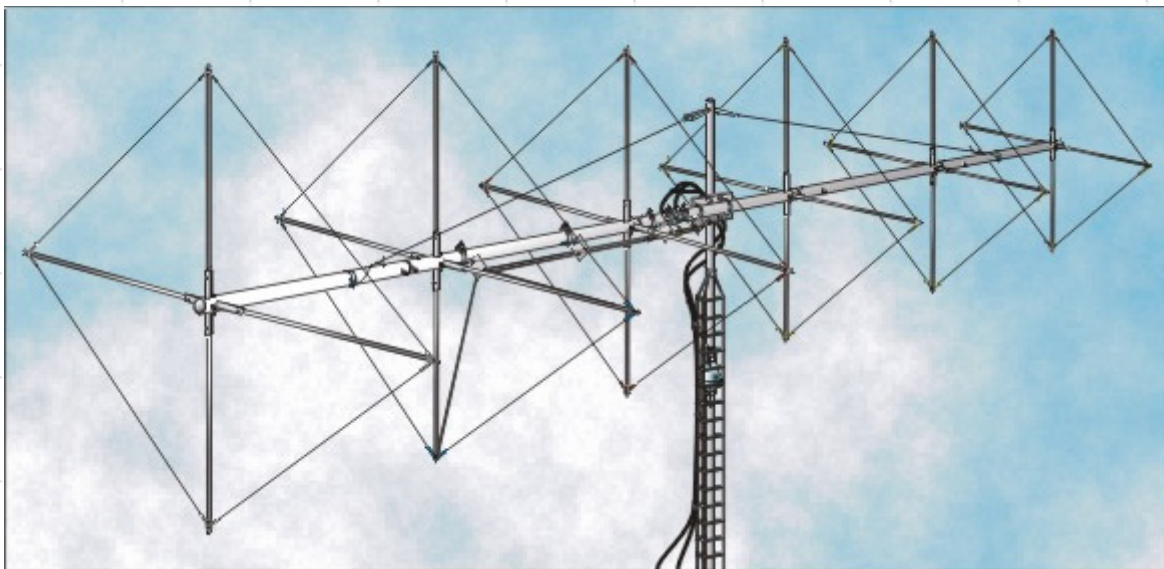


# **SIGNAL ENGINEERING**

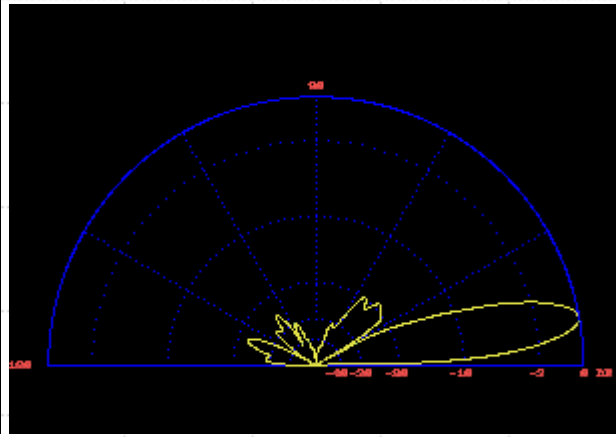
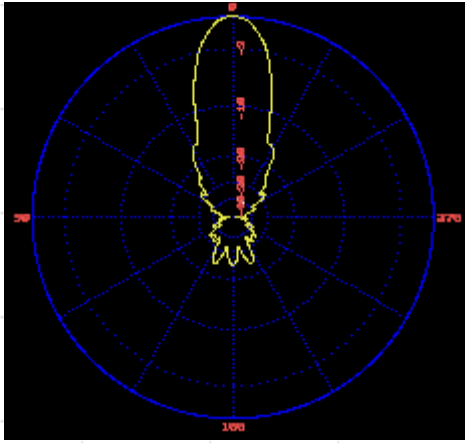
## CB Antennas



### ***Lightning 6 Specifications***

<b>Mechanical</b>	
Boom	30 ft. x 2 in. Diameter Aluminum
Spreader Brackets	6061 Heavy Wall Aluminum
Spreaders	Rugged Fiberglass, 13'7" Longest Spreader Length
Elements	Enamel Protected Copper Wire
Fasteners	Plated For Corrosion Resistance
Wind Area	7.4 Sq. Ft.
Turning Radius	16'5"
Wind Survival	100 Mph
Weight	37 Lbs.

Frequency Range	26.965Mhz - 28.870Mhz
<b>Electrical</b>	10/11 Meter Models Available



## Lightning 6

The Lightning 6 is a 6 element directional base station antenna. The Lightning 6 takes all of the benefits of Signal Engineering's full wave design - and takes performance figures to the maximum with six elements on a wide spaced design! If you desire the performance of our Lightning 6 but space or budget is a problem now, check out the [Lightning 4+](#) - our 4 element beam that you can easily upgrade to 6 elements (making it a Lightning 6) whenever the time is right with our upgrade kit!

The Lightning 6 is a optimized directional quad antenna incorporating all of the most desirable features for superior two-way communications. Six heavy copper wire radiating elements are precisely spaced and mounted on a rugged aluminum and fiberglass frame, forming a high-gain parasitic antenna. Exclusive SFS (Signal Feed System, *patented*) matching system gives maximum directional performance and dual polarity to allow switching between close (local) and long haul signal paths (DX).

[Click here to compare SIGNAL ENGINEERING Beams Vs. Conventional Beams](#)



### SIGNAL ENGINEERING

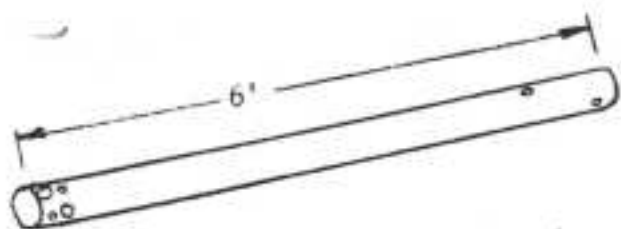
3091 Lawrence Expy  
Santa Clara, CA 95051  
Telephone (408) 247-2300  
Toll free Message Center 1-800-761-9409  
Email Us: [sigeng@att.net](mailto:sigeng@att.net)

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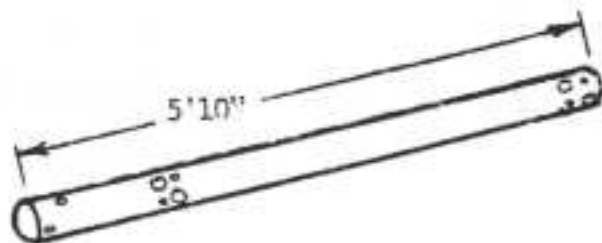
WARNING: INSTALLATION OF THIS PRODUCT  
NEAR POWER LINES IS DANGEROUS.  
FOR YOUR SAFETY FOLLOW THE  
INSTALLATION DIRECTIONS.

