Pfeiffer Maltese Quad Antenna System

For over ten years my interests and experimentation have been strictly associated with the Cubical Quad. In particular, I set out to correct its one great negative quality ...its inability to withstand violent wind and ice storms, a failure that most quad owners the world over have experienced ...the negative quality of self-destruction.

To those acquainted with the huge three-dimensional characteristics of the quad, the obvious solution to the problem is to reduce the size of each element, but at the same time retain the excellent positive qualities of the full- size quad, which has distinguished itself among its equals.

Reducing a normal size antenna, independent of type and configuration, is a simple matter, but to do this and still maintain the antenna's original efficiency comes down to choosing the proper course of action. Inserting loading coils, and/or capacitors, introduces losses which are unacceptable. I chose linear loading, and the system I have applied to the elements of my quads has accomplished a great size reduction without deterioration of the full size antenna performance.

The perimeter of my linear loaded quad resembles that of a Maltese cross, and thus came the birth of the "Pfeiffer Maltese Quad".

The outer square drawing, in Fig. 1, is the actual wire perimeter of a normal size quad driven element for the 12-meter band. Using the formula 250/fmc for one side of the square, and a centre frequency of24.940 mc, one side is 10 feet long. This translates to a spreader diagonal (point A to point B) of 14 feet for the normal quad.

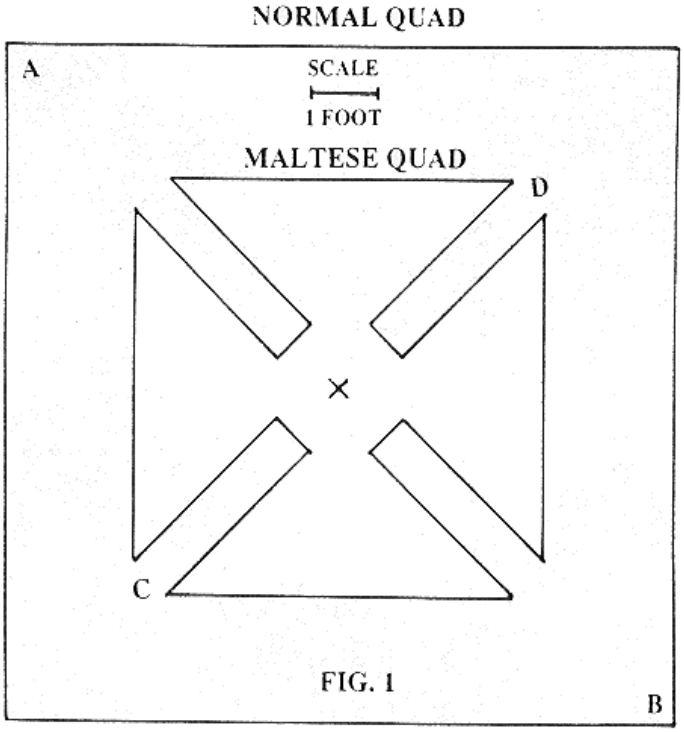

FIG. 1

The inner configuration is the actual perimeter of the Maltese quad. It is drawn to the same scale, and has a spreader diagonal, C to D, of only 8 feet. This indicates the respectable size reduction obtained by the linear loading method I have applied to the four quadrants of the Maltese quad. (The fibreglass spreaders have been omitted from Fig. I to maintain drawing clarity.)

Shortly after on the air testing of this 12 meter Maltese Quad, a second one was built for the 17 meter band, and has been equally effective as the 12 meter forerunner .

The excellent reports received during the testing period of my 12 and 17 meter 4 spreader Maltese Quads (see Figures I and 2) led me on to the 8 spreader Maltese Double-Cross, and the 16 spreader Maltese Quadruple-Cross Quads. Increasing the number of spreaders per element dramatically reduces the antenna size and the turning radius of the complete antenna (see Addendum, page 8).

From this point on in my text, now and then, I will be referring to a single normal quad element as a "wheel with four spokes" (four spreaders), attached to a centre "hub." The "rim" of this "four spoke wheel" is the wire perimeter, and the radiating element of the quad. The mechanical configuration of the Maltese quad, and its perimeter wiring, differ from that of the normal quad.

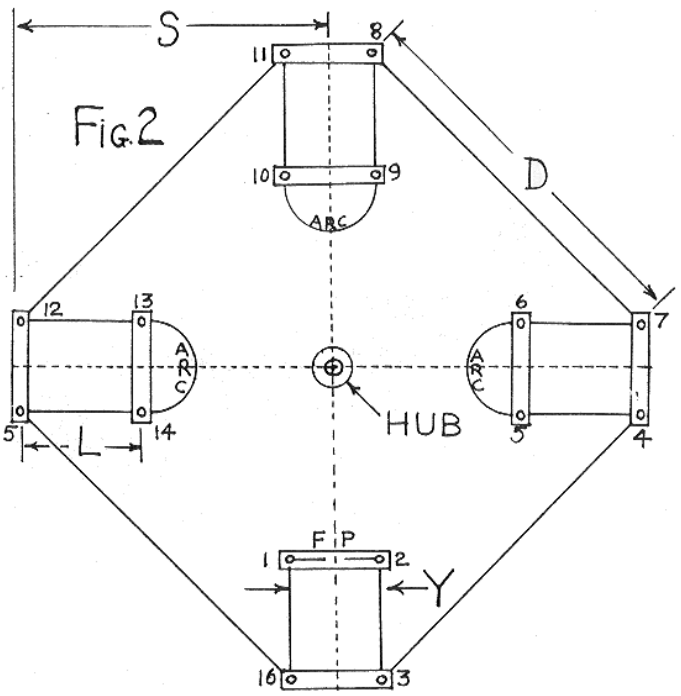

Fig. 2 (not drawn to scale) shows a complete four spreader Maltese quad driven element. (To maintain drawing clarity, the fibreglass spreaders have been omitted, but are indicated by the dotted lines.
Regarding the spreaders on all Maltese quads in this manuscript, it's a good idea to make them one to two inches longer than the "S" dimension. They may be cut after completion if desired.)

Sixteen separate solid copper wires form the perimeter of this 4 spreader Maltese quad. Their junction points are indicated by the numbered 8-32 stainless steel screws. *(The diameter of the wire used is an important factor! No.14 gauge solid copper wire is used on this, and on all the quads described in this manuscript/)*

Clamped to the outside tip of each spreader is a rectangular plastic block forming a *"T*" I refer to them as the "outer yard arms." A short distance up from the "hub" end of each spreader is an identical block. I refer to them as the "inner yard arms." These yard arms, which are fixed to the spreaders, may be individually moved for adjustment purposes. (The plastic material used is polycarbonate...e.g. Tuffak; Lexan.)

At the ends of all the yard arms are 8-32 stainless steel round-head screws. as mentioned above. These screws are 4 inches centre to centre. This four inch spacing determines the distance between the two. 2. parallel wires either side of the spreaders. as indicated by dimension "Y... ***(This 4 inch spacing is identical on all "yard arms" on all Maltese series quads which appear in this manuscript!)***

The inner yard arm identified by the letters "F P" is the driven element feed point for my gamma match network. (I use the gamma match on all my Maltese series quads.) The opening in this "F P" wire between numbers 1 & 2 is where I measure the resonant frequency of the driven element. Inserted in a half turn loop between 1 and 2 is a sensing coil of a grid-dip-meter which is used in con junction with a frequency counter.

The perimeter wiring of the 4 spreader Maltese quad driven element, shown in Fig. 2, is the "path" or "course" from numbers 1 through 16!

The 3 wires shown between numbers 5 and 6,9 and 10, and 13 and 14, are identified by the word "ARC" and are used to adjust the perimeter to desired frequency .Their lengths can be a minimum of 4 inches each, to a maximum of 10 inches, or more, formed as an arc. This allows an 18 inch adjustment range in the total perimeter.

The total perimeter for the driven element in Fig. 2 is equal to the sum of 4 times D, plus 8 times L, plus 3 ARCs, plus the 4 inch wire at "F p ."

The reflector perimeter will be 5% longer ...*00 feed point wire at F p is necessary,* therefore, there will be 4 ARCs extending the perimeter adjustment range of the reflector to 24 inches!

