By Andy Pfeiffer, K1KLO

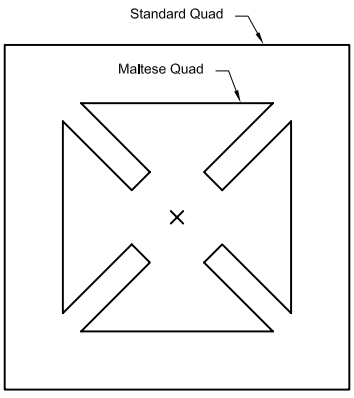
Update on the Pfeiffer Quad System

Andy Pfeiffer, K1KLO, loves small quads. After all, he's got seven of them at his house! He describes here his latest design—the Pfeiffer Maltese Quadruple Cross, a miniature 40-meter quad.

In the March 1994 *QST* I described in some detail how I'd managed to shrink the standard quad using linear loading techniques (see "The Pfeiffer Quad Antenna System," page 28). The object was to make a quad that was more manageable to maintain despite icing and high winds, even hurricanes. I called the resulting designs the "Maltese Quad" and the "Maltese Double-Cross Quad" because the perimeter of the radiating wires resembled a Maltese Cross. See Figures 1 and 2 (from the original article) showing the layout for these two unique element designs.

I mentioned in the original article that my next project was going to be a 40-meter version. Well, here it is: the *Pfeiffer Maltese Quadruple-Cross Quad*. Figure 3 is a photograph showing the 15-meter miniature Double Cross quad on one of my towers. I've been using this miniature antenna for several years now and the performance is very satisfying. The 40-meter version is similar in appearance, but with twice the number of spreaders.

Figure 1—The outer square represents the wire perimeter of a full-sized standard quad driven element. The inner configuration defines the wire perimeter of the driven element for the Maltese Cross quad. It's drawn to the same scale, but has a spreader diagonal only 56% the size of the standard quad element. For example, on the 12-meter band, the standard quad's diagonal spread is 14 feet 2 inches, while the Maltese Cross quad's diagonal spread is 8 feet. For a 40-meter element, the diagonal spread would be 49 feet for a standard quad, and 27 feet 8 inches for the Maltese Cross quad.



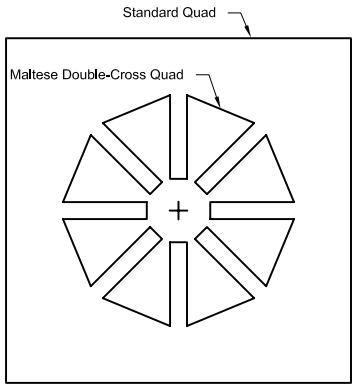


Figure 2—The perimeter wiring of the Maltese Double Cross quad on the inside, compared to a standard-sized quad driven element. Here the extra linear loading reduces the diagonal spread on 40 meter from 49 feet for the standard quad down to 20 feet 3 inches for the Maltese Double Cross.

Let's Look at the Special Spreaders

Like my previous *QST* article, this is not a blow-by-blow description of how to build the 40-meter version. I've got a well-equipped machine shop, and being retired, the time to really fuss over mechanical details. I really do make my antennas to stand up to the elements! This is an *idea article* and should give the dedicated experimenter enough information to get him or her going.

I feel at this point it is imperative that the reader be fully knowledgeable regarding the perimeter wiring of my three basic Maltese designs: the four-spreader Maltese Quad, the eight-spreader Maltese Double-Cross Quad and this new 16-spreader-per-element 40-meter Maltese Quadruple-Cross Quad.

Figure 4 (not drawn to scale) shows a complete four-spreader Maltese Quad driven element. (To maintain drawing clarity, the spreaders have been omitted, but are indicated by the dashed lines.) It shows the path of the 16 separate 14-gauge copper wires that form its perimeter.

The eight-spreader Maltese Double-Cross Quad would have 32 wires in its perimeter, and my 40-meter Maltese Quadruple-Cross Quad would have 64 separate perimeter wires.

Upon completing an element, check with an ohmmeter to be absolutely sure that there is continuity. An open element will not function as a closed loop.