ASSEMBLY INSTRUCTIONS  
LIGHTNING 6

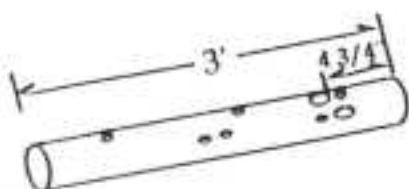
- 1) The boom of the antenna consists of five 2" diam. sections and four 1 7/8" diam. coupling sections. These parts are identified in the drawings below.



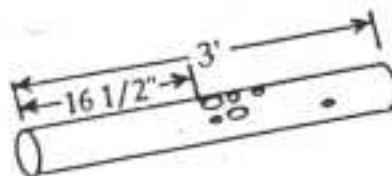
A-type boom section (4ea.)  
(2" dia.)



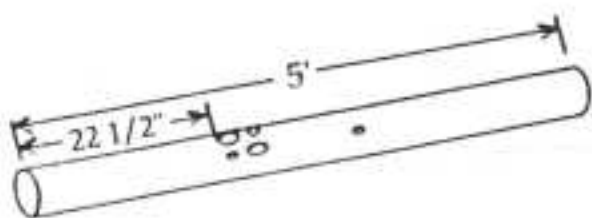
B-type boom section (1 ea.)  
(2" dia.)



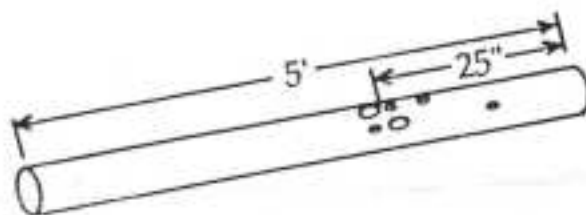
C-type coupling (1 each)  
(1 7/8" dia.)



D-type coupling (1 each)  
(1 7/8" dia.)



E-type coupling (1 each)  
(1 7/8" dia.)



F-type coupling (1 each)  
(1 7/8" dia.)

figure 1- boom sections & couplings

The boom is assembled by first putting together 5 sub-assemblies, then joining these to form the complete structure which is 30' long.

- 2) Install 2 of the 1/2" dia X 18" long rod support brackets in one end of an A-type boom section. Refer to figures 2a & 2b. Secure in the boom section with 10-32 X 2 1/2" bolts, nuts, and lockwashers.



figure 2a

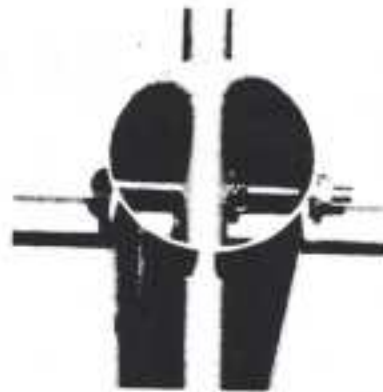


figure 2b

- 3) Install the E-type coupling (identify from fig.1) in the appropriate end of the B-type boom section, as shown in fig.3. Insert 2 of the 1/2" dia rod support brackets through both the boom and coupling sections after aligning the 1/2" holes. Again bolt the rod support brackets in place with 10-32 X 2 1/2" bolts. Note: You will not be able to install nuts and lockwashers inside the boom.

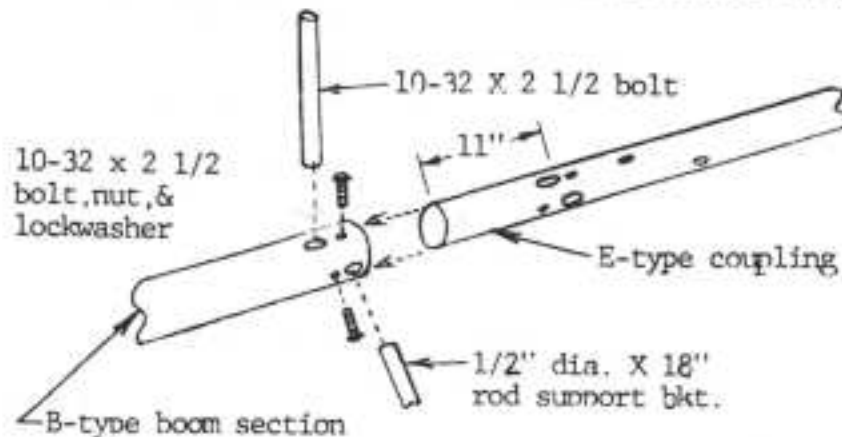


figure 3

Install the "C" type coupling in the other end of the "B" type boom section. Insert 2 of the 1/2" diam. rod support brackets through both the boom and coupling sections. (Refer to figure 9)

- 4) Install the F-type coupling in the appropriate end of an A-type boom section. Again insert 2 rod support brackets through both the boom section and coupling after aligning the 1/2" dia holes. Refer to figure 4.

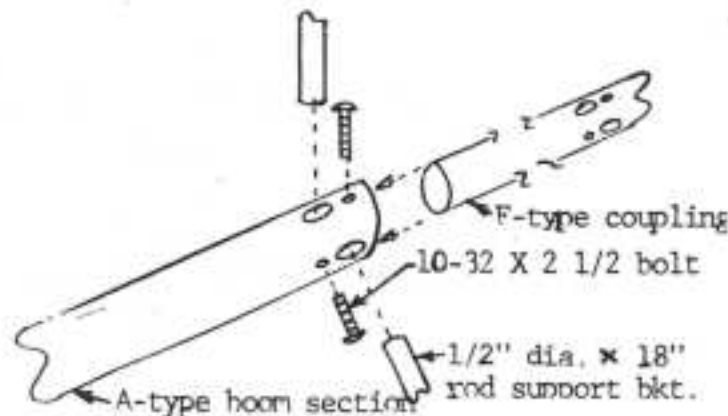


figure 4



Install the D-type coupling in the appropriate end of an A-type boom section. Install 2 rod support brackets after aligning the 1/2" holes. Refer to figure 4a.

