ANTENNAS & THINGS

BY JOE CARR, K4IPV

SIMPLE ANTENNAS AND ACCESSORIES FOR SIGNAL IMPROVEMENT

The only antenna on most small portable shortwave receivers is a small telescoping whip extending from the case of the radio. Attempts to put up random length wire antennas of large size will help, but will destroy all of the portability and may cause overload of the receiver front-end circuitry.

Another problem with shortwave reception, whether using a portable radio or a AC powered radio, is due to the nature of ionospheric shortwave propagation. When signals are refracted in the ionosphere, their components tend to spread out causing the signal to arrive at different angles of arrival at different times. As the dynamic ionosphere changes, the angle of arrival changes. These changes can occur over the course of a few minutes. Common loop antennas aimed at the desired station are reasonably insensitive to changes of elevation angle of arrival, but their null is essentially a point-source notch. The solution to the problem is to build antennas with fan shaped, adjustable null with reasonable insensitivity to vertical angle. This class of antenna, popularized by Villard, includes the single-turn, low-inductance wide loop.[1] This trick is seen in a lot of antenna books and magazine articles,[2] and was also told to me by a missionary (who held an SM0 ham call sign) who worked in Sudan.

A clever, simple to build antenna of this class is shown in Fig. 1. The loop antenna shown in Fig. 1 schematically and as a photo in Fig. 2A, calls for a 24 inch single-turn square loop antenna made from 3-inch wide sheet metal stock. The metal can be copper, aluminum or brass, as available (not aluminum if you want to solder to it). A two-inch gap is left at one end to accommodate the tuning capacitor, C1 (see Fig. 2B). This capacitor must be relatively large, on the order of 750 to 1200 pF. This capacitance can be accommodated by two-section and three-section AM broadcast band variable capacitors of 365 pF per section (note: some capacitors, intended for superheterodyne radios, have two sections that are different capacitances). On the same side of the loop as the gap there are four 5/32-inch holes (A, B, C and D) drilled to accommodate mounting the loop to a 1X2 wooden piece, or other suitable support. A wire that is equipped with an alligator clip is attached to the loop, and this clip will be connected to the telescopic antenna on the portable radio. In operation, the loop can be oriented for best reception.

Two controls are used on this antenna. Capacitor C1 tunes the loop to the resonant frequency of the desired station. Potentiometer R1 is used as a phasing control.

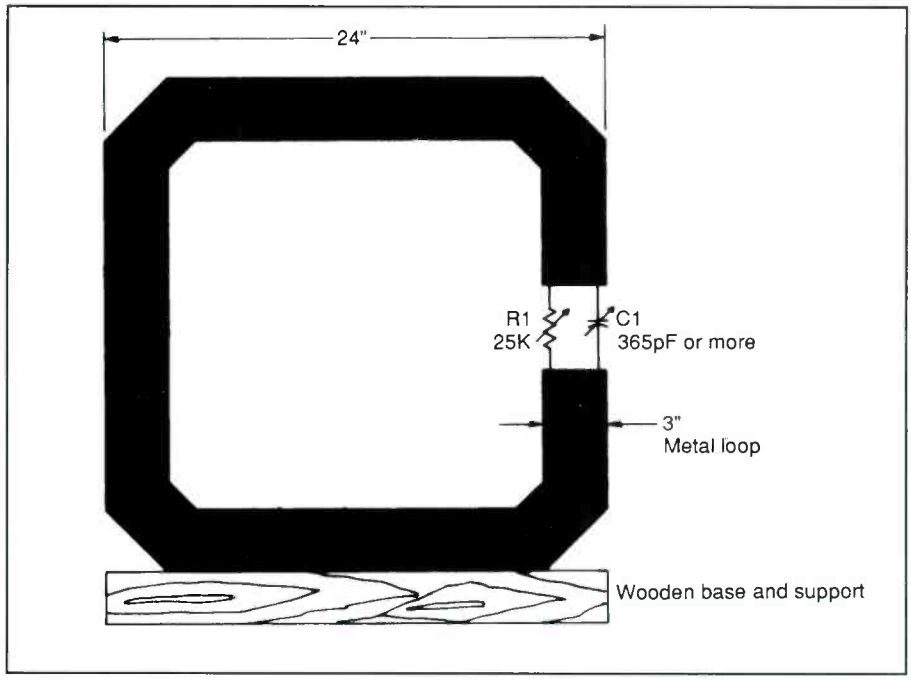

Figure 1. Schematic of the single-turn loop antenna.

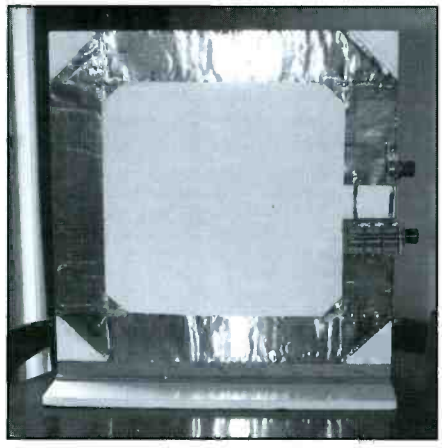

Figure 2A. Construction of an actual single-turn loop.

