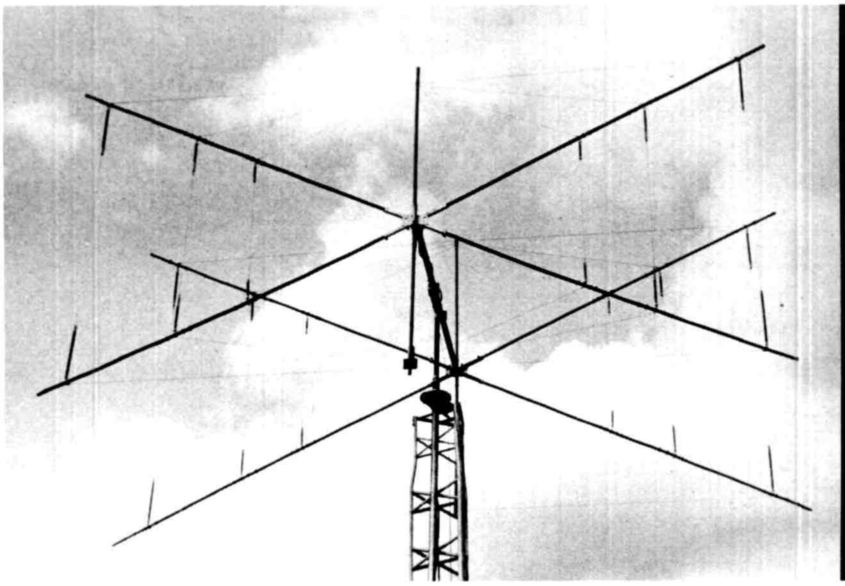

improved low-profile three-band quad

An updated version of this compact antenna which features higher structural strength and a different tuning method

My previous article on the low-profile quad[1] ended with a statement about a new model with better structural rigidity. The version described here has been designed with hexagonal-shaped 10- and 15-meter elements, providing such improvement. Another innovation has been added which consists of loading coils in place of the folded three-wire section and its shorting bars. This doesn't imply that the loading-coil version is better; it's merely another method resulting in easier element assembly. The biggest problem is making 24 loading coils, 8 for each band. I've provided instructions for making these coils using simple shop equipment.

The low-profile quad is unique[2] because the basic quarter-wavelength radiator sections have been retained and compactness achieved by tampering with the "no-good" quarter-wavelength vertical antenna. It's surprising to find that many quad users are unaware that only 50 per cent of a full-wavelength quad is being used effectively. The vertical sections are out of phase, and radiation fields cancel. The primary purpose of the ver-

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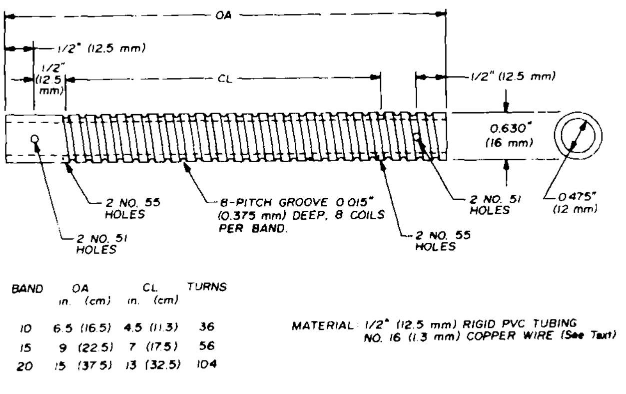
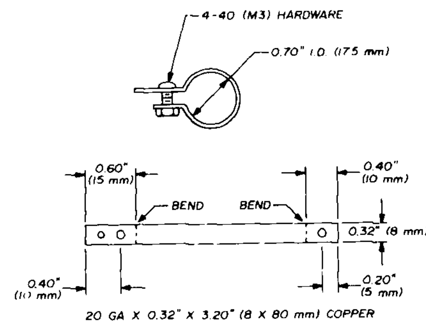
tical sections is to complete the full-wave loop. If a small loss occurs because of the closer spacing, such loss is compensated by a smaller and stronger structure.

The loading-coil shape factor isn't critical. I used ½ inch (25mm) (nominal) PVC plastic tubing because of its low wind resistance. Some builders may be tempted to use one large coil at the center of each vertical leg; however, this wasn't tried because the high rf voltage at this point could be a trouble spot. Wire size isn't critical because the coils are located 1/8 wavelength or more from the high-current points. I used no. 16 AWG (1.3mm) copper wire salvaged from a discarded electric motor. Coils are exposed to the elements, but no serious detuning occured during rain or snow. **Fig. 1** shows the sets of coils required. To avoid any mixup, driven-element and reflector coils are identical.



