BY ED NOLL W3FQJ

The Low Square Loop

When you are interested in low-frequency bands, HF ham operation, or tropical bands SWB reception and you don't have room to spread out a long single resonant wire on these frequencies, give some thought to a square loop. You can feed it at the center of one of the legs, or at a corner in diamond-like manner, Fig. 1. Choose the feed point that is most convenient to your location. Dimensions in the table represent a full wavelength on the HF ham and SWB band. The basic equation is given so you can calculate the length needed to obtain resonance on some specific frequency:

$$\text{Loop Wire Length (in feet)} = \frac{984}{\lambda\text{MHz}}$$

Such a loop has good bandwidth and for reception purpose only, the cut is not that critical. For ham use without a tuner, you may wish to cut the wire two percent longer so you can trim it back to some exact resonant frequency for minimum SWR. If you are using a tuner, then the cut becomes less critical.

Note from the table, that a full wavelength cut for 3.8 MHz is 259′ and, for the 75M shortwave broadcast band it is 249′. For reception only, there would be little difference in performance. However, a ham might wish to have minimum SWR centered about 3.8 MHz and the exact cut then becomes more important.

The low loop of Fig. 2 resonated on 3.82 MHz and in my location it was fed at a corner because that point could be located just a short distance from the radioroom. The total length of wire to obtain resonance on 3.82 was 255′. The mast at the feed point was 10′ high and the remaining three were 19′ tall.

The loop did very well for general all-band shortwave broadcast reception and did not occupy much space. If your interest is only in the 41 meter band and SWB bands that are higher in frequency, your total length of wire need only be about 137′ as shown in the table. Such a squared loop could then be erected in a reduced area about 35′ × 35′.

Loops need not be squared to be successful. Hams have been winding them through short and tall trees using insulated wire for some time and operating them successfully on a number of bands with the use of a tuner. Tuner use permits multi-band opertion of loop configurations. Often the loops are fed with open-wire transmission line. Such line contributes little loss despite a high SWR when you tune up on bands off the resonant band of the loop. A good tuner will also peak the incoming signals for you.

In working with loops of various types, I've noticed the performance on some off-frequency bands can be improved by opening the loop at the center of the wire. The final version of the diamond installed here is shown in Fig. 3 and differs from Fig. 2 in that the antenna end wires drop down the far

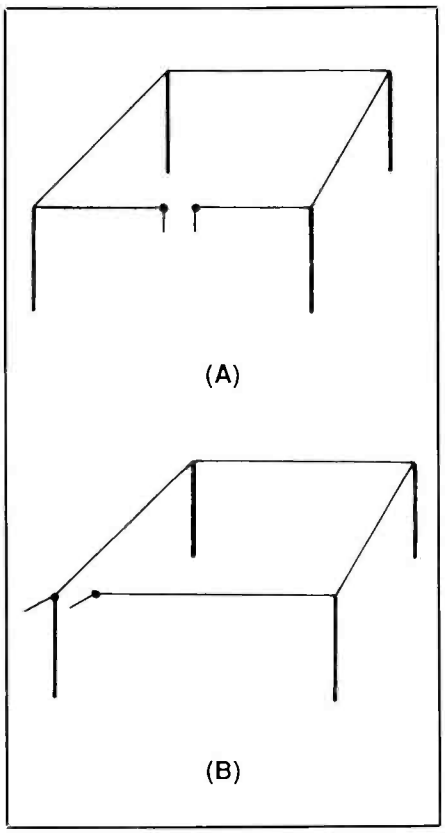

Fig. 1- Horizontal square loops, side-fed (A) and corner-fed.

Table 1

Meters	MHz	Total Wire Length
120	2.4	410′
90	3.3	298′
75	3.95	249′
60	4.9	201′
49	6.0	164′
41	7.2	137′
31	9.7	101′5″
25	11.8	83′4″
21	13.7	71′10″
19	15.3	64′3″
16	17.7	55′7″
13	21.6	45′7″
11	25.8	38′2″
Meters	**MHz**	**Total Wire Length**
160	1.85	532′
80	3.8	259′
40	7.2	137′
30	10.12	97′3″
20	14.24	69′1″
17	18.11	54′4″
15	21.3	46′2″
12	24.95	39′6″
10	28.5	34′6″

Table 1- Full-wave low loop wire lengths for shortwave broadcast and ham bands.

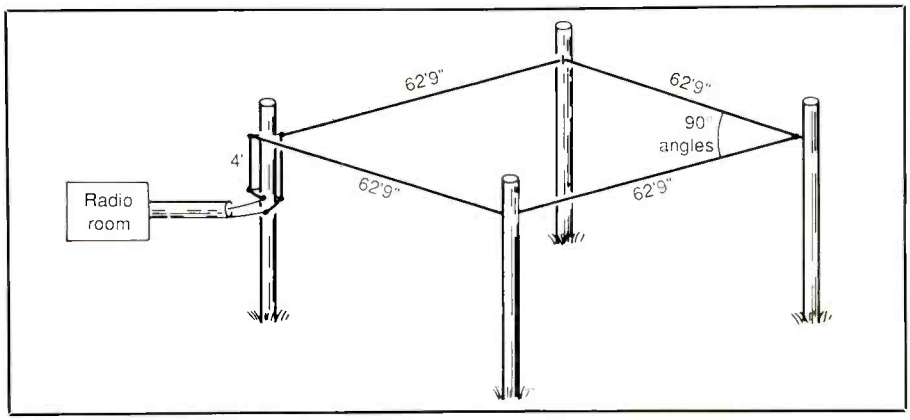

Fig. 2- End-fed diamond loop.

