

02062

2M-22C HIGH GAIN TWO METER CIRCULARLY POLARIZED ANTENNA SPECIFICALLY FOR SATELLITE AND MULTIMODE TERRESTRIAL USE.

Since the launch of OSCAR 10 it has become more and more obvious that more two meter downlink receive gain is helpful at times. The 2M-22C offers 2 db more gain than the popular 2M-14C and a beamwidth almost the same as its uplink mate, the 432-18C.

The tapered boom yields low windload yet strength where required. Of course the 2M-22C comes complete with both 4:1 coaxial baluns for direct individual 50 ohm feedlines if desired as well as the phasing/matching harness and CS-3 polarity switch which has proven valuable at low satellite elevations as well as during terrestrial use.

Four or more 2M-22C antennas will make an excellent array for moonbounce (EME) by eliminating Faraday fading. Of course, an array like this would be dynamite for satellite and terrestrial use as well.

KLM also provides fiberglass/aluminum stacking frameworks as well as 2 and 4 port power dividers and phasing harnesses to yield maximum performance from this type array.

SPECIFICATIONS

ELECTRICAL

BANDWIDTH:.....(Spec.) 144-146MHz
(Usable) 144-148MHz
GAIN:.....13 dBdC
F/B:20 db
F/S:.....25 db
BEAMWIDTH.....34 degrees
FEED IMP.....50 ohms, unbal.
VSWR:.....Better than 1.5:1
POWERHANDLING:.....2 KW PEP, derate to 600 watts
when used with CS-3 Switcher.

MECHANICAL

Boom length.....19' 1"
Windload.....1.85 Sq. Ft.
Turning Radius.....135" typical
Weight.....11 lbs
Mast:.....1-1/2 to 2" (1-1/2" U-bolts supplied)
Rec. Mount:.....Non-metallic mast at least 10" beyond element tips
Balun:.....4:1 coax (2) 2KW PEP
Element:.....22; 11(H) 11(V)

12-26-84

I. BEFORE YOU BEGIN.....

1. Select an assembly area large enough to comfortably accommodate overall antenna dimensions. A shallow box is handy for holding and sorting the smaller hardware, as is a marking pen for identifying components.

2. Some simple tools are required: A tape measure, screwdriver, and a set of spin-tite, socket or end wrenches. Common nut sizes are:

5/16"....6-32 hdwe	7/16"....1/4-20 hdwe
11/32"...8-32 hdwe	1/2".....5/16-18 hdwe

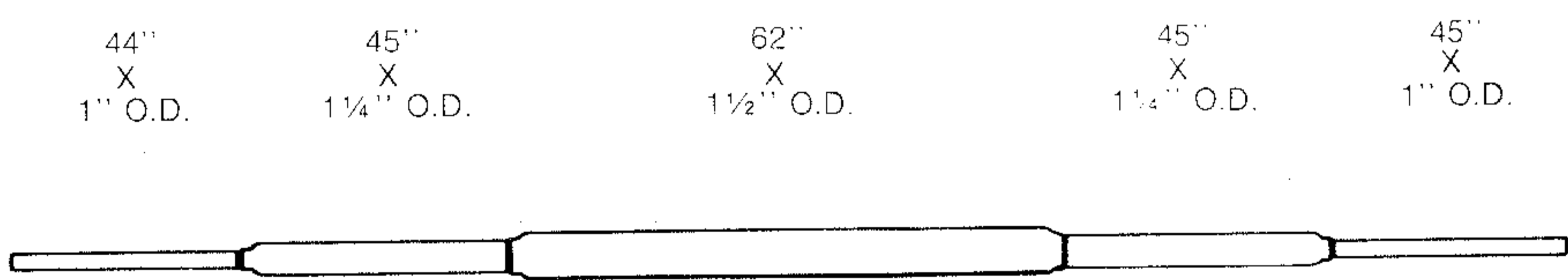
To avoid damage to antenna components, be aware that most hardware need only be moderately hand tightened with screwdriver or spintite to be secure. When using tools with mechanical leverage, such as socket or end wrenches, care must be taken not to over-torque nuts and damage components.

3. Thoroughly unpack shipping box and check components and hardware against the Parts List. If there is a difference, look for a "factory Update/Change" sheet accompanying the assembly instructions prior to contacting your KLM dealer or the factory.