This project has been a rather exciting one for me and, like the proverbial.. "not being able to let go of the tiger's tail"...I proceeded to design and build a second type Maltese linear loaded quad, modified so that it would further reduce the size of the normal quad. Because of its formidable size I selected the 20 meter band for this modification.

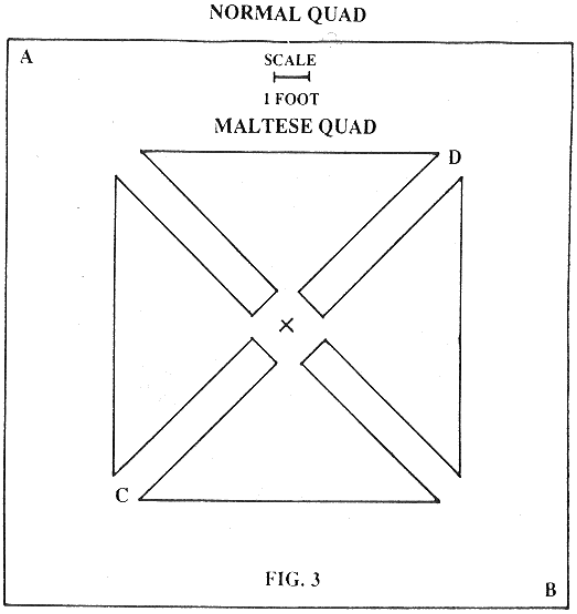

FIG. 3

Fig. 3 shows the square perimeter wiring of the normal quad driven element. Once more using the formula 250/finc for one side. and a centre frequency of 14.175 mc. one side is about 18 feet long. This translates to a spreader diagonal. A to B. of about 25 feet. The inner drawing. the Maltese Quad. drawn to the same scale. has a spreader diagonal of 14 feet. A fair size reduction.

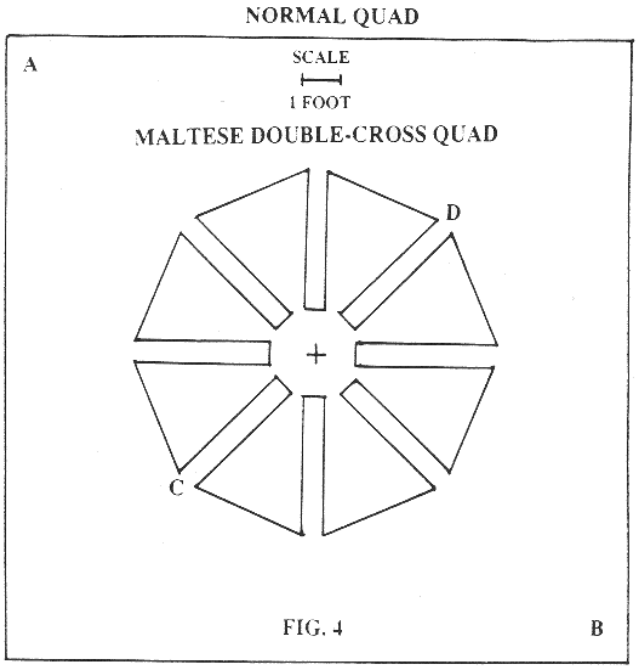

Fig. 4 shows the outer square perimeter of the normal 20 meter quad driven element identical to that in Fig. 3, a "four spoke wheel" with a diameter of about 25 feet. Inside this "wheel" is the drawing of a second "wheel" with "eight spokes," eight spreaders. This configuration I call the Pfeiffer Maltese Double-Cross Quad. The diameter of this inner "wheel" is only 10 feet!! This further reduction in size is quite respectable. (Spreaders have been omitted from Fig. 3 and Fig. 4 to maintain drawing clarity.)

The Maltese Double-Cross Quad for the 20 meter band has been in service since 1993, and its performance record has been consistent with those of the 12 and 17 meter Maltese Quads. It is a real pleasure for one person to assemble a two-element 20 meter quad, attach its boom and mast, and then easily carry this complete assembly to its tower location. A second Maltese Double-Cross Quad for the 15 meter band was built and went into operation in 1994.

At this time I concluded from the success of the eight spreader, "eight spoke wheel" 20 meter quad, that one built for the 40 meter band would be most interesting!

A normal 40 meter quad would translate to a "wheel" about 49 feet in diameter; my Maltese Double-Cross Quad would produce a 40 meter quad "wheel" with a diameter of only 19 feet or so.

The years vaulted to 1997. In the interim I built quads to fill the voids in the HF spectrum that I had neglected. In February of '97 I once more grabbed the ever-thrashing tiger's tail. I by-passed the project of an eight spreader, "eight spoke wheel," for the 40 meter band, and went for a third linear loaded Maltese quad modification.

I launched, and I do mean launched, a sixteen spreader, "sixteen spoke wheel," for the 40 meter band. The "ways" were greased with several months of design, experimentation, and construction, ending with a two element 40 meter quad with a "wheel" diameter of only 14 feet!

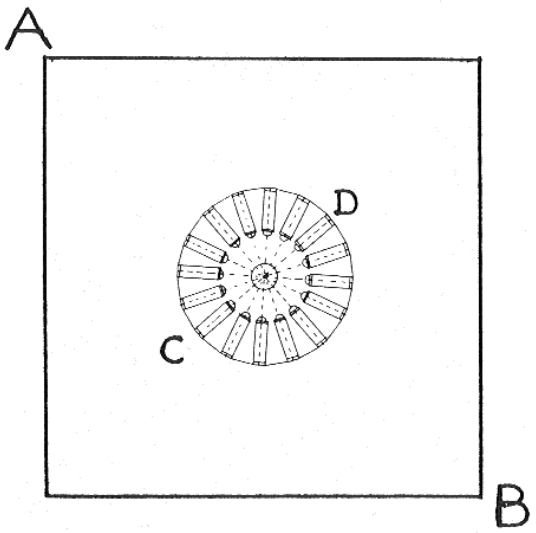

Fig. 5

The square represents the size of a normal quad driven element for the 40 meter band. Its diagonal, A to B, is 49 feet. Centred in the square, drawn to the same scale, is the drawing of the Pfeiffer Maltese Quadruple-Cross Quad with its diagonal, C to D, of 14 feet!

This new addition to my quad fleet I christened the Maltese Quadruple-Cross Quad, and its initial on-the-air tests began in April 1997.

It takes months to obtain a meaningful evaluation of an antenna's performance. Entering into this equation is not only the time of day that a particular QSO is made, its distance from one's location, but also the multitude of propagation variables!

As of this writing. August 1997. several hundred contacts have been made throughout the United States and Canada. DX contacts were made with stations in the Caribbean. and South America...also Australia! All these contacts were conducted running a power of about 75 watts.

Regarding the front to back ratio, forward gain, and the side rejection of this 40 meter diminutive quad, the reports have been excellent. The interest has been great!

You will not find many rotatable quads on this band! You certainly will not find any that have a "wheel" diameter of only 14 feet! ...and which exhibit the performance and efficiency of a full size two element quad.

Prior to the Maltese, I used home-made three element monoband yagis. They have all been replaced for the following reasons:

- The quad is a quiet antenna in regard to reception. A closed loop is far quieter than the yagi which "spits" off its electrostatic charges from its element ends.
- The quad operates highly efficiently at a much lower height than that necessary for the yagi
- The bands open up earlier, and stay open longer: Quad vs. Yagi.

Not having access to an antenna range, the following conclusions regarding the performance of the "Maltese Quad" vs the standard, normal quad antenna have been drawn through on-the-air QSOs. One of the *most* valuable

series of these were those with Joseph J. Belson. K2ANR. of Riverhead. Long Island. New York; his QTH some 60 miles from mine. here in Old Lyme. Connecticut

Both of us, through the years, have realized the importance of a superior antenna system, and we both "graduated," so to speak, at the same time we both changed our direction of antenna experimenting from yagis to quads. Joe used the normal quad, I used my linear loaded Maltese configuration. We ran the same power, approximately 100 watts.

Over several years, we conducted many many three way QSO comparison tests. All distances...all compass points...all continents. The results were that the two quads were equal in performance; that is, front to back ratio, forward gain. and side rejection. Joe's quads were mounted a good deal higher than mine. but height above ground did not seem to matter .I used the diamond orientation for my Maltese four spreader. 'four spoke' quads, their lowest point being one half wavelength or less above ground.

