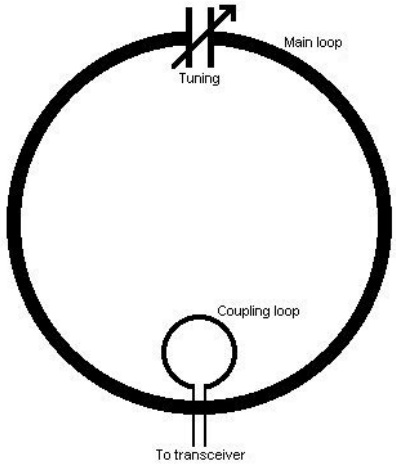
# PA3CQR Magnetic loop antenna page

### A homemade magnetic loop for 10-17 meters.

*Introduction.*

Magnetic loop antennas are very compact hf antennas. If properly build they can be used for transmitting. There are already many good theories about them so i will keep this part of the story very short. Information can be found in the ARRL Antennabook, Rothammels Antennenbuch (German) and on the internet. (See links section)

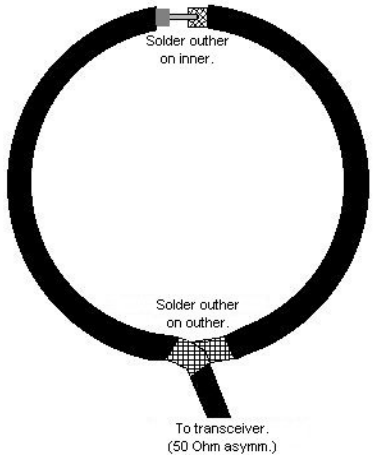
*Schematic diagram.*




The schematic diagram of the antenna is shown right here. You can click on it to see a larger version. The mainloop is an LC circuit where L has just 1 big turn. The coil acts as a radiator and the capacitor brings the circuit into resonance. The current distribution is equal in the whole loop. The main loop is inductively coupled to the transceiver with a smaller loop. This coupling loop can be made in various ways but always has a diameter which is 5 times smaller than the main loop and is coupled to the transceiver directly with 50 ohm coax. The radiation resistance of the antenna is very low and therefore it's very important to keep the dc losses in the range of milliOhms. Practical construction details are described in the next paragraph.

*The first experiment.*

The loop i have build has a diameter of 75 cm and is made of 12 mm Copper tubing obtained from the local Do-It-Yourself shop. The main loop is made of 1 piece to keep the dc resistance very low. The split stator capacitor was obtained from the militairy dump and has 2 sections of 100pF - 1mm spacing in series, resulting in 50 pF - 2mm spacing. The loop is soldered to the fixed plates on both ends. Never use rotator contacts because the voltage at the capacitor will be several kV's and there will flow high rf currents even at qrp level!




The coupling loop has a diameter of 15 cm and is made of RG58 coax. It's called a shielded- or Faraday loop. You can click on the image right of this text for the construction details. It is not connected to the main loop and should be placed opposite of the tuning capacitor. The loop is coupled directly to the transceiver, no antennatuner is needed.

The loop needs to be tuned carefully and the practical bandwidth varies from 20 kHz on 17m to 100 kHz on 10m. Coarse tuning is done by searching a noise peak while receiving. Next tune for the lowest swr with low power. At last increase transmitting power to the desired level. The SWR is below 1:1.5 on all bands.

*The results.*

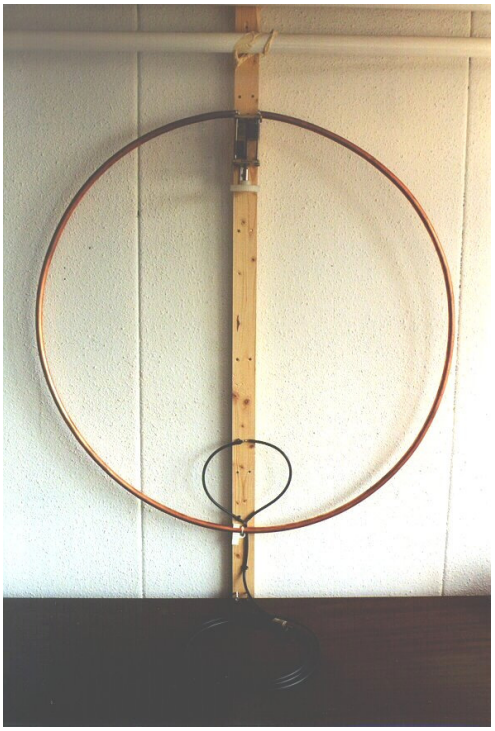
The antenna works properly with 50 watt rf without sparks at the tuning capacitor. Within 2 weeks i made some qso's on 12 and 17 m cw with 50 watts. Distances up to 10000 km (several times) were no problem and reports varied from 559 to 599. The antenna is still inside the house just under the rooftop at 8 meters above the ground. Propagation was moderate to good. With 50 watt cw there is no BCI or TVI at all !