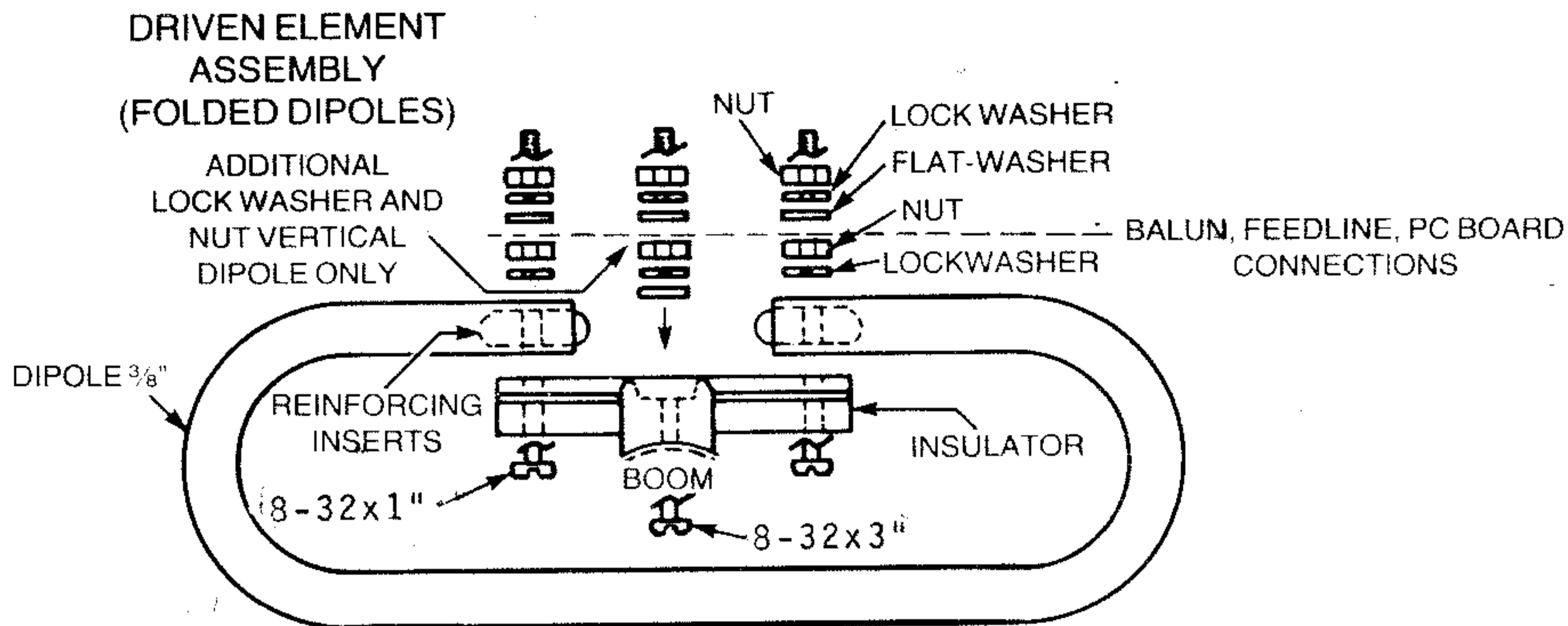
4. For the best results, use the pictorials to identify the various antenna components before you begin assembly.

II. BOOM ASSEMBLY

1. The end of each boom section to be assembled is marked with a letter in felt-pen. Assemble boom sections matching like letters ("A" to "A", etc.) and aligning screw holes. Each joint requires two sets of screws, lockwashers and nuts. Hand tighten nuts securely. Section placement and length will follow the sketch below:



Use 1-3/4" screws at 1-1/4" joints and 1-1/2" screws at 1" joints.



1. Select one of the folded dipoles and insert the reinforcing inserts into the tubing ends, aligning the holes.

2. Mount the dipole element to the insulator using the 8-32 x 1" screws, nuts, and lockwashers. See the sketch above for the correct hardware arrangement. Repeat steps #1 and #2 for other dipole assembly.