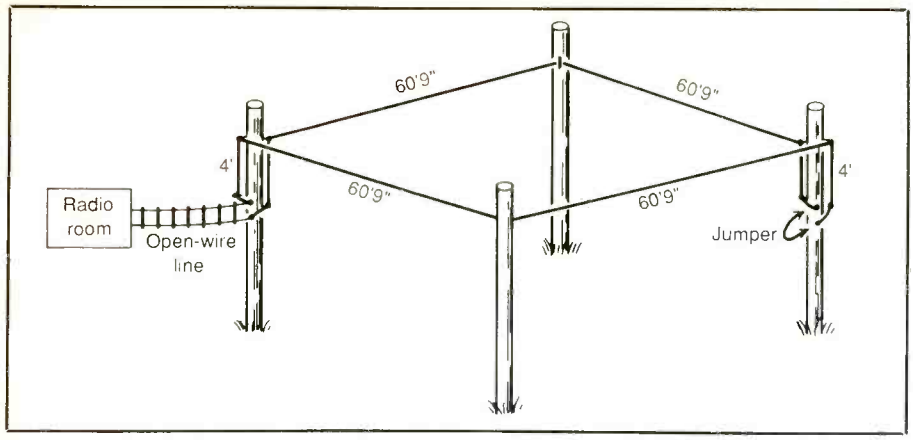

Fig. 3- Modification of diamond loop to improve all-band results.

PVC mast to a level accessible for changing between closed or open loop operation, Fig. 4. Also, open-wire line connects the loop to the tuner. The loop closed always performed better on the resonant band. Open operation provides improvement on most of the other bands.

Performance is influenced by whether the diamond is a right angled one or stretched out as in Fig.5. At any rate, if it is at all possible, it is helpful to be able to find out whether the opened or closed loop provides the better results on each of the various bands.

A stretched out version also becomes more bi-directional on the higher frequency bands taking on some rhombic-like characteristics on 10, 11, 12, 15 and 16 meters as indicated by arrows. Thus, you may wish to try to angle the stretched out loop in some favorite direction. The loop is an interesting multi-band antenna and with a tuner you can cover a wide span of frequencies. The open connection produces a decided improvement on bands lower in frequency than the band for which it is cut. A good tuner will further peak the received signals.

Some of you ham and shortwave listeners have a favorite wire antenna you have evolved to meet your special site or needs. Readers would like to hear about it. Send in a clear drawing with dimensions and a short qeirw-up including results. If suitable, we'll find a spot for it in the column.

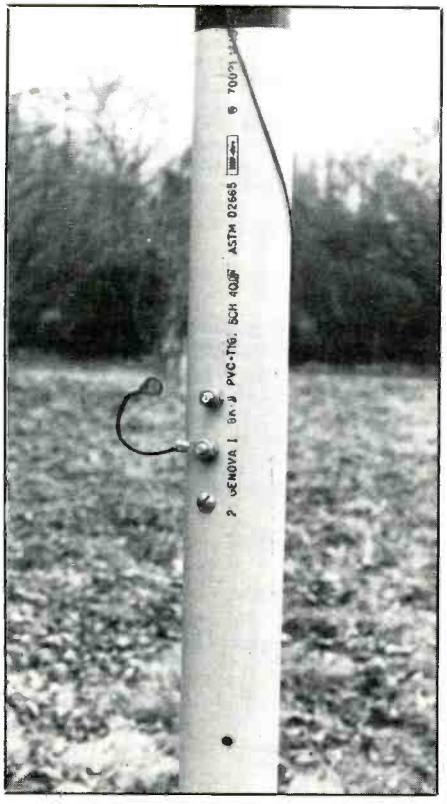

Fig. 4- Terminals attached to far mast of diamond can be used to operate loop open or closed.

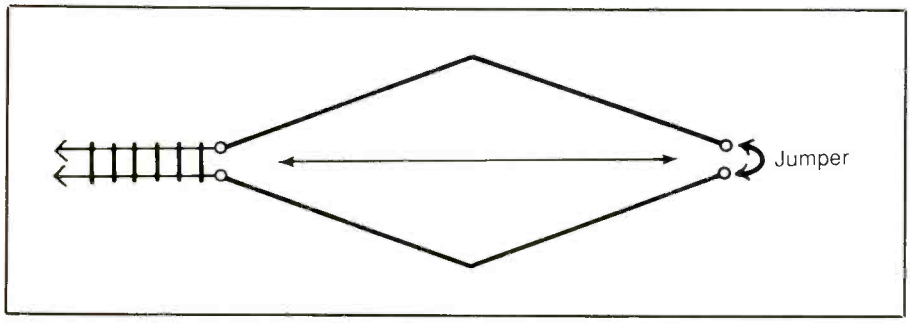

Fig. 5- Elongated diamond loop.