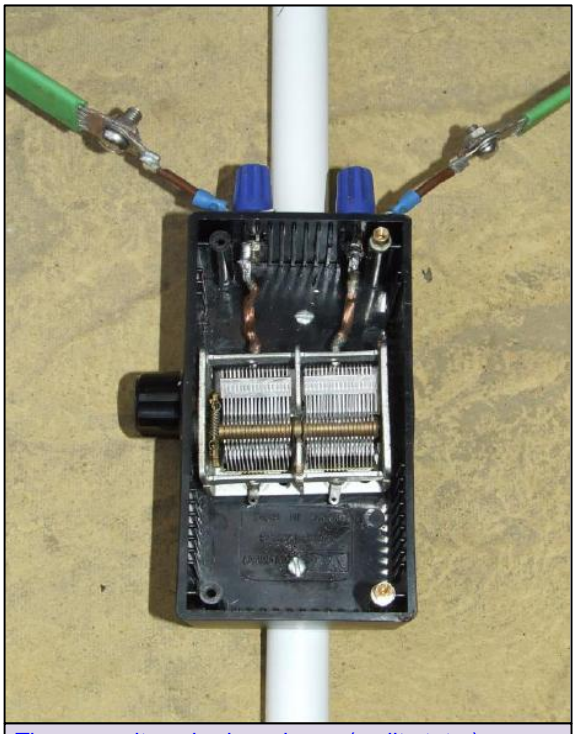
PORTABLE Mag Loop For 40m-10m - G8ODE

WARNING Even when fed at low power levels, small mag loop antennas produce very high voltages across the capacitor and concentrated electromagnetic radiation

The size of the this loop was dictated by the quantity of electrical earth tape (braid) , which just happened to be lying spare. **A bit of re-cycling and the tape became a small mag loop.** Since this type of computer grade earthing tape has a very low impedance at HF to reduce electrical noise, the hope was that its associated low resistance might the 2.5m loop's overall efficiency.



The capacitor wired as shown (split-stator) can withstand 30 watt RF on all the bands without any flashover

LOOP CONSTRUCTION DETAILS

The square loop has 60cm sides and, with the capacitor, tunes from 7.0-30 MHz. The Faraday coupling loop is approximately 1/5 (2.4m + 10cm wire tails) of the circumference of the loop. It is better to make the loop slightly longer and trim for an SWR of 1:1 (ref 50 ohms) on the lowest band.

It may not be possible to reduce the SWR to 1:1 as the photos show that the coupling loop is not a perfect circle when suspended underneath the loop. Changing the shape and the relative position of the loop will affect the coupling and can improve the SWR of the antenna.

The square loop is constructed from a 2.4m length of insulated computer grade electrical earth braid - 12.5mm x 2.0mm. The ends of the braid are tinned with solder, so that 6mm holes can be drilled in them. Two flat head bolts are used to secure the 5cm wire (2.5mm dia) tails, which are crimped onto spade terminals. (Recently received advice suggest that the Tape and short tails are better soldered with only a crimp at the 4mm terminals end. Apparently solder creeps when under the pressure of the bolt and washer and the connection deteriorates.

The two sections of an ex-domestic radio twin gang 500pF+500pF tuning capacitor are connected in series, i.e connections are only made to the static vanes. This doubles the voltage rating but halves the overall capacitance to 250pF. The capacitor is fitted with a well insulated knob and housed inside a plastic box because of the high voltages that appear across the capacitor even at QRP levels (as much as 1500Volts).

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My special thanks to G3YEU in helping prepare this article