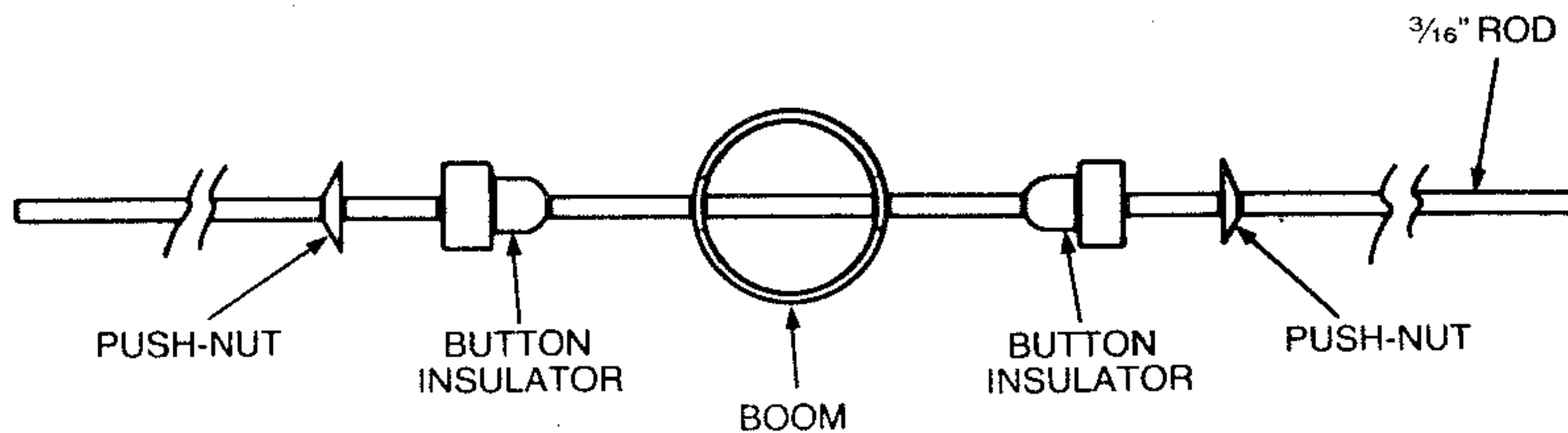
(REFER TO ASSEMBLY PICTORIAL)

3. Mount the vertical dipole first, element to the rear, insulator mounting block to the front. Orient insulator on left side as seen from rear of boom. Insert 8-32 x 3" mounting screw from the opposite side of the boom. Place a #8 flatwasher, lockwasher and nut on the screw and hand tighten down into insulator cavity.

Mount the horizontal dipole in the same way, with the insulator oriented on the top of the boom.

4. Add one lockwasher and 8-32 nut on the 3 in. screw then place the PC board onto the vertical dipole studs then add the coax balun leads (lugs on feedpoints, strap on mounting stud). Secure with 3 sets of 8-32 flatwashers, lockwashers and nuts. Mount the SO-239 case clip to the boom with two 6-32 x 1 $\frac{1}{2}$ " screws, nuts, and lockwashers.

5. Place the SO-239 case into the clip, connector facing rear. Place the other coax balun on the horizontal dipole studs, then add the coax lead from the SO-239 case. Place braid strap on the mounting stud. For unkeyed RHC (right-hand circularity) connect the center lead to the RIGHT feedpoint stud of the horizontal dipole.



ROD ELEMENT/INSULATOR ARRANGEMENT

Separate the parasitic elements into two groups of vertical and horizontal elements. Install one group (vertical or horizontal) at a time.