In summing up this venture into Lilliputian Antenna Land, my goal has been reached. My Maltese, my Double-Cross, and Quadruple-Cross quads have most definitely reduced the unwieldy size of the normal quad antenna. I can say without hesitation, that my linear loading system has not degraded the efficiency, nor any of the other favorable characteristics, of the normal quad, an antenna with a very low Q...a most forgiving antenna. Due to the reduction in size and their extremely rugged structure, they have stood up, without flinching, to the violent storms which have visited this QTH.

This project has been well worth the great amount of time and energy spent in their evolution,

As has been the case in my past antenna experiments, I would not have been able to see this project through to its conclusion without the invaluable aid of my wife, Marianne, who through the years has weathered the brain-storms of K1KLO.

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U.S.A.

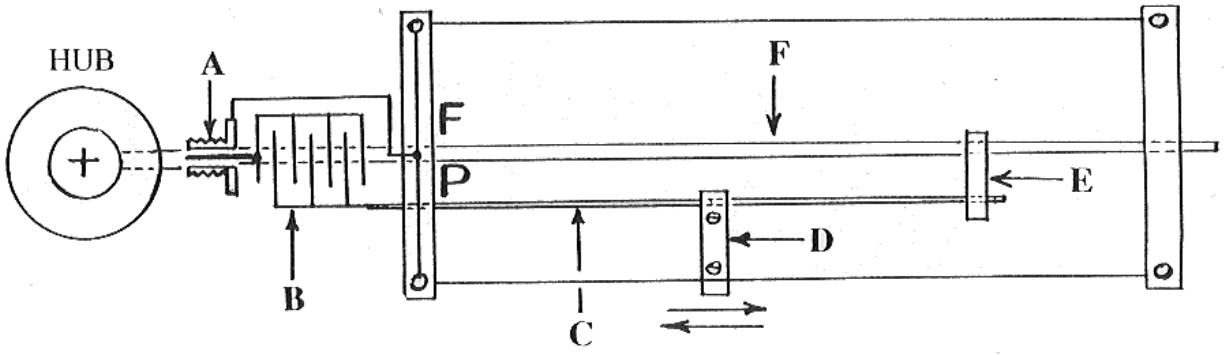
Maltese Quad Additional Information

Frequency in megacycles	Diameter Normal Quad	Perimeter Normal Quad	Spreader 'Spokes" on Maltese	Diameter Maltese Quad	Perimeter Maltese Quad	Perimeter Increase Maltese over Normal Quad
7.200 mc	49'	139'	16 A	14'	243'	75%
14.200 mc	25'	70' 6"	8 F	10' 6"	94'	33%
18.118 mc	19' 8"	55' 2"	4 F	10' 6"	67'	21%
21.250 mc	16' 8"	47'	8 F	7'	61'	30%
24.940	14' 2"	40'	4 F	7' 3"	47' 3"	18%
24.940	14' 2"	40'	8 F	5' 7"	54'	33%
28.5	12' 5"	35'	4 A	6' 10"	41'	17%
50.150 mc	7'	20'	8 F	3' 2"	24' 2"	21%

ABOVE DIMENSIONS ARE APPROXIMATE; A = AUJMINUM SPREADERS, F = FIBERGLAS SPREADERS

You will notice that the linear loading method I use in the Maltese quad series antennae requires a substantial increase in the length of the total perimeter wiring as compared to that needed in the normal quad perimeter in order to reach a full wave length measured resonant frequency. This stresses the importance, as I mentioned earlier in this manuscript, to accurately measure the resonant frequency of the driven element after it has been completed.

Fig. 6



MALTESE GAMMA MATCH CONSTRUCTION

The above assembly assumes a vertical position, pointing down (refer to Fig. 2).

- A -S0-239 Coax Connector
- B- Variable Capacitor
- C-Gamma Rod
- D -Gamma Rod Adjustment Bar
- E -Gamma Rod Support
- F -Fiberglas Spreader

(The spacing between Gamma Rod C and Quad Perimeter wire is 1 to 1.5 inches. Not critical.)

The value of Variable Capacitor B varies per band. **It** may be found in any antenna handbook in the section relating to feed systems for Yagi and Quad antennae.

ADDENDUM

The past several years have been spent modifying the mechanical design of the Maltese Quads, simplifying both construction and ease in the adjustment procedure for establishing driven element resonance.

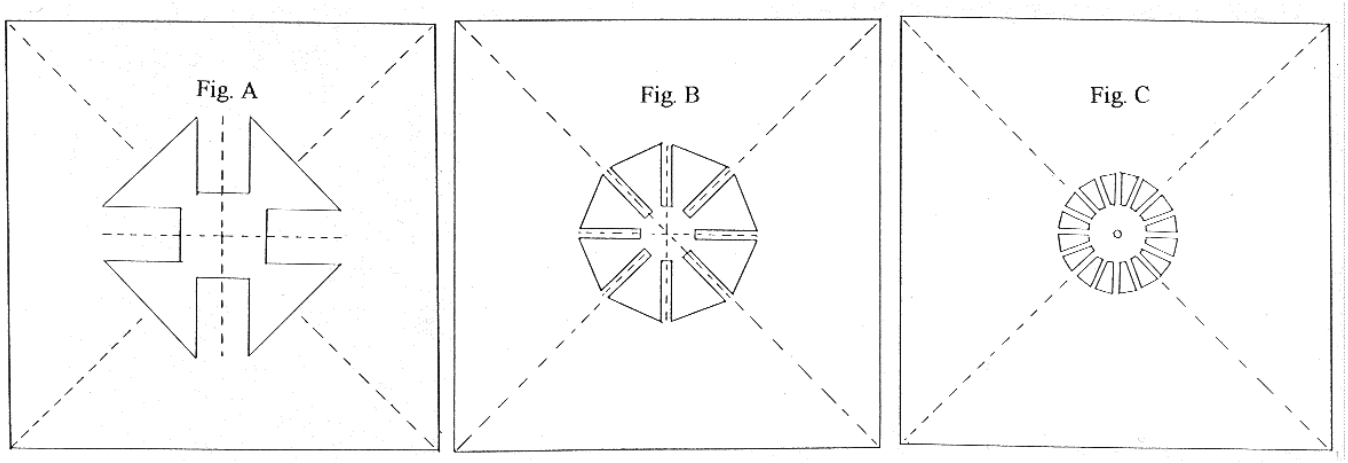
A recent major change came about upon my realization that one of the two linear loading wires parallel to, and either side of each Fiberglas spreader, could be replaced by aluminium tubing, and thereby act as both spreader and the second linear loading wire.

Exhaustive on the air experimentation has proved that this radical mechanical design change has not diminished in any way the excellent performance and efficiency of the Fiberglas spreader Maltese Quads. Aluminium tubing is easy to obtain, and its mechanical qualities exceed that of other materials one might choose for quad spreaders.

Of my seven quads that are presently in, and "on the air", the 40 meter, 12 meter, and 10 meter quads use aluminium tubing there are two drawings of the 12 meter quad Figure II, that of my origina14 spreader Maltese Quad with Fiberglas spreaders, and figure 12, the 8 spreader Maltese Double-Cross Quad with aluminium spreaders.

Since the aluminium tubing spreaders are part of the wire perimeter of each quad element, they must be electrically separated from each other where they are fastened to the "HUB". Fig. 7, Page 9, that of the 40 meter Maltese Quadruple-Cross Quad, shows in great detail this aluminium spreader transition.

Bear in mind that there are 16 separate wires which make up the perimeter of each 4 spreader Maltese element, 32 wires in the 8 spreader Maltese Double-Cross, and 64 wires in the Maltese Quadruple-Cross Quad! Check with an ohmmeter to be absolutely sure that there is continuity! An open element will not function as a closed loop! Obviously, this applies to all the Maltese Quads.

