Here's a neat idea to increase your travel fun, whether on the water or in your RV. It also makes a nice construction project, easily completed.

How To Build A Marine/RV Antenna For Two Meters

BY IVAN T. LORENZEN*, W4JC

This antenna is based on the justly venerated "J" antenna. It is scaled for the 2 meter band when enclosed in a protective 3/4 inch, thick-wall PVC pipe. It is simple and easy to make, has wide bandwidth and more gain than a quarter-wave antenna, and best of all it works! Since a "J" antenna is a half-wave radiating element end-fed by a quarter-wave matching section, no ground plane is required.

The so-called "end effect," which requires shortening an antenna when in close proximity to dielectric material such as insulators at the ends, is very noticeable here—more so, because plastic and PVC dielectric completely enclose the antenna Consequently, the dimensions are quite a bit shorter than those for a "J" antenna in open air.

The antenna is made from 300 ohm 20-gauge twin lead, and the protective enclosure is made from 3/4 inch, thick-wall PVC pipe. Dimensions are shown in fig. 1.

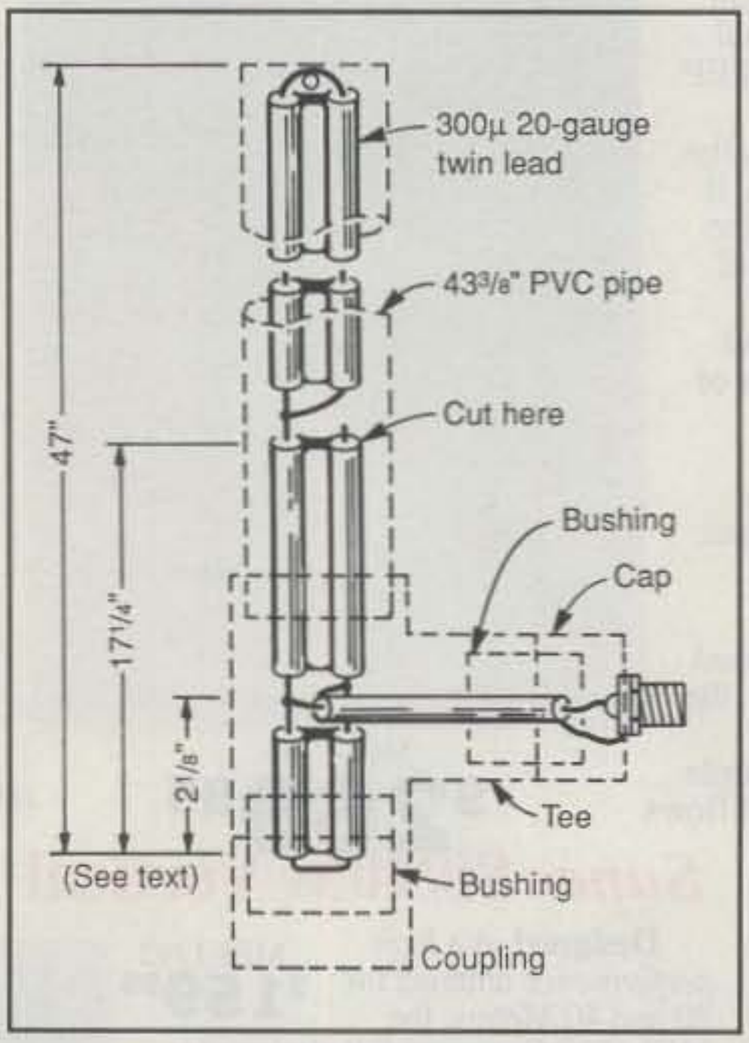


Fig. 1–Construction details for the 2 meter marine/RV antenna.

Parts List
1—10 foot length of 3/4 inch thick-wall PVC pipe
2—3/4 inch PVC end caps
1—3/4 inch PVC tee
1—3/4 inch PVC coupling
1—plastic alignment tool, cannibalized to make the 1/4 inch rod 1 inch long
1—4 foot length of 300 ohm 20-gauge twin lead (Radio Shack #15-1174, or equivalent)
1—Single-hole, rear-mount SO-239 socket (Amphenol #83-878, or equivalent—see text)
1—Short piece of RG-58U
6—No. 6 × 3/8 inch stainless steel, self-tapping screws

Construction

Exposing the wire in twin lead is easily done by stripping the plastic with a knife, taking care not to nick the wire. The wire can then be pried out. At both ends of the antenna snip off the plastic between the exposed wires. At the top end, form the wires into a loop to accommodate the 1/4 inch plastic rod which will go through the loop and rest in the quarter inch slots in the top of the pipe. At the bottom end the two wires are just connected together neatly. Confirm that the overall length is 47 inches before soldering. Press the twin lead flat and straight so that measurements will be accurate.

