

# Wire Antennas for Ham Radio

Iulian Rosu YO3DAC / VA3IUL <http://www.qsl.net/va3iul>

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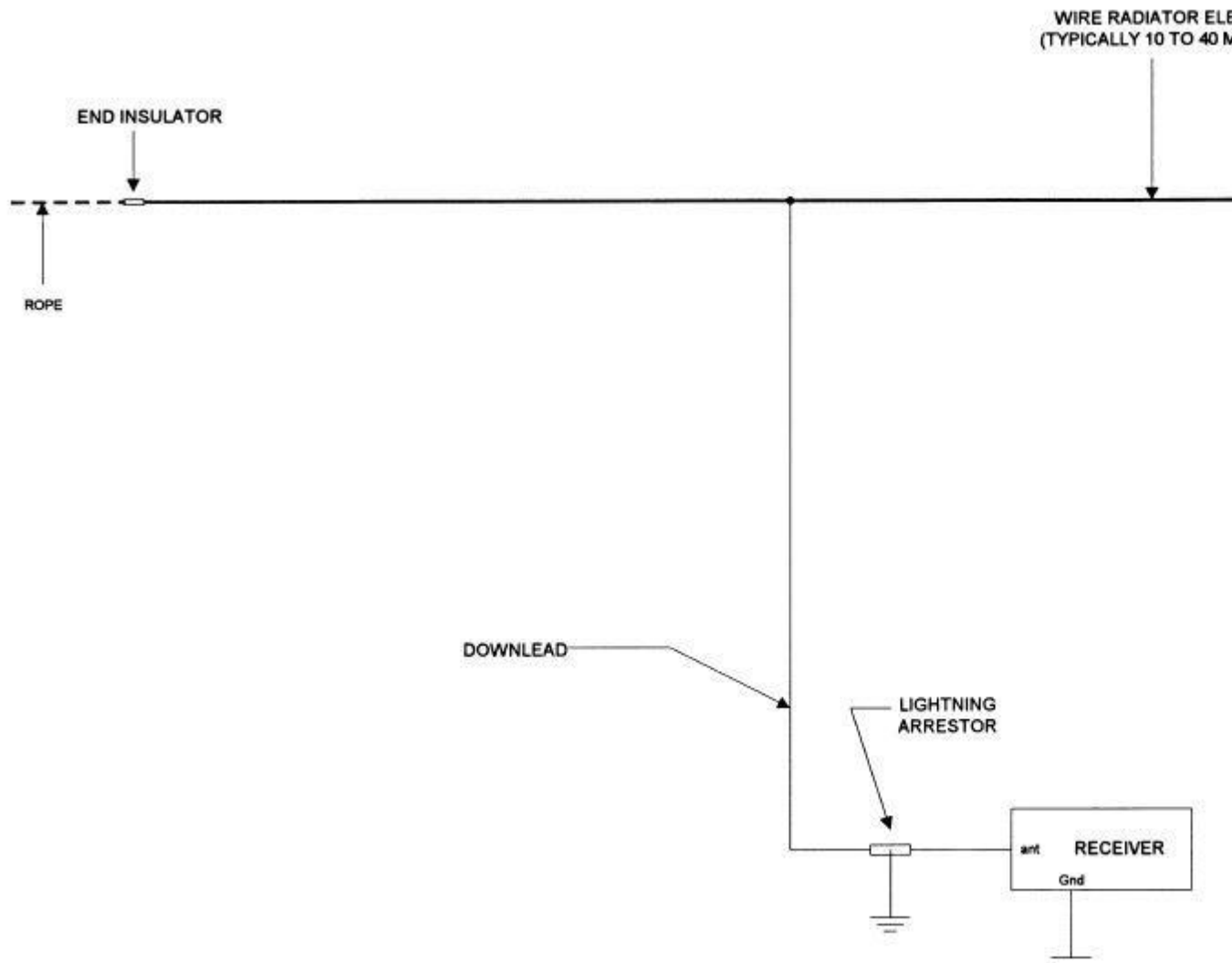
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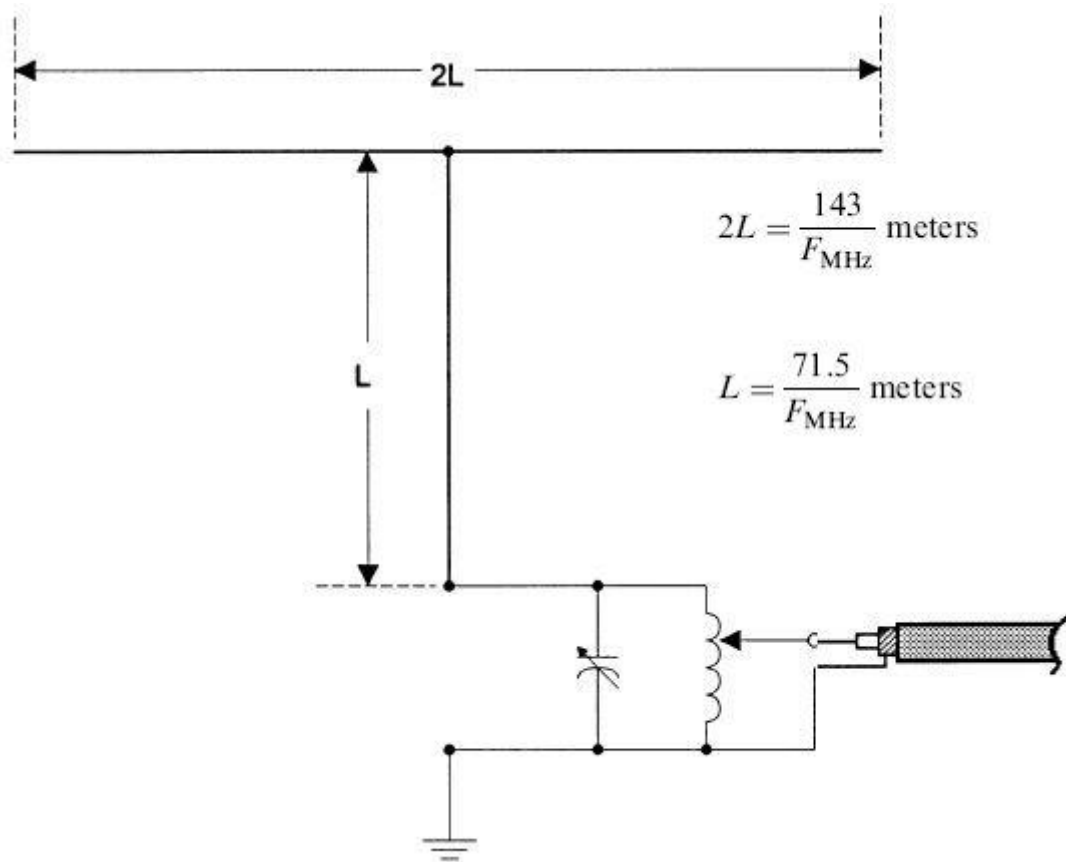
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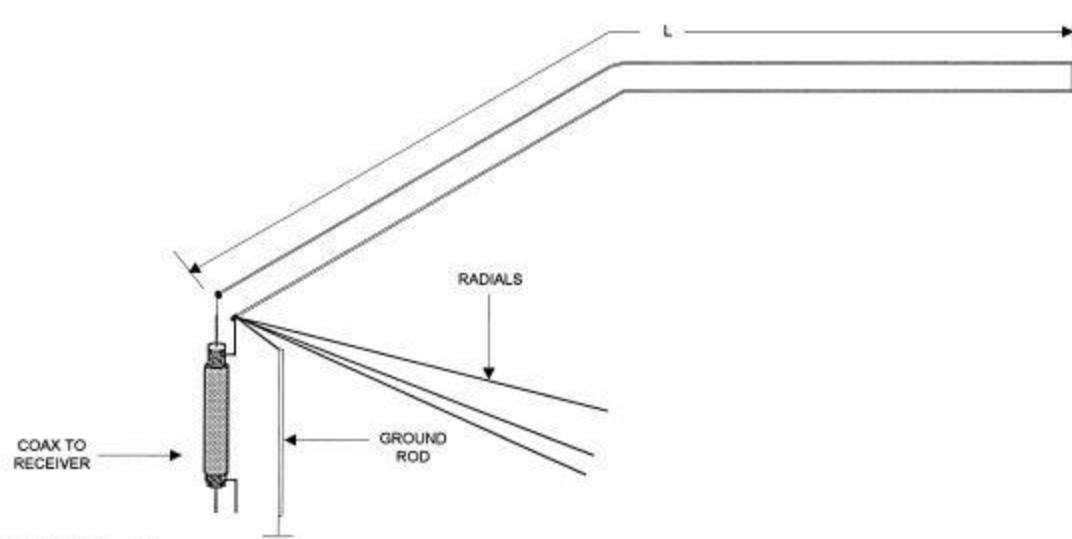
## 01 - Tee Antenna



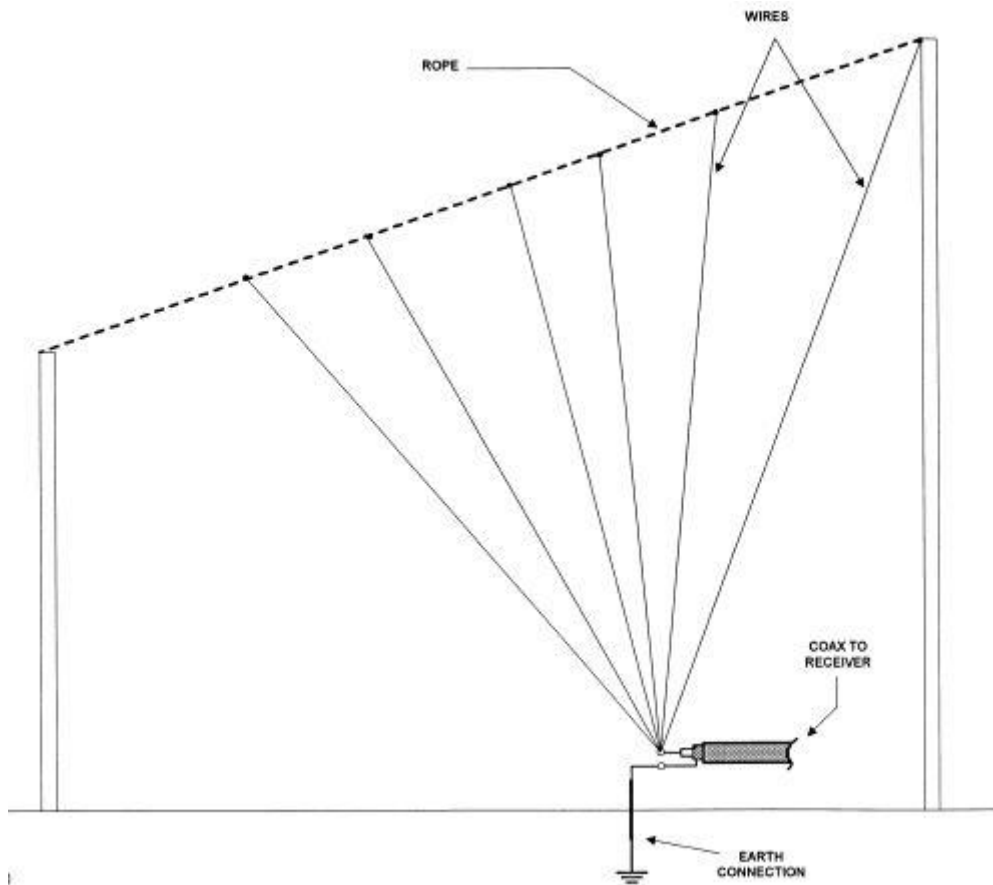
## 02 - Half-Lambda Tee Antenna



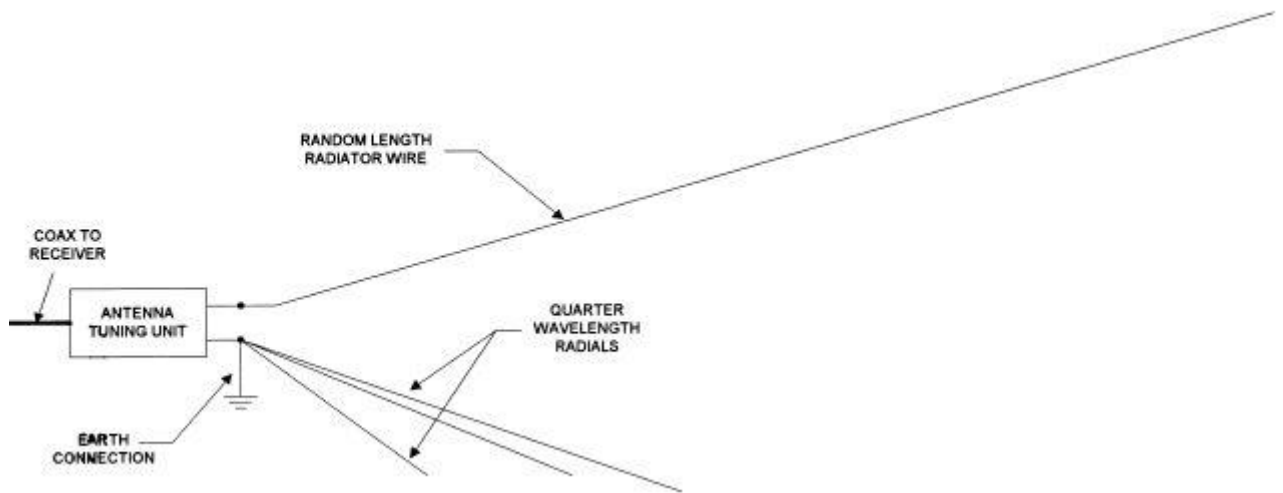
## 03 - Twin-Led Marconi Antenna



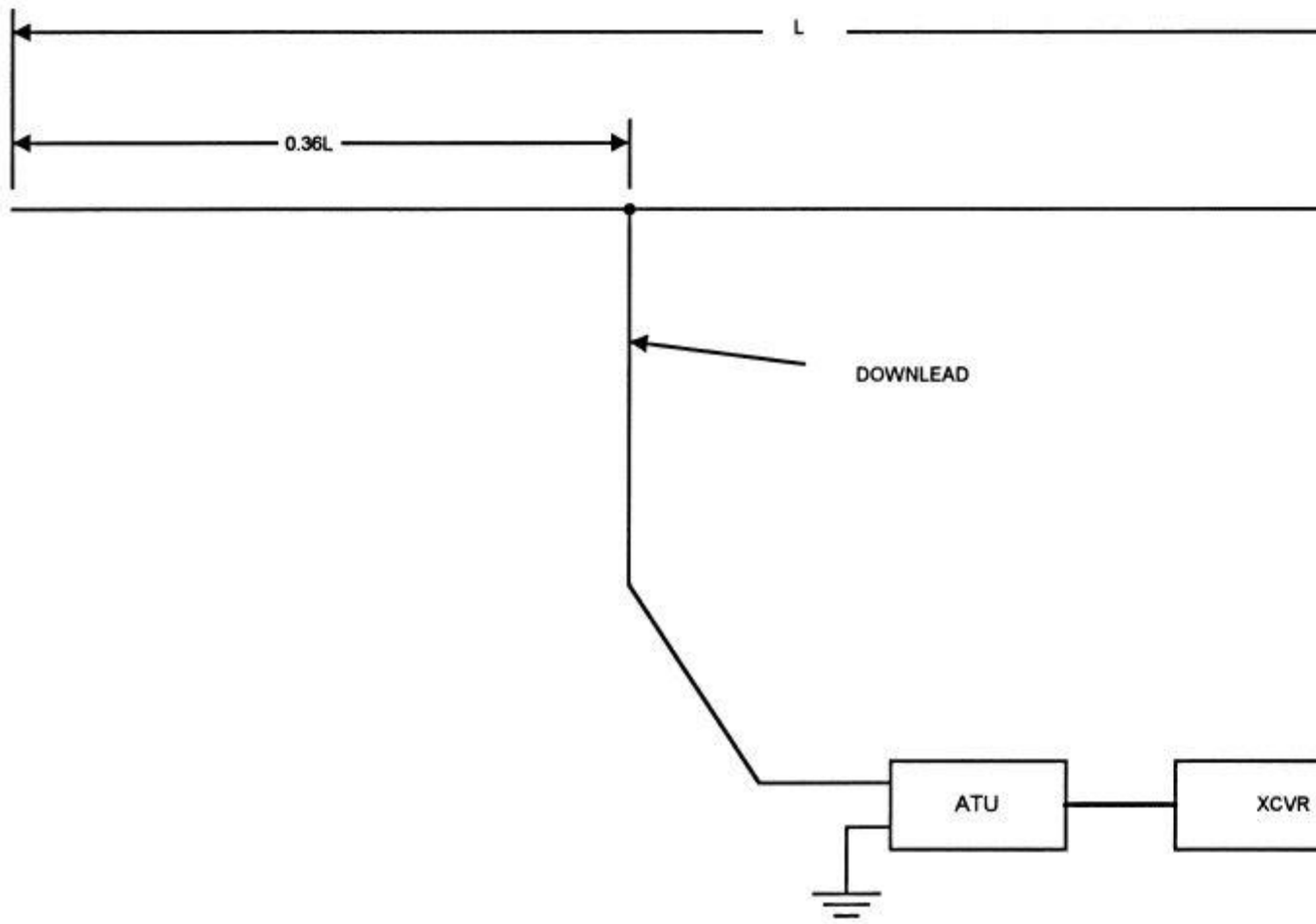
## 04 - Swallow-Tail Antenna



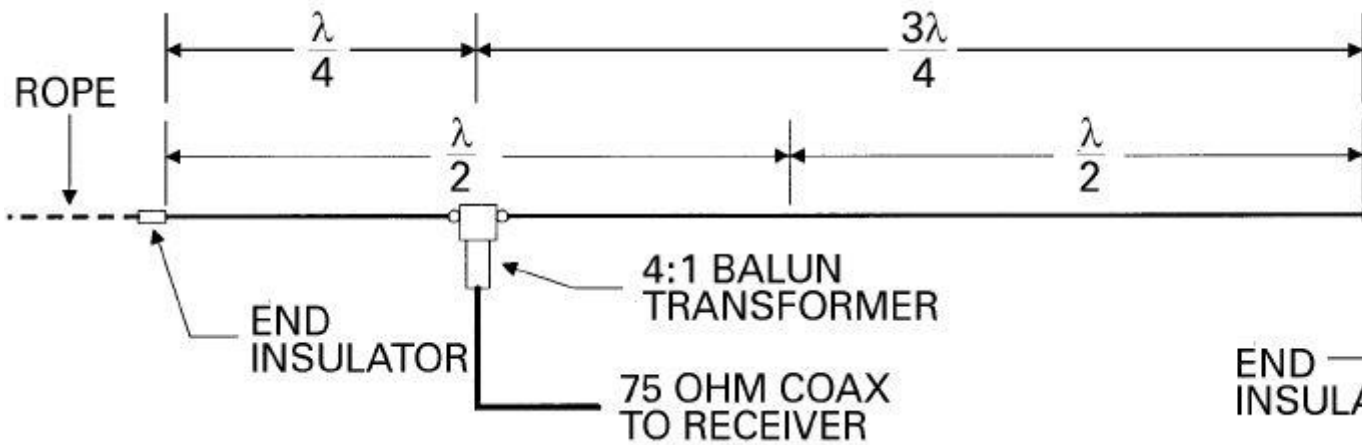
**05 - Random Length Radiator Wire Antenna**



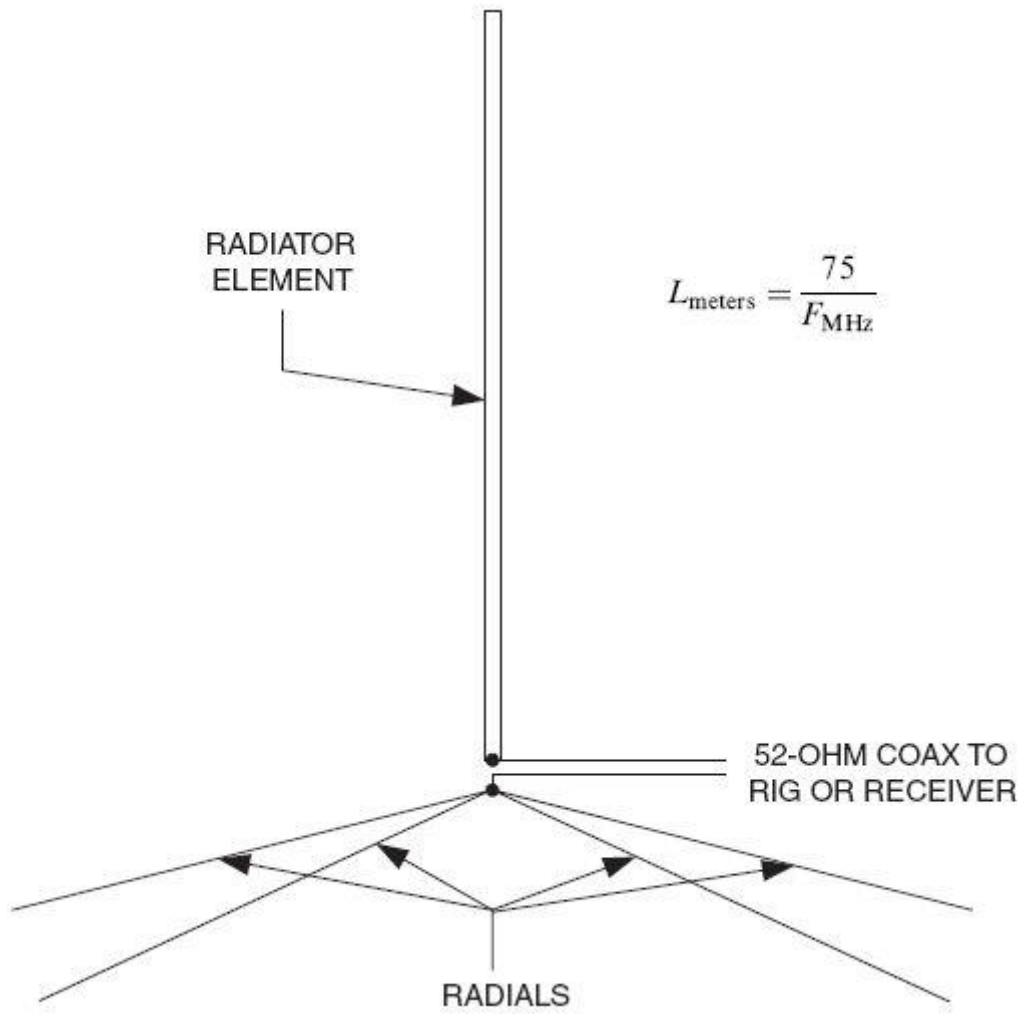
**06 - Windom Antenna**



**07 - Windom Antenna - Feed with coax cable**



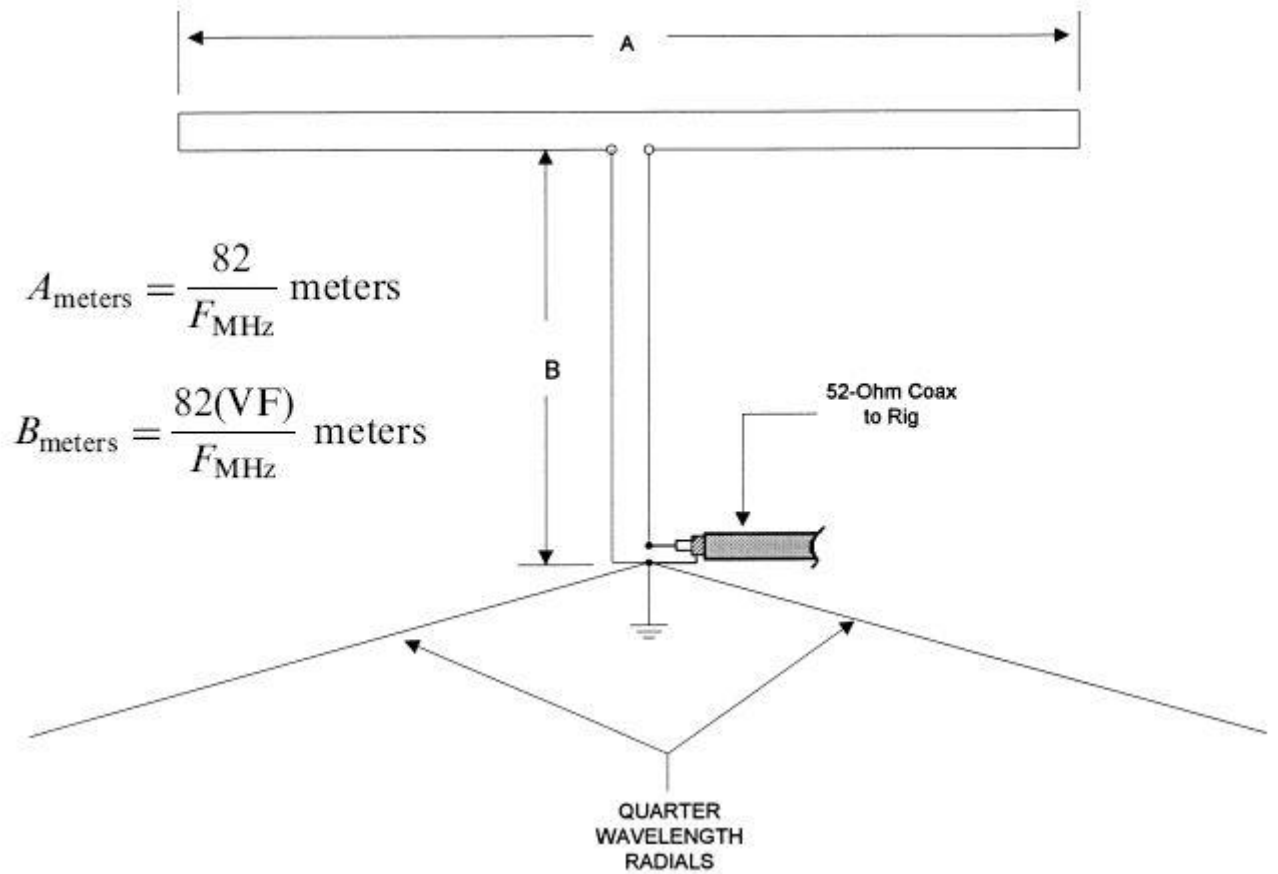
**08 - Quarter Wavelength Vertical Antenna**



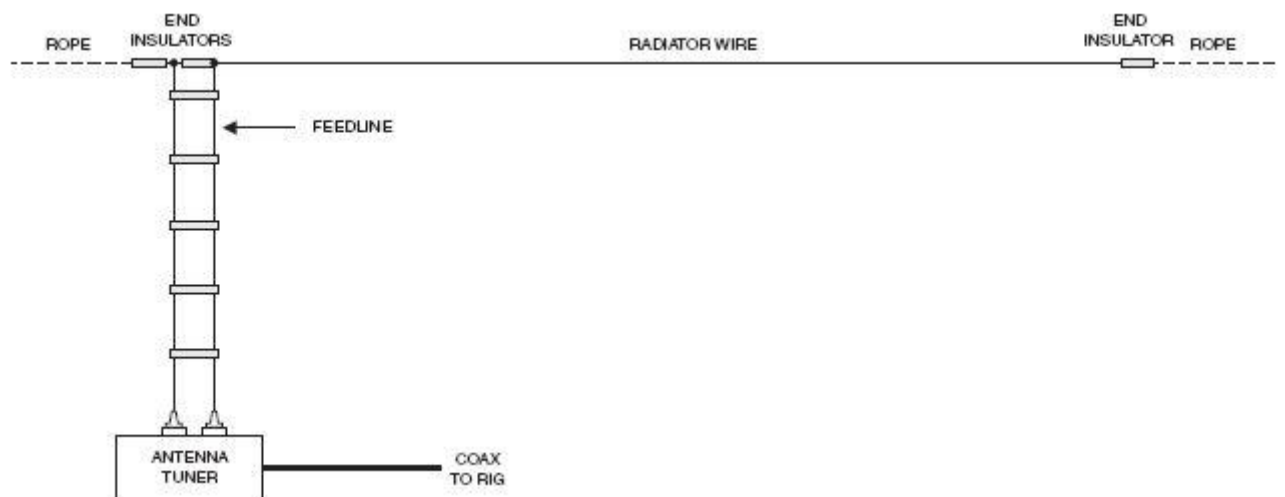
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**09 - Folded Marconi Tee Antenna**

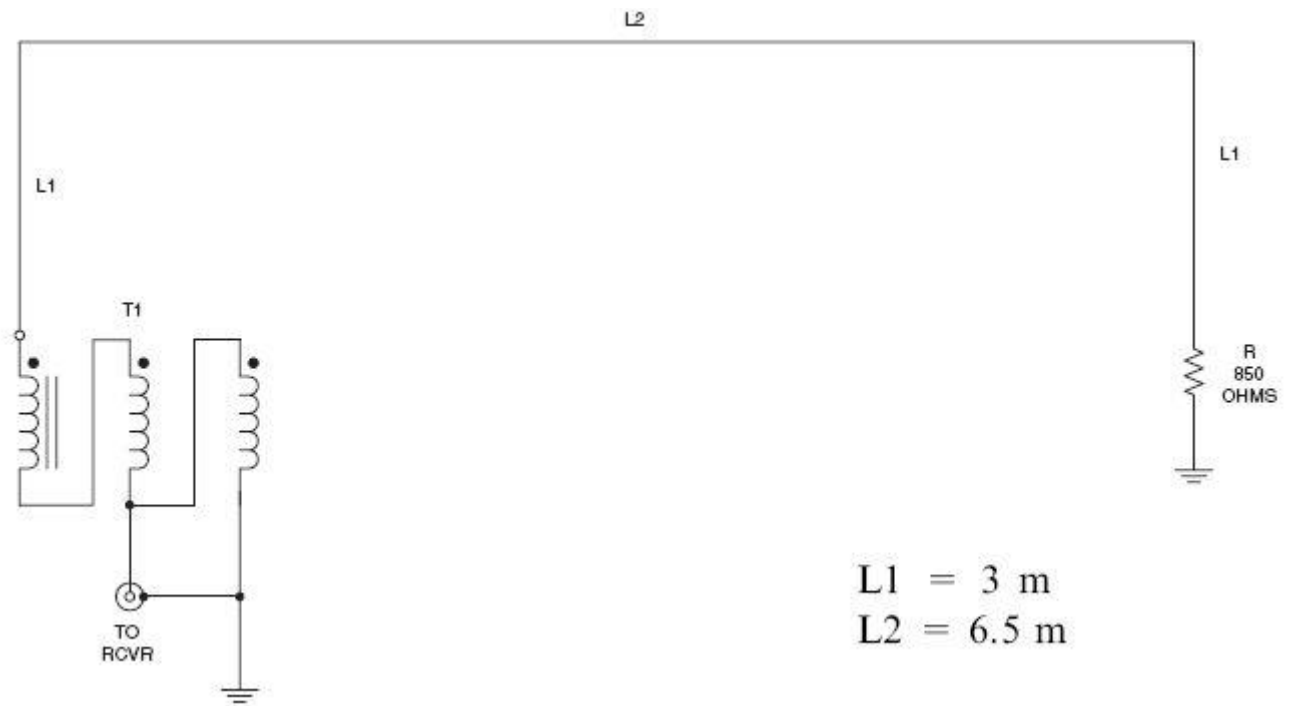




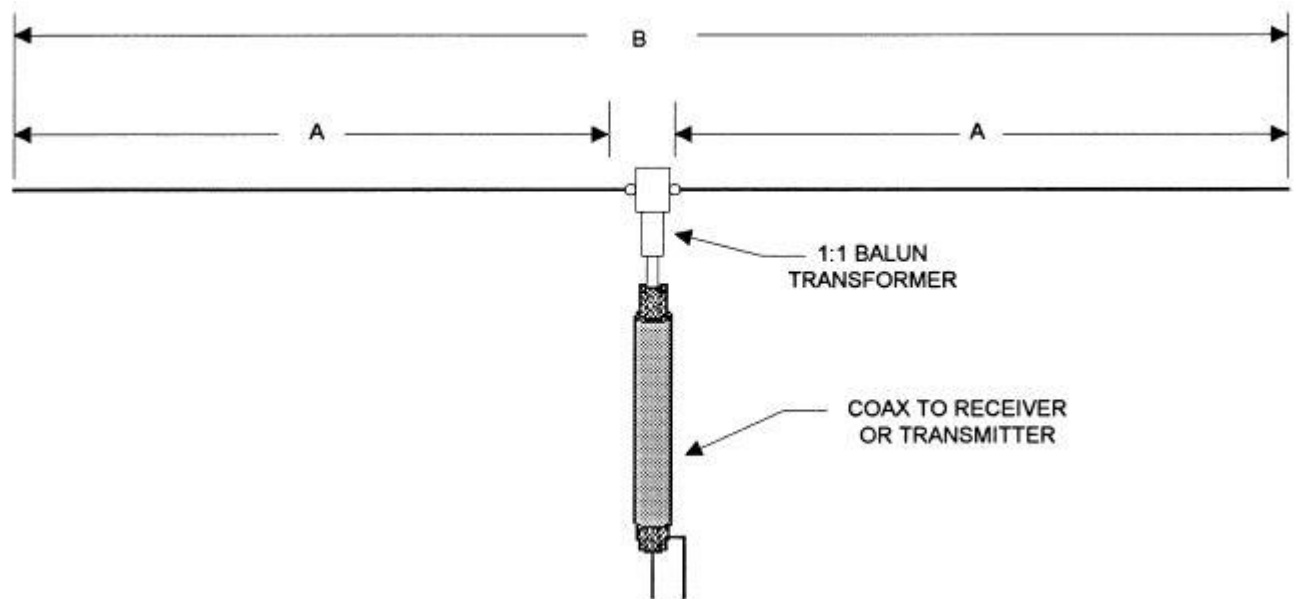
### 10 - Zeppelin Antenna



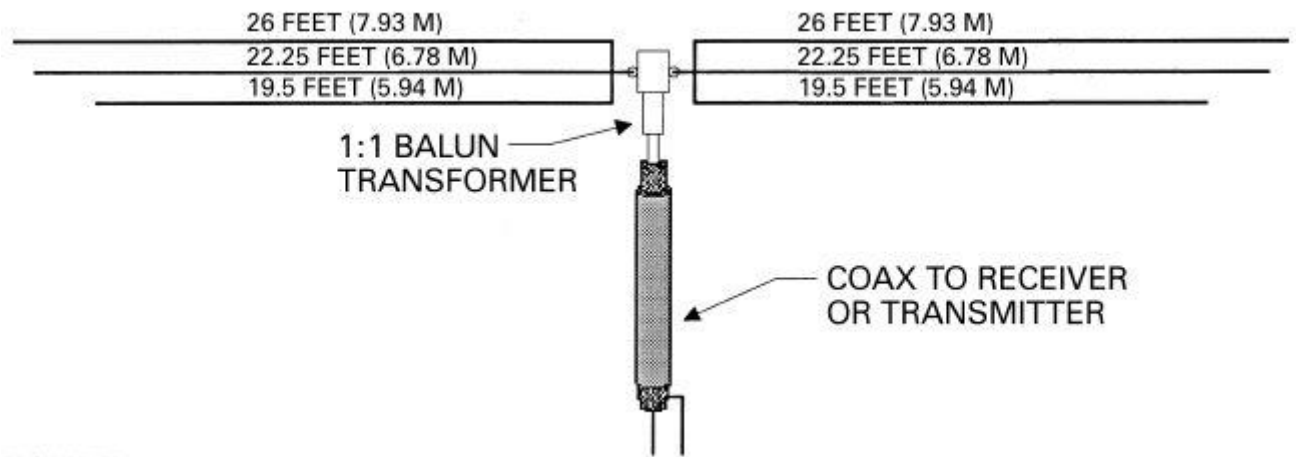
### 11 - EWE Antenna



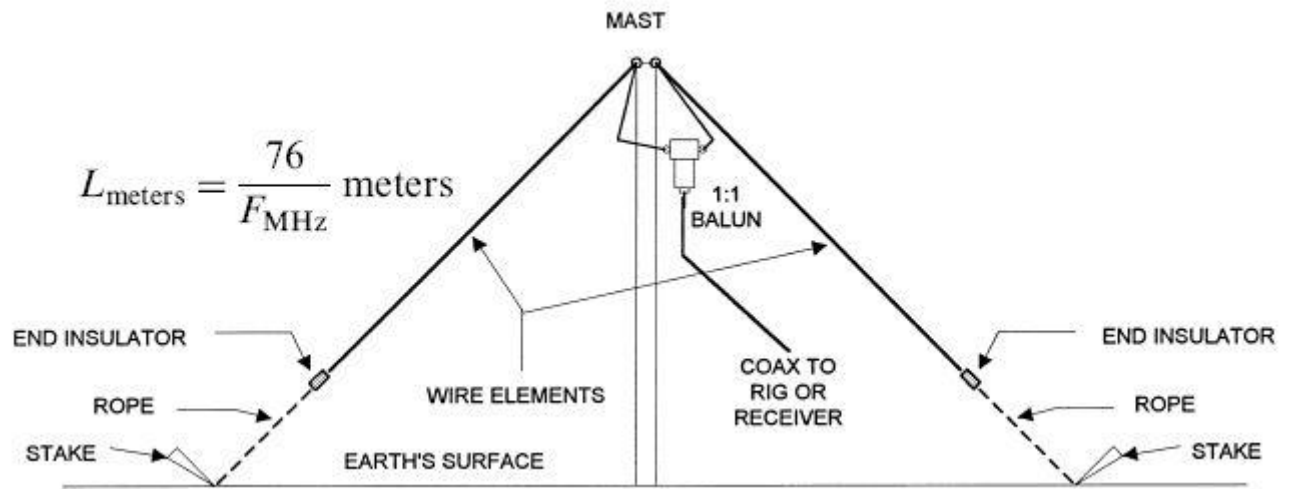
## 12 - Dipole Antenna - Balun



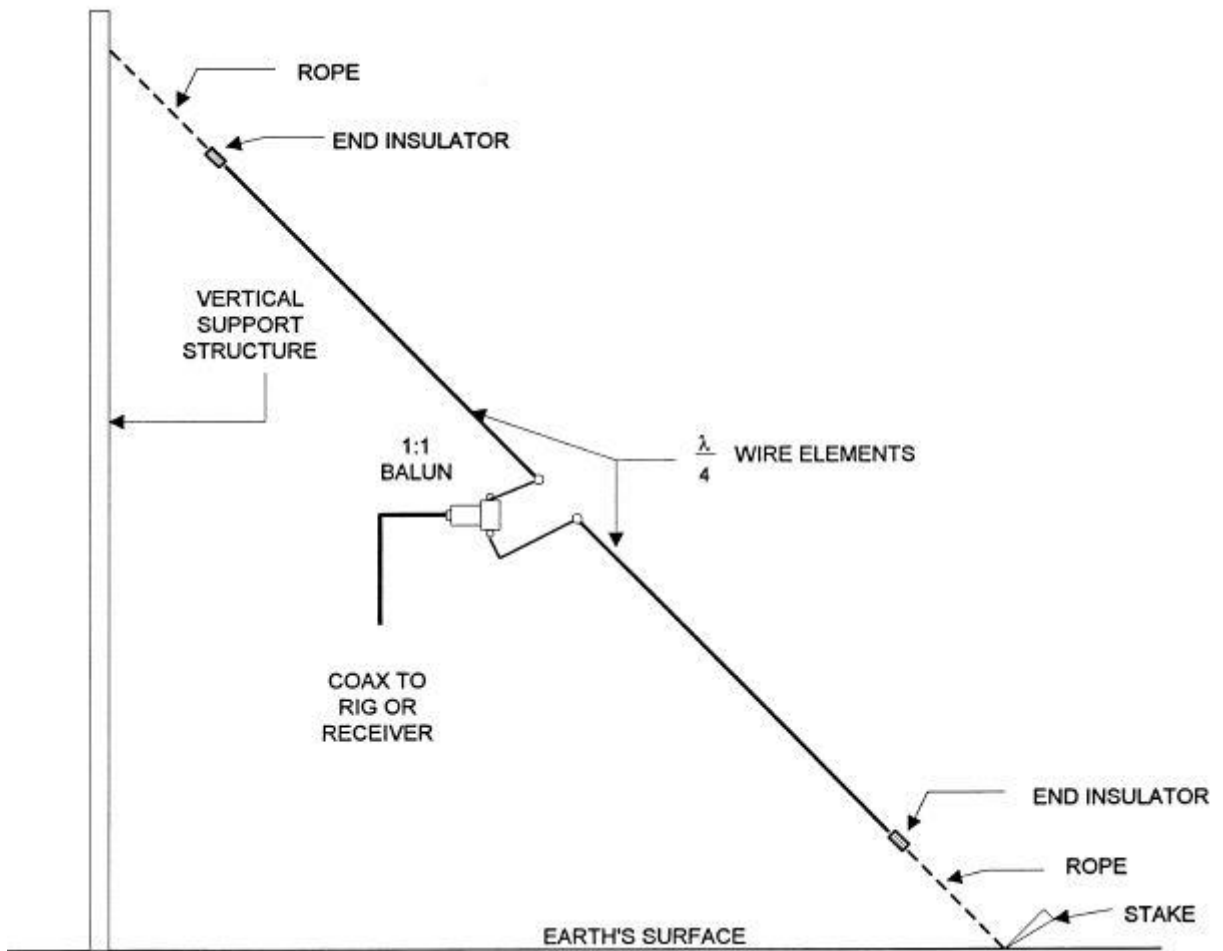
## 13 - Multiband Dipole Antenna



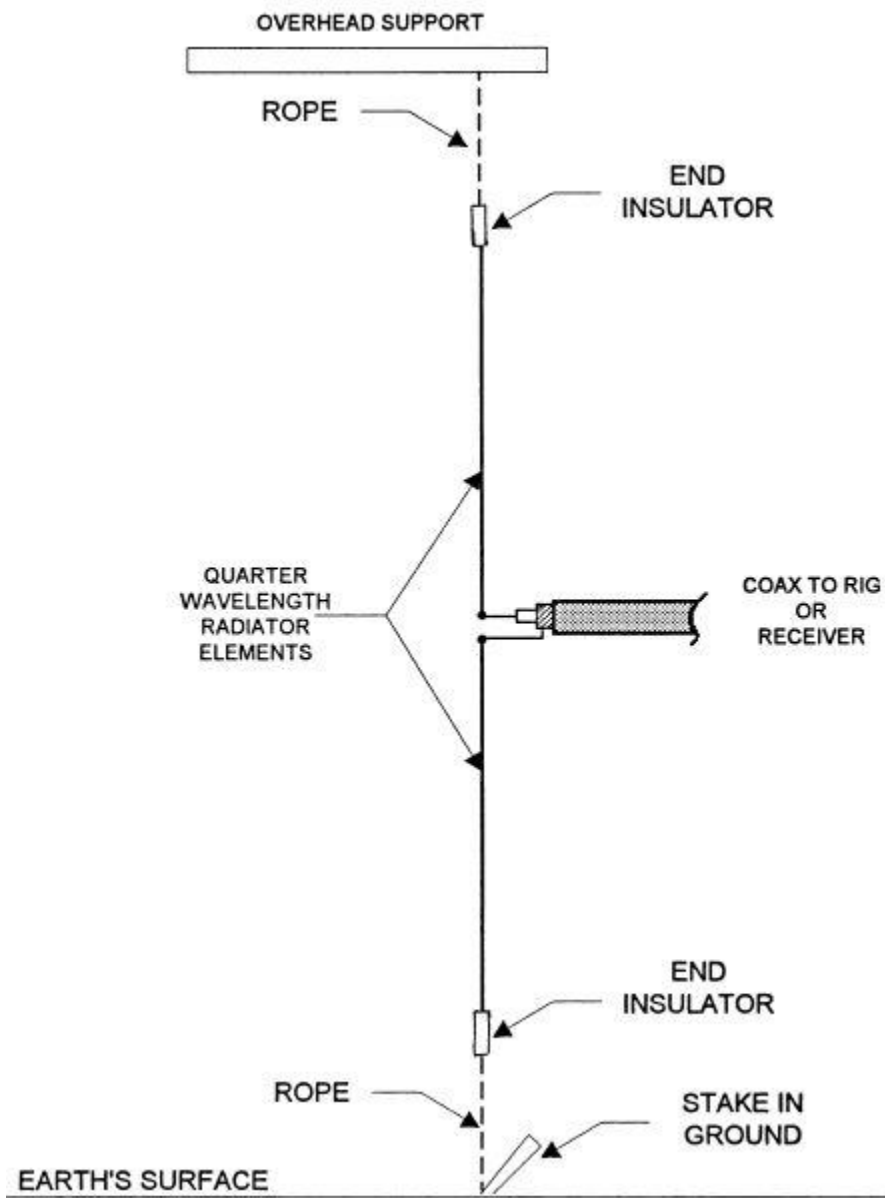
### 14 - Inverted-Vee Antenna



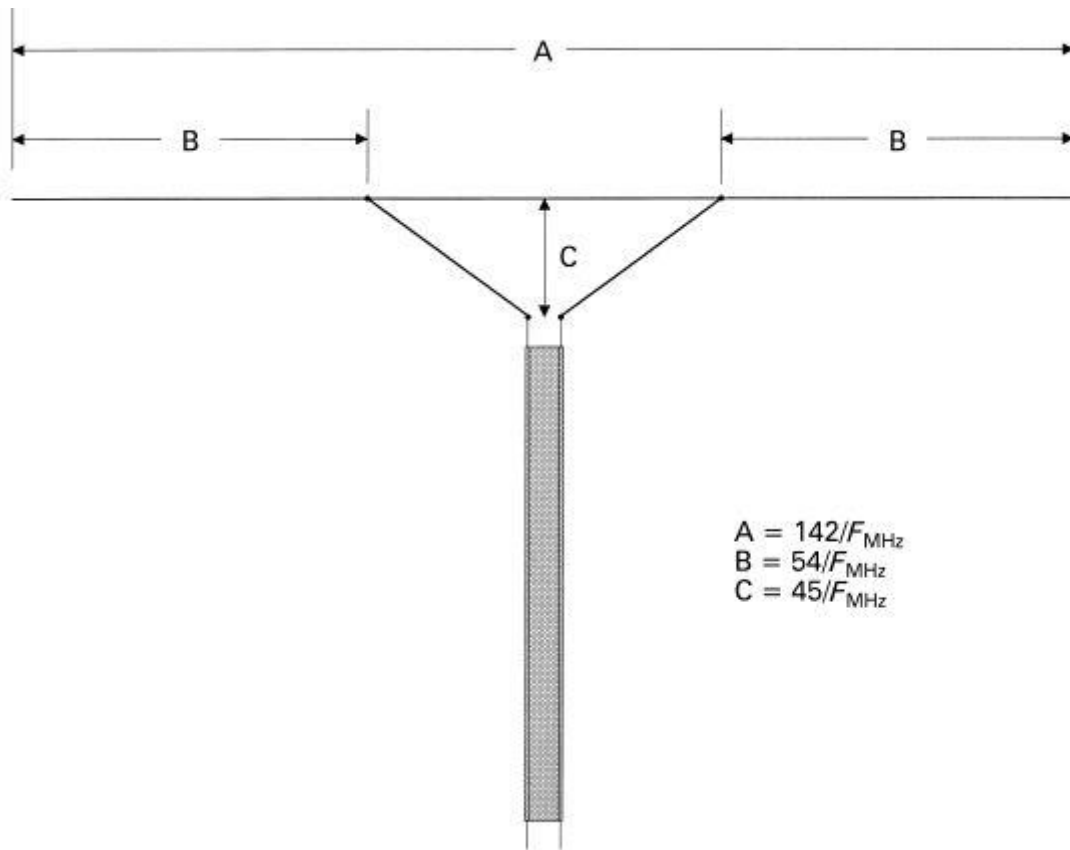
### 15 - Sloping Dipole Antenna



**16 - Vertical Dipole**

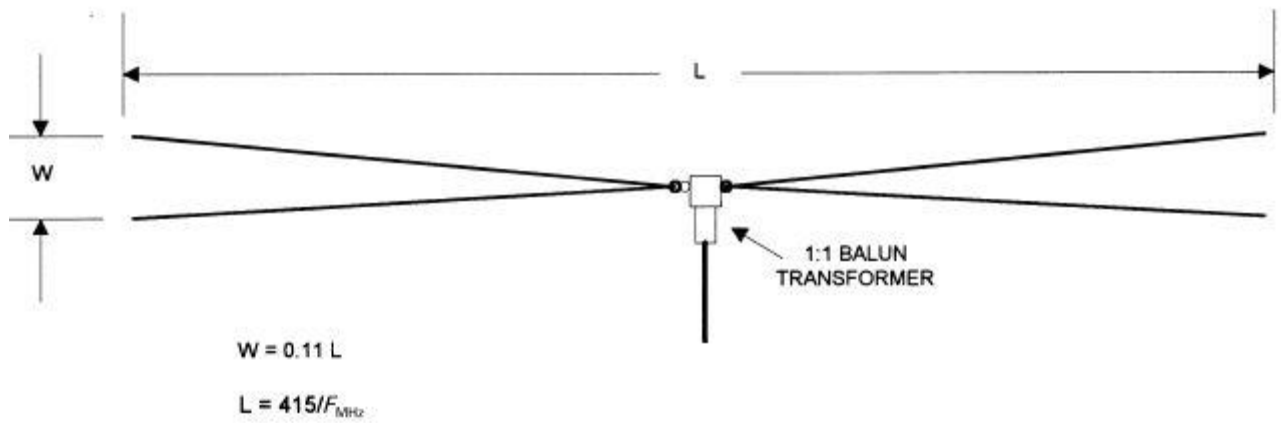


**17 - Delta Fed Dipole Antenna**



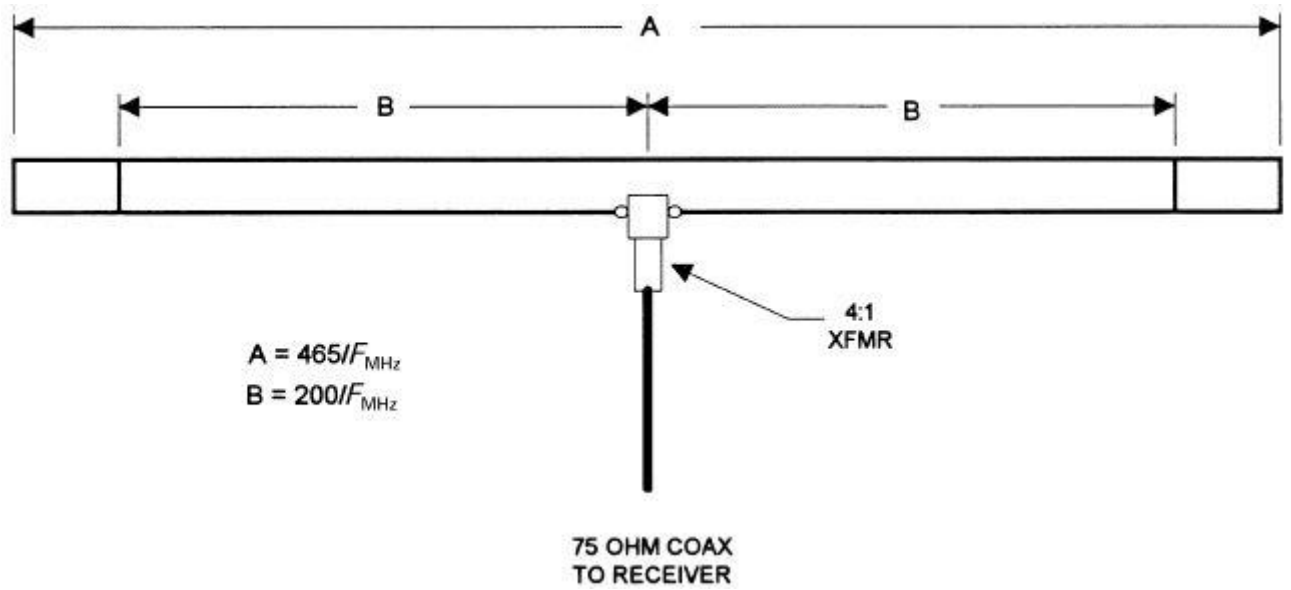

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### 18 - Bow-Tie Dipole Antenna

