

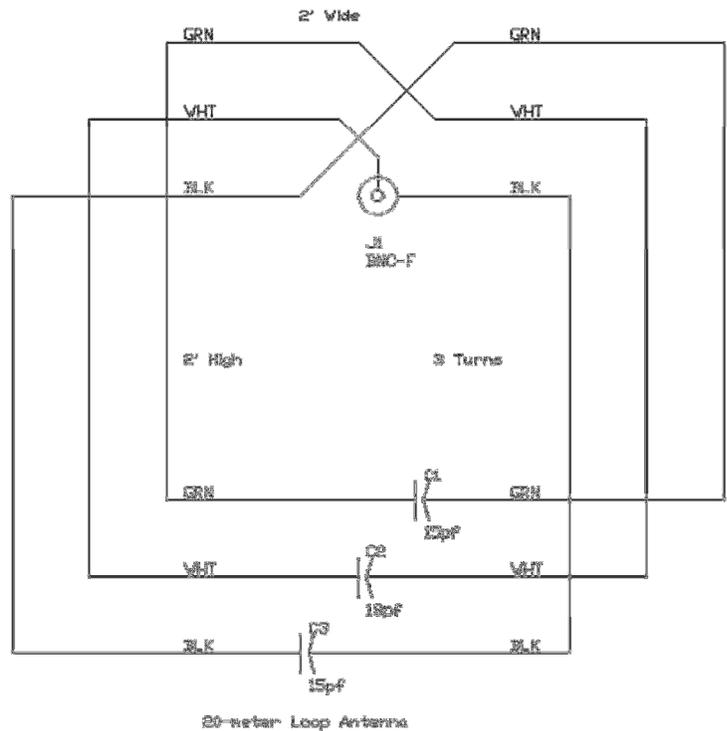
## Multi-band Micro-loop Antenna

A two-foot square, three-turn loop for the 20m, 30m, and 40m Amateur Radio bands

By Rob L. Dey, KA2BEO 1/7/2013



This project is based on modification of the 20-meter Micro-loop Antenna by Rob L. Dey, KA2BEO 1/9/1999.



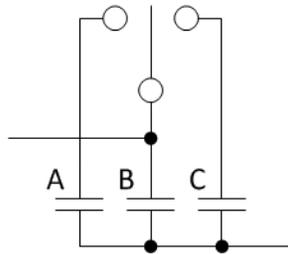
### Introduction

While certainly not the most efficient antenna for transmitting, this small loop antenna exhibits a high signal-to-noise ratio during receive operation, and compares favorably beyond an electrically-small vertical monopole antenna. Positioned vertically (as shown above), the loop functions in a bidirectional manner. The height of the antenna above ground does not appear to be critical for operation, although overall effectiveness may be improved by higher elevation.

### Procedure

1. Remove the PVC Tee from the bottom PVC tubes of the original 20-meter loop antenna.
2. Remove  $\frac{1}{2}$ " insulation from the #18 AWG wires at capacitor C2 (one white wire from each side), while leaving about  $\frac{3}{8}$ " of insulation exposed on each of the two wires that exit the bottom PVC tubes (at the bottom center of the loop). About 1" can be cut from each of the other two turns of #18 AWG wire (green and black) to avoid excess wire in the PVC Tee.

3. Add a single-pole, triple-throw (SP3T) ON-OFF-ON type of miniature toggle switch to the bottom PVC Tee. The switch should be panel-mounted to the PVC End Cap by drilling a ¼" diameter mounting hole in the top of the End Cap.
4. Solder a new 500pF ±5% 500V dipped silver-mica capacitor (at position A in the schematic below) to one switch position (for 40m operation).
5. Solder a new 51pF ±5% 500V dipped silver-mica capacitor (at position C in the schematic below) to the other switch position (for 30m operation).
6. Solder the existing 18pF ±5% 500V dipped silver-mica capacitor (at position B in the schematic below) to the center (common) switch terminal (for 20m operation).
7. Solder the three (unconnected) capacitor leads together.
8. Solder one antenna wire (white from the original 18pF capacitor) to the junction of the three capacitors.
9. Solder the other antenna wire (white from the original 18pF capacitor) to the center (common) switch terminal (with the 18pF capacitor connected).
10. The two original 15pF capacitors remain in line with the other two turns of wire.
11. Complete the antenna assembly by pushing the two PVC tubes into the PVC Tee, and placing the PVC End Cap onto the PVC Tee. Apply PVC primer and cement if necessary.



## Results

This 20-meter Micro-loop Antenna modification was originally completed on 5/29/2000. The modified antenna has been in use as a Multi-band Micro-loop Antenna for more than 12 years.

While the first and third turns (the outer windings) of each wire loop has a series capacitor value of 15pF, the second turn (the center winding) capacitance equals the following values when switched appropriately for each Amateur Radio band:

- 20m = 18pF total (with switch centered in its OFF position)
- 30m = 18pF//51pF = 69pF total (with switch ON at one end)
- 40m = 18pF//500pF = 518pF total (with switch ON at the opposite end)

**Note:** With capacitors rated at 500V, the RF output power must be limited to 15W maximum. A current balun is not required for low-power operation (of less than 15W) and for receiving, but a 1:1 current balun and capacitors rated at 5kV are required for transmitting at high power levels (between 15W and 150W maximum).

## Internet

Visit the following web page for additional information.

<http://www.natradioco.com/rdev/robsloop.htm>

## Capacitors

The table below lists capacitor values for other three-turn square loop antenna sizes and various Amateur Radio bands.

Side Length (ft)	Wire Gauge (#AWG)	Cable Type	Band (m)	Freq (MHz)	C1 (pF)	C2 (pF)	C3 (pF)	Cpar (pF)	Cser (pF)
1*	14	Romex	10	28	6.8	12	6.8	25.6	2.649
1*	14	Romex	20	14	10	15	10	35	3.750
2	18	Linecord	20	14	15	18	15	48	5.294
2	14	Romex	20	14	5	33//10	5	53	n/a
2	18	Linecord	30	10	15	18//51	15	99	6.765
2	18	Linecord	40	7	15	18//500	15	548	n/a
4	16	Linecord	40	7	25	25//10	25	85	9.211
4	14	Romex	40	7	27	33//20	27	107	10.759

### Notes:

All capacitance values are in picofarads (pF).

A value of 33//10 indicates 33pF in parallel with 10pF.

Use capacitors rated at 5kV (ceramic transmitting type) for 150W or less, and 500V (dipped silver-mica) for 15W or less.

Install a 1:1 current balun in the feedline for power levels above 15W.

*\*The 1-foot square loops have not been tested.*

### Ceramic (Doorknob) Transmitting Capacitors:

Centralab/CRL (Philips) #850 series (850S, 853, 854, 855, 857 858S)

HEC #HT-50, HT-53, HT-55, or HT-58 series

Murata Erie #UFP1 or UFP17 series

Philips #850S or 8500 series