Rubber Duckies may be great in the bathtub, but they may not always be what you need to punch that signal through to the repeater. W1ICP takes us from the rubber ducky to other simple, yet effective portable antennas for our HTs.

The J-Pole Antenna

A roll-it-up, stuff-it-in-your-pocket, portable alternative to the rubber ducky antenna

BY LEW McCOY*, W1ICP

All of our 2 meter users are more than familiar with the so-called "rubber ducky" antenna commonly used on handheld transceivers. I have no idea who originally came up with the name, but it certainly has been the way to describe these antennas. Usually the antenna consists of wire, sometimes a quarter wavelength, 19 inches (2 meters) long, wound around a flexible form. The form and the winding then are encased in a flexible rubber-type shield—hence the name "rubber." This antenna has a fitting which mates with one on top of the handheld transceiver. There is no real ground return, and as far as impedances, etc., are concerned, just forget that facet of this most popular antenna.

It is a strange phenomenon in amateur radio that the absolutely poorest antenna one could use is also is by far the most popular antenna. In fact, it is impossible to say exactly how bad the rubber ducky antenna is, say, compared to a half-wavelength dipole. This antenna is so popular because in most cases it is adequate and easy to use.

The main reason for the popularity of the rubber ducky is not in the antenna itself, but because the signal that is sent out is more than strong enough to capture a repeater and to produce contacts. However, as Shakespeare wrote, there is the rub. To be very honest, though, the rubber ducky is very inadequate, and often one fails to capture the repeater or to even hold it, when one really needs it.

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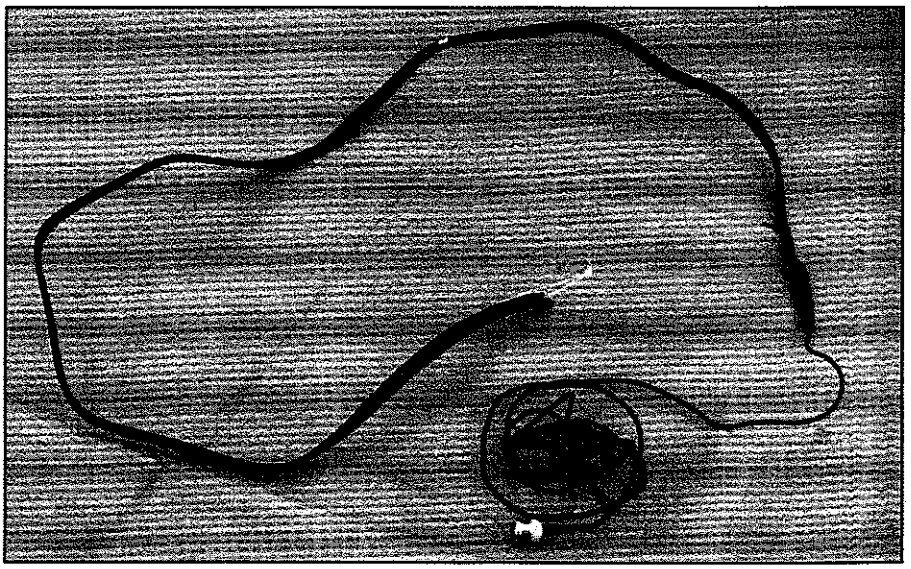
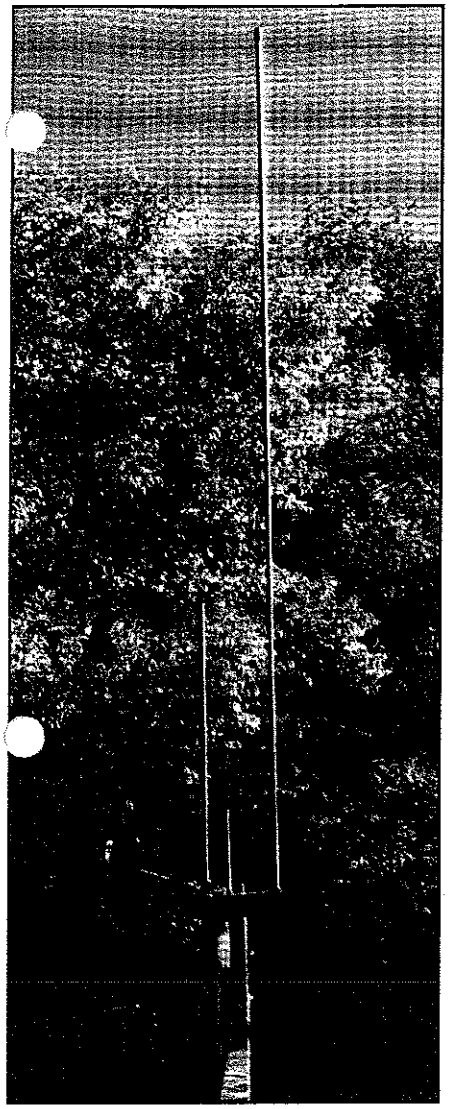


