

# The Campbell J

## — a little antenna that "can"

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The Campbell Soup can antenna is a variation of the familiar J antenna. Four advantages of the soup can antenna are: (1) its unique construction uses many parts from around the house, (2) it can come apart for portable operation and storage, (3) the matching

section is unbalanced to match coaxial feedlines, and (4) the matching section has immunity to detuning by nearby objects. Like the J antenna, the soup can antenna gives 3 dB gain over a  $\frac{1}{4}$ -wavelength whip because it uses a  $\frac{1}{2}$ -wavelength radiator.

### Background

In a J antenna the bottom  $\frac{1}{4}$  wavelength is a parallel

transmission line used for matching. This matching section is shorted together at the bottom to give a zero impedance. Then, due to the transformation of a  $\frac{1}{4}$ -wavelength transmission line, the top of this  $\frac{1}{4}$ -wavelength matching section has a very high impedance. This very high impedance matches the impedance of an endfed  $\frac{1}{2}$ -wavelength antenna. By tapping up on the  $\frac{1}{4}$ -wavelength matching section, a point can be found for the proper impedance match for the feedline being used.

The Campbell Soup can antenna, like the J antenna, uses a  $\frac{1}{4}$ -wavelength matching section, but in the Campbell Soup can antenna, the matching section is a coaxial line. The bottom of the soup can coaxial matching section is shorted together to give a zero impedance. Then  $\frac{1}{4}$  wavelength above the zero im-

pedance is, once again, the very high impedance needed to match an endfed  $\frac{1}{2}$ -wavelength antenna.

Because of the coaxial design, this matching section can be fed with coaxial line without upsetting a balanced condition. Also, being coaxial, if metal objects are near the matching section, they will not upset the matching section operation.

### Construction

Both ends are cut out of 3 of the Campbell Soup cans. These will be used in the middle of the coaxial matching section. For the top can of the coaxial matching section, one end is completely removed and the other end is cut out except for a  $\frac{1}{4}$ -inch-wide lip.



Two-meter soup can antenna.

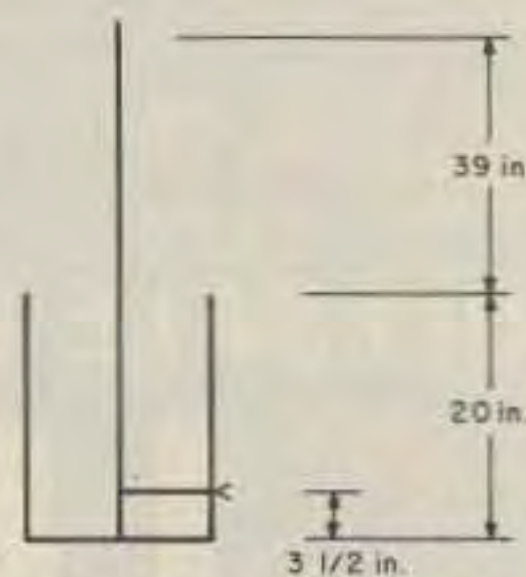


Fig. 1. Two-meter soup can antenna dimensions.