Figure 5 shows the perimeter of a normal quad element. . . all for the same band. Part A shows the relative reduction of the four-spreader Maltese Quad, Part B that of the eight-spreader Maltese Double-Cross Quad and Part C the 16-spreader Maltese Quadruple-Cross Quad for the 40-meter band.

Figure 3—Photo of the Double Cross 15-meter quad at the top of one of K1KLO's towers, about 50 feet high.

Aluminum Tubing for Spreaders

I realized over the last few years since my earlier article in *QST* that one of the linear loading wires could

Table 1

Comparing Standard Quad and Quadruple Cross Quad
(Dimensions shown in feet)

Diameter Standard Quad	*Perimeter Standard Quad*	*Diameter Quadruple Cross*	*Perimeter Quadruple Cross*	*Percentage Difference*
49	139	14	243	75%

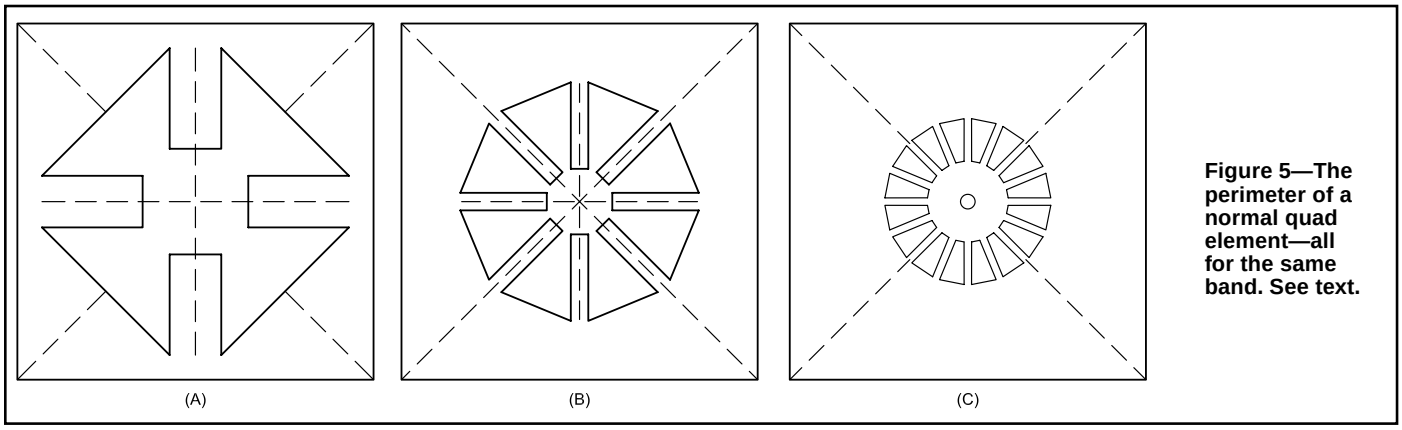


Figure 5—The perimeter of a normal quad element—all for the same band. See text.

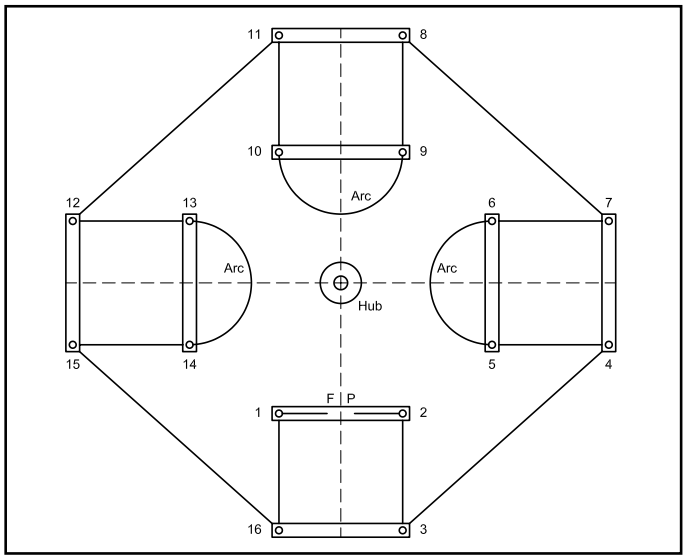


Figure 4—A complete four-spreader Maltese Quad driven element.

be replaced by aluminum tubing. This simplifies the mechanical structure by acting both as a spreader and as part of the linear loading system. Figure 8 shows details of the 40-meter Quadruple Cross driven element and reflector, including the gamma-match system. Note that this drawing is not drawn to scale to aid in clarifying the essential ideas behind the design.