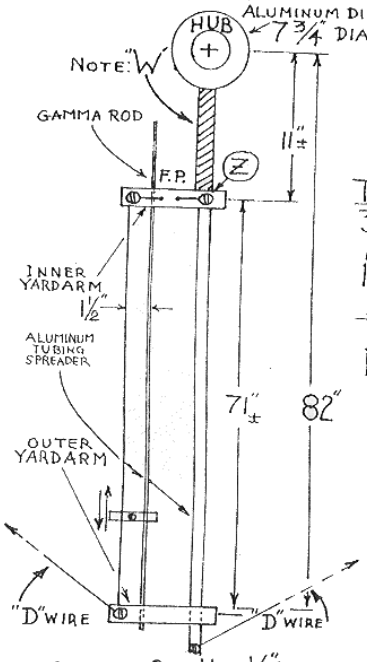


The three squares above show the perimeter wiring of a single, normal quad element. (The dotted lines indicate the spreader locations and these three squares are for the same band.) Fig. A shows the relative reduction size of a 4 spreader Maltese Quad, Fig. B, the relative reduction size of the 8 spreader Maltese Double-Cross Quad, and Fig. C, that of the 16 spreader Maltese Quadruple-Cross Quad

"MALTESE QUADRUPLE-CROSS QUAD"

40 METER, CENTER FREQ. 7.200 mc, 16 SPREADERS PER ELEMENT.
SPREADERS ARE 6061T6 ALLOY ALUMINUM TUBING.
5/8" DIA X .058" WALL
[THEY ARE ACTUAL SECTIONS OF THE WIRING PERIMETER.]

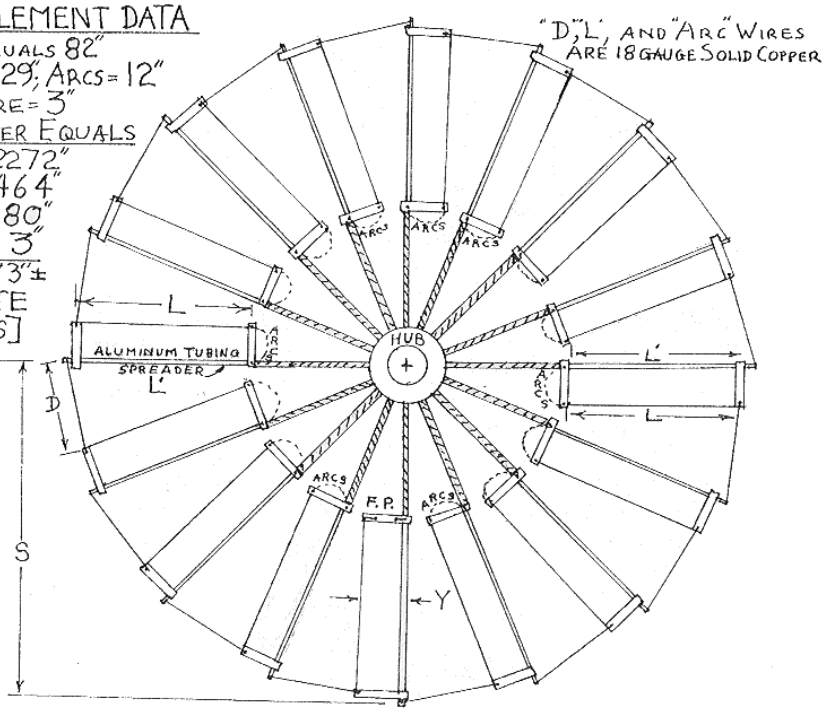
FIG. 7



ALUMINUM DISC HUB ½" THICK.
SECTION MARKED: "W"; SOLID, ¾ DIA. INSULATED ROD.
SCREW, IN INNER YARDARM, MARKED ②,
MUST MAKE ELECTRICAL CONTACT WITH ALUMINUM TUBING SPREADER!! IT IS THE CONNECTION POINT FOR THE "F. P." WIRE, AND ALSO FOR CONNECTION POINT FOR THE "ARC" WIRES USED ON BOTH DRIVEN & REFLECTOR ELEMENTS!!!
INNER & OUTER YARDARMS ARE IDENTICAL BLOCKS OF POLYCARBONATE PLASTIC: EG. "TUFFAK" OR "LEXAN". THEY ARE ½" THICK SECTIONS.
RE: GAMMA MATCH; GAMMA CAPACITOR, 200 μμfd. GAMMA ROD: ⅛" DIA. STAINLESS STEEL. [AS IN ALL THESE QUAD DRAWINGS REFER TO FIG 2, FIG. 6, AND "ADDENDUM," "THE PFEIFFER QUAD ANTENNA SYSTEM" 2ND. EDITION.]

DRIVEN ELEMENT DATA

RADIUS, "S" EQUALS 82"
L & L' = 71"; D = 29"; ARCS = 12"
Y = 3"; F.P. WIRE = 3"
TOTAL PERIMETER EQUALS
32 L of 71" = 2272"
16 D of 29" = 464"
15 ARCS of 12" = 180"
1 F.P. WIRE = 3"
2919" = 243'3" ±
[APPROXIMATE DIMENSIONS]

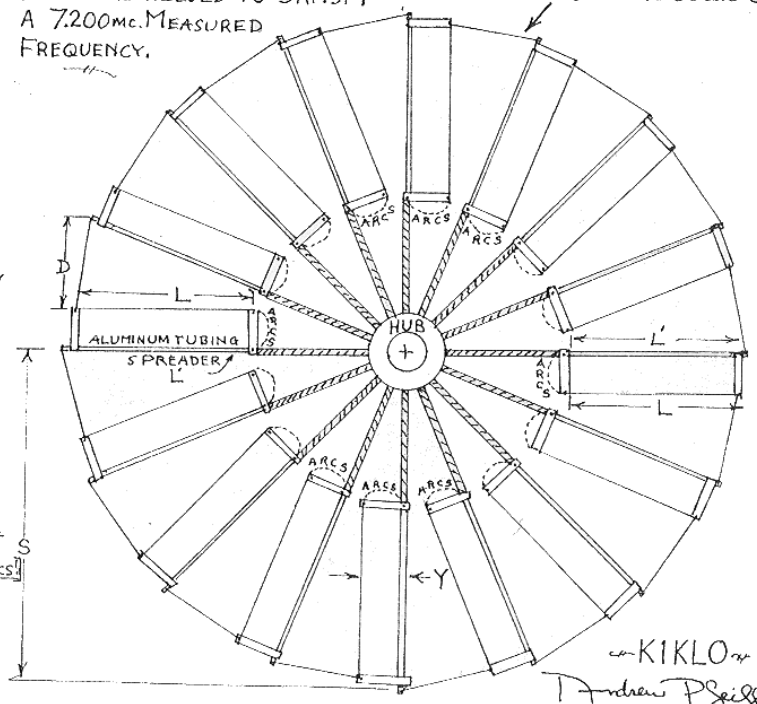


"DRAWINGS NOT TO SCALE"

PERIMETER OF NORMAL QUAD DRIVEN ELEMENT IS 139'±. THE MALTESE QUADRUPLE-CROSS A PERIMETER OF 243'. AN INCREASE OF 75% MORE WIRE NEEDED TO SATISFY A 7.200 mc. MEASURED FREQUENCY.

BOOM LENGTH 17 FEET.

"D", "L" + "ARC" WIRES ARE 18 GUAGE SOLID COPPER.



REFLECTOR ELEMENT DATA

RADIUS, "S", EQUALS: 86"
L & L' = 76"; D = 30"; ARCS = 9"
TOTAL REFLECTOR PERIMETER EQUALS
32 L of 76" = 2432"
16 D of 30" = 480"
16 ARCS of 9" = 144"
3056" = 255'

[THERE IS NO F.P. WIRE ON REFLECTOR ELEMENT! THEREFOR THERE ARE 16 ARCS!]

