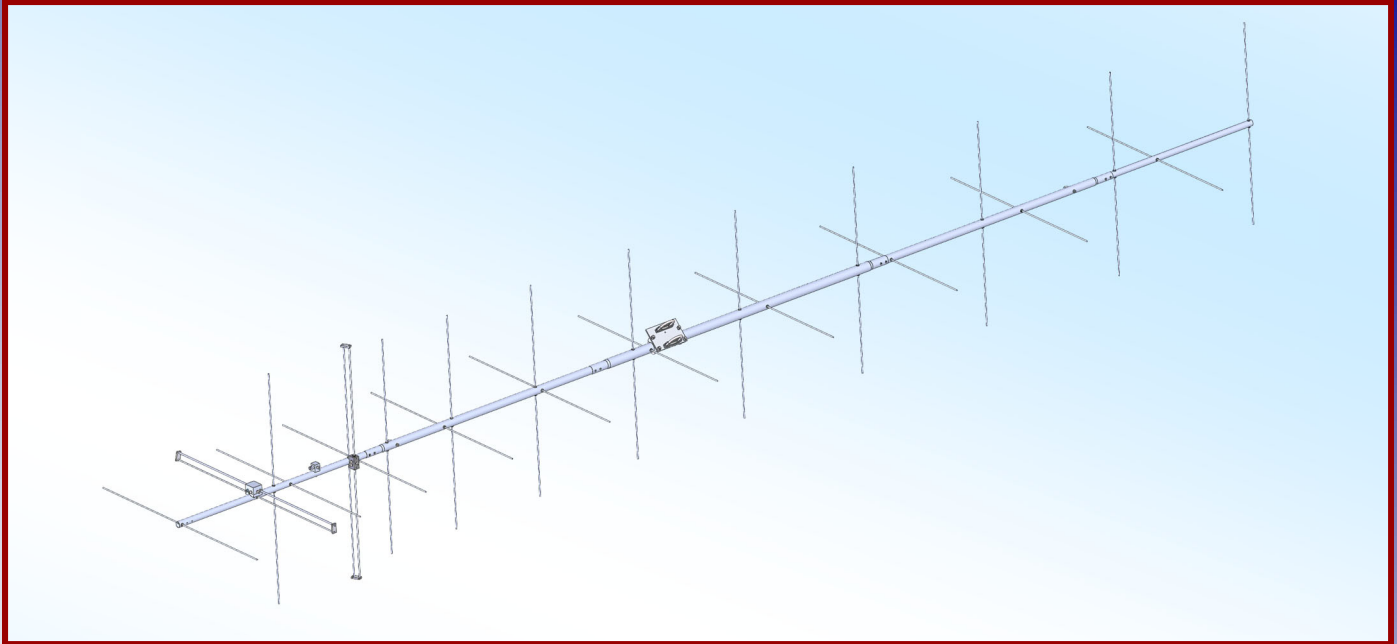




# M2 Antenna Systems, Inc. Model No: 136CP22



### SPECIFICATIONS:

Model .....	136CP22	Input Connector .....	"N" Female
Frequency Range.....	135 To 137 MHz	Power Handling .....	1.5 kW
*Gain .....	14.14 dBic	Boom Length / Dia.....	237" / 1-1/2" To 1"
Front to back .....	20 dB Typical	Maximum Element Length.....	42"
Ellipticity .....	>3db	Turning Radius: .....	Call
Beamwidth .....	40°	Stacking Distance.....	114" to 120"
Feed type .....	Folded Dipole	Mast Size.....	1-1/2" to 2" Nom.
Feed Impedance. ....	50 Ohms Unbalanced	Wind area / Survival .....	2.75 Sq. Ft. / 120 MPH
Maximum VSWR.....	1.5:1	Weight / Ship Wt.....	13 Lbs. / 15 Lbs.

**\*Subtract 2.14 from dBi for dBd**

### FEATURES:

The 136CP22 is a light, high performance circularly polarized antenna. Optimum match and gain are between 135 & 137 MHz for the satellite band. Computer design techniques help keep spurious side lobes low down for optimum signal to noise ratios. This antenna features the same CNC machined, O-ring and silicone-gel sealed, driven element assemblies common to all M<sup>2</sup> Yagi antennas. This insures years of trouble free performance regardless of weather.

# 136CP22 ASSEMBLY MANUAL

Tools required: Tape measure, 11/32" socket, spin-tite or end wrench, flat blade screwdriver, 7/16" end wrench, needle nose pliers and a 1/2" socket or end wrench.

Note: this antenna is made up of two basically identical yagi type antennas, one set beginning at the extreme rear of the boom and the other set beginning one quarterwave in front and in a plane at right angles to other antenna.

