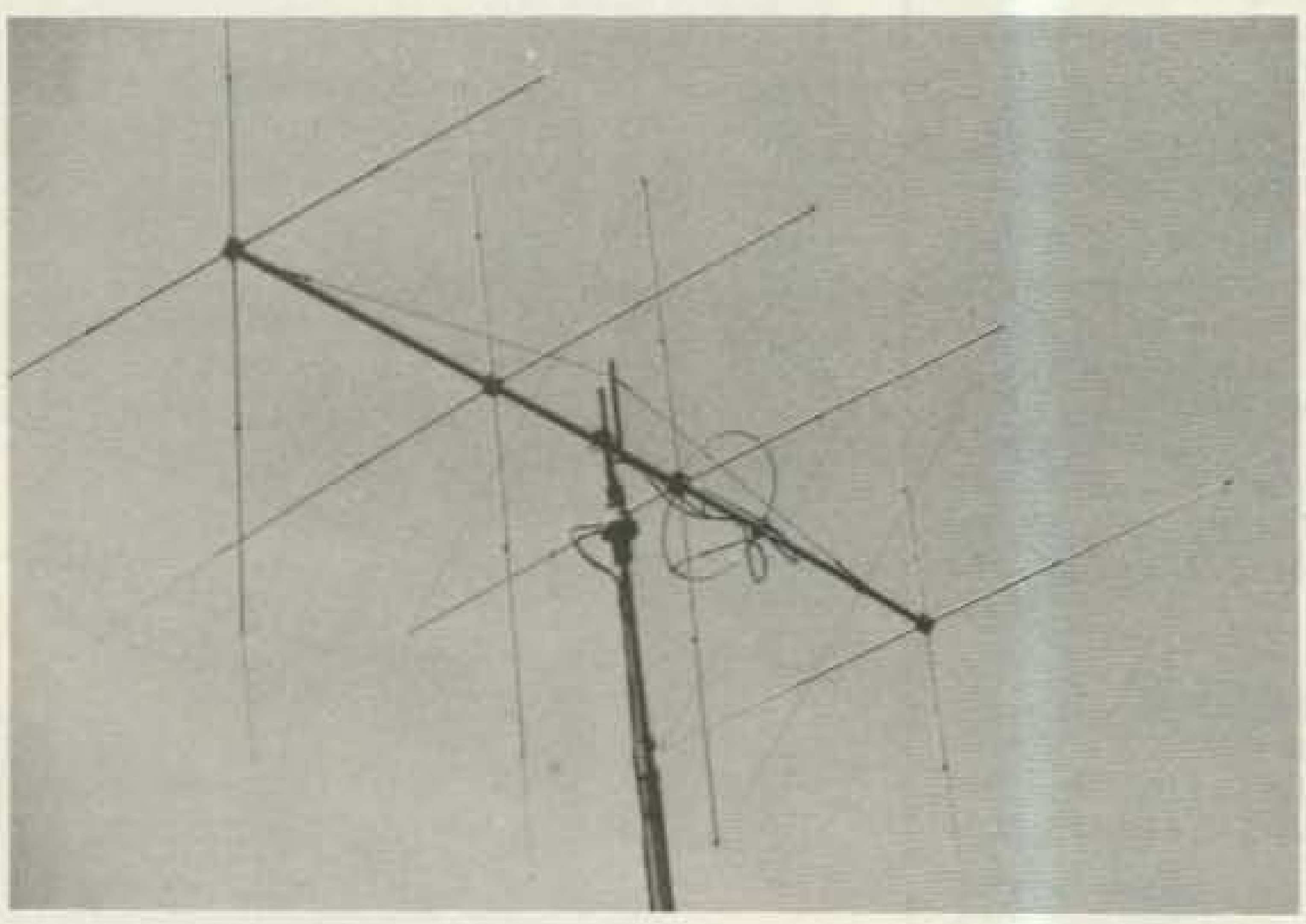
Photo A. The CB to 10-meter beam.