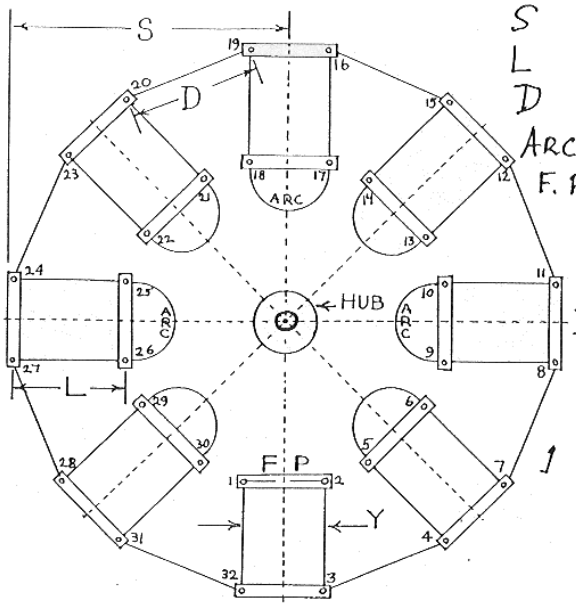
[APPROXIMATE BANDWIDTH 200KC]

—K1KLO

Andrew P. Pfeiffer
APRIL 1997

PFEIFFER MALTESE DOUBLE-CROSS QUAD
20 METER BAND - CENTER FREQ. 14.175 MC
DRIVEN ELEMENT : APPROXIMATE DIMENSIONS

Fig. 8

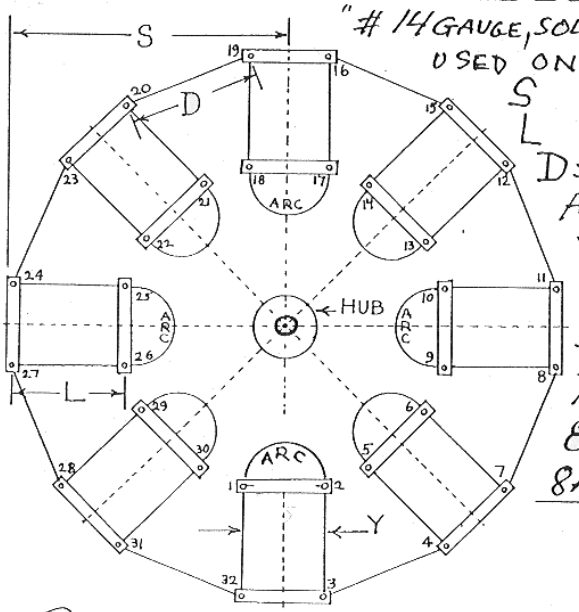


"DRIVEN ELEMENT"
S = 63"
L = 44 5/16"
D = 42 1/2"
ARC = 10 1/2"
F. P. WIRE = 6"
Y = 6"⊗

NOTE: ↓
"SPREADERS ARE INDICATED BY DOTTED LINES,"
AND ARE FIBERGLAS TUBING
↓

TOTAL WIRE PERIMETER:
16 L = 709"
8 D = 340"
7 ARCS = 73 1/2"
1 F. P. WIRE = 6"
1128.5" = 94'

"REFLECTOR ELEMENT"



"#14 GAUGE, SOLID COPPER WIRE USED ON BOTH ELEMENTS"
S = 64"
L = 44 1/2"
D = 43 1/4"
ARCS = 10"
Y = 6"⊗

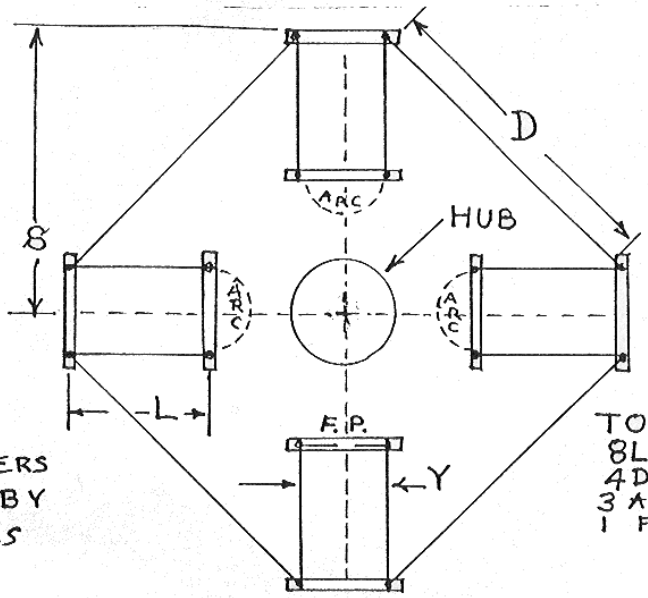
TOTAL WIRE PERIMETER
16 L = 728'
8 D = 346"
8 ARCS = 80"
1154" = 96'2"

BOOM LENGTH: 118 / FREQ. M.C.
118/14.175 MC = 8'4"

⊗ THIS IS AN EARLY MODEL! ALL YARD ARMS ARE NOW 4" LONG ↓

↓ FOR DETAILS REFER TO: Fig. 2, PAGE 2. ↓

PFEIFFER MALTESE QUAD
17 METER BAND - CENTER FREQ. 18.118 MC
DRIVEN ELEMENT : APPROXIMATE DIMENSIONS



S = 63"
L = 53¼"
D = 85¾"
ARC = 10"
Y = 4"
F.P. WIRE = 4"

-H Fig. 9 H-

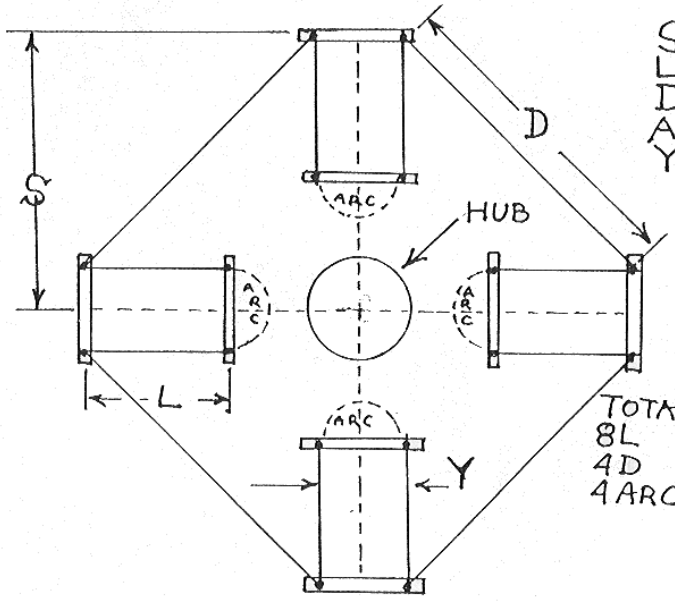
NOTE:
FIBERGLAS SPREADERS ARE INDICATED BY DOTTED LINES

TOTAL WIRE PERIMETER:
8L = 426"
4D = 343"
3 ARC = 30"
1 F.P. WIRE = 4"
803" = 67 FEET ±

BOOM LENGTH: 118 / FREQ. MC
118 / 18.118 MC = 6'6"

"REFLECTOR ELEMENT"

14 GAUGE SOLID COPPER WIRE USED ON BOTH ELEMENTS



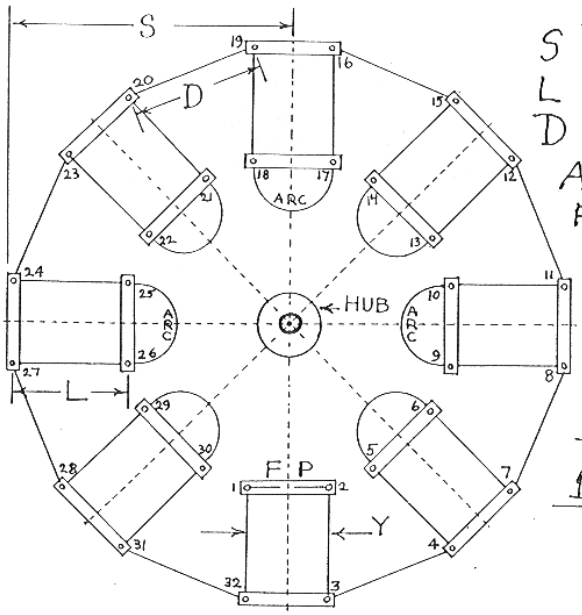
S = 64"
L = 55½"
D = 89"
ARC = 10"
Y = 4"