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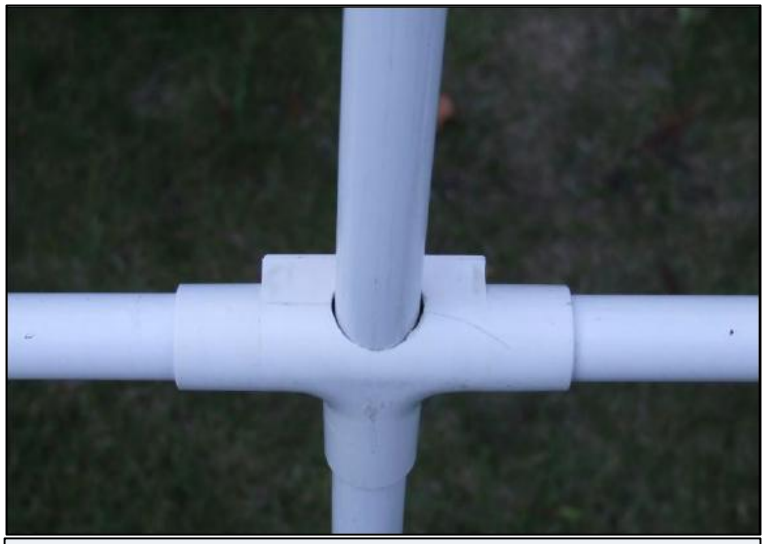
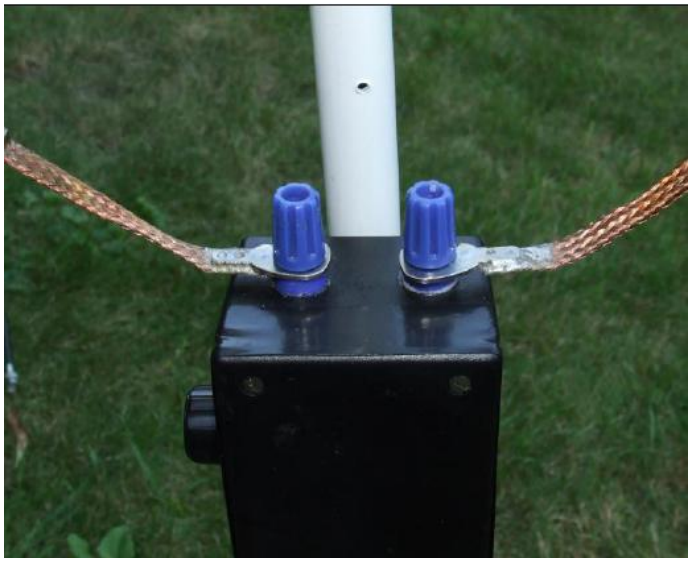


The 15mm "T" joint is modified by drilling a clearance hole from top to bottom and by filing away the inside step. This allows a vertical tube to pass through, but make sure it is still a reasonably tight fit.

The computer earth tape is held in place using nylon tie-wraps that pass through holes drilled in the ends of the 15mm plastic conduit tube.

The photo show the uncovered soldered joint on the body of the BNC connector, which is normally protected by a layer of insulation tape. The small tie-wrap is used to secure the unconnected braid and acts as a strain relief so that the inner core does not get jarred and snap off.

The Faraday loop must be positioned directly opposite the tuning capacitor for the coupling to work properly. This type of coupling improves the small magnetic loop's performance because it helps to screen out the electric fields that are normally associated with local QRM.



The computer earth tape is too wide to be easily secured to domestically available crimps. The photo on the left shows the improvement that was added later. The thin 2.5mm wire tails were replaced with lengths of braid stripped from RG213 coax, these were soldered to two flat brass hooks that clip round the 4mm screw terminals on the tuning capacitor box.

Tip :- A 25/45w electric soldering iron is not hot enough to solder the tape. To make a traditional hot iron copper bit from a 20cm length of 15mm flattened copper tube, fold over 6cm of flattened tube and leave one end open for a wooden dowel to be inserted and secured with a screw to form a handle.

Heat the copper bit in a flame and test occasionally with solder, if it melts it's hot enough. The flattened copper should hold the heat long enough to solder the braid and hooks together.

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*The loop was designed using KI6GD program **"loopcalc.exe"** This caters for imperial and metric measurements, using copper or aluminium tube for an octagonal, circular or square small loop shapes.*

2.5m circumference copper square	Frequency (MHz)	7	14	18	21	25
	Tuning Capacitor	205pF	45.5pF	24.5pF	15.9pF	8.9pF
	Loop efficiency	3.80%	30.70%	51.70%	64.70%	77.10%

"OK not too efficient but works great as DX receive antenna!"

The KI6GD program does not cater for braid, but, by assuming that the braid is equivalent to a 15mm tube, the program will be able to give an estimate of the loop's performance. In practice the loop works very well as a receive antenna having fairly sharp tuning. It was also possible to transmit using an output power of 50watts.

OK this version of the loop does not look that pretty, but it worked !

Two bamboo sticks were used on the prototype using an antique 300pF capacitor .

A simple unscreened coupling loop made from 2.5mm copper wire salvaged from mains "twin and earth " 15 amp flat grey sheathed mains cable.

A 4mm-BNC adapter was used to create the loop and connect to the 50 ohm coax feeder to the transceiver. The adapter makes it easier to adjust the size of the loop so that the SWR is 1:1

Having proved the concept the MkII was created that's shown on the first page

I demonstrated the MKII loop in the work's car park to a colleague using my FT817. I was able to tune the loop to several DX stations on each of the HF bands (40m-10m) receiving signals between 5/8 5/9. The FT817 LCD display did not always shows any LCD bars for the signal strength but the audio was crisp and lacking noise, which is the important property of loops . I also demonstrated that the loop is directional. The maximum strength is obtained when the loop is broadside to the distant station. The DX reception was excellent with the antenna close to the ground, and elevating the loop did not improve the reception. However, even with reduction gearing, the tuning capacitor required a steady hand when tuning, especially on the higher bands.