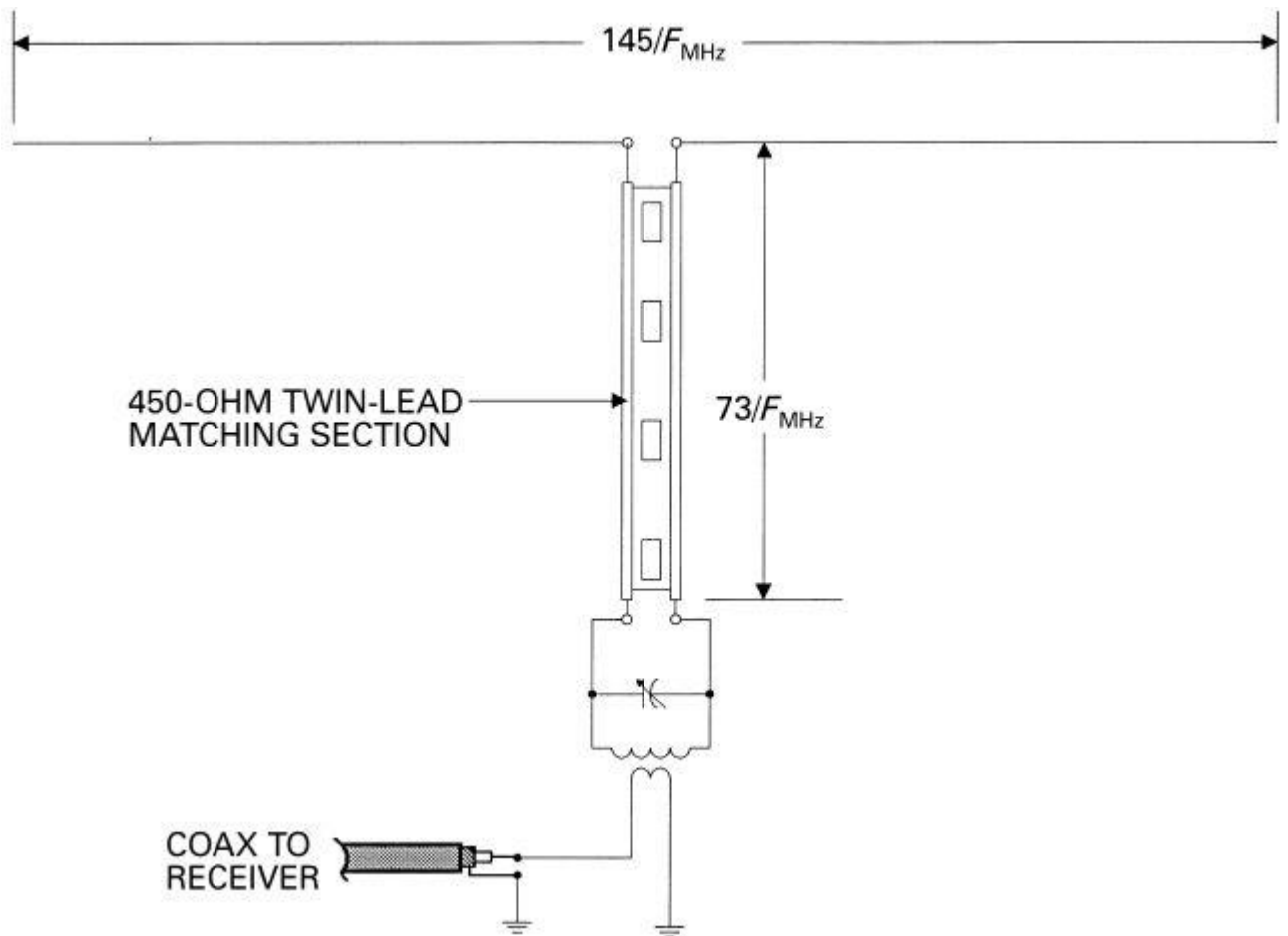



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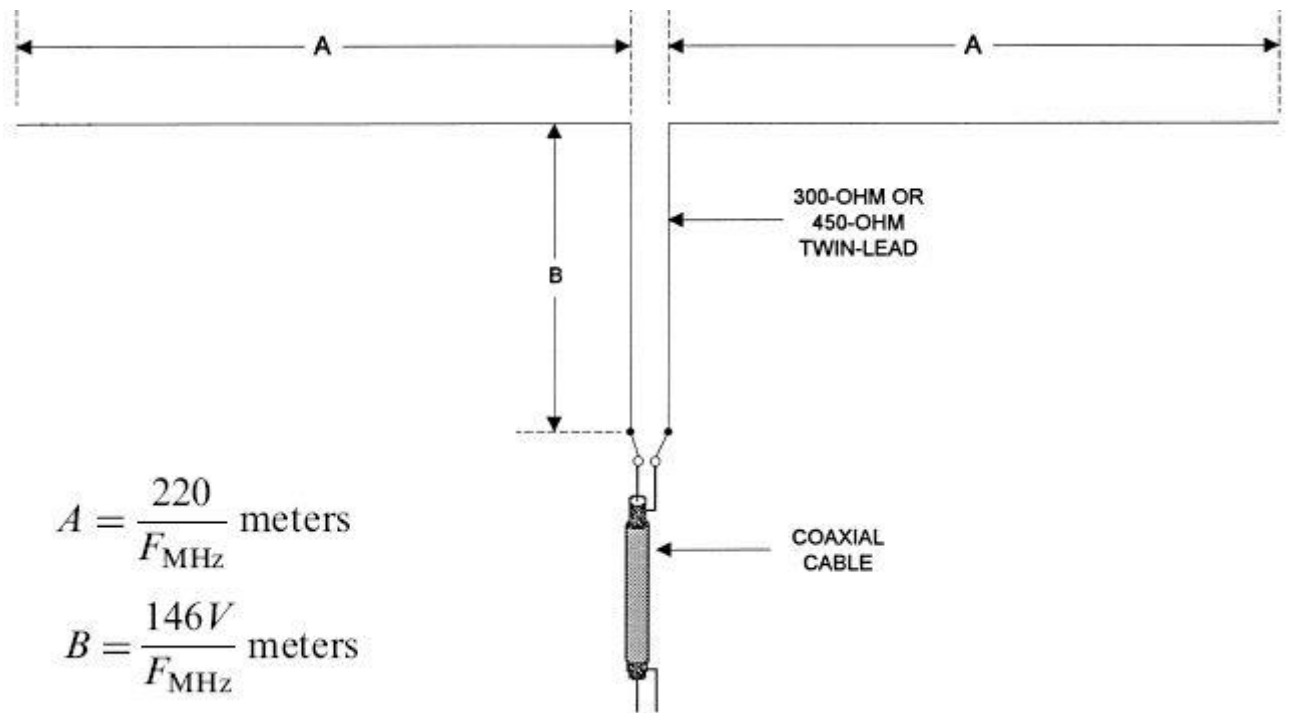
### 19 - Bow-Tie Folded Dipole Antenna for RX



## 20 - Multiband Tuned Doublet Antenna



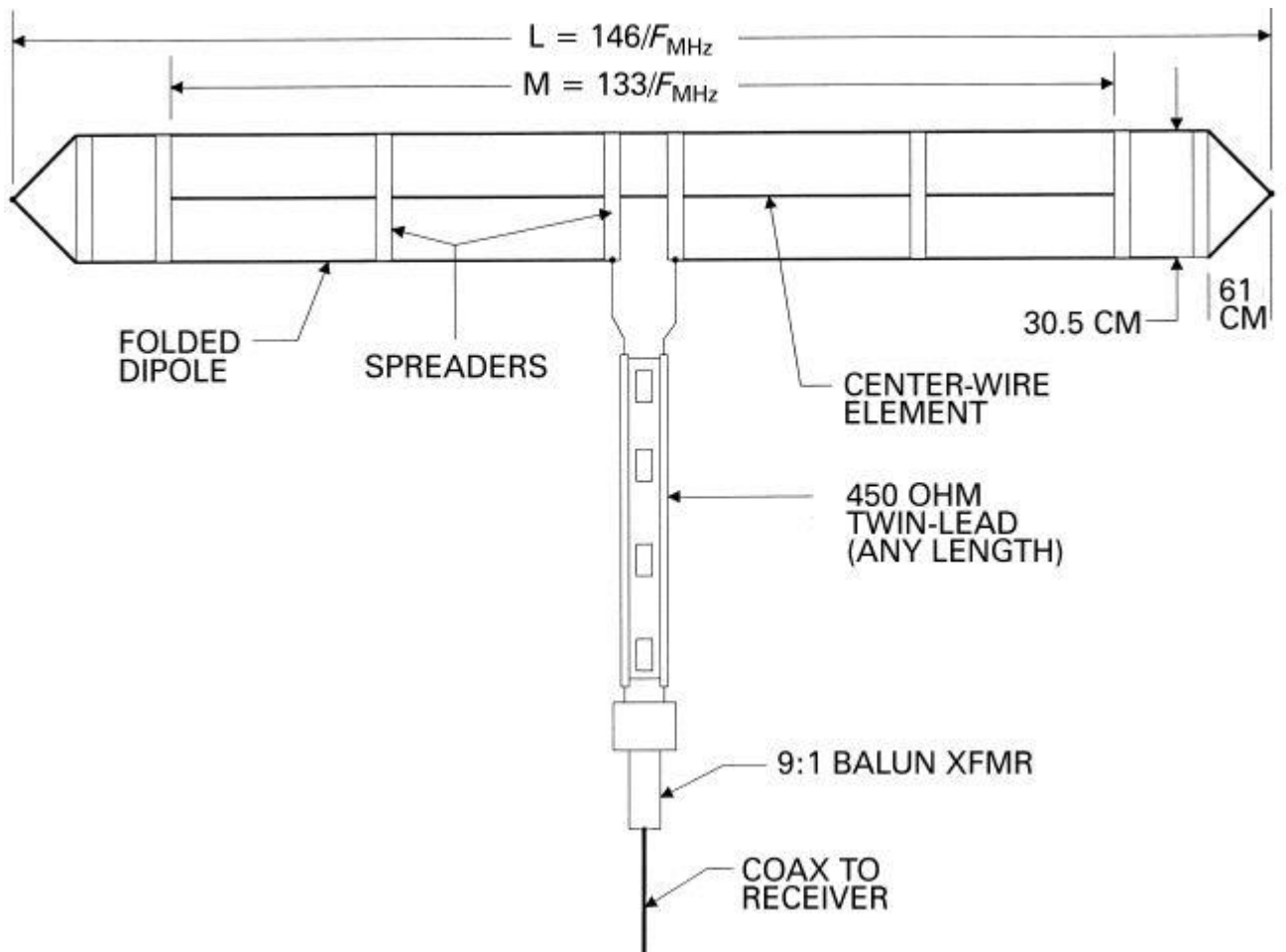
## 21 - G5RV Antenna



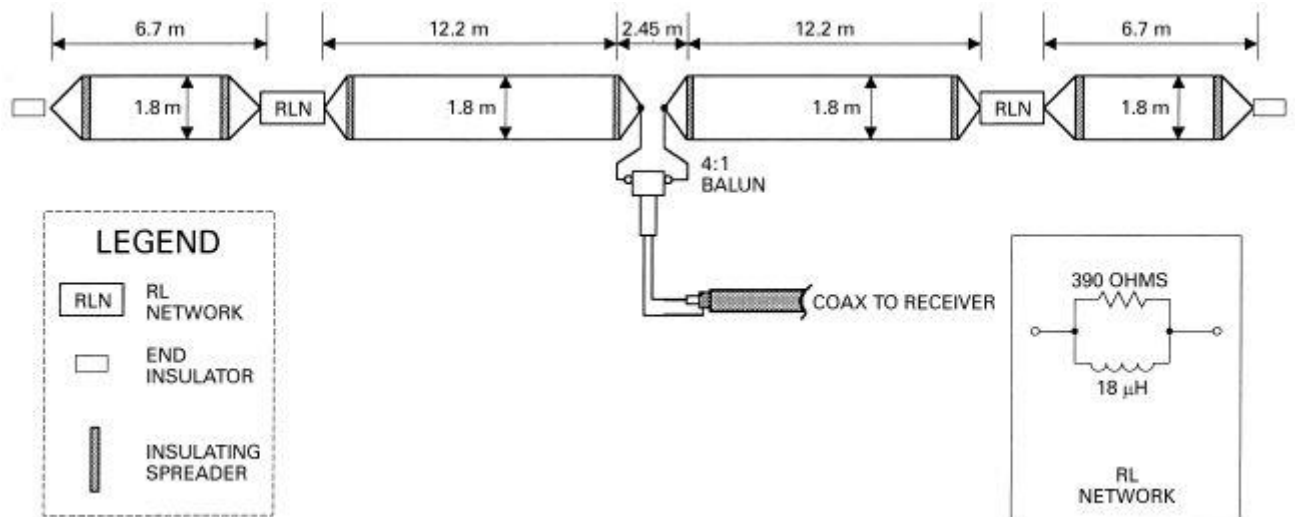
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## 22 - Wideband Dipole Antenna

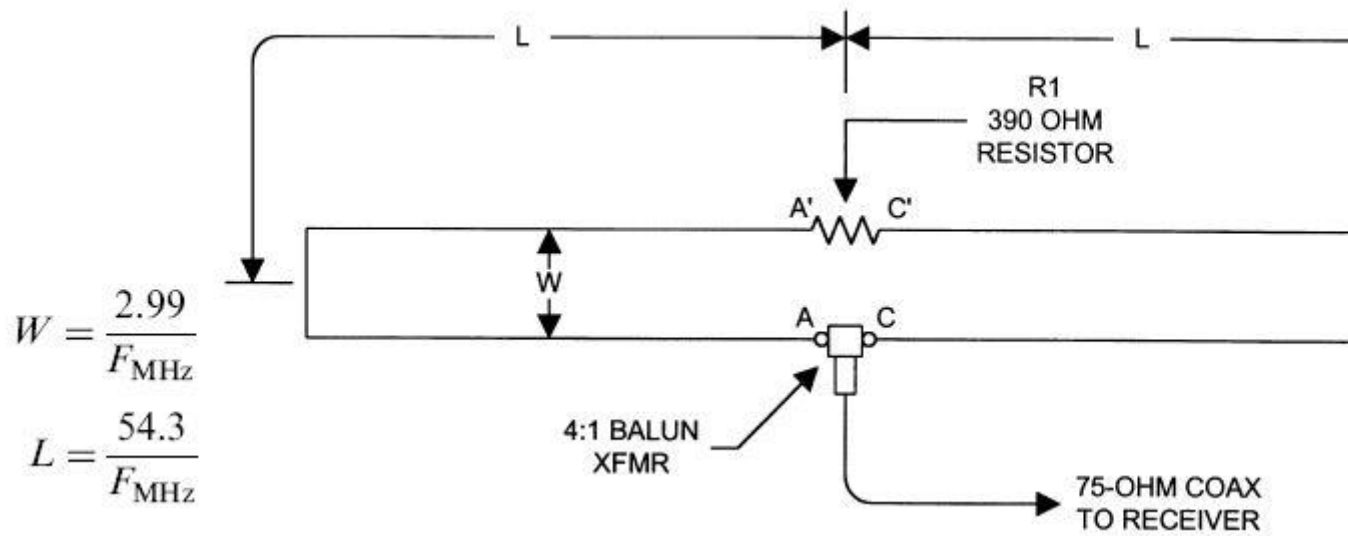




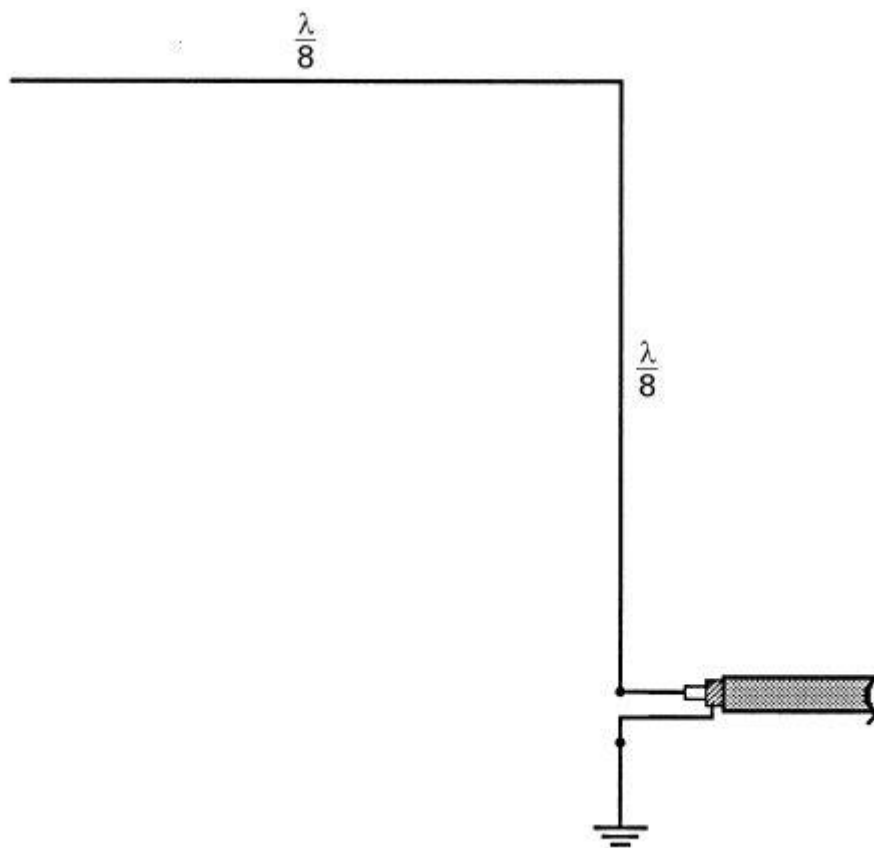
### 23 - Wideband Dipole for Receiving



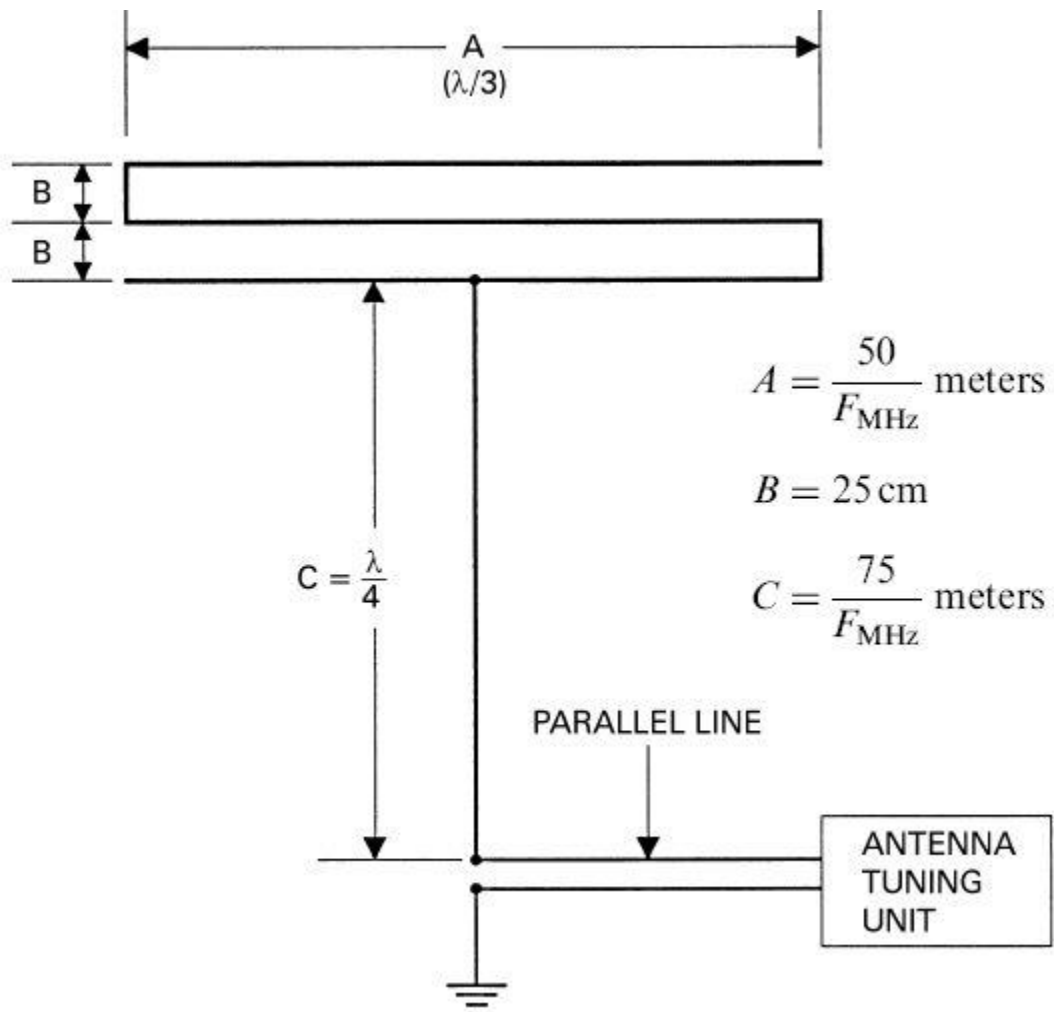
### 24 - Tilted Folded Dipole Antenna



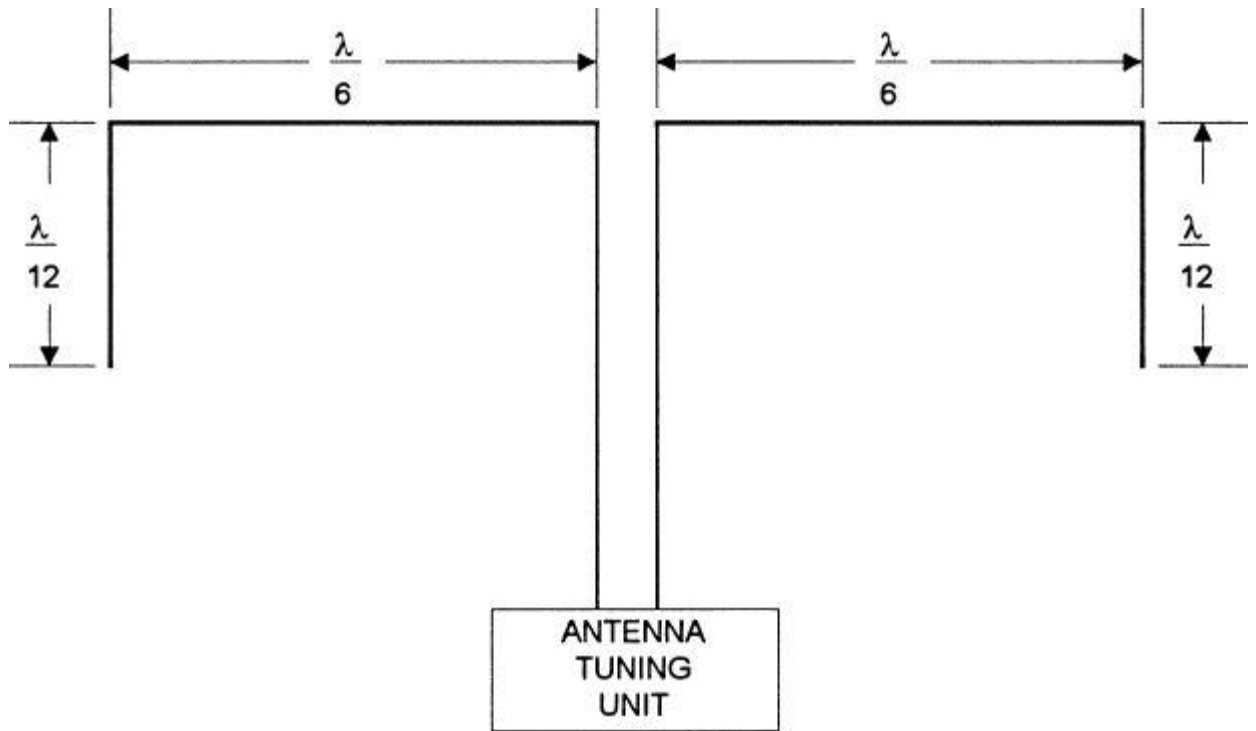
## 25 - Right Angle Marconi Antenna



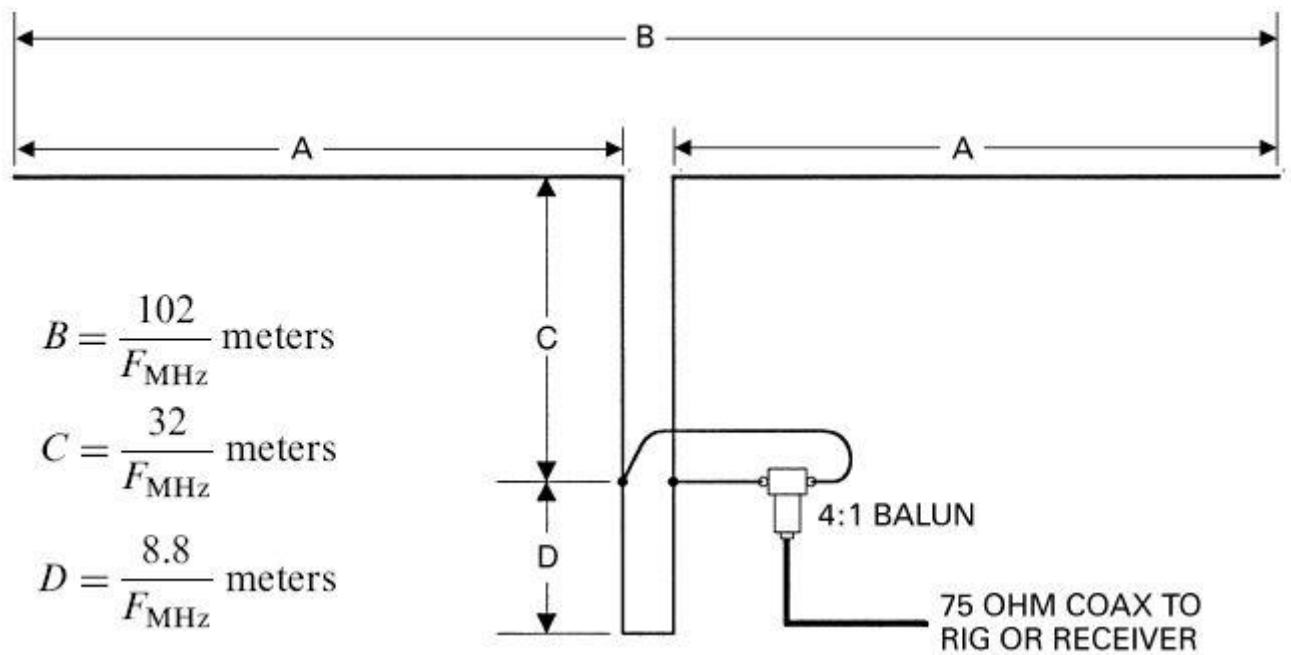
## 26 - Linearly Loaded Tee Antenna



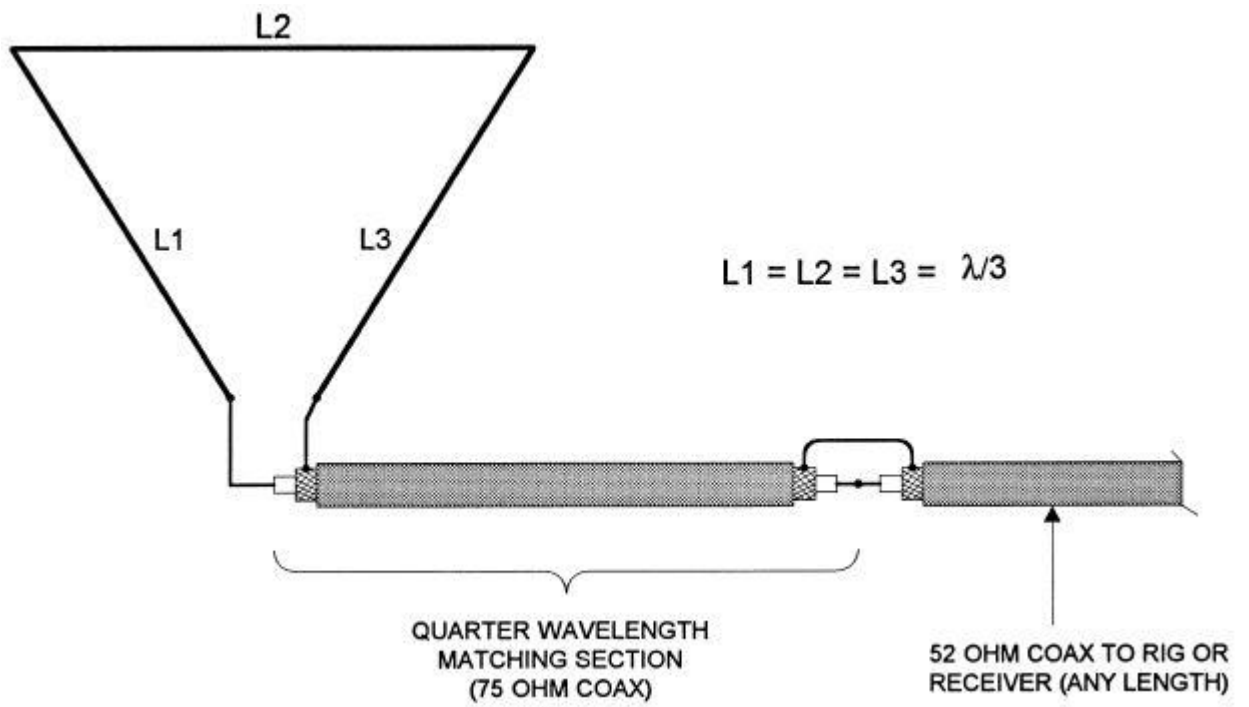
**27 - Reduced Size Dipole Antenna**



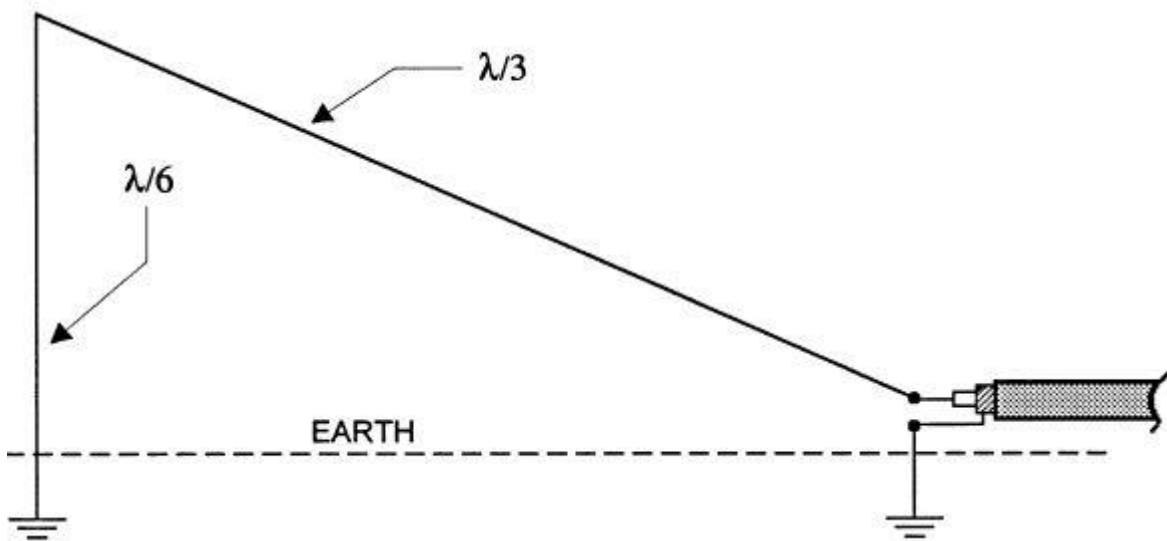
### 28 - Doublet Dipole Antenna



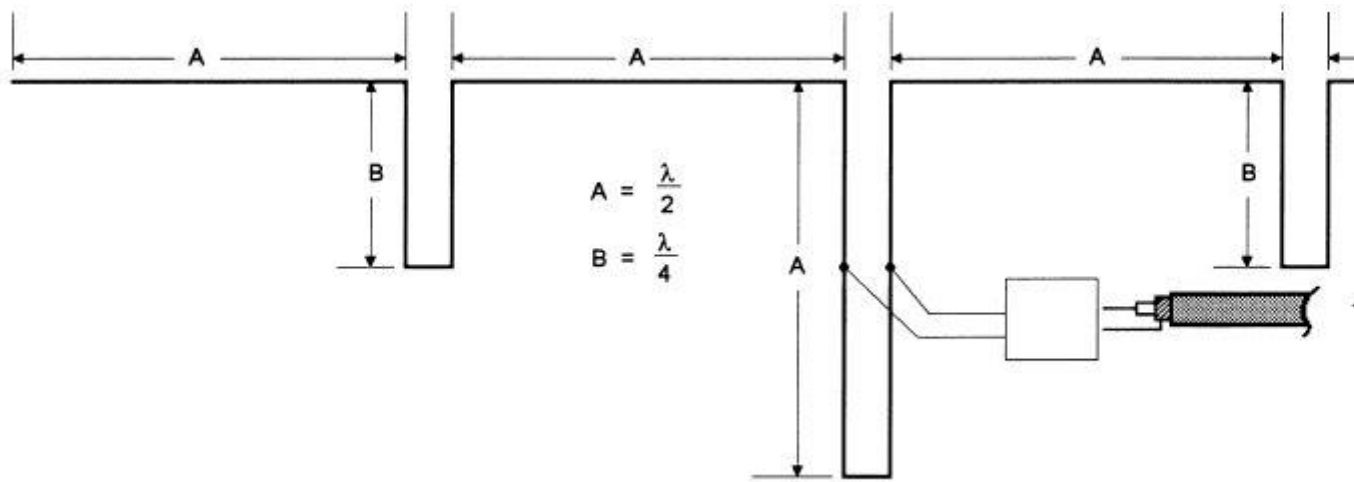
### 29 - Delta Loop Antenna



### 30 - Half Delta Loop Antenna



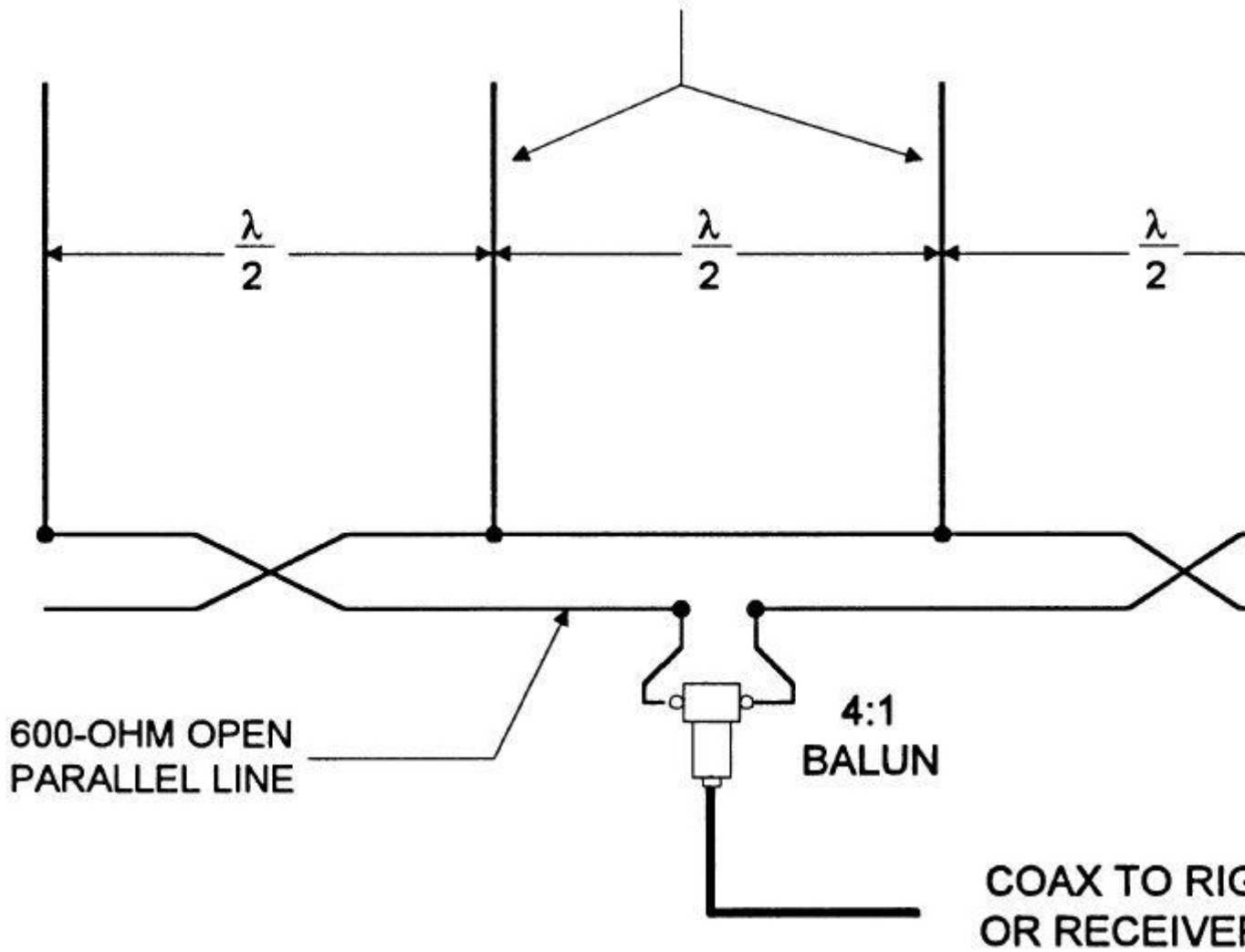
### 31 - Collinear Franklin Antenna



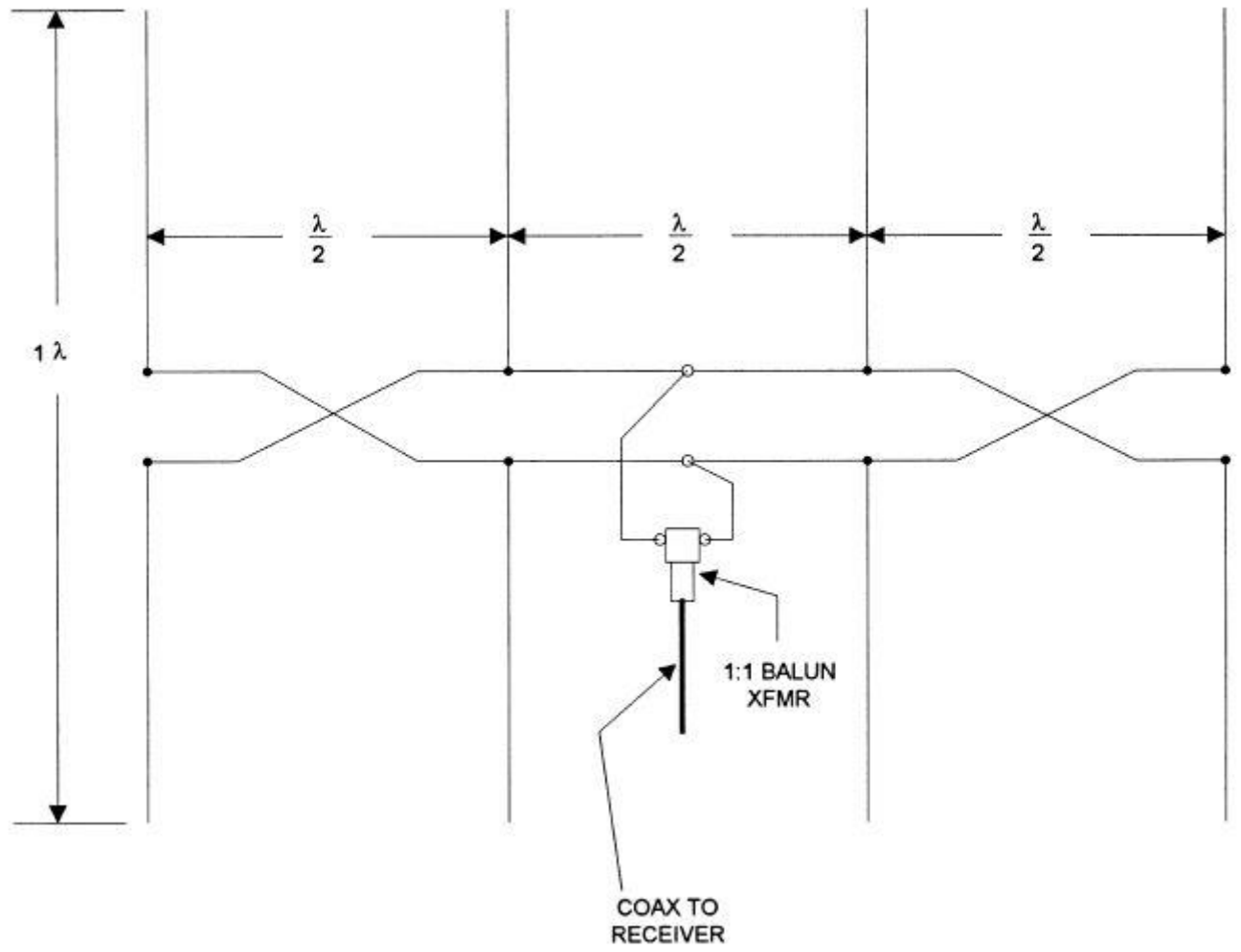
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**32 - Four Element Broadside Antenna**

HALF-WAVELENGTH  
VERTICAL ELEMENTS (4)

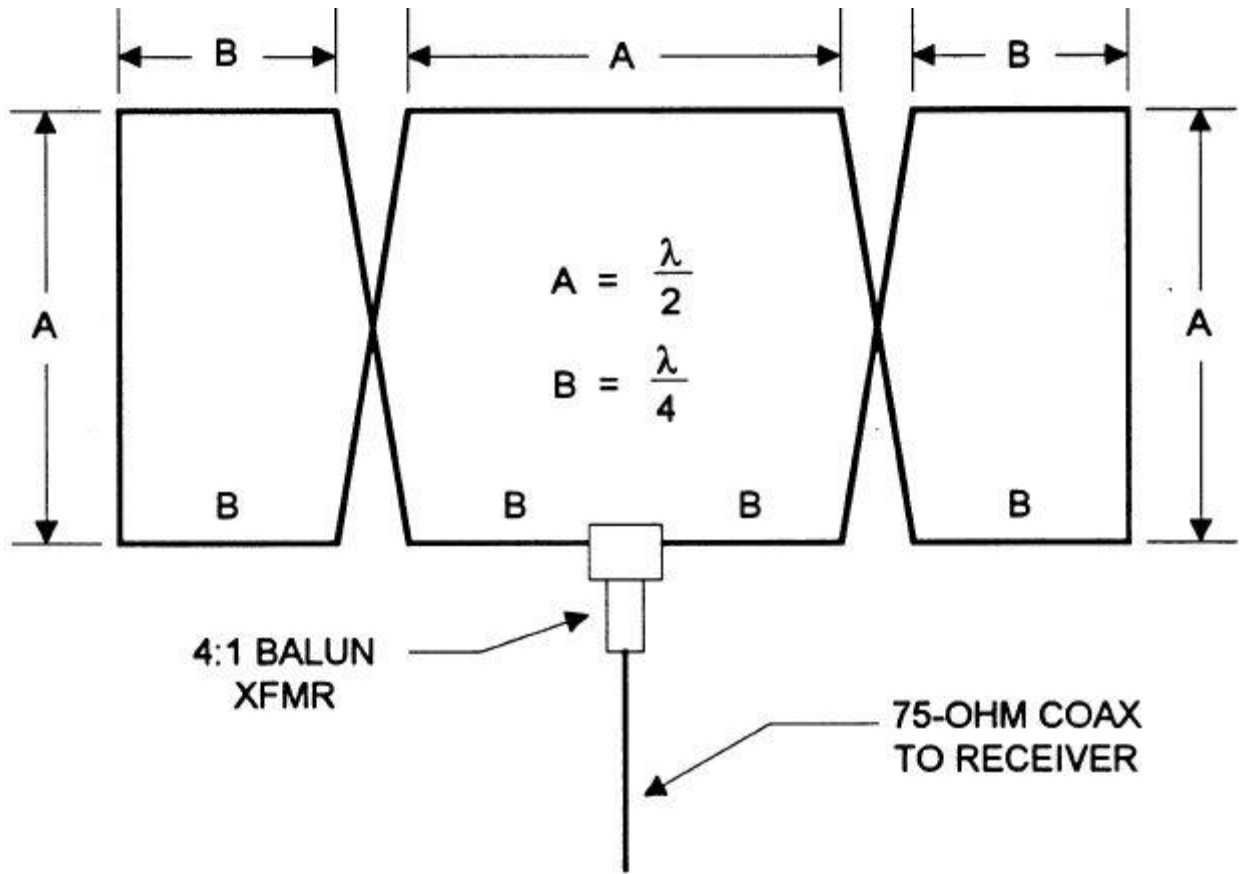


33 - The Lazy-H Array Antenna



**34 - Sterba Curtain Array Antenna**





**35 - T-L DX Antenna**

$$L1 = \frac{53.2}{f_{\text{MHz}}} \text{ meters}$$

$$L2 = \frac{39.8}{f_{\text{MHz}}} \text{ meters}$$

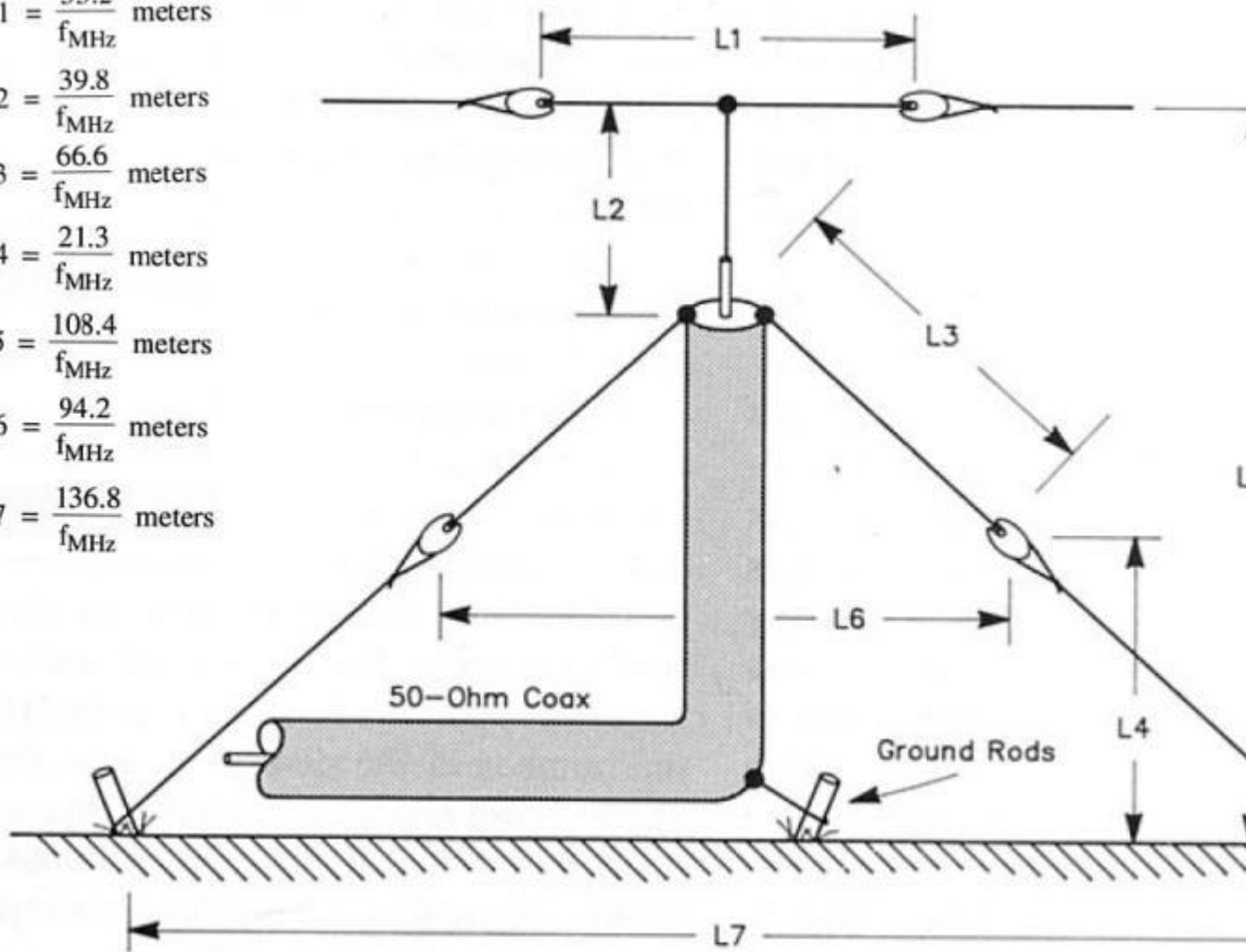
$$L3 = \frac{66.6}{f_{\text{MHz}}} \text{ meters}$$

$$L4 = \frac{21.3}{f_{\text{MHz}}} \text{ meters}$$

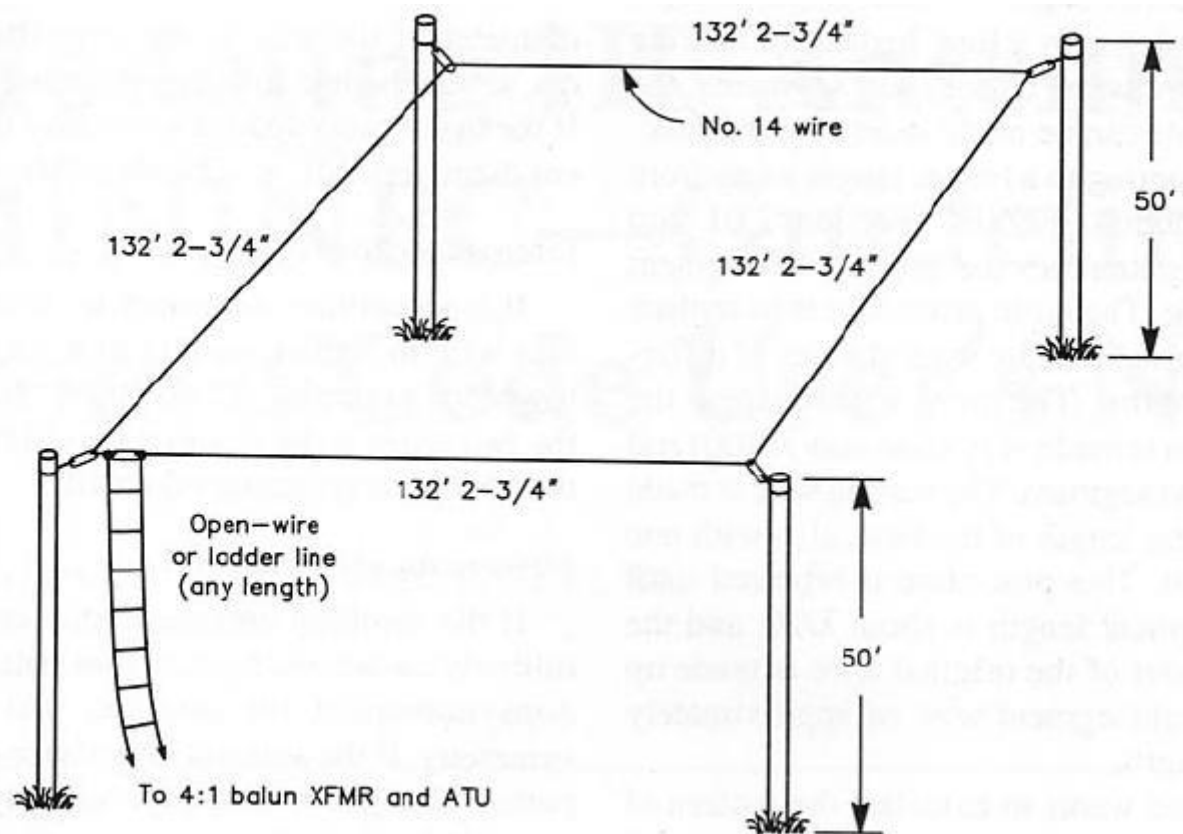
$$L5 = \frac{108.4}{f_{\text{MHz}}} \text{ meters}$$

$$L6 = \frac{94.2}{f_{\text{MHz}}} \text{ meters}$$

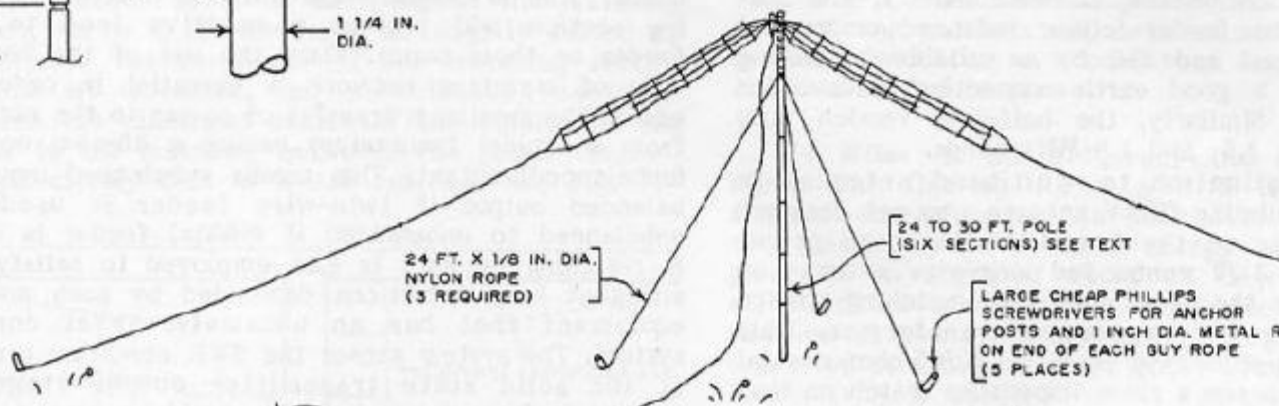
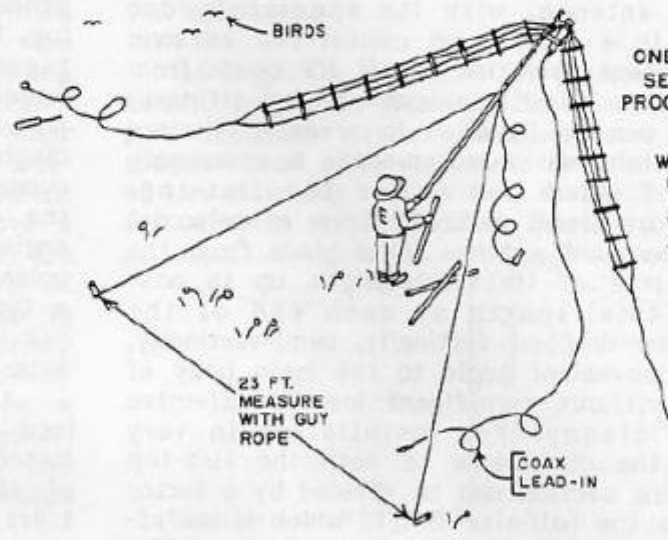
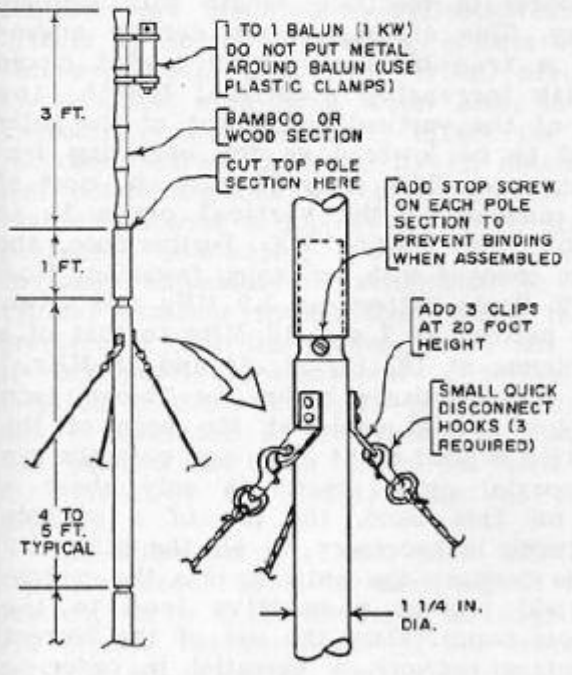
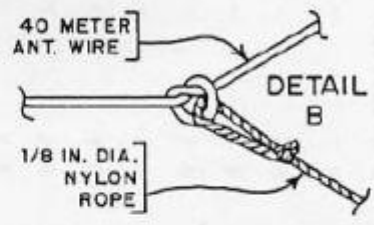
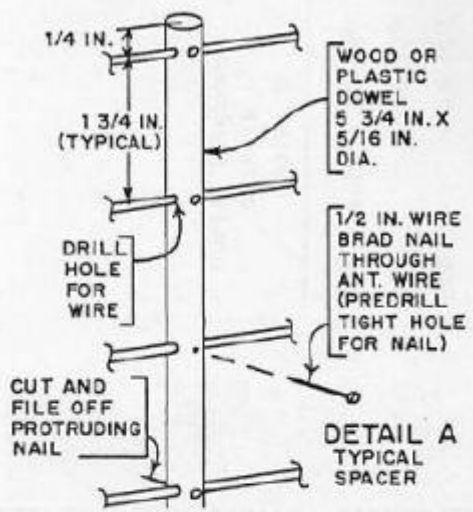
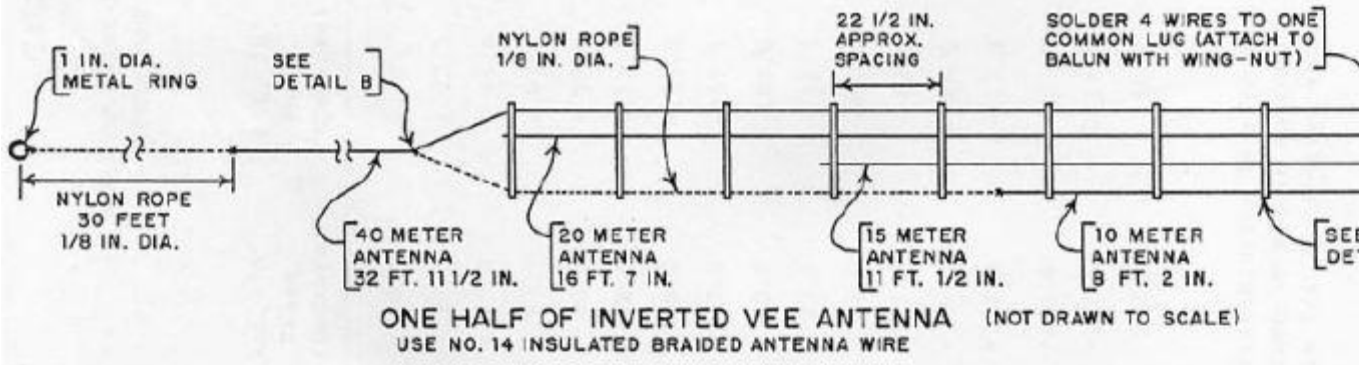
$$L7 = \frac{136.8}{f_{\text{MHz}}} \text{ meters}$$