Tuning the Quadruple Cross Quad

I used the wires that bridge the inner yardarm insulators (labeled "Arc" in Figure 8) to fine-tune the driven elements to the correct frequency using a grid-dip meter slaved to a frequency meter. In Figure 8 you will see two terminals labeled "FP" (for feed point). The opening in this "FP" wire is where I insert a half-turn loop for the grid-dip meter. The lengths of the "Arc" wires can be as small as 4 inches, up to a length of about 10 inches when it is formed into the shape of an arc. The total variation for all 16 spreaders is thus (10 – 4) ∞ 16 = 96 inches, more than enough for this job.

Feeding the 40-Meter Quadruple Cross Quad

I use gamma matches for my entire fleet of seven quads. The gamma capacitor needed for 40 meters was approximately 200 µF. The approximate 1:5 SWR bandwidth for the antenna was 200 kHz.

Conclusion

I've been using the Quadruple Cross quad on 40 meters since April 1997. I've made hundreds of contacts with it, including DX contacts with stations in the Caribbean, South America and the South Pacific. I made these contacts running a power output of about 75 W.

Most times people have commented that they rarely, if ever, have worked someone using a rotatable quad on 40 meters. When I tell them my antenna has a "wheel diameter" of only 14 feet they're really surprised and intrigued!

In closing, let me say that many radio amateurs in different parts of the world have built my Maltese series quads. They were determined to construct them after having worked me on the air and experiencing the quads' efficiency first hand. Their individual ingenuity, in design and choice of materials, was most evident in the photographs they mailed me along with their positive descriptions of the performance of these miniature directional quads.

Andrew (Andy) Pfeiffer, K1KLO, figures he's spent some 10 years since retirement developing the Maltese Cross series of small quads. At the age of 83, Andy continues to climb his many towers, mainly experimenting with various versions of the Maltese Cross. Through the years, his consuming interests in Amateur Radio have mainly involved antenna experimentation, design and construction. He jokingly confides that he doesn't "fiddle with computers, since they're the devil's own work." Although Andy is unable to answer written inquiries, he can be reached at 860-434-5621.

Figure 6—The author adjusting an earlier fiberglass version of his 40-meter Quadruple Cross. Center frequency was 7.2 MHz. The "wheel" diameter was only 14 feet. In contrast, a full-size 40-meter quad would require a diameter of 49 feet.

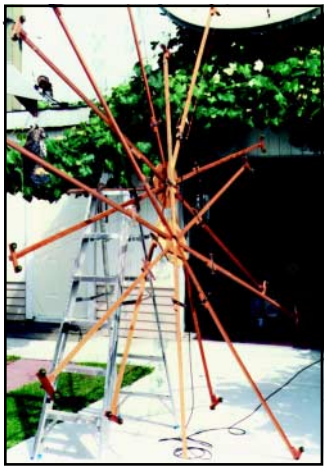


Figure 7—At left, a cedar version of the 20-meter Double Cross quad at VE7FJR just before it was installed. Above, Dave, VE7DWG, assembles the quad elements to the boom.