At exactly 17 1/4 inches from the bottom of the antenna use side cutters to cut through the wire on one side of the twin lead. This dimension is critical in that very small changes in this dimension result in rather large changes in the frequency at which minimum SWR occurs.

Strip away 1 inch of plastic above this cut and bend the wire out of the plastic. Also strip away 1 inch of the plastic on the radiator side of the twin lead. Bend the exposed cut lead diagonally over to the uncut wire and solder them together. From this point upward, the radiator is composed of two wires.

Centered 2 inches above the bottom end, strip away about an inch of plastic on both sides of the twin lead. A little more plastic may have to be cut away here so the wires won't have to be bent out so far for soldering the coax connections.

Cut a piece of RG58/U 2 1/4 inches long. At each end remove 1/2 inch of the outer sleeve, comb the braid out, and twist it together, bringing it out at a right angle. Remove 1/4 inch of the inner insulation from each end. Form a 1/8 inch hook on one end of the center conductor and on the end of a short piece of #18 solid copper wire which connects to the braid stub. This end of the coax will be connected to the twin lead. At the other end of this short coax use a longer piece of #18 wire to form a one-turn loop around the shoulder of the SO-239. Then bend it back to reach the braid stub and solder it. Clip off the excess braid.

A 5/8 inch hole in the end cap for the SO-239 socket can be made either by a 5/8 inch hole saw or by drilling a smaller hole and enlarging it with a reamer.

The only single-hole, rear-mount SO-239 sockets I could find had a threaded sleeve length of 1/2 inch. This is okay for mounting on panels up to 1/8 inch thick, but the PVC end caps available locally are a little thicker. Therefore, a PL-259 does not screw on quite far enough for a tight fit. If a rear-mount SO-239 with a 9/16 or 5/8 inch threaded sleeve is unavailable, the problem can be solved in either of two ways. One way is to insert a 7 mm spring washer (not a lock washer), available at the hardware store, into the PL-259 plug before screwing it onto the SO-239 socket. The 7 mm hole in the washer adequately clears the center prong in the PL-259 and is of the right thickness. The other way is to use a coarse file to remove about 1/16 inch from the top of the end cap after

*343 North Tropical Trail-A205, Merritt Island, FL 32953

the 5/8 inch hole is made in the cap. I have used both methods, and they both do the job. End caps come either with a flat top or a rounded dome top. The latter requires less filing.

After the coax is soldered to the SO-239 socket and its #18 jumper wire, slip a 1¼ inch PVC bushing over the coax and into the end cap. Then lay the twin lead flat across a couple of supports and hook the coax onto the twin-lead wires at a point 2⅛ inches from the bottom of the twin lead. The coax must come away from the twin lead at a right angle before the connections are soldered.

A 10 foot length of ¾ inch, thick-wall PVC pipe cut into four pieces will provide a 43⅜ inch length to enclose the antenna, two 1¼ inch pieces for the bushings, and about 6 feet remaining to serve as a mounting mast. The PVC shop can quickly cut the pipe for you, and you will get neat, square ends. Use fine sandpaper on the edges to make an easy fit. The 6 foot piece will fit into the coupling at the bottom of the antenna. Mounting the mast on your boat or RV will depend on your particular situation and ingenuity. It may be possible to fabricate an adapter to fit onto a commercial lift-and-lay mount, or for occasional use it could be lashed to whatever is appropriate. Do the lashing to the mounting mast, not the antenna.