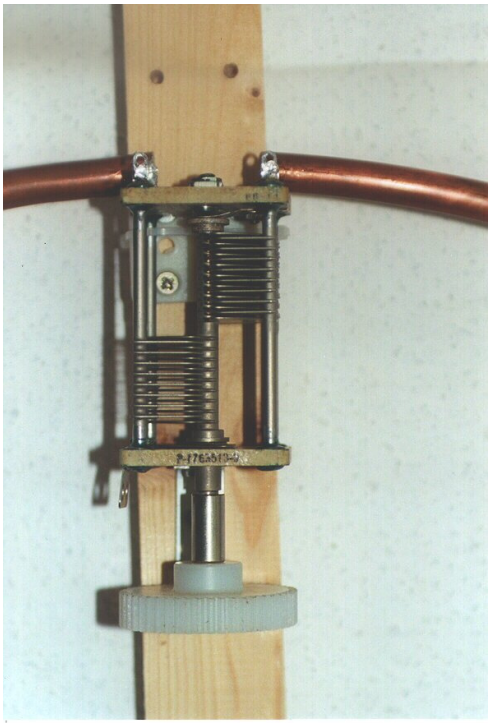
*Vertical or horizontal mounting ?*

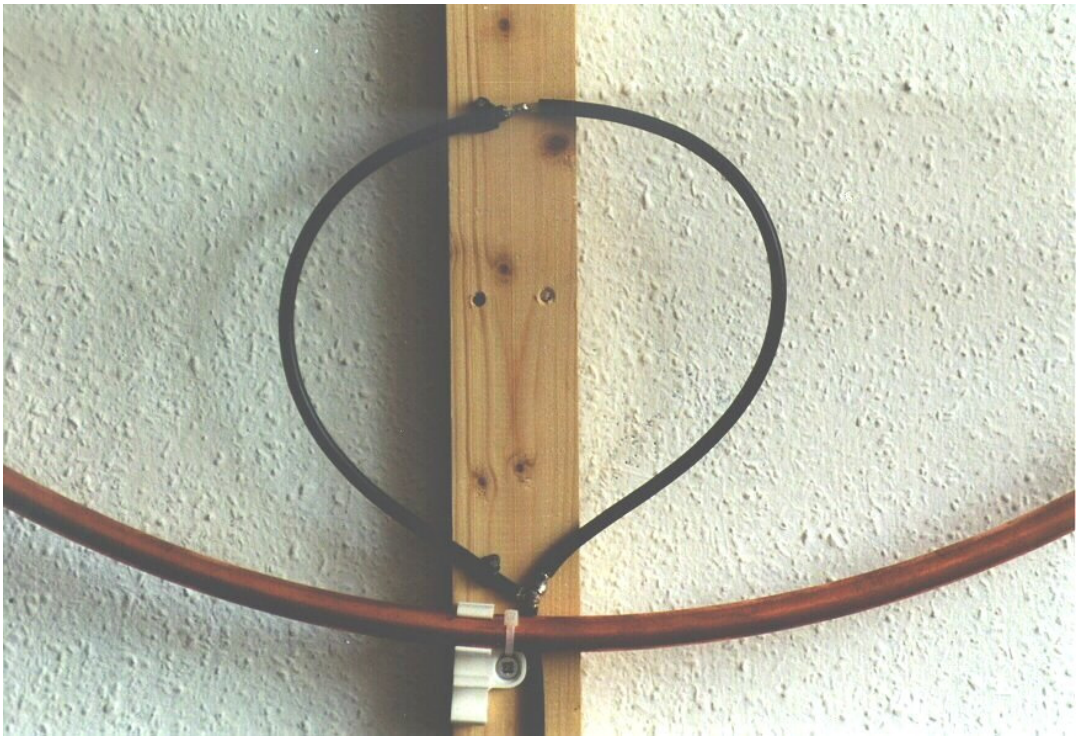
According to the theory you can mount the antenna vertically at very low heights above the ground (Minimum of 2 meters for the lowest part). It results in a somewhat bi-directional behaviour and equal radiation at angles between 5 and 90 degrees. With horizontal mounting the antenna will radiate omnidirectional and the radiation angle will depend on the height above the ground. The same rules like the half wave dipole can be used. In short we can say that if you can mount the antenna at more than a half wavelength above the ground use horizontal mounting for dx results, otherwise use vertical mounting. In this case a rotor is needed.

The first qso's i made with vertical mounting. Next i changed to horizontal mounting which appears to work a little better at longer distances because the antenna is mounted more than a half wavelength above the ground.

*Photographs of the loop. (Click on them to enlarge)*







*Advantages and disadvantages*

**Advantages**

Small size

Easy to build

Results comparable to a dipole

Good rx preselection (High Q)

Direct match to 50 ohm coax, no tuner needed

Low BCI/TVI risk

Strong reduction of manmade noise

**Disadvantages**

Small bandwidth (High Q)

High voltage on capacitor

Precision remote tuning needed (for outdoor use)