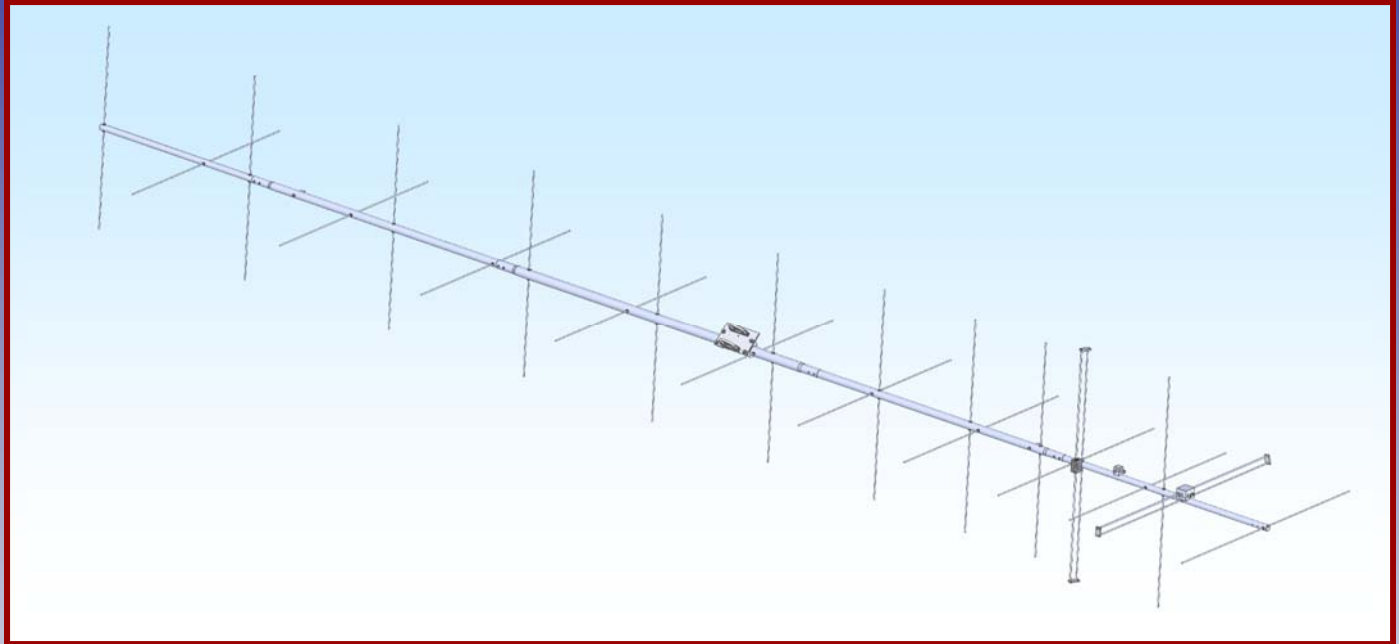




M2 Antenna Systems, Inc. Model No: 149CP22



SPECIFICATIONS:

Model	149CP22	Input Connector	"N" Female
Frequency Range.....	144 To 150 MHz	Power Handling	1.5 kW
*Gain	14.25 dBic	Boom Length / Dia.....	216.5" / 1-1/2" To 1"
Front to back	20 dB Typical	Maximum Element Length.....	39"
Ellipticity	>3db	Turning Radius:	115"
Beamwidth	40°	Stacking Distance.....	10' High & 10' Wide
Feed type	Folded Dipole	Mast Size.....	1-1/2" to 2" Nom.
Feed Impedance.	50 Ohms Unbalanced	Wind area / Survival	2 Sq. Ft. / 120 MPH
Maximum VSWR.....	1.4:1	Weight / Ship Wt.....	12.5 Lbs. / 14 Lbs.

***Subtract 2.14 from dBi for dBd**

FEATURES:

The 149CP22 is a light, high performance circularly polarized antenna. Optimum match and gain are between 144 & 150 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 M² Yagi antennas. This insures years of trouble free performance regardless of weather.

149CP22 ASSEMBLY MANUAL

TOOL REQUIRED FOR ASSEMBLY: screwdriver, 11/32" nut driver or wrench, 7/16" and 1/2" end wrenches, pliers, measuring tape.