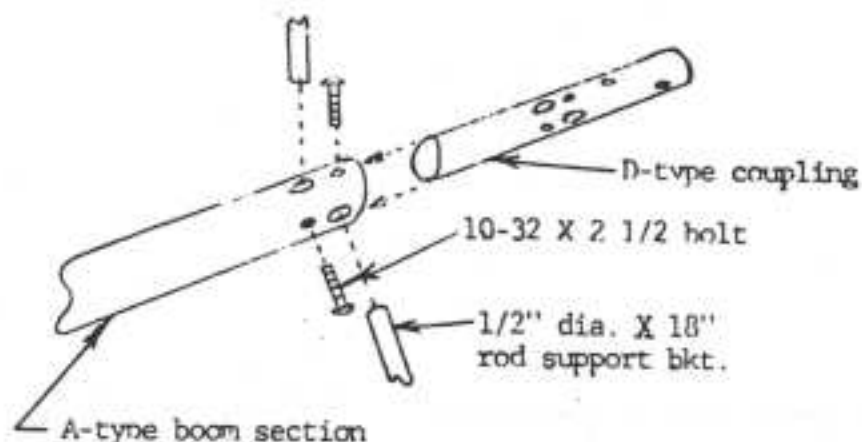


figure 4a

- 5) Install 2 rod support brackets in the last A-type boom section, as in step 2.
- 6) There are 6 bundles of fiberglass rods. Select the 4 longest rods, and insert them in the 1/2" dia rod support brackets in the A-type boom section from step 2. (The drilled end of the rods must be away from the boom). Carefully unroll the REFLECTOR element wire. This wire is identified by WHITE shrink tubing, marking the points of attachment to the fiberglass rods. Attach the wire to the rods using 4 wire clamps and 4-40 hardware, including 4-40 X 3/4 bolts, nuts, & lockwashers. Refer to figures 5 & 6.

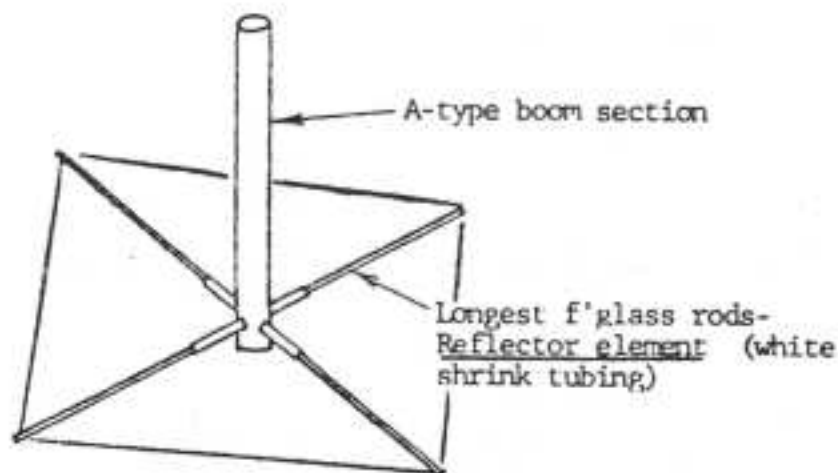


figure 5

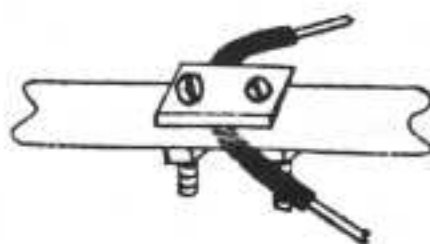


figure 6

Slide each of the fiberglass rods out equally (approximately). Secure two opposing rods (180 degrees apart) in place in the rod support brackets by installing a #8 X 1/4 self-tapping screw in the hole in the bracket. The screw should be started at an angle, and screwed in at an angle in order to capture the fiberglass. Refer to figure 7.

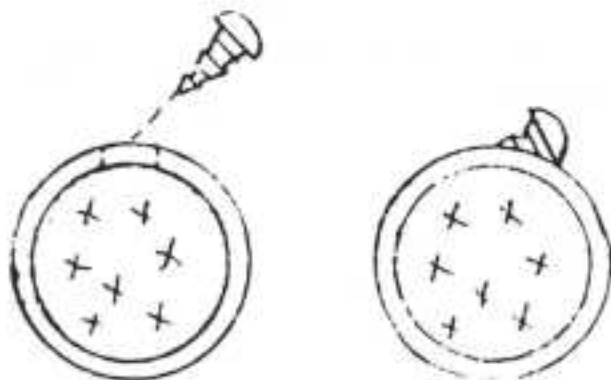


figure 7

Now slide the other two fiberglass rods out to tension the element wire, and lock the rods in place with self tapping screws. The rods should be pushed out until they are just ready to bow-but are not bowed. This will ensure adequate tension in the wire and correct element spacing.

- 7) Select the 4 next-longest fiberglass rods, and the B-type boom section (with E-type coupling installed). Insert the rods in the rod support brackets that are spaced in approximately 1' from the end of the boom.

Carefully unroll the driven element wire. This wire is in two pieces and is identified by blue shrink tubing marking two attachment points to the fiberglass rods. Attach this wire to the fiberglass rods using two wire clamps and two 4-40 X 3/4 bolts (use single bolt in outermost hole in f'glass at "feedpoint A & feedpoint B"). Refer to figure 8.

Note: Make certain that the wires leave the bolts at feedpoint A & feedpoint B at a 45 degree angle as shown. This is best accomplished by not tightening these two nuts until the fiberglass rods have been pushed out to tension the wire all around, and locked in place. If the wire is not in line with the crimp terminal where it leaves the f'glass rod, it may break due to flexure in the wind.

It is a little difficult to judge the tension in the driven element wire, as it is not on a flat surface as was the reflector wire during tensioning. Therefore it is best to make a trial tensioning and pick up the boom section so the element is vertical, and note the tension/bowing. Again the rods must be pushed out to the point where they just ready to bow.

- 8) Insert 4 of the remaining fiberglass rods (the remaining rods are all the same length) in the rod support brackets at the other end of the B-type boom section.

Carefully unroll the 1st director element wire, identified by red shrink tubing. Attach this wire to the fiberglass rods at the points marked by shrink tubing as before. Tension the wire as before.

- 9) Insert 4 fiberglass rods into each of the remaining boom sections. Attach one of the director wires identified by yellow shrink tubing to each set of rods, and tension as before. All of the wires with yellow shrink tubing are the same length.

At this point all 6 elements are assembled and tensioned on the 5 boom sections. You are now ready to join the boom sections together. Refer to figure 9 for the proper sequence. Although the 2nd, 3rd, and 4th directors are the same length, the boom sections they are mounted on must be joined together as shown in figure 9.

