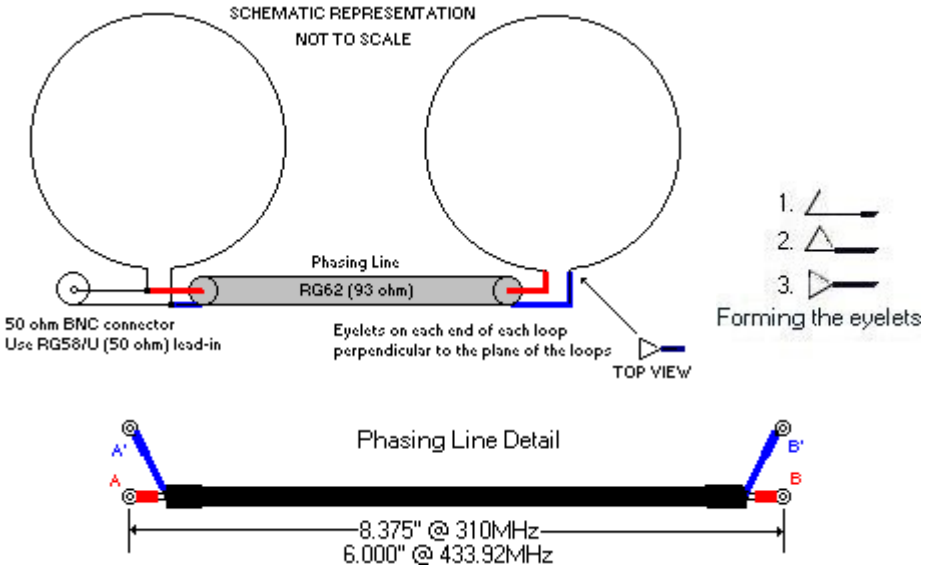
Eggbeater Antenna

The CM15A isolates its electronics from the powerline so no isolation transformer is needed. Clip the lead from the existing antenna, leaving about 1-1/2" connected to the RF receiver. Solder the other end to the center of a 50-ohm, bulkhead BNC connector (e.g. Digikey 367-1018-ND), mounted where the antenna was mounted. (This page has some nice step-by-step pictures but I recommend a 50-ohm BNC rather than 75-ohm F connector.) Solder a lead between the shell of the connector and V_{ss} on the main circuit board. Use 50-ohm coax (RG58/U) between the antenna and CM15A.

With the original X-10 antenna, reception was marginal beyond 20 feet through one interior wall. With an external, remotely located eggbeater antenna, range is over 100 feet through one exterior and two interior walls. Both tests used the same HR12A (Palmpad) transmitter. Since RF propagation is affected by many factors, there is no way to guarantee that everyone will get the same improvement but everyone should get a significant increase in range. Adding a Ten-Tec 1001 wideband preamp kit at the antenna further improves reception. The Ten-Tec 1001 will fit the Polycase LP11F enclosure recommended to mount the antenna.

The eggbeater antenna is constructed of two circular loops made of 16 AWG copper-clad steel wire insulated with heatshrink tubing. The circumference of each loop is equal to one wavelength, adjusted for the velocity factor of the wire. For the 310MHz used by X-10 in North America, circumference is about 36 inches with diameter just under 12 inches. For the 433.92MHz used elsewhere, circumference is about 25-3/4 inches with diameter just over 8 inches. The loops are connected to each other by a phasing line (wavelength/4) made from RG62 (93-ohm) coax. Adjusting for the velocity factor of RG62, the phasing line is about 8-3/8 inches at 310MHz and about 6 inches at 433.92MHz. For a receiving antenna like this, dimensions need not be exact. Ring terminals crimped to the ends of the coax along with eyelets, formed by bending the ends of the antenna elements, simplify connections.



For clarity, the schematic representation above shows the loops separated but they are assembled perpendicular to each other with one loop inside the other as shown below.

DIY Construction Details

Cut the antenna elements 1-1/2 inches oversize to allow for forming eyelets on each end. The copper-clad steel wire tends to retain the curvature from the coiling operation which makes measuring the length awkward. The easiest method is to cut the heatshrink tubing to size, slip it over the antenna wire and then cut the wire so it is 1-1/2 inch longer than the heatshrink. To form the eyelets, lay the heatshrink covered loop on a flat surface. Using 6 inch long nose pliers, bend 1/4 inch at each end up 120°. Move in 1/4 inch and bend up 120°. Move in 1/4 inch and bend down 30°. You want to end up with a triangular eyelet with 1/4 inch sides as shown in the schematic representation at the top of this page.

The elements are mounted to the top of a **Polycase LP11F** enclosure using stainless steel hardware:

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6 ea. insulated ring terminals
4 ea. 6-32x5/8 phillips or hex head machine screws
8 ea. internal star lockwashers
4 ea. 6-32 hex nuts
8 ea. flat washers
4 ea. 6-32 locknuts (nylon insert type)
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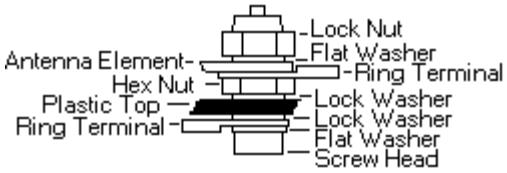

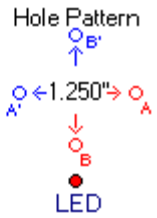

Remove the top cover from the enclosure. Drill 4 holes in it for the 6-32 screws. The holes are in a symmetrical diamond pattern with about 1-1/4 inches cross corner.

Assemble as shown in the photo and hardware sketch. Tie the elements together at top center with a small tie-wrap.

The best location for the antenna is usually the one that is most central (both horizontally and vertically) to your transmitters but slight variations in location and/or angular orientation can make a difference. We recommend rotating the antenna in 30-45° increments to find the optimum orientation with your mix of transmitters.