the **weekender**

the verti-loop a folded whip antenna for vhf mobile operation

Do you want a simple, inexpensive way to improve your 2-meter mobile performance in the fringe areas? How about a 3/4-wavelength vertical on your car roof? The concept sounds mind boggling — but what if it were only 1 meter (3 feet) long? Sound interesting? Try building one of these verti-loops, a name coined for a 3/4-wavelength vertical ground plane compressed to less than 1/2-wavelength long by folding the bottom section into a horizontal loop. The advantage is 2-3 dB gain over the 1/4-wavelength whip, and it still lets you keep the car in the garage. It's an easy weekend project and should cost less than $3.00 if you already have a roof-mounted antenna or an old discarded mag-mount CB whip. The results will be well worth the effort.

theory

Most vhf mobile operators know that a 1/4-wavelength whip is ideally located in the center of an unobstructed car roof. A compromise, because of physical size, is to use a 5/8-wavelength gain antenna on the trunk lid, where, because of obstructions on most cars, the 2-3 dB of potential gain is usually lost; results may even be inferior to those of the smaller roof-mounted whip.

A 3/4-wavelength ground-plane antenna is resonant, therefore nonreactive, and has a high-current feedpoint. The length of such an antenna may be calculated as half the length of a 3/2-wavelength dipole[1]:

$$L = \frac{149.95\,(N - 0.05)}{f} \qquad (1)$$

where L is the 3/2-wavelength dipole length in meters, N is the number of half wavelengths on the antenna (3), and f is the frequency in MHz (146).

$$L = \frac{149.95\,(2.95)}{146}$$

$$= 3.03 \text{ meters } (119.3 \text{ inches}).$$

The vertical length would be half of this, or 1.52 meters (59.6 inches). The antenna impedance would be half of the 3/2-wavelength antenna impedance (105 ohms), or 52.5 ohms.

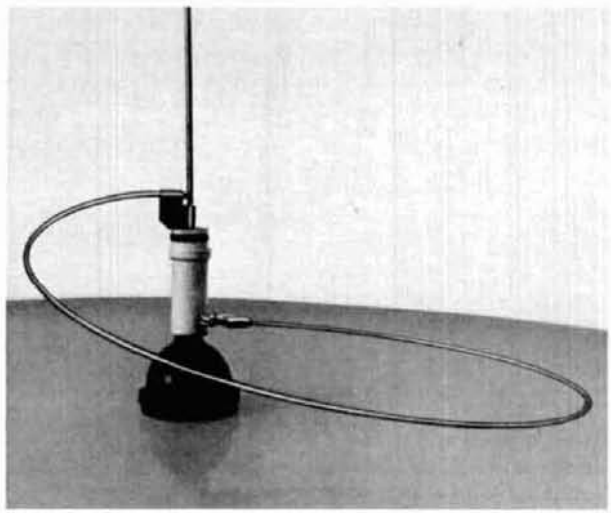
design

To shorten the 3/4-wavelength vertical to a reasonable size, it was divided into 1/4- and 1/2-wavelength sections, and the 1/4-wavelength section was folded into a loop. The result was the upside-down "halo" antenna depicted in **fig. 1**. The top section was shortened slightly to 91 cm (36 inches), and the bottom section was lengthened slightly to 61 cm (24 inches) for convenient fabrication sizes. When folded into a loop, the bottom section results in a 19-cm (7.5-inch) diameter.

construction

The antenna was constructed very simply using a 2.4 mm × 91 cm (3/32 × 36 inch) stainless-steel welding rod (available at any welding supply shop) as the 1/2-wavelength section, and an ordinary tv uhf loop (available from Sears) as the folded 1/4-wavelength section.

To one end of a 5-cm (2-inch) section of plastic tubing (PVC works fine), a threaded stainless steel nut, which matched the threaded end of my rooftop 1/4-wavelength antenna, was epoxied. A piece of wood dowel (or plastic filler) was cemented into the other end of the tube and was drilled for a snug fit for



Close-up of the ¾-wavelength mobile vertical antenna. It resembles an "upside-down" halo.