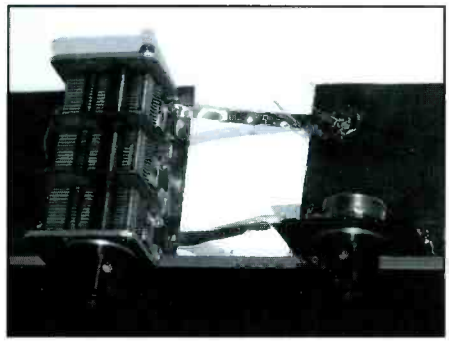

Figure 2B. The controls connections for a single-turn loop.

Construction of the antenna is simple, if you use the right materials. The large support unit material is styrofoam backed poster board. Use either the 3/8-inch or 1/2-inch material (the 1/4-inch tended to sag a bit). This material is typically available at hobby shops, artists supplies, craft supplies or graphics supplies shops for relatively low cost. The copper is 36 gauge tooling copper. It comes in 36"X 12" rolls from hobby shops. If they don't know what you are talking about, tell them to order from St. Louis Crafts. A single roll, with judicious use of heavy scissors, will suffice to build the entire antenna.

{Note: This sheet copper is also useful for shielding other forms of loop antenna. It solders well, and is easy to manipulate.}

I laid out the pattern with pencil and straight edge on the poster board surface. I then cut the copper to fit. The copper is fitted to the poster board using contact cement to secure. I found that the *Elmer's* brand was best, and could easily be applied with a paint brush. Other brands either took too long to set up, or set up so darn fast (and unforgiving) that I made mistakes.

The styrofoam backed poster board comes in larger sizes than needed for backing the antenna, so I cut a piece off the end for use as the base support. It was about 8-inches wide, and provided a reasonably stable platform. The vertical piece of poster board and the horizontal piece were fastened together with a piece of 3/4-inch right angle trim molding. Three brass machine screws held the vertical piece to

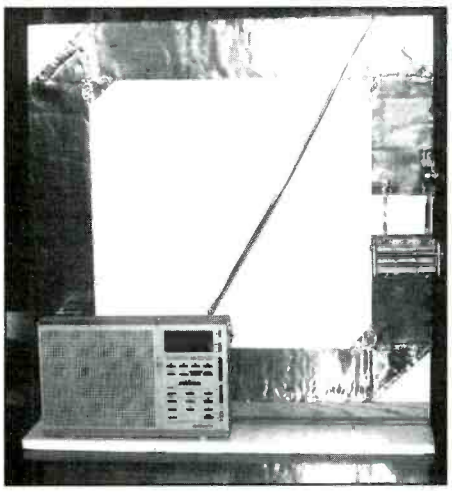

Figure 3A. Vertical orientation for the operation.

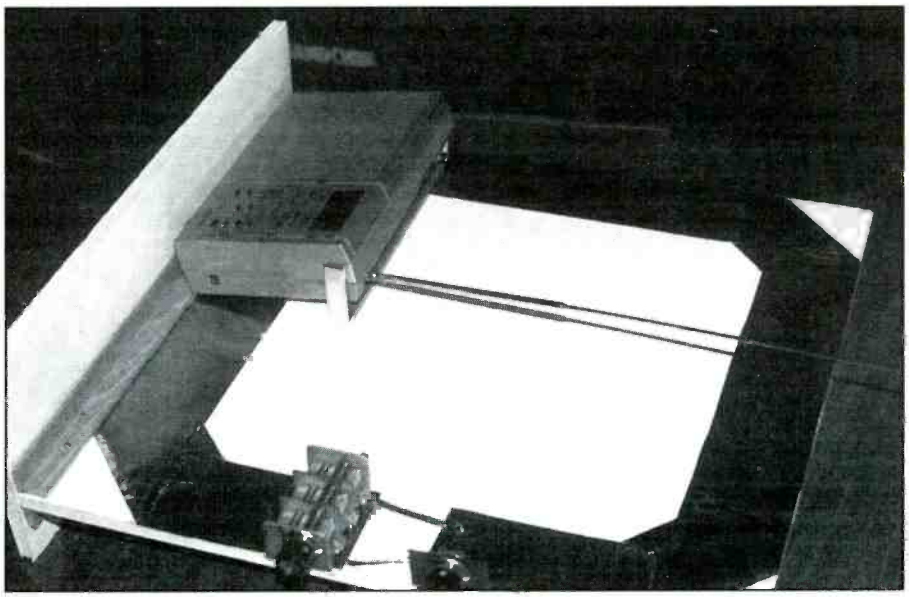

Figure 3B. Horizontal orientation for operation.

the trim molding, while the base was fastened to the trim molding with contact cement.

To use this antenna, position the radio's telescopic antenna close and adjacent to the loop, but not touching it. The loop antenna can be rotated to find the best position to either null or enhance a particular station. The "Lazy Susan" idea will work well in this case. Either vertical mounting (Fig. 3A) or horizontal mounting (Fig. 3B) is used according to propagation conditions at your location, and rotate to suit best conditions.

1) O.G. Villard, "Indoor Interference-Reducing Antennas For Shortwave Listening," Newsletter of the Association of North American Radio Clubs (ANARC), January 1990; "Combat Interference in Shortwave Reception With Compact Indoor Directive Antennas," World Radio-Television Handbook, 1990; "Miniature Indoor Directional Antennas For Reducing Sky-Wave and Ground-Wave Interference in the Shortwave Bands." ANARC newsletter March 1990.

2)For a particularly good article on this subject, see "Improving Portable Radio Performance," Richard Q. Marris, G2BZQ. Elektor Electronics USA. February 1992, pp. 14ff. See also the O.G. Villard, Jr. articles cited elsewhere for a very similar class of antennas. ■