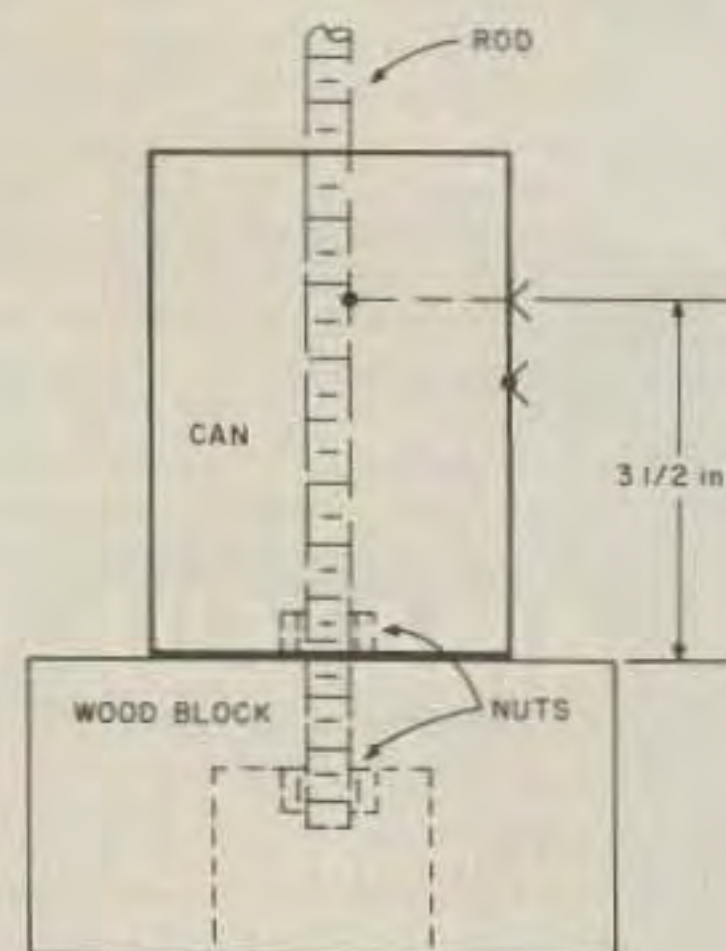


Fig. 2.

Later this lip will be the support for the plastic spray can top. For the bottom can, one end is completely removed and the other end has a hole cut in it to just pass the 5/16-inch threaded rod.

The wooden block should have a hole bored through it that is just big enough to pass the 5/16-inch threaded rod. The bottom of the block should have a larger hole countersunk in it to hold a nut and washer.

The bottom soup can is mounted on the wooden block using the threaded rod. The soup can is turned so that the end with the small hole is next to the wooden block. A nut and washer in the soup can and another nut and washer in the countersunk hole of the block will hold the items together. The rod should not extend below the block so that the block can sit on a surface and not scratch it.

A coax chassis connector

is mounted on the side of the bottom soup can about 3½ inches from the bottom. The center conductor of the coax connector is attached to the threaded rod 3½ inches from the bottom of the soup can. It can be soldered, but a convenient method is to wrap a wire around the rod and hold it in place between two nuts and washers.

#### MATERIALS REQUIRED

- 5 Campbell Soup cans (or any other can 4 inches tall and about 2-1/2 inches or less in diameter)
- 1 5/16-inch threaded rod, 24 inches long (available at most hardware stores)
- 6 nuts for the 5/16-inch threaded rod
- 6 washers (use with the 6 nuts if desired)
- 1 adjustable replacement automobile antenna that will fit over the 5/16-inch threaded rod (the rod or antenna size may be varied to get a combination that will fit together)
- 1 two by four wood block, 5 inches long (this block size may be varied to suit the builder's needs just as long as the block is large enough to support the soup cans)
- 1 coax chassis connector (BNC type or SO-239)
- 1 plastic spray can top approximately 2-7/16 inches in diameter that will just fit inside an empty soup can (see text)

The remaining 4 soup cans are soldered together with the top soup can on one end with the lip away from the other cans. Next the 4 soup cans are soldered to the bottom soup can so that the lip of the top soup can is on top.

The top of the soup cans and the top of the threaded rod must be held rigid yet be insulated from each

other. The plastic spray can top is used for this. A hole is cut in the spray can top so it will just slide over the threaded rod and then rest on the lip of the top soup can. The plastic spray can top can be held in place between two nuts and washers or, better yet, by one nut and washer screwed down tight. A piece of sheet plastic or thin wood will also work as an insulator and support.

Finally, the replacement automobile antenna is mounted on top of the threaded rod. Most replacement auto antennas designed for stud mounting have setscrews that will hold them in place.

#### Adjustments

The only adjustment is to adjust the length of the auto antenna. A length of 39 inches is needed as measured from the top of the top soup can to the top of the auto antenna. ■