1. Start by laying out the boom sections, noting hole positions and matching to the DIMENSION SHEET. Use 8-32 X 1-1/2" screws and locknuts to join 1" to 1-1/4" sections; 1-3/4" screws for 1-1/4" to 1-1/2" sections.

2. Separate elements by length into two identical sets, "H" and "V." Position the "H" element set along the boom by "H" length and position as shown the DIMENSION sheet. Start with the reflector (longest) element. Balance it on your finger to find rough center and push on a black button insulator to about 1/2" off center. Push the element through the holes 1/2" from the rear of the boom and install the second button, snugging it up into boom. **DO NOT BOTHER CENTERING** the element at this time and **DO NOT INSTALL** the stainless steel shaft retainers yet. It is easier to do after all the horizontal elements are installed in the boom.

3. Install the 3/16" rod DRIVEN ELEMENT as you did the reflector. Then continue with the installation of the DIRECTORS. **Note that the Director Elements do not consistently diminish in length from rear to front, so pay close attention to length and position.**

4. Now begin centering the elements. Use a tape measure to EQUALIZE the amount the element sticking out on each side of the boom. Once you have all the elements centered, sight down the element tips from the rear comparing each side. Look for any obvious discrepancies and correct if found.

5. Begin installing the stainless retainers. Use thumb and index finger to hold a retainer over end of the 3/8 x 3" push tube (retainer dished into tube). Hold the element firmly and start the retainer onto the rod by applying pressure with the push tube. Push the retainer until up tight against the button insulator (Locking pliers, **lightly** clamped up against opposite button insulator will help maintain center reference and keep you from pushing the first retainer too far). Repeat for the opposite side. Continue installing retainers until all elements are locked in place.

6. Mount the **HORIZONTAL DRIVEN ELEMENT BLOCK / ROD ASSEMBLY** to the **TOP** of the boom using a single 8-32 X 1-1/4" screw. See FIG 2. for reference. Install the 8-32 x 1/4" set screws (internal Allen head - tool supplied) into the SHORTING BARS. Slide the bars onto the Driven Element Block Rods and the driven element rods. Position the Shorting Bars at the ends of the 3/16" rod that passes through the boom. Align the bars with each other and tighten the set screws.

7. Mount the "T" JUNCTION BLOCK on the top of the boom. See FIG 2. for hole location. Secure with a 8-32 X 1-1/4" screw.

8. ASSEMBLING THE VERTICAL ELEMENTS

Repeat steps #2 through #5 for the Vertical elements, using the Dimension Sheet as your guide for lengths and spacing.

9. INSTALLATION OF THE VERTICAL DRIVEN ELEMENT BLOCK DETERMINES THE CIRCULARITY OF THIS ANTENNA. THE ORIENTATION OF THE BLOCK FOR RHC - RIGHT HAND CIRCULARITY, IS SHOWN ON THE DIMENSION SHEET AND CABLE ROUTING DIAGRAM.

10. Attach Baluns and Phasing lines to the Driven Element Blocks and Junction Block as shown on FIG. 2. Tighten the connectors **gently** using a 7/16" end wrench. A lot of torque is unnecessary. Depending on model and polarity, the Vertical balun may loop around another element. This is normal. Form balun and phasing line coax close to the boom and secure with nylon cable ties. Ties should be snug but not crushing or kinking the coax.

149CP22 ASSEMBLY MANUAL

11. Use good quality coax and "N" connector for your feedline. Secure feed coax near connector on Junction Block, to provide stress relief, route to rear of boom and secure again. Allow coax to hang in a loop between the rear end of the boom and the reattachment point (at least 12" beyond element tips) on the mast or cross boom. ***Do not route feedline to boom- to- mast plate as exiting antenna here will adversely affect circular field.***

12. The boom to mast plate is normally mounted to the boom at, ***or near***, the physical balance point, and ***only*** to the 1-1/2" boom section. Use two 1-1/2" U-bolts and the stainless nuts and lock washers provided. DO NOT OVER TIGHTEN. 2" U-bolts and stainless hardware are provided for mounting the antenna to your NON-CONDUCTIVE 2" mast or cross boom. Since the feed line represents significant weight it is best to have it attached and fastened to the boom with cable ties before final mounting of the plate. Element alignment is your choice. Elements oriented at 45 degrees works well for bringing the feedline off with minimal interference to the pattern or VSWR.