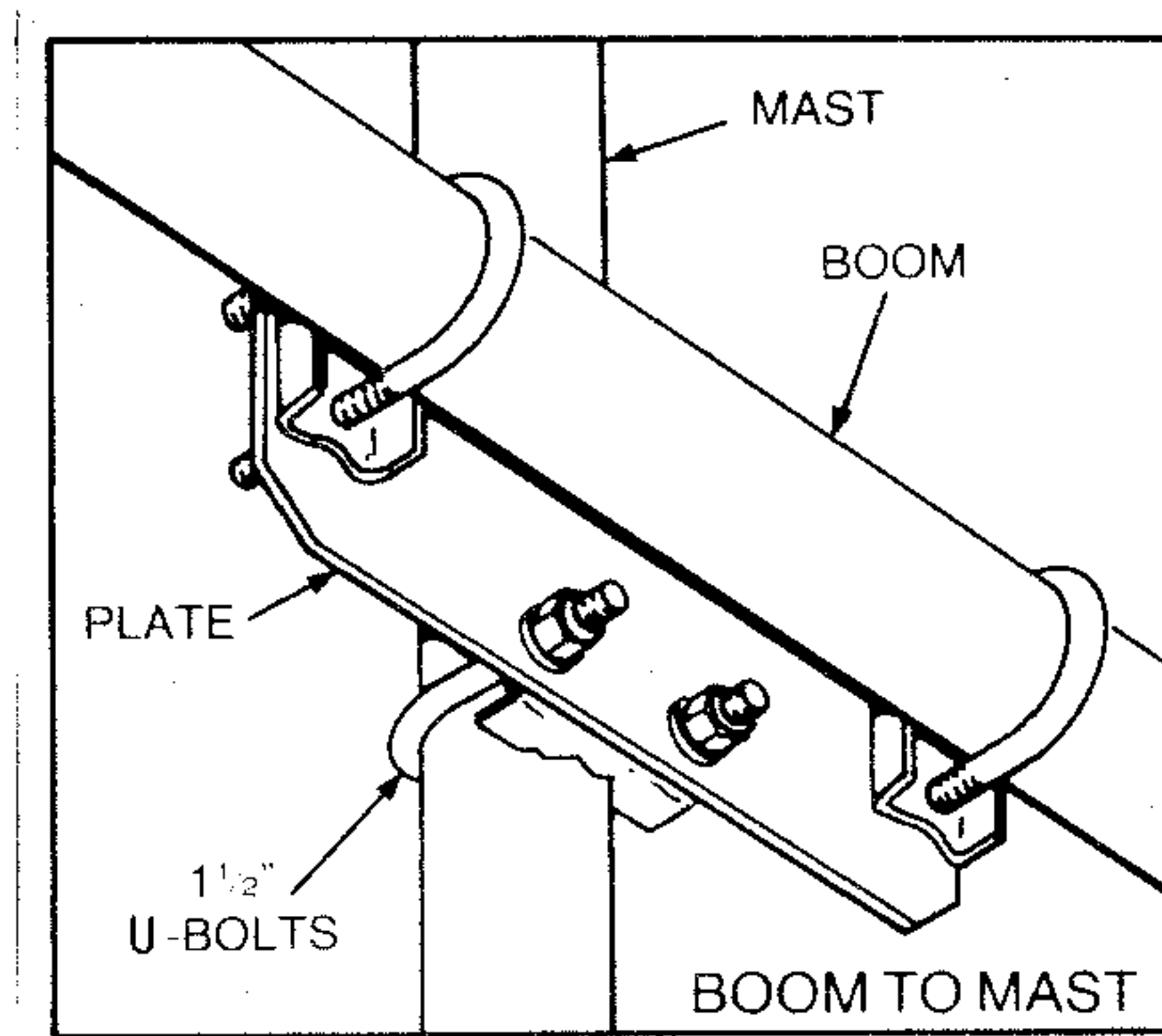
Locate the longest 3/16 inch diameter element (reflector). Slide on one of the "button" mounting insulators small end first. Push the insulator to the element balance point. DON'T WORRY ABOUT THE EXACT LOCATION AT THIS POINT. Repeat this operation for each of the remaining rod elements.

Pick up all the rod elements and settle them in your grasp on a flat smooth surface. Starting with the longest rod, insert it through the end hole in the boom near the driven elements. Next move to the hole directly in front of the driven elements and insert the next longest element. Continue inserting the next longest rod director in the next hole, and the next, and the next, until all the rod directors are in place.

Now return to the reflector and slide on the second button insulator from the opposite side of the boom. Visually center the element in the boom. Consult the antenna dimension sheet and using a tape measure, set the element position so the element is centered in the boom. THIS CENTERING OPERATION IS VERY CRITICAL FOR PROPER PERFORMANCE OF THE ANTENNA.

Move the next rod director and repeat the second button insulator installation and centering operation. Continue until each rod director is fully mounted and centered.