This is not the easiest antenna to photograph, but essentially it is the coiled up feed coax with a fitting for the rig. It looks like one continuous length of twin lead, but actually, refer to fig. 1, which shows the electrical detail. As pointed out in the text, if you don't want to build your own, Antennas West sells a completed unit.

We have all experienced this occurrence, so there is no point in belaboring it.

A few years back when I was visiting a club in Palm Springs, California, some of the amateurs there had come up with and were talking about a portable, roll-up-and-put-in-your-pocket type of antenna called a J pole, sometimes referred to as a J beam. Since then I've always kept one close at hand and take one with me when I travel. I'll describe it shortly so you can make your own.

New Mexico, where I live, is an area of national parks and forests and many mountain areas with corresponding deep ravines, arroyos, and in general rather wild terrain, with bears, mountain lions, rattlesnakes, and so on. We also have many people—hikers, campers, prospectors, and the like—who can and do manage to get lost. When that happens, search-and-rescue teams go out to find them. It has been determined that the use of amateur radio, and the use of repeaters, is a great aid in staying in touch with and directing the searchers. It is also true that many of



This antenna, made by Arrow Antennas and described in the text, is an excellent performer. The longest upright element is the J pole half wave; to its left is the 450 MHz J pole; and the matching quarter wave is at the far left.

the amateur newcomers to the hobby who get involved in the search and rescue have little, if any, technical knowledge of antennas and signal propagation. These people are basically communicators.

I recall one instance where this lack of knowledge showed up, and startlingly so. I was out with a group on a search and the amateur operator I was teamed up with tried to bring up the repeater (which was many miles away) with his handheld and rubber ducky antenna. He could not get a response and then told me that we would have to hike up a mountain to get a clear shot. (I was not about to climb a mountain at my age!) I dug into my pocket and took out my folded up J antenna, reached up and hung one end on the limb of a tree, and told him to remove the rub-

ber ducky and plug in my J pole. He did just that, and the repeater came booming back. I have never seen such amazement and astonishment on the face of an amateur. Since that time I have convinced many amateurs to carry rolled-up J pole antennas in their pocket. Whenever I travel, I always make sure I have such an antenna along. I have yet to be stymied by a bad motel or hotel room keeping me out of the local repeater.

The beauty of this simple antenna is that it is relatively cheap to build (it only costs a few dollars) or easy to buy ready-made. Antennas West (they run an ad here in *CQ*) has a J pole made from twin lead that is very inexpensive. Included in this article is a photo of their unit in case you don't want to build your own.

Exactly What is A J Pole?

So exactly what is a J pole? The J pole is a half-wavelength antenna which is fed at one end via a quarter wavelength of twin lead; at the other end of this quarter wave of twinlead is the 50 ohm coax, which goes to the rig.