**36 - 1.9 MHz Full-wave Loop Antenna**

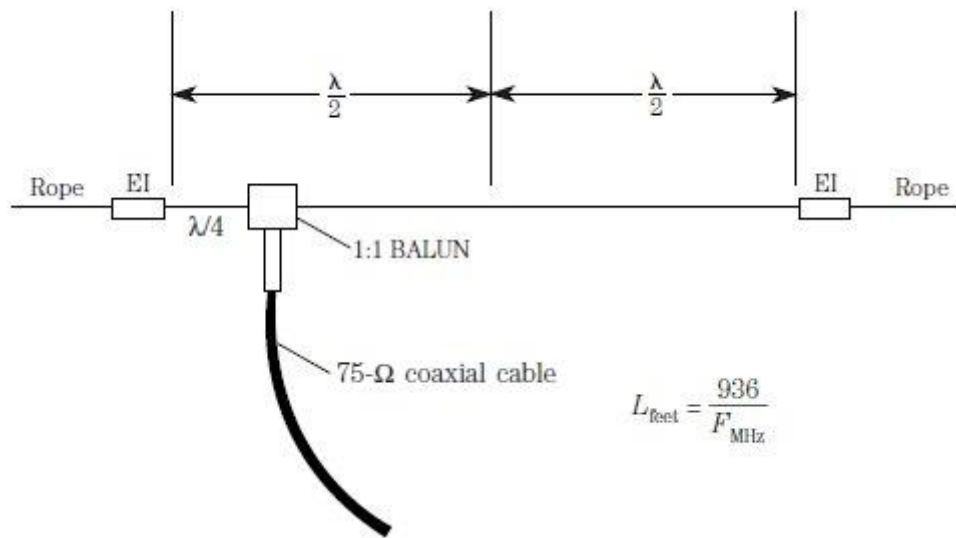


**37 - Multi-Band Portable Antenna**



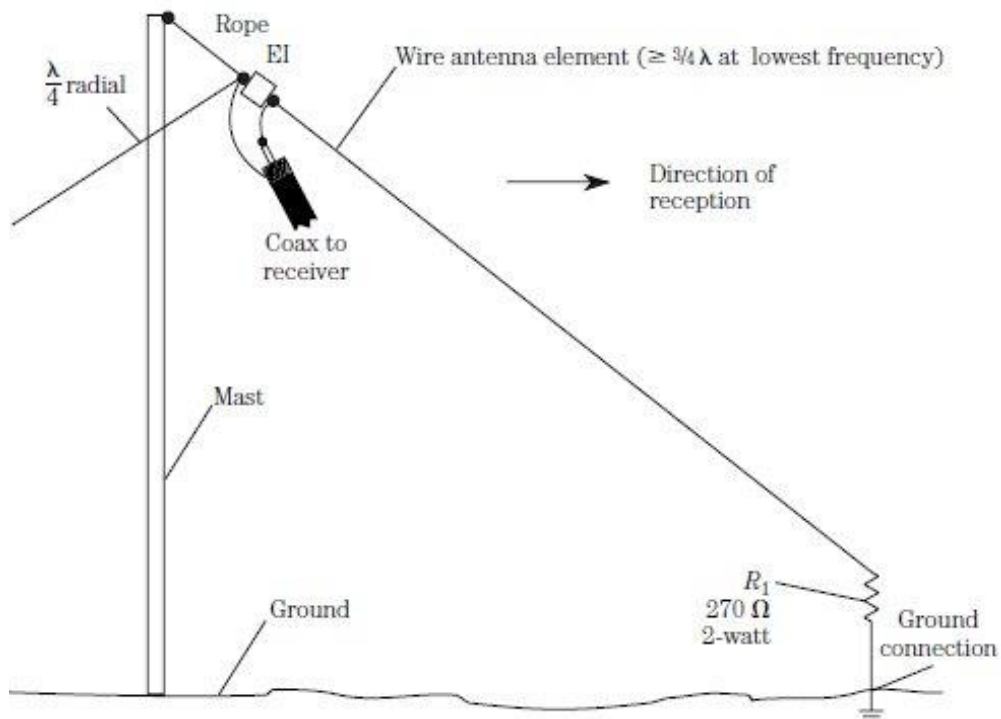
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### 38 - Off-center-fed Full-wave Doublet Antenna



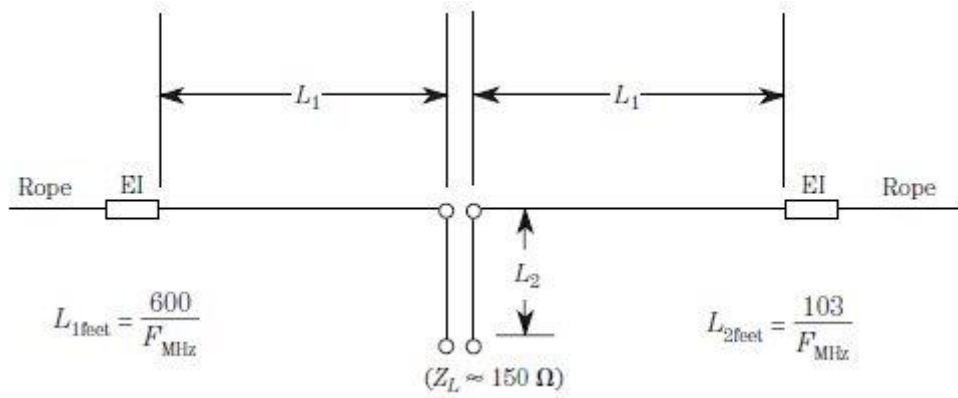
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### 39 - Terminated Sloper Antenna

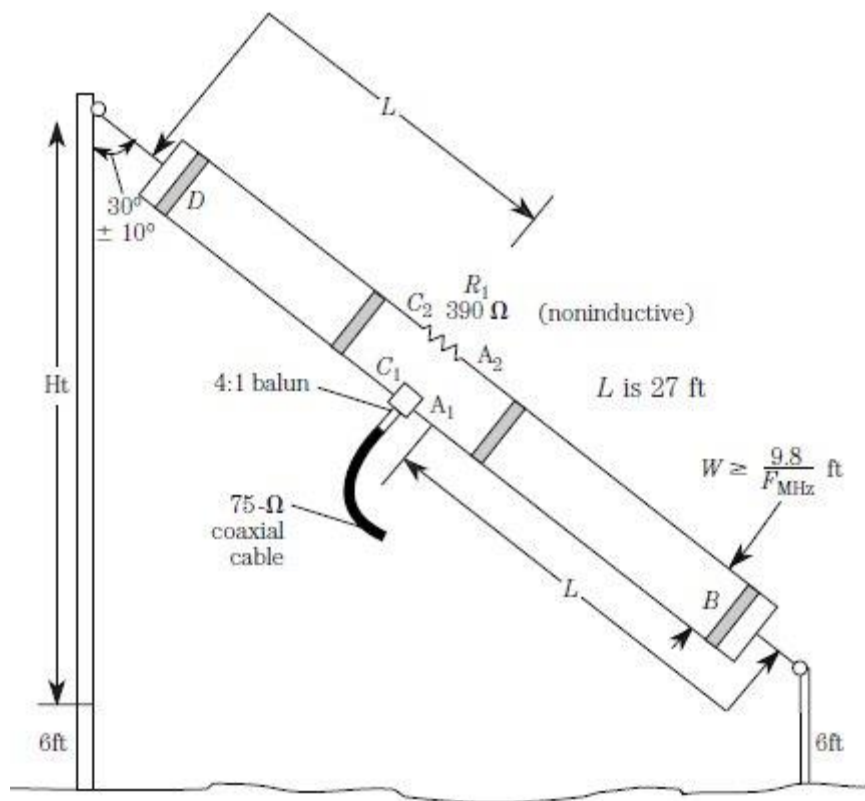


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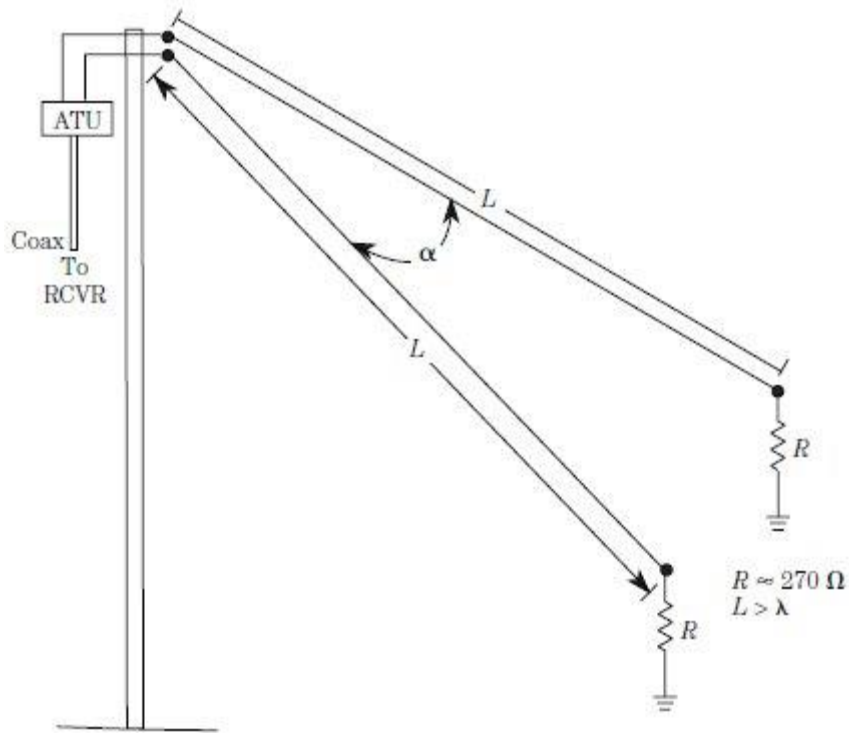
### 40 - Double Extended Zepp Antenna



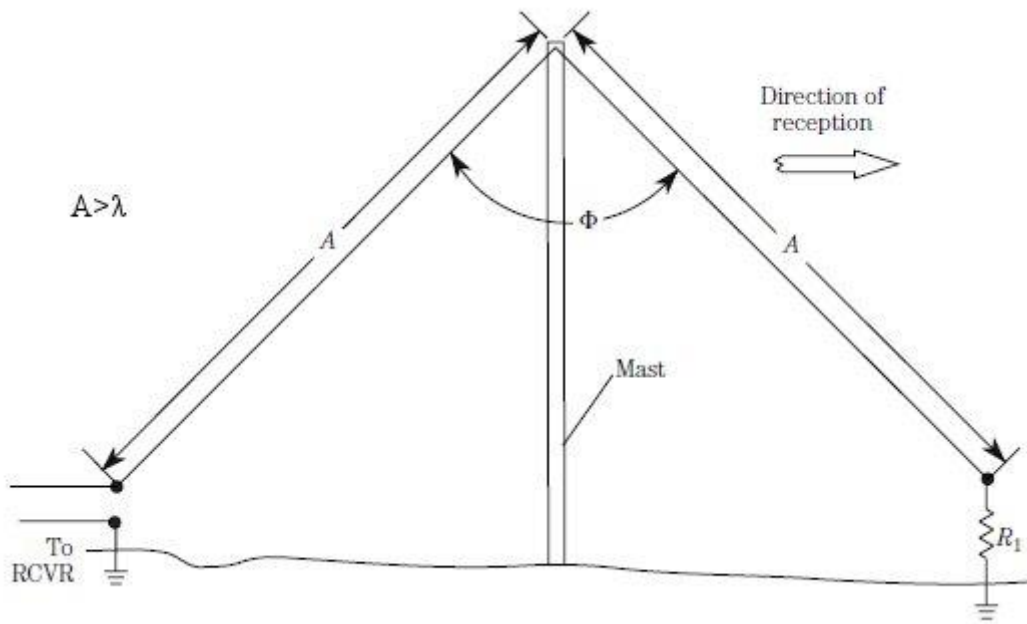
**41 - TCFTFD Dipole Antenna**



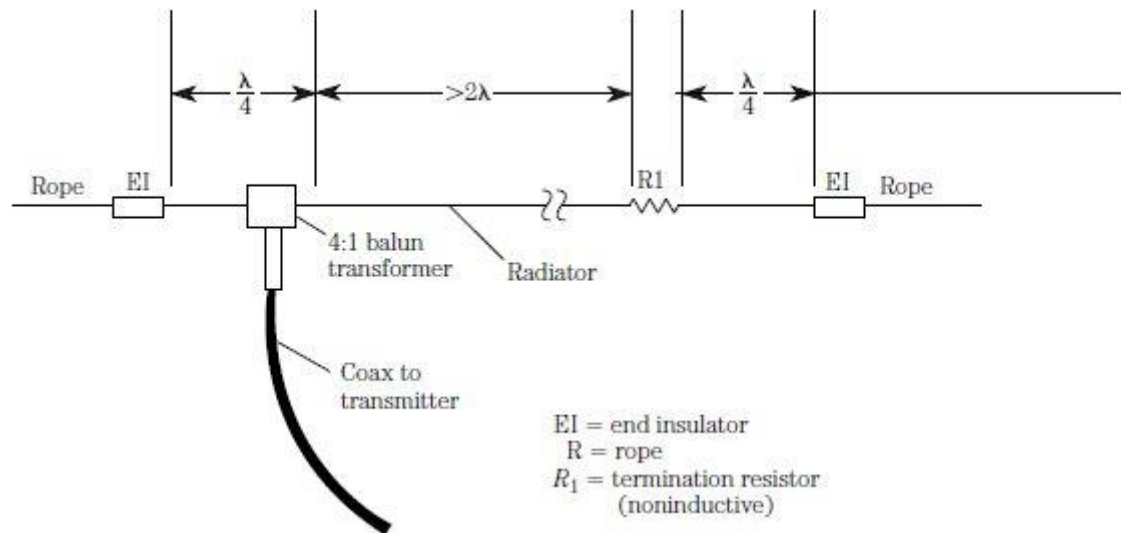
**42 - Vee-Sloper Antenna**



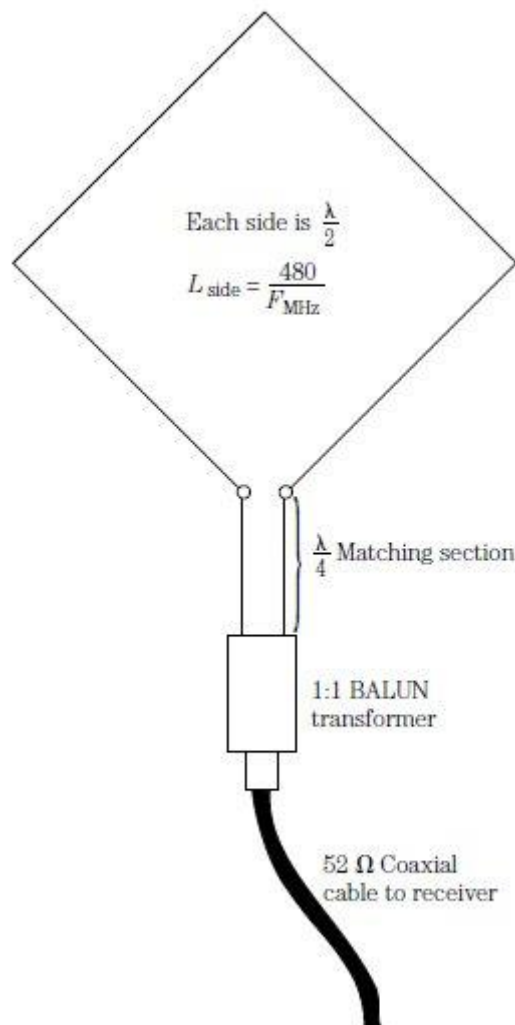
**43 - Rhombic Inverted-Vee Antenna**



**44 - Counterpoise Longwire**

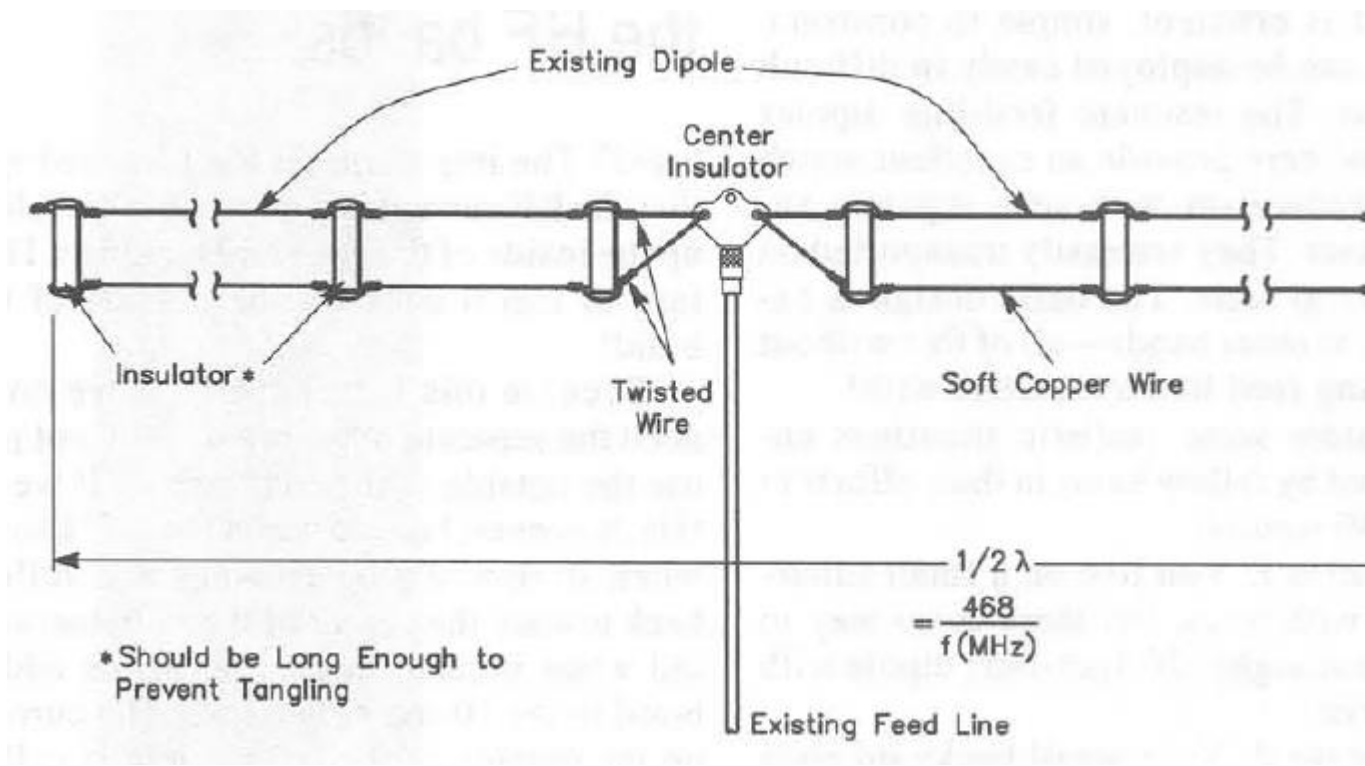


### 45 - Bisquare Loop Antenna



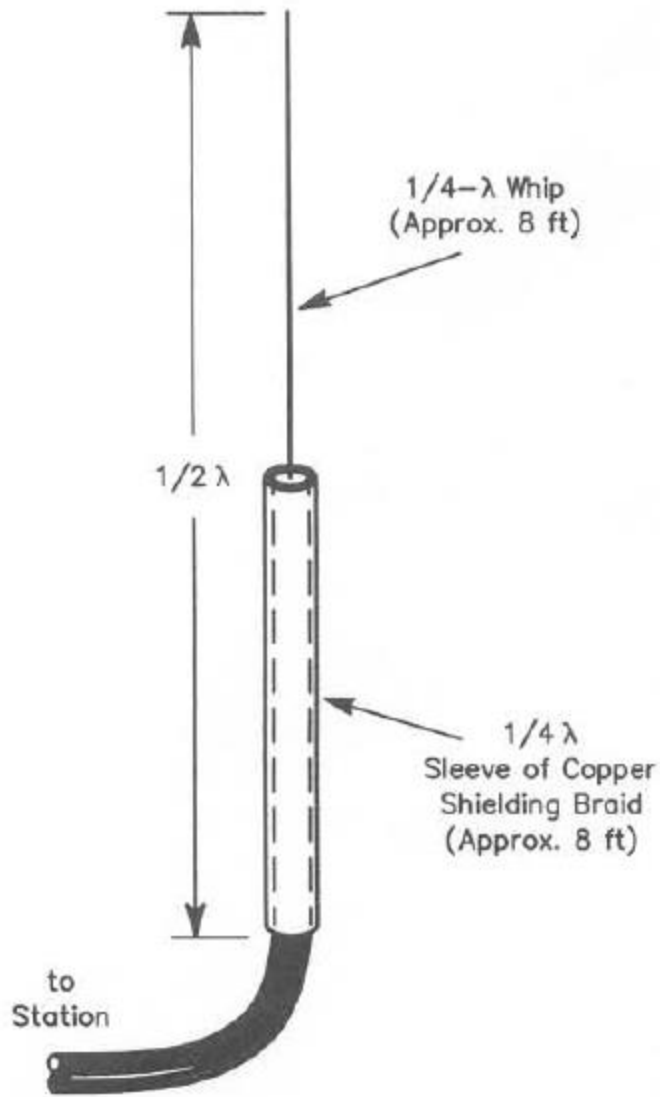
### 46 - Piggyback Antenna for 10m





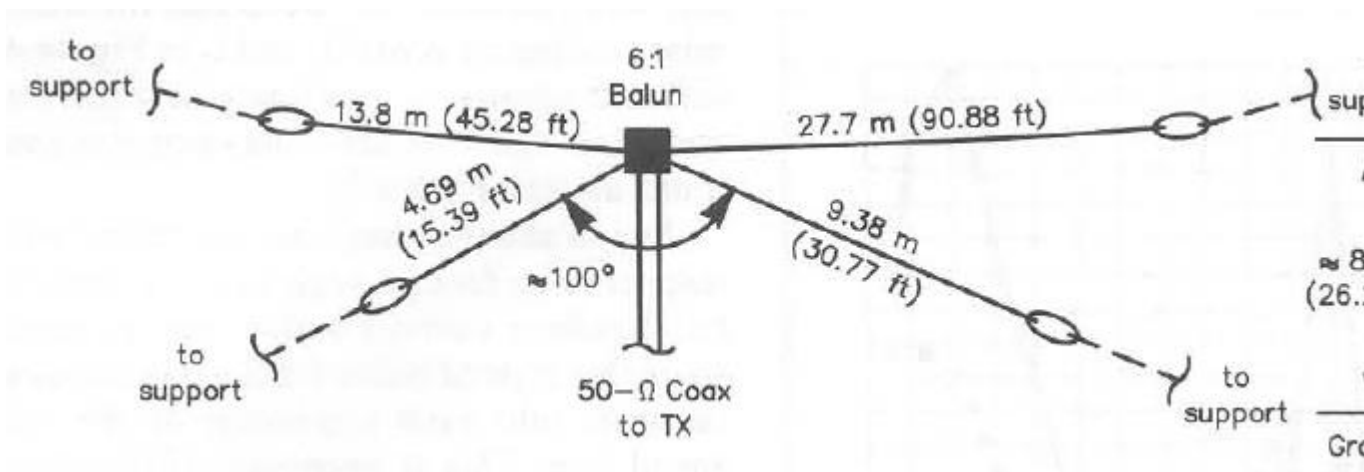

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**47 - Vertical Sleeve Antenna for 10m**

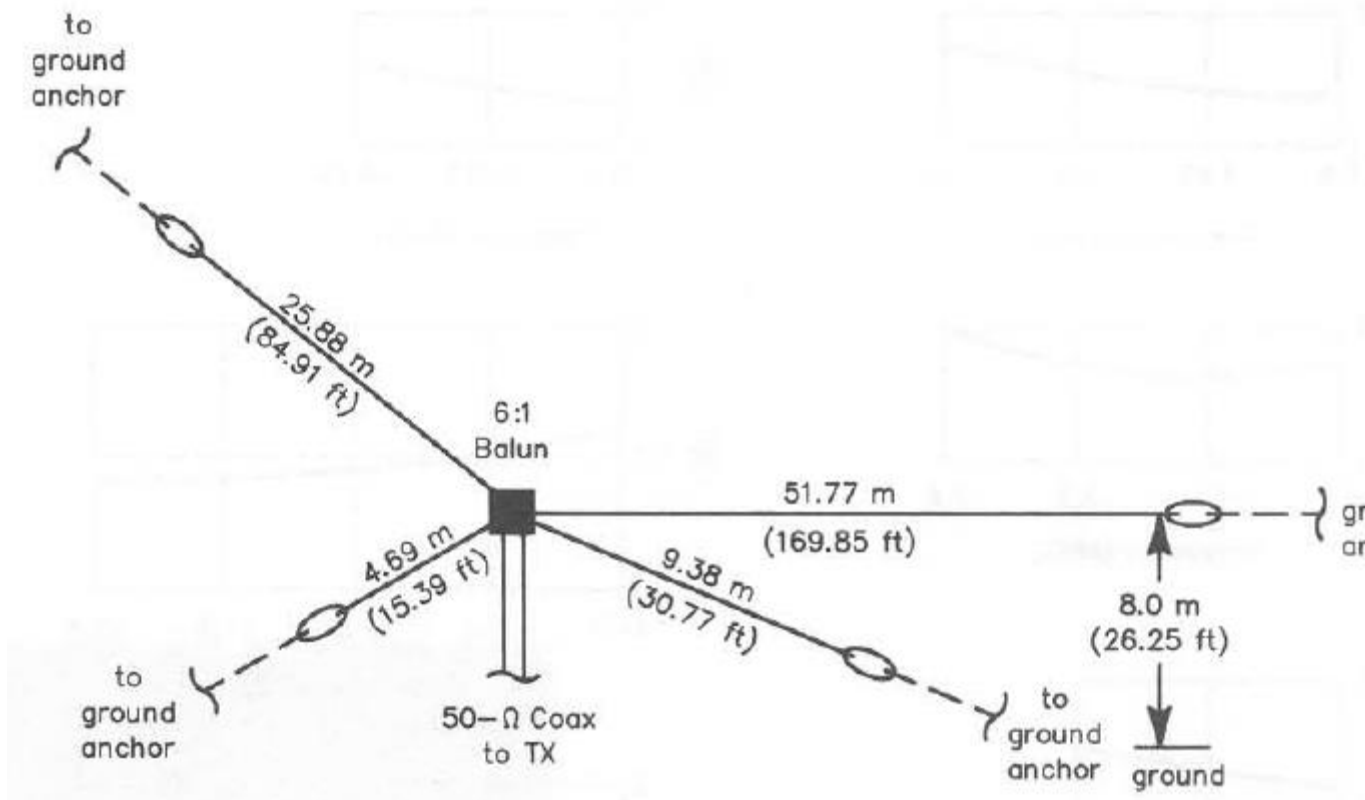



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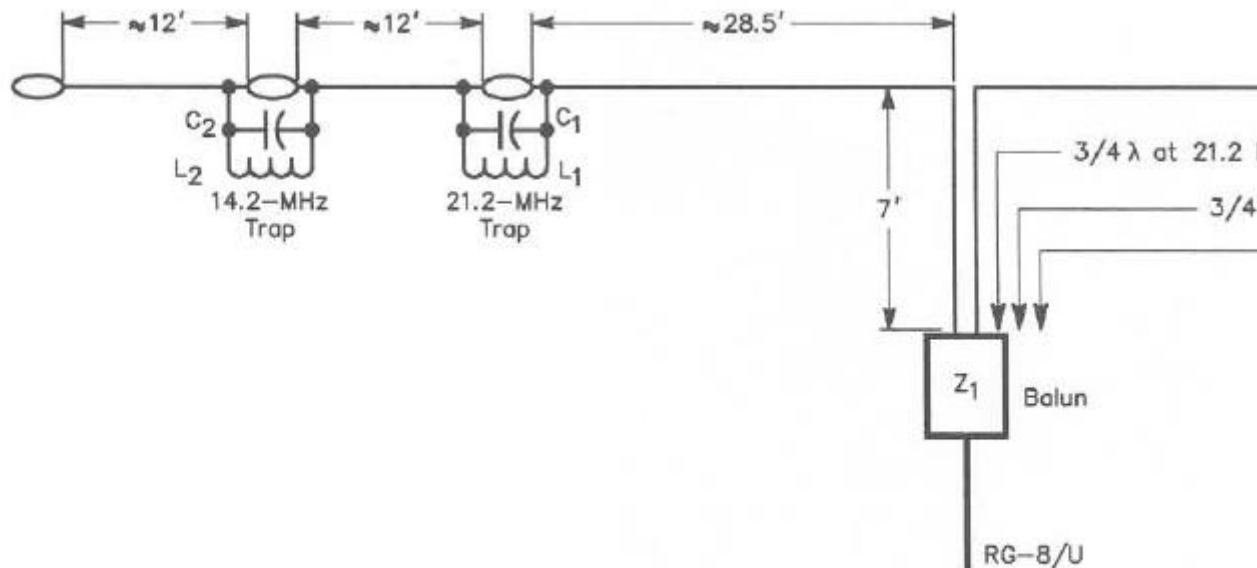
### 48 - Double Windom Antenna



## 49 - Double Windom for 9 Bands



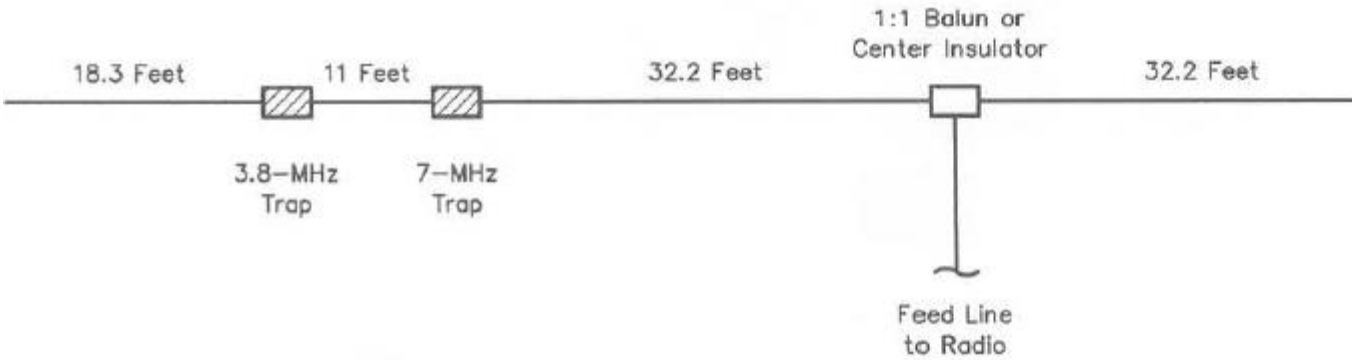
## 50 - Collinear Trap Antenna



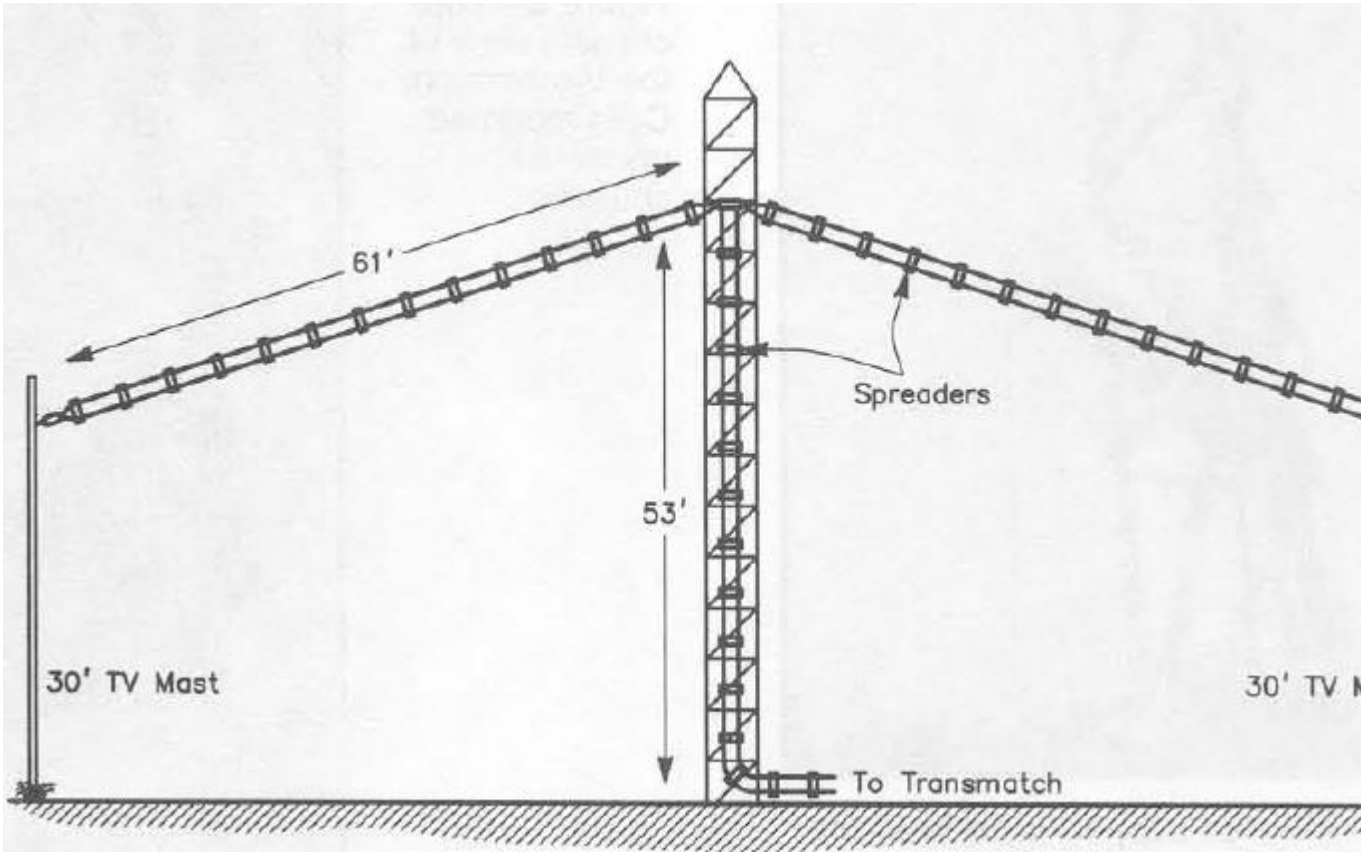
C<sub>1</sub>, C<sub>2</sub>—25-pf. 6000-volt disk ceramic. See text.  
 L<sub>1</sub>—Approx. 2 μH—4<sup>3</sup>/<sub>4</sub> turns No. 18, 2<sup>1</sup>/<sub>4</sub>-inches diam., <sup>3</sup>/<sub>8</sub> inch long, or 5 turns No. 18, 2-inch diam., 16 tpi. See text.

L<sub>2</sub>—Approx. 5 μH.  
 9 turns No. 18,  
 Z<sub>1</sub>—1 to 1 balun.

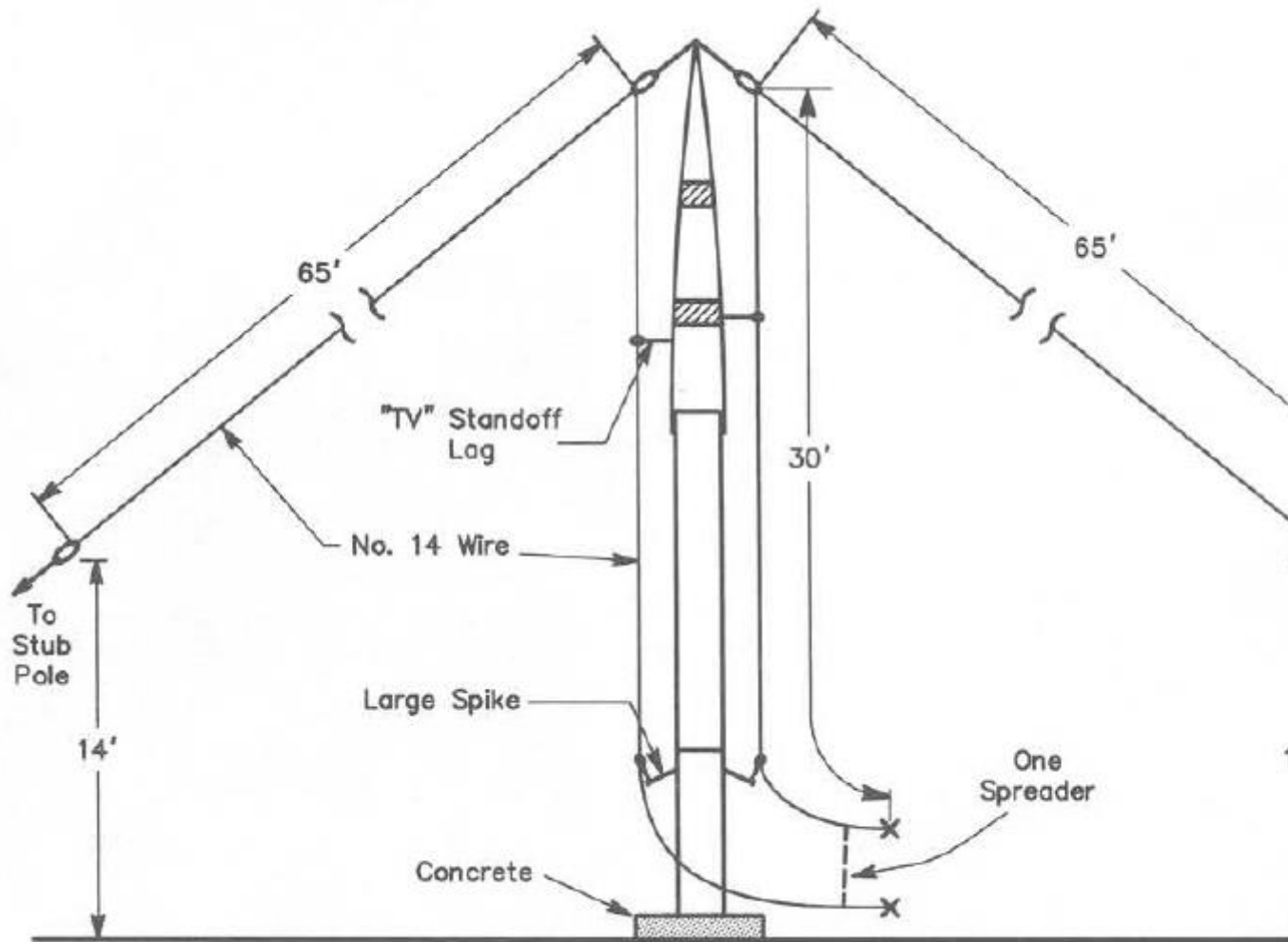
**51 - Short Dipole Antenna for 40m - 80m - 160m**



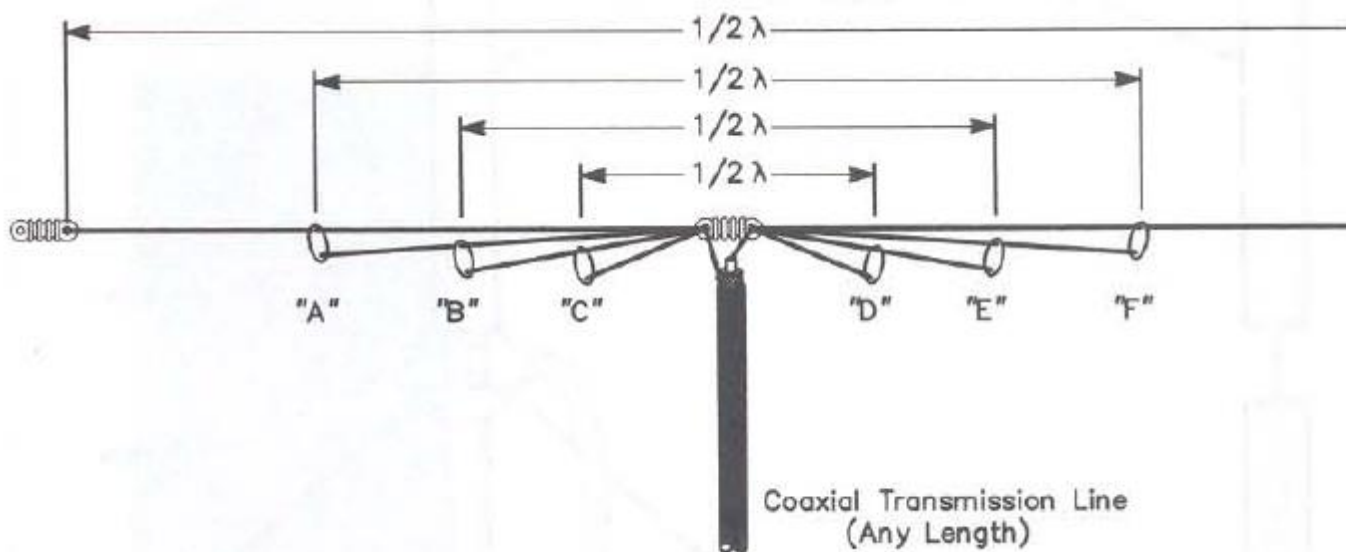
**52 - Center Fed-Zepp Antenna for 80m - 40m**



**53 - All-Bands Antenna**

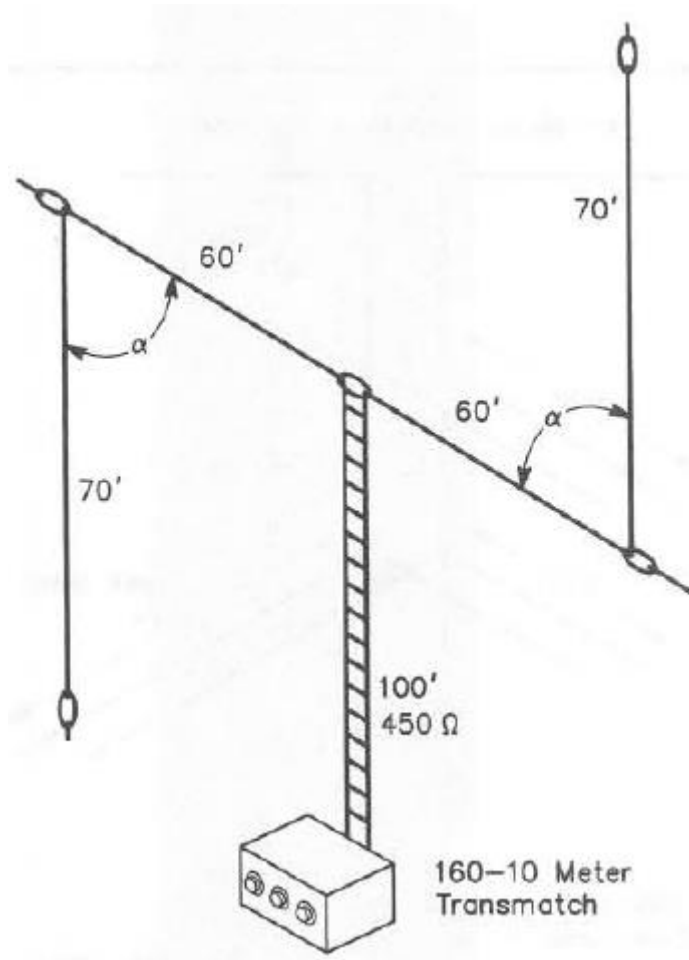


**54 - All-Bands Dipole Antenna**



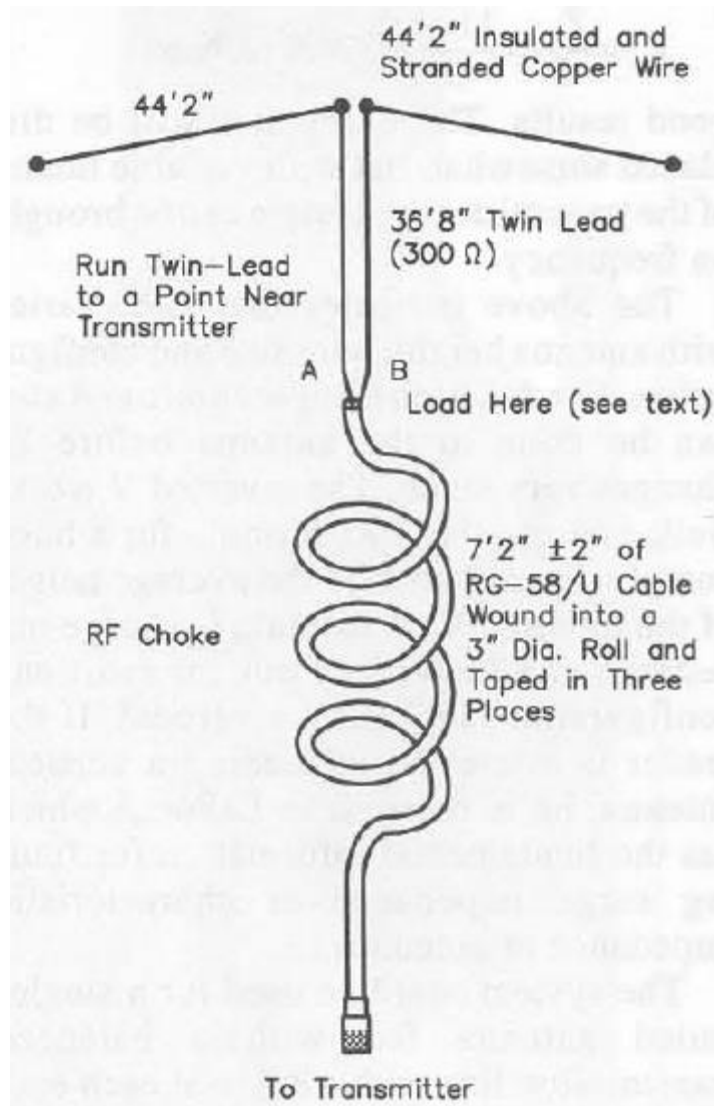
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**55 - Multiband Z Antenna**



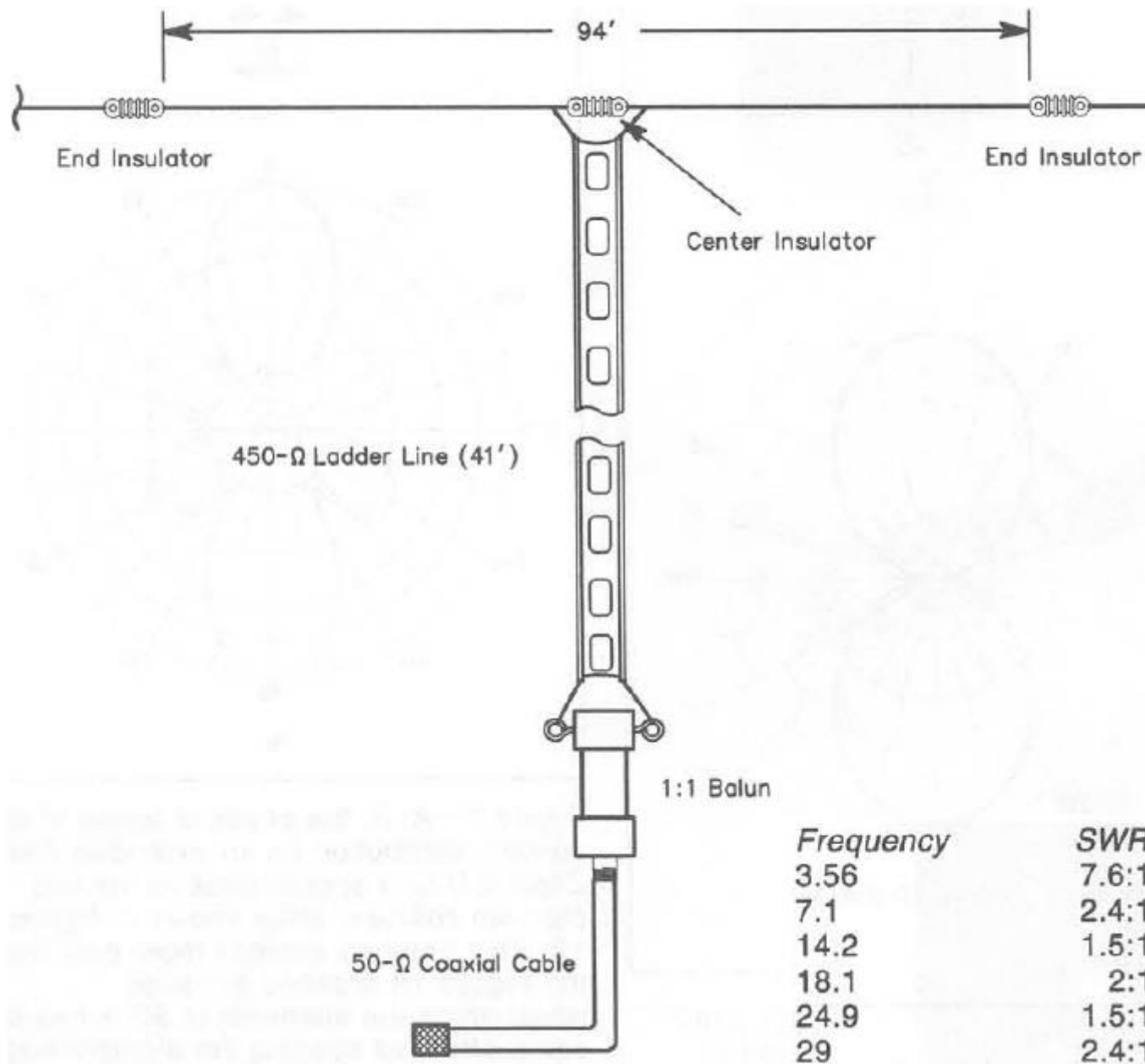
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**56 - Multiband Dipole Antenna**