Construction

Both the Moonraker 4 and the PDL 2 booms were used. Assemble the three Moonraker boom sections together to form a total length of 186 inches end to end. Do not fasten these sections until all elements and the mast mount are in place. The PDL boom section can be joined to the Moonraker boom with a wooden dowel or a short (two-foot) section of 1½-inch-diameter aluminum tubing.

Slide both boom sections together over the dowel (or the tube) until they meet. Drill 1/8-inch diameter holes in the ends of the booms; drill a total of six holes, three for each boom end. Make the holes about 120 degrees apart and about six inches from the seam where both booms are joined together. Refer to Fig. 1.

From the short PDL end of the boom assembly, measure exactly 36 inches from the end of the boom. Place a mark at this measurement with a scribe or marking pen. With a hacksaw, saw off this measured 36-inch piece of boom section and discard it. Now your entire boom length should be 207 inches end to end.

Assemble the quad reflector arms as per the PDL 2 instructions. The new length of wire for the reflector will be a total of 442 inches. Measure and mark your wire carefully. This will give each side 110.5 inches. Before tightening the hose clamps on the fiberglass spreaders, make sure that the quad reflector is not bowed due to over tension.

The PDL driven element is assembled as per the PDL instruction manual except for these minor changes: Measure the outer ½-inch aluminum elements from the flat end in and mark at 40 inches. Slide the outer tubing into the 5/8-inch inner tubing to this mark. Measure all four elements in this manner.

Next, the wire for the driven-element assembly must be measured. The wire will have a measurement end to end of 437 inches. This will give each side 109.25 inches. Measure this carefully. Adjust for proper tension as before in the reflector assembly.

Now, from the end of the boom which was sawed off, measure in exactly 87 inches. Place a mark at this point and drill a 1/8-inch hole in the boom. This will be used to anchor the plastic hub of the driven element to the boom assembly.

Temporarily slide off the larger 1¾-inch boom section from the Moonraker to allow installation of the driven-element assembly. Now hold up the boom, and from the end opposite to the one sawed, slide the assembled driven element onto the boom, with the globe-matching section going on first. Align the 1/8-inch hole in the boom with the hole in the plastic hub. I secured the plastic hub by using a 1¾″×1/8 sheet-metal screw. Next, tighten the metal hub of the globe section. When all is tight, reinstall the larger boom section which was removed.