LOADING COIL FORM

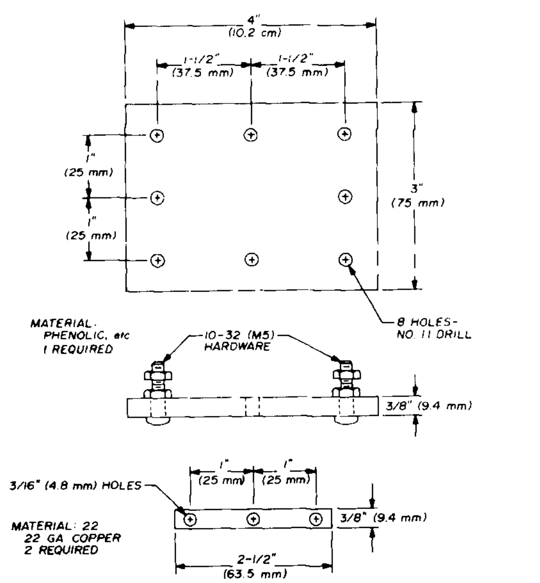


SHORTING SLIDER CLAMP

fig. 1. Construction details for the coil forms and shorting clamp.

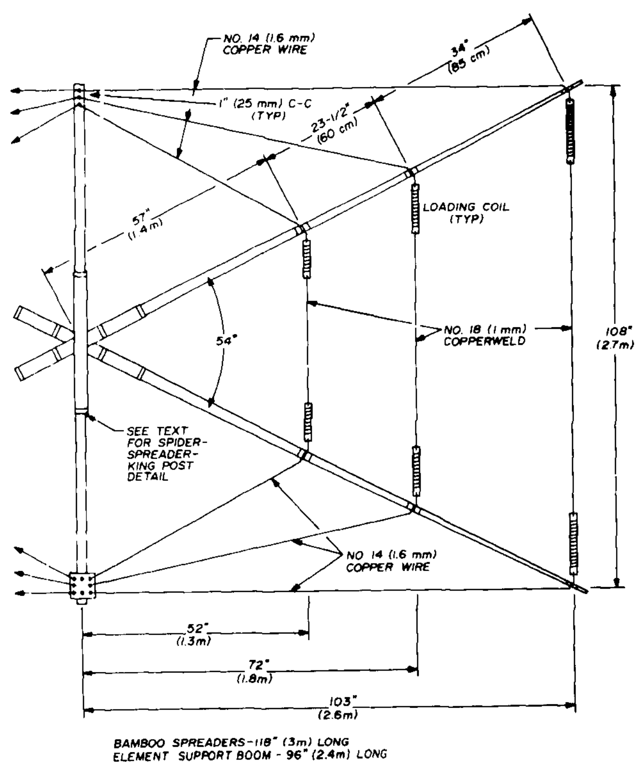
The coil forms are made by machining a groove on the PVC tube. This was done on a lathe set up for an 8-pitch thread. A steel mandrel was made to fit the inside diameter of the PVC tube. One-half inch (25mm) of the tube was held by the lathe chuck. The cutting tool was ground to a radius slightly larger than the wire diameter. The cut was made in two passes: the first was 0.010 inch (0.25mm) deep, followed by a second cut 0.005 inch (0.13mm) deep.

The coils are wound by stretching a length of wire held in a bench vise and rotating the coil form by hand to accept the wire. Gloves are a must. Wrap two layers of masking tape around the end of the coil, cut the wire to allow a 6-inch (15cm) lead, and pull the wire through the holes in the form. Insulation should be cleaned from the bottom end of each coil for several turns (see **fig. 3**) so that an adjustable clamp can be moved over the coil



LOOP CONNECTORS

fig. 2. Details for constructing driven element and terminal block (1 required).



for tuning. Only one set of upper and lower coils per element need be tuned.

element assembly

Construction of spiders, spreaders, wire anchors and boom was covered in reference 1. **Figs. 2** and **3** show the radial dimensions necessary to give the proper spans. The final dimensions can vary a bit, preferably on the long side, to ensure sufficient tuning range. Fastened to the bottom of the driver element king post is an insulated terminal block, **fig. 2**.