13. IF YOU WILL BE USING THE ANTENNA FOR TERRESTRIAL USE ONLY, you may want to consider installing the overhead Dacron cord boom support system (supplied). FOR SATELLITE USE most users don't find it necessary and prefer to "keep the antenna simple". A slight droop in the boom may be noted but it will not effect the antenna performance.

14. To add the support, install a 2" U-bolt into the TURNBUCKLE PLATE and attach the turnbuckles. Temporarily install the turnbuckle U-bolt studs into the top set of U-bolt holes in the boom to mast plate and loosely secure with a couple of 5/16" nuts. This "locks" the alignment of the turnbuckle plate to the boom to mast position. Install the two eyebolts into the boom and secure with retainers. Rotate boom so clips are vertical.

15. Now attach one end of the BLACK DACRON SUPPORT CORD to the front eyebolt. Two turns of cord and a square knot is adequate. Heat-seal the left over end and tape back to the main line. Route the cord back to the rear clip and knot the same. Even-up excess cord at the turnbuckle plate and cut. The turnbuckles should be extended until just a thread or two shows inside the body of the turnbuckle. Attach cord ends to the turnbuckles as on the eyebolts. When completed, the two lines should be tight, the turnbuckles laying flat out just over the boom. After the antenna is installed to a mast, the turnbuckle plate is attached and slid up about one foot until the boom is straight. Use the turnbuckles to balance and fine tune the support. After final adjustments, safety-wire the turnbuckles to maintain settings.

16. The 149CP22 is a circular polarized antenna and creates a field in all planes or polarities. PERFORMANCE DETERIORATES SIGNIFICANTLY if it is mounted on a metal (conductive) mast / cross boom or if the feedline exits the boom anywhere but at the rear. A 2" mast or cross boom of any NON-CONDUCTIVE material can be used. Fiberglass is the prime choice for its strength and weather resistance (1/4" wall x 2" OD). Fiberglass tube is available from M²). Mount the 149CP22 so that element tips are at least 12" from any conductive material (mast, tower, feedline, etc.).

17. If you have purchased PS149CP22 polarity switch use the dimension sheet and the picture in FIG 4. for driven element, balun and phase line orientation. RHCP is shown in both the dimension sheet and in FIG 4. when the polarity switch is un-energized.

THIS COMPLETES THE ANTENNA ASSEMBLY.

149CP22 DIMENSION SHEET

ELEMENT SPACING		149CP22 SHOWN RHCP	ELEMENT LENGTH		
H	V		V	H	
0.50				38.50	
15.75				39.00	
22.50	19.50			38.5	35.875
35.75	34.75			39.00	35.75
	41.50			35.875	
52.625	54.625		EYEBOLT	35.75	35.313
72.50	71.625			35.313	35.062
	91.50			35.062	
94.50					34.75
	113.125			34.75	
118.125					34.00
	137.125			34.50	
143.375					34.188
	162.375			34.188	
169.875					34.00
	189.25		EYEBOLT	34.00	
197.50					33.75
	216.50			33.75	

149CP22 DIMENSION SHEET W/ PS

ELEMENT SPACING		149CP22 W PS SHOWN RHCP	ELEMENT LENGTH		
H	V		V	H	
0.50				38.50	
15.75				38.5	39.00
22.50	19.50			39.00	35.875
35.75	34.75			35.875	35.75
	41.50			35.75	35.313
52.625	54.625			35.313	35.062
72.50	71.625			35.062	34.75
94.50	91.50			34.75	34.00
118.125	113.125			34.50	34.188
143.375	137.125			34.188	34.00
169.875	162.375			34.00	33.75
189.25	189.25			34.00	
197.50	216.50			33.75	