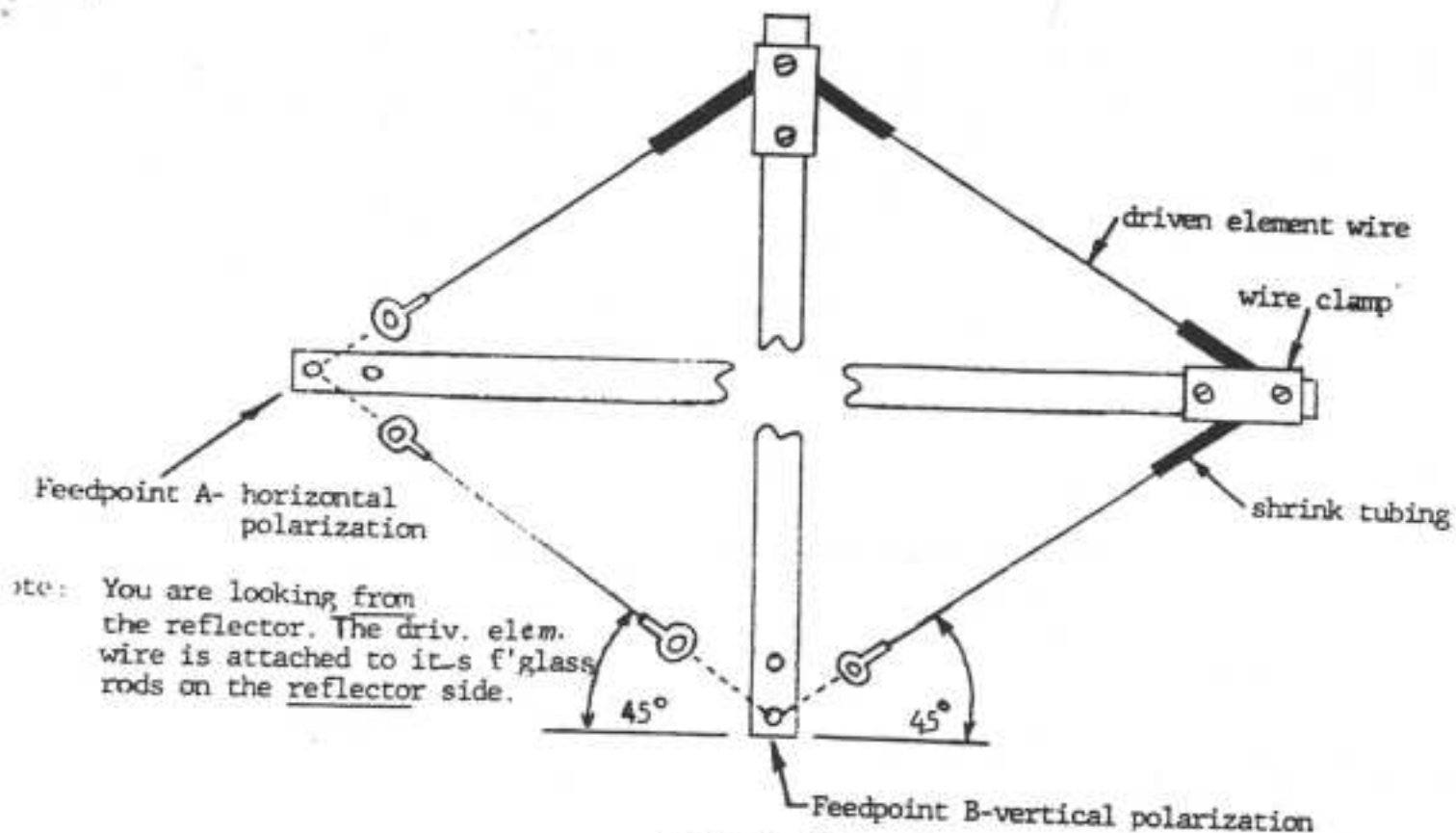


figure 8- driven element assembly

Note: Drawings not to scale

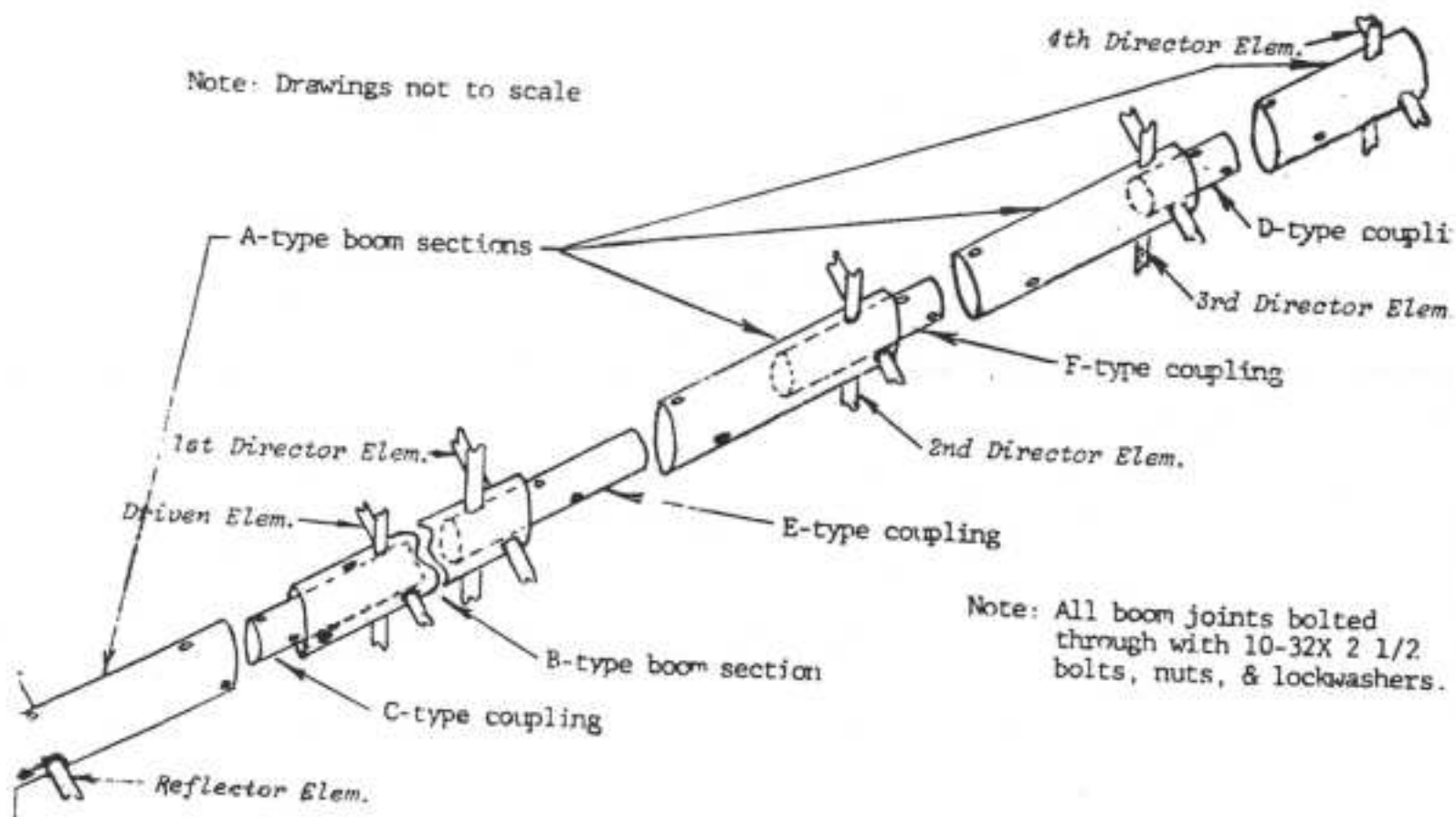


figure 9



- 10) The final steps in assembling the boom involve preparation of your mast section as shown in fig. 10 (this is the mast section that goes into the rotor), and installation of this mast along with the boom to mast plate on the boom. Figure 11 show the location of guy points on the boom, and height of the short mast section above the boom.