TOTAL WIRE PERIMETER:
8L = 444"
4D = 356"
4 ARC = 40"
840" = 70 FEET

-H FOR DETAILS REFER TO FIG. 2, PAGE 2 H-

PFEIFFER MALTESE DOUBLE-CROSS QUAD
15 METER BAND - CENTER FREQ. 21.250 MC
DRIVEN ELEMENT : APPROXIMATE DIMENSIONS

FIG. 10

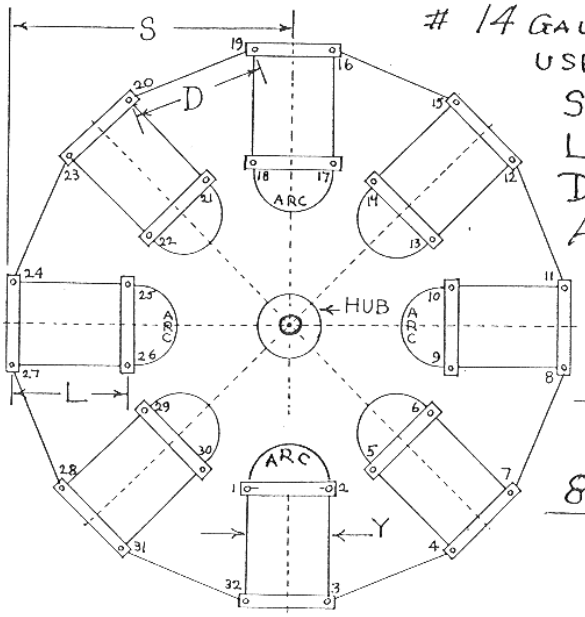


NOTE: V
"SPREADERS ARE INDICATED BY DOTTED LINES," AND ARE OF FIBERGLAS
-H-

DRIVEN ELEMENT
S = 41 3/4"
L = 27 5/8'
D = 26 1/8'
ARC = 10 1/2"
F. P. WIRE = 6"
Y = 6" ⊗

TOTAL WIRE PERIMETER
16 L = 442"
8 D = 209"
7 ARC'S = 73 1/2"
1 F. P. WIRE = 6"
730.5" = 60' 10 1/2"

REFLECTOR ELEMENT



14 GAUGE, SOLID COPPER WIRE USED ON BOTH ELEMENTS

S = 43 3/4"
L = 28 7/8"
D = 27 1/2"
ARC'S = 10"
Y = 6" ⊗

TOTAL WIRE PERIMETER
16 L = 462"
8 D = 220'
8 ARC'S = 80"
762" = 63' 6"

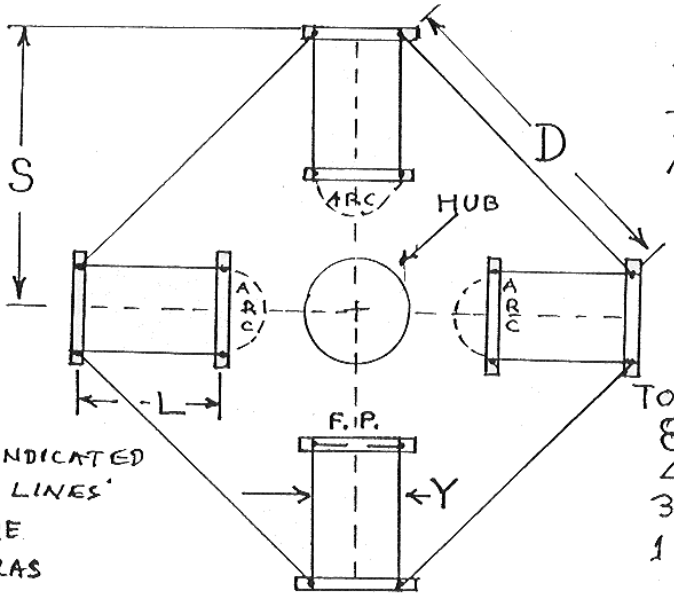
BOOM LENGTH: 118/FREQ. M. C.
118/21.250 MC = 5' 7"

⊗ THIS IS AN EARLY MODEL! ALL YARD ARMS ARE NOW 4" LONG "H

-H- FOR DETAILS REFER TO: FIG 2, PAGE 2 -H-

PFEIFFER MALTESE QUAD
12 METER BAND - CENTER FREQ. 24.940 MC
DRIVEN ELEMENT : APPROXIMATE DIMENSIONS

FIG. 11



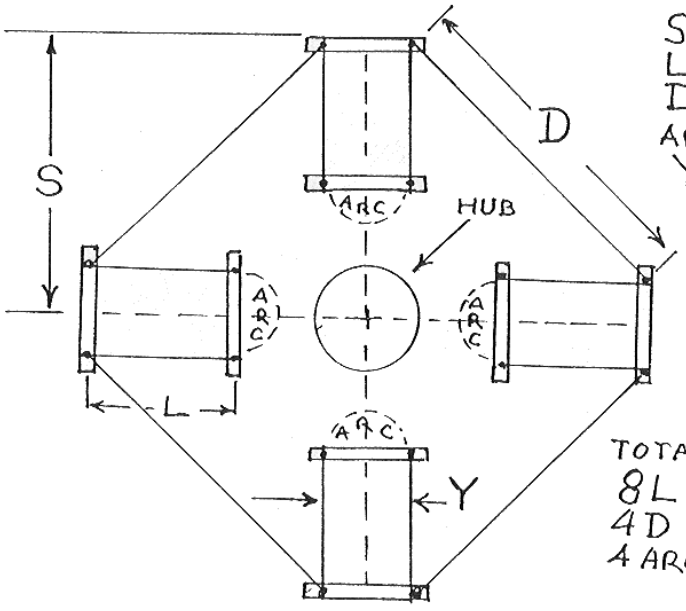
S = 43 3/4"
L = 38"
D = 58 3/4"
ARC = 7 7/8"
Y = 4"
F. P. WIRE = 4"

NOTE # "SPREADERS ARE INDICATED BY DOTTED LINES" AND ARE OF FIBERGLAS

TOTAL WIRE PERIMETER:
8L = 304"
4D = 235"
3 ARC's = 23 5/8"
1 F.P. WIRE = 4"
566.625" = 47'3" ±

BOOM LENGTH: 118/freq. m.c.
118/24.940 mc = 4'9"

"REFLECTOR ELEMENT" # 14 GAUGE, SOLID COPPER WIRE USED ON BOTH ELEMENTS #



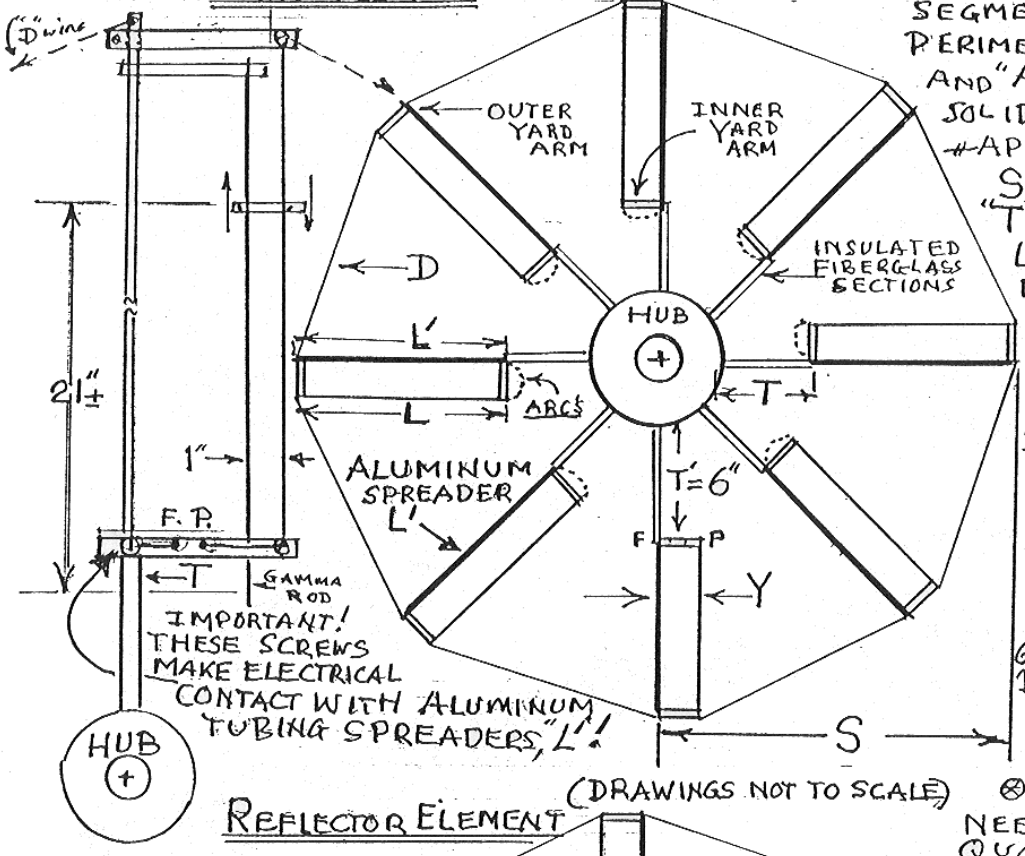
S = 45 1/4"
L = 39 3/4"
D = 60 3/4"
ARC = 8 1/2"
Y = 4"