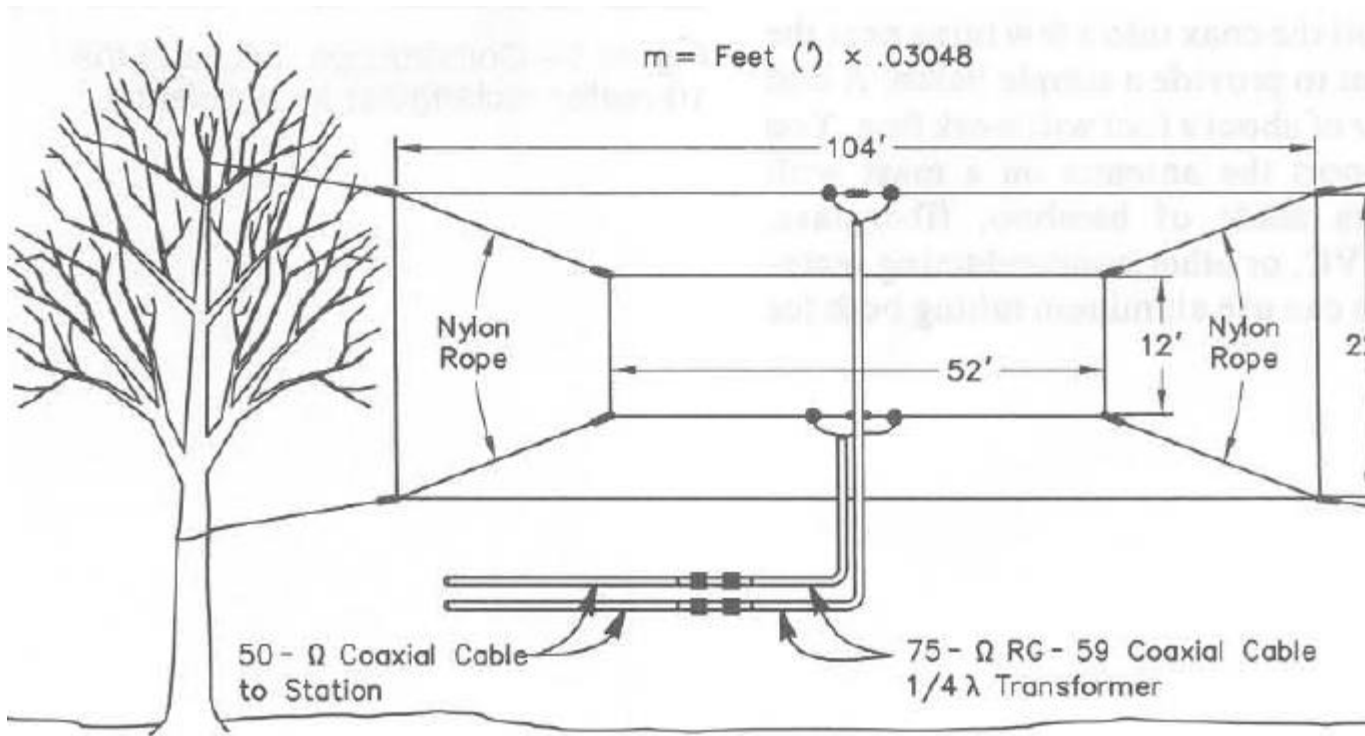
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**57 - Five-Bands No-Tuner Antenna**

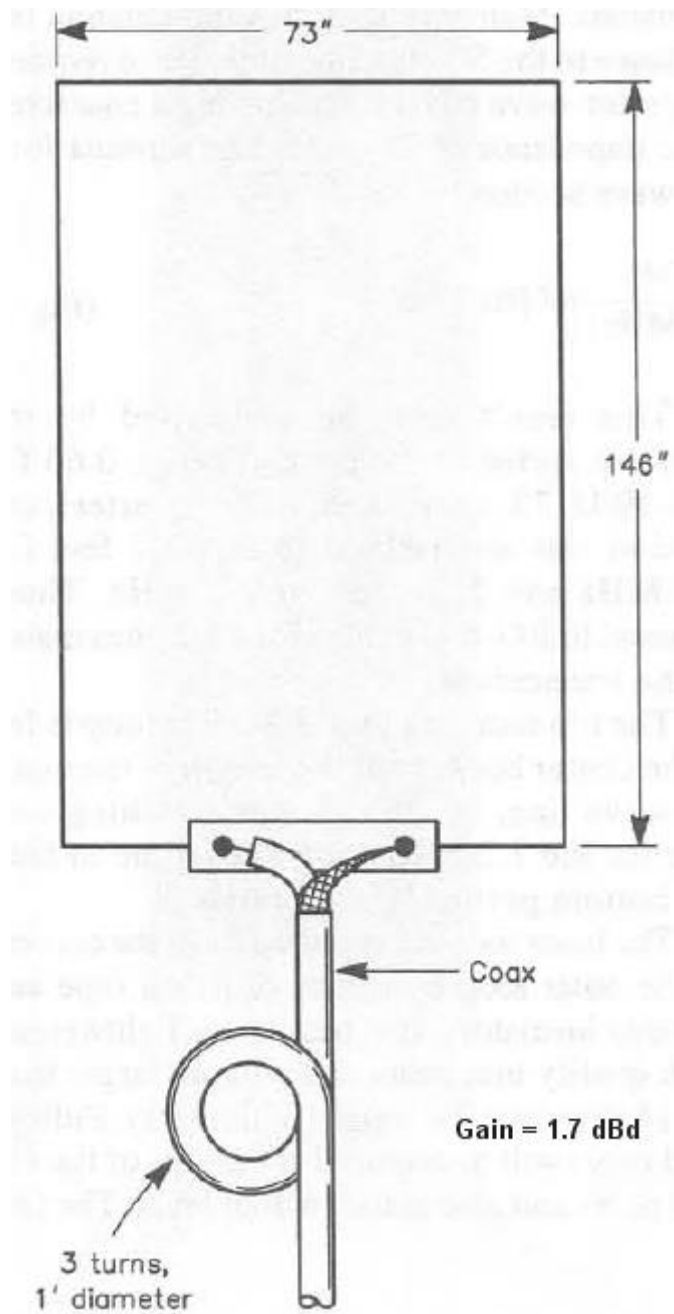


**58 - Dualband Full-wave Loop Antenna for 80m-40m**



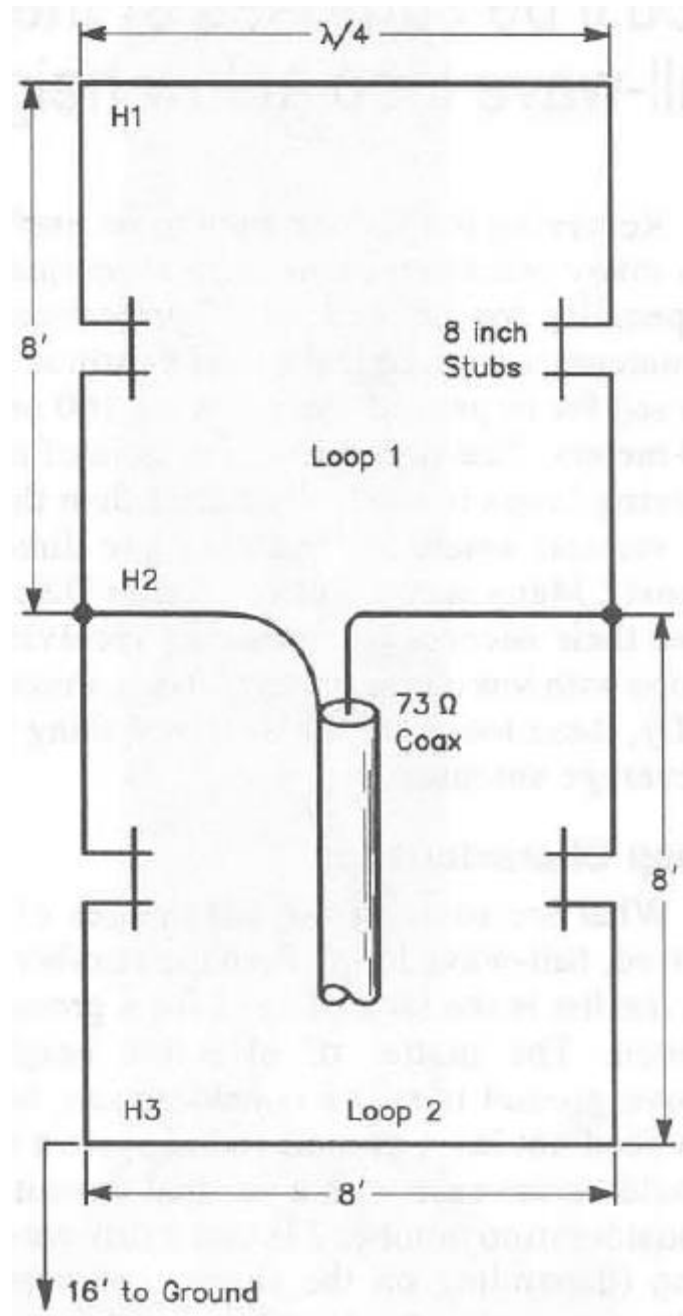


**59 - Loop Antenna for 10m**

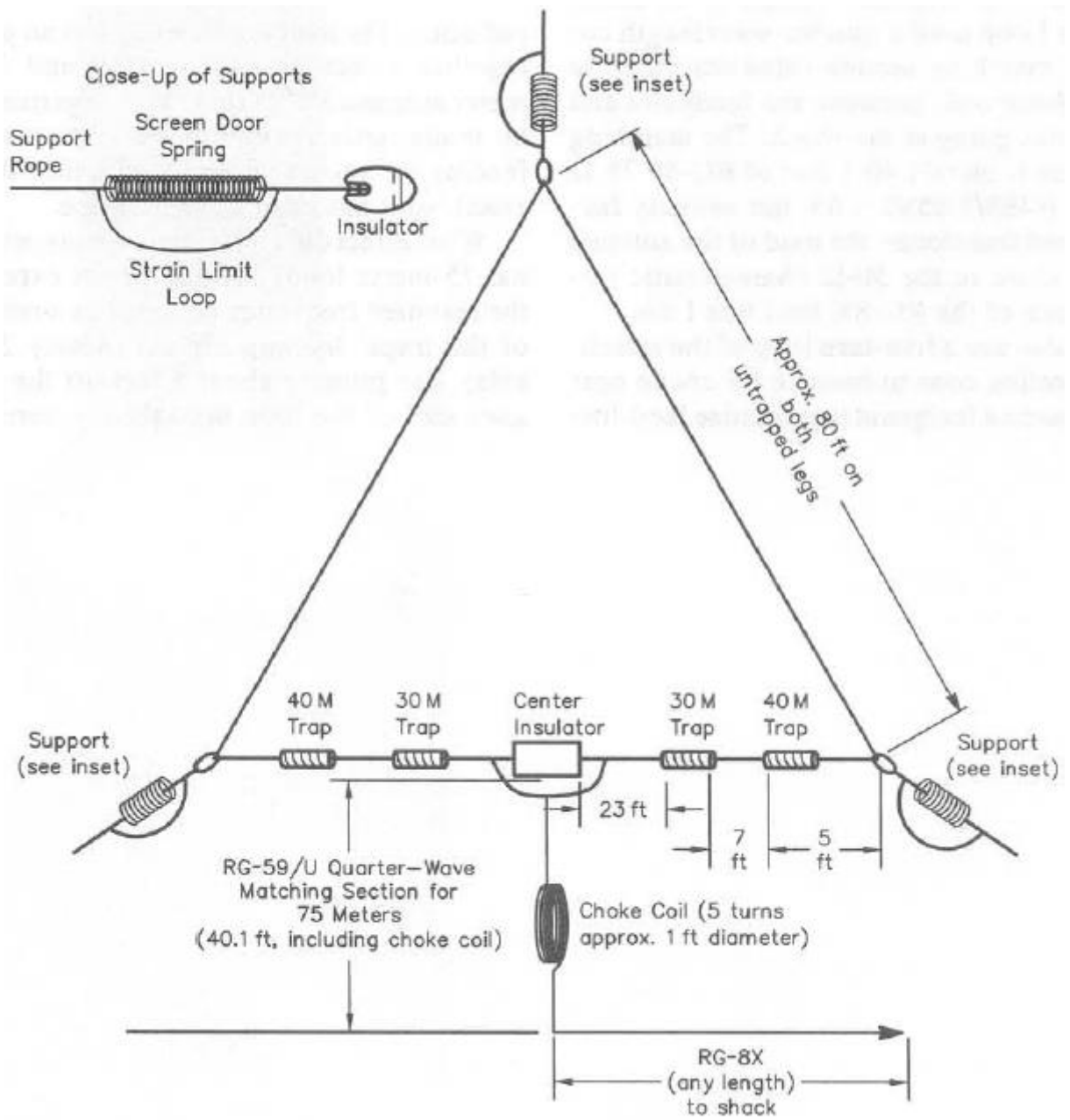


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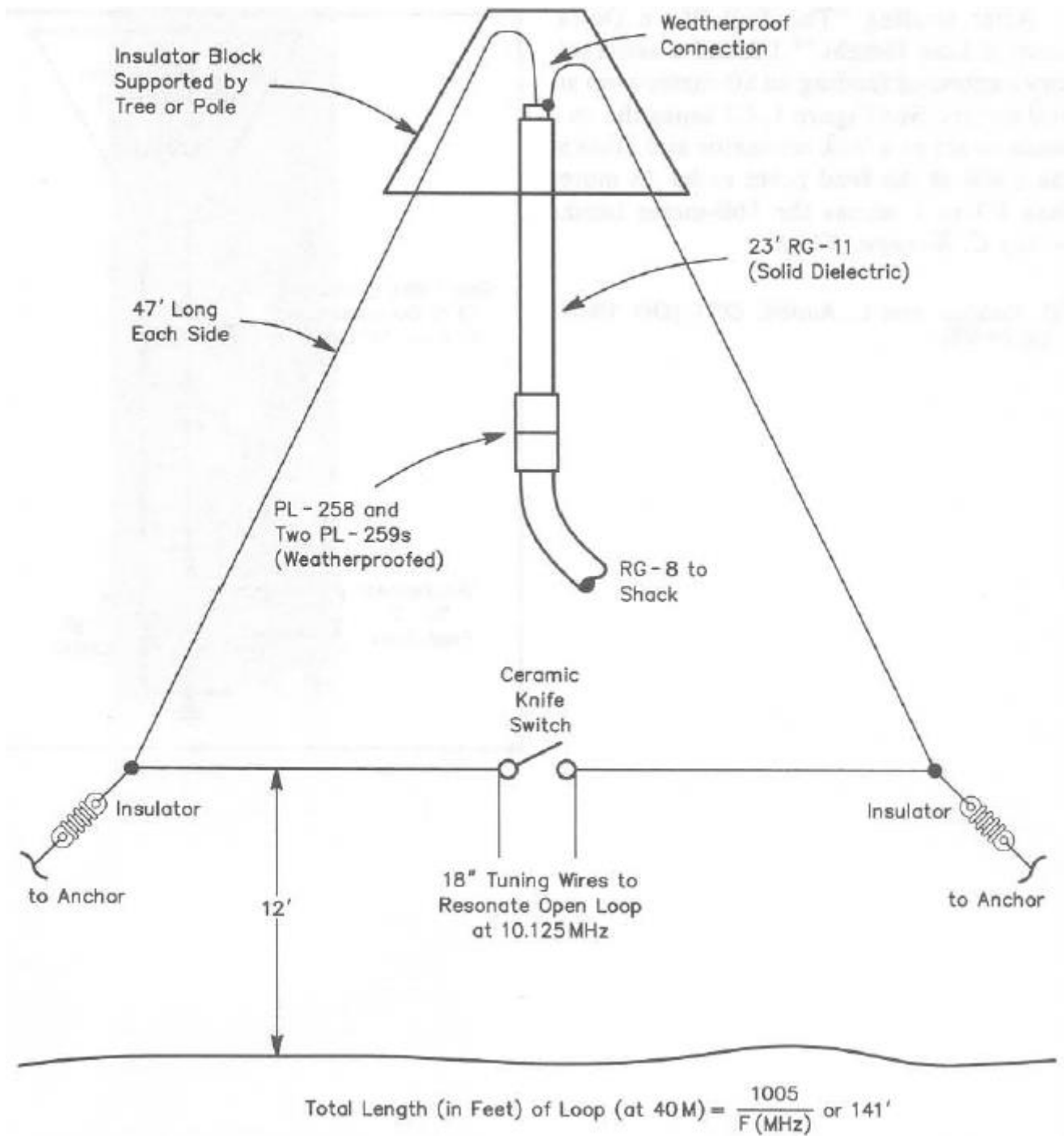
**60 - Lazy Quad Antenna for 10m**



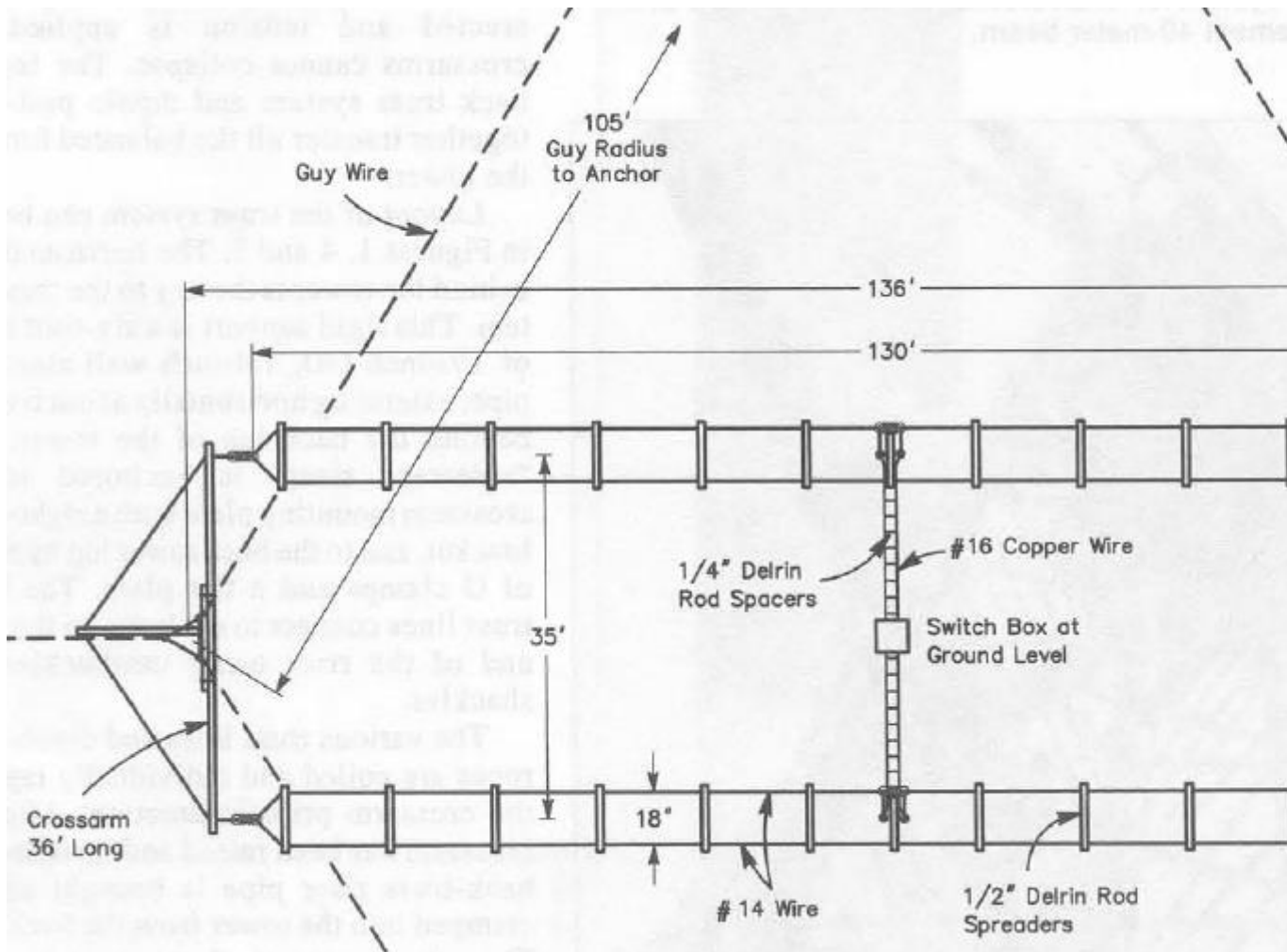
**61 - Tri-band Delta Loop Antenna for 80m - 40m - 30m**



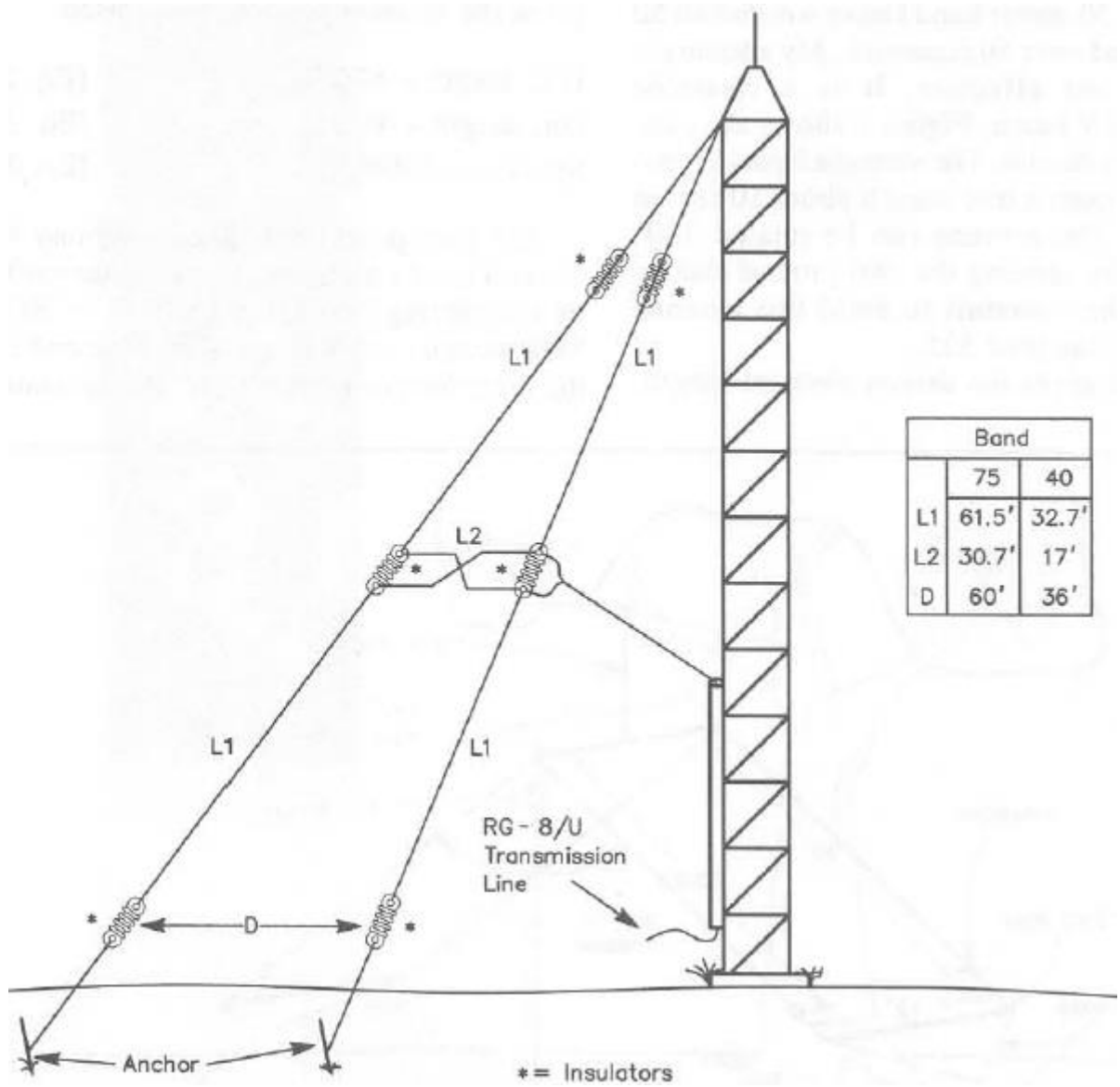
**62 - Dual-band Loop Antenna for 30m - 40m**



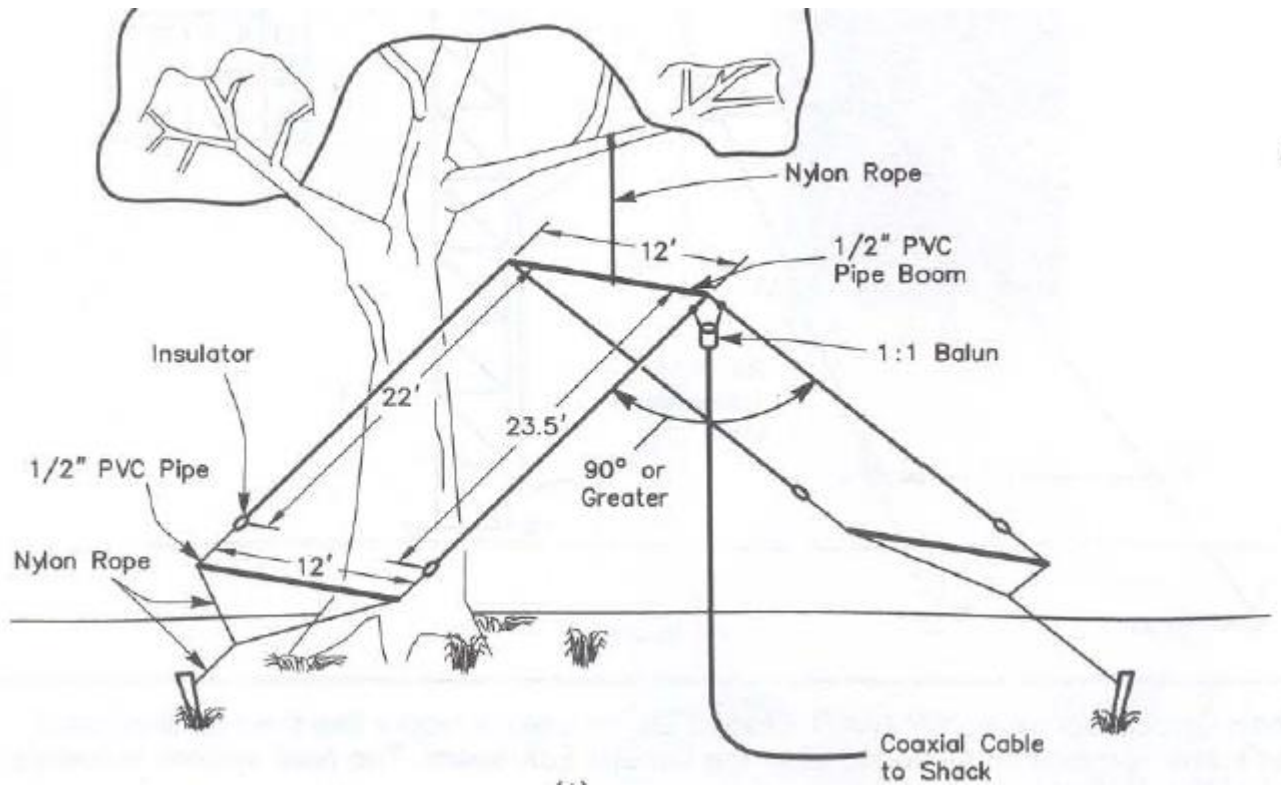
**63 - Wire-Beam Antenna for 80m**



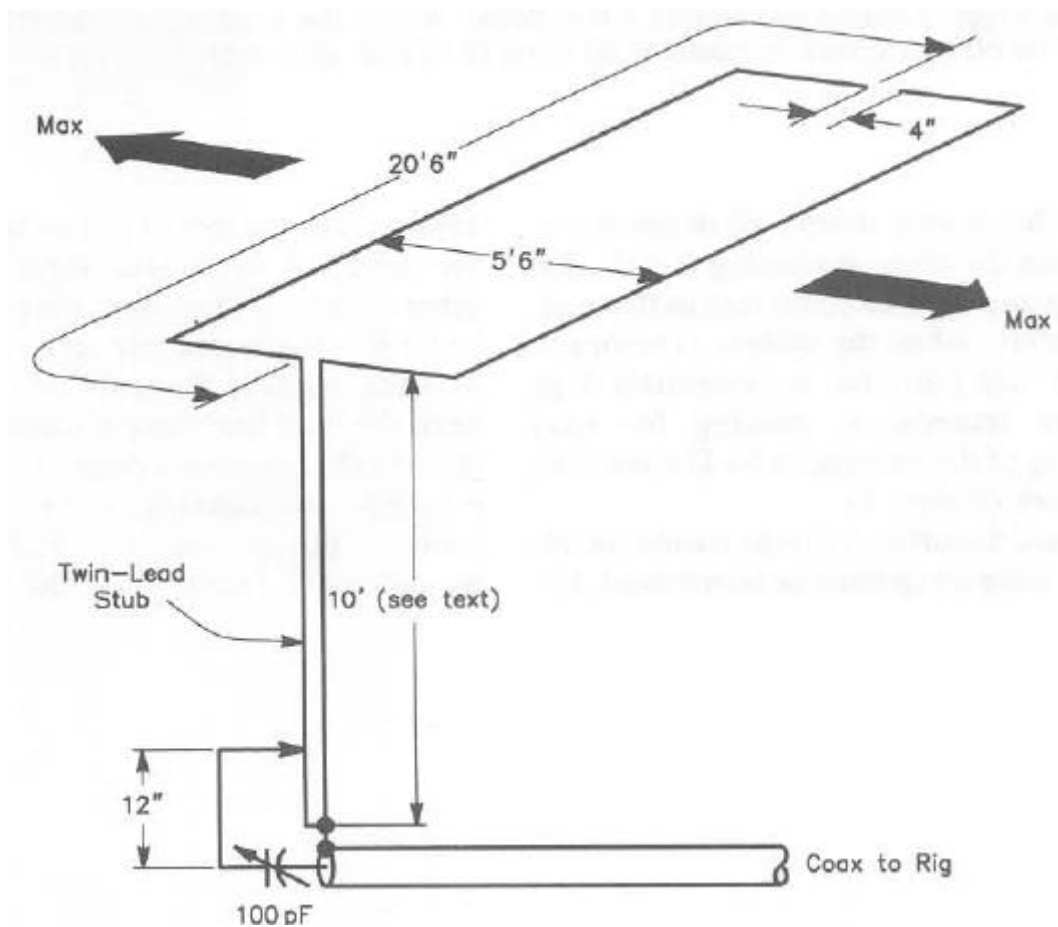
**64 - Dual-Band Sloper Antenna**



**65 - Inverted-V Beam Antenna for 30m**



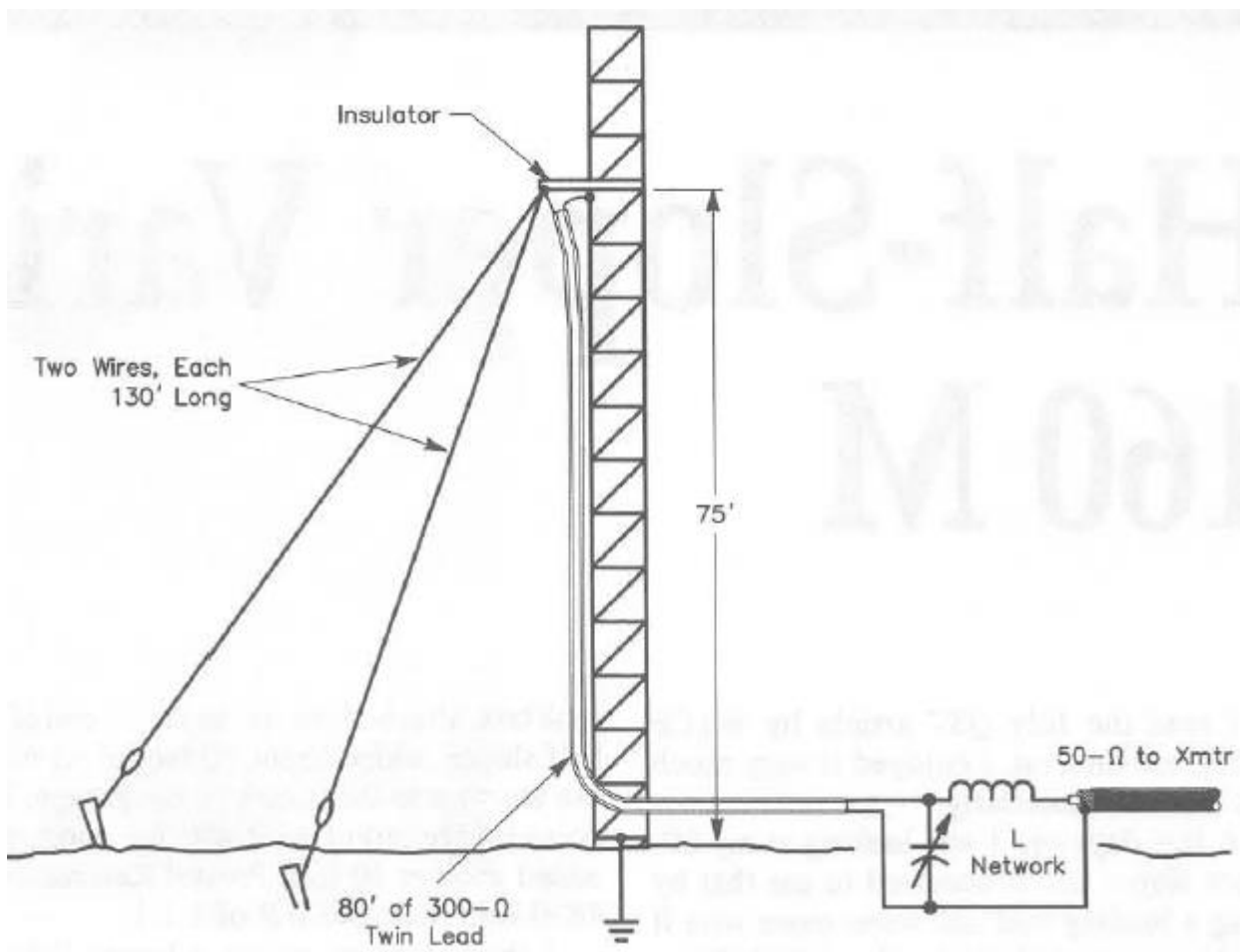
**66 - ZL-Special Beam Antenna for 15m**





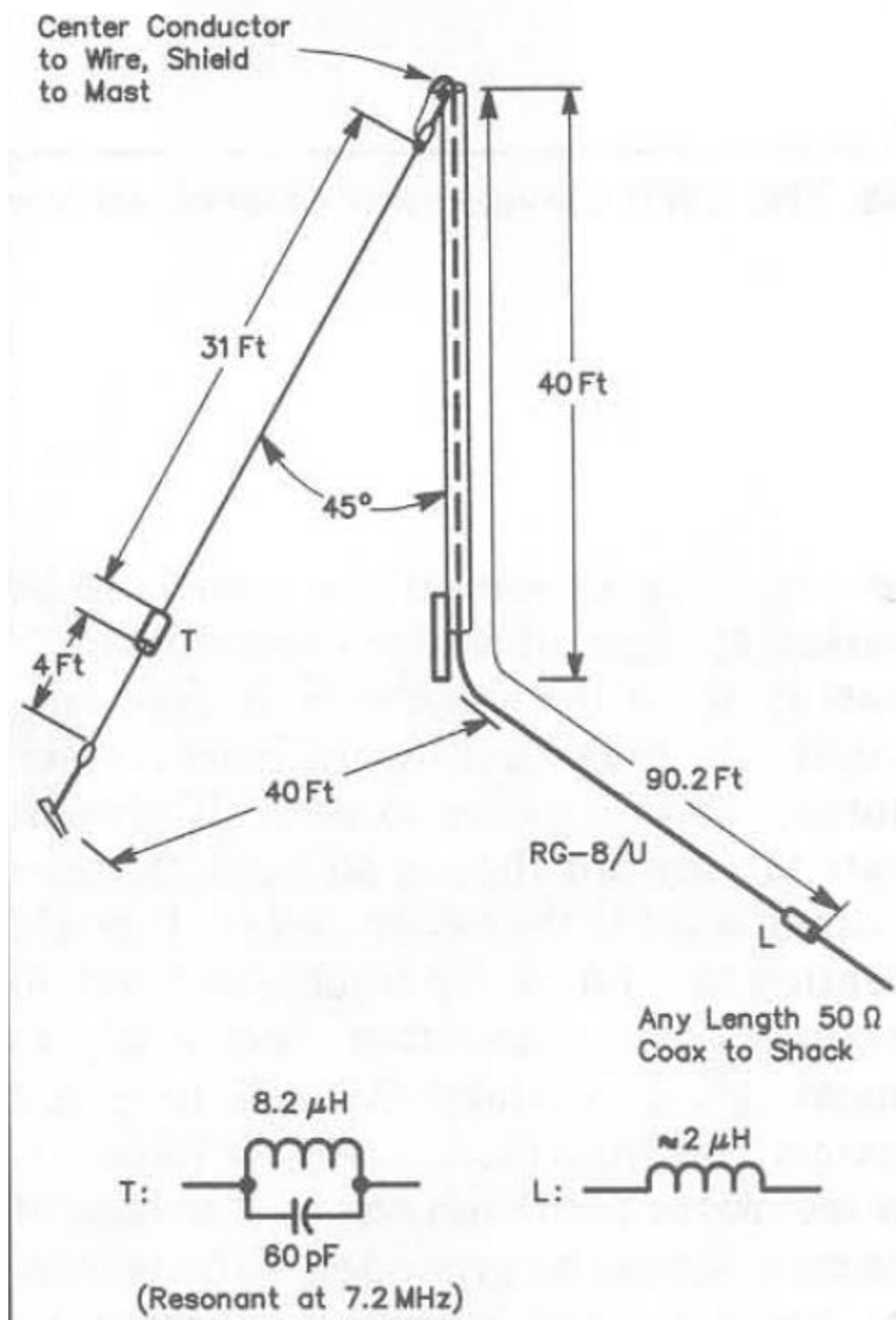
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**67 - Half-Sloper Antenna for 160m**

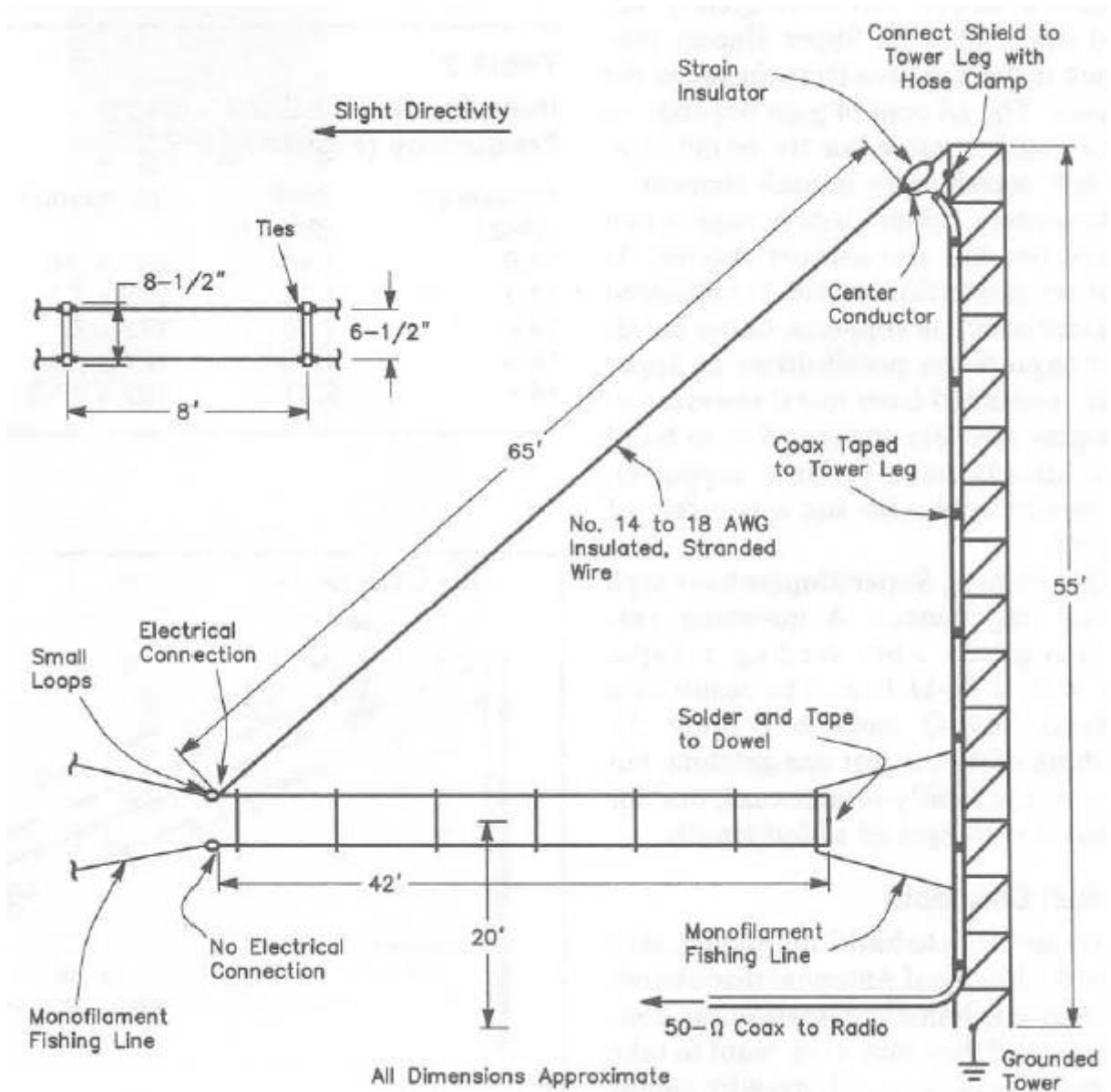


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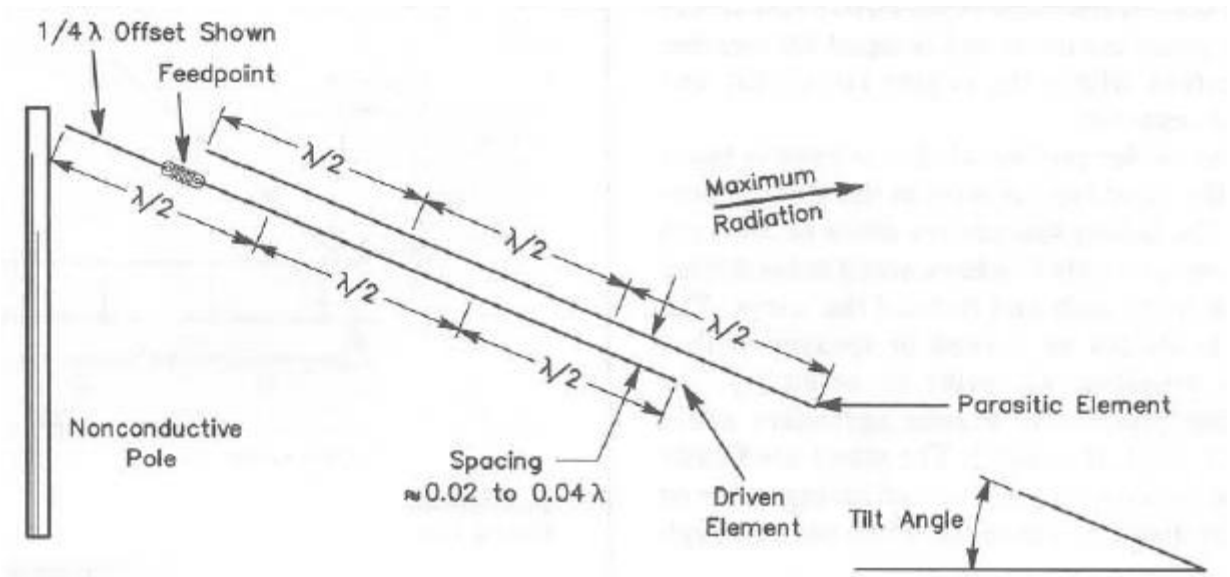
**68 - Two-Bands Half Sloper for 80m - 40m**



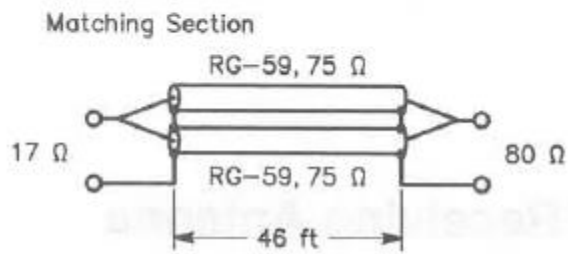
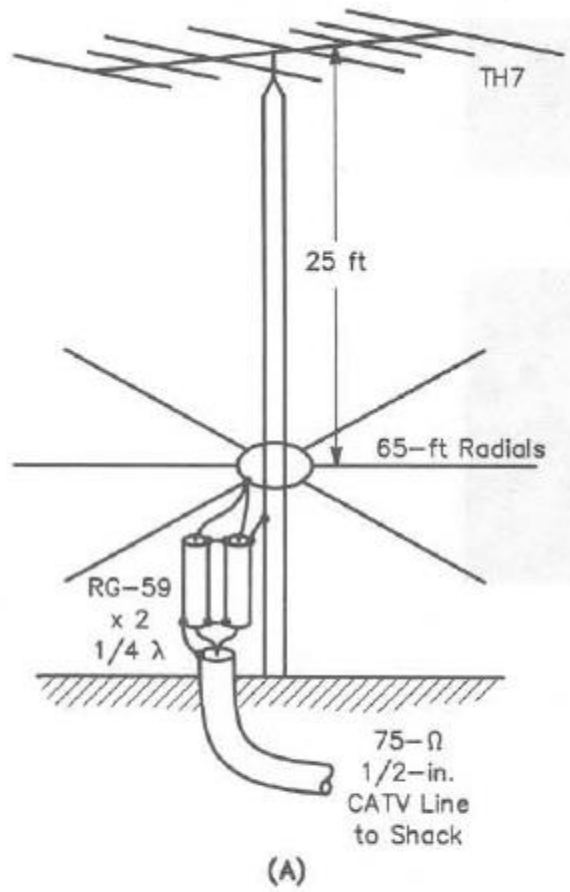
**69 - Linear Loaded Sloper Antenna for 160m**



**70 - Super-Sloper Antenna**

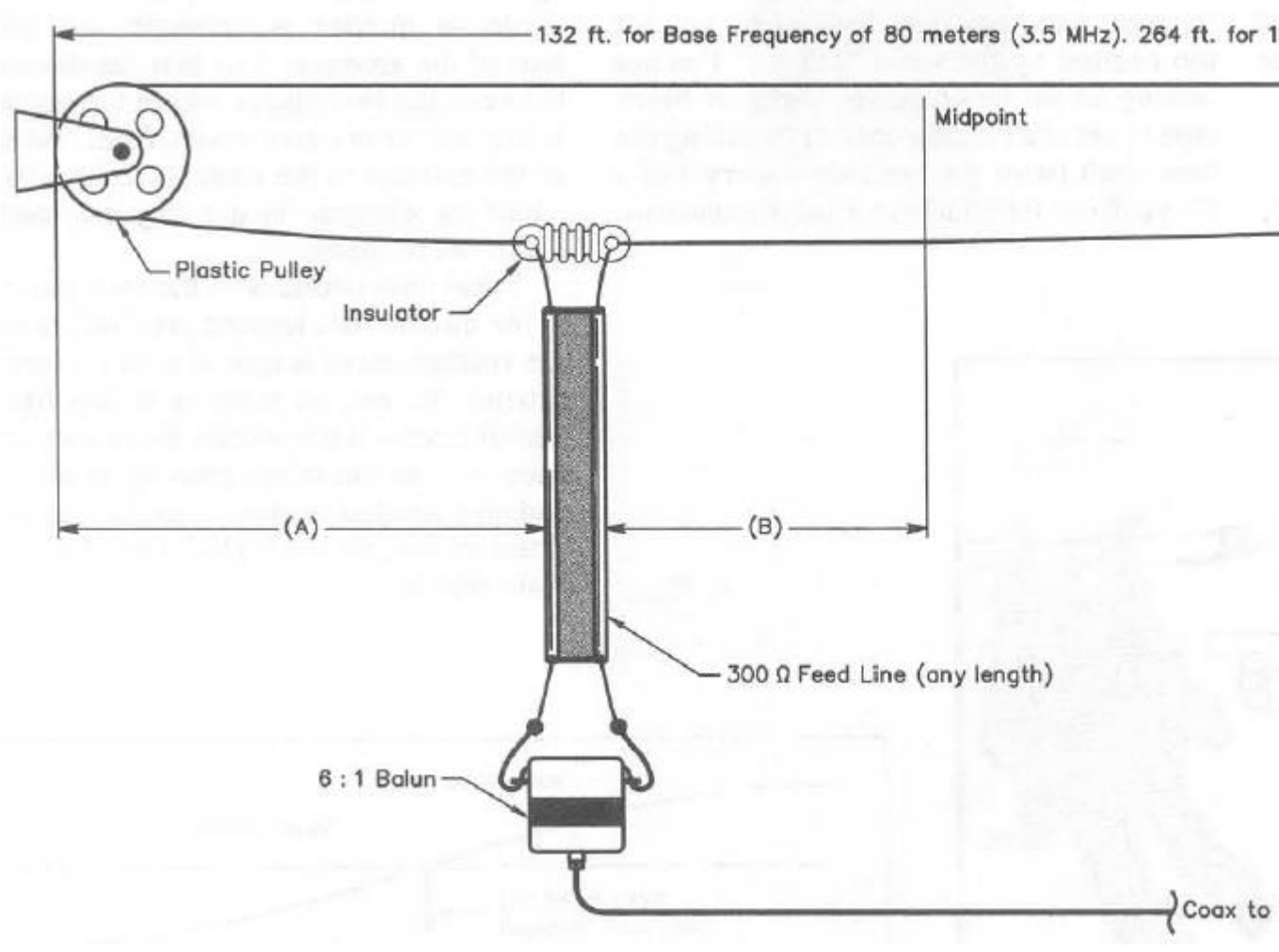


**71 - Tower Pole as a Vertical Antenna for 80m**

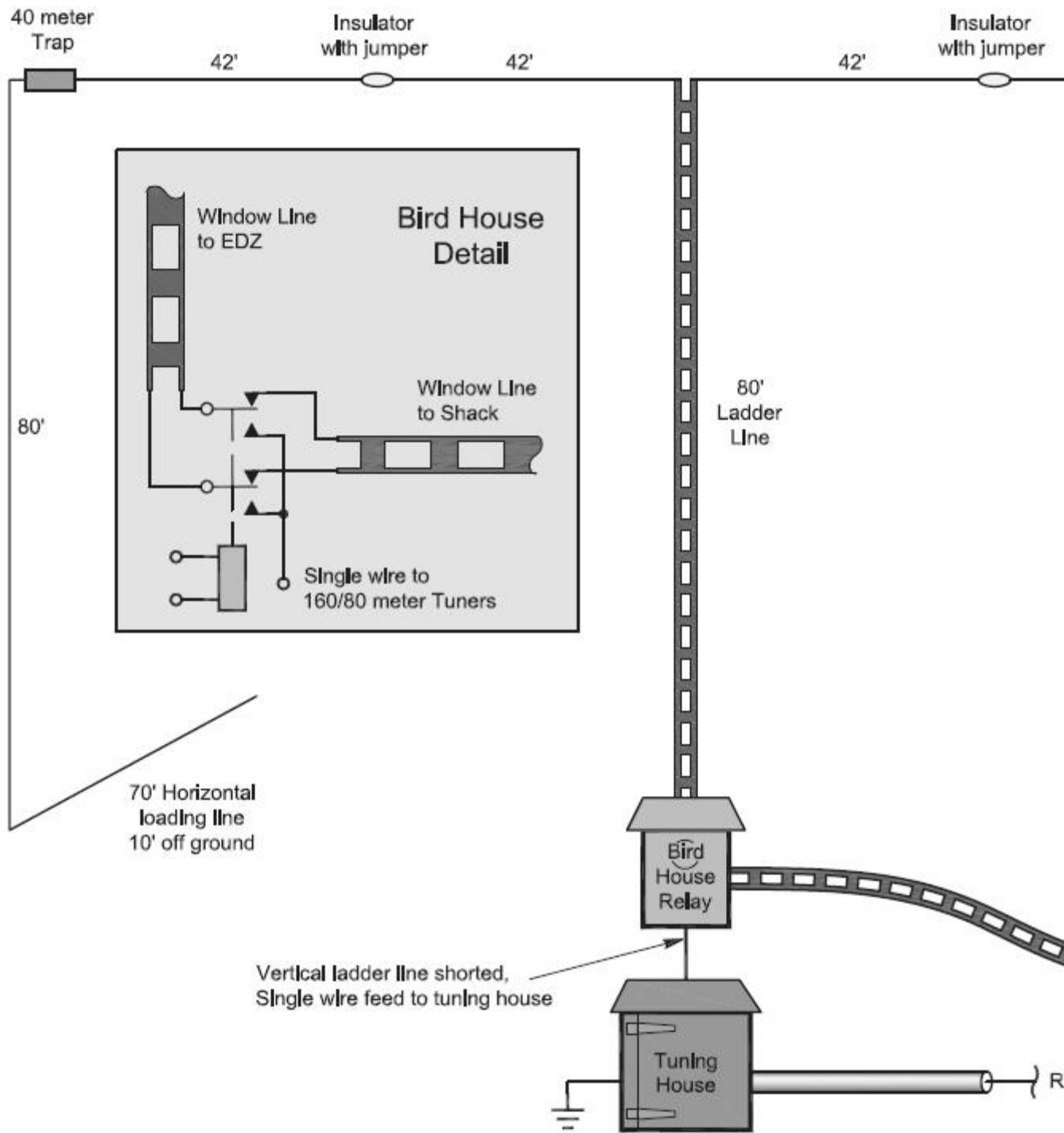



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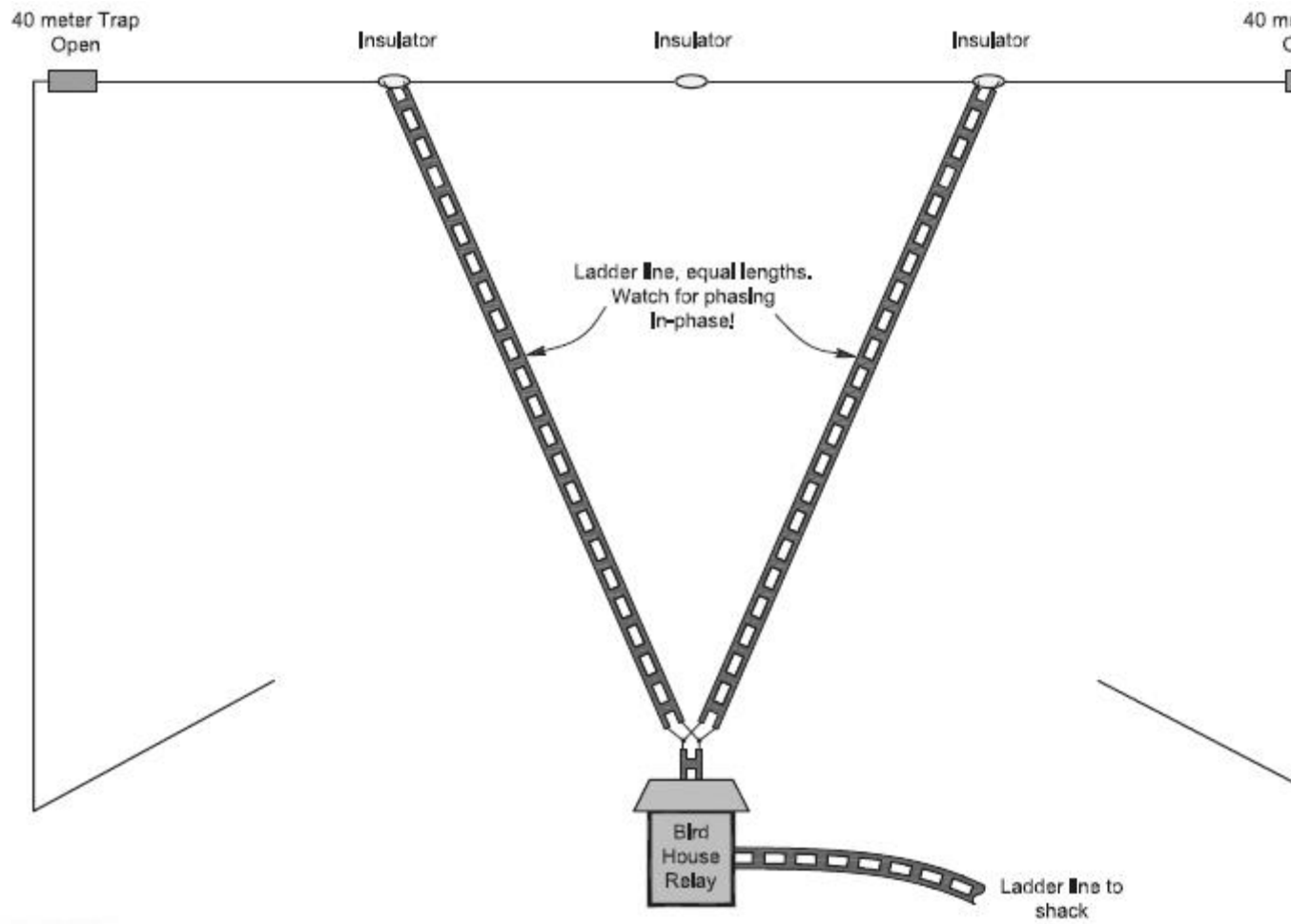
**72 - Clothesline Antenna**



