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General Purpose VHF/UHF Antenna

This is a good, cheap broadband antenna that can be built in a weekend, and it's great for those who don't have a lot of space.

Winter storms wreaked havoc with my scanner antenna and I needed to find a replacement.

I was attracted to the discone. This type of antenna, when properly designed, is capable of operating over a 10 to 1 frequency range. With this range an antenna designed for low-end operation of 100 MHz is usable up to one GHz.

I was turned off by the cost of the commercial version; it cost nearly what I had paid for the scanner! So, I decided to build one myself. I did, however, avoid parts that needed special machining.

This project is simple to build and requires only basic tools and readily available materials (see Parts List). The basic antenna, along with the formulas for determining the lengths of the various elements, is shown in Figure 1. The RSGB VHF/UHF Manual was my reference. I decided that a low-end frequency of 108 MHz would be desirable, since this is the low end of the aircraft band covered by many of the new scanners. This allows maximum utilization of the brazing rods. The parts are cut, drilled, and assembled as shown in Figures 2 and 3.

The results have been encouraging—the swr on the amateur frequencies between 144 and 450 MHz is less than 2.5:1 over the entire range. When measured at the end of a 50-foot piece of coax, the swr is 1.5:1 or better. Spot-checks on various commercial frequencies gave similar results. A modified version provides adequate receive coverage on the VHF low (30–50 MHz) public service frequencies.

Construction details are as follows:

108–145 MHz

1. Cut the brazing rod to dimension A (27").
2. Prepare the brass pipe cap—drill and tap

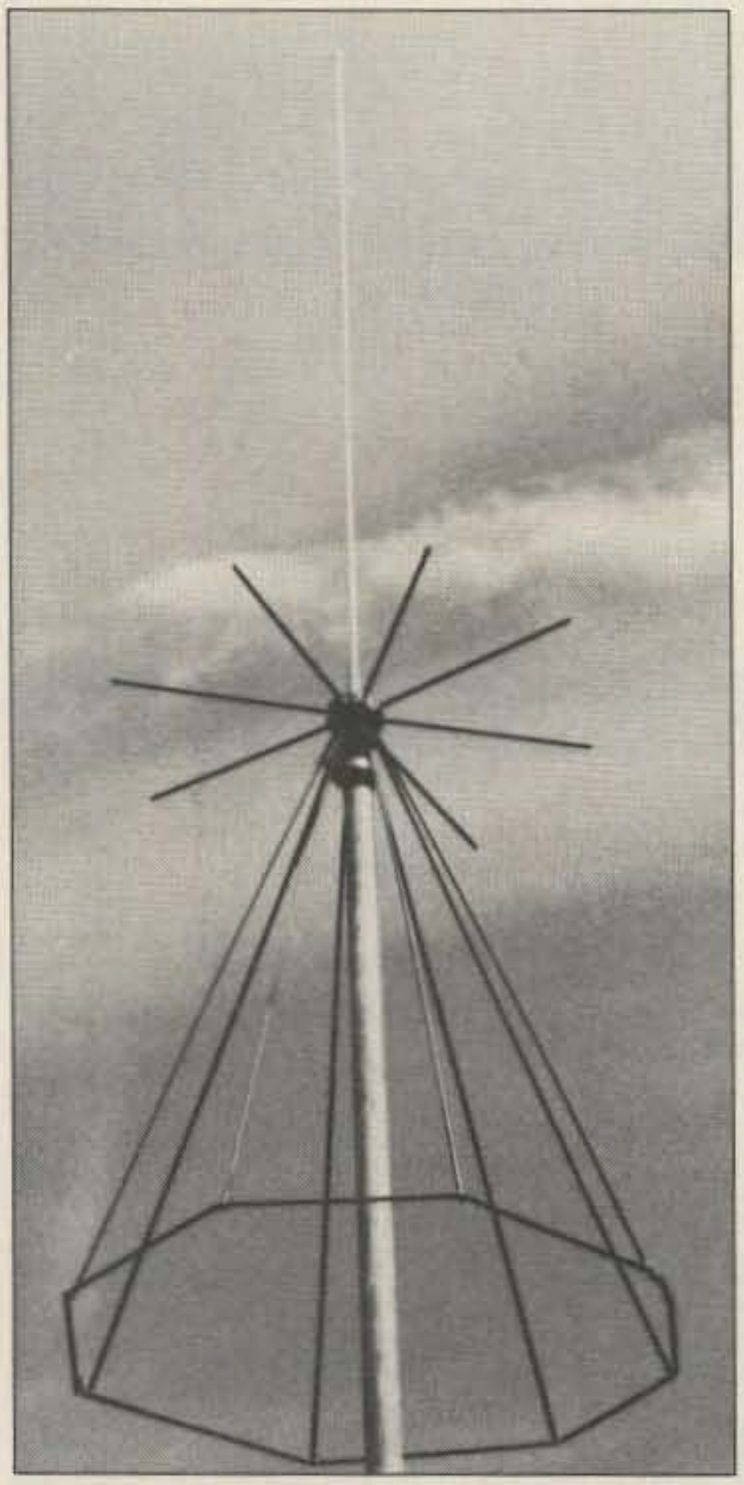

Photo A. The WA1GPO home-brew VHF/UHF discone antenna.

A Cone Element Length = 2952/F(MHz) = 27 inches.
B Disc Diameter = A x .7 = 19 inches
C Cone Diameter = as small as possible. Here is 1.25 inches.
D Space between disc and cone = .2 x C = .25 inches

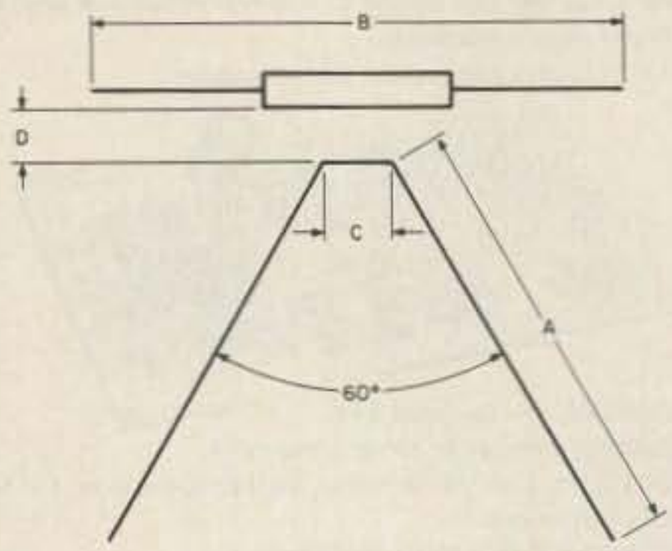

Fig. 1. Schematic diagram of the antenna and formulas for determining the lengths of the elements.