TOTAL WIRE PERIMETER:
8L = 318"
4D = 243"
4 ARC's = 34"
595" = 49'7"

FOR DETAILS REFER TO FIG. 2, PAGE 2

24.940 MC. 12 METER, MALTESE DOUBLE-CROSS QUAD:
(CENTER FREQUENCY) [8 SPREADER PER ELEMENT: ALL SPREADERS 3/8" DIA ALUMINUM TUBING, WHICH ARE ACTUAL SEGMENTS OF THE WIRING PERIMETER: WIRES MARKED "D" AND "ARCS" ARE 14 GAGE SOLID COPPER WIRE]

FIG. 12



(DRAWINGS NOT TO SCALE)

APPROXIMATE DIMENSIONS:

S = 33½". HUB DIA. 4"
"T" SECTIONS 3½". Y = 4"
L = L' = 26½"
F.P.L = 24¼"
D = 21 1/16"
F.P. WIRE = 4"
6 ARCS of 8" EACH
1 ARC of 5"

TOTAL DRIVEN ELEMENT PERIMETER EQUAL

14 L, L' = 371"
2 F.P.L = 48½"
8 D = 171.5"
1 F.P. WIRE = 4"
6 ARCS of 8" = 48"
1 ARC of 5" = 5"

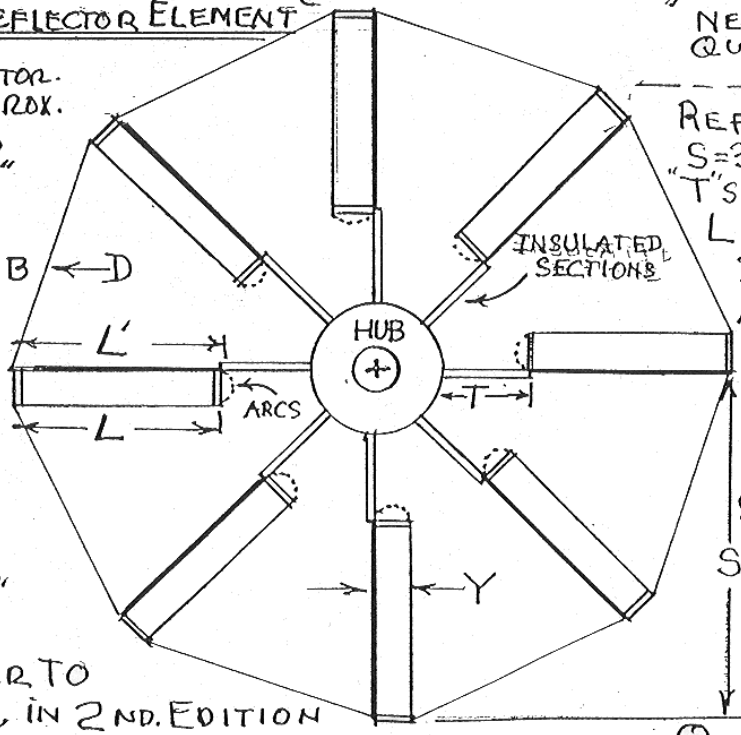
648"
OR, 54 feet ⊗

⊗ 35% MORE WIRE NEEDED THAN NORMAL QUAD PERIMETER OF 40'

GAMMA CAPACITOR.
50 μμfd; APPROX.
30 μμfd USED

SEE NOTE: "W," FIG. 7, FOR SPREADER HUB DETAILS.

REFLECTOR ELEMENT



REFLECTOR DATA:

S = 35" ±
"T" SECTIONS: 3½". Y = 4"
L = L' = 28½"
D = 22½"
ARCS = 5¼"

TOTAL REFLECTOR PERIMETER

16 X "L" = 456"
8 X D = 180"
8 ARCS = 42"
678", OR 56'6"

BOOM LENGTH:
118 / 1 mc = 4'9"

NOTE: REFER TO FIGS 2 & 6, IN 2ND. EDITION OF: "PFEIFFER QUAD ANTENNA SYSTEM" MANUSCRIPT

FIG 12,

OCT. 10TH 1999

/s/ Jim Pfeiffer
+ K1KLO

MALTESE QUAD
10 METER BAND – 28.500 MC
(ALUMINUM TUBING 3/8" DIA. .058" WALL SPREADERS.)
DRIVEN ELEMENT
NOT TO SCALE

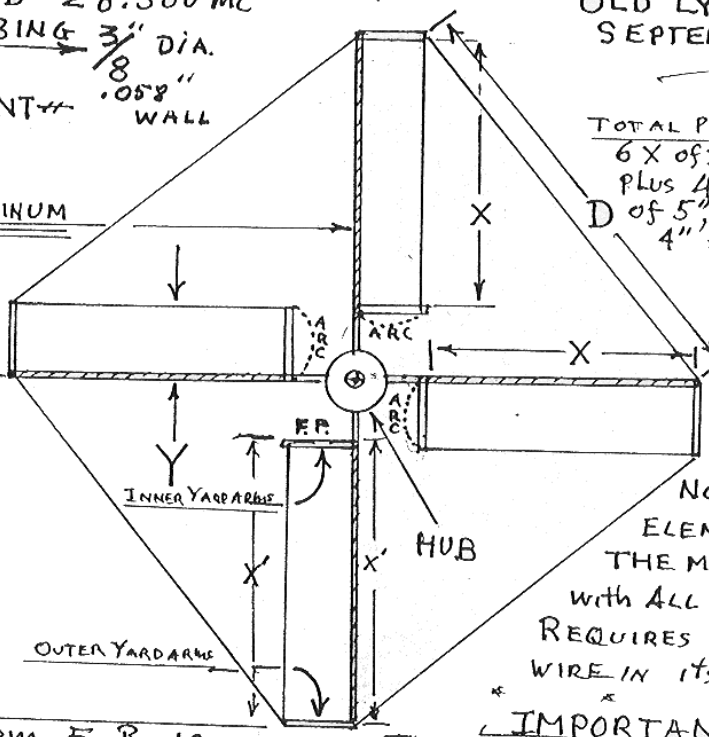
Fig. 13

ANDREW PFEIFFER
OLD LYME, CT. 06371
SEPTEMBER 10TH 1998

TOTAL PERIMETER EQUALS:
6 X of 33½", plus 2 X of 30", PLUS 4 D of 5", plus 1 F. P. WIRE OF 4" = 492", OR 41 FEET.

ALL SPREADERS ALUMINUM

NOTE
GAMMA ROD: 13" ±
GAMMA CAP. 30 Mfd ±
GAMMA Rod Spacing. 1¼" ±
SEE FIG 6, 2nd Edition MANUSCRIPT FOR GAMMA MATCH DETAILS.



(Y = 4")
(S = 41")

NOTE:
NORMAL QUAD DRIVEN ELEMENT PERIMETER = 35' ±.
THE MALTESE DRIVEN ELEMENT, with ALL ALUMINUM SPREADERS, REQUIRES ABOUT 17% MORE WIRE IN ITS PERIMETER!