**73 - Curtain Zepp Antenna for 160m, 80m, 40m**

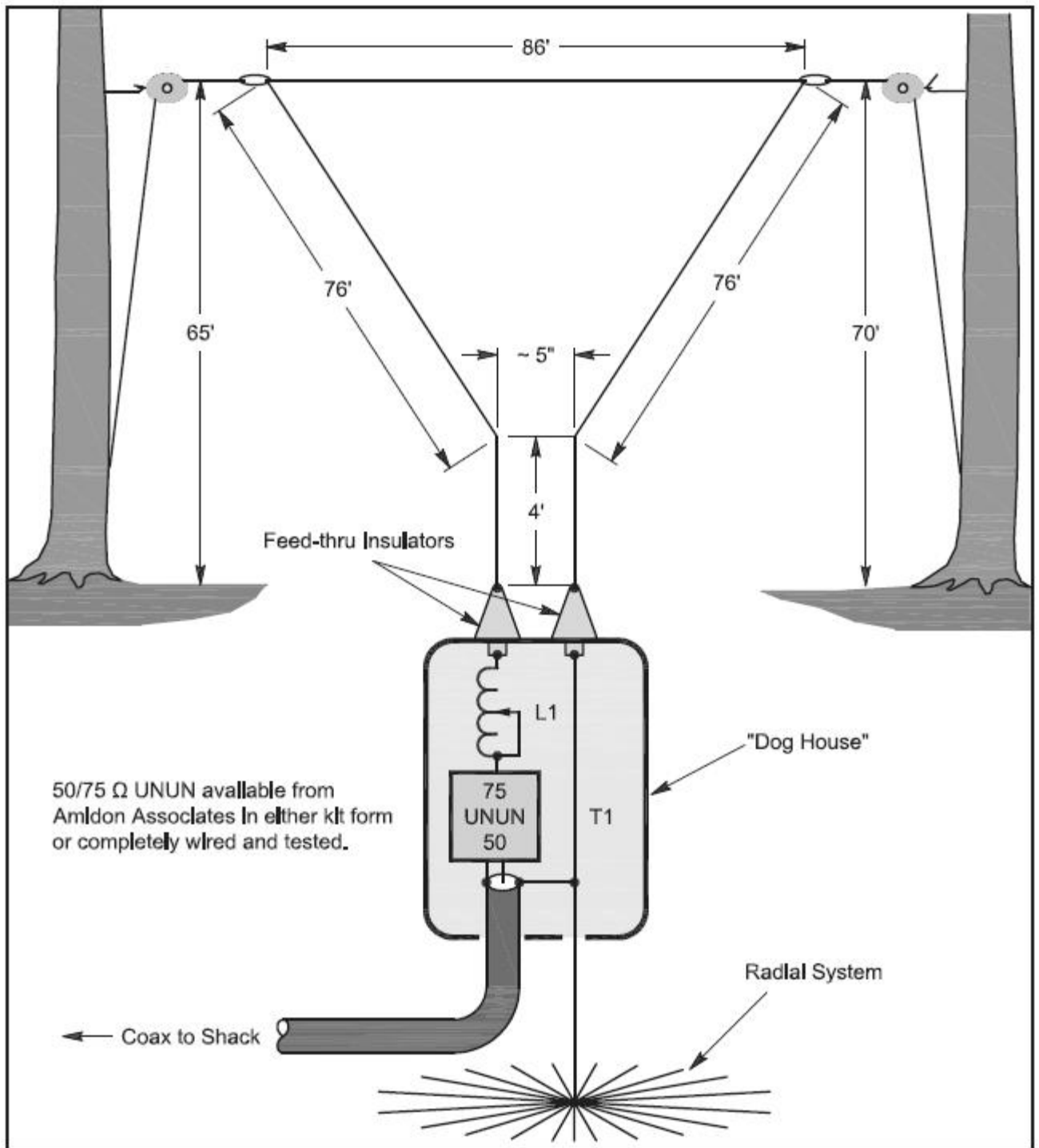


**74 - Collinear Array Antenna for 40m, 30m, 20m**

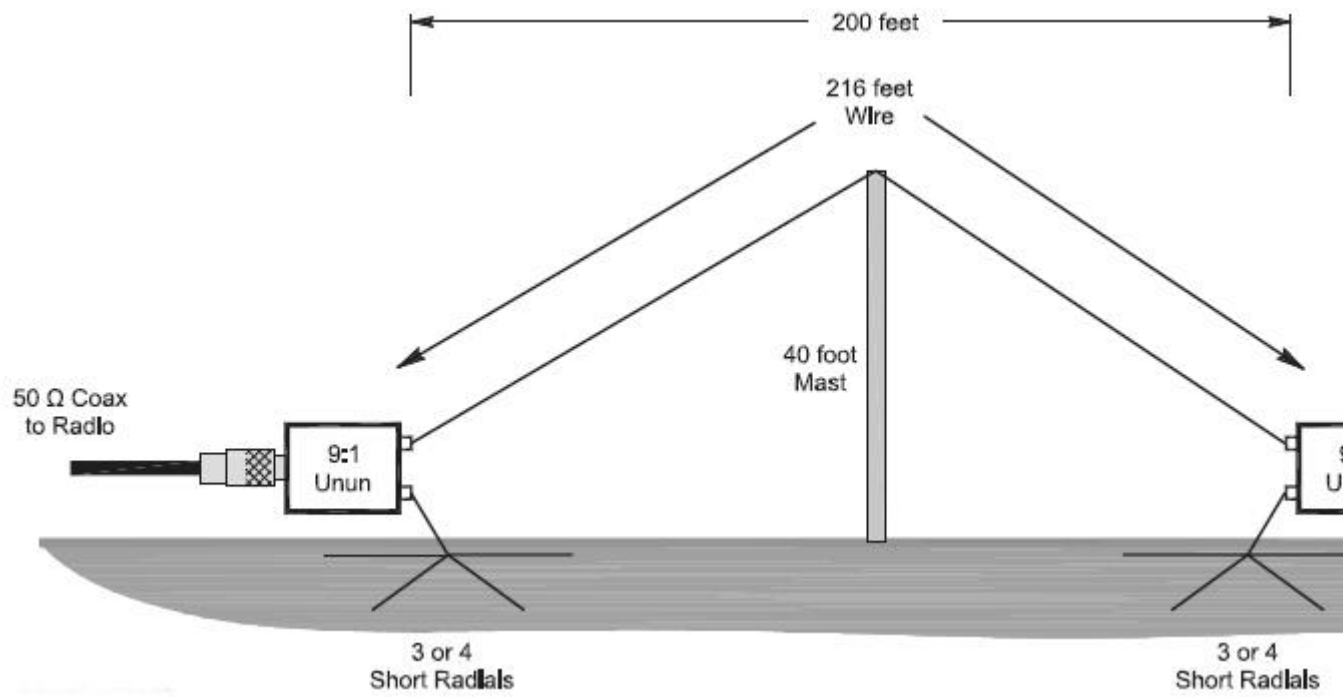


**75 - 160m Inverted Delta Loop**



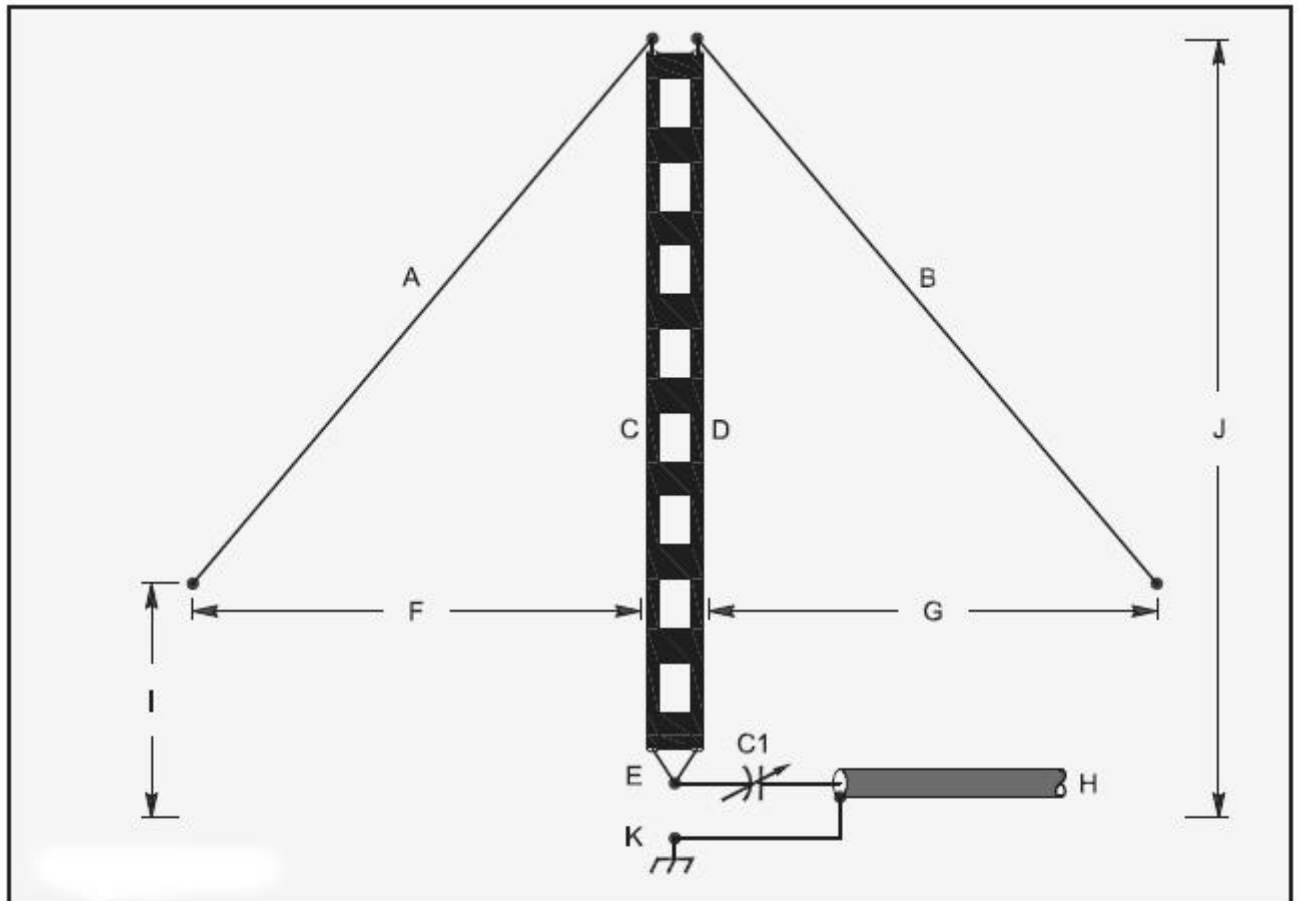


**76 - Half Rhombic Unidirectional Vertical for 20m to 6m**



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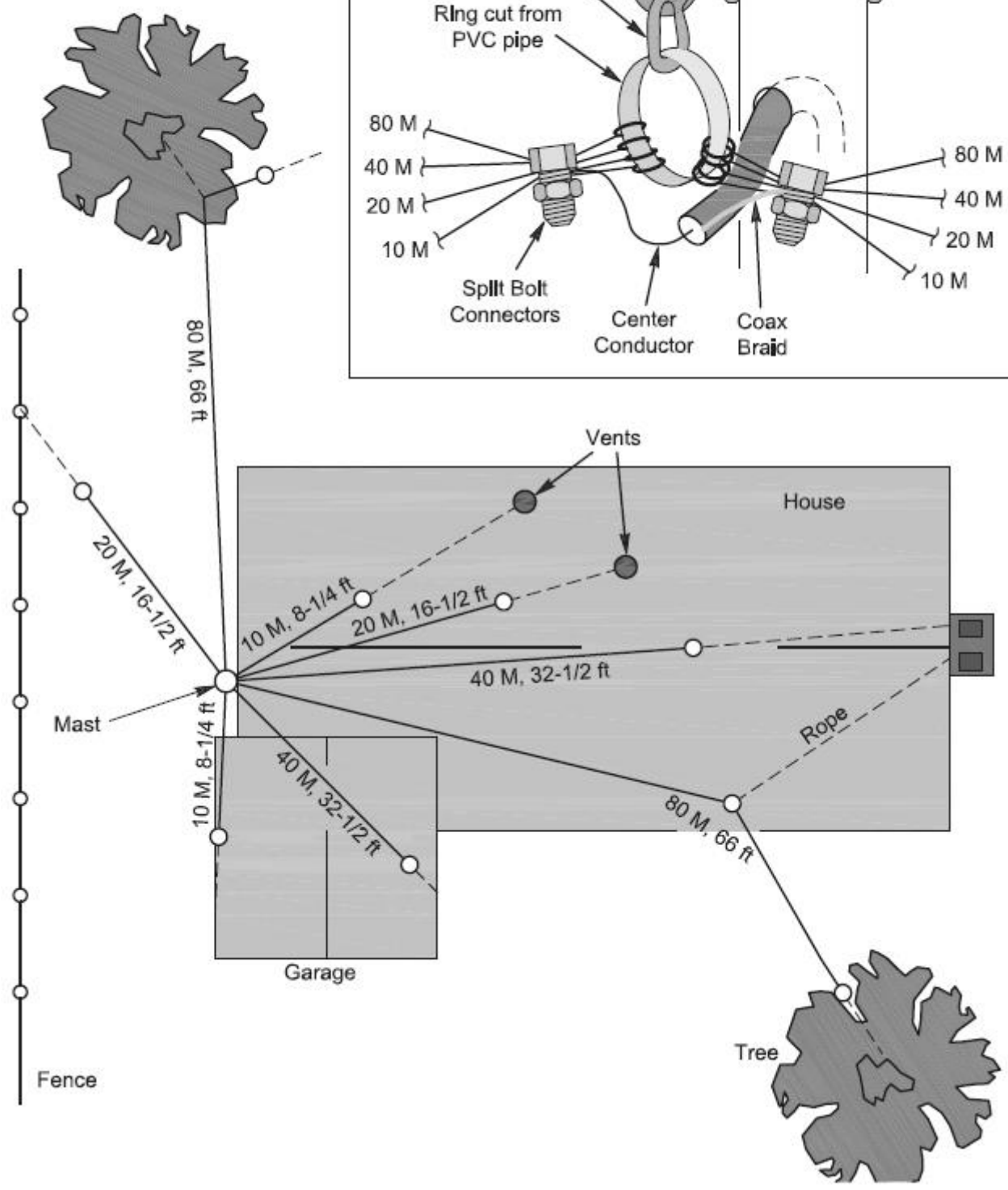
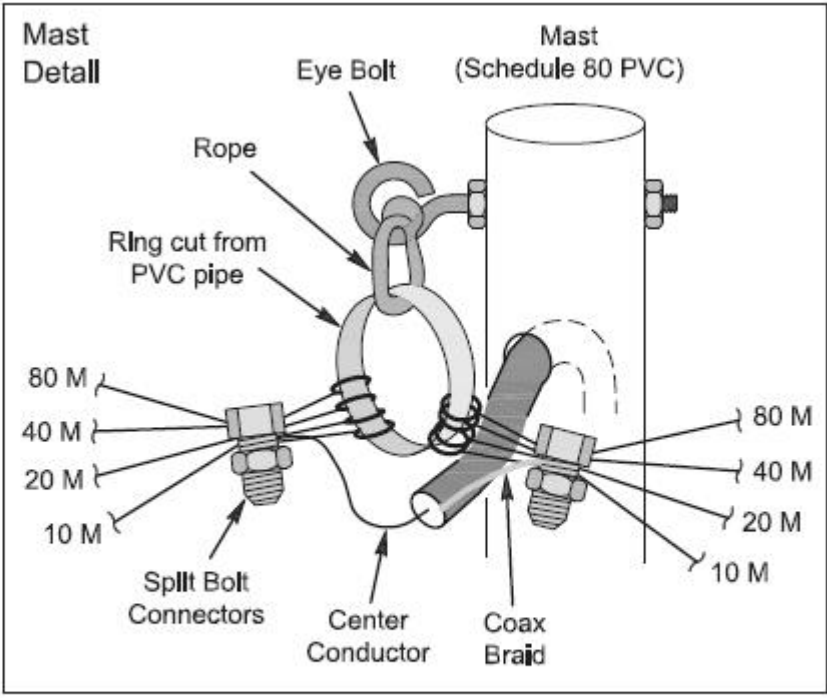
**77 - Capacitance Loaded Vertical Antenna for 160m**



C1 — Variable capacitor, 0-1500 pF, 7 kV.  
 A, B — Sloping segments of 66 foot, 4 inch pieces of #16 AWG enameled copper wire soldered to the top of segments C and D and forming a 45° angle.  
 C, D — 59 feet of 450 Ω open wire or window line or, alternatively, two parallel lengths of #16 AWG enameled copper wire with a 1 inch separation.  
 E — 1 inch triangle formed by the bottom ends of the open wire line. Solder them tightly at the vertex and connect to C1.  
 F, G — Distance between the lower ends

of segments A and B from segments C and D, 51 feet.  
 H — Any length of 50 Ω coaxial cable (RG-213 in this case). The central conductor must be soldered to C1, and the braid to the ground radials.  
 I — Approximately 16 feet from ground to lower ends of sloping segments A and B.  
 J — 60 feet from antenna top to bottom.  
 K — Ground radials,  $60 \frac{1}{4} \lambda$  (the more the better — 32 will form a reasonable ground).

## 78 - Fan Dipole Antenna for 80m to 6m



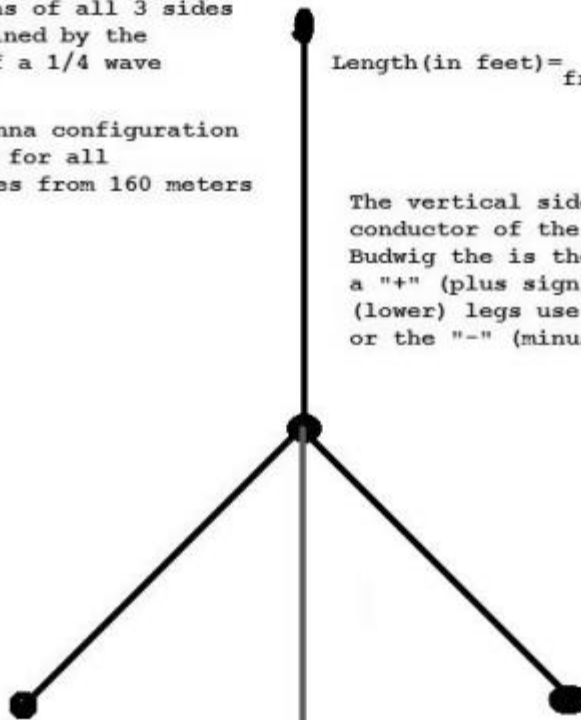
## 79 - Wire Ground Plane Antenna

The lengths of all 3 sides is determined by the formula of a 1/4 wave antenna

This antenna configuration will work for all frequencies from 160 meters to VHF.

$$\text{Length (in feet)} = \frac{234}{\text{frequency in MHz}}$$

The vertical side uses the inner conductor of the coax. On the Budwig the is the side the shows a "+" (plus sign). The outer (lower) legs use the outer braid or the "-" (minus sign).



Coax to XCVR or XMTR

Budwig Antenna Connector

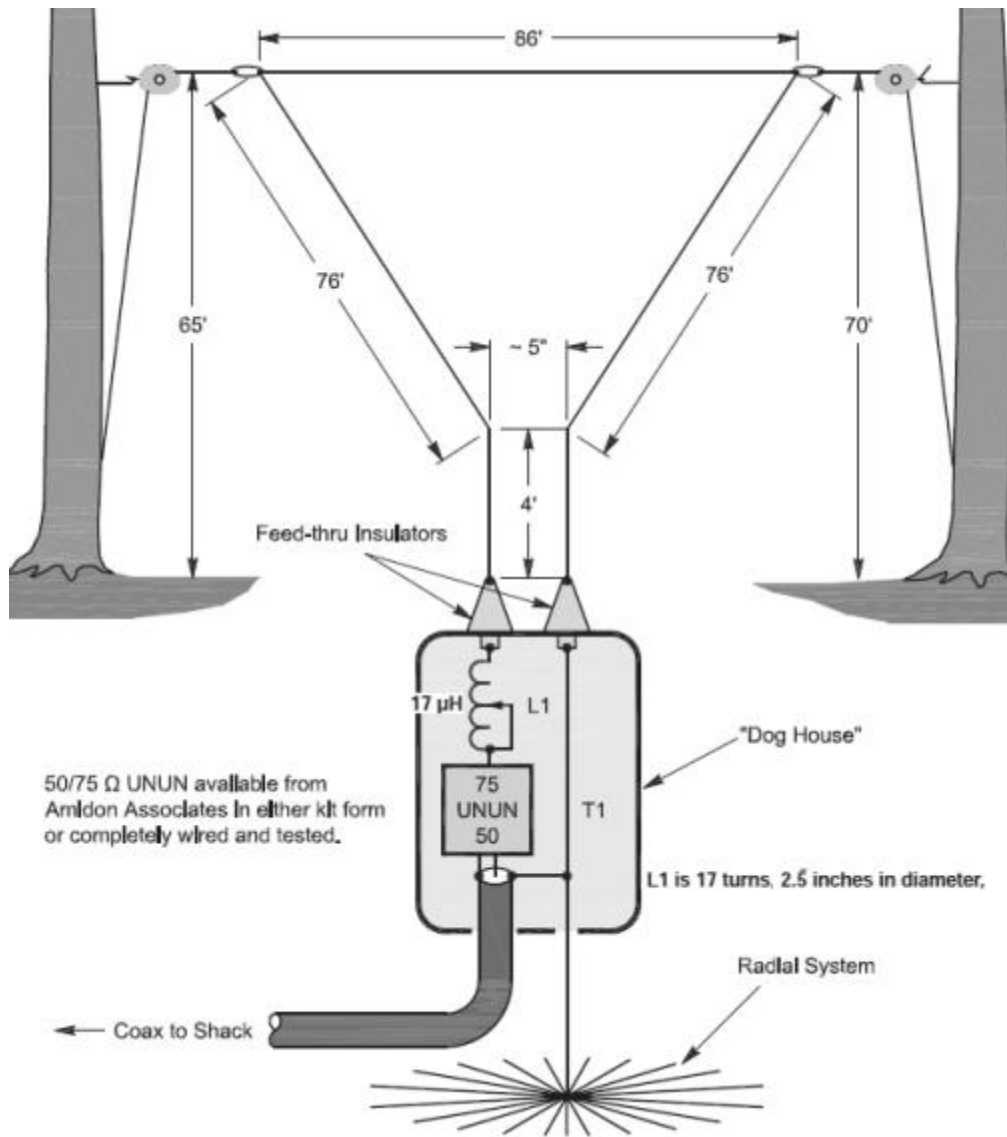


SO-239 Chassis mount, 4 hole

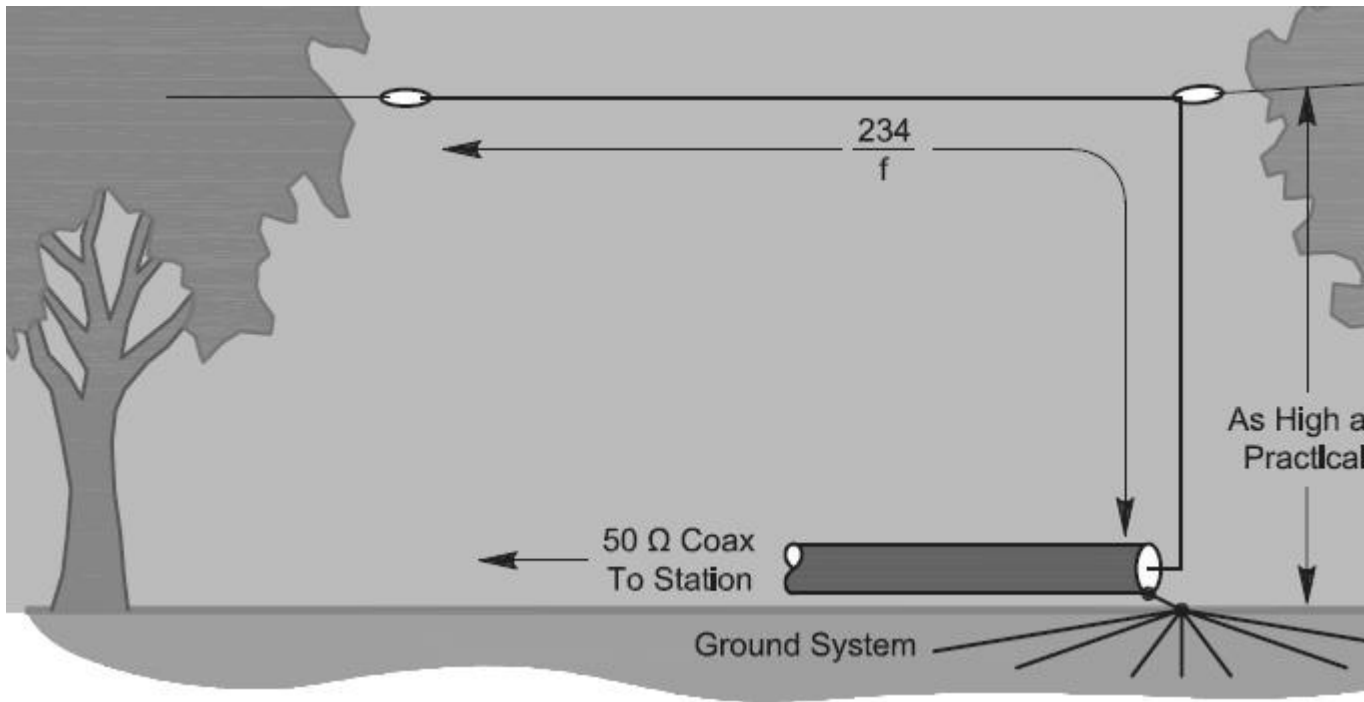


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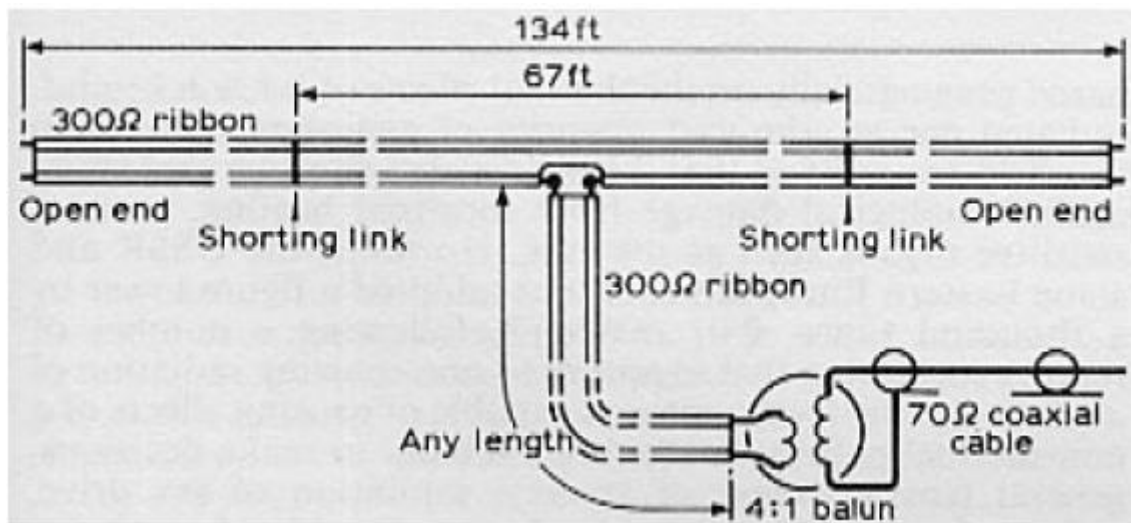
## 80 - Inverted Delta Loop Antenna for 160m



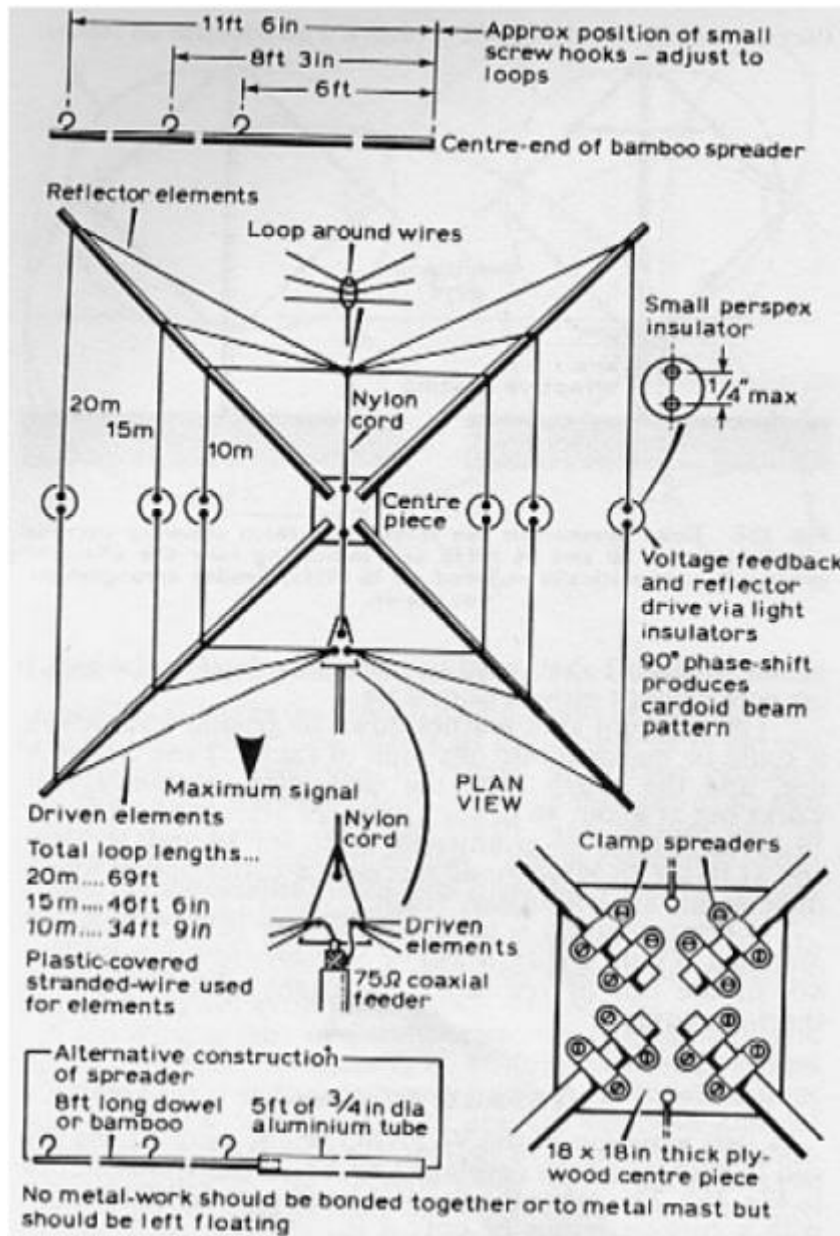
**81 - Inverted-L for 160m**



**82 - 300ohm-Ribbon Dual Band Dipole**

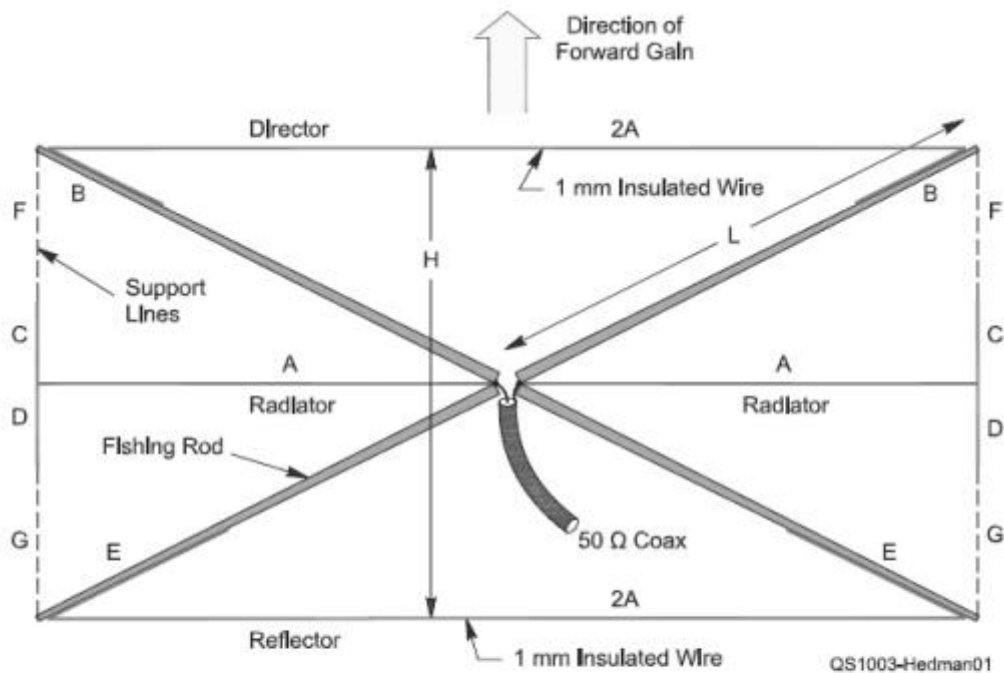


**83 - Tri-Band Beam for 20m, 15m, 10m**



84 - Mini-Horse Yagi Antenna

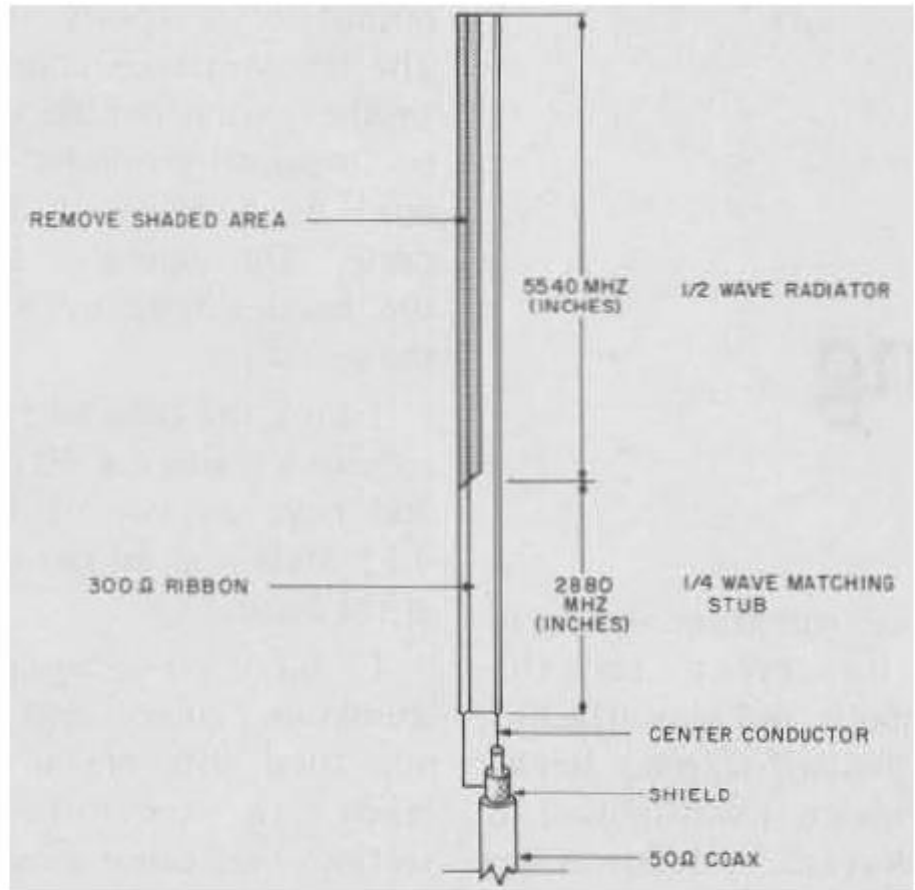




QS1003-Hedman01

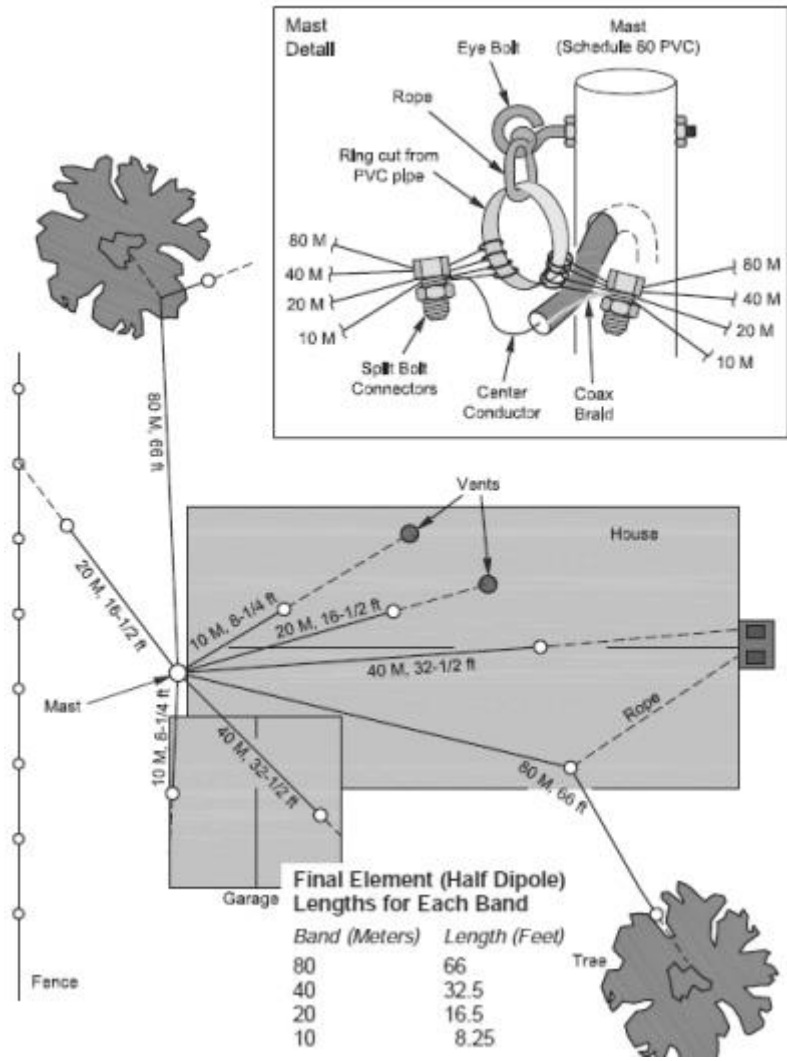
MHz	A	B	C	D	E	F	G	H	L
144	1' 2.2"	0' 4.7"	0' 3.5"	0' 1.8"	0' 7.1"	0' 4.7"	0' 6.5"	1' 4.5"	1' 4.3"
28	5' 11.6"	1' 10.8"	1' 6.9"	0' 9.4"	2' 11.8"	1' 10.8"	2' 8.3"	6' 11.4"	6' 11.0"
21	7' 11.6"	2' 6.3"	2' 1.2"	1' 0.6"	3' 11.6"	2' 6.3"	3' 6.9"	9' 3.0"	9' 2.6"
14	11' 11.3"	3' 9.7"	3' 1.8"	1' 6.9"	5' 11.2"	3' 9.7"	5' 4.6"	13' 10.9"	13' 9.7"
7.1	23' 10.5"	7' 7.3"	6' 3.6"	3' 1.8"	11' 10.5"	7' 7.3"	10' 9.1"	27' 9.8"	27' 7.4"

## 85 - Half-Rhombic Directive Antenna for 20m to 6m

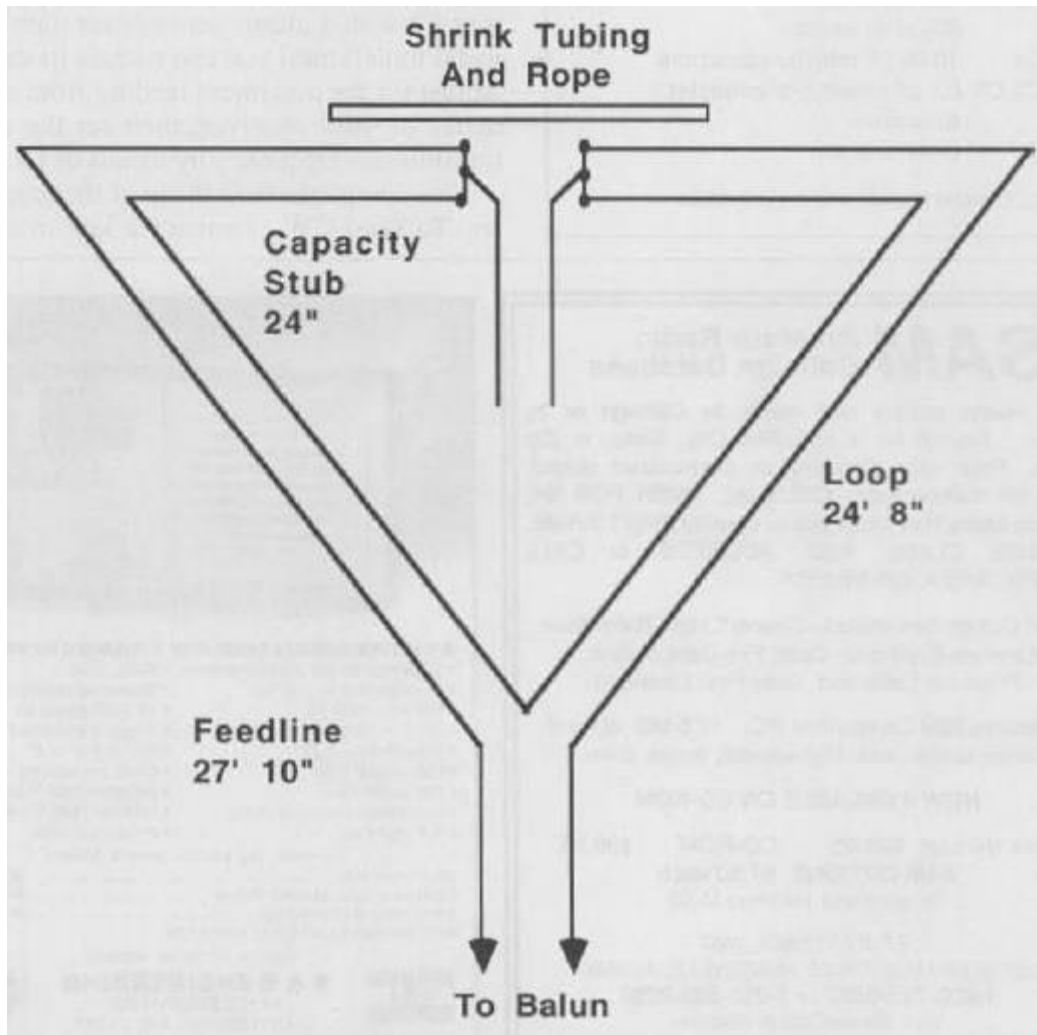


Frequency (MHz)	28.0	28.5	29.0	50.0	51.0	52.0	144	145
Radiator (inches)								
1/2 wave	197.8	194.3	191.0	110.8	108.6	106.5	38.4	38.2
Stub (inches)								
1/4 wave	102.8	101.0	99.3	57.6	56.4	55.3	20.0	19.8

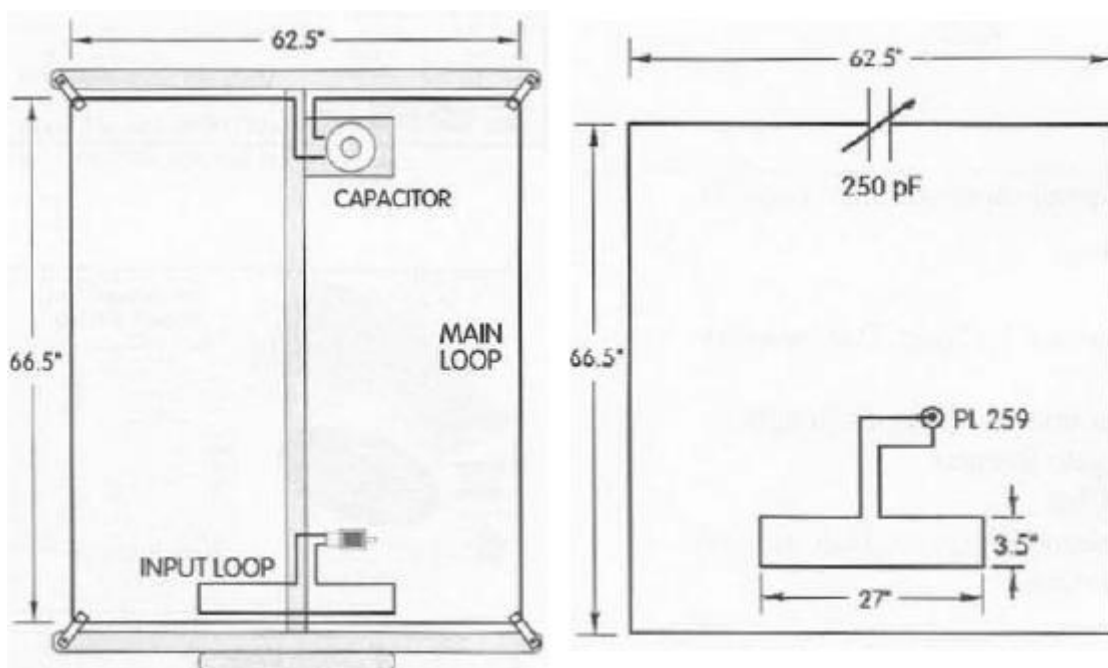
## 86 - Fan-Dipole Antenna for 80m to 6m



**87 - Capacity Tuned Folded Loop Antenna for 20m**

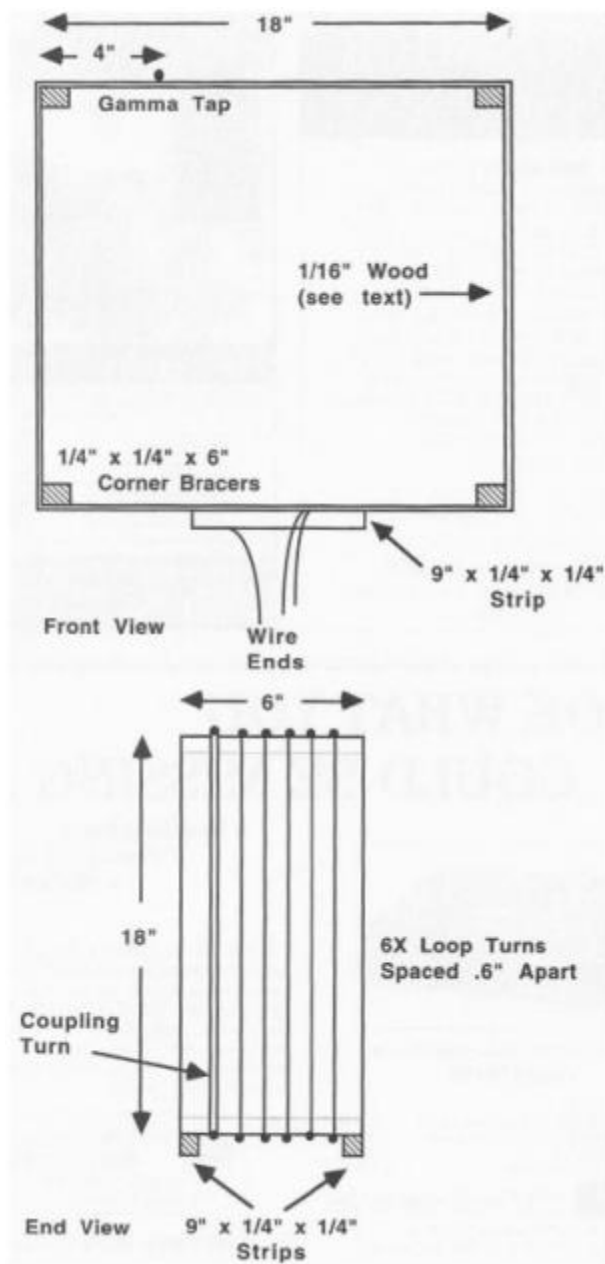


**88 - Indoor Loop Antenna for 80m to 30m**



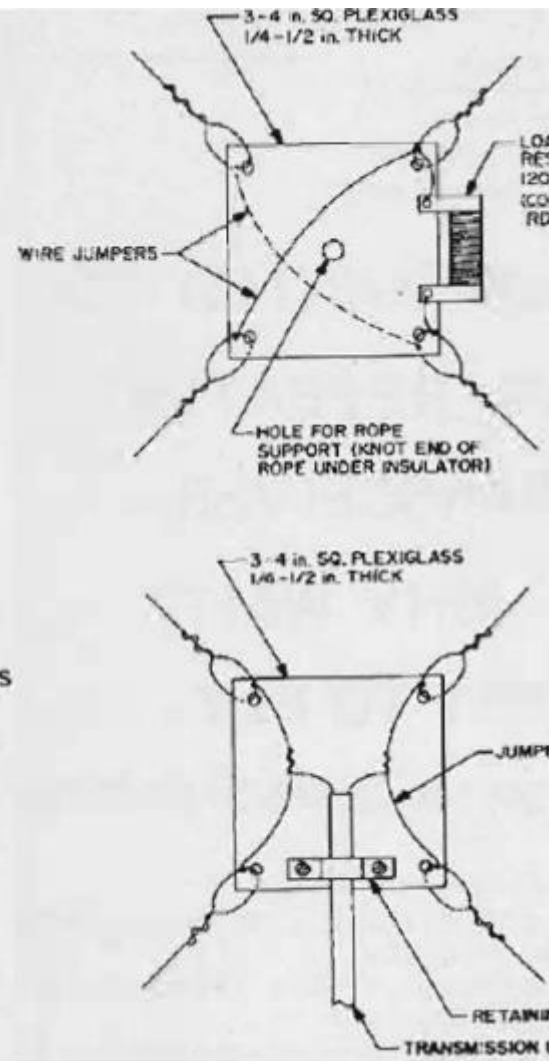
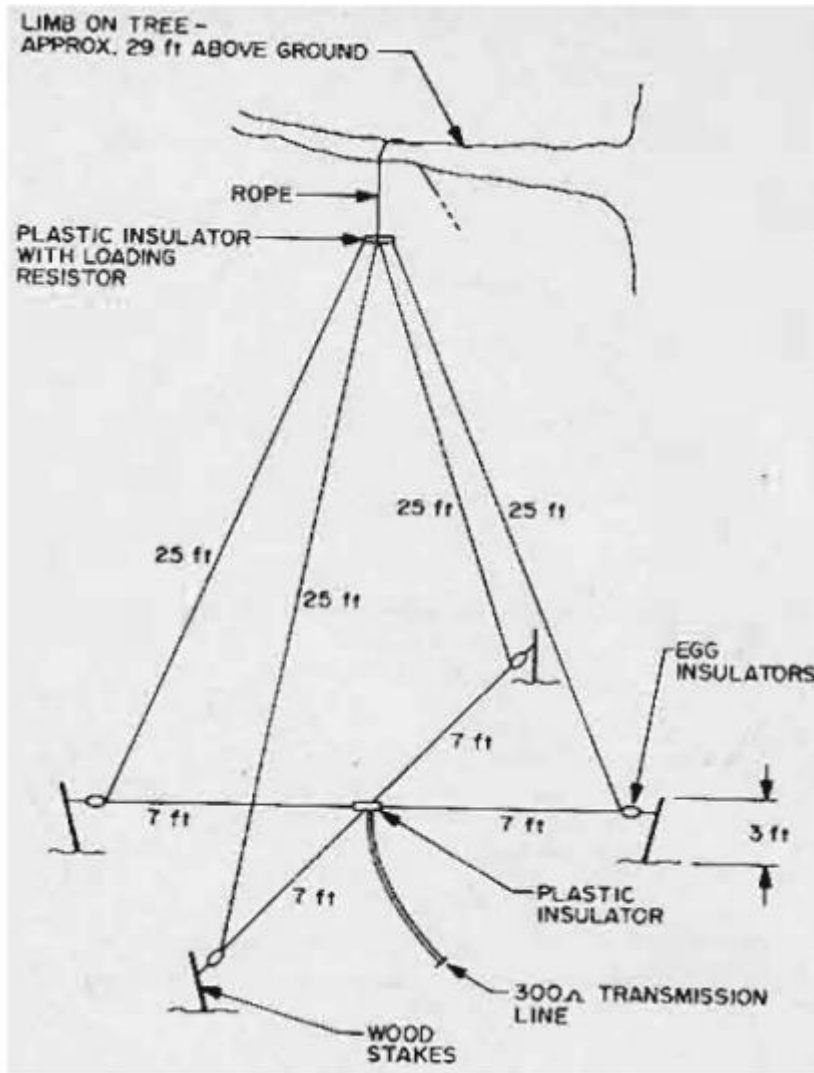
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**89 - Indoor Loop Antenna for 80m**