149CP22 ASSEMBLY DETAILS

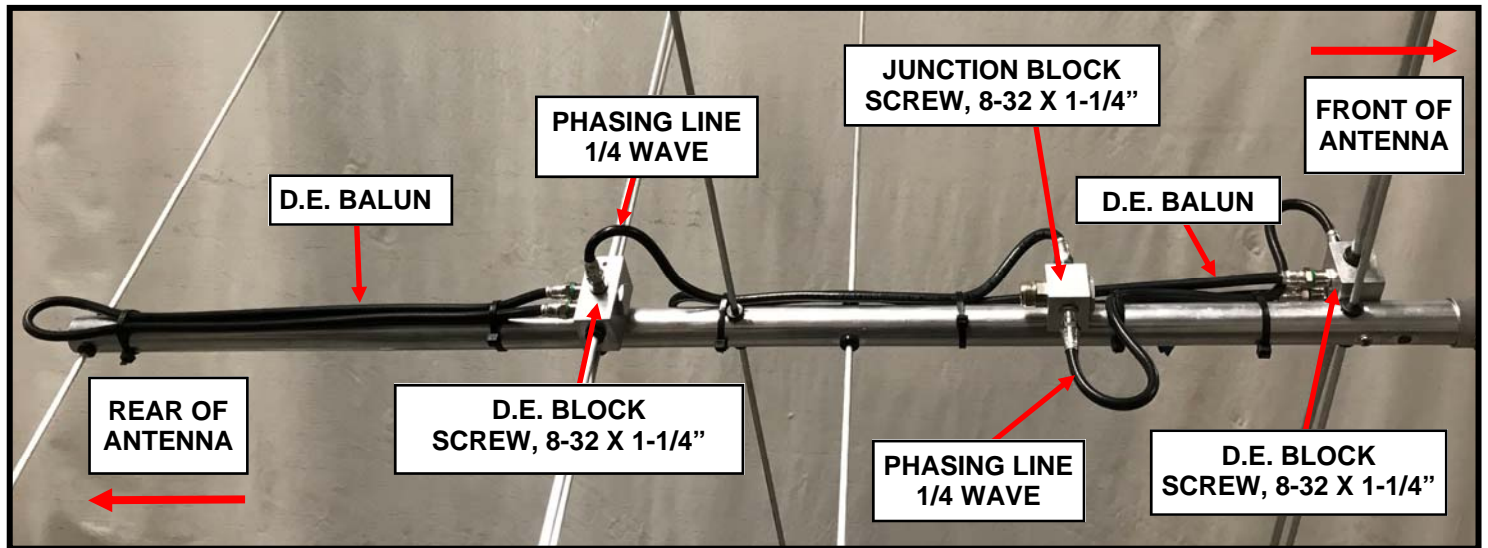


FIG 2.
CABLE ROUTING DIAGRAM

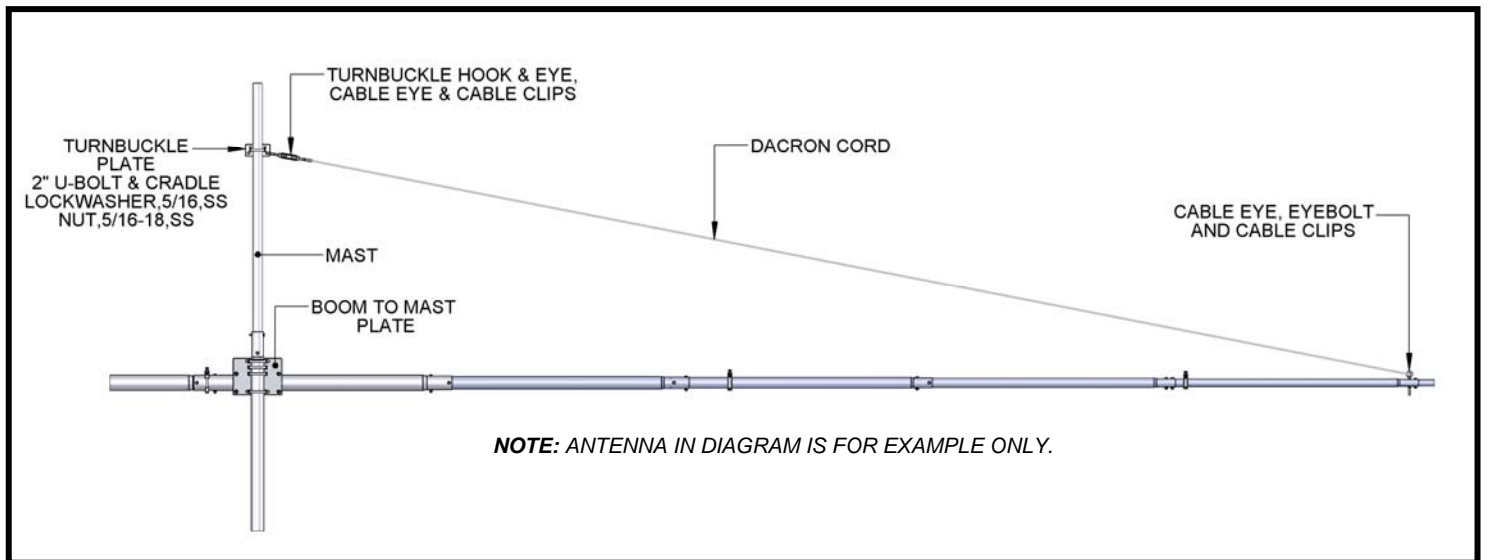


FIG 3.
VERTICAL RISER ASSEMBLY DIAGRAM

149CP22 W/ PS CABLE ROUTE DETAILS

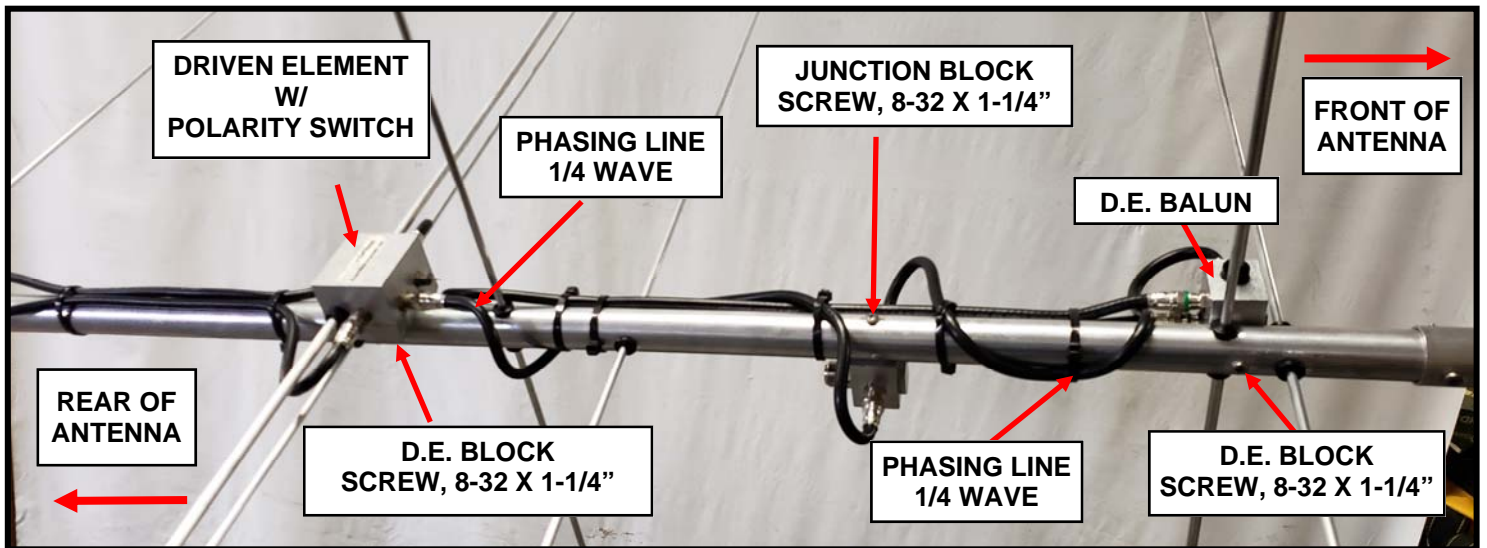


FIG 4.
CABLE ROUTING DIAGRAM

149CP22 PARTS & HARDWARE

DESCRIPTION	QTY
BOOM SECTION #1, 1" X .058" X 40", PLAIN	1
BOOM SECTION #2, 1" X .058" X 31.5", PLAIN	1
BOOM SECTION #3, 1.250" X .058" X 48.75", SOE	1
BOOM SECTION #4, 1.250" X .058" X 48.75", SOE	1
BOOM SECTION #5, 1.500" X .058" X 60", SBE.....	1
ELEMENTS, 3/16" ROD x Dimension Sheet	22
DRIVEN ELEMENT BLOCK ASSEMBLY (SADEA149CP22).....	2
JUNCTION BLOCK ASSEMBLY (SADE0060)	1
BALUN, RG-6, 1/2 WAVE, 34"	2
PHASING CABLE, RG-6, 1/4 WAVE, 17.5"	2
BOOM-TO-MAST PLATE, 4" X 6" X .188" (M2APT0022).....	1
TURNBUCKLE PLATE, 2" X 4" X .125" (M2APT0102).....	1
U-BOLT AND CRADLE, 2"	3