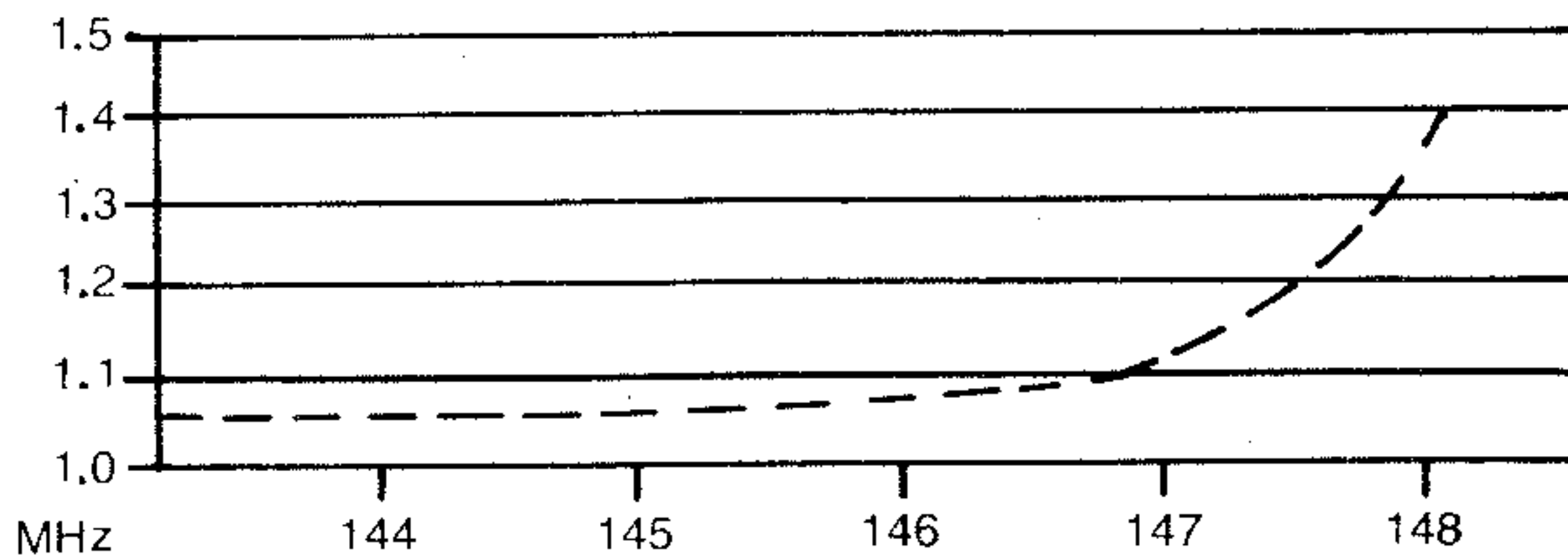
Return to the reflector now and install the element keeper washers on each side. BEFORE PUSHING THEM TIGHTLY UP AGAINST THE BUTTON INSULATORS, CHECK FOR PROPER CENTERING ONE MORE TIME. Proceed by adding the keeper washers to the rest of the rod directors until all have been center-checked and have the keepers installed.