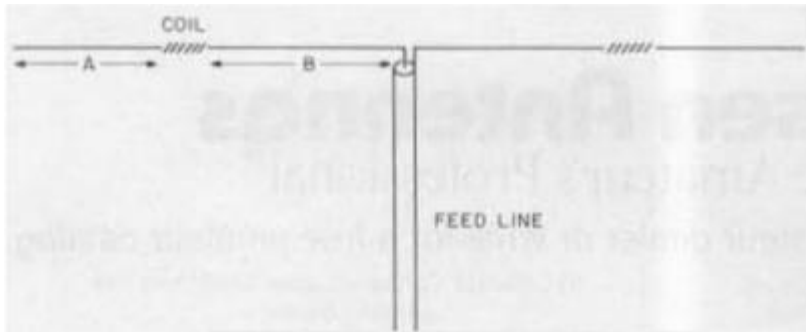


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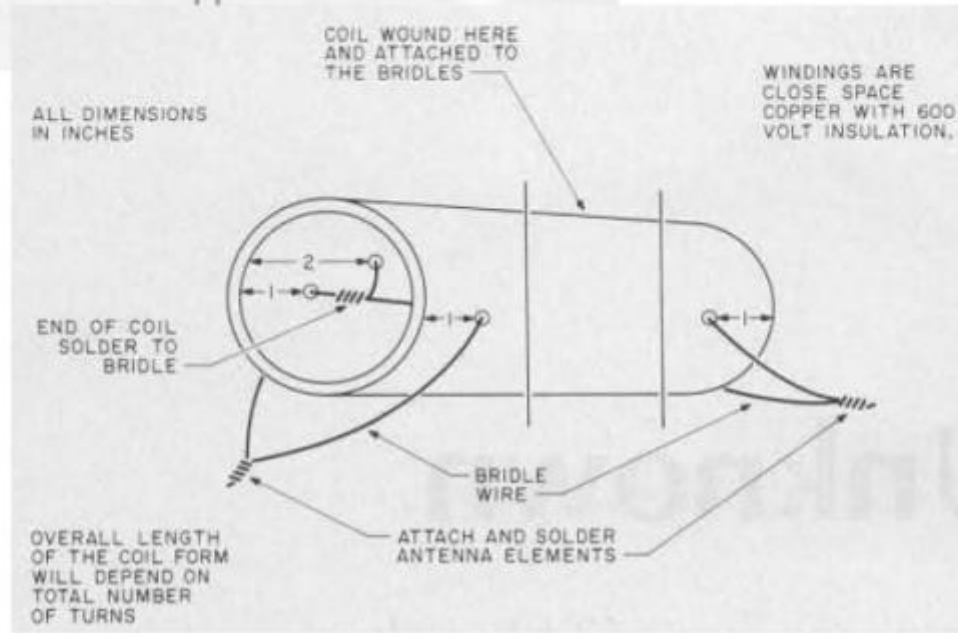
**90 - Double-Delta Antenna 80m and 40m**



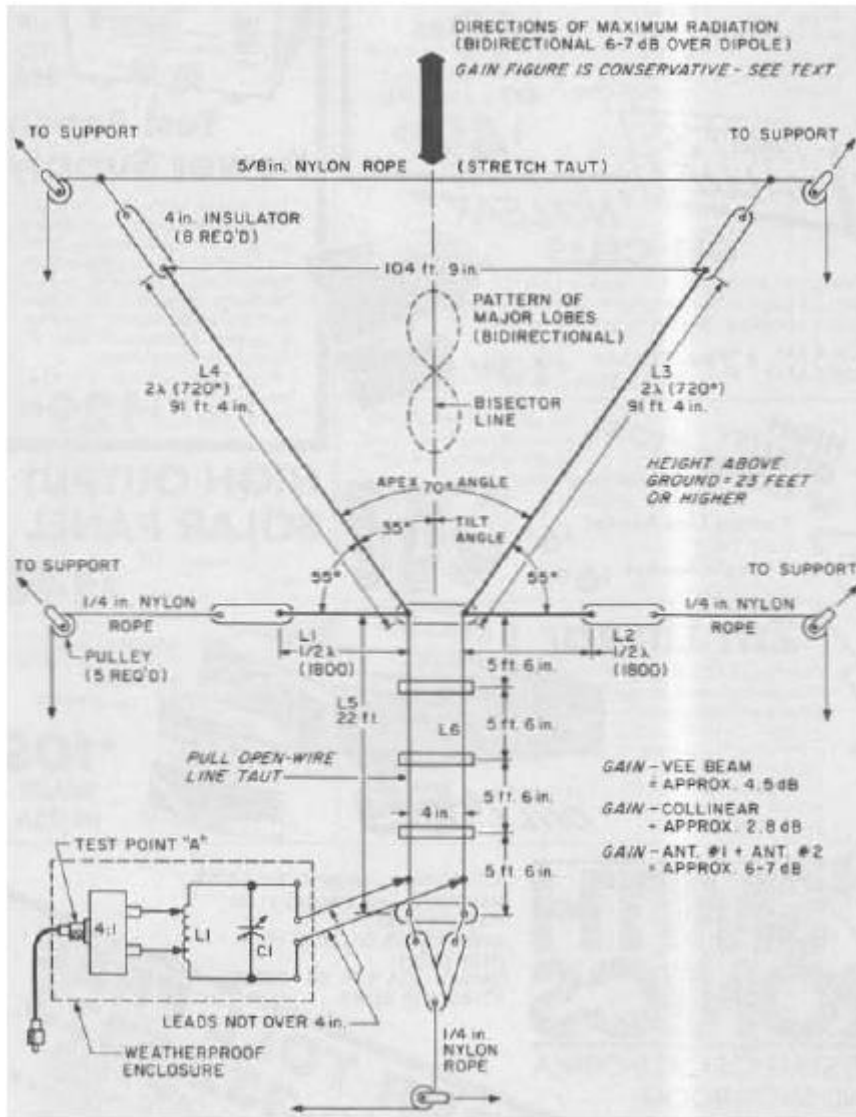
91 - Inductance-Loaded Shortened Dipole for 160m



Overall Length (ft.)	Element A Length	Number Of Coil Turns	Element Length
246.3	full-size antenna		
221.3	66.5	10	44.3
197.1	59.1	20	36.9
172.4	51.7	33	34.3
147.8	44.3	48	29.6
123.2	36.9	65	24.6
98.5	29.6	86	19.1

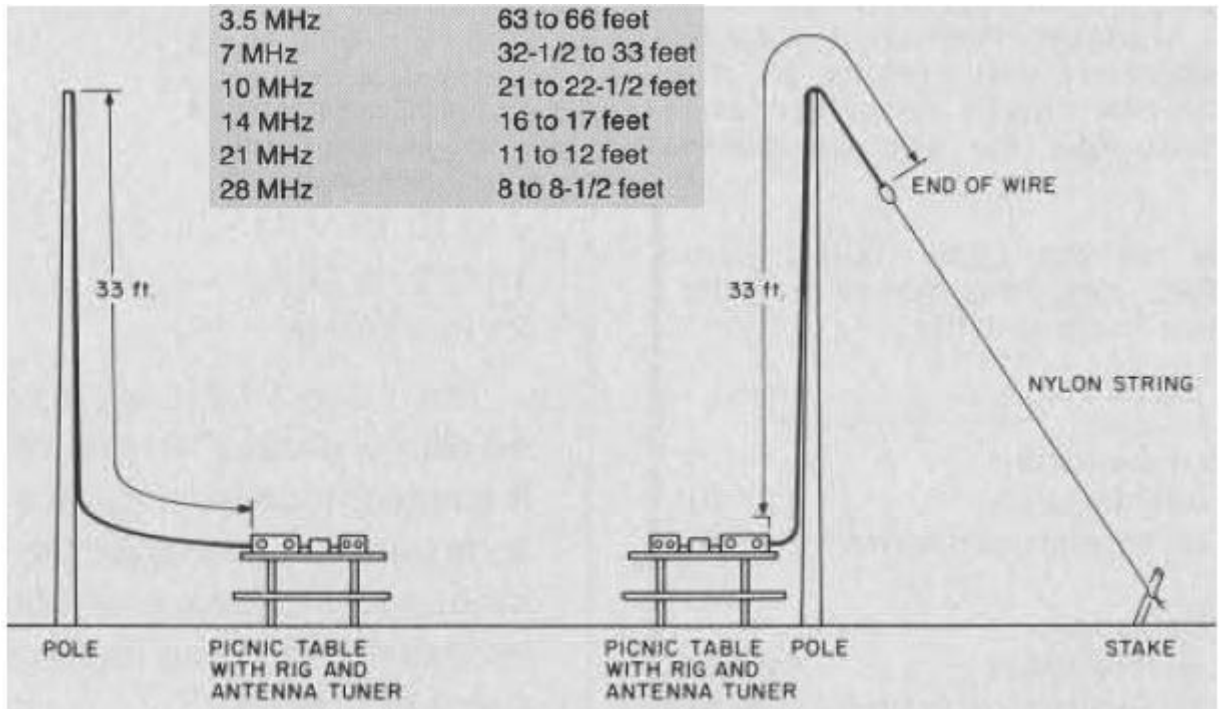


## 92 - V-Beam Antenna for 15m

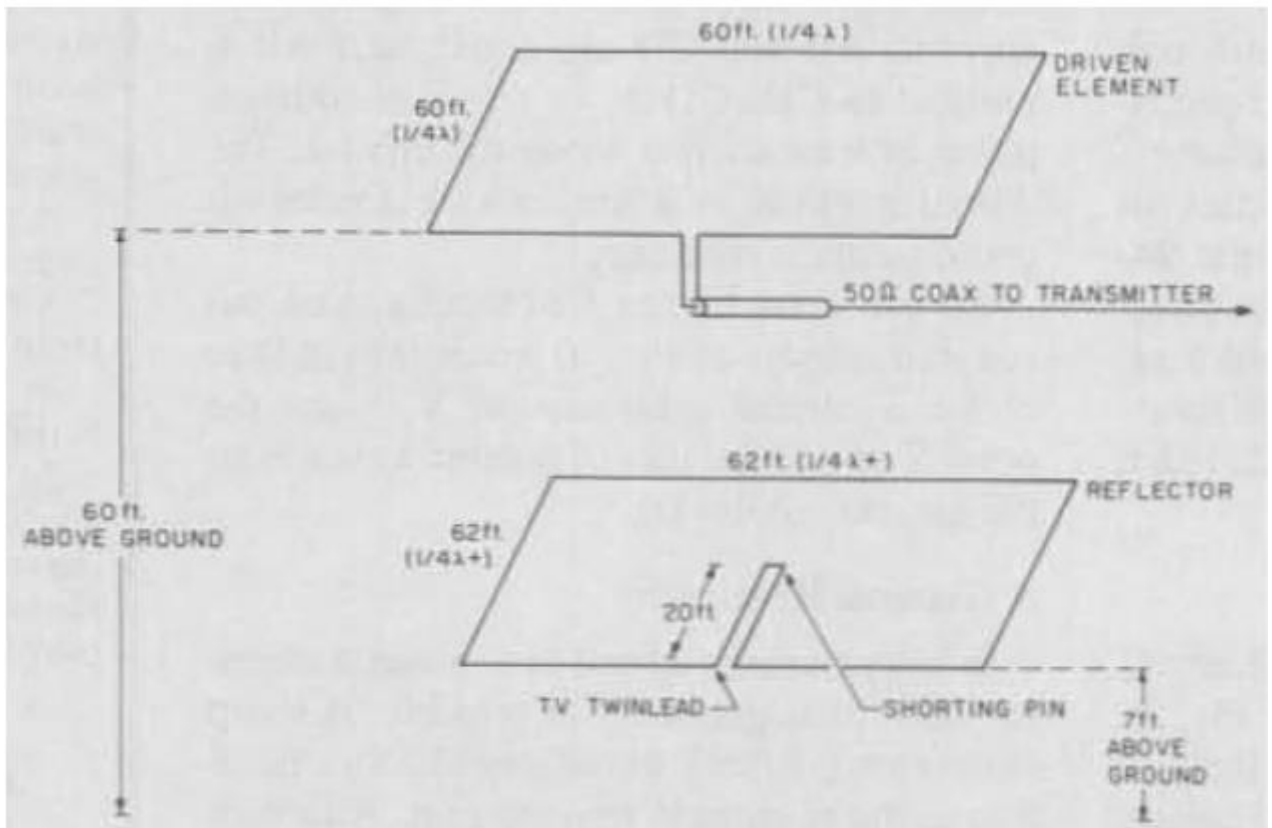


**93 - Picnic Vertical Wire Antenna**

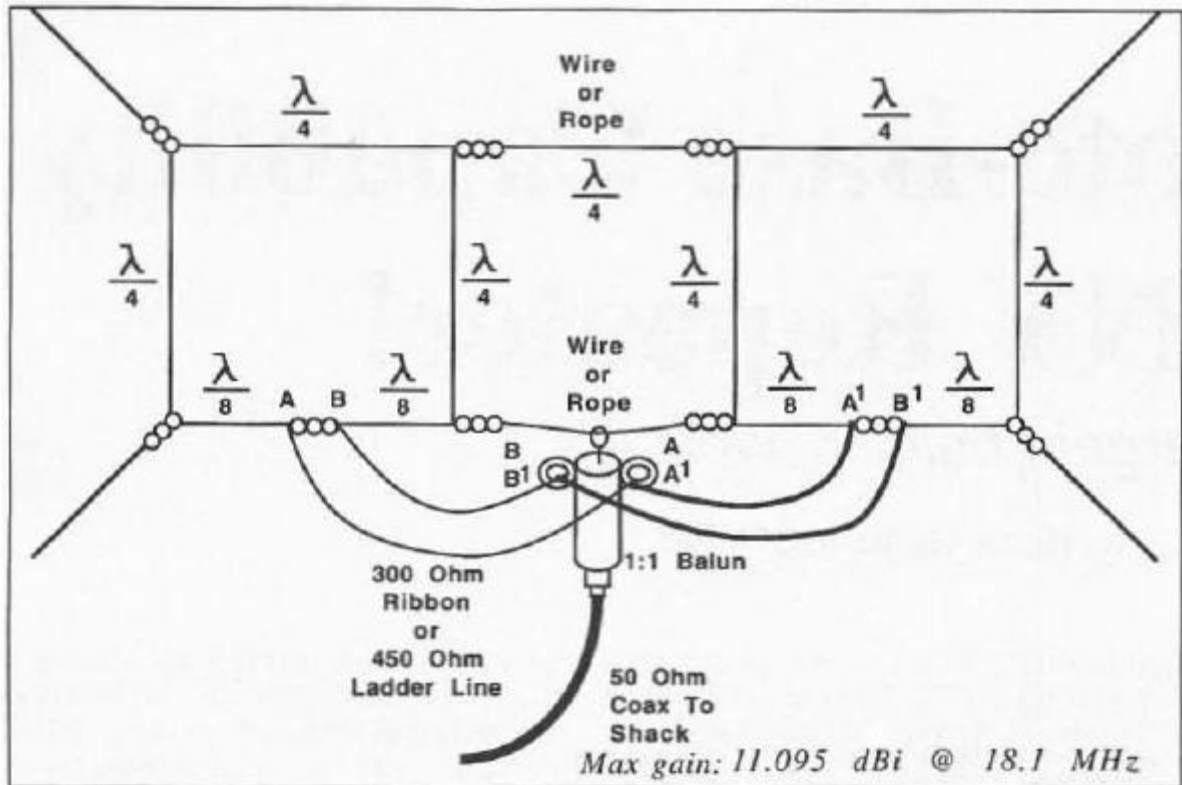




**94 - Laid-Back Quad Antenna for 80m**

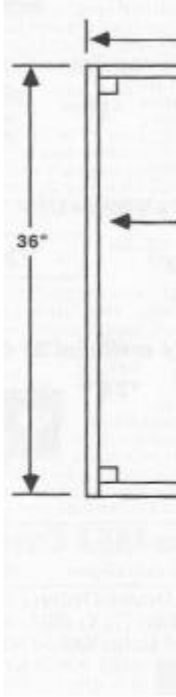
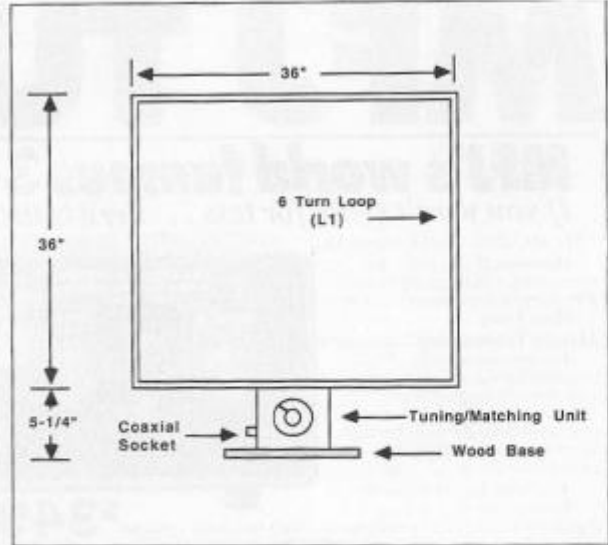
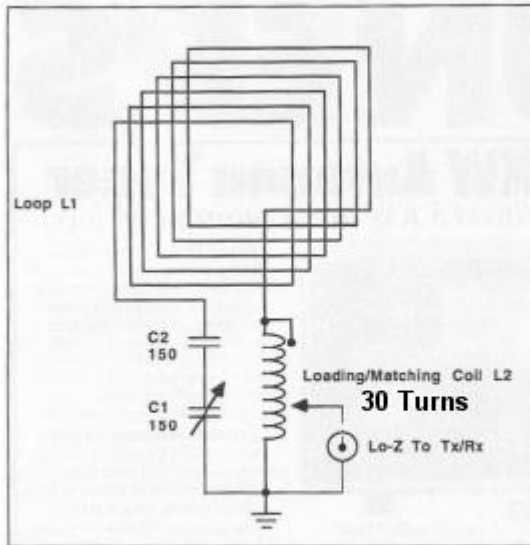


**95 - Phased Loop Antenna**

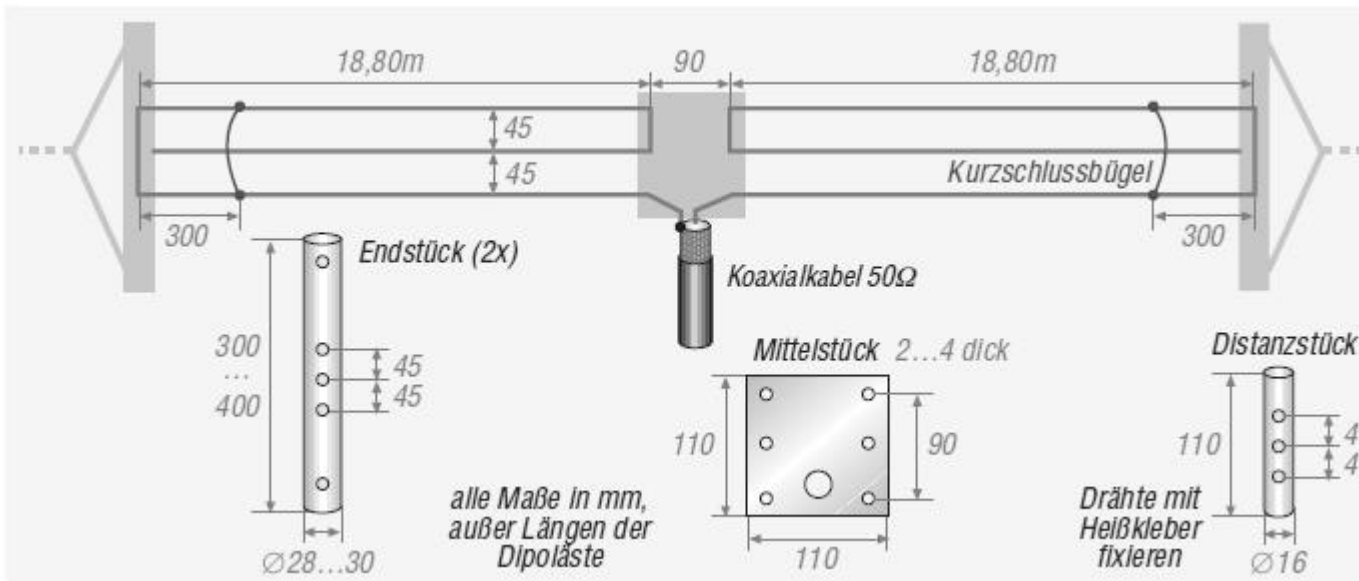


	$\lambda/4$	$\lambda/8$	300 $\Omega$ Ribbon	450 $\Omega$ Ladderline
40m	34.9 ft.	17.5 ft.	53.3 ft.	62.2 ft.
20m	17.6 ft.	8.8 ft.	27.0 ft.	31.2 ft.
17m	13.9 ft.	6.9 ft.	21.2 ft.	25.2 ft.
15m	11.8 ft.	5.9 ft.	18.1 ft.	21.97 ft.
10m	8.67 ft.	4.33 ft.	13.2 ft.	15.33 ft.

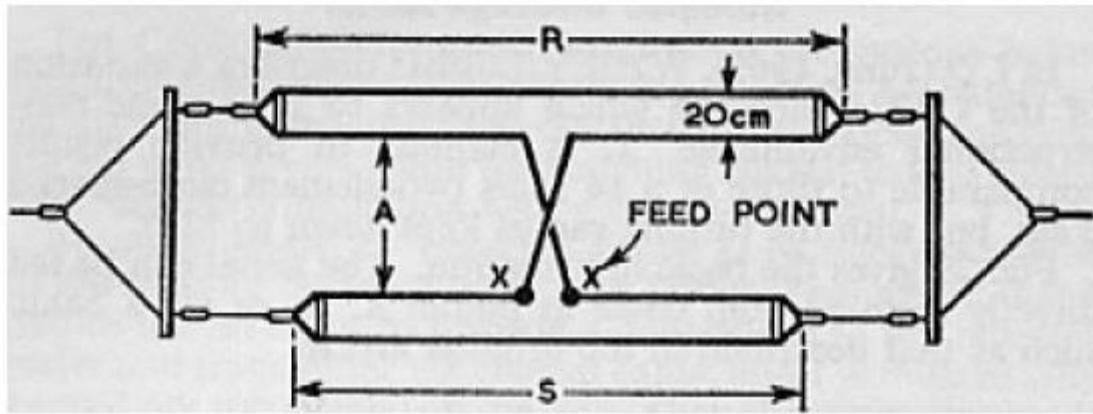
**96 - Loop Antenna for TX for 160m**



### 97 - Morgain-Dipole Antenna for 160m and 80m

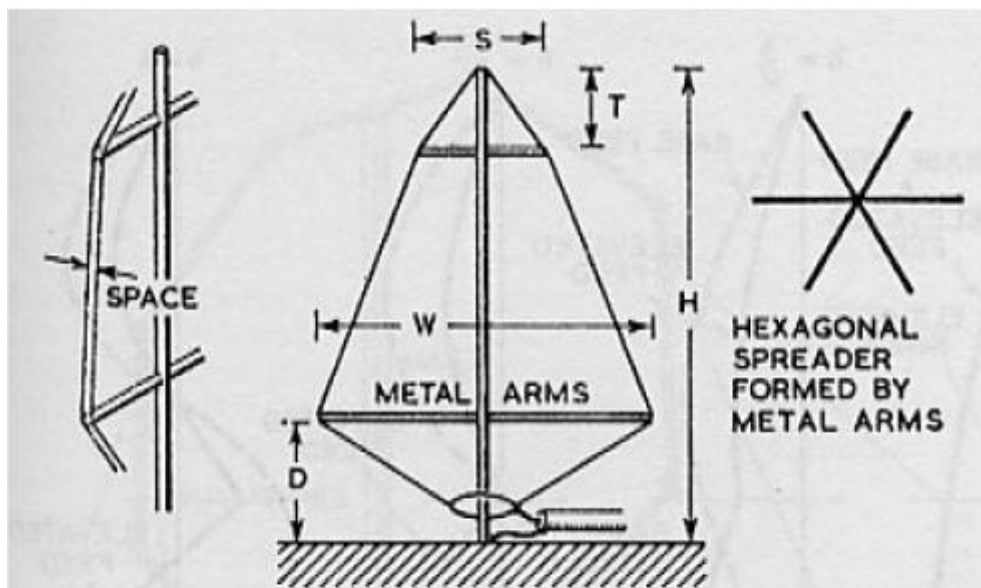


### 98 - ZL-Special for 20m, 15m, 10m



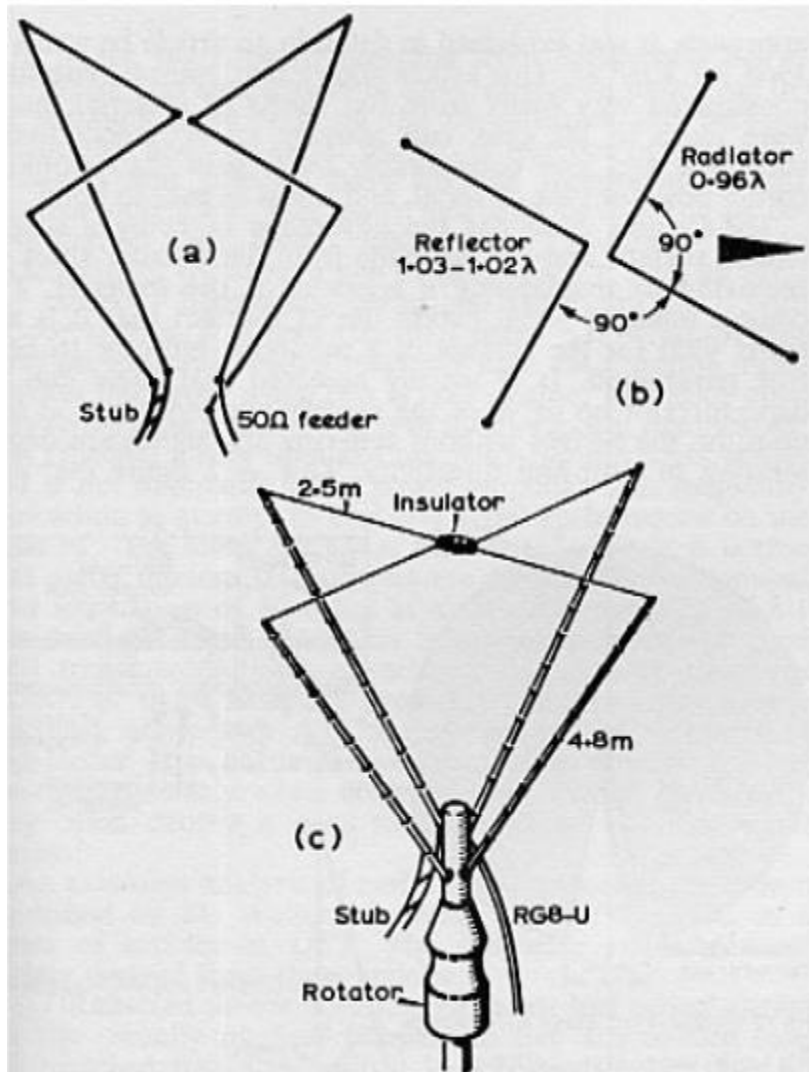
	S	R	A	A
28 Mc/s	5.09m	5.39m	1.29m	$\frac{1}{10}\lambda$
	4.17m	4.42m	1.06m	$\frac{1}{10}\lambda$
21 Mc/s	6.85m	7.24m	1.72m	$\frac{1}{10}\lambda$
	5.62m	5.94m	1.41m	$\frac{1}{10}\lambda$
14 Mc/s	10.30m	10.85m	2.58m	$\frac{1}{10}\lambda$
	8.45m	8.90m	2.12m	$\frac{1}{10}\lambda$

### 99 - Biconical Antenna

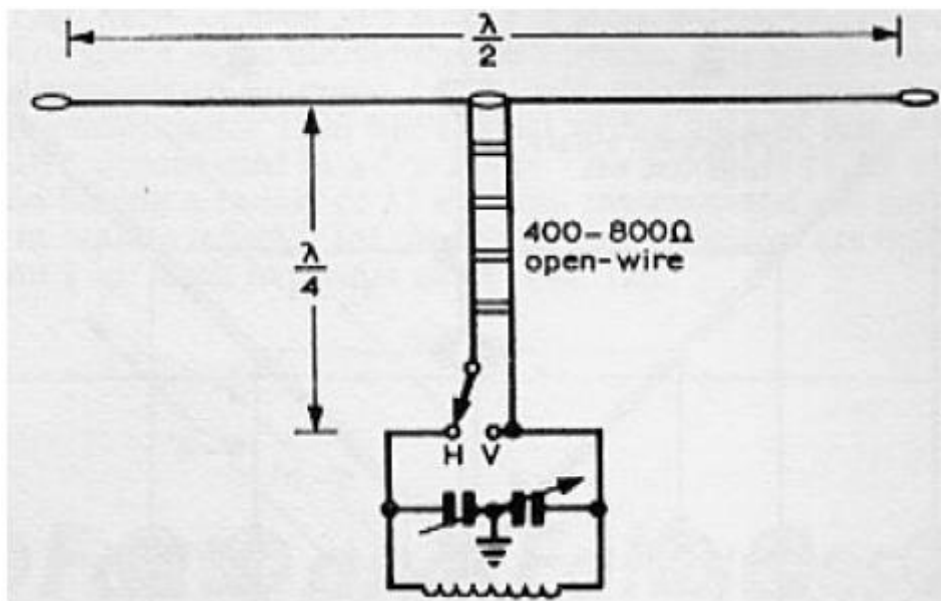


	H	W	D	T	S	SPACE	WIRE
3.5 - 15 Mc/s	43'	17'-8"	16'-10"	2'-2"	5'-10"	3"	NR 8
7 - 28 Mc/s	23'	9'-6"	9'	12"	3'-2"	2"	NR 10
14 - 56 Mc/s	12'	5'	4'-9"	8"	1'-8"	1"	NR 12

### 100 - Directive Delta-Birdcage Antenna for 20m to 10m

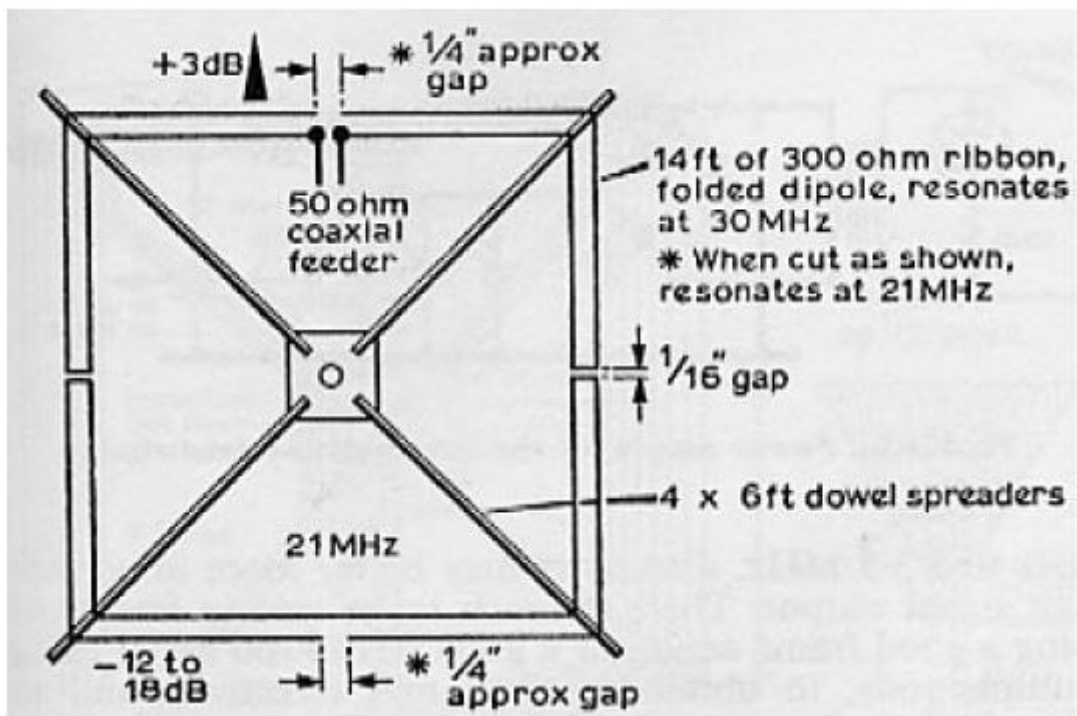


**101 - Dual Polarization Antenna for 80m and 40m**



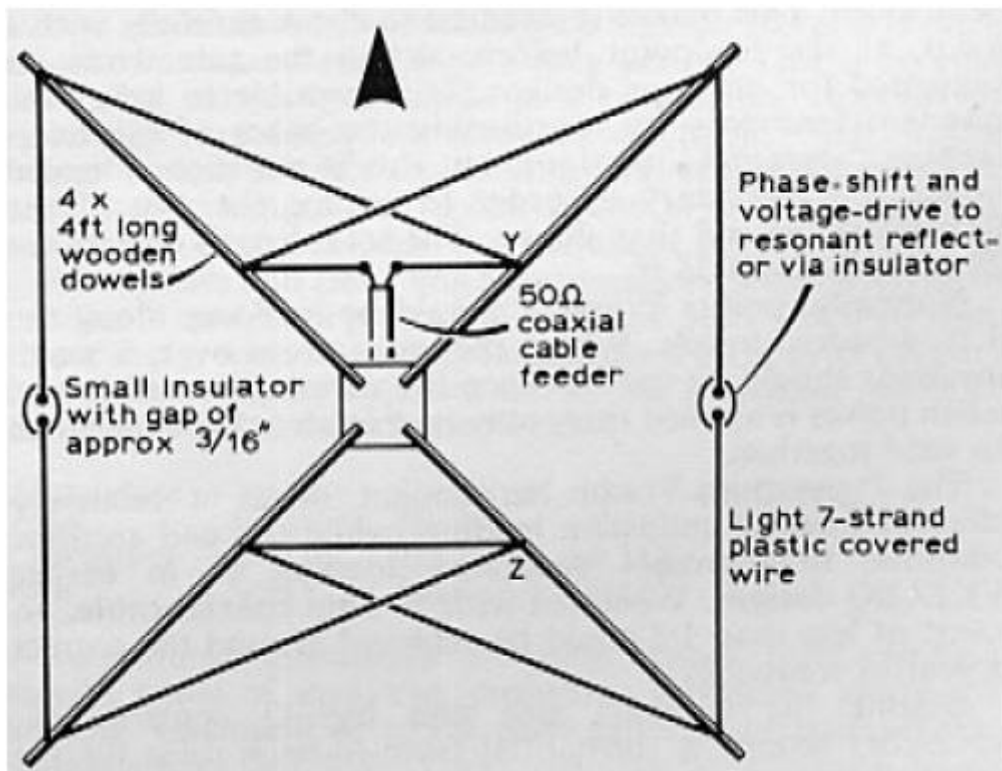
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### 102 - Directive 300-ohm-Ribbon Folded Dipole for 15m

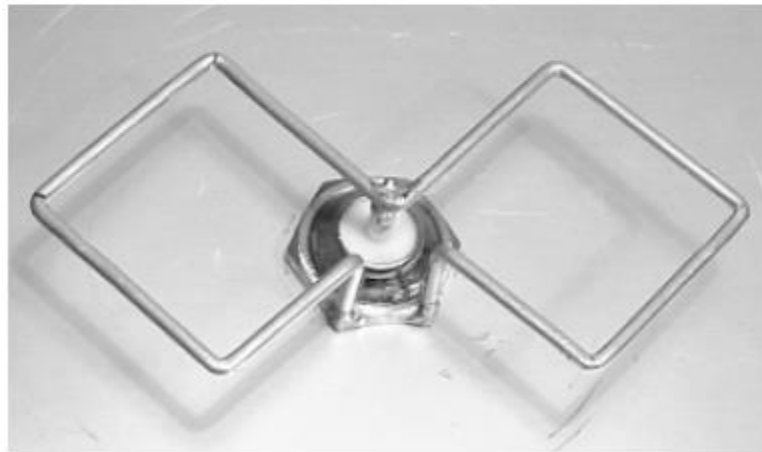
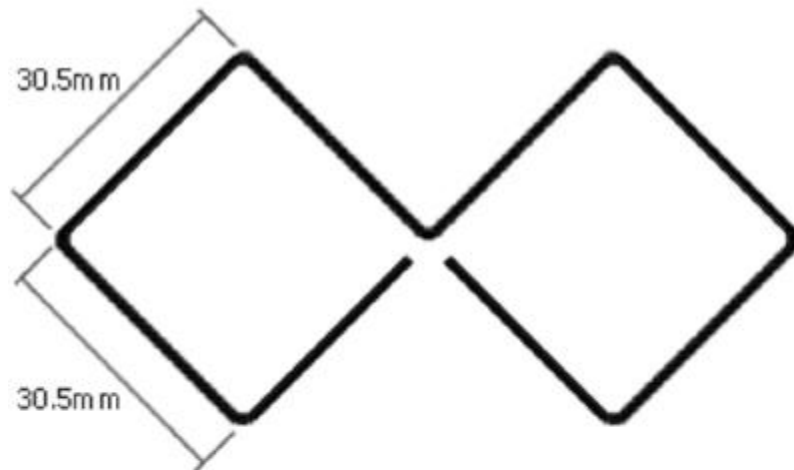


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### 103 - Miniature Directive Antenna for 10m

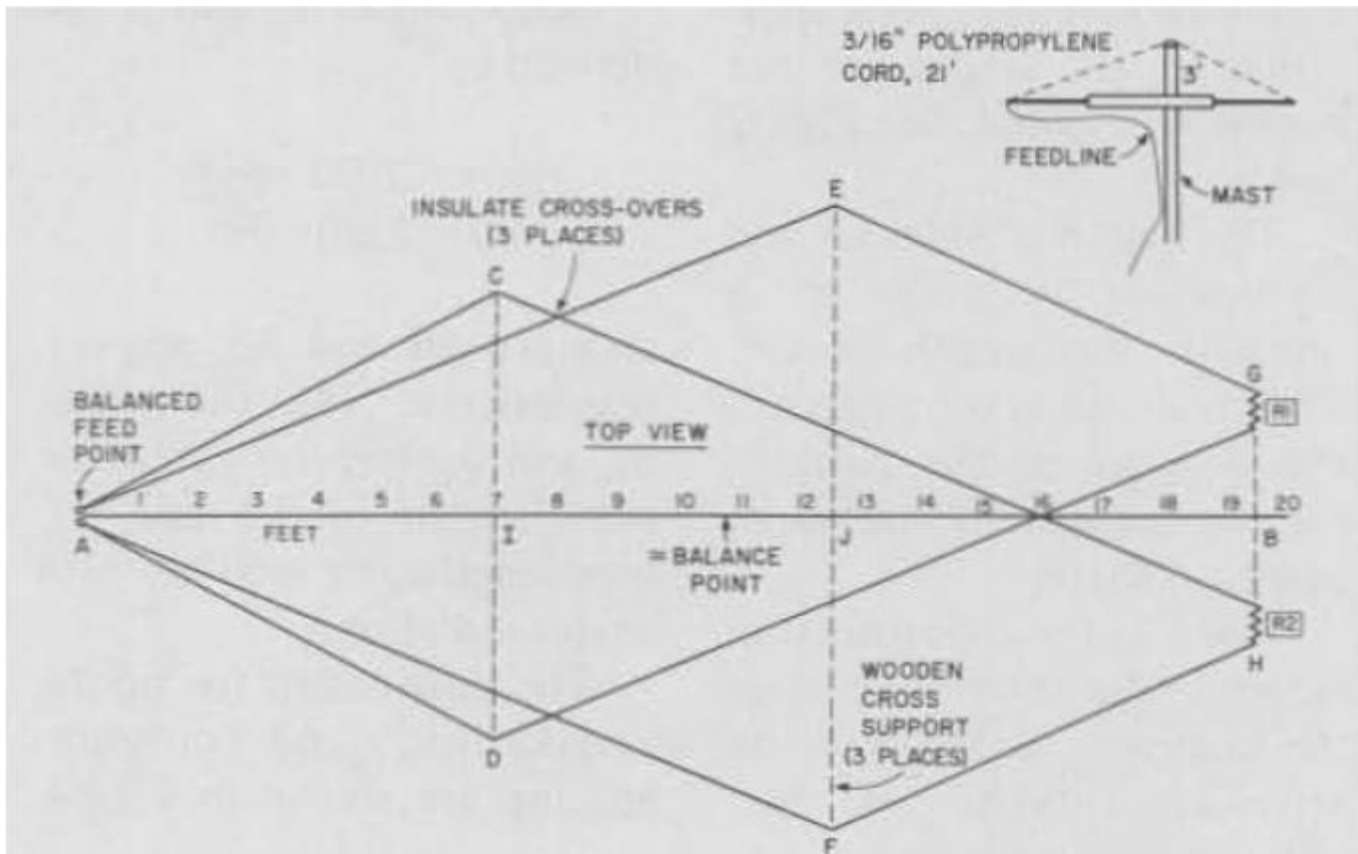


**104 - Biquad Antenna 12dBi-Gain for 2.4GHz**



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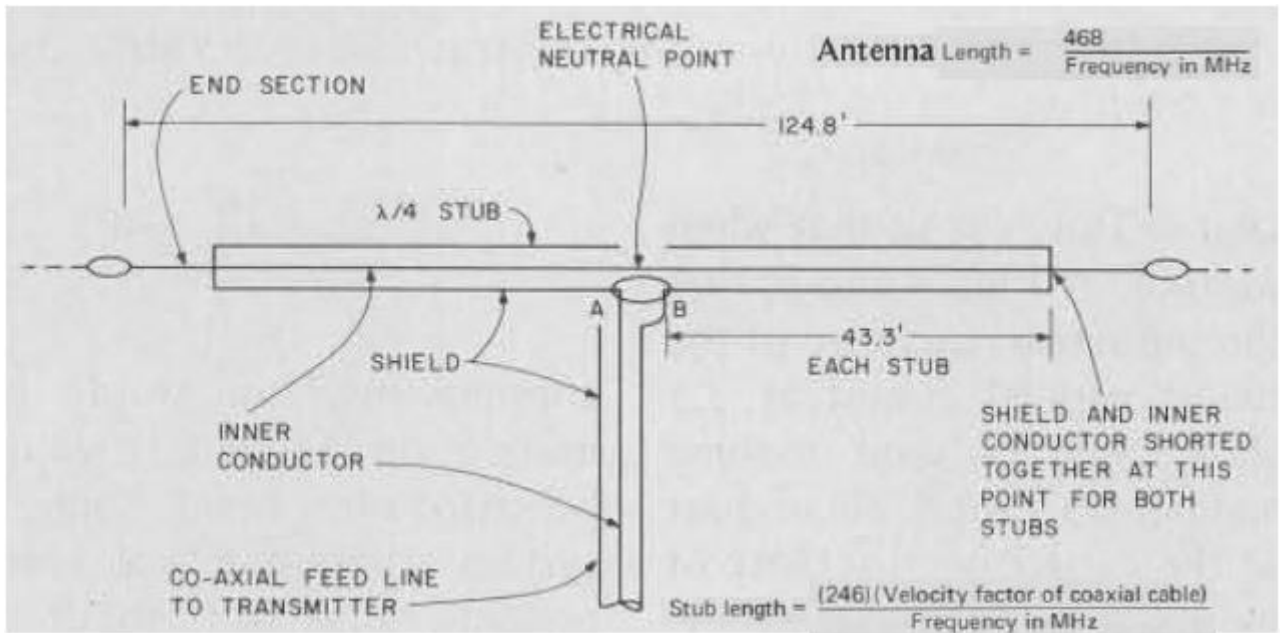
**105 - Dual-Rhomboid Antenna for 435MHz to 870MHz**



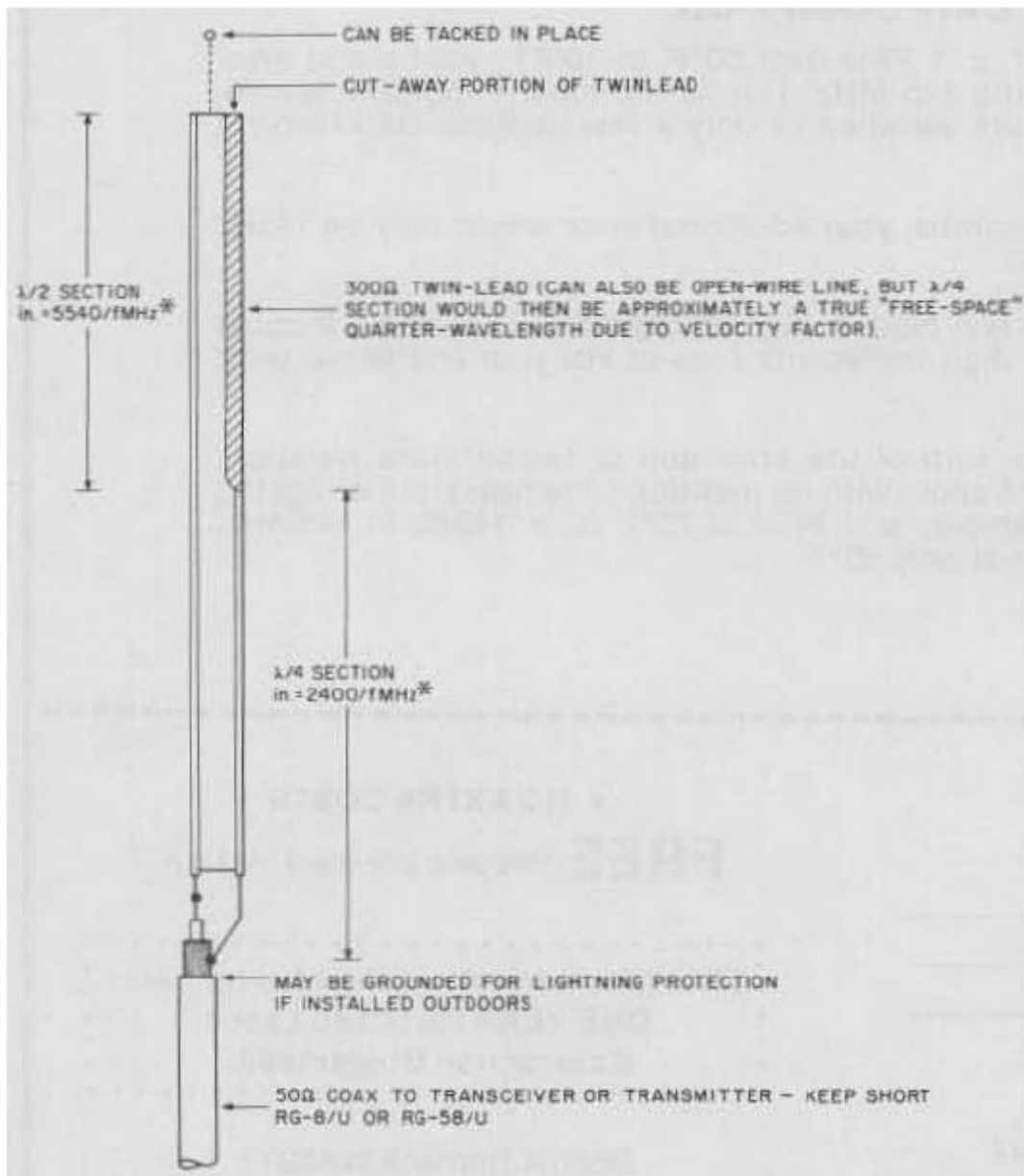
Dual rhomboid antenna for 435-870 MHz. Beamwidth  $\approx 10^\circ H \times 6^\circ V$ . Gain over DP  $\approx 26$  dB. Boom length: AB = 19'6". Support spacing: AI = 7'; IJ = 5'6"; JB = 7'. Support length: CD = 7'3"; EF = 10'3"; GH = 3'0". Rhomboid sides: AC, AD, EG, FH = 7'9.5"; AE, AF, CH, DG = 13'5.5". Feedline: Wire needed: 14 AWG formvar,  $\approx 86'0"$ . Boom material: AI, JB = wood; IJ = metal. Cross support: CD, EF, GH = wood. Terminators: R1, R2 = 600 Ohms; Watts