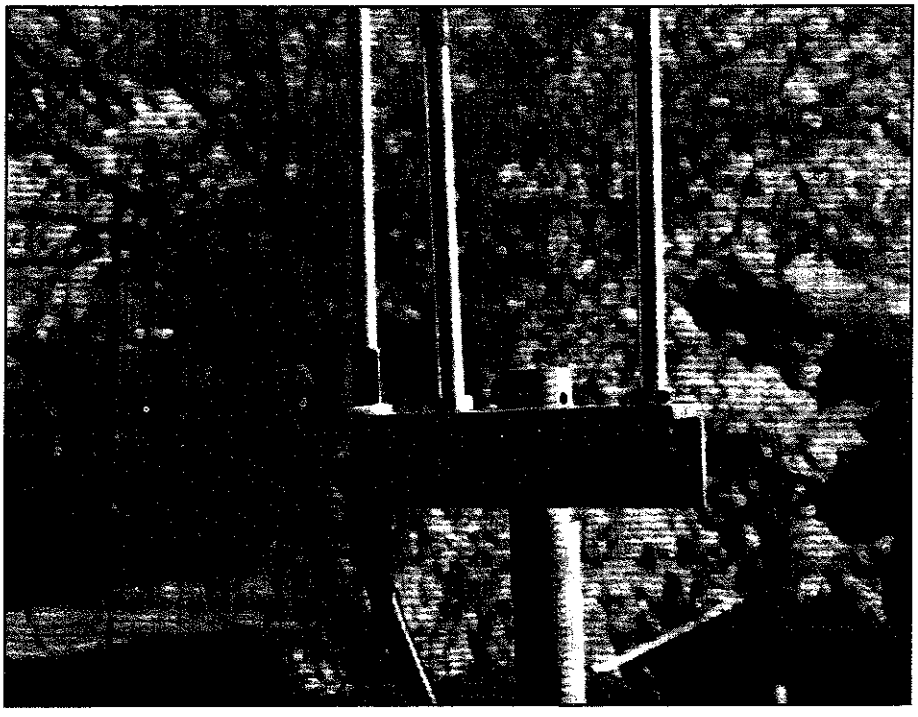
A little antenna knowledge at this point won't hurt, so here goes. A half-wave dipole, fed at the center of the half wave, has a center-fed impedance in the vicinity of 50 to 70 ohms. However, when we try to end feed this half wavelength, the impedance goes up to several thousand ohms. Therefore, we can use a quarter-wavelength "stub" to match this high impedance, and at the other end of the stub, where we attach the 50 ohm coax, there is a much lower impedance—right down at 50 ohms, what we want for our handheld. That is what we do with a J pole.

Table I shows various gains of commonly used antennas on 2 meters.

Fig. 1 shows the basic antenna setup. End feeding a half-wave dipole results in a very high impedance—much too high to attach coax directly to the end. The quarter-wave section steps this impedance down to the 50 ohm vicinity, making it possible to use 50 ohm feed.

This J pole is made from 300 ohm TV twinlead, a piece that is 54 1/2 inches long. Study the drawing in fig. 1 at (A) and (B). (B) shows what the electrical circuit of the J pole actually is. The long single wire is the half wave plus the quarter wave, while the short lead is the other section of the quarter wave. The quarter wave is shorted together at the very bottom, and the coax conductors are soldered to the quarter-wave stub 1 1/2 inches up from the bottom. These dimensions will provide the best match in the 146 MHz. range. However, the antenna dimensions will work well across the entire band.

At (A) in fig. 1 we have the actual twinlead antenna. Measure down the twin lead on one of the conductors, 36 inches, and at that point cut the wire and remove 1/2 inch of the wire below the cut. Actually remove that 1/2 inch of wire. Skin off a 1/2 inch of insulation on both sides of the twin lead at the bottom and then twist the two



This is a close-up of the base mounting of the Arrow J pole. The feed goes to the section on the left. The base design is really outstanding. Standing wave checks showed that my Bird wattmeter never left 1.2 to 1 across the entire 2 meter and 450 MHz bands. This is a very fine performing antenna.

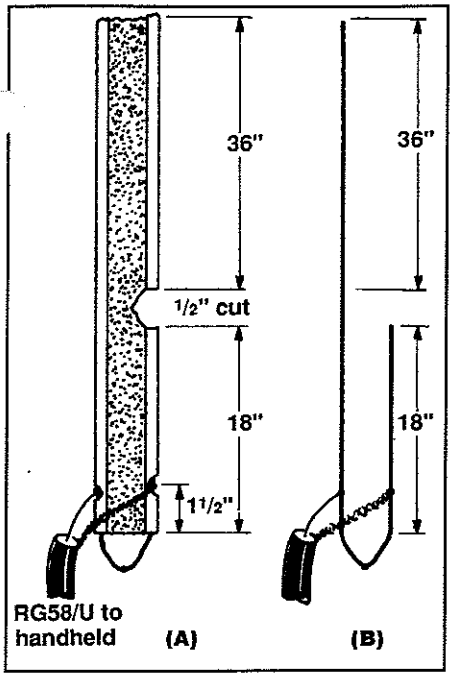


Fig. 1– At (A) is shown the construction information for the J pole. The bottom 18 inches of twin-lead is the quarter-wave matching section used to feed the bottom of the 36 inch, one-half wave section. The coax feed line (50 ohm coax) is used to connect to the rig. The line is tapped up 1 1/2 inches from the bottom of the assembly. I found an excellent match at this point; the antenna was less than 1.5 to 1 across the entire band. At (B) is the actual electrical circuit of the J pole. Basically, this antenna consists of a half-wave vertical (the 36 inch section) fed with a quarter-wave section to convert the very high impedance of the end-fed half wave down to 50 ohms. Keep in mind that this is a vertical antenna and it has a very low angle of radiation.