U-BOLT AND CRADLE, 1-1/2"	2
DACRON ROPE, 3/32" X 252"	1
ASSEMBLY MANUAL	1

IN HARDWARE BAG:

TURNBUCKLES, 1/4"	2
SHORTING BAR, (M2ASB0090)	4
BUTTON INSULATORS	44
KEEPER, SS.....	48
NUT, 5/16-18, SS.....	10
LOCK WASHER, 5/16", SS.....	10
EYEBOLT, 1/4" X 3"	2
LOCKNUT, 1/4-20, SS	2
SCREW, 8-32 X 1-3/4", SS.....	4
SCREW, 8-32 X 1-1/2", SS.....	4
SCREW, 8-32 X 1-1/4", SS.....	3
LOCKNUT, 8-32, SS.....	8
SET SCREW, 8-32 X 1/4", SS	8
CABLE TIE, NYLON	5
ALLEN HEAD WRENCH, 5/64"	1
PUSH TUBE, 3/8" X 3"	1

CAREFULLY MANUFACTURED BY:

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149CP22 w PS PARTS & HARDWARE

DESCRIPTION	QTY
BOOM SECTION #1, 1" X .058" X 40", PLAIN	1
BOOM SECTION #2, 1" X .058" X 31.5", PLAIN	1
BOOM SECTION #3, 1.250" X .058" X 48.75", SOE	1
BOOM SECTION #4, 1.250" X .058" X 48.75", SOE	1
BOOM SECTION #5, 1.500" X .058" X 60", SBE.....	1
ELEMENTS, 3/16" ROD x Dimension Sheet	22