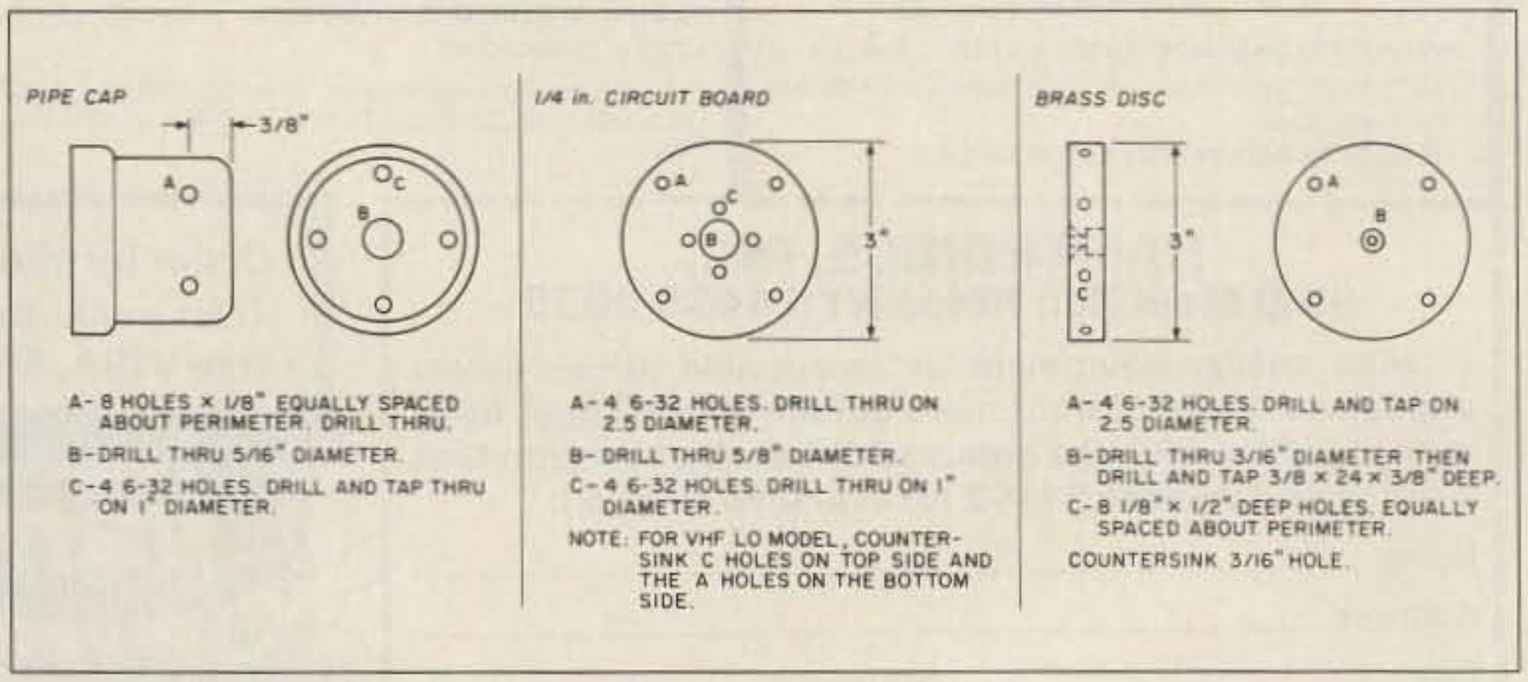

Fig. 2. Top and side views of the base assembly for the elements and vertical whip.

all holes, buff clean, and file the top of the cap flat.
3. Bend the elements to the desired 30° angle, and solder the elements on the cap.
4. Install the BNC connector in the cap.
5. Trim the circuit board to size, drill the mounting holes, and solder the remaining pieces to the brazing rod in position to form the disc, then trim the disc to a 19" diameter.
6. Attach the disc to the brass cap with nylon screws, and solder the center conducter of the BNC connector to the disc, and seal the connector hole with silicone sealer.

VHF Low and 108–450 MHz

Complete steps 1 through 4 above.
5. Trim the circuit board to size, drill and countersink all holes, mount the BNC connector on the cap, and mount the board to the brass cap with flathead s.s. screws.
6. Prepare the brass disc—drill and tap holes as required, and solder the remaining pieces of rod to the brass disc.
7. Solder a 3" piece of #18 solid wire to the BNC connector, and mount the brass disc to the circuit board using flathead s.s. screws.
8. Coil the 3" wire in the 3/8" hole, and install the modified CB whip, and trim 4" off the antenna.

The antenna can be installed using conventional pipe. In the low frequency version, the lower section of the pipe should be 84 inches long. This 84-inch section is the lower half of the sleeve dipole, and should be isolated from the mast to which it is mounted. You should select a good grade of coax to minimize the line loss; RG-59 BNC connectors fit well on RG-8X 50-Ohm cable.

Two final notes: Be careful when drilling the soft brass as it tends to "grab," and, as with any broadband antenna used for transmitting, a low-pass filter on the transmitter is recommended to minimize harmonic radiation. The photo shows the details of the discone construction. ■