There will be a bit of sag in the boom when it is assembled, and the turnbuckles are used to eliminate this. Simply support the boom near the center and tighten the turnbuckles until the boom sag is eliminated. After the turnbuckles have been adjusted, it is a good idea to tape them over with electrical tape to prevent them from loosening.

Note: When attaching the short mast and plate to the boom, align the part of the mast that will be going to the rotor with one of the fiberglass rods having "feedpoint A" or "feedpoint B" (from fig.8) on it. This feedpoint, which will be down and parallel to the tower, will be used to connect the feed stub for vertical polarization.

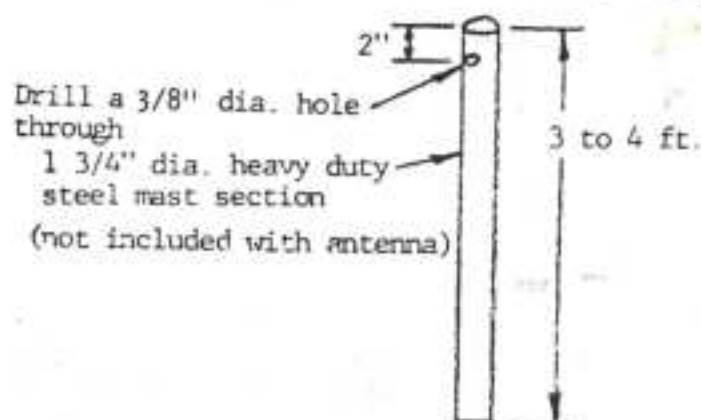


figure 10

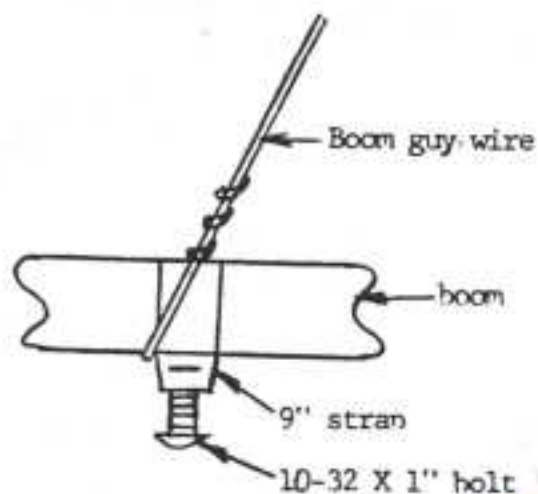


figure 11a

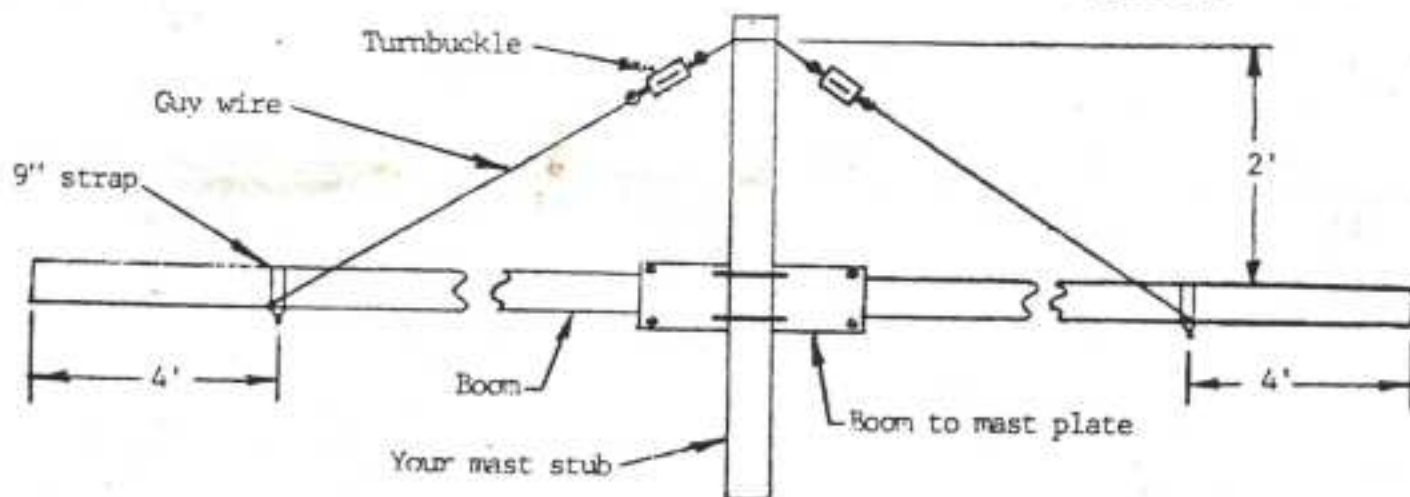
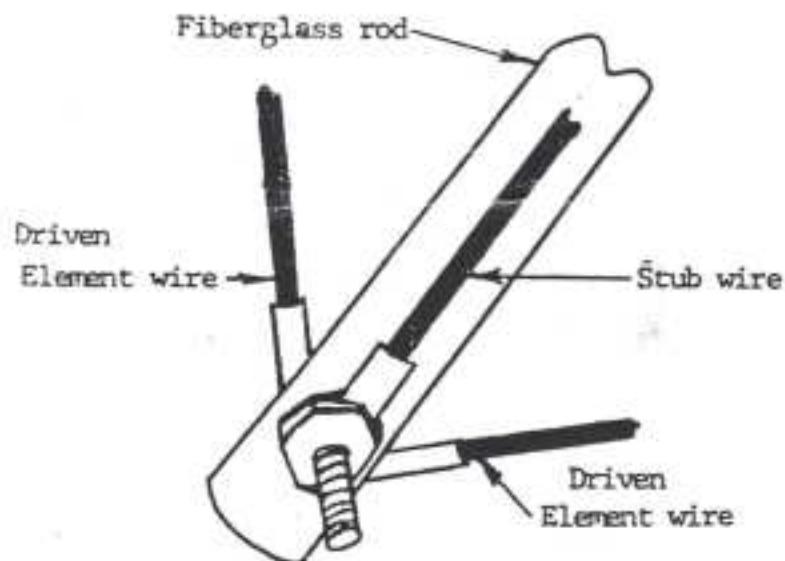