Now, from the sawed end,

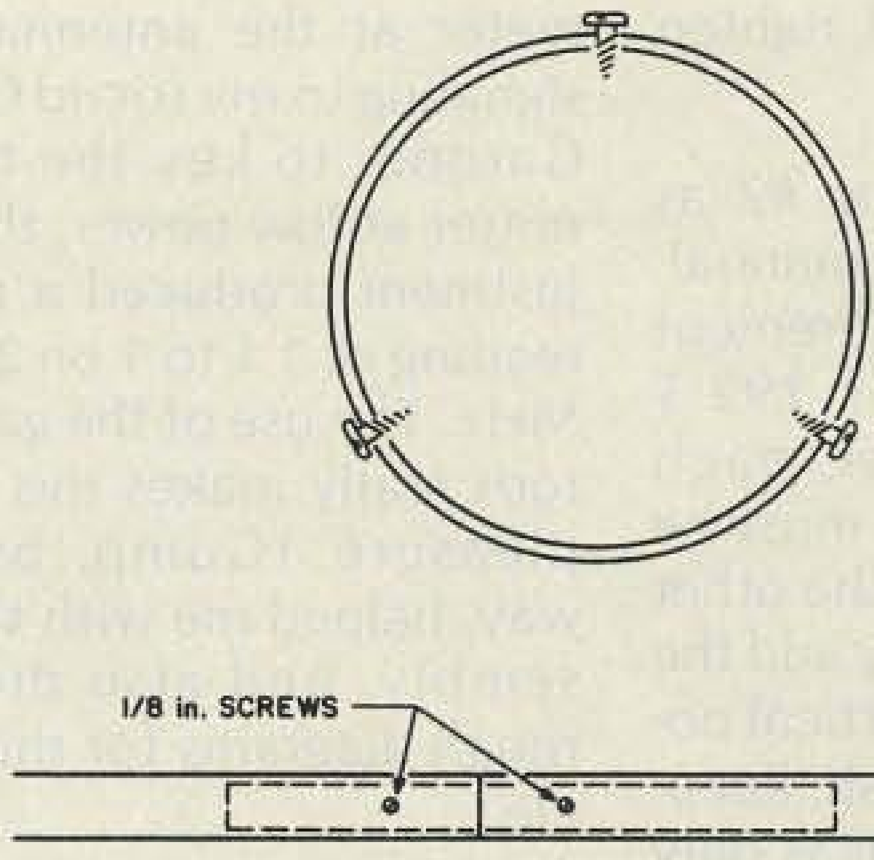

Fig.1. The booms are joined together with a section of dowel.

slide on the reflector and align the elements with those of the driven element. Tighten the hub, but make sure you have about half an inch of clearance from the hub to the edge of the boom.

After both elements are aligned, tighten all bolts securely. Now measure exactly 26 inches from the plastic hub out towards the front. Place a mark at this point on the boom. Next, slide on the mast mount from the Moonraker and center it at the marked point. Align the mast mount with the elements on the boom and tighten.

Next, assemble the two Moonraker directors as per the Moonraker instruction manual. Before tightening the hose clamps to secure the outer elements, label one element assembly #1 and the other assembly #2. Next, with a tape measure, set the element length of director #1 to 195 inches tip to tip. If you wish to retain the vertical elements, do the same with the other two elements on the hub.

If you wish not to have vertical polarization, then assemble the hub with all four of the 36-inch elements but use only the two outer elements in place for the horizontal polarization. After the tip-to-tip measurement of 195 inches is made, tighten the two hose clamps.

Next, slide the #1 director assembly onto the boom. Measuring it a distance of 56 inches from the plastic hub, align the #1 director with the