### 106 - Double-Bazooka Antenna for 80m

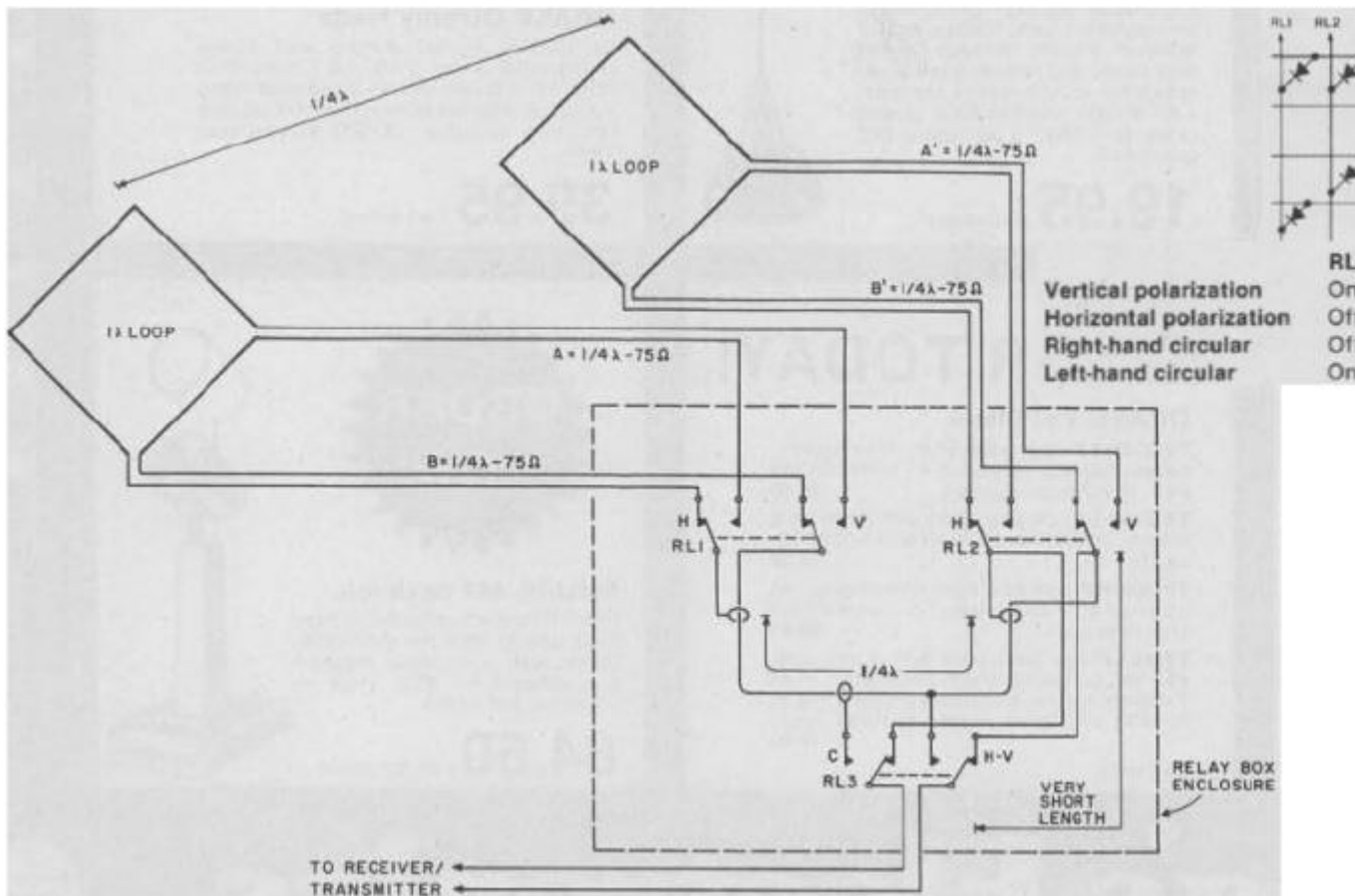




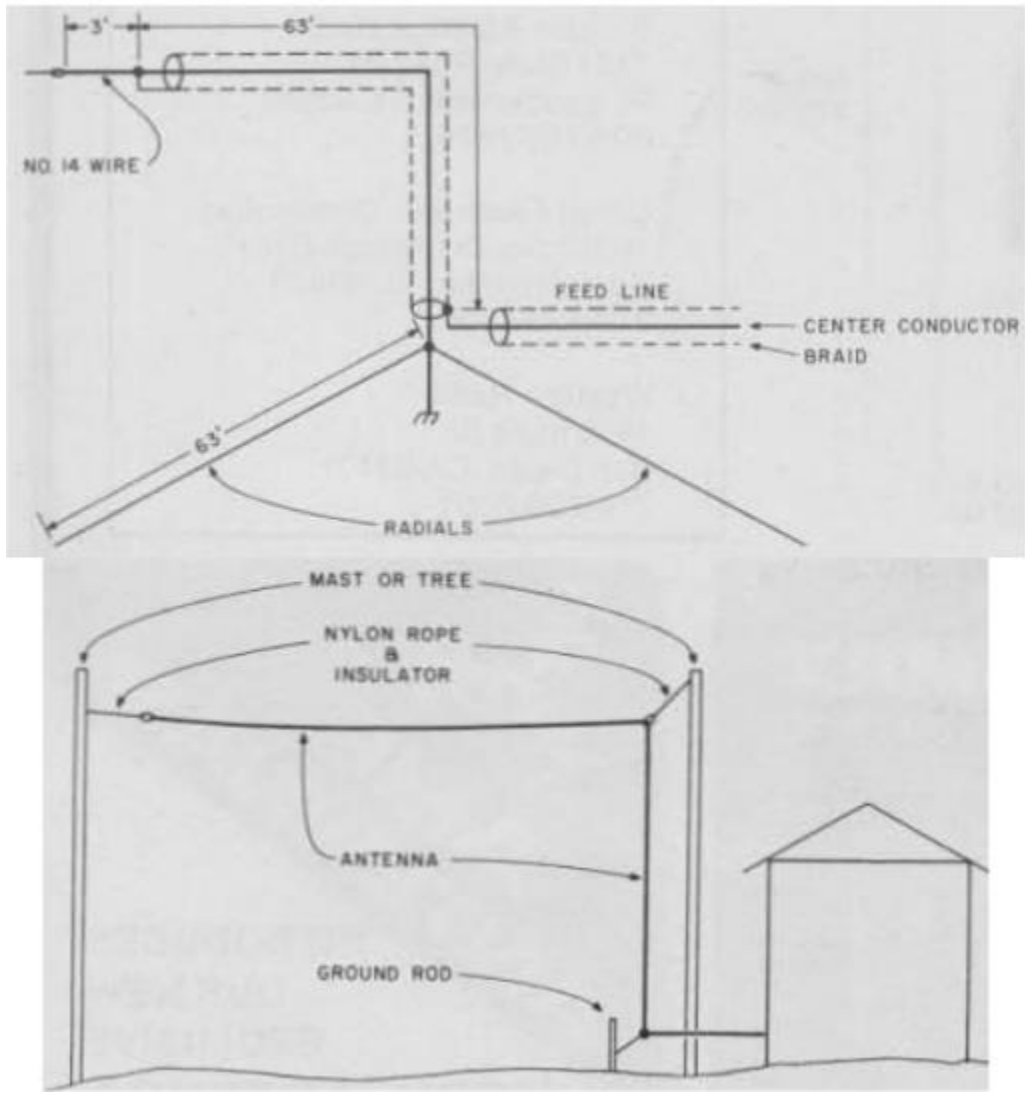
**107 - J-Style Antenna**



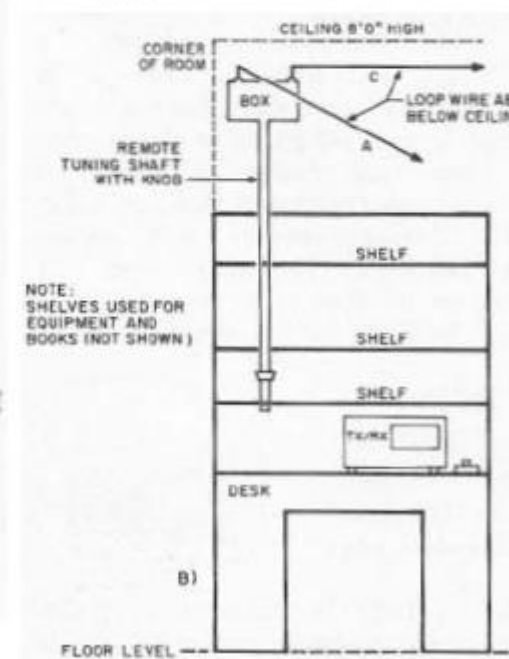
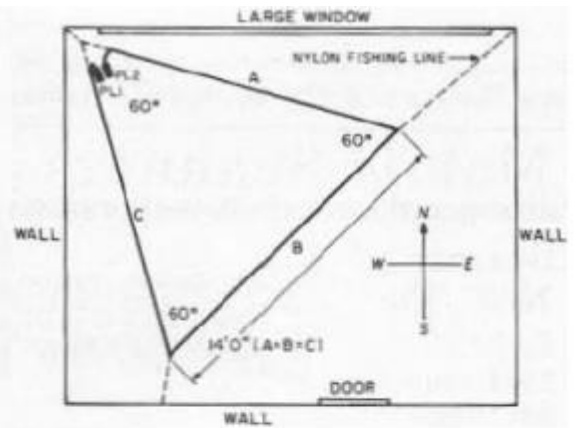
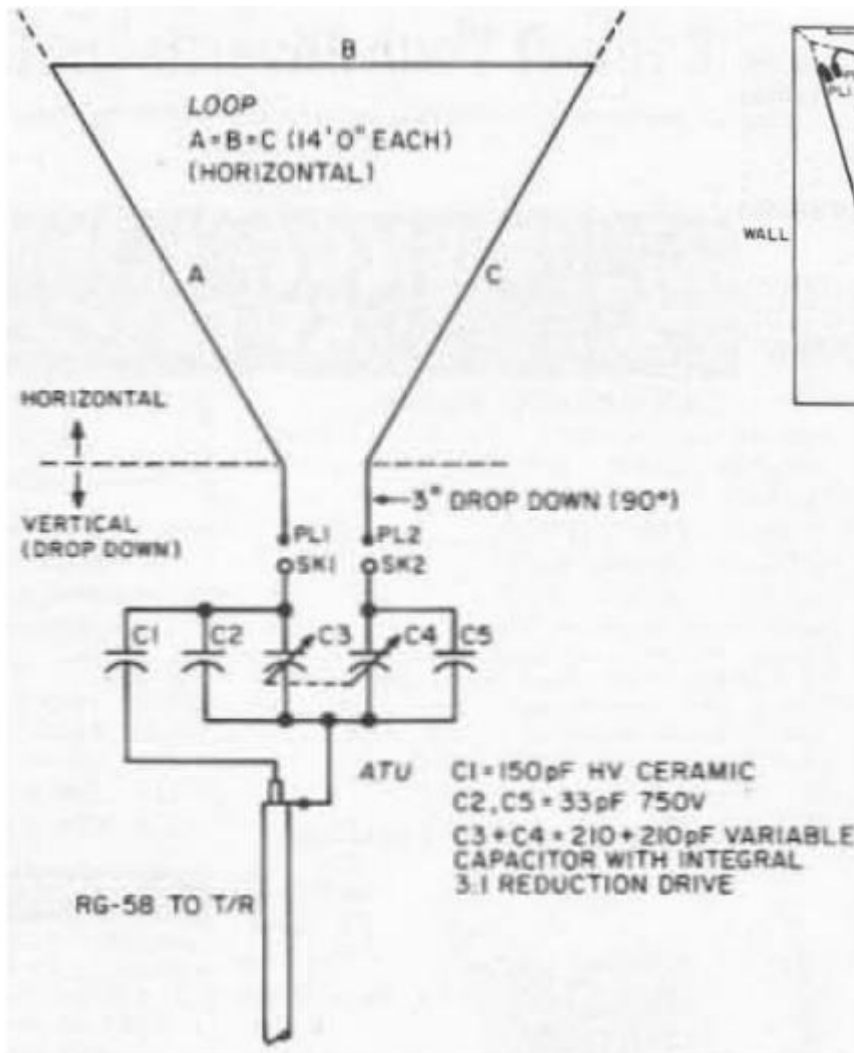
**108 - Vertical / Horizontal / Circular Polarization Antenna**



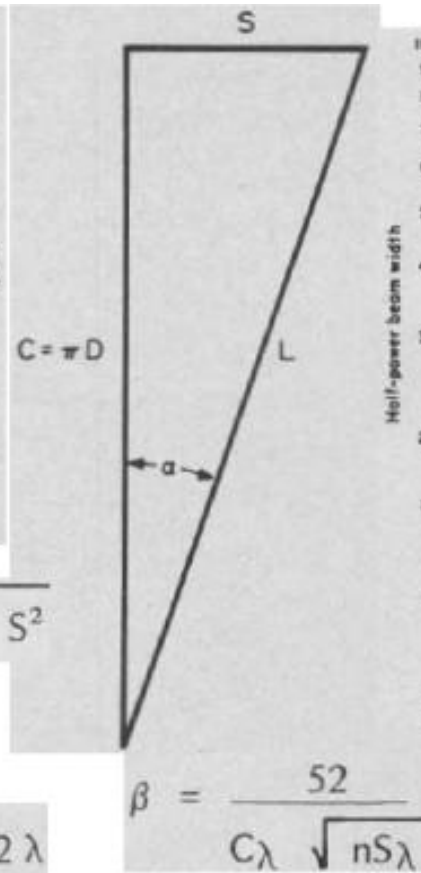
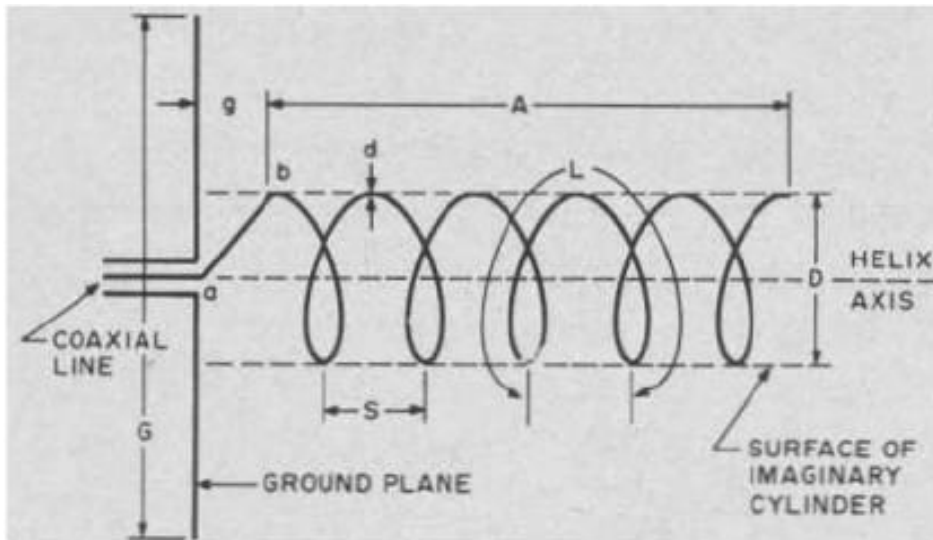
**109 - Coax Inverted-L Antenna for 80m**



**110 - Indoor Compact Loop Antenna for 80m**



## 111 - Helix Antenna



$D$  = Diameter of the helix  
 $S$  = Spacing between turns  
 $\alpha$  = Pitch angle =  $\text{Arctan} \left( \frac{S}{\pi D} \right)$   
 $L$  = Length of 1 turn  
 $n$  = Number of turns  
 $A$  = Axial length =  $nS$   
 $d$  = Diameter of conductor  
 $g$  = Distance of ground plane to first turn  
 $G$  = Ground plane diameter

$$L = \sqrt{(\pi D)^2 + S^2}$$

$$D = 0.32 \lambda$$

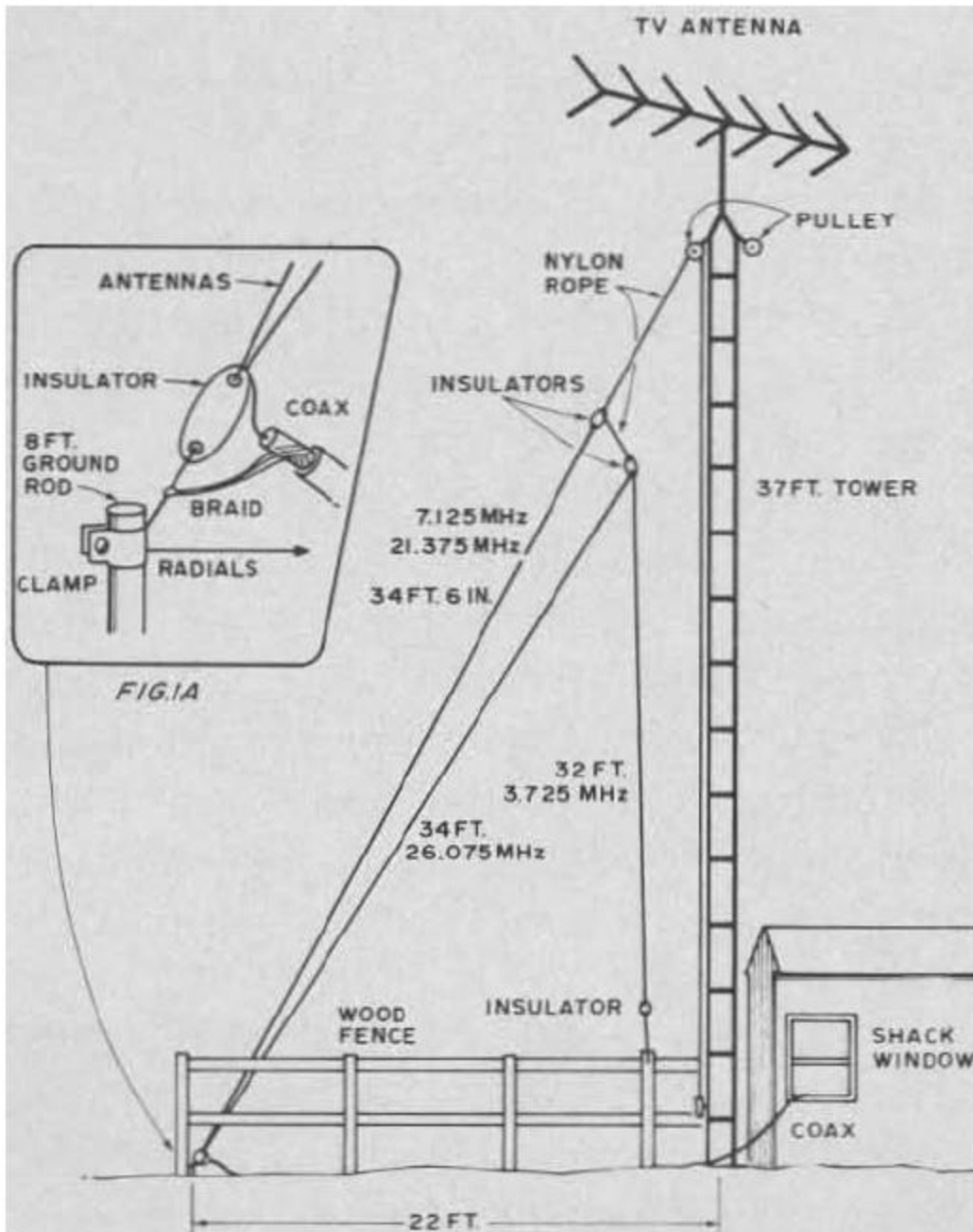
$$S = 0.22 \lambda$$

$$G \geq 0.80 \lambda$$

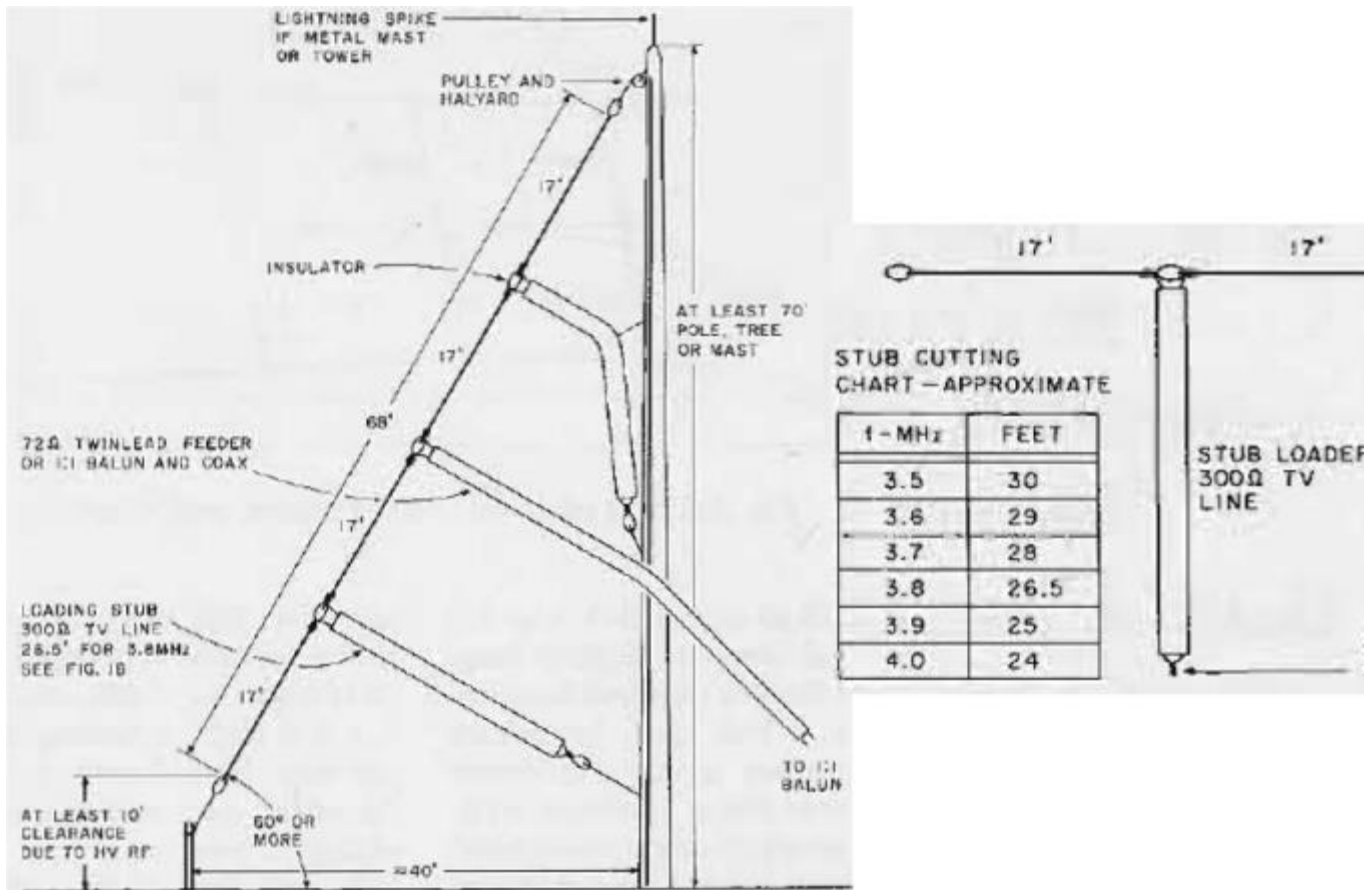
$$g = \frac{S}{2} = 0.12 \lambda$$

$$\beta = \frac{52}{C \lambda \sqrt{n S \lambda}}$$

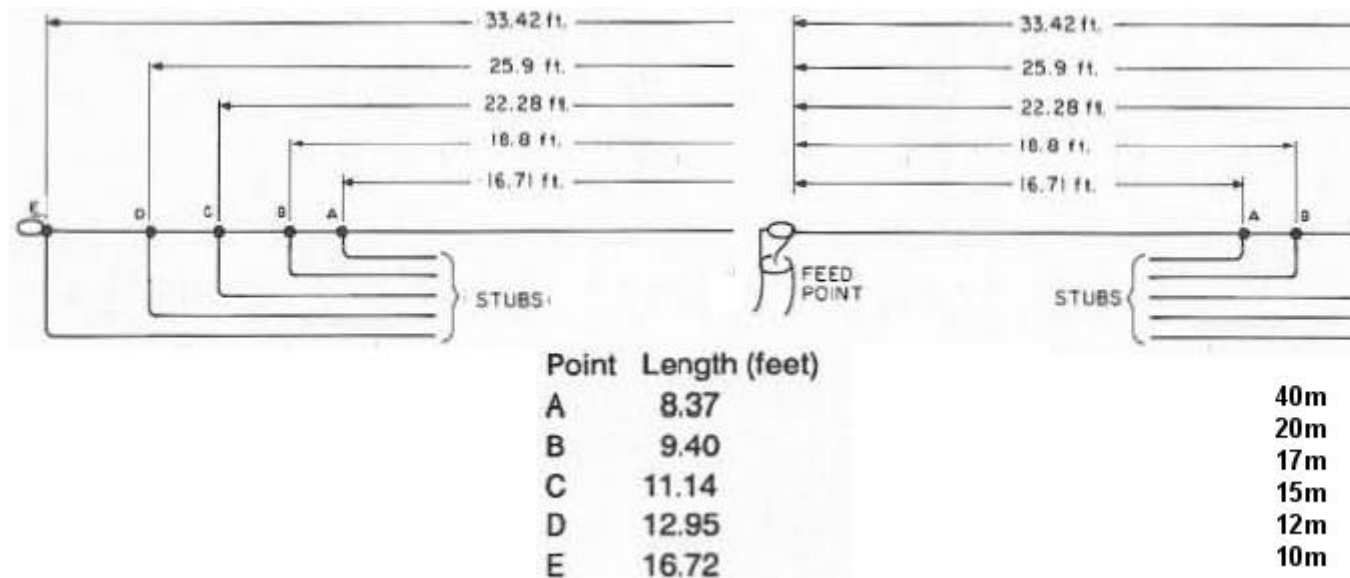
**112 - Novice Vertical Antenna for 80m, 40m, 15m, 10m**



**113 - Stub-Loaded Shortened Dipole for 80m**

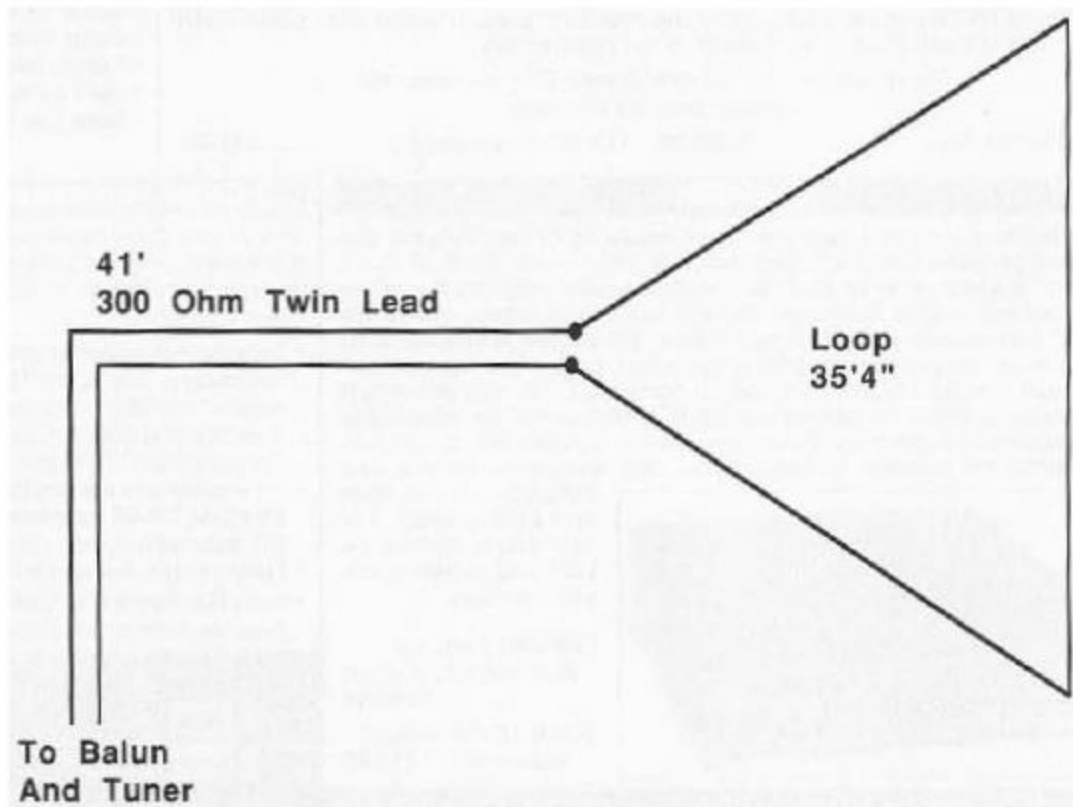


### 114 - Six-Band Wire-Stub Trap Antenna for 40m-10m

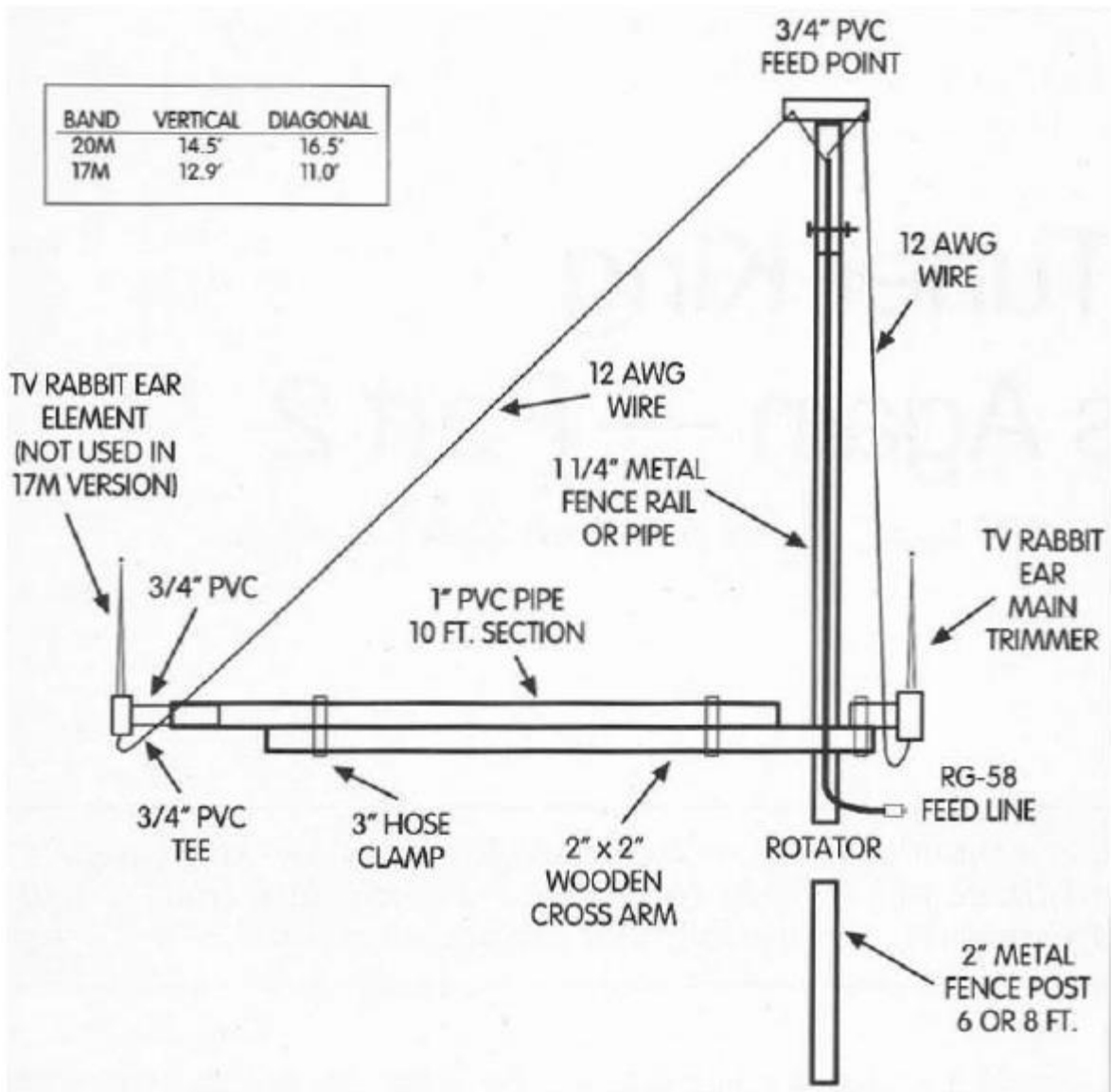


### 115 - Multiband Half-Wave Delta-Loop Antenna

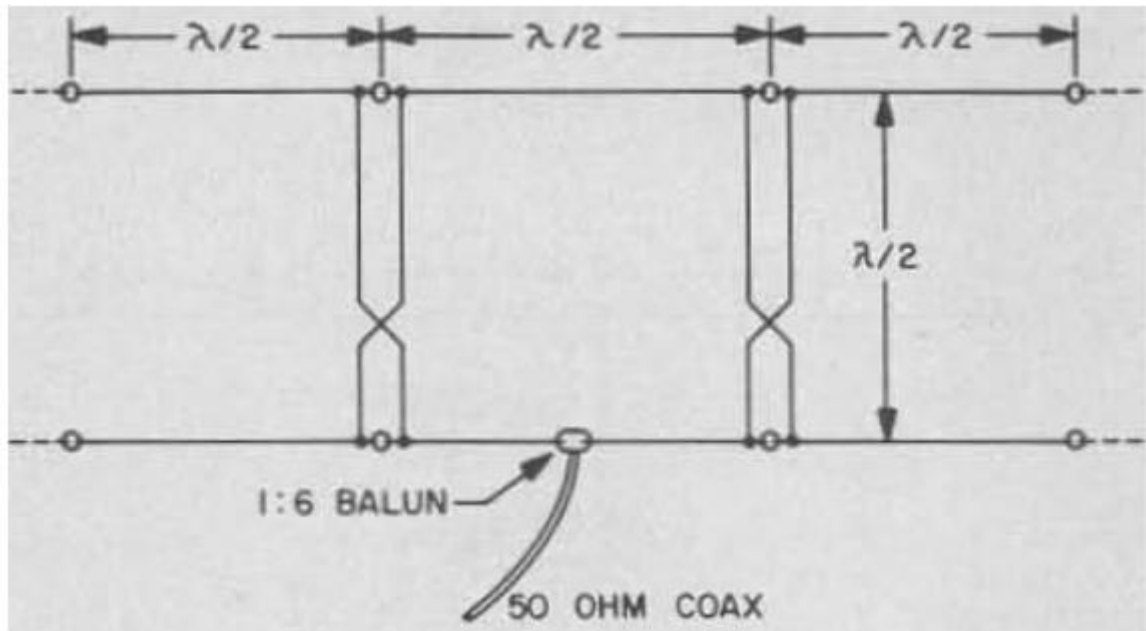




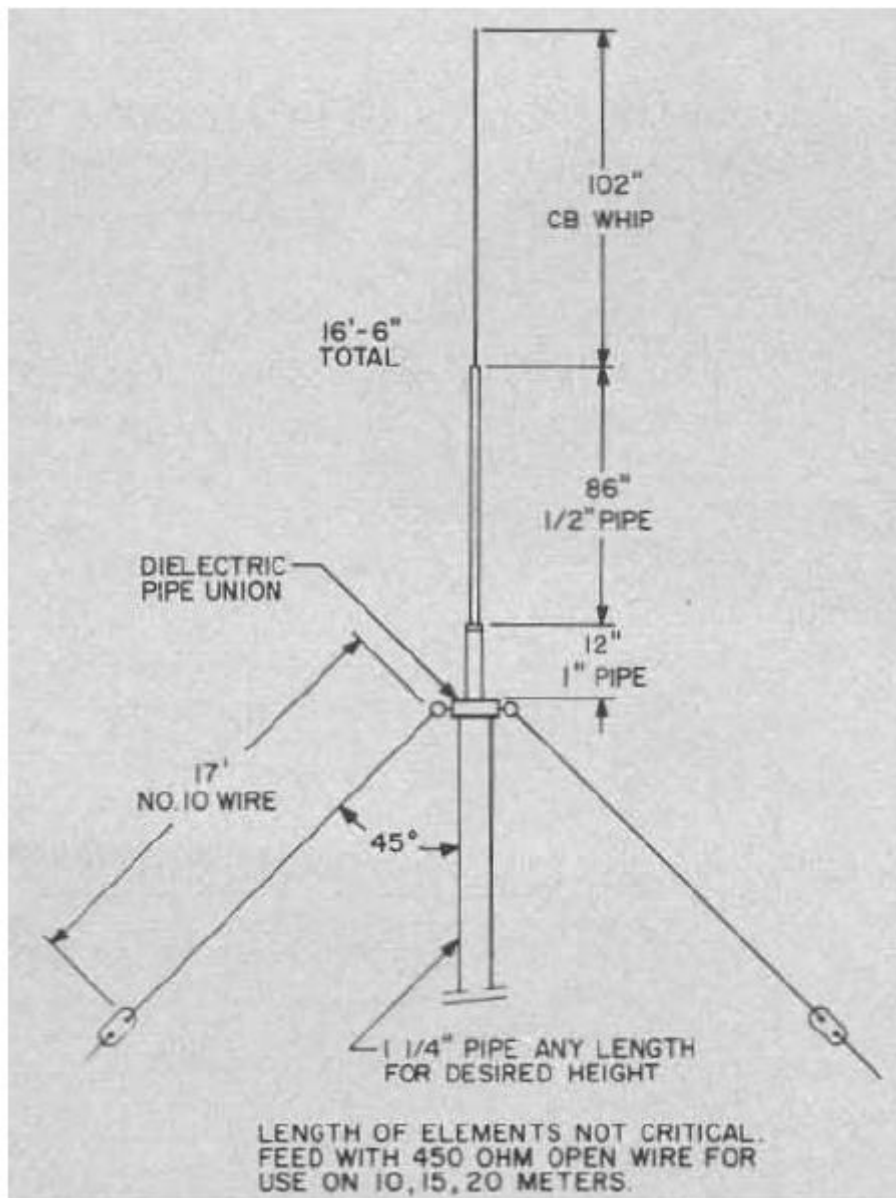
**116 - Hybrid Vee for 20m, 17m**



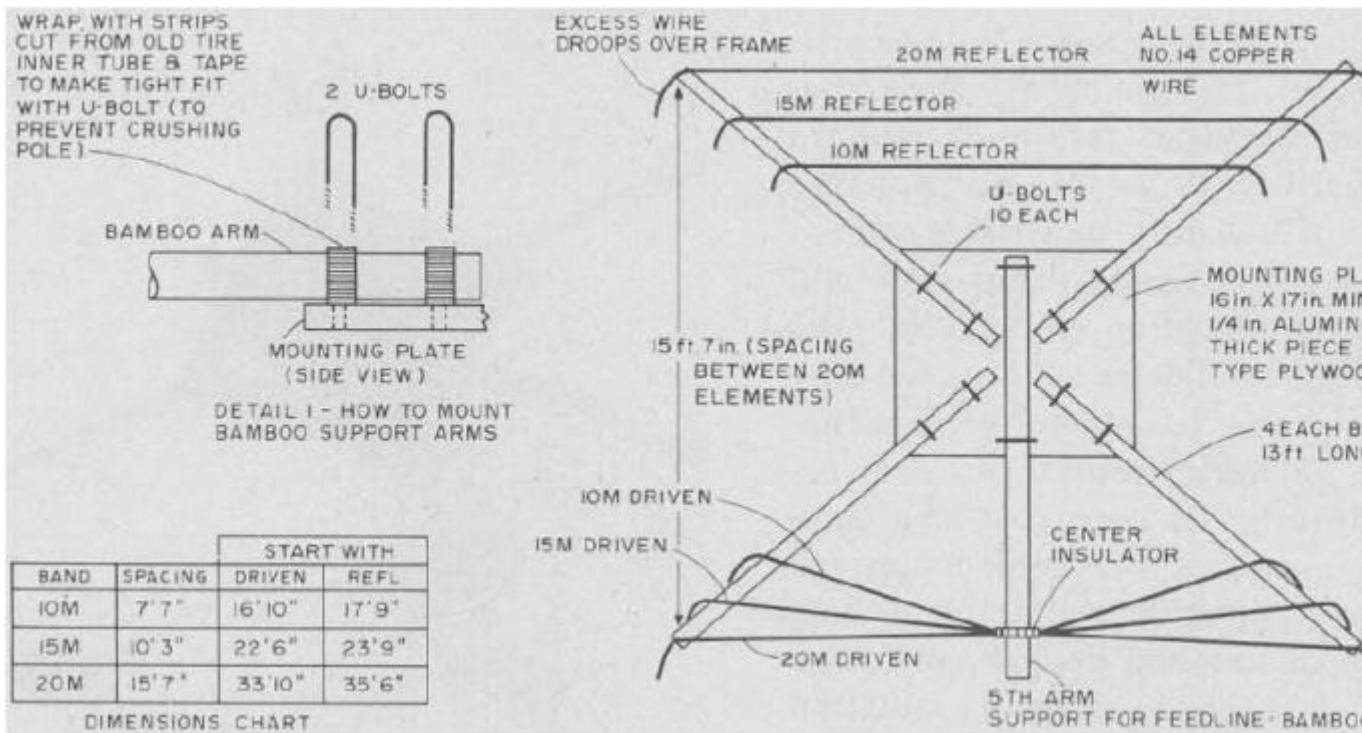
**117 - Six-Shooter Array Antenna, Gain=7.5dB**



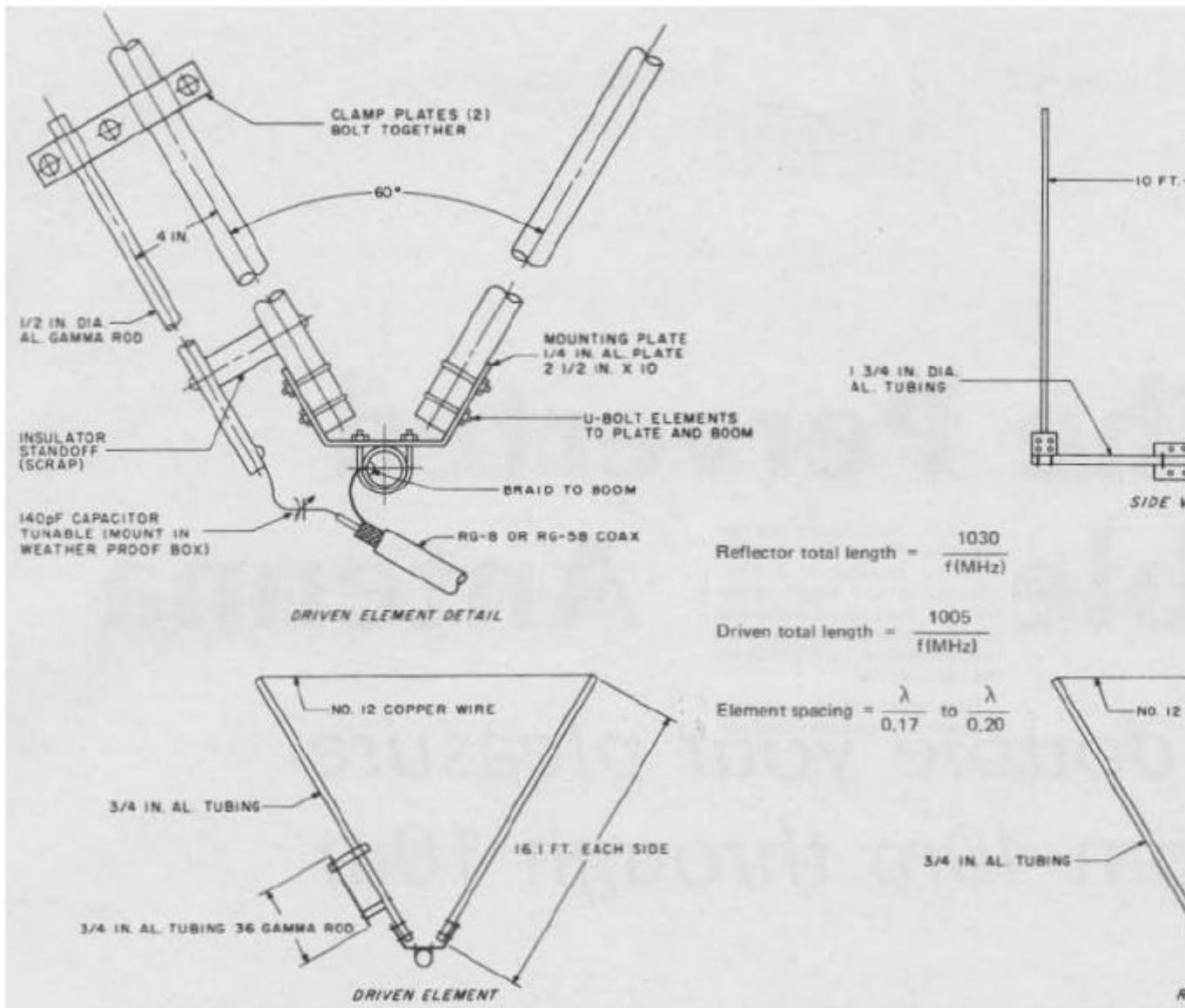
**118 - Multiband Ground-Plane Antenna for 10m, 15m, 20m**



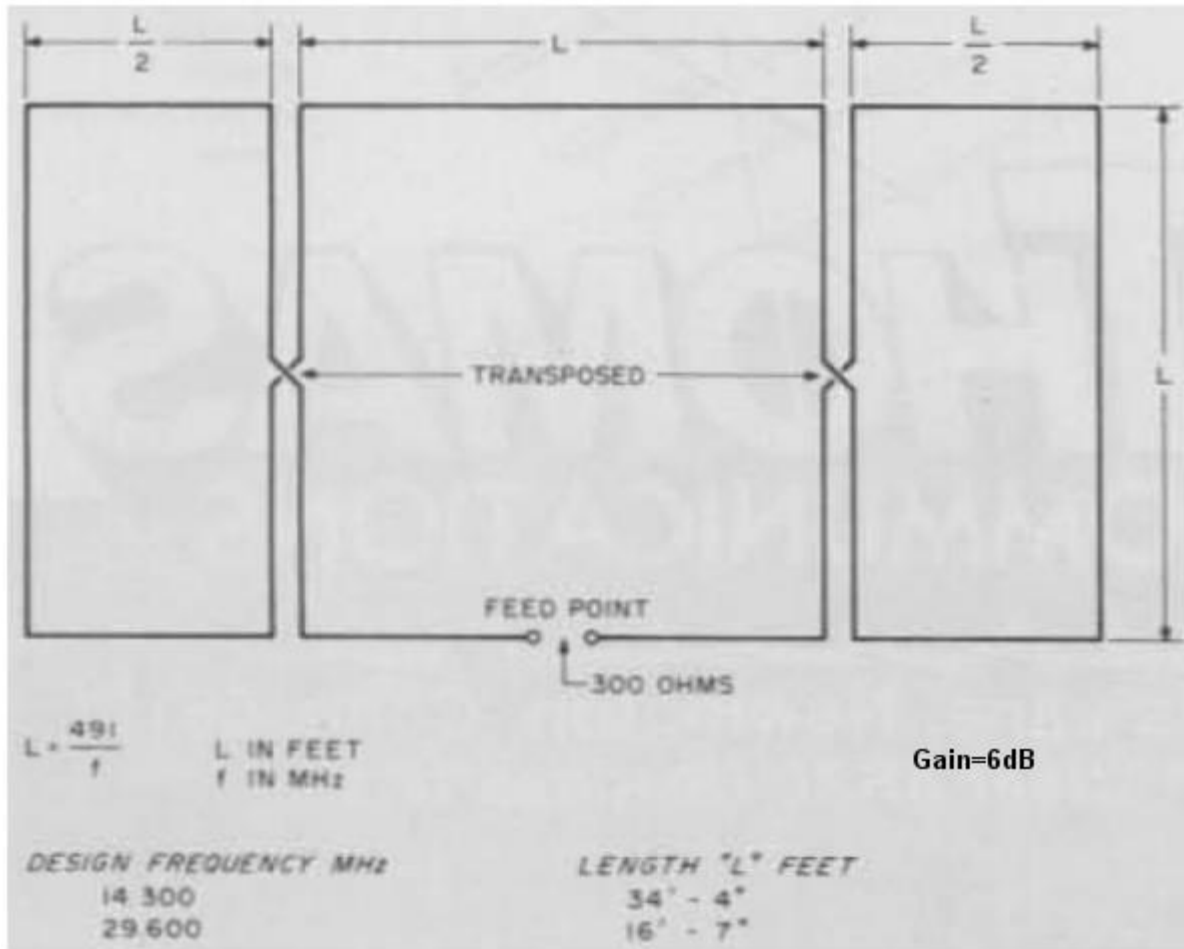
**119 - Wire Superbeam Antenna for 10m, 15m, 20m**



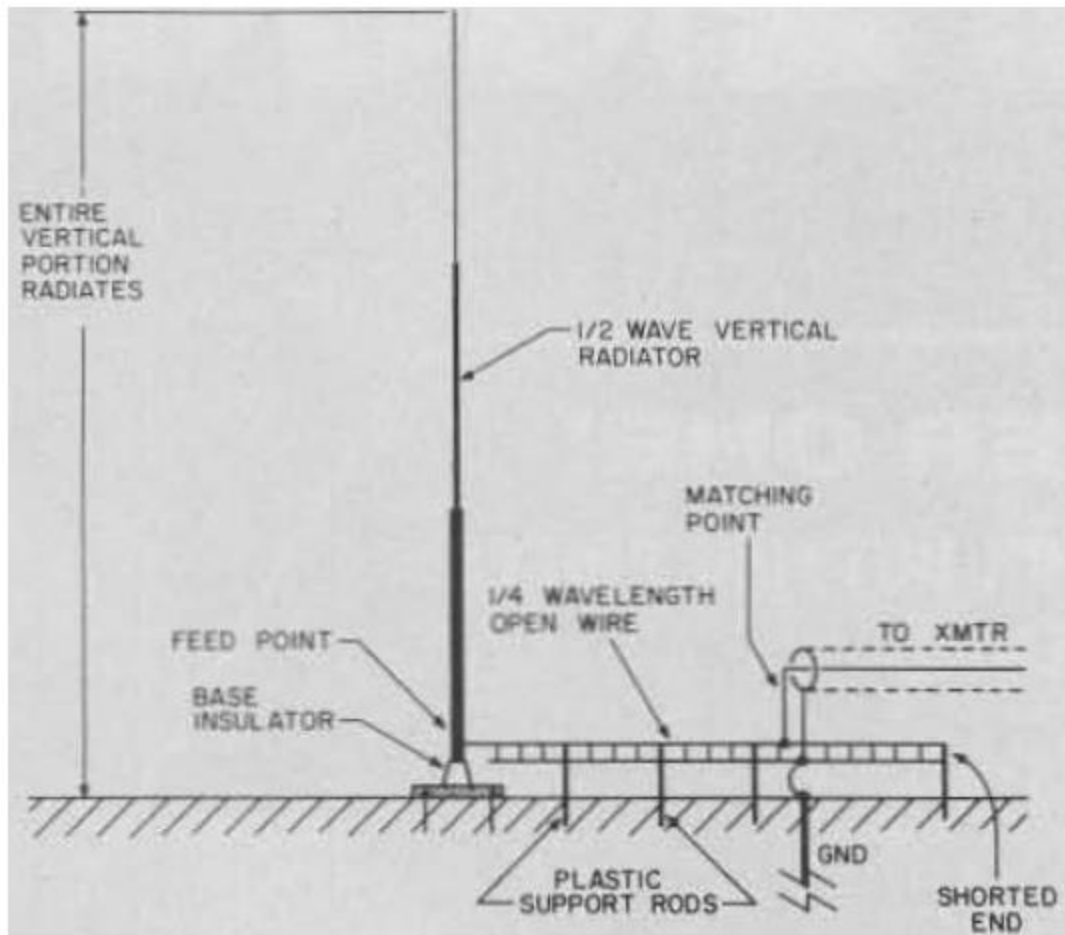
## 120 - Two Elements Delta-Loop Antenna