Figure 11b



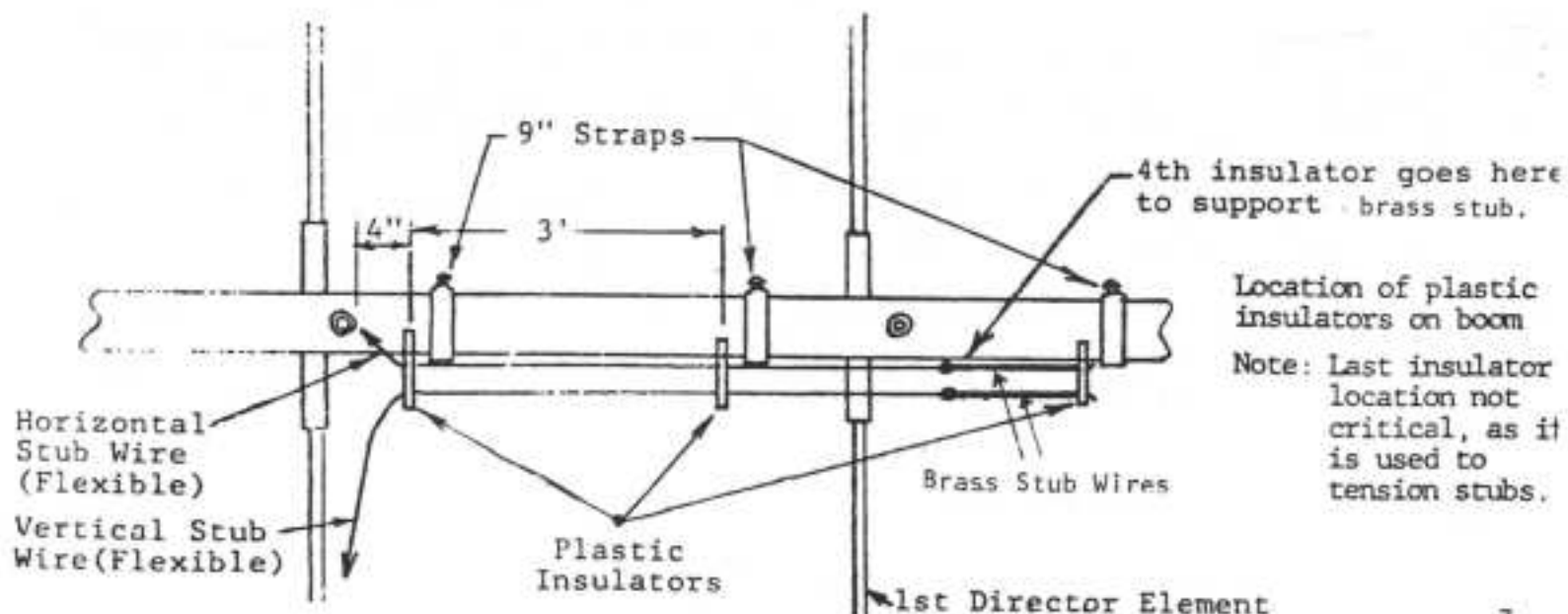
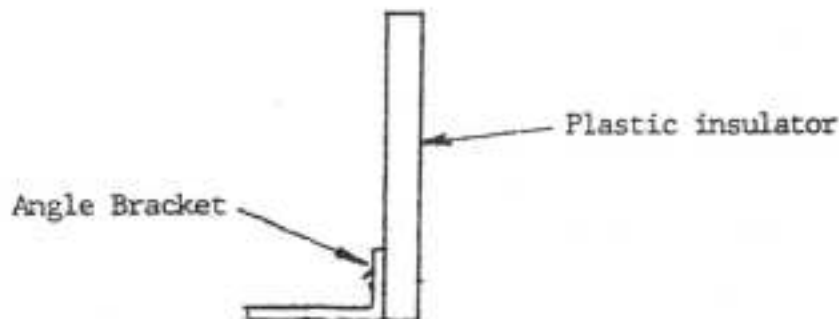
# 11) INSTALLATION OF THE SFS<sup>TM</sup> MATCHING SYSTEM

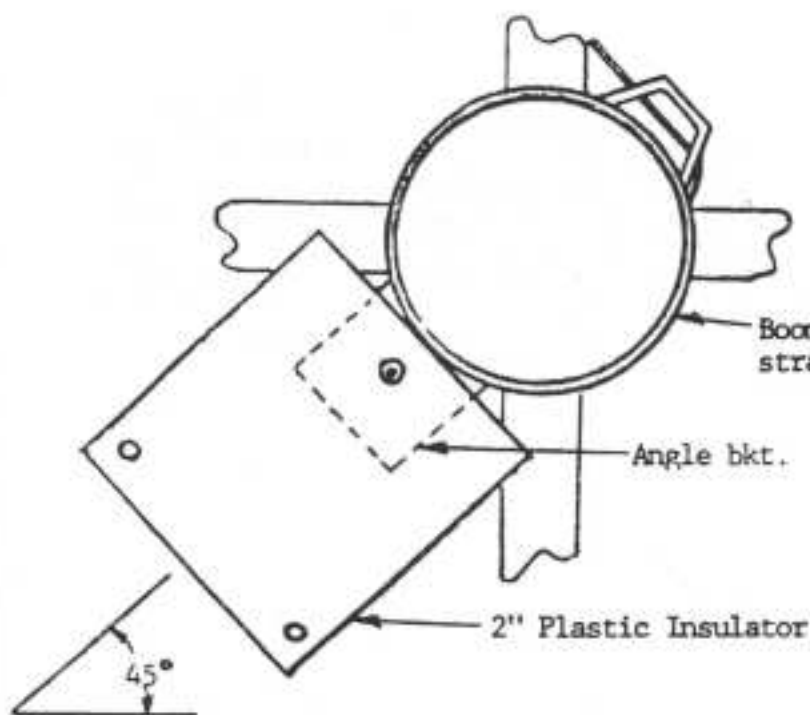
The feed system consists of two stub wires ( supplied) which connect to the driven element at "feedpoint A" and "feedpoint B" (fig. 8), then run up to the boom parallel to the fiberglass rod, and then along the boom toward the boom to mast plate. The stub wires are supported by 2" plastic insulators where they run along the boom, and they terminate at one insulator near the boom to mast plate. The plastic insulators are mounted to the boom using the 9" straps supplied, and are mounted at a 45 degree angle such that both stub wires can be fed through each insulator. Refer to the figures below for details of the stub wire installation and connection to the driven element.