IV. BOOM TO MAST PLATE MOUNTING

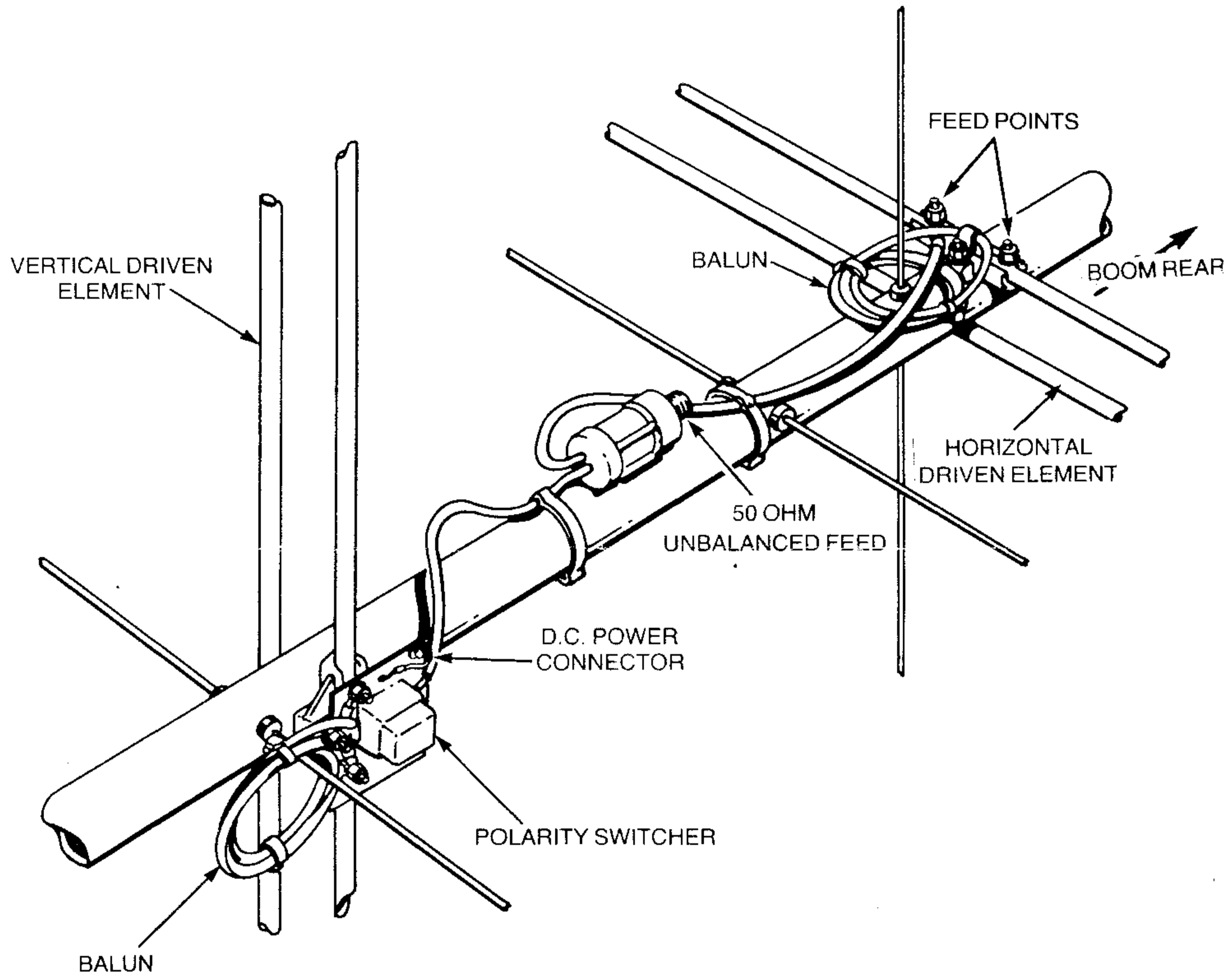
Locate the balance point of the completed antenna. This should be done with the feedline mounted on the antenna as it will be in its final mounting position since the weight of the feedline can affect the physical balance point. Typically the balance point is 94 inches from the rear of the boom. Install the boom to mast plate to the boom using the 1-1/2 inch U-bolt and cradles provided. U-bolts and cradles have been provided for mast mounting.

2M-22C
TYPICAL VSWR CURVE



ASSEMBLY PICTORIAL

KLM-2M-22C
DRIVEN ELEMENT
FEED ARRANGEMENT
(NOT TO SCALE)