leads together and solder them. Next skin back the insulation 1 1/2 inches up from the end and connect your length of coax to those two points. Use insulated tape to cover the soldered end of the antenna so it won't accidentally make contact with the coax. Next tape the coax end firmly to the end so that the assembly is solid or more rugged. Your antenna is ready to use. I carefully measured the SWR bandwidth of this J pole and it was less than 1.5 to 1 across the 2 meter band.

The Arrow Antennas J Pole

If you've never used this type of antenna before, you are really going to be amazed. Many amateurs make fancy installations and use them as fixed antennas at home. Along those lines, when I mentioned on the antenna rec. forum on the Internet that I was going to write this article, Arrow Antennas sent me a combination 2 meter/450 MHz J pole for testing. I honestly was amazed at the fine workmanship. This is a very rugged antenna that can be used for mobile work or for fixed-station work. When I opened the package it only took me about 20 minutes to assemble the antenna. I mounted the antenna on a pipe on my wooden deck, which is about 12 feet above ground. I have a beam on 2 meters, so I thought a good comparison would be from the beam to the J pole. We have one repeater out here that is at least 50 airline miles from my location. Honestly, and I'm not joking, I couldn't tell any difference between the two antennas. I am sure the J beam didn't have the gain of the beam, but for practical purposes, my strength in to that far- away repeater certainly appeared the same. Incidentally, with a rubber ducky, *nada*—nothing—just background hiss!

Antenna Type	Gain or loss (dB) (compared to isotropic)
Isotropic antenna	0 gain
Quarter-wave ground plane	+0.3
Half-wave J pole	+2.147
Half-wave dipole	+2.147
Rubber ducky	There is no standard here because this antenna is impossible to measure, simply because all rubber duckies are different. But it is probably safe to assume that the "normal" rubber ducky, if there is such a thing, probably is only a very minimal fraction better than an isotropic, if even that. Also, there is absolutely no comparison of a rubber ducky to a J-pole, since the primary angle of radiation of a J pole is much lower than that of a rubber ducky. This is a big advantage in acquiring a repeater signal.

Table I– An isotropic antenna is a theoretical antenna and is used as a basic measurement figure. It is not a "real" world antenna, but if it could, it is an antenna that would radiate equally well in all directions. We therefore use it as a theoretical measurement standard.

To be honest, I had never heard of Arrow, but they have a nice catalog and make many different antennas. The J pole shown in the photo is designed for more or less fixed operation (it is not a fold-up type). There is a U bolt installed on the base of the antenna, and this U bolt can be attached to a pipe or mast to support the antenna. As I stated, this is a dual band J pole, taking care of 450 and 2 meters.

The measured SWR bandwidth of this antenna is very, very good. The SWR is less than 1.3 to 1 across the entire 2 meter band and the same across the 450 MHz. band. With the U-bolt assembly, this antenna can be mounted just about anywhere that suits you. I plan to put mine at the very top of my tower, over my low band beam. One point worth mentioning for those who don't know: While VHF and UHF antennas will work well at ground level heights, they will do a whole lot better when high and in the clear.

The Arrow J pole sells for under $40 and is available (as is their free catalog) from Arrow Antennas, 1833 S. Greeley Highway #B, Cheyenne, WY 82007 (307-638-2369).

Summary

If you don't want to make your own "roll up" J pole, Antennas West, which advertises in *CQ*, makes a model almost identical to the one I described for $19.95. They also make J poles for nearly all the low bands. I plan to do a review showing some of these handy, simple-to-use antennas. They also make a simple clip-on wire which they call a "Tiger Tail." When mounted under the rubber ducky on the handheld, the Tiger Tail makes the antenna into a sort of partial half wave, giving much better range than the rubber ducky alone.

In conclusion, keep in mind that the simple J pole described here can possibly save your bacon in an emergency! ■