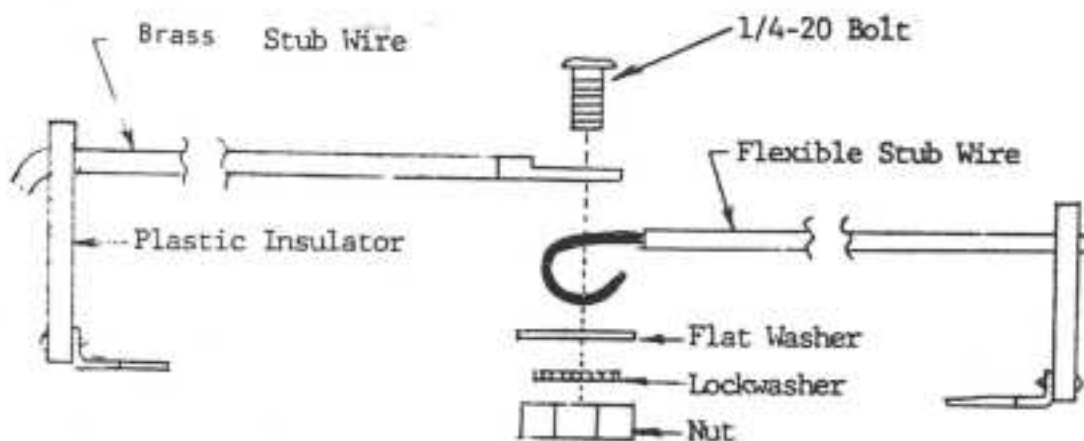
Stub wire attachment to driven element

*NOTE: Do not tape the flexible stub wires to any metal on the boom. They may be taped to the fiberglass rods no further than 3 ft. up.*





Mounting of plastic insulators to boom



Joining the Flexible and Brass Stub Wires

- 12) Prepare your two 50 ohm coax cables as shown in fig.12 below. The crimp terminals supplied may be simply crimped to the coax center conductor, however soldering is recommended in addition to crimping. One coax line is attached to each stub wire as shown in fig. 13a,b below. A good starting point for attachment of the coax to the stub is about 2" in from the insulator. The coax center conductor goes to the bare stub wire, and the braid simply is clamped directly to the boom, directly opposite the center conductor point of attachment, by means of a 9" strap.

Note: Make certain to seal the coax against moisture where the braid stops, as shown in fig. 1. A silicone type sealer works fine, as long as the coax is not moved around too much after the sealer is applied. It is therefore best to apply the sealer after any matching adjustments (described in next step) are performed.

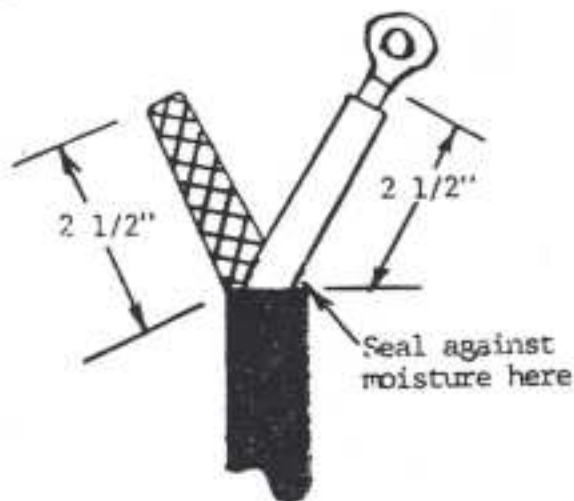


figure 12

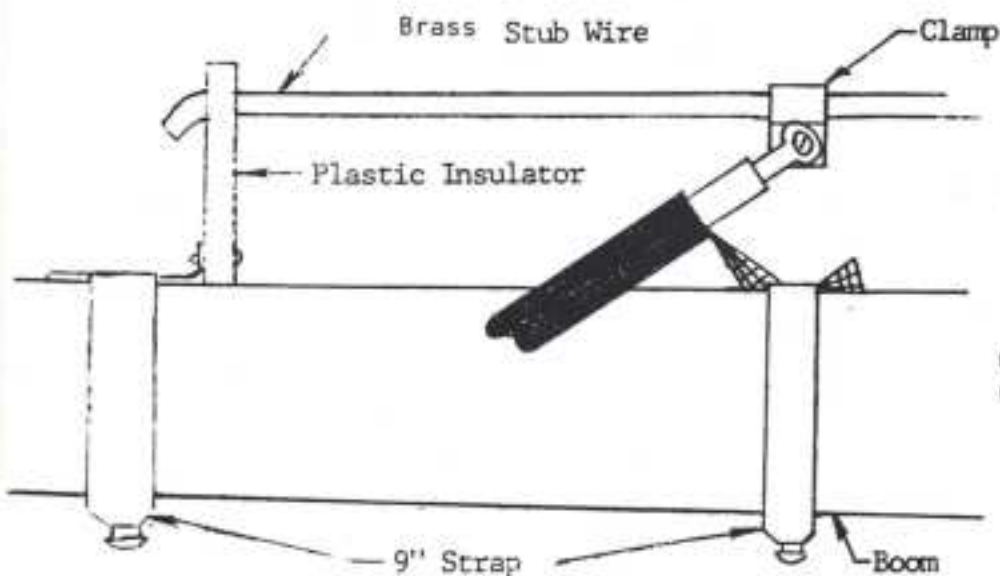


Figure 13a- Coax attachment to Brass Stub Wire

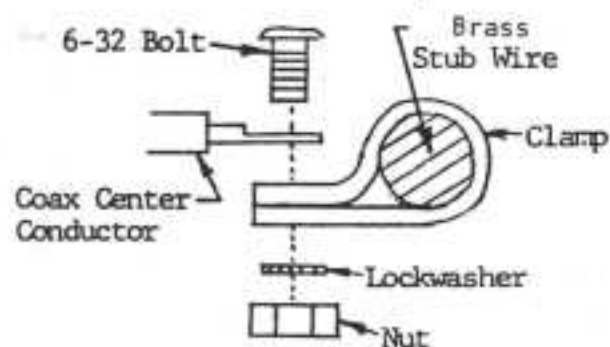


Figure 13b- Center Conductor attachment to Stub Wire

### 13) SWR ADJUSTMENT

IF SWR TOO HIGH ON CHANNEL 1- Move coax attachment point toward the end of the stub