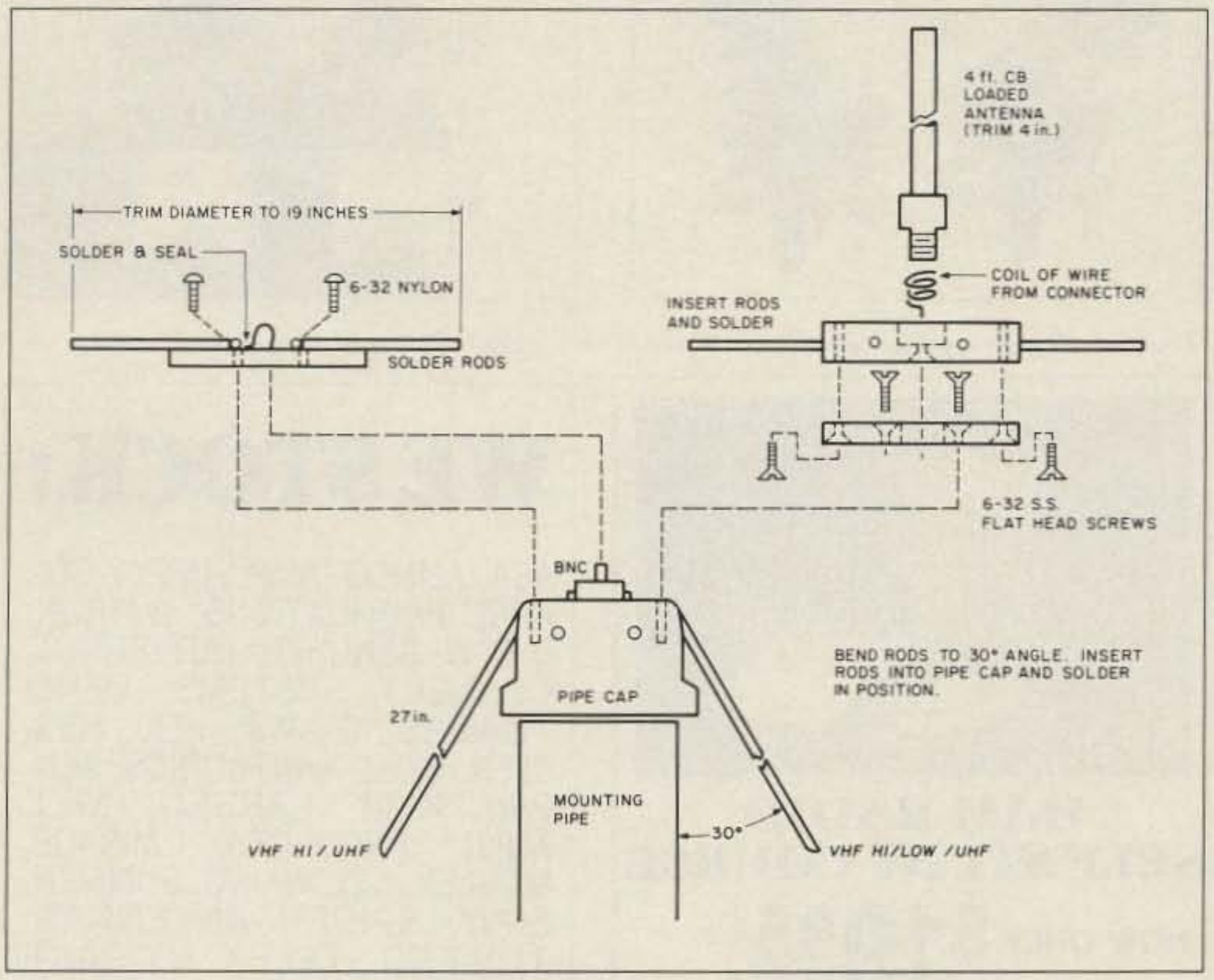

Fig. 3. Blow-up side view of the element base assembly.

Parts List

1. 1" brass pipe cap
2. BNC chassis mount connector (Radio Shack 270–105)
3. 1/4" glass epoxy circuit board, with a 3" diameter
4. 1/8" x 36" brazing rod (8 ea.)
5. 60/40 rosin-core solder
6. 6–32" x 1/2 " nylon screws (4 ea.)
7. Silicone seal

Low Frequency Version

Items 1 through 5 same as above
6. 6–32 x 1/2" stainless flathead screws (8 ea.)
7. Brass disc, 3" diameter x 1/2"
8. 4' loaded CB antenna (Radio Shack 21–934)