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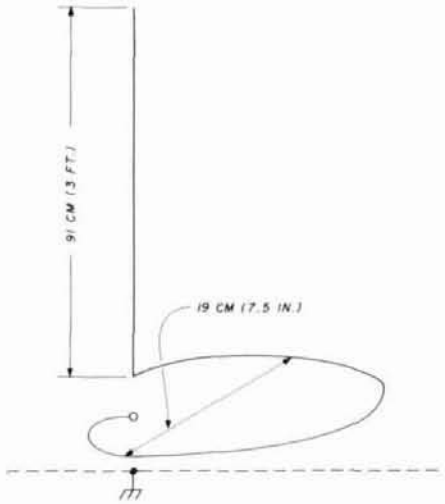


fig. 1. Design of the verti-loop antenna. Antenna is a ¾-wavelength vertical divided into ¼- and ½-wavelength sections; the ¼-wavelength section is folded into a loop. Total *extended length is ¾ wavelength on 2 meters.* Antenna mounts on your car roof with a plastic base made of PVC tubing.

the stainless rod. A little epoxy will keep it from loosening (**fig. 2**).

The Sears loop comes with hinged terminals, which were left on to permit fine tuning the antenna. One wire terminal was simply pulled out of its hinge, leaving a spring opening through which the stainless rod was forced. It makes for a snug fit, but permits sliding the loop down to where the rod joins the plastic tube.

The other wire terminal on the loop was cut off (leaving the hinge) and the wire remaining was passed through a small hole drilled in the side of the PVC tube just above the nut, where it was compressed by the threaded roof stud when the antenna was screwed on.

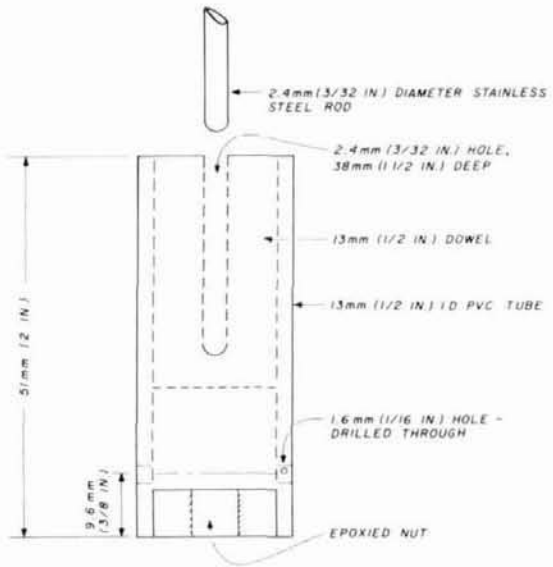
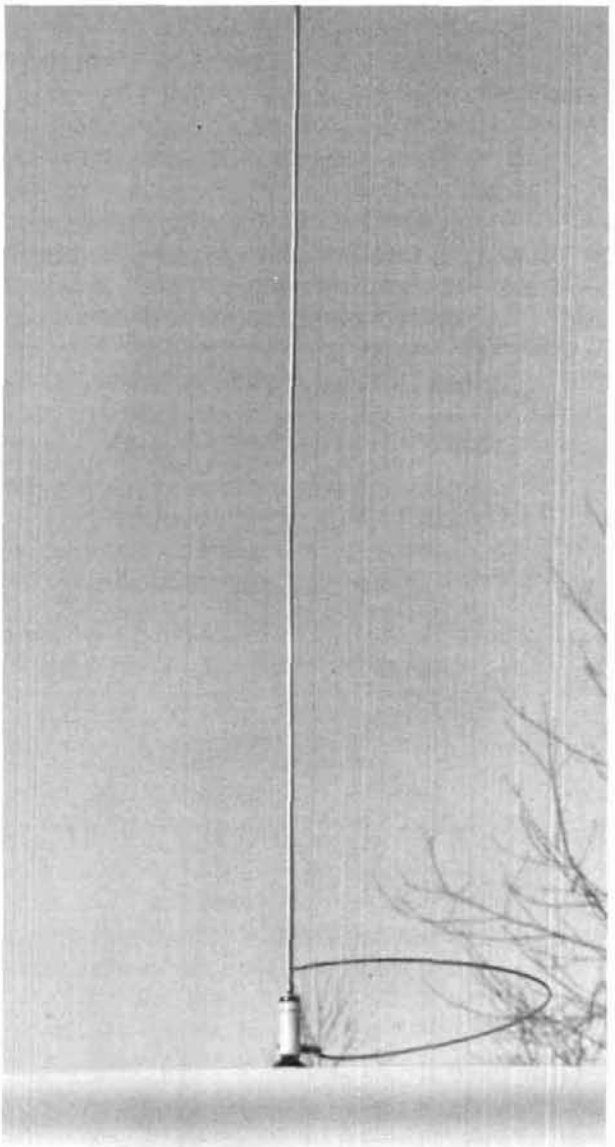