**121 - Sterba Curtain Antenna**

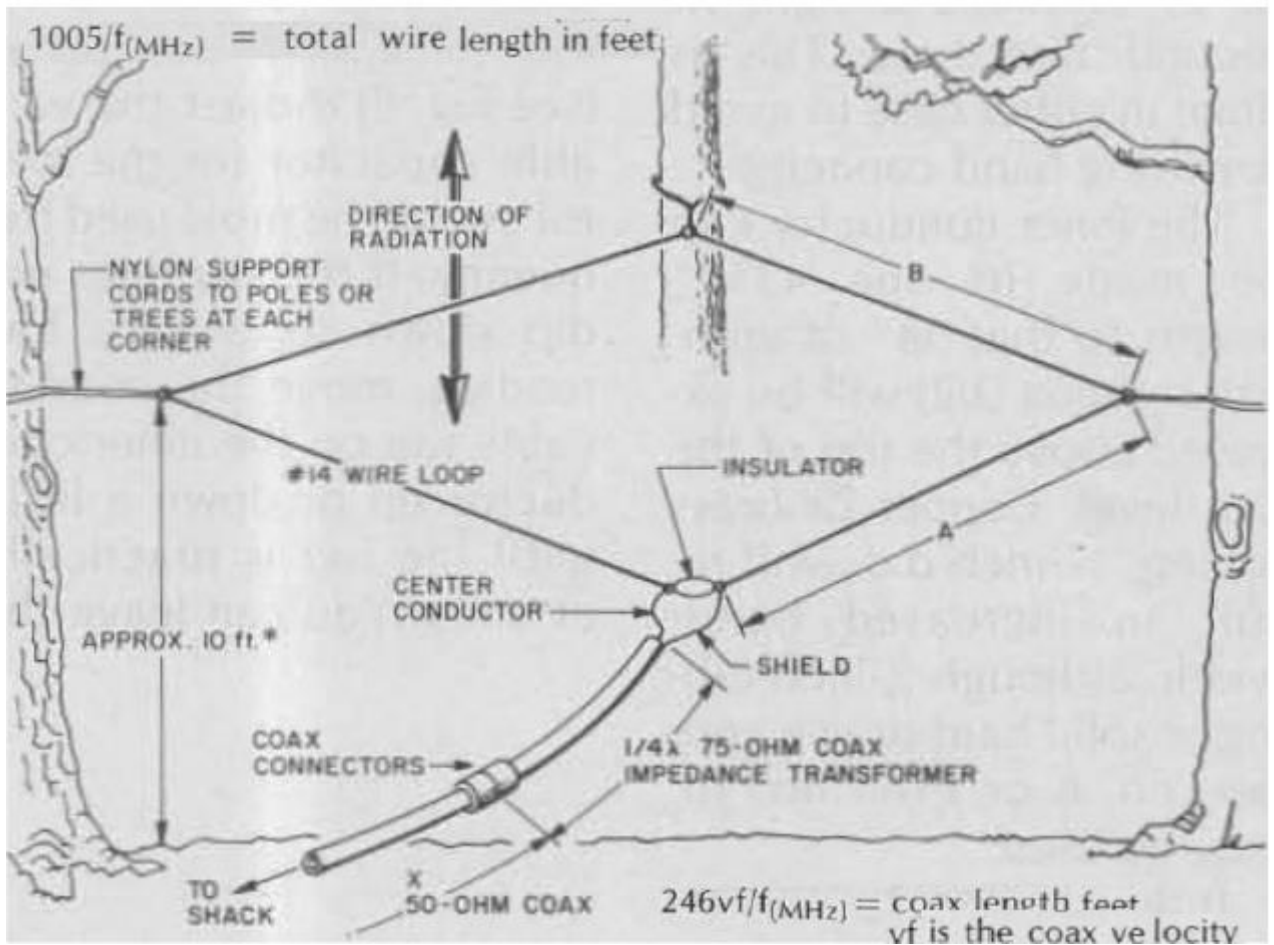


## 122 - Half-Wave Vertical Zepp Antenna

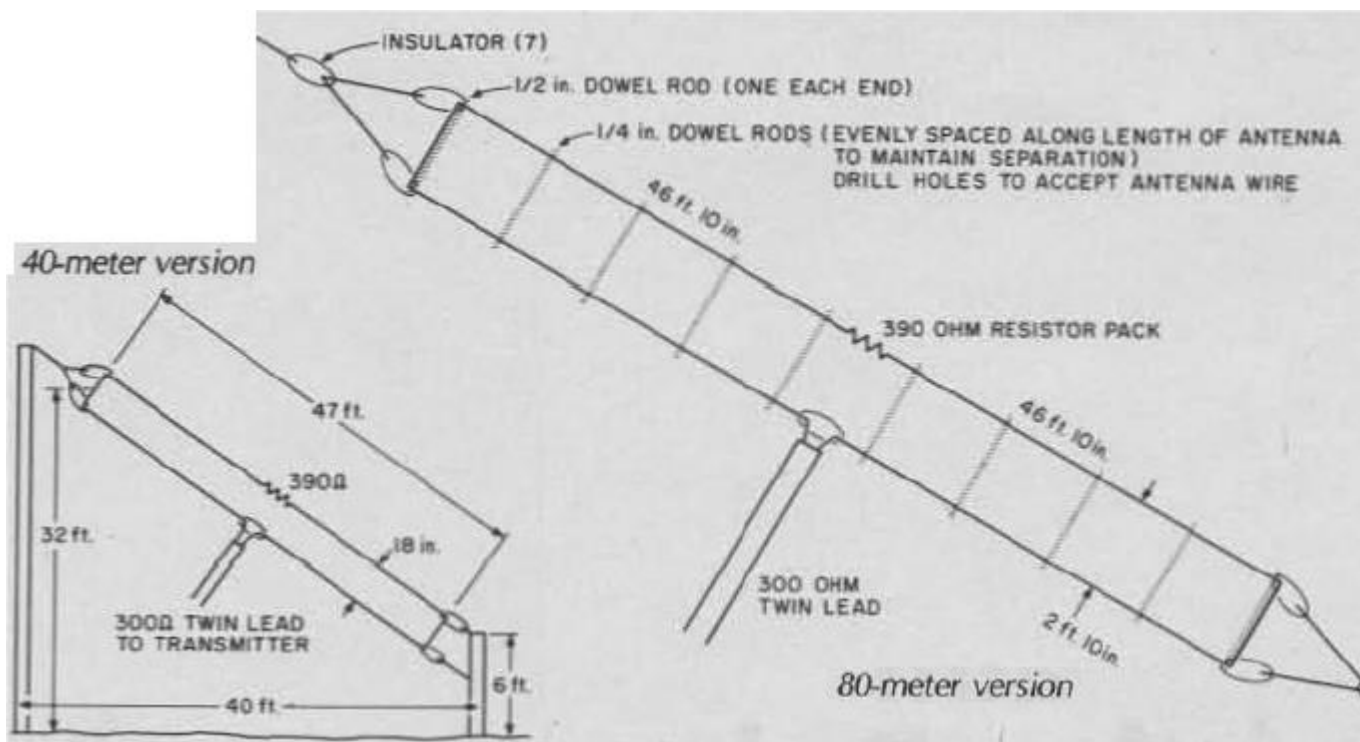


**123 - Lazy-Loop Antenna for 40m**

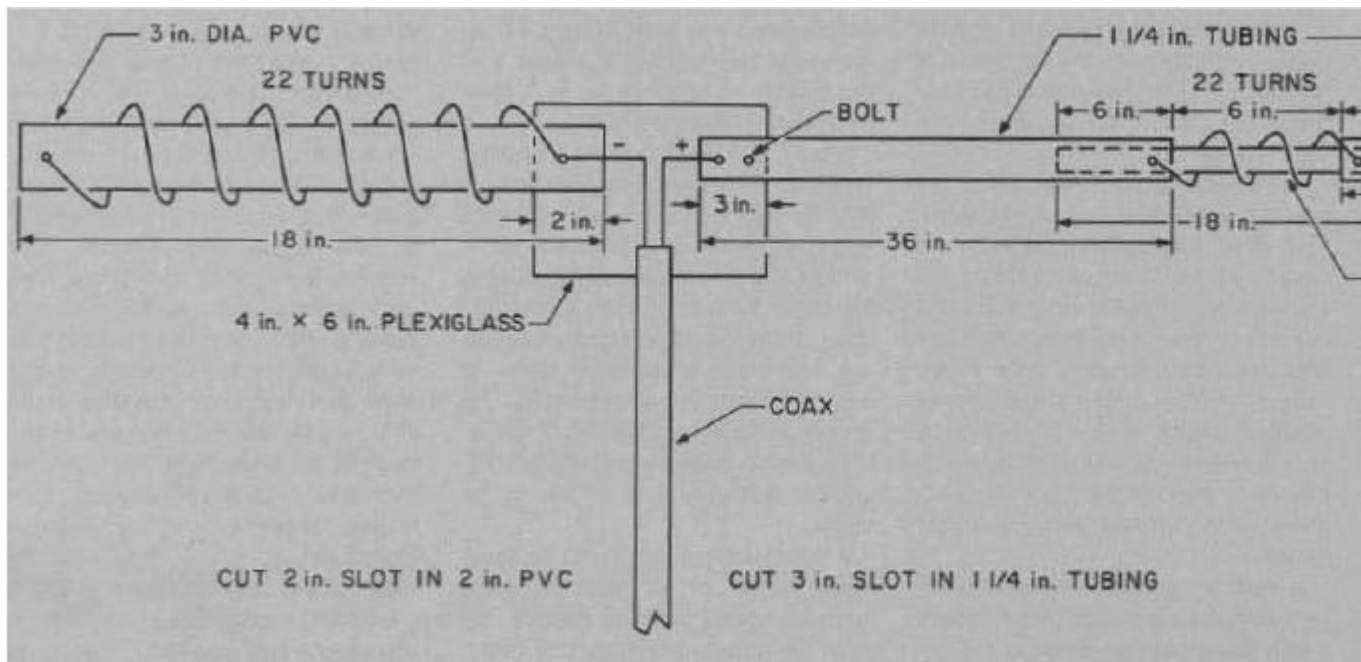




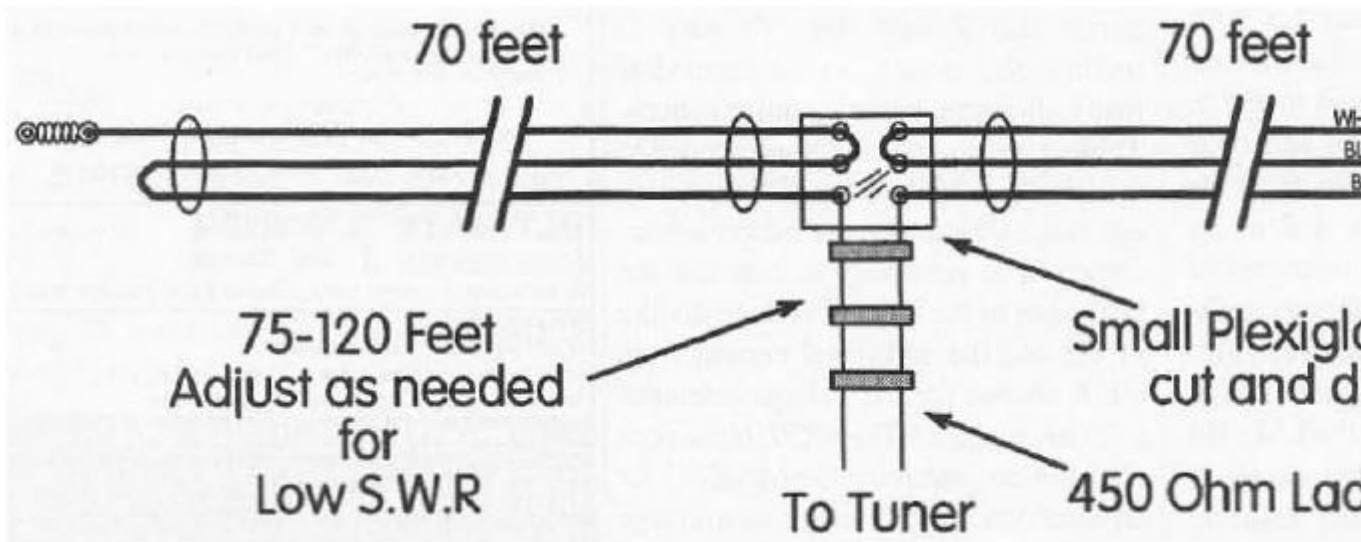
**124 - Terminated Folded Dipole for 80m, 40m**



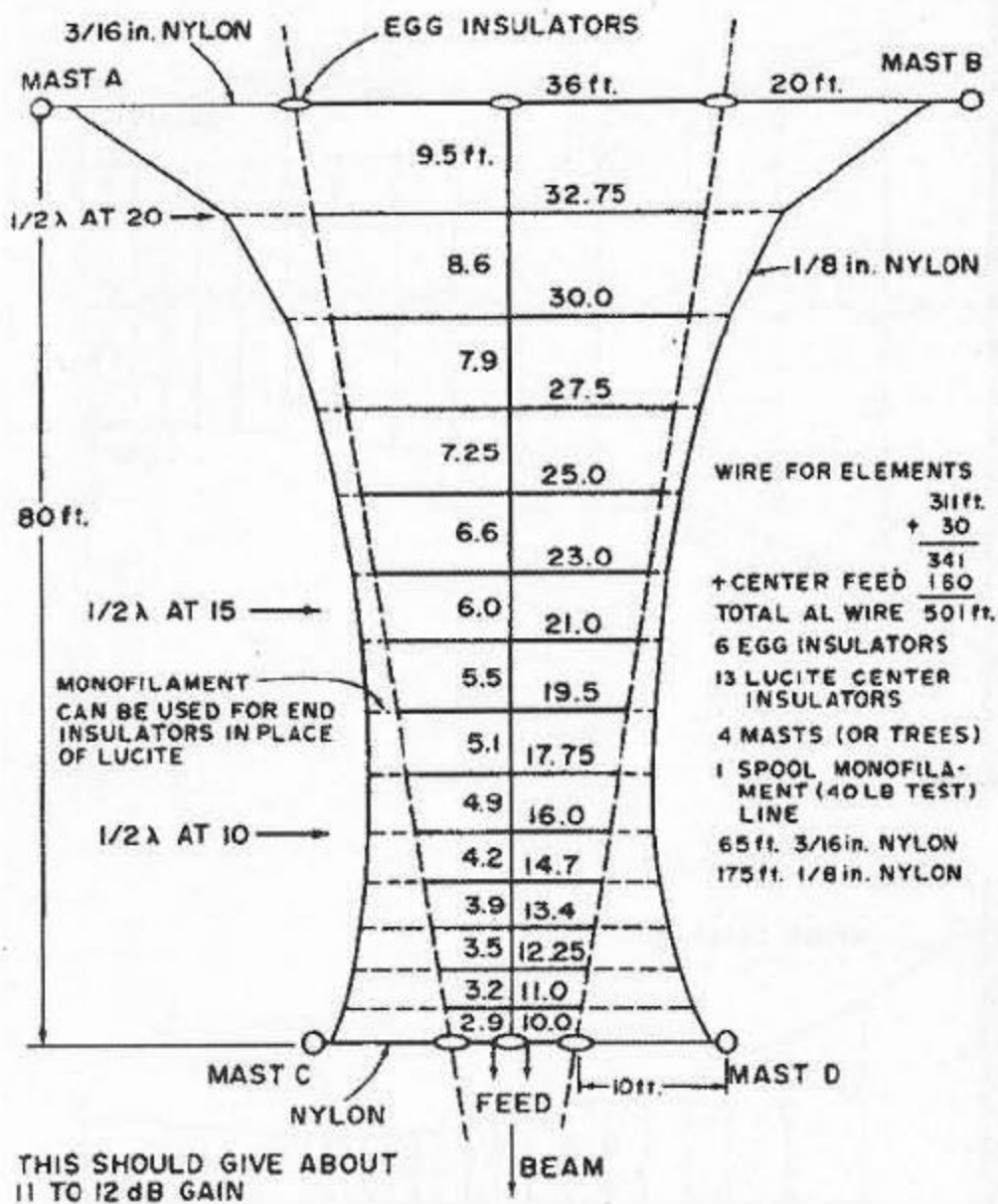
**125 - Short-Fat Antenna for 15m**



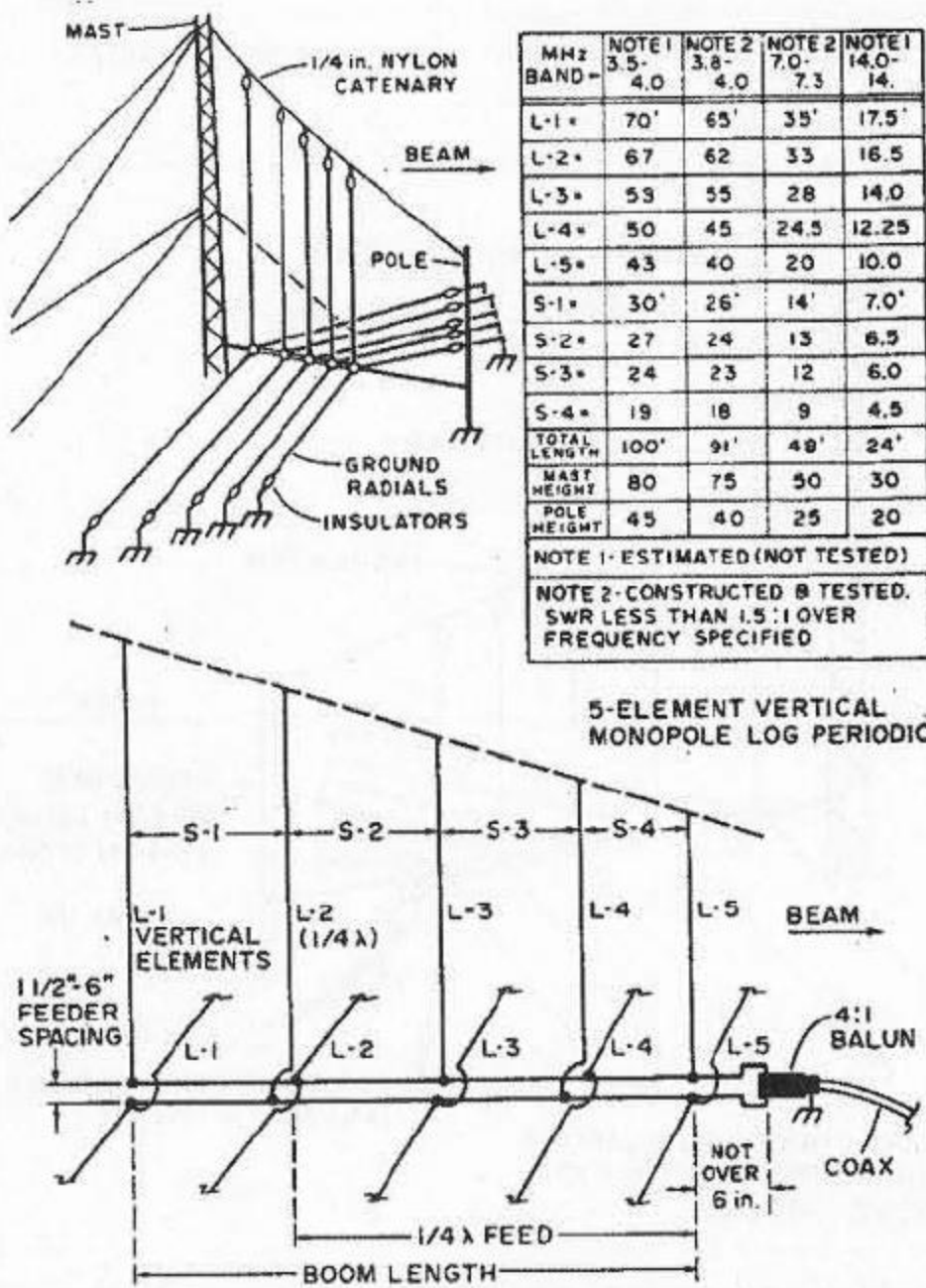
**126 - Cobra Antenna for 80m**



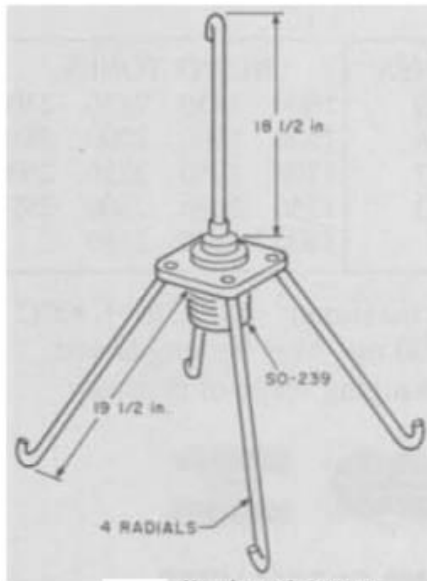
**127 - Log-Periodic Wire Antenna for 20m, 15m, 10m**



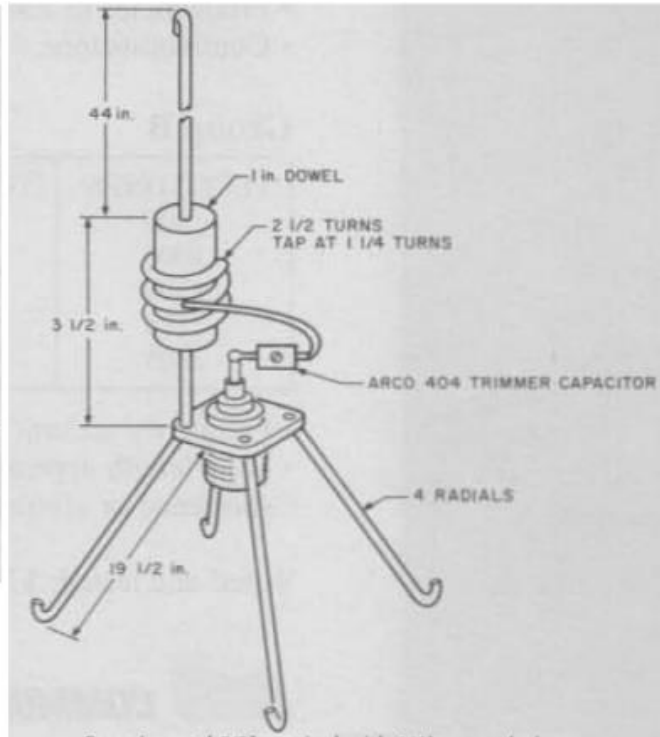
128 - 5-Element Log-Periodic Vertical Antenna for 80m, 40m, 20m



129 - 2m Vertical Wire Antennas

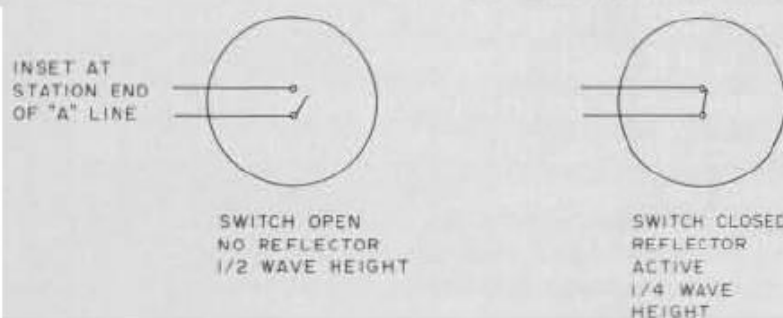
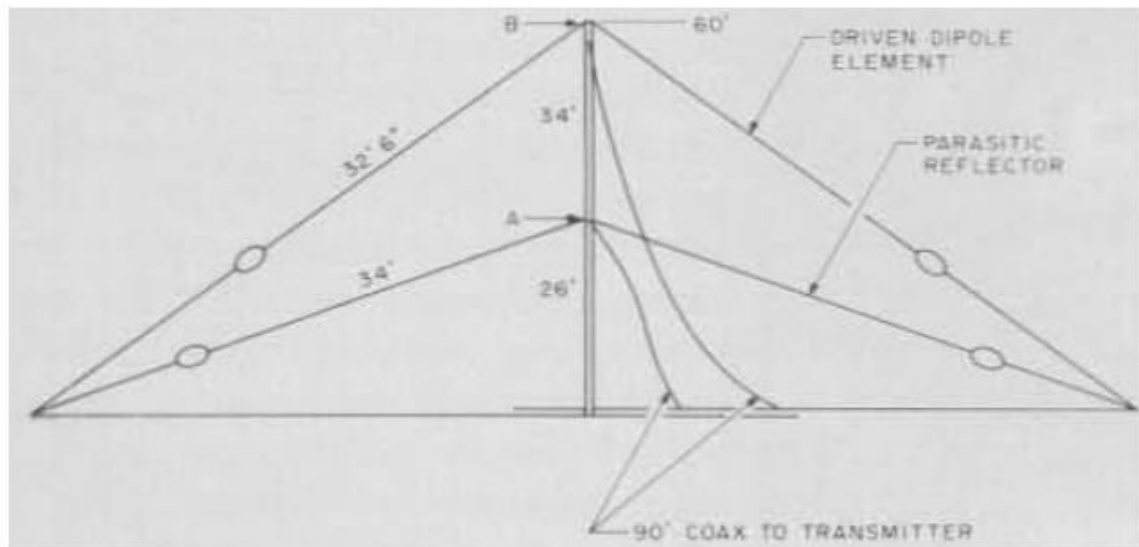


Simple  $1/4\lambda$  2-meter ground-plane antenna.

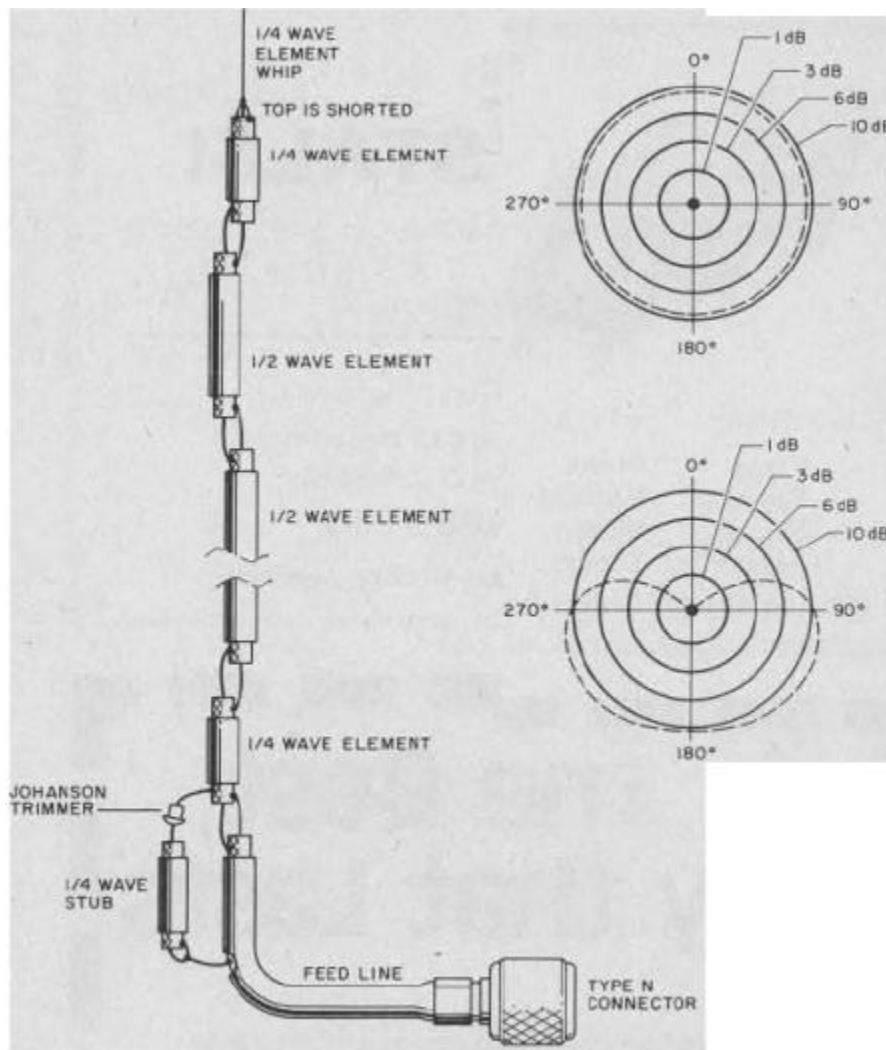


Experimental  $5/8\lambda$  vertical with  $1/4\lambda$  ground plane.

### 130 - Earth-Mover Inverted-V Antenna for 40m



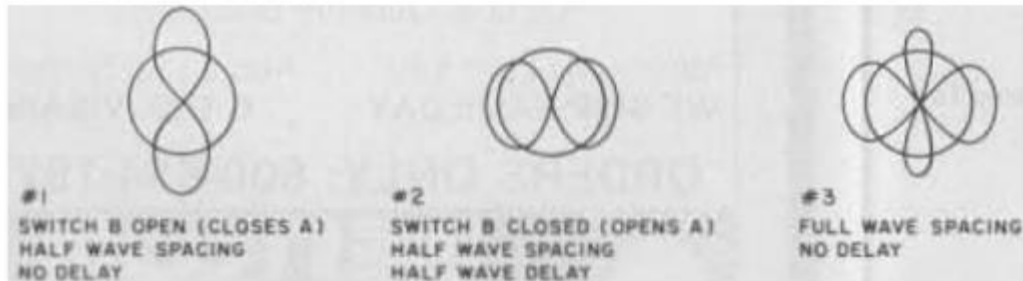
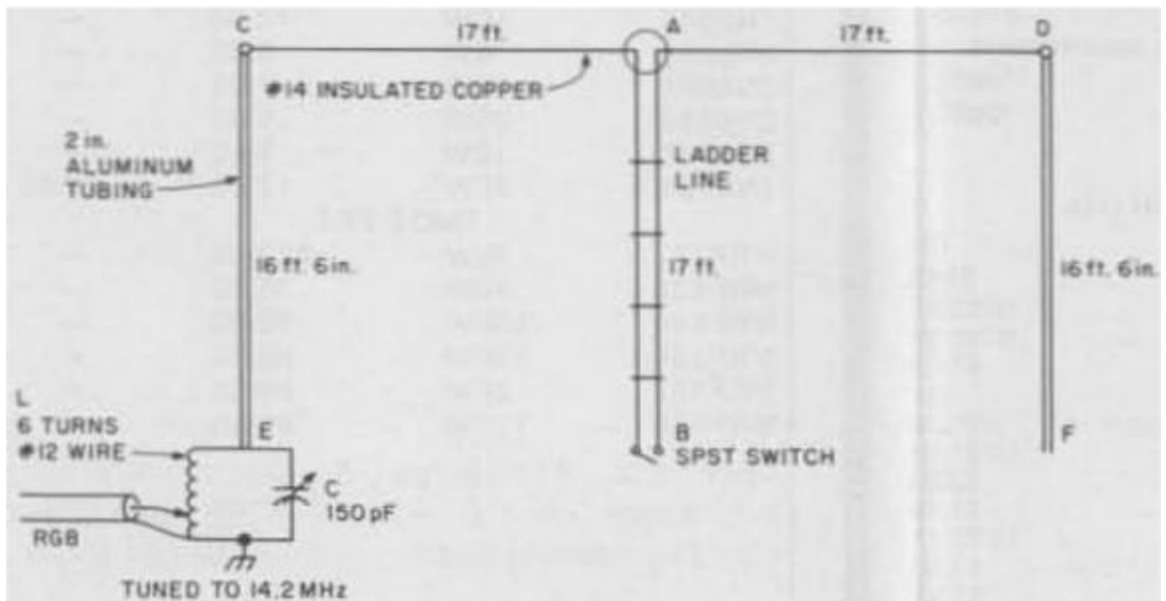
## 131 - Coax-Cable Collinear Antennas



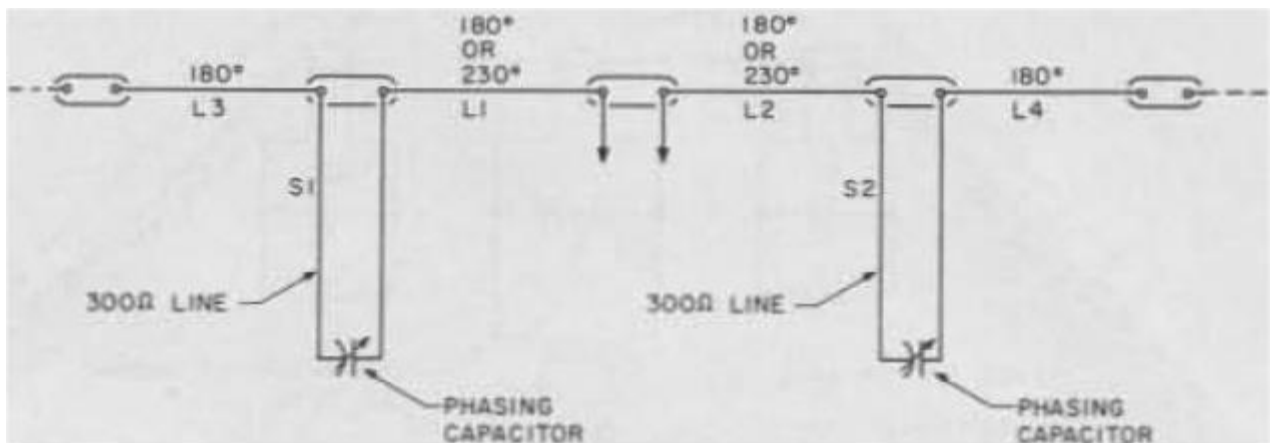
*8 elements = 6 dB. 16 elements = 9 dB*

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## 132 - Double Bobtail Antenna for 20m



### 133 - Collinear Zepp Antenna

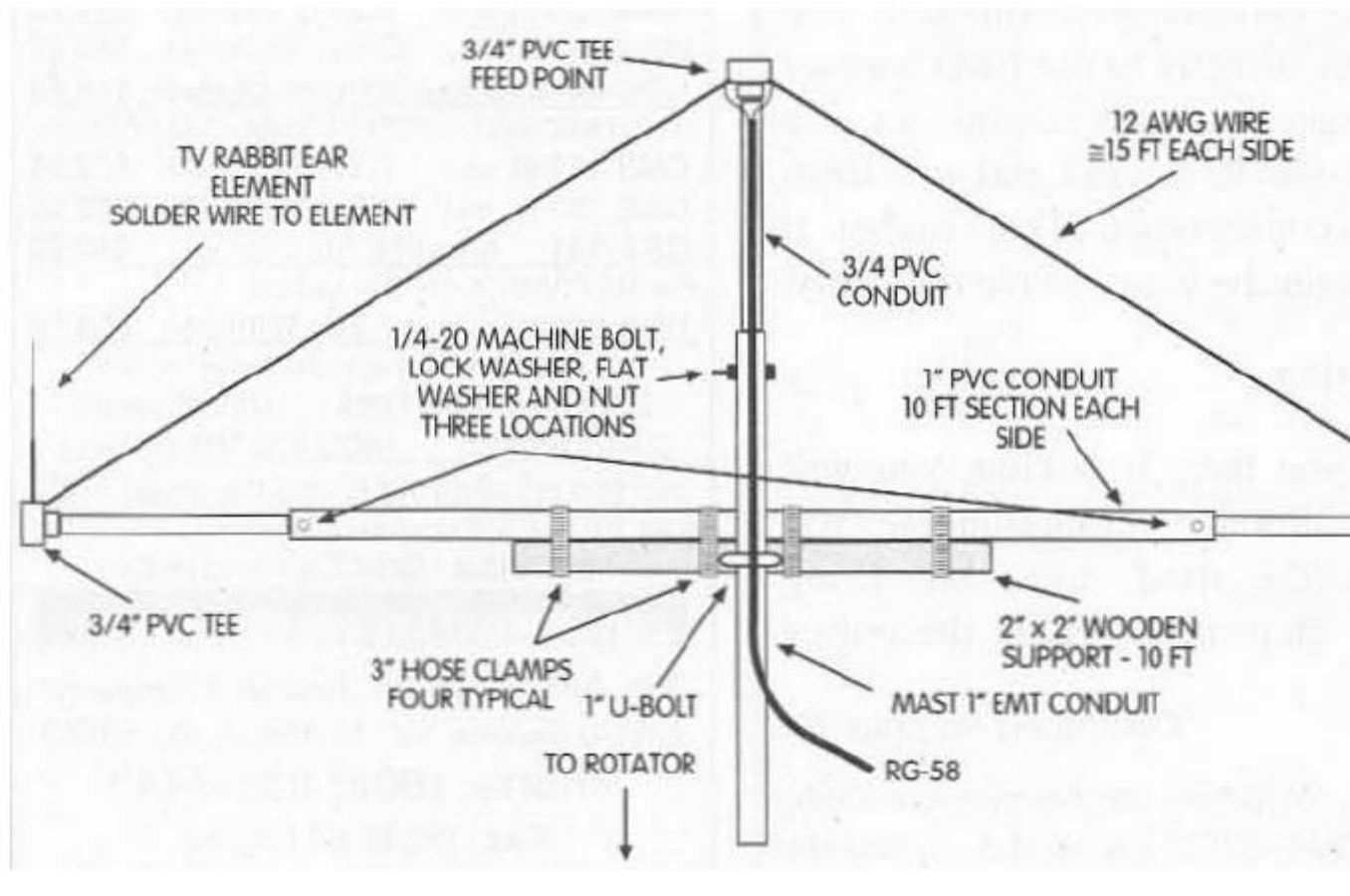


$$L1 - L2 = 180^\circ - 468/f \text{ WHERE } f = \text{MHz}$$

$$L1 - L2 = 230^\circ - 600/f \text{ WHERE } f = \text{MHz}$$

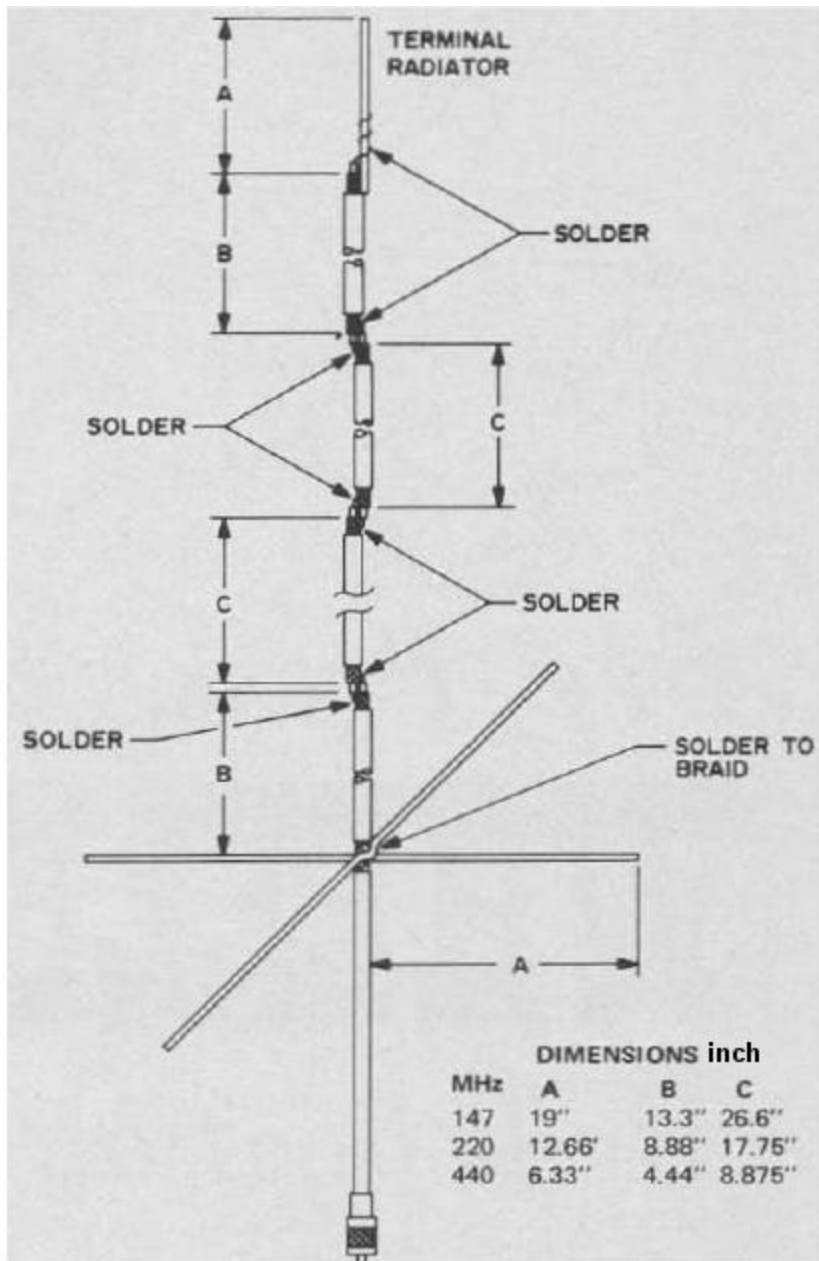
$S1 - S2 = 246 \times 0.82/f \text{ WHERE } f = \text{MHz}$   
 S1 - S2 MADE FROM 300Ω TV RIBBON.  
 MAKE ABOUT 6 INCHES LONGER THAN  
 CALCULATED VALUES. TRIM IF NECESSARY.

### 134 - Taylor Vee Antenna for 20m

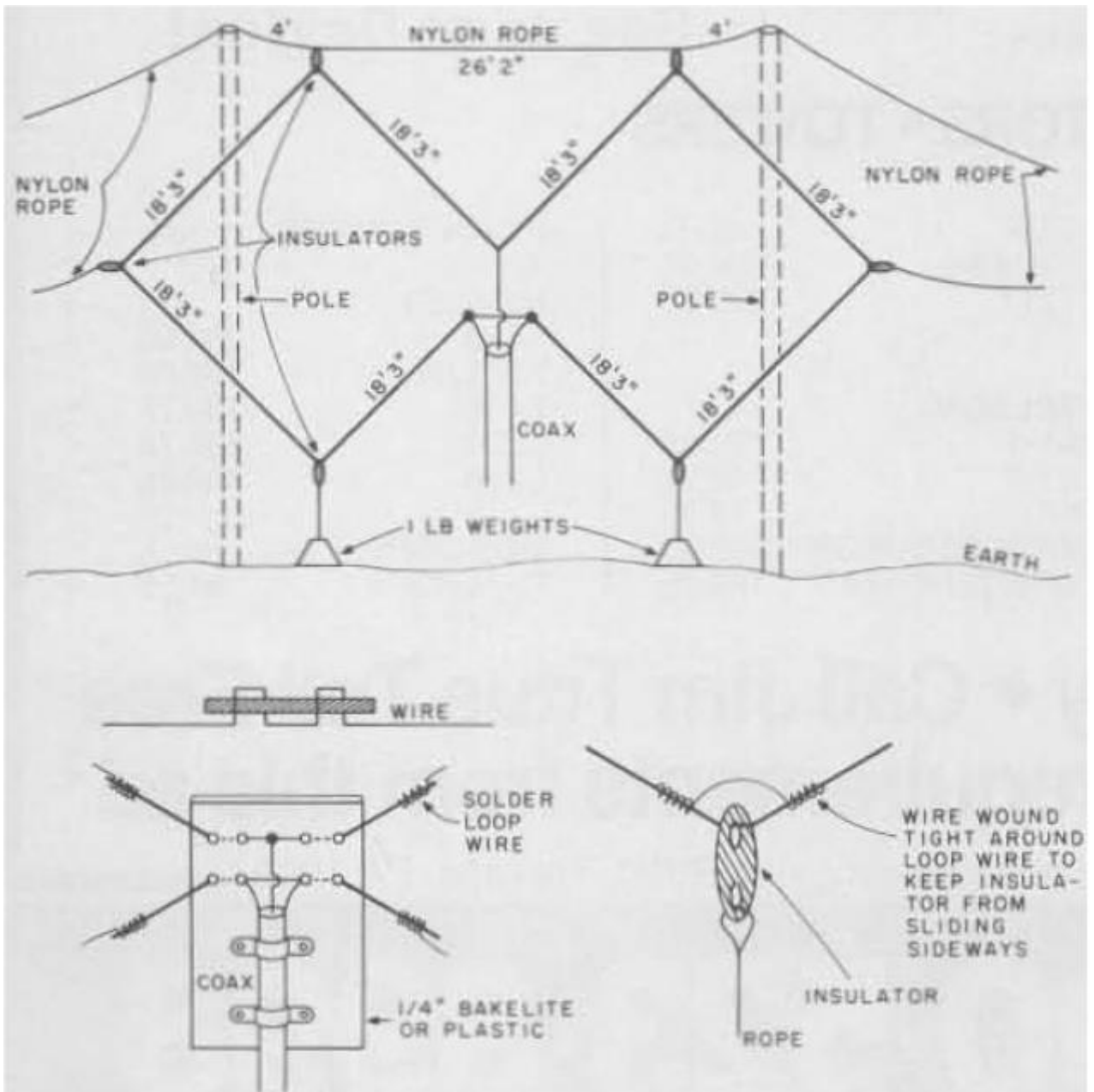


### 135 - Collinear Vertical Antenna 6dB-Gain for 2m, 1.3m, 73cm

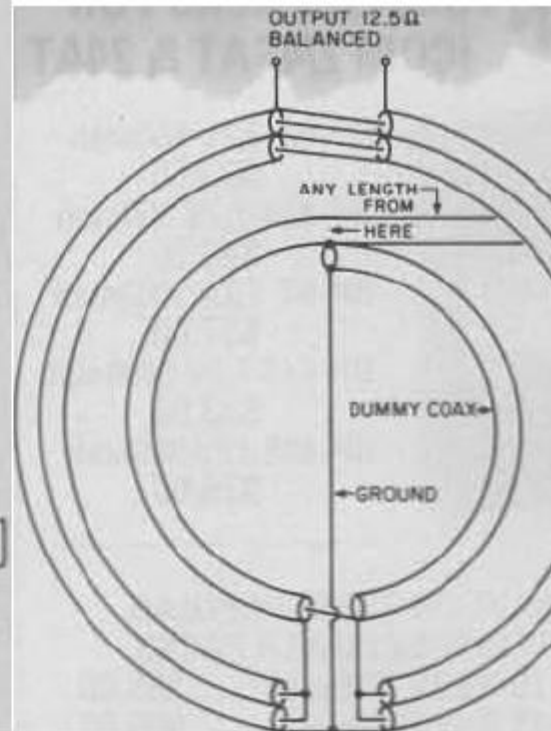
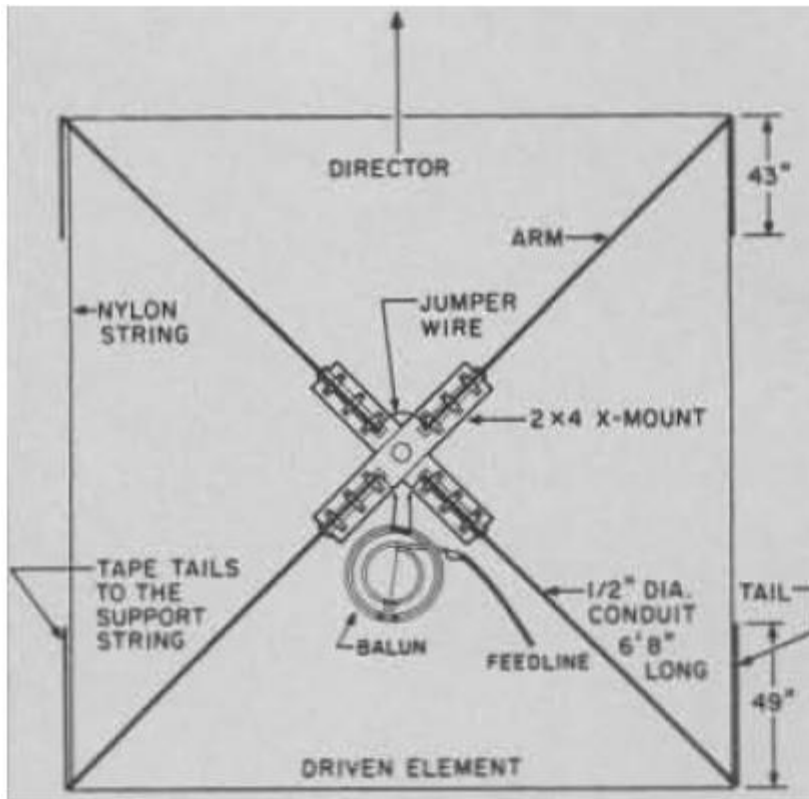




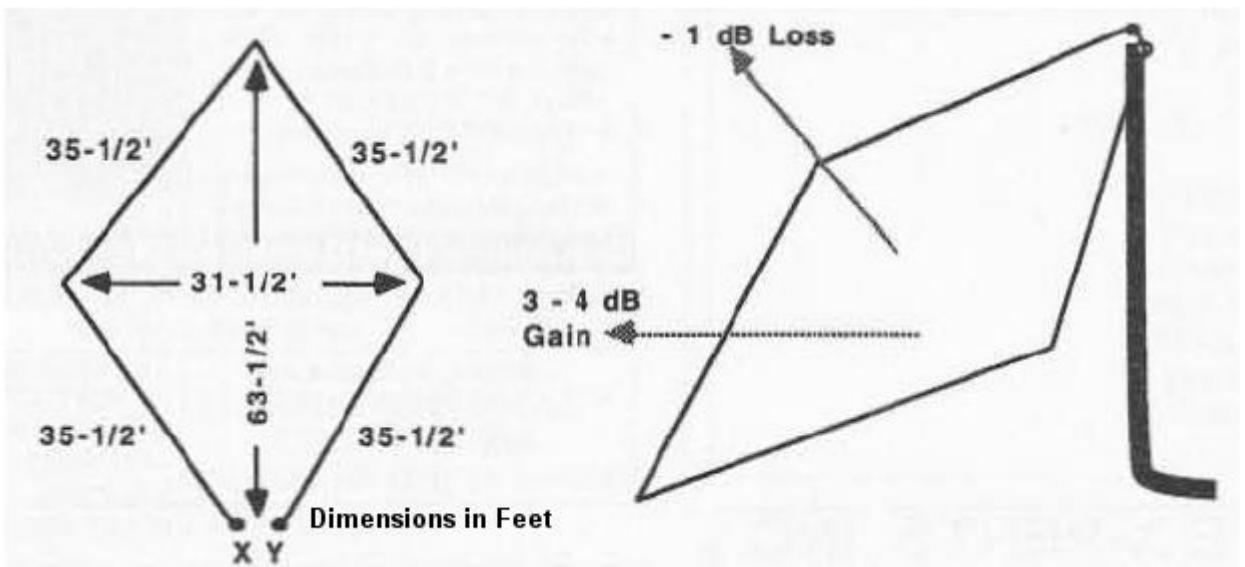
**136 - Bi-Loop Antenna for 20m**



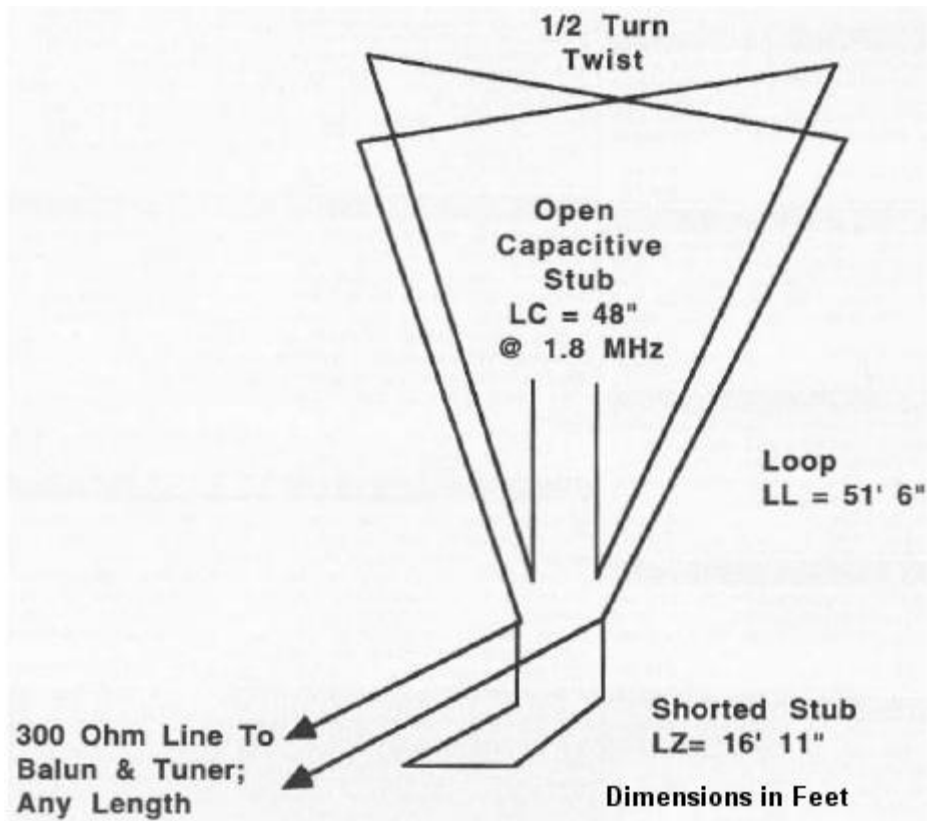
**137 - Wire Beam 6dBd-Gain for 10m**



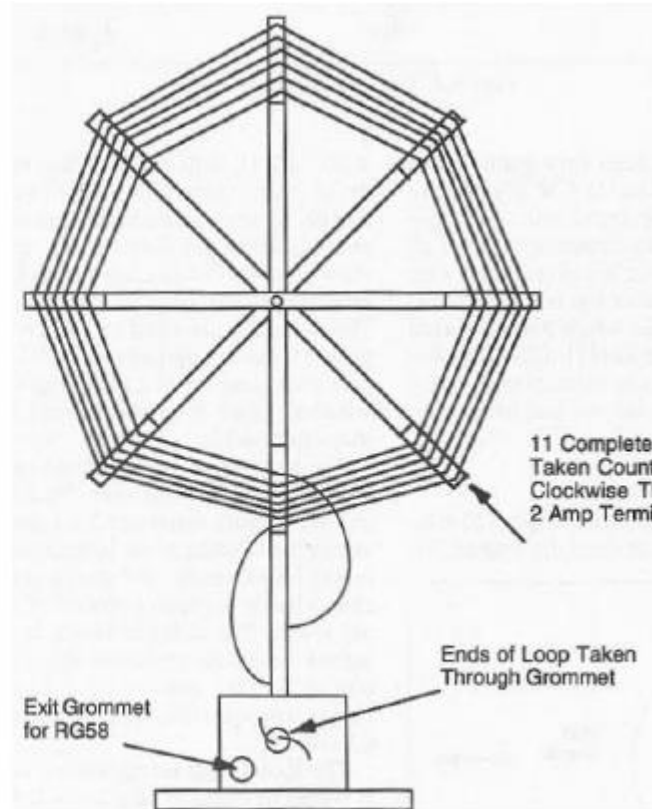
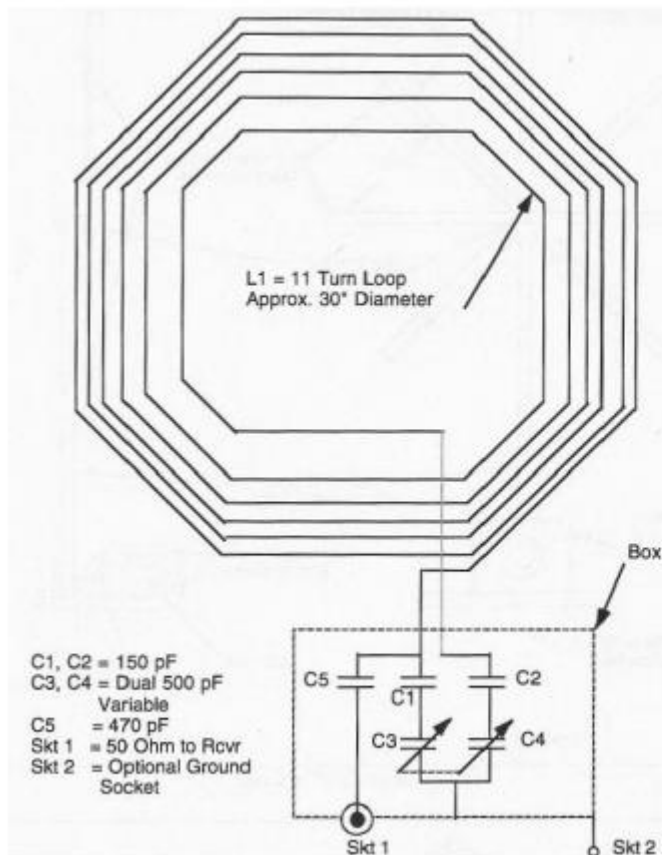
**138 - Sloping Diamond Antenna 4dB-Gain for 40m**



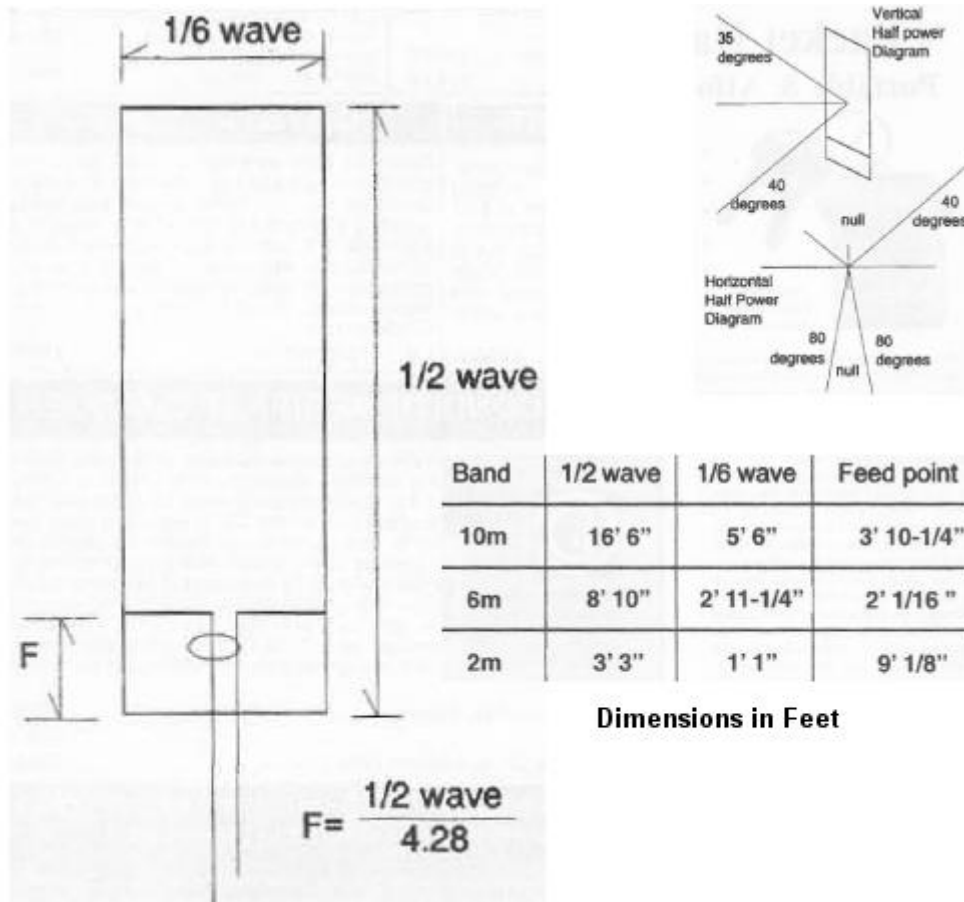
**139 - Twisted Loop Antenna for 160m**



### 140 - DX RX Loop Antenna for 160m



## 141 - Hentenna 3dB-Gain for 10m, 6m, 2m



### References:

- Antenna Toolkit - J. Carr*
- Practical Antenna Handbook - J. Carr*
- More Antenna Classics - C. Hutchinson*
- Amateur Radio Techniques - P. Hawker*
- ARRL Antenna Handbook 1990-2007*
- ARRL Handbook 1990-2009*
- ARRL Antenna Compendium*
- 73 Magazine 1970-2002*
- Funkamateur Magazine 1990-2011*