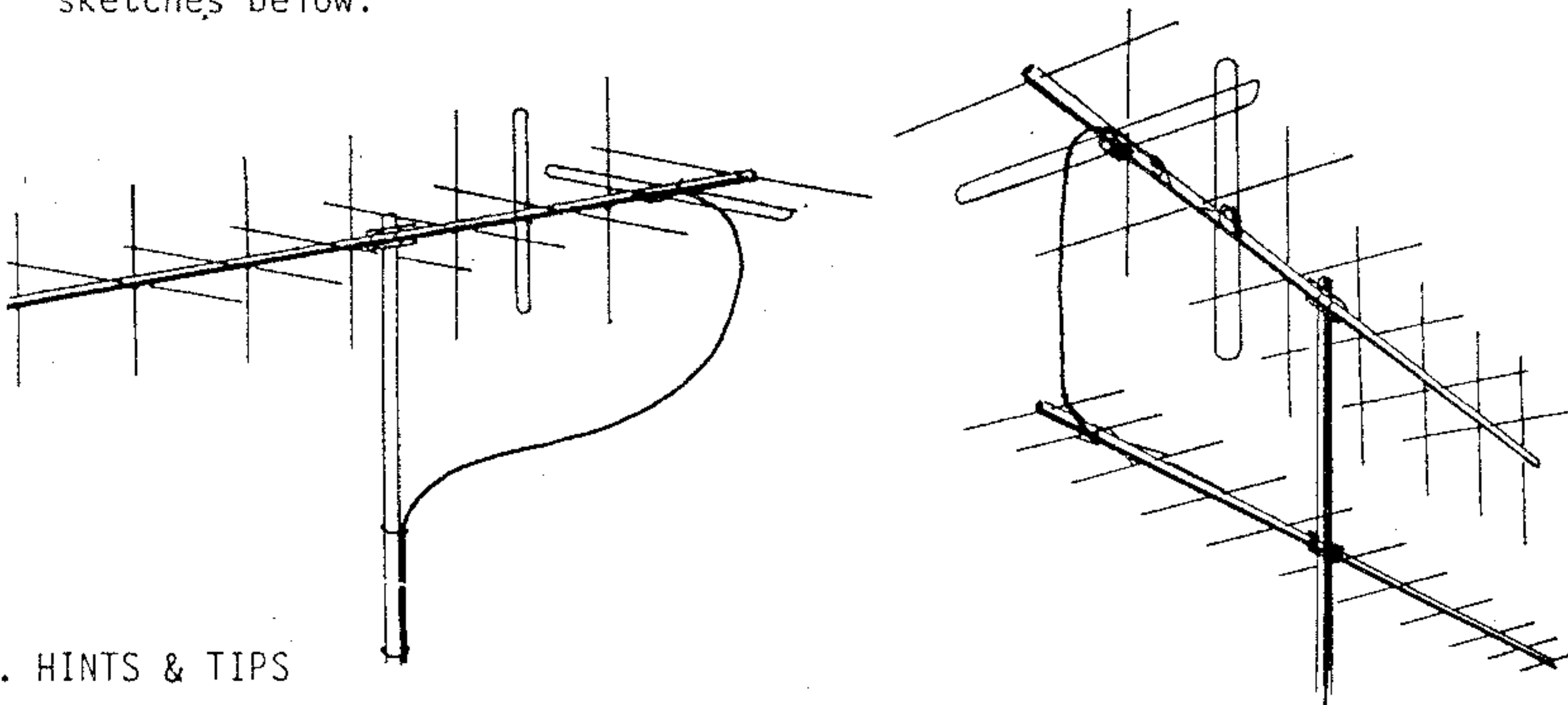
ELEMENT SPACING
INCHES FROM BOOM REAR (CM)

ELEMENT LENGTHS, INCHES (CM)

208 ¹ / ₈ (528.638)	228 ¹ / ₈ (579.438) ●	34 ¹ / ₂ (87.630)	34 ¹ / ₂ (87.630)
	199 ³ / ₄ (507.365) ●	35 (88.900)	
179 ³ / ₄ (456.565)			35 (88.900)
	172 ⁹ / ₁₆ (438.310) ●	35 ³ / ₈ (89.852)	
152 ⁹ / ₁₆ (387.510)			35 ³ / ₈ (89.852)
	146 ⁹ / ₁₆ (372.270) ●	35 ¹¹ / ₁₆ (90.648)	
126 ⁹ / ₁₆ (321.470)			35 ¹¹ / ₁₆ (90.648)
	121 ³ / ₄ (309.245) ●	36 (91.44)	
101 ³ / ₄ (258.445)			36 (91.44)
	98 ¹¹ / ₁₆ (250.668) ●	36 ³ / ₁₆ (91.918)	
78 ¹¹ / ₁₆ (199.868)			36 ³ / ₁₆ (91.918)
	78 (198.120) ●	36 ³ / ₈ (92.393)	
58 (147.32)	60 ¹ / ₂ (153.67) ●	36 ⁹ / ₁₆ (92.870)	36 ³ / ₈ (92.393)
	45 ¹ / ₂ (115.570) ●	36 ³ / ₄ (93.345)	
40 ¹ / ₂ (102.87)			36 ⁹ / ₁₆ (92.870)
	39 ⁵ / ₁₆ (99.855)	37 ¹ / ₄ (94.615)	
25 ¹ / ₂ (64.77)			36 ³ / ₄ (93.345)
	21 (53.34) ●	41 (104.14)	
19 ⁵ / ₁₆ (49.055)			37 ¹ / ₄ (94.615)
1 (2.54)			41 (104.14)