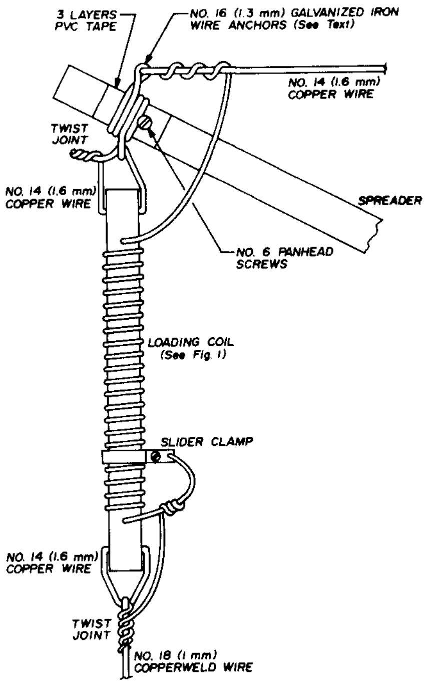
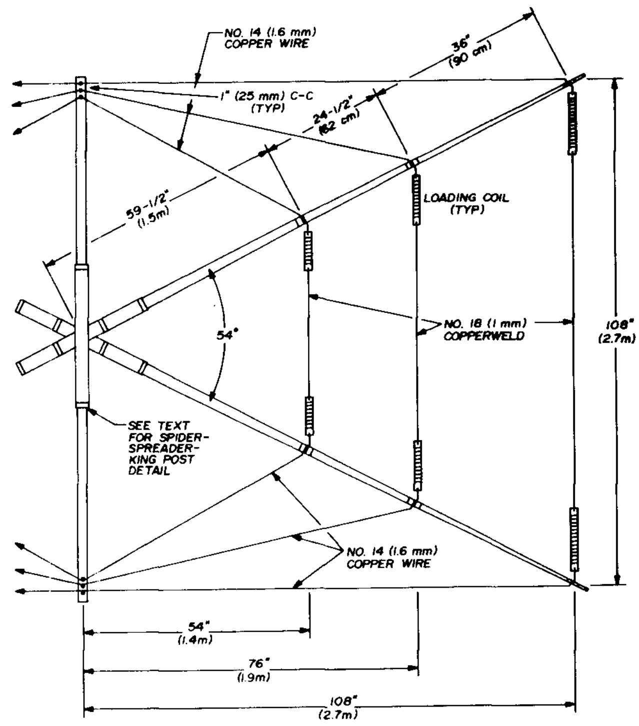


fig. 3. Reflector-element construction and loading-coil installation.



Wire stringing is started with the 20-meter loading coils and wire pieces, followed by the upper and lower horizontal wires. Next, the 15- and 10-meter sloping wires are added, and finally the remaining coils and wire parts. The coil leads are connected to the driver and reflector wires. *Do not* rely on continuity through the wire anchors!

tuning and adjustment

Initial tuneup can be done near ground level with a grid-dip meter monitored by a calibrated receiver. At the driven element terminal block, close the element loops with an insulated wire jumper having a one-turn loop to which the gdo can be coupled. Scanning will reveal a multitude of dips because of mutual coupling between three resonant elements. The trick is to isolate the correct dip by its second harmonic. With full-turn loading coils the resonant frequency should be at the low end or perhaps out of the band. The frequency is now increased by shorting turns from the two lower or upper coils. If more than half of the two coils must be shorted, then the respective opposite coils should be partially shorted. Do not remove any turns at this time.

The reflector coils can now be adjusted to the same settings as those of the driven-element coils, providing the reflector-element span is approximately 5 per cent longer; otherwise make an educated guess. Recheck the driven-element loops with the gdo. Remove the loop jumpers from the terminal block and install the vertical strap jumpers, connecting the three loops in parallel. A homemade balun[3] was used with the RG-8/U, 50-ohm coax.

Direct feed with a single coax cable is not the best method; nevertheless, it works out quite well. Because of some reactance, the swr is sensitive to line length – a case of conjugate tuning. The resonant frequency of the elevated antenna can be quickly determined with an antenna noise bridge. A simple field-strength meter was used for front-to-back ratio and forward-gain adjustments. Current expert opinion[4] is not to lose any sleep if the swr can't be decreased to less than 2:1. The low-profile quad with loading coils and the three-wire version seem to be equally good; each has its merits.

references

1. John Tyskewicz, W1HXU, "Low Profile Three-Band Quad," *ham radio*, July, 1975, page 22.
2. John Tyskewicz, W1HXU, "The Low Profile Quad," *CQ*, February, 1974, page 24.
3. William I. Orr, W6SAI, "Broad Band Antenna Baluns," *ham radio*, June, 1968, page 6.
4. M. Walter Maxwell, W2DU, "Another Look at Reflections," *QST*, December, 1974, page 11.

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