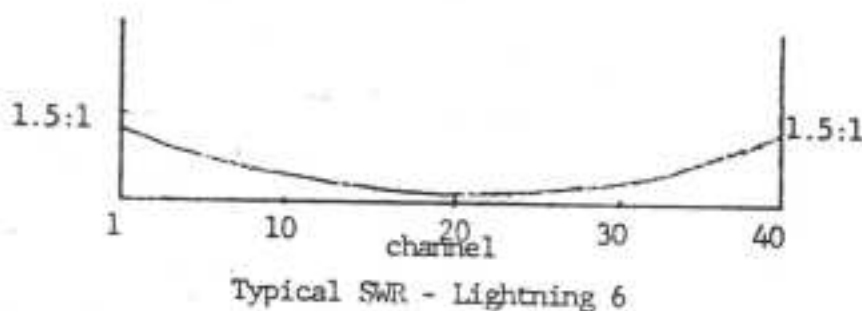
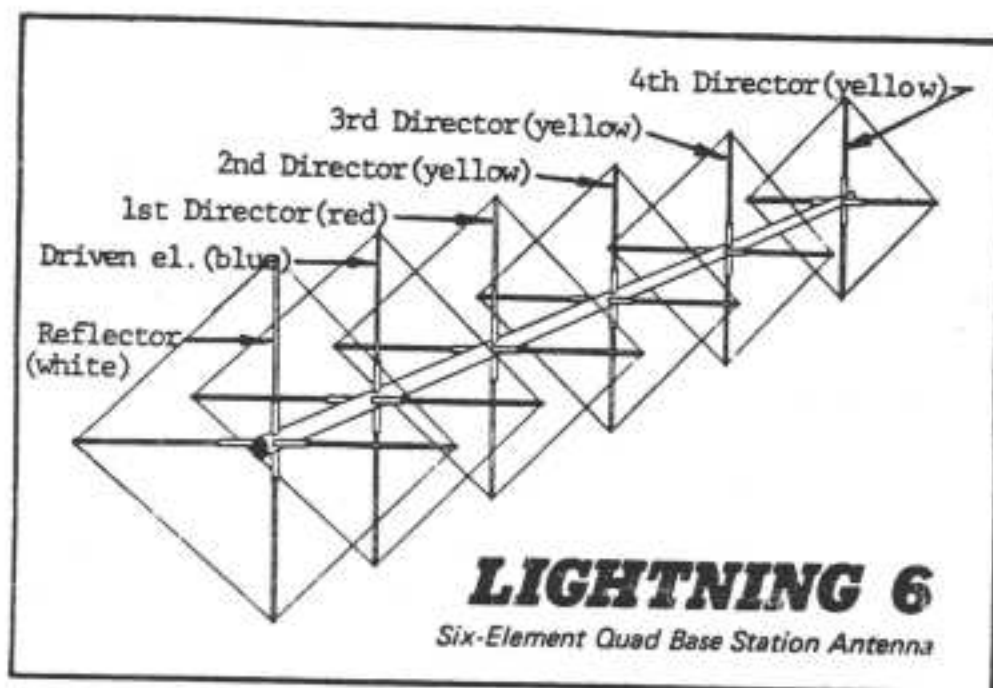
IF SWR TOO HIGH ON CHANNEL 40- Move coax attachment point away from the end of the stub.

Make certain the connections to the stub and boom are tight. Tape the coax cable to the boom where it leads away from the stub.

SWR should be adjusted with the final length of coax feeding the antenna. The typical swr is shown in the figure below.

Note: The horizontal and vertical feedlines may attach to the stubs at different points.





A two-position switch may be used to select between horizontal and vertical polarization at the operating position.

For optimum results, follow the tips below;

- Break up all guy wires in the vicinity of the antenna with "egg" insulators spaced at 10-13' intervals.
- Locate the Lightning 6 as far as possible from other antennas and metal objects.

**WARNING:** INSTALLATION OF THIS PRODUCT NEAR POWER LINES IS DANGEROUS.  
FOR YOUR SAFETY FOLLOW THE INSTALLATION DIRECTIONS.

- 1) WHEN PUTTING UP OR TAKING DOWN THE ANTENNA, CARE MUST BE TAKEN TO ENSURE THAT NO PART OF THE ANTENNA OR SUPPORTING STRUCTURE COMES INTO CONTACT WITH ELECTRIC POWER LINES. IF CONTACT IS MADE WHILE A PERSON IS HOLDING THE ANTENNA, COAX, OR SUPPORTING STRUCTURE, ELECTROCUTION CAN RESULT.
- 2) A COMMUNICATIONS TOWER IS THE RECOMMENDED SUPPORTING STRUCTURE FOR THIS ANTENNA. THE TOWER SHOULD BE RATED TO CARRY BOTH THE WEIGHT OF THE ANTENNA, ROTOR, AND MAST AS WELL AS THE COMBINED WIND LOAD. TV-TYPE TELESCOPING MASTS AND TUBULAR, NON-TELESCOPING MASTS ARE NOT STRONG ENOUGH TO USE WITH THIS ANTENNA, AND PIPE IS NOT RECOMMENDED AS IT IS TOO DIFFICULT TO RAISE WITH THE COMBINED WEIGHT OF ANTENNA, ROTOR, ETC.



- 3) CARE MUST BE TAKEN TO LOCATE THE ANTENNA INSTALLATION SUCH THAT IF THE ENTIRE ASSEMBLY WERE TO FALL DOWN, NO PART WOULD CONTACT AN ELECTRIC POWER LINE. A GOOD RULE TO FOLLOW IS TO LOCATE THE TOWER BASE TWICE AS FAR FROM THE NEAREST POWER LINE AS THE DISTANCE FROM THE GROUND TO THE TOP OF THE HIGHEST PART OF THE ANTENNA.
- 4) IF THE TOWER YOU ARE GOING TO USE TO SUPPORT THE ANTENNA DOES NOT HAVE A WARNING LABEL ON IT, YOU ARE REQUIRED TO ATTACH THE ONE PROVIDED WITH THE ANTENNA TO THE TOWER.

# PARTS LIST- LIGHTNING 6 SIX ELEMENT QUAD

DESCRIPTION	QUANTITY	PART NO.
Support bracket, fiberglass rod	12	6EL70
A-type boom section	4	6EL71
B-type boom section	1	6EL72
C-type boom coupling	1	6EL73
D-type boom coupling	1	6EL74
E-type boom coupling	1	6EL75
F-type boom coupling	1	6EL76
Reflector rod(fiberglass)	4	6EL77
Driven element rod(fiberglass)	4	6EL78
Director rod(fiberglass)	16	6EL79
Reflector element wire	1	6EL80
Driven element wire	1	6EL81
First director element wire	1	6EL82
2nd, 3rd, & 4th director elem. wires	3	6EL83
Boom to mast plate	1	6EL84
Matching stub wire (flexible)	2	6EL85
Plastic insulator	4	6EL86
Wire clamps	22	6EL87
1/4-20 U-bolts	4	
4-40 X 3/4 machine screw	46	
4-40 nut & lockwasher	48	
10-32 X 2 1/2 machine screw	22	
10-32 nut & lockwasher	26	
10-32 X 1 machine screw	5	
9" mounting strap	8	
#8 X 1/4 self tapping screw	24	
1/4-20 X 3/8 machine screw	2	
1/4-20 nut	10	
1/4-20 split lockwasher	8	
1/4-20 external tooth lockwasher	2	
1/4 flat washer	2	
Turnbuckle	2	
Terminal Lug, #6	2	
Clamp, 1/8	2	
6-32x 3/8 Machine Screw	2	
6-32 Nut & Lockwasher	2	
Brass Stub Wire	2	
Guy Wire	25 FT.	