V. INSTALLATION

1. Circularity of the 22C can be reversed when +9 to +15 VDC is applied to the relay through the phono jack mounted on the PC board. Prepare the DC supply lines (22 AWG or larger) with a male phono plug, + lead to center pin, - lead to shell.
2. Route the DC line through the horizontal dipole, from the rear, and plug into PC board jack. Route the feedline the same way and connect to the SO-239 connector. Use a harness tie to secure both cables to boom just forward of the dipole. Secure again about 4" behind the dipole. This is the takeoff point - refer to the Assembly Pictorial. From this point, tape or strap feedline and DC line together to aid in routing.
3. Attach the 4"X 8" Boom to mast plate as close to the balance point as possible. Keep plate at least $\frac{1}{2}$ " from elements. Secure with 1- $\frac{1}{2}$ " U-bolts.
4. The 22C, like any antenna with vertical elements, MUST BE MOUNTED ON A NON-CONDUCTIVE MAST. Thickwall fiberglass tubing is ideal (available from KLM) although hardwood rod and PVC pipe of suitable strength have also been used. Use of a metal mast will adversely affect VSWR, gain, pattern, etc, acting just like an untuned element in the wrong place. Mount with rear element horizontal.
5. After the 22C is installed on the mast, route feedline/DC line off the boom in a large loop and re-attach to the mast at least 6" below the lowest element tip. If you have another antenna mounted below the 14C, route the lines down to the boom of the lower antenna and then back to the mast. This reduces the length of unsupported line and improves the appearance of the installation. See the sketches below:



VI. HINTS & TIPS

1. The 22C may also be used as two separately fed antennas. Remove the polarity switcher board and matching harness. Reinstall the balun to the horizontal feedpoints. Run separate 50 ohm feedlines. Attach solder lugs to braid and center conductor. Attach Gnd/Braid lug to insulator mounting screw stud. Attach center conductor lug to either of the feedpoint studs.
2. Stacking with other antennas: Keep 22C at least 80" from 2 meter antennas, 40" from non-resonant antennas. Keep element tips at least 1/4 wave (20" @ 144 MHz) from other antenna element tips or metallic objects.
3. Always use high quality coax for your feedline(s) and eliminate one possible source of losses, mismatches, and distorted patterns. Belden 8214 or Times FM-8 are recommended.

2M 22C PARTS LIST

KLM PART NO.	QTY	SIZE	PART DESCRIPTION
O.D.	1	1-1/2' O.D. x .049 x 62"	SWAGED 1-1/4"
	2	1-1/4" O.D. X .049 X 45"	SWAGED TO FIT 1"
	1	1" O.D. X .049 X 45"	STRAIGHT
	1	1" O.D. X .049 X 44"	STRAIGHT
	2	3/16 X 41"	ROD ELEMENT
	2	3/16 X 36-3/4"	ROD ELEMENT
	2	3/16 X 36-9/16"	ROD ELEMENT
	2	3/16 X 36-3/8'	ROD ELEMENT
	2	3/16 X 36-3/16"	ROD ELEMENT
	2	3/16 X 36"	ROD ELEMENT
	2	3/16 X 35-11/16"	ROD ELEMENT
	2	3/16 X 35-3/8'	ROD ELEMENT
	2	3/16 X 35"	ROD ELEMENT
	2	3/16 X 34-1/2"	ROD ELEMENT
	2	3/8 O.D. X .035 X 37-1/4"	DIPOLE ELEMENT
	2	3/8 O.D. X .035 X 37-1/4"	DIPOLE ELEMENT
	2	RG 142 4:1	COAX BALUN
	1	2M-14C	PHASING COUPLING HARNESS
	1	4" X 6" X 1/8"	BOOM TO MAST PLATE

BAG OF HARDWARE:

BAG #1

28007	2	6-32 X 1-1/2"	SCREWS
28201	2	6-32	NUTS
28351	2	#6	LOCKWASHERS
28014	4	8-32 X 1-1/4"	SCREWS
28019	2	8-32 X 2-1/2"	SCREWS
28015	4	8-32 x 1-1/2"	SCREWS
28016	4	8-32 x 1-3/4	SCREWS
28202	22	8-32	NUTS
28352	22	#8	LOCKWASHERS
28302	8	#8	FLATWASHERS
28206	8	5/16-18	NUTS
28356	8	5/16	LOCKWASHERS

BAG #2

66106	4		PEANUT INSERTS
66125	40		BUTTON INSULATORS
28218	44	3/16"	PUSHNUTS

LARGE BAG

28401	4	1-1/2"	U-BOLTS & CRADLES
66113	2	3/8 X 1-1/2"	TYPE 2 DRIVEN INSULATORS
66119	6		LARGE NYLON TIES
84072	1		ASSEMBLY MANUAL