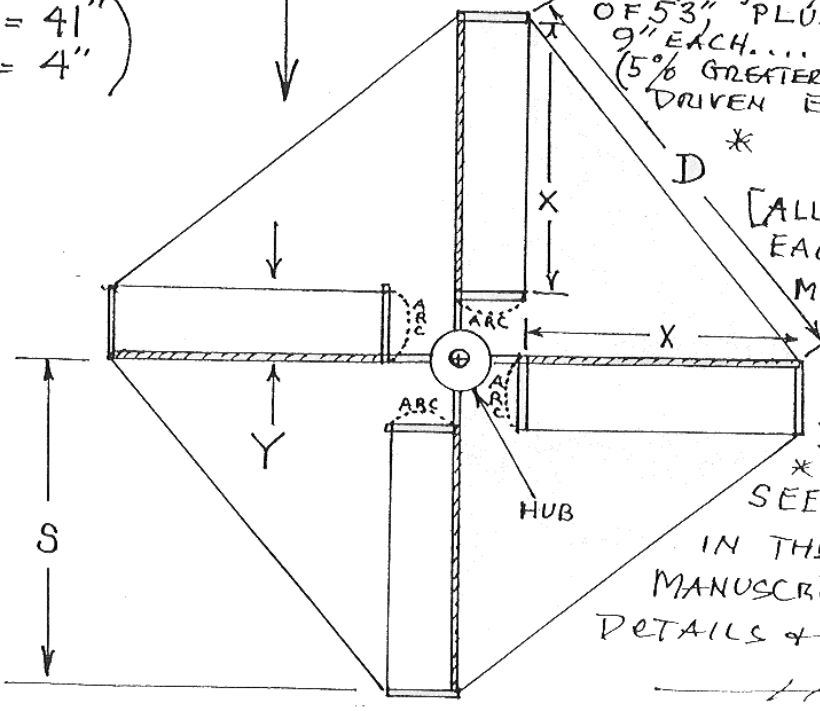
(AT INNER YARD ARM, F. P., IS THE FEED POINT FOR THE GAMMA MATCH)

IMPORTANT NOTE !!!!
THE HUB MUST BE MADE OF BAKELITE, MICARTA, HARD WOOD, OR OTHER SIMILAR MATERIAL IN ORDER TO ELECTRICALLY INSULATE THE ALUMINUM SPREADERS FROM EACH OTHER XXXX

REFLECTOR ELEMENT
BOOM LENGTH $\frac{118}{f\,mc}$ = 42"
XXXX SEE NOTE "W" ON Fig. 7, FOR SPREADER HUB DETAI

(S = 41")
(Y = 4")

TOTAL PERIMETER EQUALS:
8 X "X" of 33½", PLUS 4 X D OF 53", PLUS 4 "ARCS" OF 9" EACH.... 516", OR 43 FEET.
(5% GREATER PERIMETER THAN DRIVEN ELEMENT.



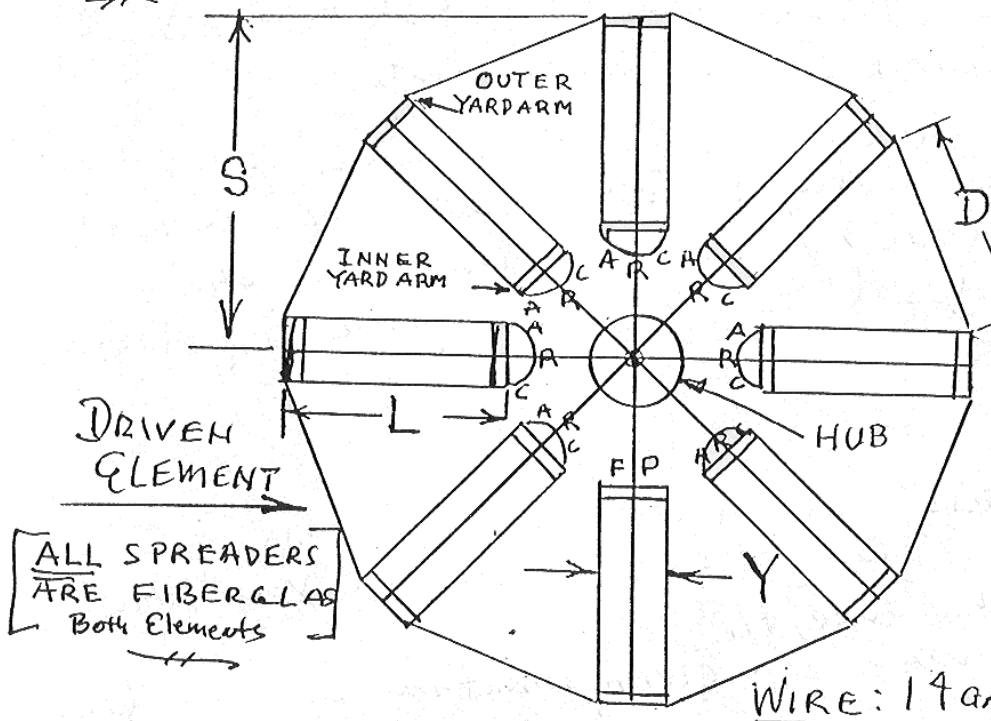
[ALL 8 YARD ARMS, IN EACH ELEMENT, ARE MADE OF POLYCARBONATE, eg., LEXAN, OR TUFFAK, OR SIMILAR "HIGH IMPACT" PLASTIC.]

SEE FIG. 2, PAGE 2, IN THE 2ND EDITION MANUSCRIPT FOR FURTHER DETAILS & DATA!

MALTESE DOUBLE-CROSS QUAD

FIG: 14 [6 METER] 50.15mc

Oct 30th 1997



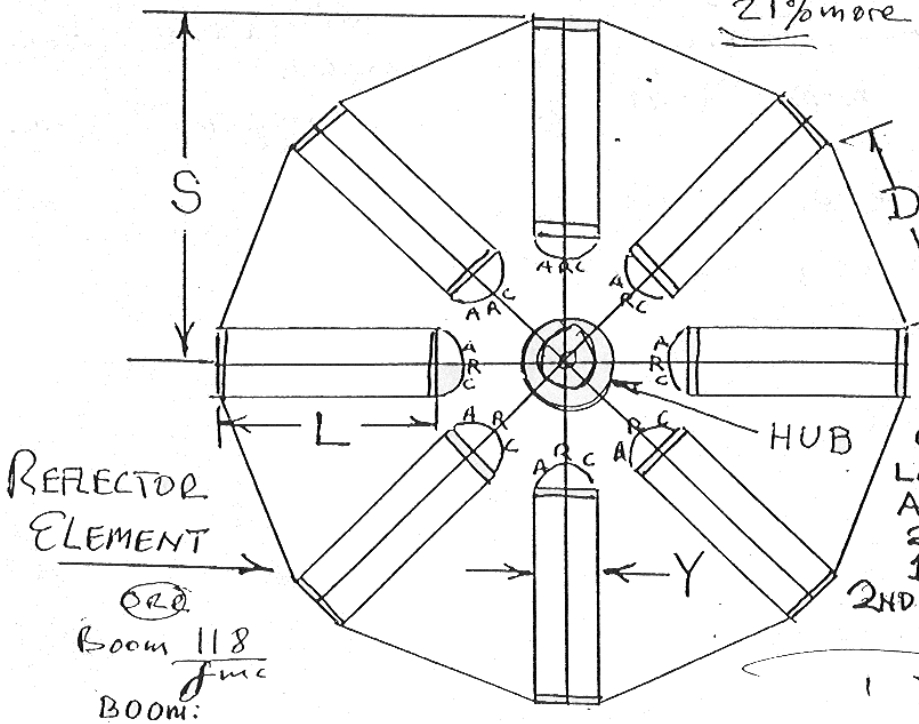
S = 19"
L = 10½"
D = 10 13/16"
ARCS = 4½"
Y = 4"

Perimeter =
16 "L" of 10½" = 168"
8 "D" of 10 13/16" = 86.5
7 Arcs of 4½" = 31.5
1 FP = 4" = 4"
290"
OR: 24.166'

ALL SPREADERS ARE FIBERGLAS Both Elements

WIRE: 14 GAUGE: SOLID Copper

NORMAL Quad Driven Element Perimeter @ 50.15mc Equals: 19.940' (DRIVEN Maltese Double-Cross requires 21% more wire than Normal)



S = 19"
L = 10½"
D = 10 13/16"
ARCS = 6¼"
Y = 4"

REFLECTOR PERIMETER: 304"± (25'4")

GAMMA MATCH @ F.P.
LOCATION ON DRIVEN ELEMEN
Approx. Data. Rod. 8"; CAP. 25 μfd; Gamma Rod Spacin 1 INCH: SEE FIG. 2 & 6, 2ND Edition MANUSCRIPT.

ORD
Boom 118 fmc
BOOM: 32" long

10/30/97