DRIVEN ELEMENT BLOCK ASSEMBLY (SADEA149CP22).....	1
DRIVEN ELEMENT W POLARITY SWITCH (SAPS149CP22)	1
JUNCTION BLOCK ASSEMBLY (SADE0060)	1
BALUN, RG-6, 1/2 WAVE, 34"	2
PHASING CABLE, RG-6, 1/4 WAVE, 17.5"	2
BOOM-TO-MAST PLATE, 4" X 6" X .188" (M2APT0022).....	1
TURNBUCKLE PLATE, 2" X 4" X .125" (M2APT0102).....	1
U-BOLT AND CRADLE, 2"	3
U-BOLT AND CRADLE, 1-1/2"	2
DACRON ROPE, 3/32" X 252"	1
ASSEMBLY MANUAL	1

IN HARDWARE BAG:

TURNBUCKLES, 1/4"	2
SHORTING BAR, (M2ASB0090)	4
BUTTON INSULATORS	44
KEEPER, SS.....	48
NUT, 5/16-18, SS.....	10
LOCK WASHER, 5/16 SS.....	10
EYEBOLT, 1/4" X 3"	2
LOCKNUT, 1/4"-20.....	2
SCREW, 8-32 X 1-3/4", SS.....	4
SCREW, 8-32 X 1-1/2", SS.....	4
SCREW, 8-32 X 1-1/4", SS.....	3
LOCKNUT, 8-32, SS.....	8
SET SCREW, 8-32 X 1/4", SS	8
CABLE TIE, NYLON	5
ALLEN HEAD WRENCH, 5/64"	1
PUSH TUBE, 3/8" X 3"	1

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