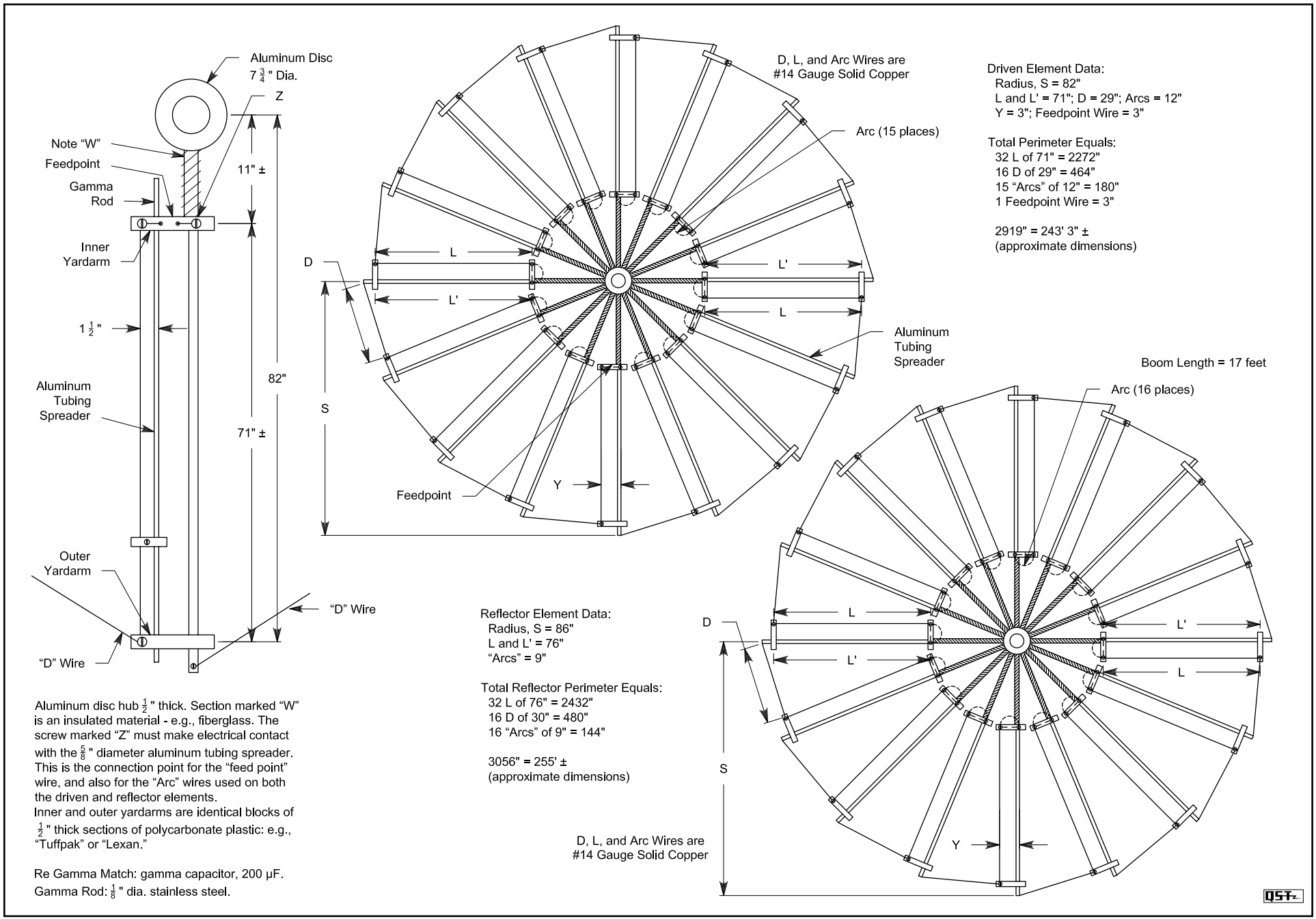


Figure 8—Details of the 40-meter Quadruple Cross quad driven element and reflector. These are not drawn to scale. Note how the aluminum spreaders now function not only as spreaders, but also as part of the linear loading system. #14 solid copper wires connect the aluminum spreaders to form the rest of the perimeter wires for the element.

FEEDBACK

◊ In “Update on the Pfeiffer Quad System,” Sep 2001 *QST*, the gamma capacitor referred to in Figure 8 should be 200 pF. In addition, the relative sizes of the three parts of Figure 5 are more accurately represented here.