Mario G8ODE

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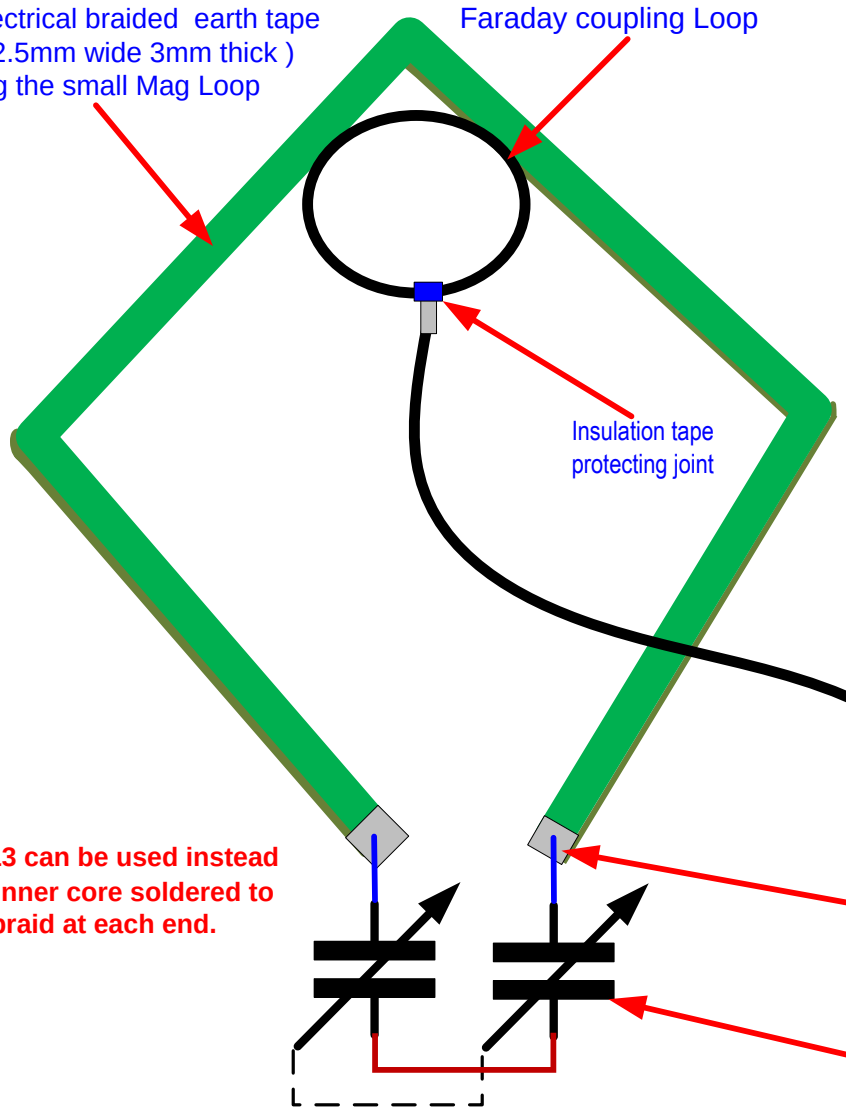
GENERAL DETAILS

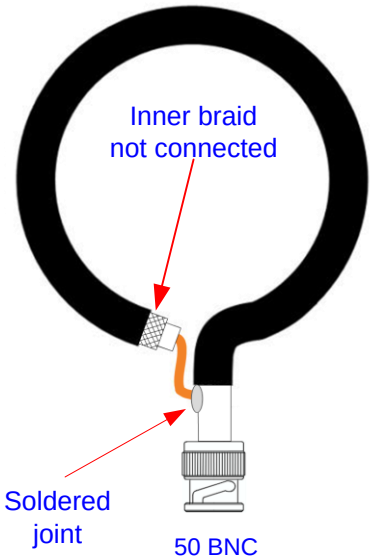


Computer room green insulated electrical earth tape (braid) is normally used to remove the high frequency noises and help prevent the interference affecting other computer room systems and on-site communications..

The earth tape is stretched out on a cross made from 15mm PVC tube available from DIY stores . The arms of the cross are held together with a modified Tee piece as shown on the photo on the previous page.

 # RG213 can be used instead with the inner core soldered to the braid at each end.

Coaxial loop approx 65cm



Coaxial Faraday Loop

An easy way to make and adjust the Faraday coupling loop is as follows. Crimp a 50 ohm BNC connector to a length of RG58 or Mini-8 coax, which is slightly longer than 1/5 (20%) of the main loop's circumference. As the loop including the tails is 250 cms, initially cut the coax to 60cms.

Using an alligator clip, connect the coax inner core to the body of the BNC connector, the illustration on the left shows a soldered connection after adjustment. Tune the loop to the lowest band, shorten the loop coax and repeat the tuning process until an SWR of around 1:1 is obtained.

Finally, check on the other bands to make sure that the SWR is around 1:1. If it is still too high, try distorting (reshaping) the Faraday loop as this alters the degree of coupling and may help.

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