fig. 2. Details of the mounting base. An ordinary tv uhf loop was used for the ¼-wavelength section, or you can use stainless-steel wire.

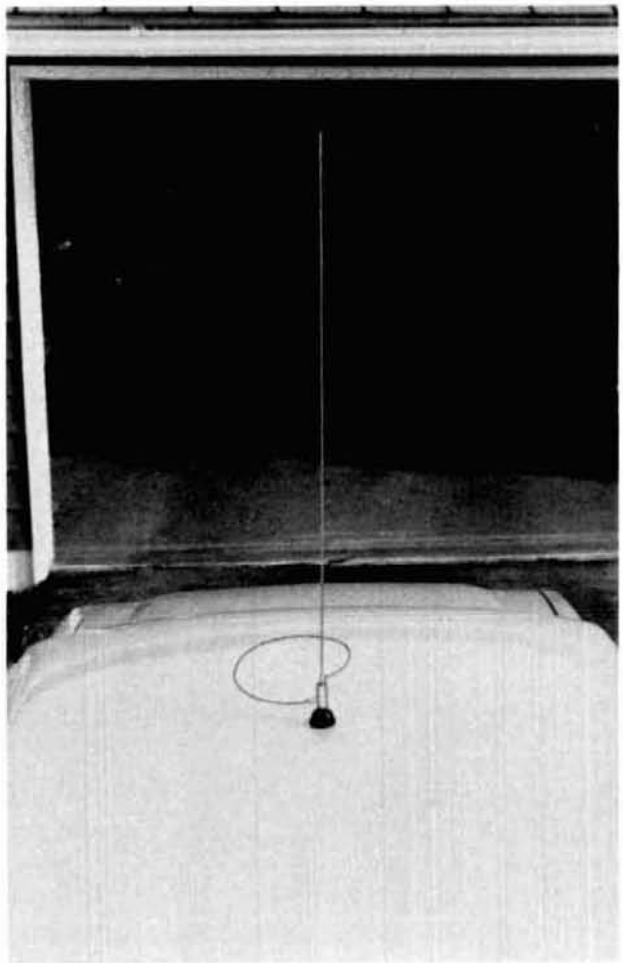
The antenna rod should be insulated from the stud except through the loop connection. The design can be modified easily to fit other base mounts or for new installations using a PL259 coax fitting, or even to a discarded CB magnetic mount if you don't want to drill a hole into your car roof.



View of the antenna at car-top level.

results

With the transmitter on an unused frequency and a SWR meter attached, the loop position was moved on its hinges for minimum SWR. It's not a critical adjustment if the dimensions are followed. I obtained 1.1 to 1.0 SWR with the loop about 2.5 cm (1 inch) from the car roof with the first try. The hinges are stiff enough to maintain the loop position even when



Author's antenna is a full-fledged ¾-wavelength vertical but fits under garage opening without dismantling. The stainless-steel radiator bends easily to 30-40 degrees from vertical.

driving over bumpy roads. I've built three of these antennas at a cost of $2.00-$3.00 each. All have resonated with practically no adjustment.

Actual dB measurements on the antenna have not been made; however, tests indicate a marked improvement over the 1/4-wavelength whip. One repeater that was barely readable is now almost full quieting into my receiver. Reports from friends are that noise on my signal (from a portable HT in the car) was all but gone and no evidence of mobile flutter occurred.

Best of all the car still fits into my garage, and, although the top of the antenna does hit the entrance, the stainless-steel rod is flexible enough to recover from a 30- or 40-degree bend. The antenna has a somewhat futuristic look to it — at least it looks different from your good buddy's 11-meter job!

reference

1. *The ARRL Antenna Book*, 12th edition, 1970, page 33.

ham radio