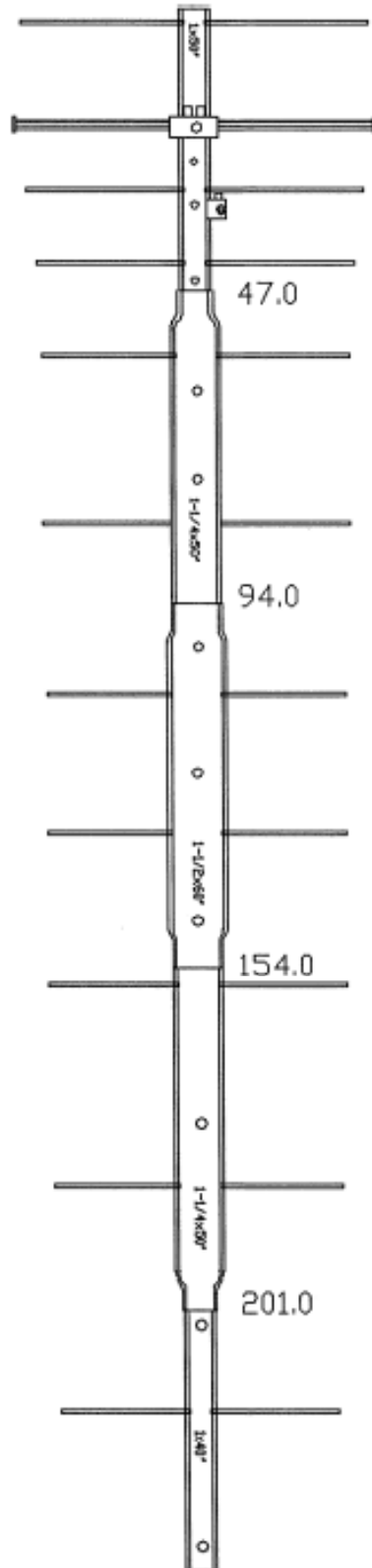
1. ASSEMBLING THE BOOM. Note the boom drawing and start with the rear one inch diameter section and the rear 1-1/4" section. Slip the one inch section into the swaged or necked down end of the rear 1-1/4" section, align the two screw holes and add two 8-32 x 1-1/2" screws, lock washer and nuts and tighten. Next, add the 1-1/2" section, again noting hole positions referenced to the end that connects to the rear 1-1/4" section. Slip the two sections together and add the 8-32 x 1-3/4" screws, lock washers and nuts and tighten. Now add the front 1-1/4" and 1" diameter sections in similar manner. This completes the boom assembly.

Note: at this point it may be handy to add the 4" x 6" x 3/16" boom to mast plate using two 1-1/2" U-bolts and cradles. Locate the plate at 104" from the rear of the boom and mount the plate in a vice or on a temporary mast to hold the antenna about waist high for easy element installation.

2. ELEMENT INSTALLATION. Begin at the rear of the boom. Locate a Reflector (see drawing x 3/16") rod element and slide on a black button insulator to the balance point or approximate middle. Insert the rod in through the rear set of 5/16" diameter holes and install the second button insulator and push both insulators up tight against the boom. Center the element only, approximately because it is easier to center all the elements in this plane at one time.
3. The next rod element to install is part of the driven element assembly. Refer to the ANTENNA DIMENSION DRAWING for the proper length. Install it the same as the reflector element. Continue installing 3/16" rod elements until all are in place.
4. CENTERING THE ELEMENTS. It is generally easiest to use a tape measure and simply equalize the amount of element sticking out of the boom on each side to within 1/16 inch. Tips of the elements from the rear of the boom and look for gross irregularities. Correct if found and prepare to install the element retainers or Keepers.

# 136CP22 DIMENSION SHEET

ELEMENT H	SPACING V		ELEMENT V	LENGTH H
0.5				42.0
17.5	21.5			42.5
24.562			42.0	39.375
39.0	38.25		42.5	39.062
57.625	45.562	47.0	39.375	
	60.0			38.75
79.375	78.625		39.125	
			38.75	38.375
	100.375	94.0		
103.437			38.437	38.125
	124.437			
129.5			38.125	37.813
	150.5			
157.125		154.0	37.875	37.562
	178.125			
186.125			37.562	37.25
	207.125	201.0		
216.437			37.313	37.062
	237.437			
			37.062	



# 136CP22 ASSEMBLY MANUAL

5. **INSTALLING THE KEEPERS.** Locate the 3" x 3/8" aluminum tube (INSERTION TOOL). Start a keeper on the end of the first element with your fingers. **BE SURE TO HOLD THE ELEMENT FIRMLY TO PREVENT IT FROM SLIDING OFF CENTER.** Using the INSERTION TOOL, push the keeper up against the button insulator. Repeat for the other side. Continue until all the keepers are in place. Repeat for the other side. Continue until all of the keepers are in place.

6. **INSTALLING THE SECOND SET OF ELEMENTS.** Again, refer to the ANTENNA DIMENSION DRAWING and install the second set of elements the same as the first set.