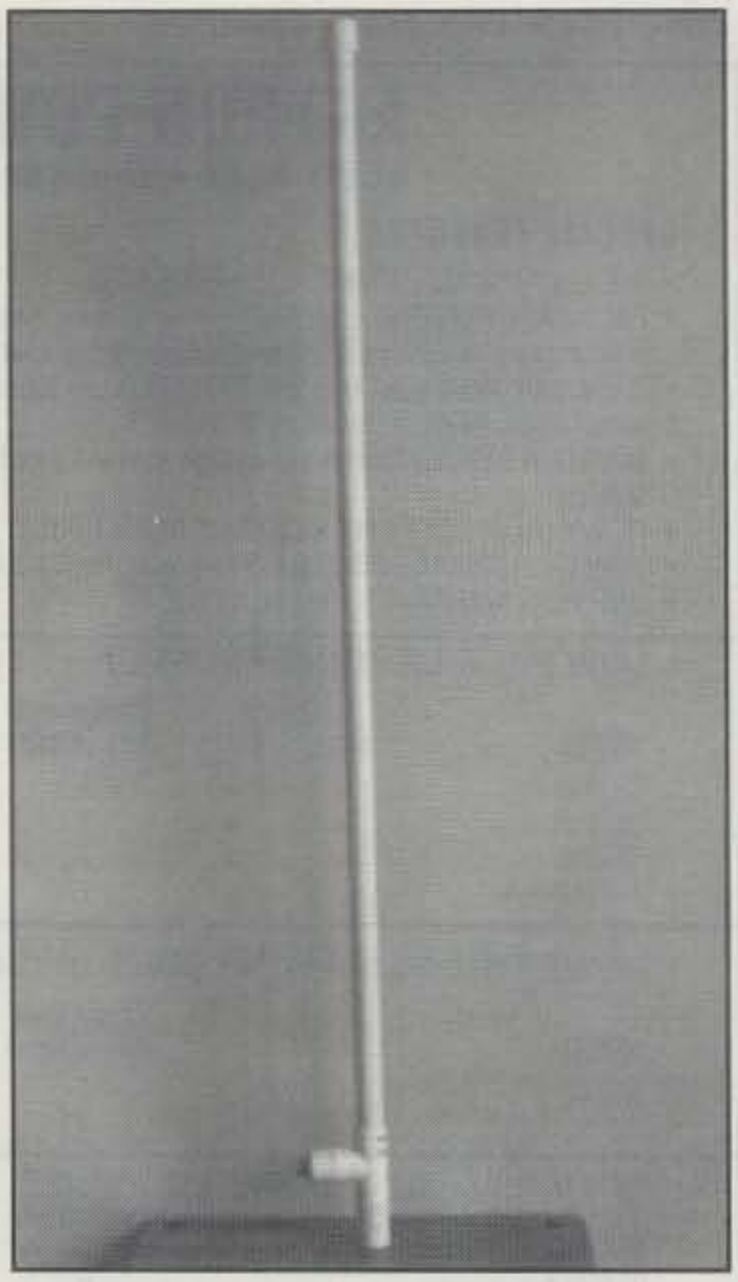
Insert the top end of the twin lead into the side opening and out through the top of the tee. Push the tee down onto the twin lead toward the coax. Bend the 2⅛ inch stub down and back on itself as you feed the tee over the coax. Then pull the stub down into the bottom opening of the tee. Push the PVC pipe onto the twin lead and finish assembly as shown in fig. 1.

A 1 inch piece of ¼ inch plastic rod was made by cutting it out of the center section of a plastic alignment tool. This plastic rod goes through the quarter inch loop at the top of the antenna and rests in the quarter inch slots in the top of the pipe to support the twin lead and keep it from settling and possibly putting a physical strain on the soldered coax connections. Place a little dab of clear silicone caulk on the rod where it rests in the slots and at the center where it supports the antenna. Add a PVC end cap on top of the pipe.

If you find that the SWR is higher at 148 MHz than it is at 144 MHz, the stub is too long. If the SWR is higher at 144 MHz than at 148 MHz, it is too short. If you feel that you really want to trim, and approach the optimum dimension gradually, you can start with a stub length of 17⅜ inches. This will allow two trim cuts of 1/16 inch each before reaching the final dimension of 17¼ inches. If the SWR readings show that the stub is too long, you may not have had the twin lead pressed flat and straight when you measured, and the dimensions may actually be longer than you thought.

Finally, six No. 6 × ⅜ inch stainless steel, self-tapping screws can be used to permanently secure the end caps, coupling, tee, and bushings together.

Dimensions were determined by using an MFJ-249 SWR Analyzer. Transmitting tests were made outdoors well in the clear, away from buildings, trees, etc. A Radio Shack SWR/PWR meter (19-320) was inserted between the transceiver and a 10 foot length of RG58/U which fed the antenna. The SWR was well under 1.5:1 across the 2 meter band, and a 2 watt hand-held transceiver raises a repeater 25 miles away. ■



The completed antenna ready to withstand any and all elements.

The bottom section of the antenna showing the SO-239 connector. At the bottom is a PVC coupling to facilitate mounting.

The top section of the antenna with the cap removed. You can see the loop of the antenna being supported by the ¾ inch plastic rod, which rests in the cutouts.