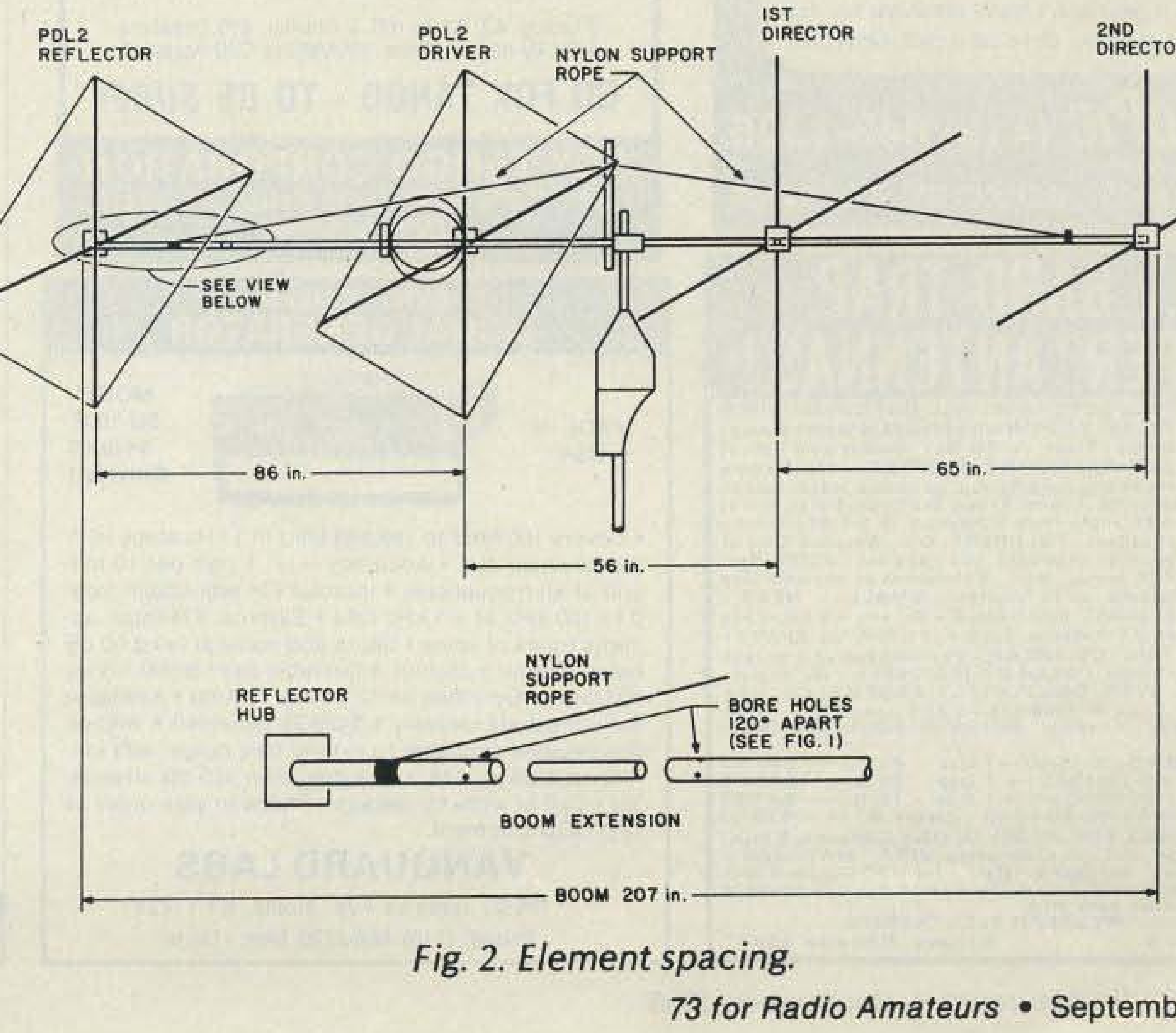

Fig. 2. Element spacing.

driven element and tighten it securely.

Assemble director #2 as per the instruction manual. The tip-to-tip measurement of this element is 192.5 inches. Remember, each half of an element must be the same length as the other half. Again, you may add the two elements for vertical polarization if you wish, keeping in mind that this is only an option, not a necessity.

Next, with a tape measure, measure a distance of 65 inches out from the #1 director. Make a mark at this point with a scribe. Slide on the #2 director assembly, align it with director #1, and tighten it to the boom at the point marked.

Adjustments

This completes the construction of the antenna assembly. Next comes the fun part, adjusting the swr. This is not really a big chore, though. After placing an swr meter at the antenna and signaling to my friend Gump Gardner to key the transmitter at low power, the adjustment produced a meter reading of 1.1 to 1 on 28,600 MHz. The use of the gamma rods really makes this job a pleasure. (Gump, by the way, helped me with the assembly, and also did the rough diagrams for this article.)

The shack installation was composed of RG-213/U; this cable has a velocity factor of .66 and is a good quality coaxial cable. The distance from the shack to the top of the tower was measured along with a few feet for slack. The total distance in coax was made in half-wave multiples. (492 × .66)/f = half wavelength of coax with a velocity factor of .66.

Now that we have most of the hard work done, it's time to get into the control seat and see just how well everyone else on the band can hear us with our new antenna; after all, isn't this what we're really concerned about?

The first station I heard was a CE7. Report was 59, not bad for only 50 Watts output. Next I received a ZL1. His report was 53, still not bad for the low wattage that I was running. Next station to call was a W7 in Arizona; the report he gave was 58 and loud and clear modulation.

Conclusion

Well, after having my converted CB beam up for over a year now, I must say that I'm pretty pleased with the results. Not only is the antenna working very well, but I am surprised when many of the hams I talk with begin asking me questions about the construction of my antenna. Many stations, especially the Europeans, send questionnaires along with their QSL cards. I knew that the antenna was working well for me, but I guess I really didn't realize how well others were receiving me and how interested they would be after learning that my output was only 50 Watts PEP.

The antenna is very broadbanded: 28.0 through 29.6 MHz. The highest the swr reached was 1.6 to 1. An amazing thing I discovered also was that the antenna had an swr reading of 1.7 to 1 on 21.2 MHz. The directivity wasn't as good on 15 meters, but it amazed me to have such a low swr on this band.

I hope that this article will answer a lot of questions for those of you wishing to build a good beam antenna for 10 meters. Anyway, it just goes to show that you don't need a big amplifier to talk where you want to—just a darn good antenna. Good luck and happy DXing! ■