7. **DRIVEN ELEMENT ASSEMBLY.** Mount the DRIVEN ELEMENTS as shown in the sketch with the two BALUN connectors to the rear. **NOTE** the position of the blocks are critical and it is shown in the RIGHT HAND CIRCULAR position. If LEFT HAND CIRCULAR is required, reverse the side the front to block is mounted on. Use 8-32 x 1-1/4" screws to attach the blocks to the boom and tighten in place. Add the JUNCTION BLOCK as shown, with the "N" connector facing the rear, fastening with another 8-32 x 1-1/4" screw. Attach the SHORTING BLOCKS to the ends of the driven elements and tighten in place with the 5/64" Allen wrench provided. Orient the boom so that REAR driven element block and the shaped 3/16" rod pieces into the boom from the top through the two sets of one inch holes spaced to accept the rod ends. Install KEEPERS on each rod end as it protrudes from the bottom of the boom. These U clips form attach points for the black Dacron boom support cable installed near antenna completion.

8. **ADDING THE BALUNS AND PHASING HARNESS.** The BALUN cables are about 3 feet long and the PHASING CABLES are half as long. Attach the baluns first and tighten the connectors GENTLY with a 7/16" end wrench while holding the body of the connector with a pair of needle nose pliers. This prevents the cable from twisting during installation. Now add the phasing cables as shown in the sketch. Tighten the same as the balun connectors.

9. **FINALIZING THE ANTENNA.** The main feedline is attached now and routes back to the rear of the boom. USING THE BLACK CABLE TIES provided, form the various cables against the boom and AWAY FROM ELEMENTS. The last tie point for the main feedline should be just about one inch in front of the rear REFLECTOR and coming away at right angles to it.

10. Position and tighten the BOOM TO MAST PLATE moderately at inches from the rear of the boom and align it with VERTICALLY POLARIZED WHEN THE ANTENNA IS MOUNTED ON THE SUPPORT MAST OR "H" FRAME.

Install the last 2" U-bolt into the small TURNBUCKLE PLATE and attach the turn buckles. If possible install a short (one foot long or less) temporary mast section through the 2 inch U-bolts in the boom to mast plate and slide on the turnbuckle plate right down against the boom to mast plate ALTERNATELY, temporarily install the turnbuckle U-bolt into the top set of U-bolt holes in the boom to mast plate. This "locks" the alignment of the turnbuckle plate to the boom to mast position. Now attach one end of the BLACK DACRON SUPPORT LINE to the front U clip. Two turns of the line and a square knot is adequate and tape the left over end back to the main line to prevent fraying. Route the line back to the forward turnbuckle as on the U clip. Repeat for the rear section of support line. When completed, the two lines should be tight, the turnbuckles laying flat out just over the boom and the turnbuckle plate U-bolt CENTERED over the two other U-bolts in the boom to mast plate. When the antenna is installed in a mast, the turnbuckle plate is slid up on foot above the boom and after turnbuckle adjustment, the boom should be perfectly straight.

THIS COMPLETES THE ANTENNA ASSEMBLY. THE RECOMMENDED MAST FOR THIS ANTENNA IS TWO INCH DIAMETER 1/4" WALL FIBERGLASS OR EQUIVALENT. DO NOT MOUNT ON A METAL MAST OR RUN THE MAIN FEEDLINE FORWARD AND DOWN THE MAST AS THE ANTENNAS VSWR, GAIN AND CIRCULARITY WILL BE DEGRADE.

Carefully Manufactured by  
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# 136CP22 PARTS LIST

PART LIST	
Boom section 1" x .058 x 50.0 aluminum	1
Boom section 1' x .058 x 40.0 aluminum	1
Boom section 1-1/4" x .058 x 50.0 aluminum	1
Boom section 1-1/4" x .058 x 50.0 aluminum	1
Boom section 1-1/2" x .058 x 60.0 aluminum	1
Driven element assembly top section	2
Driven element rod 3/16 x	2
Parasitic elements rod (see drawing for lengths)	20
Balun cable RG-6U with sealed 'F' fittings	2
Phasing cables RG-6 with sealed 'F' fittings	2
Junction block machined aluminum	1
Boom to mast plate 4 x 6 3/16"	1
Turnbuckle plate 1-1/2 x 4"	1
Dacron support line 3/32 x	1
U-bolt 2"	3
U-bolt 1-1/2"	2
Assembly instructions	1
HARDWARE BAG	
Turnbuckles 1/4"	2
Nuts 5/16-18 stainless(for U-bolts)	10
lockwashers 5/16" split ring stainless	10
Shorting blocks machined aluminum	4
Screw 8-32 x 1-3/4 slot panhead stainless	4
Screw 8-32 x 1-1/2" slot panhead stainless	4
Screw 8-32 x 1-1/4" slot panhead stainless	3
Set screw 8-32 x 3/16" int. hex stainless	8
Nut 8-32 hex stainless	8
Lockwasher #8 split ring stainless	8
Allen wrench 5/64"	1
U clips 3/16 rod formed	2
Button insulator black 3/16"	44
Keeper stainless 3/16"	48
Insertion tool 3 x 3/8" aluminum	1
Nylon ties black	5